REPORT

Mirny (Kazakhstan) 1GW Wind Farm Project

ESIA Report Chapter 04 - Impact Assessment, Physical Components

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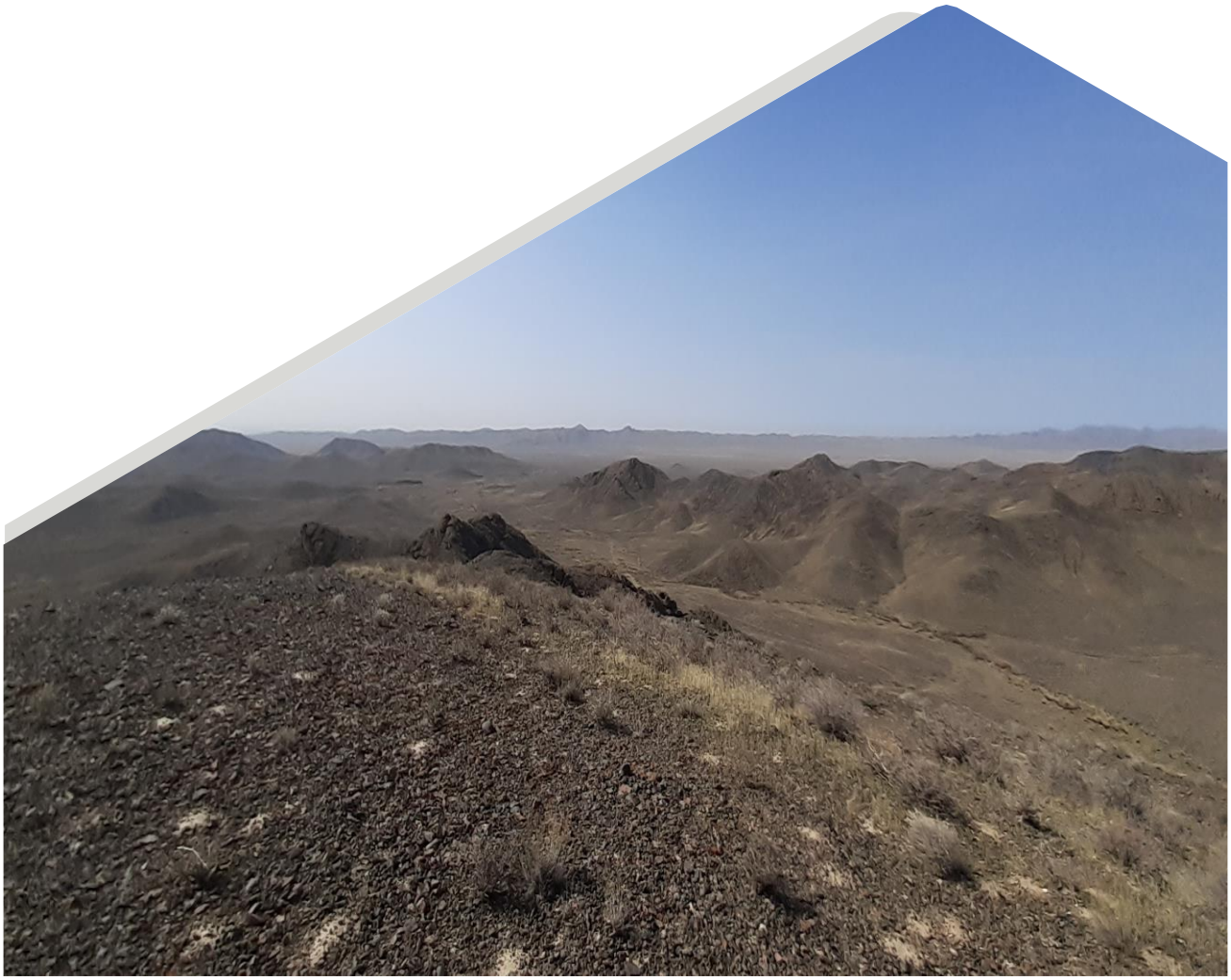

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APPENDICES

4.0 IMPACT ASSESSMENT – PHYSICAL COMPONENTS

This section presents the results of the impact assessment on physical components conducted according to the Impact Assessment ("IA") Methodology described in Chapter 03. For each impact factor identified an impact assessment is presented for all affected components, along with the related mitigation measures and the residual impacts. The Project is composed of two elements, the WPP and the OHTL. When these generate different impacts on an E&S component, the impact assessment reported below presents them separately.

4.1 Impact Assessment for Construction Phase

4.1.1 Impact Assessment

As described in Chapter 03 of this ESIA ("IA Methodology"), the Project actions carried out during the Construction phase can be primary generators of environmental or social pressures, which are identified as impact factors.

The potential environmental impacts that may be generated by the identified impact factors during the construction phase are described in the following table.

Table 1: Impact Assessment Physical Components - Construction Phase.

Impact Factor	Impact Assessment	Components Affected
Removal/degradation of soil and vegetation	The Project-related roads to be built and/or renovated, the WTGs foundations and crane pads areas and the OHTL steel transmission towers areas will require vegetation clearance, topsoil stripping and levelling. The removal/degradation of soil and vegetation will cause localized changes in soil structure, texture, moisture and infiltration rate; moreover, they will likely alter original landforms, native vegetation, and waterways, that could lead to surface runoff, soil erosion, stream water sedimentation, and land degradation. Even though the soil erosion is a natural process, the excavation works can accelerate it, since the disturbance of the soil makes it more vulnerable to being washed away by rain or blown away by wind. Without the implementation of appropriate erosion control measures, this can lead to issues such as sediment runoff and even the destabilization of the excavation site itself. In addition, the soil degradation due to erosion could lead to an exacerbation of the effects of severe events, such as droughts and/or floodings. During extreme rainfall events, the exposed soils at WTG foundations, crane pads, OHTL tower areas, and associated access roads may be particularly susceptible to accelerated erosion, potentially increasing sediment runoff and affecting nearby watercourses. The implementation of targeted soil erosion control strategies, such as temporary stabilization of disturbed surfaces, proper drainage channels, and progressive re-vegetation, will help minimize these risks and reduce the likelihood of contamination or destabilization during heavy rain events. Impacts related to soil and vegetation removal are expected to be smaller in magnitude for the construction of the OHTL when compared to the construction of all the structures required for the WPP. This is because the construction activities of the OHTL and its parallel support road will require considerably less excavation and soil disturbance. In addition, many parts of the OHTL will be built close to existing structures, i.e., areas that have been already disturbed.	▪ Soil

Impact Factor	Impact Assessment	Components Affected
Change in the local morphology and topography	In relation to the geomorphological environment that could be potentially impacted by the Project, two main scenarios are considered: - The impact on geomorphological features, including landforms and geomorphological units/assets which might be essential for supporting certain ecosystems and could be altered or destroyed by human activity; - The impact on geomorphic hazards and processes that naturally occur in the Project AoI, which could be induced, modified and/or exacerbated by the human activity. Due to the magnitude of the Project construction activities, it is considered that the Project has the potential to generate changes in the local geomorphological environment. The activities include mainly earth movements and excavation activities necessary for building the infrastructure foundations and subsequent filling and backfill activities; the preparation of subgrades for the construction of new roads; and earth movements for the construction of all the necessary infrastructure for the campsite, among others. In addition, the Project demand of raw materials will make use of various materials, the majority of which will be taken on site as much as possible in order also to minimize the impact on transportation; however part of the materials will be acquired both from local quarries and external quarries, therefore the Project will also be impacting the local geomorphology, albeit indirectly. The baseline characterization informs that risks of geomorphic hazards are low in the WPP construction site, however they do exist and need to be accounted for, such as landslides and flooding. In particular, flood risk is considered low in the WPP AoI, as seasonal streams flow in an outward direction from the Project footprint; this is due to the elevated topography that drains water to the lower elevation regions, which could instead contribute with water volume and affect communities located downstream (such as the flooding observed near Ulken and Shyganak villages in February 2024). If the Project drainage infrastructure is not properly dimensioned, this may cause aggradation of the drainage channels (accumulation of sediments), which may increase the risk of flooding. Moreover, this aggradation could carry a larger amount of sediment to the lower areas, potentially negatively impacting communities and ecosystems located downstream. In relation to landslides, a moderate risk due to the annual spring snowmelt and presence of relevant seismicity was identified in the WPP construction site. An inadequate slope grading, poor drainage and the eventual disturbance of old landslide zones could then increase the landslide risk. The impact on the geomorphological environment is expected to be lower for the construction of the OHTL. This is because, although very extensive (more than 200 km long), OHTL construction requires less excavation, ground disturbance, and less materials than for the WPP. However, human intervention can still cause impacts on the local geomorphological assets and processes, and therefore appropriate mitigation measures must be implemented.	▪ Geomorphology and topography
Change in the local hydrology and surface water quality	During rainfalls, the stormwater generated has the potential to wash away the loose soil, along with various materials and products stored outside. As the stormwater flows, it can pick up sediment and debris and pollutants such as chemicals residues and carry them to the nearest surface water bodies. Wastewater, if not properly managed, can introduce several contaminants and pathogens to soil, which could eventually reach surface water bodies.	▪ Hydrology and Surface Water

Impact Factor	Impact Assessment	Components Affected
	In addition, some construction activities (such as excavations, transportation of materials and machinery, among others), if not well planned, may interfere with the small seasonal streams and water springs existing in the WPP AoI, which may cause the disruption of the natural land irrigation and drainage especially during the rainy season. Project impacts on surface water bodies may also occur due to interference caused by potential pollutants from accidental spills of hazardous substances. Furthermore, maintaining clean and clear areas may occasionally require the use of pesticides. If such management activities involve chemicals, particularly pesticides or herbicides, preference will be given to products with low human toxicity, proven effectiveness against the target species, and minimal impact on non-target species and the environment. Appropriate control measures will also be applied as part of the associated management plans. The two most significant water bodies in the Project AoI (Lake Balkhash to the north, and the Shu River to the south) are located far from the WPP site itself, but very close to the OHTL. There is no reason to believe that the construction of the OHTL to the SS Yukgress will cause any disruption to the waters of Lake Balkhash since the SS is located in the highest part of the plateau, at a distance of 350 m before the lake. On the other hand, the OHTL section that will be connected to the SS Shu, in the south, will literally cross the Shu River and the tributary Kuragaty River. However, given the distance between the pylons and the waterbody, the construction activities in this section are predicted to have a low potential to disrupt watercourses and wetlands.	
Change in the local hydrogeology and groundwater quality	Groundwater may be impacted by any pollutants that reaches the ground and percolates through the soil. Any release of pollutants is more likely to reach shallow aquifers that are present in the Project AoI, which sometimes even support small water pools on the surface, as indicated in the baseline studies for the WPP site. Pollution of soil and groundwater is possible in the event of accidental spills of pollutants and/or if solid waste and wastewater from construction activities are disposed of or managed improperly, and if leachate from waste enters the ground. In addition, earthmoving works and even blasting activities that will be needed for construction, could mobilize metals and other elements that are naturally present in the local geological/pedological structure, potentially reaching groundwater. Moreover, in some instances, materials such as detonators and explosives not entirely combusted during blasting, may result in the release of soluble substances into the groundwater. The same reasoning applies to the construction of the OHTL since excavations will be necessary for the towers' foundations and for the construction of the permanent support road. However, it is expected that a potential impact on groundwater during the construction of the OHTL would be of lesser magnitude than in the WPP site, due to expected less ground disturbance and less need for materials when compared to the WPP site.	▪ Hydrogeology and Groundwater
Emission of greenhouse gases	During construction, heavy construction vehicles and equipment are the main Project contributors to greenhouse gas ("GHG") emissions. Construction vehicles, in particular, are known for their heavy carbon footprint, emitting harmful pollutants into the atmosphere. A summary of the construction activities and their potential impacts on the atmosphere from GHG emissions are described below:	▪ Air Quality

Impact Factor	Impact Assessment	Components Affected
	- Clearing vegetation will require the use of heavy machinery that burn fossil fuels; moreover, as an indirect impact, vegetation removes carbon dioxide from the air naturally. The removal of vegetation interrupts the natural carbon capturing process; - Earthworks will require the use of heavy-duty vehicles (excavators, dump trucks, vibrating roller, loaders), fed by diesel engines, generating large quantities of pollutants such as carbon dioxide ("CO_2"); - Transportation services (procured materials, equipment, waste disposal, etc.) will require the use of vehicles that burn fossil fuels; - The operation of backup fuel-based power generators will emit CO_2 into the atmosphere through fuel burning; - Use of large quantities of cement for the preparation of concrete will generate large amounts of CO_2. In fact, worldwide, the manufacture of cement is responsible for around 8% of global CO_2 emissions[1]. According to the UN[2], the production of construction materials such as cement, steel and aluminium has a very significant carbon footprint, and the manufacture of these materials contributes largely to GHG emissions into the atmosphere. - Although most of the construction materials will be sourced locally, the wind turbines and also some heavy, large-sized equipment for the SS will be imported primarily from China, via the international and national road network. According to literature, road freight makes up for around 5-8% of global CO_2 emissions[3]. The impact of Project construction alone in terms of GHG emissions into the atmosphere is considered negligible when compared to the total emissions from Kazakhstan. However, it is a contributing part of the total, albeit small, therefore relevant mitigation measures shall be applied.	
Emission of dust and particulate matter	During the construction phase, the main impacts on air quality are expected to be the generation of dust and particulate matter, due to activities such as excavation, levelling, transportation of materials, loading and unloading of materials, road construction, waste stacking, etc. These activities are short-term and temporary; therefore, dust is unlikely to cause long-term or widespread changes to local air quality since particles fall out of the atmosphere quickly after it release. While community receptors are very limited and sparse, dust is expected to be an aspect to consider for this Project, when it comes to the health of workers, in particular related to the following: - Small particles of construction dust from cement, concrete, silica, and wood contain sulphates and silicates, which can increase the risk for respiratory problems; - Dust and particulate matter emissions due to the natural climate and landscape (i.e., desert/arid area) potentially leading to health risk for workers, especially when considering strong wind gusts that will raise even further the concentrations of suspended dust in the breathable air.	▪ Air Quality
Emission of gaseous pollutants	The combustion of fossil fuel will be generated from construction equipment and machinery such as the heavy-duty vehicles (e.g., dump trucks, cement mixer, transport trucks, excavators, cranes and bulldozers), the stationary engines (e.g., generators, pumps, compressors, mobile cement mixer trailer) and heating of the buildings,	▪ Air Quality

[1] Concrete is Worse for the Climate Than Flying. Why Aren't More People Talking About It? - Inside Climate News.

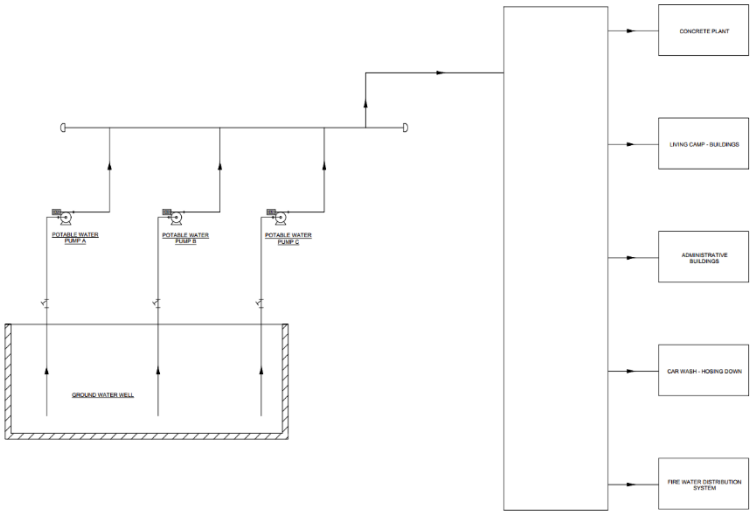
[2] Building Materials And The Climate: Constructing A New Future | UNEP - UN Environment Programme.

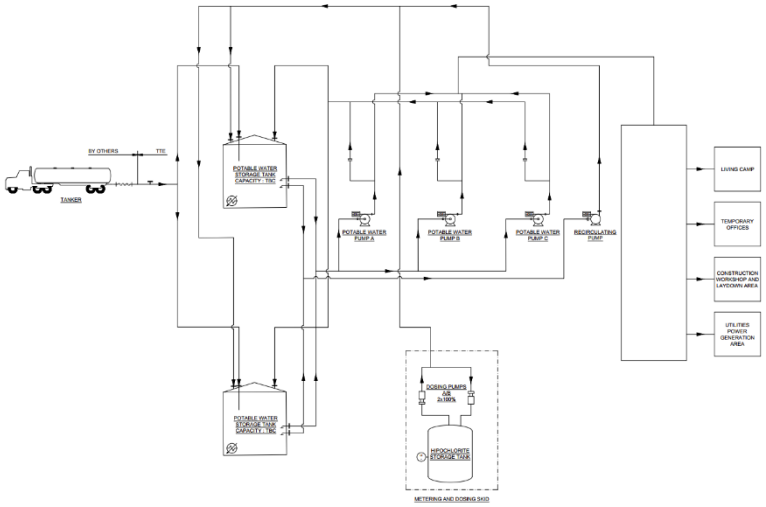
[3] a) How sustainable is the transformation in road freight? | SEI; b) Freight Transportation | MIT Climate Portal

Impact Factor	Impact Assessment	Components Affected
	such as the accommodation camp and temporary offices. These combustions will generate several gaseous emissions such as carbon oxides ("CO" and "CO_2"), sulphur compounds, nitrogen oxides ("NO" and "NO_2"), and hydrocarbons, in addition to exhaust emissions (i.e., Carbon, Polycyclic Aromatic Hydrocarbons – "PAHs" and heavy metals). Due to the short-term and temporary aspects of construction, it is unlikely that these pollutants will cause long-term or widespread changes to local air quality. However, the emission of gaseous pollutants shall be seen as an aspect for consideration to the point of view of the health of the workers, especially when considering volatile organic compounds ("VOCs") , which can be emitted from a wide variety of construction sources and activities, such as from hazardous chemicals (like paints, glues, oils, thinners, and plastics), cleaning products, fuel, roofing materials, tile adhesive, etc., exposing workers to noxious vapours.	
Emission of noise and vibrations	During the construction phase, potential impacts of noise will mainly be originated from the operations of heavy construction equipment and machinery used for surface levelling and grading, temporary stockpiling of material, transportation of construction materials, construction of the Project units and facilities, etc. Some activities relevant to crushing of blasting rocks will be carried out on site but the majority will be done in the quarries, part of the supply chain authorized by local legislation. However, considering that these activities will mainly take place away from the sensitive receptors and will be performed gradually in segmented areas of the Project AoI over a short-term and temporary basis, impacts related to the construction noise are expected to be low. While not a significant issue for community receptors, noise emissions shall be seen as a relevant aspect for consideration to the point of view of the health of the workers. Therefore, relevant mitigation measures in the scope of occupational health and safety will be applied. Due to the mobile nature of herders and the inability to determine their exact locations in advance, the potential noise impacts of construction activities are expected to vary depending on their location at any given time. Therefore, stakeholder engagement activities will be conducted with herders prior to the commencement of construction work on site. In line with the project schedule, herders will be informed of the locations and timing of construction activities, and of the potential noise impacts that may arise. In terms of vibrations, the Project has the potential to generate vibrations during the construction phase due to the construction activities (vibratory compaction, heavy vehicles passing through the roads, crushing of blasted rocks, etc.). However, vibrations to be generated from construction activities is unlikely to be significant at distances over 100 m from the source[4]. Since the nearest sensitive receptor is located over 100 m from the Project footprint, and the construction activities will be performed gradually in segmented areas of the Project AoI over a short-term and temporary basis, impacts related to vibration are expected to be low.	▪ Noise and Vibration

[4] This is based on the guidance in the Design Manual for Roads and Bridges LA111 *Noise and Vibration* (2020) which states that "*a study area of 100m from the closest construction activity with the potential to generate vibration is normally sufficient to encompass vibration sensitive receptors*" and that equations for predicting groundborne vibration arising from mechanised construction works in BS 5228:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites* Part 2: *Vibration* are only valid up to a maximum of 110m.

Impact Factor	Impact Assessment	Components Affected
Presence of new buildings/ infrastructures	The construction equipment, infrastructure, the camps, accesses and work force will be elements that are uncharacteristic to the environment. The Project AoI consist of a greenfield and presents no activities or installations. The land occupation by construction-related buildings (e.g., construction camp) and infrastructures (e.g., electricity and wastewater treatment service buildings) and the machinery and equipment transportation, delivery and operation will highly influence all Project construction sites and the surroundings. A land that previously had minimal human influence will come into contact with different structures, materials, and substances when construction activities begin. The components that will be immediately affected are the soil and potentially the surface water. Activities involving the use of materials and substances (especially hazardous ones) must be managed carefully to avoid environmental impacts. The same applies to blasting activities, which, in addition to directly impacting the local soil structure, also require the use of explosives, which may contain substances that are harmful to the environment. Moreover, modifications of the stormwater infiltration rates, potential accidental oils and fuels spills and leaks from the operating machinery and equipment and adverse impacts on soil resources and the local hydrological context cannot be excluded. Artificial lighting may be required for night-time work, security of equipment, and worker safety. The potential impacts include localized skyglow, glare, and light trespass into surrounding areas. Given that the Project Area of Influence is largely rural and sparsely populated, the risk of significant disturbance to nearby communities is low. However, artificial lighting could still cause temporary disturbance to nocturnal fauna, particularly bird and bat species, by altering foraging, migration, or navigation patterns.	▪ Soil ▪ Hydrology and Surface Water
Demand for solid waste treatment/disposal	During the construction period, 12,353.951 tons of waste are expected to be generated, including 197.134 tons (1.6%) of hazardous waste. The main volume will consist of non-hazardous waste: construction materials, soil and food waste. The improper management of solid waste (e.g., its spread or abusive accumulation on the bare soil) may lead to soil and surface water pollution and air quality degradation (due to odor and pollutants' emissions) both onsite and offsite. Hazardous waste, if spread on soil or in surface water bodies, can result in highly pollutive events. To comply with the Project standards, licensed local/national waste company(ies) shall be in charge of collecting all the waste that will not be recycled/reused at the construction site and of transporting it to landfills and treatment plants compliant with the Project requirements and specifications. Currently, it is identified a lack of appropriated solid waste landfills and treatment plants in Mirny vicinities (< 200 km) to treat large part of the waste that will be generated during construction. Therefore, alternatives will need to be implemented to deal with this waste including: - Recycling options on-site or through external facilities. - Transporting non-recyclable waste to regional or national facilities (such as Promtechnoresurs/Vitaprom, which operates in the Zhambyl and Almaty regions) that comply with Project standards. - Installing an on-site emissions-free incineration facility for daily solid domestic waste. - Installing an on-site composter for organic/food waste to reduce volumes and produce usable compost.	▪ Solid Waste

Impact Factor	Impact Assessment	Components Affected
	These alternatives will be selected according to the actual capabilities of the Contractor, and measures will be implemented to ensure compliance with Project standards and international best practices. These will be described in the mitigation measures below, according to the actual capabilities of the Contractor. It is known that, currently, the government is working to upgrade municipal landfills to meet required standards. The WPP construction site, which will serve as main base, will be provided with a solid waste temporary accumulation area. The OHTL corridor and the roads construction sites will be provided with minor solid waste accumulation areas and the waste will be periodically transferred from there to the main base. The OHTL and roads waste accumulation areas will undergo the same rules and requirements.	
Demand for liquid waste and wastewater treatment/disposal	The construction phase of the Project will generate large amounts of wastewater if compared to the amounts generated from the surrounding areas. The Project construction will generate both hazardous and non-hazardous liquid waste. The liquid waste generated will consist of oils, lubricants and chemicals residues, of equipment and machinery washing/cleaning wastewater, of domestic/sewage wastewater from workers' facilities (i.e., toilets, showers and catering) and of stormwater run-off. 	▪ Wastewater

Impact Factor	Impact Assessment	Components Affected
	 The improper management of liquid waste (e.g., the accumulation on the bare soil of dripping hazardous products drums containing residues and the ineffective collection and conveyance of wastewater to treatment stations) may lead to leaks and spills generating soil and surface water pollution, and air quality degradation (i.e., odor emissions) both onsite and offsite. It should be considered that at the Project AoI or in its vicinities there is no public sewage system, so the Company plans to treat domestic sewage waste through a closed-cycle wastewater treatment system. This information is still pending confirmation. The Project AoI will be also served with stormwater drainage systems. As far as concerned, the OHTL corridor and the roads construction sites will not be served by any kind of wastewater treatment facility or liquid waste temporary accumulation area. Currently it is not known how wastewater generated during the OHTL construction will be managed.	
Energy demand (fuel and electricity)	All Project activities will require some type of energy generation, either through the direct combustion of fossil fuels or through the use of electricity. The Project's electricity needs will be initially managed through the use of diesel generators and then supplied through a transmission line stretching from the Kiyakhty SS to the existing 35kV Sholpan SS. No significant environmental impact is identified from the use of electricity from this SS, however the proper management of electricity inputs to the Project, including obtaining any permits for its use, must be performed in order to not overload the system and therefore do not negatively affect other users of the network. Two mobile diesel generators, with a capacity of 250kw each, will be placed in the campsite as emergency backup power source. Operation of vehicles and machinery will use diesel as energy source. The combustion of diesel is directly linked to the emission of several pollutants to the atmosphere. The impacts of this are covered in the sections above “Emission of gaseous pollutants” and “Emission of greenhouse gases”.	▪ Air Quality

Impact Factor	Impact Assessment	Components Affected
Water demand	In accordance with the standards of the Republic of Kazakhstan and other similar enterprises, the estimated water demand during the construction and installation works will be approximately 682,378 m³/period (33 months), of which 320,589 m³/period will be of drinking quality and 361,789 m³/period will be of technical quality. The Project's water demand has the potential to impact the Groundwater component since water wells will be drilled onsite to provide water for construction activities. Water trucks can be also used as an extra support, if needed. A temporary water treatment station will be installed onsite to make sure that the well water meets the quality standards for construction, according to the national legislation. Drinking water will be delivered via trucks and stored onsite. The water storage method is still under evaluation, but most likely it will be above-ground tanks. A relevant factor to be taken into consideration is the water scarcity characteristic of the Project region, which makes water management even more relevant for this Project, especially taking into account that the construction will most likely use significant amounts of water for the concrete mixing plant and for dust suppression of roads. The groundwater abstractions may put water systems under pressure, potentially affecting the local users. In addition, without proper consideration of aquifer characteristics and without pre-defined groundwater management, excessive pumping without respecting aquifer recharge rates could contribute to groundwater depletion, affecting any potential local users. Also, an overexploitation of the aquifer may affect its permeability and may cause groundwater contamination by creating fast paths for pollutants. Moreover, in case water wells are poorly designed and/or constructed, this can result in groundwater contamination due to problems such as faulty casings and inadequate covers or lack of concrete footing, etc., what could allow external water and any accompanying contaminants to flow into the well. In relation to the OHTL, if water is needed for its construction, it will most likely be delivered through water trucks. Therefore, impacts on local groundwater are not foreseen for the OHTL construction.	▪ Hydrogeology and Groundwater

4.1.2 Mitigation Measures

The mitigation measures listed below reflect the mitigation hierarchy and are proposed for the construction phase. These measures will be implemented in addition to the Project embedded mitigation measures which are a standard procedure applied by the Contractor to achieve compliance with legal requirements and regulations and alignment with Good International Industry Practices (“GIIP”).

ESMPs to be implemented during the Project’s construction phase will be prepared in a timely manner before the start of construction activities and will incorporate the mitigation measures presented below. The ESMPs will be part of the ESMS, whose structure and functioning are described under Chapter 12 of this ESIA (Environmental & Social Management System Framework Document).

Based on the impact assessment, the Management Plans to be prepared are included in the following table. However, the MPs mentioned may be not exhaustive and depending on future needs, they can be modified to better adapt to the Project needs, as well as others can also be included.

Table 2: Mitigation Measures Physical Components - Construction Phase.

Mitigation hierarchy	Mitigation Measure
Impact Factor: Removal/degradation of soil and vegetation	
Avoidance	The Contractor will plan in advance the soil and topsoil removal activities, and the site will be prepared prior to construction to clearly identify the areas to be protected (i.e., erosion-prone areas, areas with nests/burrows or of biodiversity value), haul roads, topsoil stripping areas, and soil/topsoil storage areas.
Avoidance	Only the strictly necessary topsoil and subsoil portions will be removed or affected and – consequently – only the strictly necessary buildings and facilities will be built, as per the design. The Contractor will forbid unnecessary soil excavations and vegetation clearance which can lead to a soil weakening and an excess of waste generation.
Avoidance	The Contractor will develop and implement appropriate method statements for soil stripping, storage, and placing.
Avoidance	All necessary local permits to dig and drill will be obtained from the competent public entity before construction works start.
Minimization	The Contractor will Implement soil erosion control measures, including temporary stabilization of disturbed areas, proper drainage, and progressive re-vegetation, with particular attention to WTG foundations, crane pads, and OHTL sections, especially during heavy rainfall events.
Minimization	A *Soil Management Plan* will be prepared and approved before the start of construction activities, to ensure the work is done correctly, safely, and in compliance with all regulations at every stage. The plan will incorporate the mitigations presented in this section.
Minimization	Layers (e.g., geotextiles, tarpaulins) and barriers will be placed for protecting the excavation fronts and surfaces from weathering.
Minimization	Soil stripping, stockpiling or placing will be performed in the driest condition possible, with the use of tracked equipment where possible to reduce compaction.
Minimization	The movement of heavy vehicles and the storage of construction materials will be restricted to on-site service roads and laydown areas, to minimize the compaction of undisturbed soils.
Minimization	The excavated soil and topsoil will be properly stored and - when possible - used for backfilling or for landscaping at the end of construction.
Minimization	In case more material will be needed for backfilling, clean and certified material (commercial by-products will be used when natural materials are unavailable) will be purchased.
Minimization	Keep soil storage periods as short as possible. If soil needs to be stockpiled for more than 3 months prior to placement, the stockpiles will be temporary (preferably no longer than 6 months to avoid loss of quality), and will be covered with breathable material (geotextile fabric) to prevent soil loss and weeds infestation
Minimization	If soil quality requirements are met (i.e., if the soil is not polluted during excavation process or other activities), the soil will be re-used during construction activities whenever viable.
Minimization	The excavated soil waste not re-used will be properly managed, stored and then conferred to a licensed company for its disposal according to local and international standards.
Minimization	The mitigation measures identified in the *Waste Management Plan* to avoid or minimize soil pollution will be strictly followed.
Minimization	The over consolidation of soils and the vegetation disruption will be prevented - or at least limited - by keeping the moving vehicles (e.g., dumper trucks, concrete mixers, bulldozers) on predefined paths and roads to be well identified prior starting the construction activities.

Mitigation hierarchy	Mitigation Measure
Restoration	Site rehabilitation will be implemented following the completion of construction activities, with complete backfilling of on-site excavations, removal of remnant soil stockpiles and re-establishment of vegetative cover in residual areas within the Project sites.
Restoration	The excavation surfaces will be restored and re-vegetated as soon as possible. The revegetation will be carried out following the provisions of the *Biodiversity Management Plan*.
Impact Factor: Change in the local morphology and topography	
Avoidance	The Contractor will ensure that unnecessary levelling and excavations will be avoided. The excavation rates will follow the Project design specifications, which will be defined based on the site-specific characteristics and on the natural state of the landscape.
Avoidance	Since blasting will be required for breaking rock for excavation, the Contractor will develop and implement appropriate measures to be applied before, during and after blasting operations, including the selection of explosives and their safe transportation, blasting patterns, initiation systems to optimize blast efficiency and minimize dust, fumes, and noise, etc.
Avoidance	On-site personnel, local land users, and any other potential affected parties will be communicated of blasting activities by advance notice.
Avoidance	The blasting area will have access control and warning signs will be visibly placed in the vicinities.
Avoidance	Erosion-prone locations within all the Project sites (WPP, OHTL, BESS, accommodation camp, etc.) will be identified prior to commencement of land clearing and earthworks. Construction in these locations will be avoided to the extent possible. Where prevention is not feasible, erosion control methods will be undertaken.
Avoidance	A *Soil management Plan* will be prepared and approved before the start of construction activities. This will include a clear planning of erosion and sedimentation control measures for any disturbed erosion-prone locations during construction. A buffer of 50m around these locations will also be considered. Mitigation measures such as the application of vegetative contouring for steeply sloping terrain, surface runoff control techniques, grading, etc., will be included, along with other mitigations presented in this table.
Avoidance	Before conducting activities that affect the ground, the Contractor will map all the main elements that can affect drainage and plan accordingly for the occurrence of potential soil erosion events. The mapping will consider the natural morphology and topography of the site and the patterns of the water flow and the infiltration rates.
Minimization	The Contractor will ensure that no excessive changes of the local morphology and topography will be generated and that – where possible – the general slope of site will be preserved.
Minimization	Minimize the potential instability of permanent/temporary deposit areas by means of geotechnical design, stability assessment and stormwater drainage and management.
Minimization	In case heavy rains lead to the generation of pits and ponds in the construction site, they will be clean-up and backfilled to promote erosion control and a safe job site.
Minimization	The creation of unauthorized and/or uncontrolled piles and mounds of soil and rocks, debris or waste (even if temporary) will be forbidden.
Restoration	The Contractor will ensure that the excavated areas will be restored in a short time to prevent the generation of landslides, collapses and pits and ponds due to heavy rains and to mitigate the visual impacts of the construction site.
Restoration	The Contractor will ensure the restoration and rehabilitation of the blast sites and surrounding once blasting is over.
Impact Factor: Change in the local hydrology and surface water quality	

Mitigation hierarchy	Mitigation Measure
Avoidance	The Contractor will develop and implement a sizeable temporary stormwater diversion system to collect any stormwater (washouts) produced during the construction phase, considering all Project different infrastructure (camp site, WTGs, access roads, underground pipelines, OHTL, etc.) and the different terrain characteristics where these elements will be installed (drainage controls might differ depending on site characteristics, and an assessment on a site-by-site basis will be considered during the planning stage), so that waterlogging, soil erosion and flooding are avoided as much as possible during construction also taking into consideration downstream areas that could be affected. Weather/climate information will also be considered in the planning.
Avoidance	All drainage installed will be designed to ensure the natural hydrological features are maintained.
Avoidance	All building, infrastructure and work sites will observe strict drainage practices, and will plan to prevent run-off into the stormwater system.
Avoidance	All roads constructed for the Project will have suitable crossfalls to enable free drainage of the running surface. No ponding on the running surface would be accepted.
Avoidance	Storm drain inlet protections and filters will be applied around storm drains as a last line of protection to separate sediment before it is discharged into the environment.
Avoidance	Any contaminants will be prevented of entering the stormwater network.
Avoidance	Uncontaminated stormwater will be diverted away from the work areas and into the stormwater system using flow diversion strategies and devices.
Avoidance	Any direct contact between vehicles/equipment and surface water bodies will be avoided.
Avoidance	Excavation and stockpiling will be sited as far as possible from any unprotected drainage channels, natural streams and rivers. In case this cannot be avoided, silt traps fences or curtains will be installed to prevent runoffs to reach the water streams.
Avoidance	In the case of bodies of water that need to be crossed by Project vehicles, this will only be performed through a proper crossing facility (e.g., bridge or passing place), which will be properly planned and dimensioned.
Avoidance	The Contractor will ensure that the intentional dumping/discharge of any type of materials (liquid, semi-solid or muddy), substances, objects and waste into water bodies and streams will be strictly forbidden.
Avoidance	Activities that promote any changes in the land cover which may alter natural hydrologic processes will be avoided.
Avoidance	Pollutant leaks and spills potentially generated during transportation by road will be avoided.
Avoidance	Avoid the use of pesticides or herbicides in any season and anywhere near watercourses.
Avoidance	The construction of the OHTL will not interfere in any way with the Lake Balkash waters.
Avoidance	The location of OHTL transmission towers will be defined in such a way as to avoid any interference with aquatic habitats.
Minimization	A *Water and Groundwater Management Plan* will be prepared and approved before the start of construction activities, to include the management of construction stormwater and wastewater, to ensure the protection of surface water resources and that the work is done correctly, safely, and in compliance with all regulations at every stage.
Minimization	The Contractor will provide the adequate drainage underneath Project structures, roads and surfaces to avoid excessive ponding and allow access for surface water flow.

Mitigation hierarchy	Mitigation Measure
Minimization	All work area surfaces will be maintained and well-cleaned to prevent access of pollutants, dust and particulate in the runoff waters during the rainy periods.
Minimization	Ensure building materials are stored away from drainage paths and up-slope of sediment barriers.
Restoration	In the case interventions were performed in local minor or major waterbodies/courses due to construction activities (e.g. they were channeled or modified on their natural paths), their original/natural courses and surroundings will be adequately restored.
Restoration	All work areas will be stabilized after construction has ceased.
Impact Factor: Change in the local hydrogeology and groundwater quality	
Avoidance	Avoid the creation of fast paths for pollutants in the deepest soil layers.
Avoidance	The water boreholes drilling in the WPP AoI will strictly follow pre-defined drilling good practices, which will take into consideration the aquifer characteristics, to avoid any environmental degradation. Any usage of dirty drill corers will be avoided.
Avoidance	Groundwater sampling and testing in the WPP AoI will be completed when reaching the aquifer, and also periodically during the well life-cycle, in order to check if water quality is in accordance to the national legislation.
Avoidance	After sampling, if a contamination of groundwater is suspected or confirmed in the WPP AoI, the cause will be investigated, and the pollution will be adequately managed. Local authorities will also be informed and consulted for identifying responsible parties and the measures to be adopted (e.g., remediation) according to Project standards and the Kazakh/local provisions.
Avoidance	The groundwater levels in the WPP AoI will be monitored before and during the construction activities.
Avoidance	Groundwater is not planned to be used for drinking purposes. In case this assumption changes in the future, its quality will be assessed through proper sampling with pre-defined and compliant methodology.
Avoidance	Even if the 4 geotechnical boreholes did not reach the water table, the design stage will still consider that groundwater could accumulate in the pit in case excavation reach the water table levels. The Contractor will have in place a plan on how this groundwater will be treated and disposed (e.g., dewatering system), which will also consider the potential need of authorizations for the discharge of this water into the environment. No water from foundation dewatering operations will be discharged directly into a watercourse.
Minimization	A *Water and Groundwater Management Plan* will be prepared and approved before the start of construction activities, to ensure the protection of groundwater resources and that the work is done correctly, safely, and in compliance with all regulations at every stage.
Minimization	Protecting soil from pollution also means protecting groundwater since substances can percolate beneath the surface. Several of the mitigations outlined in the *Soil Management Plan* are equally relevant to groundwater management. Therefore, this plan will be strictly followed.
Minimization	Explosive products suitable for local conditions (which are water resistant) will be selected to minimize the potential for hazardous effects of the product on groundwater.
Restoration	Backfill the unbuilt areas with soil or materials having the same permeability characteristics of the previous soils for allowing the aquifers recharge.
Restoration	The soils around the water wells will be graded and properly restored for preventing water pooling and water runoff in its vicinity.
Impact Factor: Emission of greenhouse gases	

Mitigation hierarchy	Mitigation Measure
Avoidance, Minimisation	An *Air Quality Management Plan* will be prepared and approved before the start of construction activities, which will include the actions for avoiding or minimising GHGs emissions and to ensure the work is done correctly, safely, and in compliance with all regulations at every stage.
Minimization	The Contractor will source, where practical and cost-effective, plants, machineries, vehicles, and equipment operating on carbon-neutral biofuels and/or renewable energies.
Minimization	Materials and goods sourced from local suppliers will be preferred, as far as practical.
Minimization	The Contractor will ensure that the cooling systems to be installed in the administration/offices area at the WPP site will contain exclusively refrigerant gases with low global warning potential (GWP), and that those will be periodically inspected for detecting potential pollutive gas leakages.
Minimization	The use of eco-friendly/sustainable building materials will be preferred. In addition, considering that concrete is one of the most carbon-intensive construction materials, the Contractor will evaluate the opportunity of using low-carbon concrete solutions over traditional materials (i.e., low embodied carbon construction materials).
Compensation	The Company will evaluate the possibility of compensating for its carbon emissions, e.g., with the creation and promotion of initiatives that use nature-based solutions (which does not necessarily need to be applied within the Project AoI, but also in local communities, regional/local degraded areas, etc.), such as ecosystem conservation and regeneration, reforestation, other sustainable practices.
Impact Factor: Emission of dust and particulate matter	
Avoidance	Compacted gravel will be used on unpaved roads during the construction period to prevent dust formation.
Avoidance	Any loose materials that are temporarily stored onsite will be properly protected from weathering and wind (i.e., covered up with a geotextile or other type of layers).
Avoidance	Cement and other fine powders will be sealed after use or put in containers at sheltered storage sites.
Avoidance	The daily weather forecast will be monitored to identify periods of high wind speed.
Avoidance	The appropriate personal protective equipment (“PPE”), such as the correct type of respiratory protective equipment will be delivered to workers, depending on their task. PPE will also be provided in the case of severe weather conditions (high winds) which could expose workers to long times of breathing air with large concentrations of dust. Construction activities will be ceased in case of acute health danger.
Minimization	An *Air Quality Management Plan* will be prepared and approved before the start of construction activities, for avoiding dust and particulate matter spreading and to ensure the work is done correctly, safely, and in compliance with all regulations at every stage.
Minimization	A *Traffic Management Plan* will be prepared and approved before the start of construction activities, and will contain specific mitigation measures to manage dust emissions from vehicles, such as: - Vehicles and machinery mobilization during the construction will be restricted to designated routes at all times, where practicable. - Specific speed limits will be implemented on road portions where dust emission is significant. - Heavy vehicles carrying materials with the potential to result in dust generation will be properly covered with a tarpaulin before leaving the construction site. - Avoid unnecessary traffic.

Mitigation hierarchy	Mitigation Measure
Minimization	Mobile plants for crushing, screening, and grading the materials (in case used) will be placed as far away from possible from sensitive receptors.
Minimization	Dust suppression techniques will be applied, especially during the driest periods, to minimize dust produced during activities such as excavations and earthworks.
Minimization	In case of limited availability of water for wet dust suppression at Project site, dust protection nets will be installed during earthworks in dry and windy periods with excessive dust conditions.
Minimization	If necessary, wind barriers (i.e. local reed fences as already used locally) will be used.
Minimization	Abatement measures and control systems (e.g., welding tents and barriers or mobile aspirators equipped with filters) will be adopted, when needed. Activities such as welding, cutting, grinding and sandblasting (representing important sources of airborne particles) will be carried out by using proper equipment and techniques compliant to the environmental and safety measures, especially when harmful construction materials containing silica (e.g., concrete or abrasives) are processed.
Minimization	The Contractor will ensure that the trucks loading and unloading operations will be carried out properly and that dust and particulate emissions will be controlled.
Minimization	If feasible, improvement of existing equipment by using particulate filters and catalyst converters will be considered.
Impact Factor: Emission of gaseous pollutants	
Avoidance	The burning of waste materials will be forbidden.
Avoidance	All construction equipment and machinery will undergo regular periodical maintenance, including their emission control systems (e.g., aspiration and filtration systems). Manufacturer recommendations will be respected.
Avoidance	The appropriate PPE, such as the correct type of respiratory protective equipment will be delivered to workers, depending on their task (e.g., if they are exposed to volatile organic compounds).
Avoidance	The Contractor will ensure that the materials and chemicals used at the WPP site will be properly stored in dedicated locations which will be locked-up and well-ventilated. The bulks, cans, bins and trays will be closed/sealed for avoiding pollutants runoffs.
Avoidance	Workers will not be exposed to volatile fuels and chemicals, unless they are using proper PPE and are qualified to handle these materials.
Avoidance	The use of non-compliant or unlabeled chemicals will be forbidden. The materials and chemicals' labels will show the product name and the hazard pictograms (e.g., Hazardous to the environment or Acute toxicity symbols).
Minimization	An *Air Quality Management Plan* will be prepared and approved before the start of construction activities, for avoiding the emission of air pollutants above allowed thresholds and to ensure the work is done correctly, safely, and in compliance with all regulations at every stage.
Minimization	All trucks and vehicles must be in good condition and in compliance with vehicle emission requirements, ensuring that exhaust emissions are therefore minimized. Pre-requisites will be implemented onsite to ensure that vehicles are not emitting black smoke and that any machinery or vehicle identified with black smoke requires immediate maintenance and reassessment before returning to service.
Minimization	Engine idling will be reduced as far as practical to prevent additional pollutants' emissions.
Minimization	The use low-sulphur diesel will be preferred to power equipment and vehicles.

Mitigation hierarchy	Mitigation Measure
Compensation	Considering that the vegetation plays an important positive role in atmospheric purification and air pollutants reduction and that the phytoremediation has many potential advantages for contrasting the air pollution, the Contractor will plant native species and revegetate, where possible, the Project AoI.
Impact Factor: Emission of noise and vibrations	
Avoidance	Hours of operation for specific pieces of equipment or operations will be limited in case sensitive receptors are located in close proximity.
Minimization	Project traffic will be reduced by routing it away from community areas, wherever possible.
Minimization	Grievance mechanism will be developed to record and respond to complaints regarding to noise and vibrations. In case of any noise and/or vibration related grievances, noise and/or vibration measurements will be carried out immediately at the area the grievance refers to. If monitoring results indicate that noise and/or vibration levels are above the defined limits, the Client will reduce/limit the amount of equipment at the construction site, until the construction noise and/or vibration levels are reduced below the limit values.
Minimization	Regular maintenance of the construction equipment will be carried out in order to minimize the possible high noise levels generated by the equipment.
Minimization	Equipment with lower sound power levels should be selected.
Minimization	Silencers should be installed for fans.
Minimization	Suitable mufflers should be installed on engine exhausts and compressor components.
Minimization	Acoustic enclosures should be installed for equipment casing radiating noise.
Minimization	If applicable, noise sources will be re-located to less sensitive areas (such as further from worker accommodations and rest areas) to take advantage of distance and shielding.
Compensation	Appropriate PPE and materials such as ear protectors or ear plugs will be provided to protect workers from noise impacts.
Impact Factor: Existence of new buildings/infrastructures	
Avoidance	Storage of chemical hazardous materials at the WPP site will be done exclusively in designated facilities with roofing, impervious flooring, temperature control, light protection, and fire detection and suppression. These facilities will be protected to prevent exposure of chemical/waste stock to direct sunlight, precipitation, wet outdoor conditions, and wind. These storage places will be well ventilated and locked up so that exclusively authorized and properly trained employees will be able to access. Sufficient and readily accessible spill kits will be provided for on-site hazardous material/ waste storage facilities.
Avoidance	Storage of chemical hazardous materials at the WPP site will be located as far as possible from main work areas, water sources, storm water drainage systems and ignition sources. A protective buffer of at least 100 meters will be maintained.
Avoidance	In case any liquid hazardous materials will be used at the WPP site, these will be exclusively stored in impermeable and chemically resistant structures with secondary containment, able to contain the substances in the event of a leak or spill. The capacity of secondary containment structures will be 110% of the contents of the largest primary containment structure.
Avoidance	All chemical substances and products used at the WPP site (both hazardous and non-hazardous) will be registered in an Material Safety Data Sheet (“MSDS”), showing the productor name, the chemical formula/the components, the hazard pictograms, the warnings and the danger indications, the safety advice on the proper personal or collective protection equipment

Mitigation hierarchy	Mitigation Measure
	to be used for the handling, their types, quantity, supplier details, and transportation routes information. The inventory will be periodically updated as necessary and kept at the site office.
Avoidance	All containers, bins or vessels used for temporary on-site storage of hazardous construction materials (both liquid or solid) will be appropriately labelled, with signs and descriptions in Kazakh, Russian, Chinese and English. In addition, safety and precautionary signs with multilingual descriptions will be included on labels and posters.
Avoidance	Chemical substances will be handled by properly trained and qualified personnel, with the adequate use of proper PPE.
Avoidance	Explosives and chemical substances that have potential to explode will be stored in adequate warehouses that adhere to the requirements for preventing fires and industrial safety, in accordance with Kazakh and international provisions.
Avoidance	Specific areas must be allocated to provide for loading, unloading and transportation processes of hazardous substances (impermeable ground).
Avoidance	Since different concrete batching plants will be installed on-site, the structures for containing water from washing the concrete will be designed with sufficient capacity for its operation, in addition to being located at a safe distance from the stormwater drainage systems.
Avoidance	The aggregates for the batching plants at the WPP site will be stored on clean protected hard standing area, separated by granulometry.
Avoidance	Any type of soil contamination caused by Project activities and/or originated within the construction site will be contained and then remedied to avoid further releases and associated adverse impacts. Contaminated soil will be handled as hazardous special waste.
Avoidance	The Contractor will develop a procedure to be followed in case of soil contamination, considering aspects such as soil handling, storing, treatment methods (if applicable), transportation and disposal. These procedures will be included in the *Emergency and Preparedness Response Plan* (“EPRP”). The contaminated soil will be immediately collected and treated as hazardous waste.
Avoidance	Any discharges of pollutants or potentially pollutants substances into soil will be forbidden.
Avoidance	Periodical and adequate maintenance and control on equipment, machines and moving vehicles will be carried out for avoiding oil and fuel spills and leaks. Maintenance and repair will be performed within designated workshops, over floor having barriers against leakages. Tanks, pumps, pipes and other vehicle components must be fit for purpose, with no signs of leakage. Vehicles with any identified defects will be removed from service for immediate repairment.
Avoidance	The equipment, the machines and the vehicles will be kept clean for avoiding runoffs of sludge and pollutants during rainy events.
Avoidance	Both washing and refuelling of any equipment, machinery and vehicles will be exclusively carried out in designated areas, with impermeable surfaces and isolated drainage systems leading to dedicated reservoirs and treatment facilities, including for example oil/water separators and/or lined evaporation ponds.
Avoidance	Avoid the over consolidation of soils generated by the moving vehicles.
Avoidance	Integrity of tanks and containers will be ensured at the WPP site, and they will always be stored in areas with flood control.
Minimization	A *Hazardous Materials Management Plan* will be prepared and approved before the start of construction activities, to ensure the work is done correctly, safely, and in compliance with all regulations at every stage.

Mitigation hierarchy	Mitigation Measure
Minimization	In the event of any pollutant leaks, spills and/or contamination events on soil, groundwater and/or surface water, the procedures identified in the EPRP will be strictly followed. Remedial measures will primarily involve efforts to stop or minimize the spread of contamination, recover products accidentally released into the environment and apply specialized treatment and/or disposal.
Minimization	Workers must be informed and trained about practices for soil contamination prevention and soil management and reinstatement.
Minimization	A spill response plan must be communicated to concerned personnel and training to respond emergency must be conducted.
Minimization	Concrete production will be kept under strict control.
Minimization	Minimize the soil waterproofing by limiting the expansion of low permeable and impermeable areas.
Minimization	Limit artificial lighting to essential night-time activities only, using shielded and directional fixtures to minimize spillover and disturbance to surrounding communities and wildlife
Restoration	At the end of construction, as storage and temporary deposits areas will be restored, cleaned and destinated to other purposes or vegetated.
Impact Factor: Production of solid waste	
Avoidance	The solid waste generated during the construction phase will be managed according to Kazakh laws and regulations and the international standards and best practices.
Avoidance	The WPP site will be equipped with a proper temporary waste storage/accumulation area, which will be roofed, concrete-paved or waterproofed or equipped with containment trays to prevent spills and leakages and avoid the exposure to weathering.
Avoidance	Waste temporarily placed in the temporary waste storage area at the WPP site will be segregated per categories, it will not be mixed, and it will be visibly labelled for its identification and classification.
Avoidance	Hazardous wastes at the WPP site – such as the waste deriving from the machinery and equipment maintenance (e.g., filters, oily rugs and metal parts containing hydrocarbons, oils and lubricants), medical waste, residues of paints, cement additives and other hazardous materials – will be stored in an area for such purpose and duly marked, avoid mixing incompatible wastes. This area will be located away from sources of ignition.
Avoidance	The transfer of any hazardous materials and wastes into and out of Project sites will be done using safe means of transport, for example with robust, defect-free, fully sealed/closed and inert (or product-compatible) containers and/or vessels.
Avoidance	A waste transfer register will be maintained on-site to record and track the generation, storage and segregation of various construction waste streams, as well as the dispatch of waste consignments for off-site treatment and/or disposal, with details of waste management contractors, chain of custody and transport route to designated waste management facilities.
Avoidance	Bins/containers for selective waste collection will be installed in several areas of the WPP site and workers will be oriented in relation to selective waste separation and disposal. The domestic solid waste from the accommodation camp and the rest areas will be properly collected, segregated, and managed as per the Project standards.
Avoidance	Avoid the generation of hazardous and non-hazardous waste materials. Where waste generation cannot be avoided, the 4 R's (waste Reduction, Recover, Recycle and Reuse) system of waste management will be applied to all classes of waste generated during the entire

Mitigation hierarchy	Mitigation Measure
	Project. The 4 R's system and strategies will be developed before construction works start and implemented accordingly.
Avoidance	Materials that can be recycled such as packaging paper, plastic and glass bottles, metal, etc., will be sent to licensed recycling facilities as far as practicable. Suitable recycling facilities will be identified and selected prior to the commencement of pre-construction activities.
Avoidance	Waste which cannot be recycled will be collected and transported by a licensed waste collection company (ies) to be disposed at suitable treatment facilities or at approved landfills (compliant to the Project standards, the legal requirements and the international best practices). Since local compliant landfills and/or treatment facilities are currently not available, the Contractor is considering the next options: - A composter for food waste will be installed onsite; - Installing an emissions-free incinerator onsite for the daily solid domestic waste; - Delivering other types of waste to Promtechnoresurs/Vitaprom, a waste management company that operates in the Zhambyl and Almaty regions and handles several types of wastes.
Avoidance	The collection, transportation and disposal of waste and hazardous waste will be carried out exclusively by a duly qualified and certified waste operator.
Avoidance	Waste will always travel with proper transportation documents and forms indicating details such as the type, the quantity, and the hazardousness of the waste.
Avoidance	The Contractor will visit and audit the waste treatment/recycling/disposal selected facilities and landfills to ensure that proper disposal practices are implemented and that they operate in compliance with the Project standards, the legal requirements, the international best practices and the local environmental standards. An initial audit will take place before the supplier is retained, and then periodic follow up and verification audits will follow.
Minimization	A *Waste Management Plan* will be prepared and approved before the start of construction activities, to ensure that all solid waste generated by the Project is properly managed, and that work is done correctly, safely, and in compliance with all regulations at every stage.
Minimization	Personnel at an appropriate level of seniority will be nominated to be responsible for good site practices and arrangements for collection and placement/disposal of all waste types generated by the Project. The incorrect disposal of waste (dumping) will be strictly forbidden.
Minimization	All construction workers (direct and contracted) will receive induction and refresher training on hygiene and sanitation, waste management hierarchy, construction-related waste streams, relevant categories of hazardous materials and wastes, and the impacts of hazardous materials and wastes on human health and ecosystems.
Minimization	The Contractor will liaise with local/regional governmental parties responsible for waste management to seek solutions for the appropriated disposal of waste (compliant landfills, waste processing facilities, etc).
Restoration	As soon as temporary waste storage/accumulation areas at the WPP site will be dismantled/decommissioned, these will be restored, cleaned and destinated to other purposes or revegetated.
Impact Factor: Production of wastewater	
Avoidance	Any direct discharge of wastewater into the environment will be prohibited. Appropriate controls must be applied beforehand. This refers to any type and amounts of wastewater (both from construction processes and from domestic wastewater).

Mitigation hierarchy	Mitigation Measure
Avoidance	The Contractor will provide sanitary facilities with capacity to meet sanitation requirements of personnel at all construction locations. Personnel must use the provided facilities, which will be serviced daily to ensure hygienic conditions.
Avoidance	In case chemical toilets are used at the WPP site, the domestic wastewater will be managed through authorized contractors. Records of safe treatment and disposal of sewage must be maintained.
Avoidance	The Contractor will make sure that the wastewater treatment system built at the WPP site has the capacity to adequately treat the Project wastewater, especially on the peak months, when the amounts of generated wastewater are expected to be higher.
Avoidance	The wastewater treatment system at the WPP site will be properly operated by skilled technicians.
Avoidance	The wastewater treatment system at the WPP site will go under periodical maintenance.
Avoidance	Sampling of treated wastewater (the effluent) at the WPP site will be periodically carried out to ensure the plant is working according to vendor specifications. Results of testing will be kept at site in case of inspections and audits. In case of exceedances, the Contractor will immediately carry out the inspection on the equipment (plants, sensors and flow meters) and will appoint a subcontractor to carry out the repair and maintenance eventually needed.
Avoidance	As a closed-loop system will be implemented, treated wastewater will be reused at the WPP Site for reducing water consumption (for example for cleaning purposes, for dust suppression, etc.). Treated effluents that do not meet the requirements to be discharged into the environment or reused on-site will be collected by local specialized and certified companies and sent to further treatment or to licensed sanitary landfills.
Avoidance	The sludge generated by the wastewater treatment system at the WPP site will be periodically collected by local companies specialized and certified for the activity and it will then be sent to licensed sanitary landfills.
Minimization	Mitigation measures related to stormwater management are covered in the impact factor *Change in the local hydrology and surface water quality* above.
Minimization	A *Wastewater Management Plan* will be prepared and approved before the start of construction activities, to ensure that all liquid waste generated by the Project is properly managed, and that work is done correctly, safely, and in compliance with all regulations at every stage.
Minimization	All wastewater infrastructure (such as drains, pipelines, manholes, etc.) will undergo periodical maintenance for preventing any potential malfunctions and consequent spills and leaks.
Minimization	An oil/grease trap will be used in the kitchen at the WPP site to separate these substances from the inlet drains, and the resulting amount of oil and grease waste will be properly handled and disposed of by licensed operators.
Minimization	No disposal of cooking oils and grease in the inlet drains will occur at the WPP site kitchens.
Minimization	All workers will be oriented in relation to proper hygiene processes and wastewater risks to the environment.
Impact Factor: Energy and fuel demand	
Avoidance	Ensure that the primary source of electricity at the WPP site is the one identified in the design stage (transmission line from the Kiyakhty SS), and that other sources (such as diesel generators) will be used only for emergencies, if needed.
Avoidance	All local authorizations needed for setting up the power transformer station at the WPP site and for pulling energy from the Kiyakhty SS will be in place before construction starts.

Mitigation hierarchy	Mitigation Measure
Minimization	A *Resource Efficiency Management Plan* will be drafted, according to the Project standards, and will describe the measures to adopt for optimizing energy efficiency and enhancing sustainable construction management practices. The MP will be prepared and approved before the start of construction activities, to ensure the work is done correctly, safely, and in compliance with all regulations at every stage.
Minimization	Arrangements for monitoring energy consumption will be implemented for the construction phase.
Minimization	The Project activities for which energy consumption is highest will be identified and performance targets defined prior their commencement. Targets will be periodically reviewed and compared to the Project effective energy consumption; if needed, further actions for reducing the consumptions will be taken.
Minimization	The use of machinery/equipment/plants that are powered by grid electricity will be preferred instead of diesel-fueled portable generators.
Minimization	Equipment and machinery will be kept in good running conditions and periodic maintenance will be carried out to avoid energy waste from malfunctioning.
Minimization	The use of energy efficient building-related equipment (such as lighting, electric motors, refrigerators, washing machines, cooling equipment, electronics, etc.) will be preferred. Examples include appliances that contain energy efficiency labelling, the use of LED light bulbs, and smart switches.
Minimization	Ensure that the construction activities will take advantage of natural light, where possible.
Minimization	Construction site workers will be trained on energy saving actions.
Minimization	Old and inefficient equipment will be replaced with higher efficiency models.
Impact Factor: Water demand	
Avoidance	The overexploitation of groundwater resources will be strictly avoided in the WPP AoI. The design of the Project water supply scheme is such as to minimize and avoid abstraction rates beyond the safe production volume and subsequent impacts on sensitive social and biological receptors. The Project will ensure that sensitive receptors will not be negatively impacted due to the use of groundwater for the construction activities.
Avoidance	Before groundwater is selected as a water source for construction activities at the WPP site, a comprehensive assessment of the availability and vulnerability of groundwater in and around the Project site(s) must be conducted.
Avoidance	The operation and management of groundwater intake at the WPP site will be carried out in a manner where the abstraction rate is monitored in relation to safe yield abstraction rates to be determined on the basis of the study mentioned under the previous point.
Avoidance	All local authorizations and permits needed for water resources' exploitation and use will be in place before construction starts.
Avoidance	Ensure that pipes and taps supplying the water at the WPP site are maintained on a regular basis to avoid water being lost through leakages.
Avoidance	Periodical maintenance and sanitation of drinking water tanks at the WPP site will be carried out to ensure their adequacy for intended purposes. Routine inspections for early detection of potential leaks, contamination or structural compromise will be also carried out.
Minimization	A *Resource Efficiency Management Plan* will be drafted, according to the Project standards, and will describe the measures to adopt for optimizing water efficiency and enhancing sustainable construction management practices. The MP will be prepared and approved before

Mitigation hierarchy	Mitigation Measure
	the start of construction activities, to ensure the work is done correctly, safely, and in compliance with all regulations at every stage.
Minimization	The Project activities with the highest water consumption rates will be identified and performance targets for water consumption will be defined prior their commencement. Targets will be periodically reviewed and compared to the Project effective water consumption; if needed, further actions for reducing the consumptions will be taken.
Minimization	Strategies to reduce the water consumption will be identified in the design stage and effectively implemented during construction activities. Examples to be considered by the Contractor include: - Evaluate the possibility of eliminating the need for water in certain construction activities (for example, using a broom to clean paths and gutters rather than water; using compressed air as a substitute for cleaning equipment instead of water, etc.); - Identify alternative water sources (such as rainwater collection, the use of wastewater treated effluents, etc.); - Use water-saving technologies (such as sensor-controlled taps, low flush toilets, hoses with triggers, etc.).
Minimization	Construction site workers will be trained on water saving actions.
Impact Factor: Demand for raw materials and goods/supply chain	
Avoidance	All construction raw materials, products and equipment will be exclusively sourced from verified suppliers, which are compliant with minimum environmental standards. The Contractor will – throughout the whole construction phase – assess the existence, the adequacy and the effectiveness of the suppliers' environmental management systems and processes.
Avoidance	The use of suppliers whose activities are associated to high environmental impacts will be avoided. Preference will be given to responsibly sourced raw materials.
Avoidance	Soils and aggregates for on-site construction works will be supplied from quarries that are accredited and licensed to conduct their operations.
Minimization	A *Supply Chain Management Plan* will be prepared and approved before the start of construction activities, to ensure the work is done correctly, safely, and in compliance with all environmental regulations at every stage.

4.1.3 Impact Value and Residual Impact Value Calculation

This section describes the Impact Values and the Residual Impact Values (after the implementation of the mitigation measures) assessed for each impact factor on each physical component relevant for the construction phase.

The impact assessment methodology is presented in Chapter 03 of this ESIA ("IA Methodology").

4.1.3.1 Geomorphology and Topography

WPP AoI

The impact factor that can affect the Geomorphology and Topography component within the WPP AoI is listed in Table 3.

The Project's overall impact on the Geomorphology and Topography component in the construction phase is of negative direction. According to the baseline study performed, the sensitivity of this component is assessed as **medium**.

The impact value calculated is **medium** for the impact factor *change in the local morphology and topography*. Considering the application of the mitigation measures, the residual impact has been assessed to be **low**, showing that the construction phase is not expected to change relevantly the natural site topography and morphology and that mitigation measures can be effective to tackle this impact.

Table 3: Residual impact assessment matrix for Geomorphology and Topography during construction – WPP AoI.

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features		Impact Value	Mitigation effectiveness	Residual impact value
Change in the local morphology and topography	Duration:	Medium-long	Medium	Reversibility:	Long term	**Medium**	Medium-high	**Low**
	Frequency:	Frequent						
	Geo. Extent:	Project footprint						
	Intensity:	Medium						

OHTL AoI

In relation to the OHTL AoI, a qualitative impact assessment was not performed since impacts on the Geomorphology and Topography component are expected to be lower in comparison to the WPP AoI, as it was already explained in section 4.1.1 (Table 1).

However, the mitigation measures listed in section 4.1.2 (Table 2) related to the impact factors *local morphology and topography* and *demand for raw materials and goods/supply chain* are also applicable to the OHTL and shall therefore be carefully implemented during the OHTL construction.

4.1.3.2 Soil

The impact factors that can affect the Soil component are listed in Table 4. Other impact factors such as the ones related to solid waste and wastewater generation can also potentially affect the Soil component. However, those are addressed in their specific sections below (Solid Waste and Wastewater).

The results of the impact assessment are applicable to both the WPP and OHTL AoI.

The Project's overall impact on the Soil component in the construction phase is of negative direction. According to the baseline study performed, the sensitivity of this component is assessed as **medium**.

The impact value calculated is **high** for the impact factor *removal/degradation of soil and vegetation*. This value is mostly due to its irreversibility, i.e., large parts of the areas that will be devegetated and degraded will be permanently in this condition during the construction phase, which can lead to potential soil erosion events. However, with the application of a robust set of mitigation measures, the residual impact is assessed as **low**.

The impact value calculated is **high** for the impact factor *existence of new buildings/infrastructure*. This value is mostly due to its irreversibility, i.e., buildings and infrastructure will be present during the construction phase, and the natural environment will be exposed to the most diverse materials, substances and activities. With the application of the selected mitigation measures, the residual impact is assessed as **medium**.

Table 4: Residual impact assessment matrix for Soil during construction.

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features		Impact Value	Mitigation effectiveness	Residual impact value
Removal/degradation of soil and vegetation	Duration:	Medium-long	Medium	Reversibility:	Irreversible	**High**	Medium-high	**Low**
	Frequency:	Frequent						
	Geo. Extent:	Project footprint						
	Intensity:	Medium						
Existence of new buildings/infrastructure	Duration:	Medium-long	Medium	Reversibility:	Irreversible	**High**	Medium	**Medium**
	Frequency:	Highly frequent						
	Geo. Extent:	Project footprint						
	Intensity:	Medium						

4.1.3.3 Hydrology and Surface Water

The impact factors that can affect the Surface Water component are listed in Table 5. Other impact factors such as the ones related to solid waste and wastewater generation can also potentially affect the Surface Water component. However, those are addressed in their specific sections below (Solid Waste and Wastewater).

The results of the impact assessment are applicable to both the WPP and OHTL AoI.

The Project's overall impact on the Surface Water component in the construction phase is of negative direction. According to the baseline study performed, the sensitivity of this component is assessed as **medium-high**.

The impact value calculated is **high** for the impact factor *change in the local hydrology and surface water quality*. This value is mostly related to the sensitivity of the component, since there are numerous temporary water channels and water springs in the WPP site; and that part of the OHTL will cross the Shu River and its floodplain, covering a surface area of few hundred meters. Therefore, construction activities must be well planned so as not to significantly interfere with surface water. However, with the application of a robust set of mitigation measures, the residual impact is assessed as **low**.

The impact value calculated is **medium** for the impact factor *existence of new buildings/infrastructure*. With the application of the selected mitigation measures, the residual impact is assessed as **low**.

Table 5: Residual impact assessment matrix for Surface Water during construction.

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features		Impact Value	Mitigation effectiveness	Residual impact value
Change in the local hydrology and surface water quality	Duration:	Medium-long	Medium-high	Reversibility:	Mid term	**High**	Medium-high	**Low**
	Frequency:	Highly frequent						
	Geo. Extent:	Regional						
	Intensity:	Medium						
Existence of new buildings/ infrastructures	Duration:	Medium-long	Medium-high	Reversibility:	Mid term	**Medium**	Medium-high	**Low**
	Frequency:	Frequent						
	Geo. Extent:	Project footprint						
	Intensity:	Low						

4.1.3.4 Hydrogeology and Groundwater

WPP AoI

The impact factors that can affect the Hydrogeology and Groundwater component within the WPP AoI are listed in Table 6.

The Project's overall impact on the Hydrogeology and Groundwater component in the construction phase is of negative direction. According to the baseline study performed, the sensitivity of this component is assessed as **medium**.

The impact value calculated is **medium** for the impact factor *change in the local hydrogeology and groundwater quality*. It is not expected that hydrogeological cycles or the quality of the groundwater will be significantly affected by the Project; and with the application of the selected mitigation measures, the residual impact is assessed as **low**.

For the impact factor *water demand*, the impact value is calculated as **high**. This is mainly due to the long-term reversibility value, since in an area where water scarcity is characteristic, in the case that aquifers are depleted, it may take a long time for them to return to their normal standard, assuming lower recharge rates. However, with the application of the selected mitigation measures, the residual impact is assessed as **low**.

Table 6: Residual impact assessment matrix for Groundwater during construction – WPP AoI.

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features		Impact Value	Mitigation effectiveness	Residual impact value
Change in the local hydrogeology and groundwater quality	Duration:	Medium-long	Medium	Reversibility:	Mid term	**Medium**	Medium-high	**Low**
	Frequency:	Highly frequent						
	Geo. Extent:	Local						
	Intensity:	Low						
Water Demand	Duration:	Medium-long	Medium	Reversibility:	Long term	**High**	Medium-high	**Low**
	Frequency:	Highly frequent						
	Geo. Extent:	Regional						
	Intensity:	High						

OHTL AoI

In relation to the OHTL AoI, a qualitative impact assessment was not performed since impacts on the Hydrogeology and Groundwater component are expected to be considerably lower in comparison to the WPP AoI, if any.

However, several of the mitigation measures listed section 4.1.2 (Table 2) related to the impact factors *change in the local hydrogeology and groundwater quality* and *water demand* are also applicable to the OHTL and shall therefore be carefully implemented during the OHTL construction.

4.1.3.5 Air Quality

The impact factors that can affect the Air Quality component are listed in Table 7.

The results of the impact assessment are applicable to both the WPP and OHTL AoI.

The Project's overall impact on the Air Quality component in the construction phase is of negative direction. According to the baseline study performed, the sensitivity of this component is assessed as **medium-low**.

The impact value calculated is **high** for the impact factor *emission of greenhouse gases*. This value is mostly due to its irreversibility, since many of the major greenhouse gases stay in the atmosphere for tens to hundreds of years after being released, and their warming effects on the climate persist over a long time. With the application of the mitigation measures, the residual impact is assessed as **low**.

The impact value calculated is **negligible** for the impact factors *emission of dust and particulate*, *emission of gaseous pollutants*, *and energy demand (fuel and electricity)*.

Table 7: Residual impact assessment matrix for Air Quality during construction.

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features		Impact Value	Mitigation effectiveness	Residual impact value
Emission of greenhouse gases	Duration:	Medium-long	Medium-low	Reversibility:	Irreversible	**High**	Medium-high	**Low**
	Frequency:	Highly frequent						
	Geo. Extent:	Global						
	Intensity:	Low						
Emission of dust and particulate matter	Duration:	Medium-long	Medium-low	Reversibility:	Short-term	**Negligible**	Medium	**Negligible**
	Frequency:	Highly frequent						
	Geo. Extent:	Local						
	Intensity:	High						
Emission of gaseous pollutants	Duration:	Medium-long	Medium-low	Reversibility:	Short-term	**Negligible**	Medium	**Negligible**
	Frequency:	Highly frequent						
	Geo. Extent:	Local						
	Intensity:	Medium						
Energy demand (fuel and electricity)	Duration:	Medium-long	Medium-low	Reversibility:	Short-term	**Negligible**	Medium-high	**Negligible**
	Frequency:	Highly frequent						
	Geo. Extent:	Regional						
	Intensity:	Medium						

4.1.3.6 Noise and Vibrations

The impact factor that can affect the Noise and Vibrations component is listed in Table 8.

The results of the impact assessment are applicable to both the WPP and OHTL AoI.

The Project's overall impact on the Noise and Vibrations component in the construction phase is of negative direction. According to the baseline study performed, the sensitivity of this component is assessed as **medium**.

The impact value calculated is **low** for the impact factor *emission of noise and vibrations*. It is not expected that ambient noise and vibration levels will be significantly affected by the Project; and with the application of the selected mitigation measures, the residual impact is assessed as **negligible**.

Table 8: Residual impact assessment matrix for Noise and Vibrations during construction.

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features		Impact Value	Mitigation effectiveness	Residual impact value
Emissions of noise and vibrations	Duration:	Medium-long	Medium	Reversibility:	Short-term	**Low**	Medium	**Negligible**
	Frequency:	Highly frequent						
	Geo. Extent:	Local						
	Intensity:	Medium						

4.1.3.7 Solid Waste

The impact factor that can affect the Solid Waste component is listed in Table 9.

The results of the impact assessment are applicable to both the WPP and OHTL AoI. It should be noted that the construction of the OHTL will likely generate considerably less solid waste than that generated in the WPP site, so potential impacts from the OHTL alone are expected to be smaller. However, since the solid waste produced in the construction of the OHTL will be periodically sent to the temporary waste storage located in the WPP site, it can be understood that there will be a total amount of solid waste (WPP site + OHTL site) that will be managed together.

The Project's overall impact on the Solid Waste component in the construction phase is of negative direction. According to the baseline study performed, the sensitivity of this component is assessed as **medium-high**.

The impact value calculated is **very high** for the impact factor *demand for solid waste treatment/disposal*. This value is the result of the combination of several parameters, being the most relevant the sensitivity of the component, combined to its high intensity (since if solid waste – depending on its type and quantity – reaches soil or water resources this can lead to serious negative environmental impacts, besides the spread of diseases) and also its long-term reversibility, given that it could take considerable time for the soil and water resources to return to their initial conditions if contaminated by waste derived from the construction activities.

With the application of the selected mitigation measures, the residual impact is still assessed as **high**. Many of the mitigation measures listed in Table 2 will be fundamental to prevent or minimize potential impacts arising from solid waste generation. However, currently, an effective solid waste management strategy has not been defined by the Company. Once such a strategy is drawn up, it is believed that the value of the residual impact could decrease considerably.

Table 9: Residual impact assessment matrix for Solid Waste during construction.

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features		Impact Value	Mitigation effectiveness	Residual impact value
Demand for solid waste treatment/disposal	Duration:	Medium-long	Medium-high	Reversibility:	Long term	Very High	Medium	High
	Frequency:	Highly frequent						
	Geo. Extent:	Regional						
	Intensity:	High						

4.1.3.8 Wastewater

WPP AoI

The impact factor that can affect the Wastewater component within the WPP AoI is listed in Table 10.

The Project's overall impact on the Wastewater component in the construction phase is of negative direction. According to the baseline study performed, the sensitivity of this component is assessed as **medium-high**.

The impact value calculated is **very high** for the impact factor *demand for liquid waste and wastewater treatment/disposal*. This value is the result of the combination of several parameters, being the most relevant the sensitivity of the component, combined to its high intensity (since if wastewater is discharged uncontrollably in the environment, this could lead to serious negative environmental impacts especially on soil and water resources, besides the spread of diseases) and also its long-term reversibility, given that it could take considerable time for the soil and water resources to return to their initial conditions if contaminated by wastewater or liquid waste derived from the construction activities.

The mitigation measures listed in Table 2 will prevent or minimize potential impacts generated by wastewater. The most effective measure will be the construction and operation of a wastewater treatment system that will reduce the residual risk to low or less.

Table 10: Residual impact assessment matrix for Wastewater during construction – WPP AoI.

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features		Impact Value	Mitigation effectiveness	Residual impact value
Demand for liquid waste and wastewater treatment/disposal	Duration:	Medium-long	Medium-high	Reversibility:	Long term	High	High	Low
	Frequency:	Highly frequent						
	Geo. Extent:	Regional						
	Intensity:	Medium						

OHTL AoI

In relation to the OHTL AoI, a qualitative impact assessment was not performed since impacts on the Wastewater component are expected to be minimal.

However, several of the mitigation measures listed section 4.1.2 (Table 2) related to the impact factors *demand for liquid waste and wastewater treatment/disposal* are also applicable to the OHTL and shall therefore be carefully implemented during the OHTL construction.

4.2 Impact Assessment for Operation Phase

4.2.1 Impact Assessment

As described in Chapter 03 of this ESIA ("IA Methodology"), the Project actions carried out during the operational phase will generate impact factors. The potential environmental impacts that may be in turn generated by the identified impact factors during the operational phase are described in the following table.

Table 11: Impact Assessment Physical Components - Operation Phase.

Impact Factor	Impact Assessment	Components Affected
Change in the local hydrology and surface water quality	During operations, potential impacts to surface water resources could occur due to the discharge or introduction of pollutants into freshwaters, such as from: - any Project structures' permanent drainage systems that are not properly functioning and kept in poor conditions; - personnel domestic wastewater, in case it is unproperly managed and disposed; - chemical hazardous materials and products, in case they are unsafely stored and/or handled; - any solid waste generated that is not properly managed and disposed; - spills and leakages during operation and management ("O&M") activities (servicing of mechanical and electrical equipment). Still, due to the minimal activities performed during the operation phase, potential impacts on surface waters are expected to be limited in the WPP construction site.	▪ Hydrology and Surface Water
Change in the local hydrogeology and groundwater quality	During operations, potential impacts on groundwater resources may occur due to the discharge or introduction of pollutants into aquifers, such as: - Indirect contamination, in the case where soils and/or surface waters get contaminated, and due to interconnectivity, this pollution reaches the aquifers; - Poor maintenance of the wastewater systems. In case of accidental wastewater spillage, contaminants could reach the water table; - Water well contamination. Water wells can be contaminated in different ways, such as from water run-off from rainfall or snowmelt by washing microorganisms into the well system; leaching of contaminants from on-site sources; poor well maintenance; or overtopping of flood water; - Overextraction of groundwater, without respecting aquifers' recharge rates. Due to the minimal activities performed during the operation phase, potential impacts on groundwater are expected to be very limited.	▪ Hydrogeology and Groundwater
Emission of greenhouse gases	Considering the whole lifecycle of the Project, including all its elements (wind turbines, BESS, OHTL, offices, warehouse, etc.), emissions of greenhouse gases can be considered negligible during the operational phase. In the lifecycle of a wind farm and its components, the phase where materials are manufactured (in which there is resource extraction, processing of materials and the amalgamation of final products) is by far	▪ Air Quality

Impact Factor	Impact Assessment	Components Affected
	the stage where most greenhouse gases are emitted. These are Scope 3 emissions that are not considered part of the ESIA scope. However, a few GHG emissions will still be emitted during operations, mostly related to regular maintenance and cleaning, possible replacement parts such as blades and gear components, and required material inputs such as hydraulic oil and oil filters used to lubricate turbines. Due to the urgent global need to the reduction of emissions of GHGs, a few standard mitigation measures are recommended in section 4.2.2 below, to minimize any possible GHG emissions, even if very limited in this Project phase.	
Emission of dust and particulate matter	Wind turbines and the other infrastructure part of the Project (BESS, OHTL, offices, SS, etc.) do not emit dust or particulate matter into the atmosphere when in operation. During the Project operational phase, it is expected that sources of particulate matter are identified as the maintenance vehicles that will be required sporadically. These are not considered to be relevant emitters of dust and particulate matter. However, dust emission may potentially be an occupational issue due to the natural climate and landscape, as the Project AoI is desert/arid and dust emission is a natural process, which may be intensified on very windy days, especially in the dry season. Depending on the situation, this may pose a health risk to O&M workers, who may be exposed to unhealthy air conditions. As dust will not be significantly emitted by the Project itself during operations, but is part of the natural characteristics of the area, this impact factor will not be quantitatively assessed for the operational phase; however, a few standard mitigation measures are recommended in section 4.2.2 below, aiming to protect workers and to further reduce any possible emissions.	▪ Air Quality
Emission of gaseous pollutants	Wind turbines and the OHTL do not emit gaseous pollutants when in operation. During the Project operational phase, sources of gaseous pollutants are identified as: - The eventual use of mobile backup diesel generators due to power outages, which are stationary units and release harmful substances to the atmosphere, such as CO, NOx, hydrocarbons, SO_2, formaldehyde, and benz(a)pyrene. Since the use of diesel generators to power any Project facility (warehouse, offices, etc.) during operations is expected to be used only for emergencies, this impact is considered negligible; - Emissions from fuel combustion from the use of maintenance vehicles, for both WPP site, BESS and OHTL site. Due to the sporadic and sparse need of vehicles expected to be used during operations, this impact is considered negligible; - The heating, ventilation and air conditioning (“HVAC”) system to be used for the BESS facility. Most HVAC systems rely heavily on electricity, and depending on the energy source, this could mean a significant amount of carbon emissions. Assuming that the BESS will be powered by electricity produced onsite, this impact is considered negligible. In addition, depending on the type of refrigerant use, emissions from HVAC systems can be harmful to the ozone layer and have global warming potential. These sources of pollutant gases identified above are not considered significant enough to significantly modify air quality. Therefore, this impact factor will not be quantitively assessed for the operational phase.	▪ Air Quality

Impact Factor	Impact Assessment	Components Affected
	However, a few standard mitigation measures are recommended in section 4.2.2 below, to further minimize any possible emissions of gaseous pollutants.	
Emission of noise and vibrations	Wind turbines produce noise through a number of different mechanisms, which can be roughly grouped into mechanical and aerodynamic sources. The major mechanical components include the gearbox, generator, and yaw motors, each of which produce their own characteristic sounds. Other mechanical systems, such as fans and hydraulic motors, can also contribute to the overall acoustic emissions. Mechanical noise is radiated by the surface of the turbine and by openings in the nacelle housing. The interaction of air and the turbine blades produces aerodynamic noise through a variety of processes as air passes over and past the blades.[5] Within this regard, in order to predict worst-case scenarios for noise levels at the nearest sensitive receptors that would potentially occur during the operation of WTGs, noise modelling studies have been conducted and details of the study have been presented under APPENDIX A – Noise and Shadow Flicker Modelling Studies of this ESIA Report. In accordance with the modelling results, even under the worst-case scenario, calculated cumulative noise levels at the nearest sensitive receptors are in compliance with the WBG's EHS Guidelines for Wind Energy; IFC General EHS Guidelines: Environmental - Noise Management and Kazakh regulatory noise limit values. In relation to herders, due to their mobile nature and the inability to determine their exact locations in advance, noise impacts may vary depending on their proximity to the WTGs. Therefore, stakeholder engagement activities will be undertaken with herders prior to the operation phase to inform them that noise levels are expected to exceed the Project Standards within a distance of approximately 900 meters or closer to the WTGs. Apart from the WTGs, no significant noise impact is expected from the other infrastructure part of the Project (BESS, OHTL, offices, SS, etc.) since these components primarily involve stationary equipment or infrastructure that typically operate with low noise emissions compared to the WTGs. In terms of vibrations, apart from the WTGs, impacts are considered negligible from the other infrastructure parts of the Project (BESS, OHTL, offices, SS, etc.) since these components involve static or non-moving elements that do not generate significant ground vibrations. For the WTGs, vibration impacts are also expected to be negligible. Overall, no significant impact is expected in terms of operational noise and vibration emissions.	▪ Noise and Vibration
Emission of shadow flicker	Shadow flicker occurs when the sun passes behind the wind turbine and casts a shadow. As the rotor blades rotate, shadows pass over the same point causing an effect termed shadow flicker. Shadow flicker may become a problem when potentially sensitive receptors (e.g., residential properties, workplaces, learning and/or health care spaces/facilities) are located nearby, or have a specific orientation to the wind energy facility.[6]	▪ Shadow Flicker

[5] World Bank Group. (2015). Environmental, Health, and Safety Guidelines for Wind Energy.

[6] World Bank Group. (2015). Environmental, Health, and Safety Guidelines for Wind Energy.

Impact Factor	Impact Assessment	Components Affected
	Within this regard, in order to predict shadow flicker effect at the nearest sensitive receptors for an astronomical worst-case scenario, shadow flicker modelling studies have been conducted and details of the study have been presented under APPENDIX A – Noise and Shadow Flicker Modelling Studies of this ESIA Report. In accordance with the modelling results, even for the astronomical worst-case scenario, calculated shadow flicker durations at the nearest sensitive receptors are in compliance with the WBG shadow flicker standards. Overall, no significant impact is expected in terms of shadow flicker effect.	
Demand for solid waste treatment/disposal	When compared to the construction phase, the operational phase of the Project will involve a considerably lower rate of waste generation due to limited O&M activities and a smaller workforce. In addition, operational waste will largely comprise non-hazardous waste (such as recyclable waste as paper, tin cans, plastic, cartons, rubber, and glass; and non-recyclable such as food residues and other organic wastes). The generation of hazardous solid waste during operations (such as electrical waste, general clean-up materials and solvents, used chemical containers, contaminated soil from potential spills and leaks of hazardous materials, and other miscellaneous wastes) is expected to be in small quantities. However, this type of waste can cause significant adverse impacts on human health and the environment if inadequately managed. The use of inadequate facilities and procedures for the storage, collection, transfer, treatment/recycling and/or disposal of all streams of O&M waste pose a significant risk of contamination of the environment, such as soils, groundwater and surface water, and resultant impacts on human health and sensitive biological receptors within the receiving environments. In addition, environmental contamination may also happen due to poor solid waste management by waste operators/transporters or the lack of capacity of these services at local level. As identified also for the construction phase, currently there is a lack of appropriated solid waste landfills and treatment plants in Mirny vicinities (< 200 km). It is known that the government is working to upgrade municipal landfills to meet required standards. In relation to the OHTL, no significant waste amounts are anticipated to be generated during its operation.	▪ Solid Waste
Demand for liquid waste and wastewater treatment/disposal	Wastewater generated from operational activities at the WPP site will include: - Sanitary/domestic wastewater from O&M personnel (from toilets and kitchen); - Oily wastes and oily water (from the collection of spills/leaks from transformer maintenance) – expected in very small quantities; - Potential hazardous liquid waste such as fuels, chemicals, paints, lubricants, solvents, waste oil, hydraulic fluid, resins, waste solvents and thinners, etc – expected in very small quantities, if any. The same closed-cycle wastewater treatment system used for constructions is planned to be used for operations. Inadequate segregation, storage, transfer and final disposal of wastewater pose a risk of accidental release of toxic substances into the	▪ Wastewater

Impact Factor	Impact Assessment	Components Affected
	environment and resulting contamination of soil, groundwater and surface water, which can generate significant impacts on human health and sensitive local biodiversity. In addition, environmental contamination may also happen due to poor wastewater management by waste operators/transporters or the lack of capacity of these services at local level. In relation to the OHTL, no significant wastewater amounts are anticipated to be generated during its operation.	
Energy and fuel demand	During operations, auxiliary power supply will be required to operate plant infrastructure such as: the inverters control circuit, the transformer magnetization circuit, the BESS HVAC systems, and the office (air conditioning, lights, computers, server, lighting, etc.). Power is expected to be provided by the onsite production (however, the final power supply for operations is not yet defined at this point). In that case, no impacts are expected in relation to electricity needs for operations. However, in case diesel generators are used for daily operations or even just for emergencies, this could adversely affect the local air quality (impacts related to the use of generators were addressed above, in the impact factor “emission of gaseous pollutants”). A few O&M activities will also need fuel to be carried out. The burning of fossil fuels could locally impact the air quality, mainly with emissions of gaseous pollutants and GHGs, although the Project contribution is considered to be negligible. This impact was addressed above, in the impact factors “emission of gaseous pollutants” and “emission of greenhouse gases”.	▪ Air Quality
Water demand	Water consumption in the Project operational phase power will be negligible; in accordance with the standards of the Republic of Kazakhstan and other similar enterprises, the estimated water demand during operation will be 11,258 m3/year, of which 8,896 m3/year will be drinking water quality and 2,363 m3/year will be technical water quality.. However, water will still be needed for activities such as: - the daily functioning of the office’s bathrooms and kitchen; - domestic cleaning purposes; - eventual landscaping; - for the onsite ion-lithium batteries; - eventual dust control; - for the firefighting stations. Groundwater is available onsite from three existing wells equipped with electric pumps powered by diesel generators. Groundwater sampling and analysis have shown that pollutant concentrations do not prevent its use for construction or operational purposes; however, the water is non-potable and must not be used for drinking due to health risks. Consequently, drinking water for operational personnel will be supplied through bottled water delivered to the site. Technical water for non-drinking purposes will continue to be sourced from the existing groundwater wells and will be periodically monitored to ensure that operational demand can be met.	▪ Hydrogeology and Groundwater

4.2.2 Mitigation Measures

The mitigation measures listed below reflect the mitigation hierarchy and are proposed for the operational phase. These measures will be implemented in addition to the Project mitigation measures which are a standard

procedure applied by the Project Operator to achieve compliance with legal requirements and regulations and alignment with GIIP.

ESMPs to be implemented during the Project's operational phase will be prepared in a timely manner before the start of operations and will incorporate the mitigation measures presented below. The ESMPs will be part of the Project ESMS, whose structure and functioning are described under Chapter 12 of this ESIA (Environmental & Social Management System Framework Document).

Based on the impact assessment, the MPs to be prepared are included in the following table. However, the MPs mentioned may be not exhaustive and depending on future needs, they can be modified to better adapt to the Project needs, as well as others can also be included.

Table 12: Mitigation Measures Physical Components - Operation Phase.

Mitigation hierarchy	Mitigation Measure
Impact Factor: Change in the local hydrology and surface water quality	
Avoidance	The stormwater systems at the WPP site will be maintained in good conditions during the whole operation period to allow for the proper management of stormwater.
Avoidance	All stormwater drains at the WPP site will be periodically inspected and kept free from waste, debris or any other potential clogging materials.
Avoidance	Any contaminants will be prevented of entering the stormwater network of the WPP site.
Avoidance	All unpaved roads and their drainage systems will be periodically maintained, to avoid their erosion and degradation, and potential sedimentation within watercourses.
Avoidance	The plant Operator will forbid the intentional dumping/discharge of any type of materials (liquid, semi-solid or muddy), substances, objects and waste into surface water bodies and/or into dry channels (i.e., seasonal water streams).
Avoidance	The transportation of any hazardous substances during operations will be made according to safety standards and indications, with proper supervision and control of the quantities, of the paths to be followed and of the transportation means and methods.
Avoidance	No moving vehicles will be allowed to cross any permanent streams, the Shu River or the seasonal water channels while reaching or leaving the Project site.
Avoidance	Areas where hazardous or pollutant products are stored or handled at the WPP site will be equipped with a dedicated stormwater/clean water collection system, secondary containment systems, waterproofed flooring or impermeable paving, and roofing for avoiding washouts and runoffs. The storage areas will be located away from natural water streams (seasonal or permanent).
Avoidance	All chemical substances and products used and stored during operations at the WPP site will be registered in an updated Material Safety Data Sheet (MSDS), which will be periodically updated, as needed. Handling and storage of chemicals and hazardous materials will follow the indications on the MSDS.
Avoidance	Periodical and adequate maintenance and control on equipment, machines and moving vehicles will be carried out for avoiding oil and fuel spills and leaks.
Avoidance	Avoid the use of pesticides or herbicides in any seasons and anywhere near watercourses.
Minimization	A *Water and Groundwater Management Plan* will be prepared and approved before the start of operation activities, to address the proper management of operation stormwater, to plan for potential flooding events in the low-lying areas where the OHTL is located (if needed), and to ensure the protection of surface water resources and that the work is done correctly, safely, and in compliance with all regulations at every stage.

Mitigation hierarchy	Mitigation Measure
Minimization	A *Hazardous Materials Management Plan* will be prepared and approved before the start of operation activities. This Plan will describe the appropriate practices and procedures for use, handling and storage to be followed by people working with hazardous materials during the operational phase.
Minimization	In case of accidental spills and leaks into soils or any surface water body (including dry streams), the Operator will have procedures in place as part of an EPRP to be immediately followed.
Minimization	The plant Operator will prevent any type of action that can lead to the generation of pits and ponds such as soil over consolidation, placement of unplanned impermeable surfaces and/or uncontrolled stormwater discharges.
Minimization	All wastewater infrastructure of the WPP site (such as drains, pipelines, manholes, etc.) will undergo periodical maintenance for preventing any potential malfunctions and consequent spills and leaks.
Minimization	The low-lying areas where the OHTL is located must be previously studied to understand potential flood risks. If these areas cannot be avoided, the OHTL design and materials will take into account the capacity to withstand flooding events. Installing drainage infrastructure along the OHTL support road will also be considered.
Minimization	The EPRP will include procedures to be followed in the case of flood events with potential damage to the OHTL infrastructure. Procedures will include response actions, site access routes, communication details, etc.
Impact Factor: Change in the local hydrogeology and groundwater quality	
Avoidance	The filtration system of the water well(s) at the WPP site will be checked periodically and eventually replaced if it is clogged with sand or other materials. In addition, the Project Operator will ensure that the well casing/safety cap is weather-resistant and resistant to the infiltration of insects, oils and fuels, water and sand. The top of the water well (i.e. its casing/safety cap) will always be raised at least 30 cm above ground level and will be clearly visible to avoid potential disruption by moving and passing vehicles.
Avoidance	Groundwater sampling and testing will be periodically carried out at the WPP site (i.e., groundwater monitoring campaigns) during the entire operational phase, following a specific monitoring plan which will include the frequency of sampling, sampling locations, and a list of parameters to be sampled (according to the Project standards and the national legislation).
Avoidance	After sampling at the WPP site, if contamination of groundwater is suspected or confirmed, the cause will be investigated, and the pollution will be adequately managed. Local authorities will also be informed and consulted for identifying responsible parties and the measures to be adopted (e.g., remediation) according to Project standards and the Kazakh/local provisions.
Minimization	A *Water and Groundwater Management Plan* will be prepared and approved before the start of operation activities, to address the proper groundwater management, to ensure the protection of groundwater resources and that the work is done correctly, safely, and in compliance with all regulations at every stage.
Minimization	Protecting soil from pollution also means protecting groundwater since substances can percolate beneath the surface. The *Water and Groundwater Management Plan* will contain mitigation measures to ensure the protection of soil resources, or a dedicated *Soil Management Plan* can be developed for the operation phase.
Minimization	In the case there is the presence of any tanks storing substances that could potentially pollute the soil (such as fuel tanks), those tanks will be subjected to periodical maintenance and inspections (e.g., tightness tests) and equipped with continuous monitoring devices for immediately assessing potential decreases of fuel due to losses (i.e., tanks breakage or damages).
Compensation	To allow natural recharge of the local aquifer, the Operator will ensure that green areas (i.e., permeable surfaces) will be properly maintained and periodically renewed and that, when possible, new areas will be vegetated in the plant lifetime.
Impact Factor: Emission of greenhouse gases	

Mitigation hierarchy	Mitigation Measure
Minimization	An *Air Quality Management Plan* will be prepared and approved before the start of operation activities, which will include the actions for avoiding GHGs emissions and to ensure the work is done correctly, safely, and in compliance with all regulations at every stage. The Plan will be in line with the mitigation measures listed in this ESIA report.
Minimization	The Operator will source, where practical and cost-effective, plants, machineries, vehicles, and equipment operating on carbon-neutral biofuels and/or renewable energies.
Minimization	Materials and goods sourced from local suppliers will be preferred, as far as practical.
Minimization	Cooling systems to be used during operations at the WPP site will contain exclusively refrigerant gases with low global warning potential ("GWP"), and that those will be periodically inspected for detecting potential pollutive gas leakages.
Minimization	The proper functioning and efficiency of the cooling, ventilation and heating systems at the WPP site will be ensured, through periodical maintenance actions.
Impact Factor: Emission of dust and particulate matter	
Avoidance	The appropriate PPE, such as the correct type of respiratory protective equipment will be delivered to operation workers, depending on their task. PPE will also be provided in the case of severe weather conditions (high winds) which could expose workers to long times of breathing air with large concentrations of dust.
Avoidance	Weather forecasts will be monitored to identify periods of high wind conditions and allow O&M workers to prepare in advance to carry out their activities safely, and for dust suppression measures to be applied if necessary.
Avoidance	In the event of atmospheric conditions where the dust concentration is extremely dangerous to health, the work outside may be temporarily stopped until the situation has normalized.
Minimization	An *Air Quality Management Plan* will be prepared and approved before the start of operation activities, for avoiding dust and particulate matter spreading and to ensure the work is done correctly, safely, and in compliance with all regulations at every stage. The Plan will be in line with the mitigation measures listed in this ESIA report.
Minimization	Dust suppression techniques will be applied in the Project AoI and unpaved roads, if deemed necessary, to control dust emissions.
Minimization	Vehicles and machinery mobilization will be always restricted to designated routes, where practical.
Minimization	Specific speed limits will be implemented on road portions where dust emission is significant.
Impact Factor: Emission of gaseous pollutants	
Avoidance	The HVAC systems of the BESS facility at the WPP site will go under regular maintenance. This includes cleaning and replacing filters, checking for refrigerant leaks, and ensuring all components are functioning efficiently. A well-maintained system uses less energy, which translates to lower carbon emissions.
Avoidance	The HVAC system of the BESS facility at the WPP site will exclusively use refrigerants that do not cause ozone depletion and that have a relatively low global warming potential.
Avoidance	Ensure that vehicles and fuels used for operations are in compliance with national and international regulations for pollutant emissions.
Avoidance	Maintenance vehicles and equipment, while not in use, will be properly switched off/turned off for avoiding unnecessary air emissions.
Avoidance	The use of non-compliant or unlabeled chemicals will be forbidden. The materials and chemicals' labels will show the product name and the hazard pictograms (e.g., Hazardous to the environment or Acute toxicity symbols).

Mitigation hierarchy	Mitigation Measure
Avoidance	Vehicles, equipment and machinery used for operations activities will be turned off while not in use.
Minimization	An *Air Quality Management Plan* will be prepared and approved before the start of operation activities. The Plan will be in line with the mitigation measures listed in this ESIA report.
Impact Factor: Emission of noise and vibrations	
Compensation	Grievance mechanism will be developed to record and respond to complaints regarding to noise and vibration.
Compensation	If any noise-related grievance is received from the herders, a noise measurement campaign will be conducted at the location where the grievance was reported. If measurement results confirm that the Project noise limits are exceeded due to the Project's operation, appropriate mitigation measures (e.g., sound insulation, relocation, etc.) will be determined in consultation with the grievance holder.
Compensation	Grievance mechanism at the WPP site will be developed to record and respond to complaints regarding to shadow flicker effect.
Impact Factor: Demand for solid waste treatment/disposal	
Avoidance	The solid waste generated during the operation phase will be managed according to Kazakh laws and regulations and the international standards and best practices.
Avoidance	The generation of waste will be avoided. Where it cannot be avoided, the 4 R's (waste Reduction, Recover, Recycle and Reuse) system of waste management will be applied to all classes of waste generated during the entire operational phase.
Avoidance	Solid waste generated during the operational phase will be placed in a dedicated waste storage area, which will be roofed, concrete-paved or waterproofed, with sufficient containment and separation capacity, separate drainage system, good ventilation and equipped with spill kits and spill response procedures. This area should be located away from any ignition sources.
Avoidance	Waste containers at the WPP site will be clearly labeled. Labels will be waterproof, securely attached and written in English and other languages as required by the workforce, such as Kazakh and Chinese.
Avoidance	Food waste specifically should be stored at the WPP site in sealed metal or plastic containers to prevent the proliferation of insects or other animals.
Avoidance	For food waste and household waste produced at the WPP site, an adequate number of covered bins will be strategically placed throughout the site in locations where O&M personnel work and consume food. The contents of these bins will be collected periodically and taken to the main waste storage area.
Avoidance	Recyclable solid waste will be segregated at the WPP site separately from other waste streams in separate containers/bins to facilitate recycling.
Avoidance	All the materials that can be recycled (such as cardboard, metal cans, plastic and glass bottles, etc.), will be collected and sent to licensed recycling facilities as far as practicable. Suitable and licensed recycling facilities will be identified in advance.
Avoidance	Hazardous wastes – such as general clean-up materials and solvents, used chemical containers, contaminated soil from potential spills and leaks of hazardous materials, and other miscellaneous wastes – must be stored at the WPP site for such purpose and duly marked, avoid mixing incompatible wastes. This area will be located away from sources of ignition.
Avoidance	The Operator will establish a designated storage area at the WPP site for electronic O&M waste, where it will be held prior to scheduled transportation to specialized recycling facilities within or outside Kazakhstan.
Avoidance	Waste which cannot be recycled will be collected and transported by a licensed waste collection company(ies) to be disposed at suitable treatment facilities or at approved landfills (compliant to the Project standards, the legal requirements and the international best practices). Since local compliant landfills and/or treatment facilities are currently not available, the following options are being considered:

Mitigation hierarchy	Mitigation Measure
	- A composter for food waste will be installed onsite; - Installing an emissions-free incinerator onsite for the daily solid domestic waste; - Delivering other types of waste to Promtechnoresurs, a waste management company that operates in the Zhambyl and Almaty regions and handles several types of wastes.
Avoidance	A waste inventory to document and track solid waste generated, segregated, reused and consigned, will be maintained on-site.
Avoidance	The collection, transportation and disposal of waste and hazardous waste will be carried out exclusively by a duly qualified and certified waste operator.
Minimization	A *Waste Management Plan* will be prepared and approved before the start of operation activities, to ensure that all solid waste streams (both hazardous and non-hazardous) generated by the Project are properly managed, including all necessary provisions and arrangements, and considering the location of their respective management/disposal facilities. The Plan will ensure that waste management is performed in compliance with all local and international regulations. The Plan will be in line with the mitigation measures listed in this ESIA report.
Minimization	In the event of WPP components' failure (such as blades, nacelle and associated electrical components, etc.), the Company will evaluate the possibility of sending these components to the supplier for repair and recycling.
Minimization	If deemed necessary, the Plant Operator will liaise with local/regional governmental parties responsible for waste management to seek solutions for the appropriated disposal of waste (compliant landfills, waste processing facilities, etc.).
Minimization	Personnel will be instructed on sensible resources consumption and waste reduction techniques.
Minimization	A waste recycling program will be in place during operations.
Impact Factor: Demand for liquid waste and wastewater treatment/disposal	
Avoidance	Any direct discharge of wastewater into the environment will be prohibited. Appropriate controls must be applied beforehand. This refers to any type and amounts of wastewater (both from operation processes – technical wastewater – and from domestic wastewater).
Avoidance	The operation installations at the WPP site will be provided with sanitary facilities with capacity to meet the O&M personnel sanitation requirements. O&M personnel must use the provided facilities, which will be serviced daily to ensure hygienic conditions.
Avoidance	The Plant Operator will make sure that the installed wastewater treatment system has the capacity to adequately treat the Project wastewater.
Avoidance	The wastewater treatment system at the WPP site will go under periodical maintenance.
Avoidance	Sampling of treated wastewater (the effluent) will be periodically carried out at the WPP site to ensure the plant is working according to vendor specifications. Results of testing will be kept at site in case of inspections and audits. In case of exceedances, the Operator will immediately carry out the inspection on the equipment (plants, sensors and flow meters) and will appoint a subcontractor to carry out the repair and maintenance eventually needed.
Avoidance	As a closed-loop system, effluents from the wastewater treatment system at the WPP site will be used on-site for reducing water consumption (for example for cleaning purposes, for landscaping, etc.). Treated effluents that do not meet the requirements to be discharged into the environment or reused on-site will be collected by local specialized and certified companies and sent to further treatment or to licensed sanitary landfills.
Avoidance	The sludge generated from the wastewater treatment system at the WPP site will be periodically collected by local companies specialized and certified for the activity and it will then be sent to licensed sanitary landfills.

Mitigation hierarchy	Mitigation Measure
Minimization	Mitigation measures related to stormwater management are covered in the impact factor *Change in the local hydrology and surface water quality* above.
Minimization	A *Wastewater Management Plan* will be prepared and approved before the start of operation activities, to ensure that all liquid waste generated by the Project is properly managed, and that work is done correctly, safely, and in compliance with all regulations at every stage. The Plan will ensure that wastewater is managed according to local and international regulations. The Plan will be in line with the mitigation measures listed in this ESIA report.
Minimization	All wastewater infrastructure at the WPP site (such as drains, pipelines, manholes, etc.) will undergo periodical maintenance for preventing any potential malfunctions and consequent spills and leaks.
Minimization	An oil/grease trap will be used in the WPP site kitchen to separate these substances from the inlet drains, and the resulting amount of oil and grease waste will be properly handled and disposed of by licensed operators.
Minimization	Oils and grease will not be disposed of in the inlet drains.
Minimization	All O&M personnel will be oriented in relation to proper hygiene processes and wastewater risks to the environment.
Impact Factor: Energy demand (fuel and electricity)	
Avoidance	Ensure that the primary source of electricity at the WPP site is the one identified in the design stage (provided by the onsite production), and that other sources (such as diesel generators) will be used only for emergencies, if needed.
Minimization	A *Resource Efficiency Management Plan* will be drafted, according to the Project standards, and will describe the measures to adopt for optimizing energy efficiency and enhancing sustainable management practices during the operational phase.
Minimization	The Project design will consider using an energy-efficient HVAC system for the BESS facility at the WPP site. Systems with a high Seasonal Energy Efficiency Ratio (“SEER”) rating use less energy to produce the same amount of heating or cooling, reducing carbon footprint.
Minimization	The use of smart thermostats for the HVAC systems of the BESS facility at the WPP site will be considered since they optimize HVAC usage by learning the schedule and preferences for cooling and heating. This smart technology can significantly reduce energy consumption.
Minimization	The use of insulation materials for the BESS facility at the WPP site will be considered.
Minimization	Arrangements for monitoring energy consumption will be implemented for the operation phase.
Minimization	During O&M activities, the use of machinery/equipment/plants that are powered by grid electricity will be preferred instead of diesel-fueled portable generators.
Minimization	O&M equipment and machinery will be kept in good running conditions and periodic maintenance will be carried out to avoid energy waste from malfunctioning.
Impact Factor: Water demand	
Avoidance	The overexploitation of groundwater resources at the WPP site will be strictly avoided. The design of the Project water supply scheme is such as to minimize and avoid abstraction rates beyond the safe production volume and subsequent impacts on sensitive social and biological receptors. The Project will ensure that sensitive receptors will not be negatively impacted due to the use of groundwater for the construction activities.
Avoidance	A comprehensive assessment of the availability and vulnerability of groundwater in the Project AoI must be prepared before any groundwater exploitation.

Mitigation hierarchy	Mitigation Measure
Avoidance	The operation and management of groundwater intake will be carried out in a manner where the abstraction rate is monitored in relation to safe yield abstraction rates.
Avoidance	All local authorizations and permits needed for water abstraction and use will be in place during the operational period.
Avoidance	Ensure that pipes and taps supplying the water are maintained on a regular basis to avoid water being lost through leakages.
Avoidance	In the case water storage tanks are used during operations, they will undergo periodic maintenance and sanitation to ensure their adequacy for intended purposes. Routine inspections for early detection of potential leaks, contamination or structural compromise will be also carried out.
Minimization	A *Resource Efficiency Management Plan* will be drafted, according to the Project standards, and will describe the measures to adopt for optimizing water efficiency and enhancing sustainable management practices.
Minimization	The operation activities for which water consumption is highest will be identified and performance targets for water consumption will be defined prior their commencement. Targets will be periodically reviewed and compared to the Project effective water consumption; if needed, further actions for reducing the consumptions will be taken.
Minimization	The Operator will identify strategies to reduce the water consumption during operations.
Minimization	Ensure drinking water for operational personnel is supplied via bottled water, while non-potable groundwater from onsite wells is used for technical purposes with regular monitoring to verify availability and prevent overuse.

4.2.3 Impact Value and Residual Impact Value Calculation

This section describes the Impact Values, and the Residual Impact Values (after the implementation of mitigation measures) found for each impact factor on each physical component relevant for the operation phase.

The impact calculations methodology is presented in Chapter 03 of this ESIA (“IA Methodology”).

4.2.3.1 Hydrology and Surface Water

WPP AoI

The impact factor that can affect the Surface Water component is listed in Table 13, considering the WPP AoI. Other impact factors such as the ones related to solid waste and wastewater generation can also potentially affect the Surface Water component. However, those are addressed in their specific sections below (Solid Waste and Wastewater).

The Project’s overall impact on the Surface Water component in the operation phase is of negative direction. According to the baseline study performed, the sensitivity of this component is assessed as **medium-high**.

The impact value calculated is **medium** for the impact factor *change in the local hydrology and surface water quality*. Although any potential impact on this component is expected to be limited, due to the minimal expected operation activities, the sensitivity value attributed to this component ends up pushing the impact value up. Moreover, the fact that any contamination of surface water can reach long distances and that it can take years until the initial situation is reestablished also contributes to the value found.

However, with the application of the set of mitigation measures, the residual impact is assessed as **low**.

Table 13: Residual impact assessment matrix for Surface Water during operation – WPP AoI.

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features		Impact Value	Mitigation effectiveness	Residual impact value
Change in the local hydrology and surface water quality	Duration:	Long	Medium-high	Reversibility:	Mid term	**Medium**	Medium-high	**Low**
	Frequency:	Moderately frequent						
	Geo. Extent:	Local						
	Intensity:	Low						

OHTL AoI

In relation to the OHTL AoI, a qualitative impact assessment for the impact factor *change in the local hydrology and surface water quality* was performed, focusing only on potential flooding events that may occur in the OHTL AoI, in lower parts of the terrain. The impact value calculated is **medium**. With the application of mitigation measures, the residual impact is assessed as **negligible**.

Table 14: Residual impact assessment matrix for Surface Water during operation – OHTL AoI.

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features		Impact Value	Mitigation effectiveness	Residual impact value
Change in the local hydrology and surface water quality - OHL	Duration:	Long	Medium-high	Reversibility:	Short-mid-term	**Medium**	Medium-high	**Negligible**
	Frequency:	Sporadic						
	Geo. Extent:	Project footprint						
	Intensity:	Medium						

4.2.3.2 Hydrogeology and Groundwater

WPP AoI

Considering the WPP AoI, the impact factors that can affect the Hydrogeology and Groundwater component are listed in Table 15.

The Project's overall impact on the Hydrogeology and Groundwater component in the operation phase is of negative direction. According to the baseline study performed, the sensitivity of this component is assessed as **medium**.

The impact value calculated is **medium** for the impact factor *change in the local hydrogeology and groundwater quality*. It is not expected that hydrogeological cycles or the quality of the groundwater will be significantly affected by the Project during operations. However, due to the water scarcity conditions in the area in question, and without a specific study of the behaviour of local aquifers, any overextraction without respecting the aquifer recharge rates could indeed alter the natural hydrogeological characteristics; with the proper application of the selected mitigation measures, the residual impact is assessed as **low**.

For the impact factor *water demand*, the impact value is calculated as **medium**. Even with the use of groundwater for O&M activities, it is not expected these activities will require constant and significative amounts of water to perform. However, the availability of groundwater throughout the operational phase is still a point that needs to be clarified, and which is being studied by the Company. With the application of the selected mitigation measures, the residual impact is assessed as **low**.

Table 15: Residual impact assessment matrix for Groundwater during operation – WPP AoI.

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features		Impact Value	Mitigation effectiveness	Residual impact value
Change in the local hydrogeology and groundwater quality	Duration:	Long	Medium	Reversibility:	Mid term	**Medium**	Medium	**Low**
	Frequency:	Frequent						
	Geo. Extent:	Local						
	Intensity:	Medium						
Water demand	Duration:	Long	Medium	Reversibility:	Mid term	**Medium**	Medium-high	**Low**
	Frequency:	Highly frequent						
	Geo. Extent:	Regional						
	Intensity:	Medium						

OHTL AoI

In relation to the OHTL AoI, a qualitative impact assessment was not performed since impacts on the Hydrogeology and Groundwater component are not expected during operations.

4.2.3.3 Noise and Vibrations

The impact factor that can affect the Noise and Vibrations component is listed in Table 16.

The results of the impact assessment are applicable to both the WPP and OHTL AoI.

The Project's overall impact on the Noise and Vibrations component in the operation phase is of negative direction. According to the baseline study performed, the sensitivity of this component is assessed as **medium**.

The impact value calculated is **low** for the impact factor *emission of noise and vibrations*. It is not expected that ambient noise and vibration levels will be significantly affected by the Project; and with the effective use of the grievance mechanism, the residual impact is assessed as **negligible**.

Table 16: Residual impact assessment matrix for Noise and Vibrations during operation.

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features		Impact Value	Mitigation effectiveness	Residual impact value
Emission of noise and vibrations	Duration:	Long	Medium	Reversibility:	Short-term	**Low**	Low	**Negligible**
	Frequency:	Continuous						
	Geo. Extent:	Local						
	Intensity:	Negligible						

4.2.3.4 Shadow Flicker

The impact factor that can affect the Shadow Flicker component is listed in Table 17.

The Project's overall impact on the Shadow Flicker component in the operation phase is of negative direction. According to the baseline study performed, the sensitivity of this component is assessed as **low.**

The impact value calculated is **negligible** for the impact factor *emission of light and flickering*. It is not expected that sensitive receptors will be affected by the Project; and with the effective use of the grievance mechanism, the residual impact is assessed as **negligible**.

Table 17: Residual impact assessment matrix for Shadow Flicker during operation.

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features		Impact Value	Mitigation effectiveness	Residual impact value
Emission of shadow flicker	Duration:	Long	Low	Reversibility:	Short term	**Negligible**	Low	**Negligible**
	Frequency:	Frequent						
	Geo. Extent:	Local						
	Intensity:	Negligible						

4.2.3.5 Solid Waste

WPP AoI

The impact factor that can affect the Solid Waste component is listed in Table 18, considering the WPP AoI.

The Project's overall impact on the Solid Waste component in the operation phase is of negative direction. According to the baseline study performed, the sensitivity of this component is assessed as **medium-high**.

The impact value calculated is **high** for the impact factor *demand for solid waste treatment/disposal*. This value is mostly influenced by the sensitivity of the component, since there are no compliant landfills and/or waste recovery facilities in the vicinities of the Project, and an effective solid waste management strategy has not been defined yet.

With the application of the recommended set of mitigation measures, the residual impact is assessed as **medium**.

Table 18: Residual impact assessment matrix for Solid Waste during operation – WPP AoI.

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features		Impact Value	Mitigation effectiveness	Residual impact value
Demand for solid waste treatment/disposal	Duration:	Long	Medium-high	Reversibility:	Mid term	**High**	Medium	**Medium**
	Frequency:	Moderately frequent						
	Geo. Extent:	Regional						
	Intensity:	Medium						

OHTL AoI

In relation to the OHTL, no significant waste amounts are anticipated to be generated its during operation. Moreover, it is expected that any solid waste eventually produced by OHTL's maintenance activities will be transferred to the waste storage facility present in the WPP site. Therefore, this impact factor will not be quantitatively assessed for the operation phase for the OHTL; however, mitigation measures are still recommended to minimize any possible impacts from solid waste generation. The mitigation measures that apply are listed below in section 4.2.2.

4.2.3.6 Wastewater

WPP AoI

The impact factor that can affect the Wastewater component is listed in Table 19, considering the WPP AoI.

The Project's overall impact on the Wastewater component in the operation phase is of negative direction. According to the baseline study performed, the sensitivity of this component is assessed as **medium-high**.

The impact value calculated is **medium** for the impact factor *demand for liquid waste and wastewater treatment/disposal*. This value is mostly influenced by the sensitivity of the component, since there is no sewage system in the vicinities of the Project, and an effective wastewater management strategy has not been defined

to the present date. The most recent information received is that a closed wastewater treatment system is planned, but still to be confirmed by design institute.

However, since wastewater generation is expected to be minimal during operations, with the application of the recommended set of mitigation measures, the residual impact is assessed as **low**.

Table 19: Residual impact assessment matrix for Wastewater during operation – WPP AoI.

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features		Impact Value	Mitigation effectiveness	Residual impact value
Demand for liquid waste and wastewater treatment/disposal	Duration:	Long	Medium-high	Reversibility:	Mid term	**Medium**	Medium-high	**Low**
	Frequency:	Moderately frequent						
	Geo. Extent:	Local						
	Intensity:	Low						

OHTL AoI

In relation to the OHTL AoI, a qualitative impact assessment was not performed since no significant wastewater amounts are anticipated to be generated during its operation.

4.3 Impact Assessment for Decommissioning Phase

4.3.1 Impact Assessment

During decommissioning of the WPP site, the dismantling and removal of turbines and related infrastructure from the site will take place. Impacts on the physical environment may occur such as noise emissions, air emissions, intense soil turnovers, and waste generation. These potential impacts require mitigations to avoid negative effects on the local environment, including also biological and social sensitive receptors, as per the IFC EHS Guidelines for Wind Energy[7].

Chapter 03 of this ESIA ("IA Methodology") describes the Project actions carried out during the decommissioning phase that can generate environmental and/or social pressures, which are identified as impact factors. The potential environmental impacts that may be generated by these impact factors are described in the following table.

Table 20: Impact Assessment Physical Components - Decommissioning Phase.

Impact Factor	Impact Assessment	Components Affected
Emission of greenhouse gases	During the decommissioning phase, GHG emissions will be mostly released from vehicles and machinery used for the different activities that will entail the plant removal, land restoration, and the transportation of materials and waste off-site. Due to the temporary and short-term character of these activities, impacts related to GHG emissions are assessed as insignificant. However, a few standard and good practice mitigation measures are recommended in Table 21 below to minimize any GHG emissions during decommissioning.	▪ Air Quality
Emission of dust and particulate matter	During the decommissioning phase, potential sources of dust and particulate matter emissions are likely to be similar to those associated with construction, but at a much lower rate, as there will be quite less soil movement required. It is not expected that significant amounts of dust will be generated during this Project phase, therefore potential impacts are assessed as insignificant, also due to the temporary and short-term nature of this phase. As the Project is located in a desert area where particulates in the air are most likely already quite significant, a few standard mitigation measures are recommended below to minimize any dust and particulate matter emissions during decommissioning, aiming basically to protect workers.	▪ Air Quality
Emission of gaseous pollutants	During the decommissioning phase, gaseous pollutants such as CO, NO, NO_2, hydrocarbons, PAHs, and VOCs etc., will be emitted from vehicles and machinery involved in plant removal, land restoration, and the intense transportation of materials and waste off-site. However, elevated levels of ambient exhaust pollutants are not expected, also due to the temporary and short-term character of this phase. Therefore, impacts related to gaseous pollutants emissions are assessed as insignificant. Still, gaseous pollutants could cause occupational hazards and a few standard mitigation measures are recommended below to minimize any potential impacts on workers.	▪ Air Quality

[7] final-aug-2015-wind-energy-ehs-guideline.pdf

Impact Factor	Impact Assessment	Components Affected
Emission of noise and vibrations	During the decommissioning phase, similar to the construction, noise will mainly be originated from the operations of heavy equipment/machines that will be used for dismantling the WTGs. Considering that these activities are expected to take place within the Project license area (i.e. away from sensitive receptors) and will be performed over a short-term and temporary basis, impacts related to noise are expected to be low. As for the construction, noise emissions shall be seen as a relevant aspect to the point of view of the health of the workers and relevant mitigation measures will be applied. In terms of vibrations, similar to the construction, the Project has the potential to generate vibration during the dismantling of WTGs (vibratory compaction, heavy vehicles passing through the roads, etc.). However, vibrations to be generated from these activities is unlikely to be significant, since the dismantling activities will take place within the Project license area (i.e. away from sensitive receptors). Based on that, impacts related to vibrations are expected to be low.	▪ Noise and Vibrations
Existence of new buildings/ infrastructures	In the decommissioning phase, the WPP will be removed from service. The dismantling of wind turbines, BESS, SS, and all plant related infrastructure will entail activities that have the potential to: - contaminate soils and surface waters due to leaks/spills of fuel, oil, and hazardous materials and waste; - cause soil erosion and compaction from the increased exposure of bare ground to wind and water, which can cause changes in the soil structure and further degradation of soil quality and permeability, altering also the soil natural drainage pattern; - cause water streams sedimentation, as a consequence of the soil erosive processes. After decommissioning, the access roads will be kept, while the area – once the structures are removed – will undergo land restoration.	▪ Soil ▪ Hydrology and Surface Water
Production of solid waste	Large amounts of infrastructure waste are expected to be generated in the End-of-Life (“EoL”) of the WPP (WTGs, the BESS, underground lines, etc.). Although a large part of this infrastructure could be recycled due to the materials they are made of, currently limited options seem to be available for their recycling. This is in fact a global issue, which ends up raising considerably the recycling costs, therefore, companies usually still prefer to send them to landfills or incineration, which comes with negative environmental consequences. In the recent years, Kazakhstan has developed a number of regulations and legislation related to renewable energy sources, however a specific law in relation to the waste management from decommissioning seem to be lacking. It is expected that over the next few decades, Central Asia will develop its capacity to deal with outdated wind power-related infrastructure, given the region's recent massive investment in this type of technology and the need for disposal and recycling that will become necessary in the not-too-distant future. In addition, the Project decommissioning activities will generate inert demolition waste and materials such as reinforced steel bars, broken concrete, cabling, transformer oils, etc., which have the potential contaminate the soil and water resources. However, this also promotes a significant opportunity for material re-use and recycling.	▪ Solid Waste ▪ Soil

4.3.2 Mitigation Measures

The mitigation measures listed below reflect the mitigation hierarchy and are proposed for the decommissioning phase. These measures will be implemented in addition to the Project mitigation measures which are a standard procedure applied by the Project Operator (in addition to other required parties such as local authorities and/or dismantling company) to achieve compliance with legal requirements and regulations and alignment with GIIP.

The appropriate *Decommissioning Management Plan* to be applied during the Project's decommissioning phase must be prepared at least 2 months before the start of decommissioning activities. The overarching document ESMS Framework will also be prepared.

Based on the impact assessment, the mitigation measures to be included in the *Decommissioning Management Plan* are listed in the following table. However, the following mitigation measures may be not exhaustive and depending on future needs, they can be modified to better adapt to the Project needs, as well as others can also be included.

Table 21: Mitigation Measures Physical Components - Decommissioning Phase.

Mitigation hierarchy	Mitigation Measure
Impact Factor: Emission of greenhouse gases	
Minimization	The *Decommissioning Management Plan* will include actions for avoiding GHGs emissions and to ensure the work is done correctly, safely, and in compliance with all regulations at every stage.
Minimization	Where practical and cost-effective, the plants, machineries, vehicles, and equipment needed for decommissioning will operate on carbon-neutral biofuels and/or renewable energies.
Minimization	The Operator will define strategies for decreasing the waste generation and enhancing waste reuse and recycling and, consequently, decrease the waste disposing off to landfills. This will avoid potential GHG emissions generated in landfills.
Minimization	The Operator will make sure that options for transportation routes will be evaluated in advance, and efficient vehicle routing and scheduling methods will be adopted to minimize GHG emissions (such as finding the shortest suitable paths, scheduling transportation to avoid periods of heavy traffic, etc.).
Minimization	If feasible, vehicles that have lower fuel consumption rates will be used.
Impact Factor: Emission of dust and particulate matter	
Avoidance	The daily weather forecast will be monitored to identify periods of high wind speed.
Avoidance	The appropriate PPE, such as the correct type of respiratory protective equipment will be delivered to workers, depending on their task. PPE will also be provided in the case of severe weather conditions (high winds) which could expose workers to long times of breathing air with large concentrations of dust. Decommissioning activities will be ceased in case of acute health danger. Dust suppression techniques will be applied.
Minimization	The *Decommissioning Management Plan* will include actions for avoiding dust and particulate matter emissions and to ensure the work is done correctly, safely, and in compliance with all regulations at every stage.
Minimization	Dust suppression techniques may be applied, if deemed necessary.
Minimization	Vehicles and machinery mobilization will be restricted to designated routes at all times, where practicable.
Minimization	Specific speed limits will be implemented on road portions where dust emission is significant.
Minimization	Heavy vehicles carrying materials with the potential to result in dust generation will be properly covered with a tarpaulin.

Mitigation hierarchy	Mitigation Measure
Impact Factor: Emission of gaseous pollutants	
Avoidance	Any burning of waste materials will be forbidden.
Avoidance	Equipment and machinery will undergo regular periodical maintenance, including their emission control systems (e.g., aspiration and filtration systems). Manufacturer recommendations will be respected.
Avoidance	The appropriate PPE, such as the correct type of respiratory protective equipment will be delivered to workers, depending on their task (e.g., if they are exposed to volatile organic compounds).
Avoidance	Workers will not be exposed to volatile fuels and chemicals, unless they are using proper PPE and are qualified to handle these materials.
Minimization	The *Decommissioning Management Plan* will include actions for avoiding the emission of air pollutants above allowed thresholds and to ensure the work is done correctly, safely, and in compliance with all regulations at every stage.
Minimization	All trucks and vehicles must be in good condition and in compliance with vehicle emission requirements.
Minimization	Engine idling will be reduced as far as practical.
Minimization	The use low-sulphur diesel will be preferred to power equipment and vehicles.
Impact Factor: Emission of noise and vibrations	
Avoidance	Hours of operation for specific pieces of equipment or operations, in case operating nearby sensitive receptors (e.g., community areas), will be limited.
Minimization	Project traffic will be reduced by routing it away from community areas, wherever possible.
Minimization	Grievance mechanism will be developed to record and respond to complaints regarding to noise and vibration. In case of any noise and/or vibration related grievance, noise and/or vibration measurements will be carried out immediately at the area where noise and/or vibration related grievance is received. If monitoring results indicate that noise and/or vibration levels are above the defined limits, the Client will reduce/limit the amount of equipment at the site, until the noise and/or vibration levels are reduced below the limit values.
Minimization	Regular maintenance of the equipment will be carried out in order to minimize the possible high noise levels generated by the equipment.
Minimization	Equipment with lower sound power levels should be selected.
Minimization	Silencers should be installed for fans.
Minimization	Suitable mufflers should be installed on engine exhausts and compressor components.
Minimization	Acoustic enclosures should be installed for equipment casing radiating noise.
Minimization	Noise sources should be re-located to less sensitive areas to take advantage of distance and shielding.
Compensation	Appropriate PPE and materials such as ear protector or ear plug will be provided to protect workers from noise impacts.
Impact Factor: Existence of new buildings/ infrastructures	
Avoidance	If compaction and erosion events are identified in the Project AoI, appropriate corrective measures will be taken to restore these areas. If necessary, the paths causing compaction and/or erosion will be relocated.
Avoidance	Any unnecessary land/vegetation clearance during decommissioning will be avoided.

Mitigation hierarchy	Mitigation Measure
Avoidance	Any holes, excavated areas and depressions created due to the Project will be filled with soil to mimic the pre-construction profile.
Minimization	The *Decommissioning Management Plan* will include clear instructions on how to manage soil during the decommissioning phase to ensure its sustainability and avoid the risk of losing, damaging or contaminating soil resources. The plan will also contain instructions on how to deal with potential soil contamination, in the case they are observed or caused during decommissioning.
Minimization	In the case of accidental spills of hazardous materials/waste on the soil, the procedures described in the EPRP prepared for construction phase will be followed. The contaminated soil will be immediately collected and treated as hazardous waste.
Minimization	The amount of topsoil used for backfilling/restoring the site will be consistent with the soil excavated.
Restoration	All Project sites will be restored at the end of the Project life cycle to pre-Project levels. Soil rehabilitation measures (such as promoting the use of native plants, techniques to alleviate soil compaction, use of mulch and compost, etc.) will be implemented, to improve soil fertility and prevent erosion.
Restoration	Priority areas for carrying out the soil rehabilitation interventions will be mapped before decommissioning activities start (e.g., areas where a low likelihood of natural revegetation has been identified, or areas that are more prone to compaction and erosion).
Restoration	After decommissioning, the access roads will be kept, while the area – once the structures are removed – will undergo land restoration. The amount of topsoil used for backfilling/restoring the site will be consistent with the soil excavated.
Impact Factor: Production of solid waste	
Avoidance	All wastes generated during decommissioning will be managed by a duly licensed operator (s), for collection, transportation, treatment, and disposal.
Avoidance	All oils will be drained prior to decommissioning. Transformer oil and other oils that are classified as hazardous liquid waste will be collected for recycling and/or disposal by a licensed contractor, which will minimize the risk of accidental spills and leaks during removal of equipment from the site.
Avoidance	The dumping of any waste types on soil, and waste burning will be prohibited.
Minimization	All demolition work will be carried out with reference to: - the IFC EHS Guidelines 1.6 (Waste Management); - the IFC EHS Guidelines 1.5 (Hazardous Materials Management); and - the IFC PS3 on Resource Efficiency and Pollution Prevention.
Minimization	The O&M contractor will be responsible for the management of decommissioning waste, which will be classified mainly as domestic, industrial and hazardous waste. The most sustainable available application for waste management will be prioritized, and landfill disposal will be the last option selected. The waste management hierarchy will be adopted in the following order: 1-prevention, 2-reuse, 3-recycling, 4-recovery, 5-disposal.
Minimization	Priority will be given to available local waste management facilities suitable for material recycling and/or recovery.
Minimization	Where there is no capacity available for reuse, recycling or recovery of decommissioning waste (particularly for electronic waste) or in case those options are not economically viable, their final disposal will be done at waste management facilities designated by local authorities and in compliance with international requirements.
Minimization	Hazardous waste from decommissioning activities will be exclusively handled by trained personnel and disposed of in specialized facilities designed for this type of waste stream.

Mitigation hierarchy	Mitigation Measure
Minimization	The Company will liaise with local/regional governmental parties responsible for waste management to seek solution for the correct disposal of EoL WPP and BESS infrastructure that will be generated in the next decades.
Restoration	The waste storage/accumulation area will be dismantled/decommissioned, and the area will be restored, cleaned and destinated to other purposes or revegetated.

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