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Tsogttsetsii - Tavantolgoi 110kV Transmission Line
Environmental & Social Impact Assessment

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1 Introduction

1.1 This Document

This document forms an Addendum to the Environmental and Social Impact Assessment (ESIA) for the design of the 34 km overhead line (OHL) between the Tsetsii 50 MW wind farm and the substation at Tavan Tolgoi (the Project) in the Tsogttsetsii soum of Umnugovi aimag, approximately 542 km south of Ulaanbaatar. The location of the Project site is illustrated on Figure 1-1 of Volume 2 of the original ESIA.

The ESIA Addendum presents information on the identification and assessment of the likely significant environmental and social effects of the Project. The document has been prepared by SgurrEnergy Ltd with specialist ecological and ornithological input from Turnstone Ecology Ltd, Nature Friendly LLC and Mongolica. Additional background information was obtained from the Detailed Environmental Impact Assessment (DEIA) report carried out for the project area¹.

1.2 Background to the Project

A wind farm with 25 wind turbine generators (WTG) with an installed capacity of up to 50 MW is proposed to be constructed on land to the eastern area of Tsogttsetsii soum of Umnugovi aimag, 23 km from the soum centre and 542 km from Ulaanbaatar.

It is expected that construction will take place between 2016 and 2017 and, once operational, the Project will supply power to the Central Electricity Network. The 34 km OHL is required to connect the power to the Central Electricity Network.

A special purpose vehicle company, Clean Energy Asia LLC (CEA), will own the Project and has been formed by a group of investors including Newcom LLC, a Mongolian investment company with a portfolio of in-country projects and SB Energy Corp., the renewable energy arm of Japan’s Softbank Corporation.

1.3 Need for the Project

The Mongolian Parliament passed an Energy Law in 2001 (as amended 2012) that was intended in part to establish the legal base for restructuring the country’s energy sector. A major effort is to promote private sector involvement in the country’s energy sector, and to encourage private investment and competition.

¹ Sunny Trade LLC (2014)
In 2005, the Parliament approved the National Program for Renewable Energy, with a key goal being to have renewable energy sources provide 20-25% of the nationwide energy production by 2020.

CEA has leased a total of 7,290 ha since 2008 in the Tsogttsetsii soum of Umnugovi province to carry out the studies necessary to support the development of a wind farm. Following completion of all studies, a total area of 700ha has been utilised for the wind farm.

The proposed OHL between the wind farm and the substation at Tavan Tolgoi will allow the power generated by the wind farm to be exported to the Central Electricity Network to allow the above targets to be met.

1.4 Scope and Content of the Environmental Statement

In order to successfully develop this Project, the following requirements must be met:

- The Project would meet Mongolian national requirements and international lending standards.
- The Project would include all necessary mitigation measures to minimize any significant adverse change in environmental, health and safety, and socioeconomic conditions.
- Appropriate public consultation and disclosure are undertaken in line with Equator Principles and IFC Performance Standards, ensuring all reasonable public opinions are adequately considered prior to a commitment for financing.

To ensure compliance with international lending requirements, the overall scope of this assessment includes:

- Scoping and identification of key issues.
- Definition of baseline conditions of key environmental and social resources.
- Assessment of positive and negative impacts of the Project.
- Consultation with people who may be affected by the Project and other stakeholders.
- Development of design and operating practices that are sufficient to avoid, reduce, or compensate for significant adverse environmental and social impacts.
- Development of such monitoring programs as are necessary to verify mitigation is effective in accomplishing its goals, and to develop and refine the effectiveness of mitigation measures.
1.5 Environmental Impact Assessment Best Practice

The overall approach for the ESIA and reporting were based on the following sources of guidance together with additional sources as referenced throughout the text:


Each of the stages listed in Section 1.4 above has been completed during the EIA process following the best practice guidelines as closely as possible.

1.6 Structure of the Environmental Statement

The remainder of this report is organized as follows:

- Chapter 2 describes the Project and proposed layout.
- Chapter 3 describes the alternatives considered.
- Chapters 4 to 11 describe the baseline environmental and socio-economic conditions of the area, potential impacts that may result from construction, operation and decommissioning, proposed mitigation measures and residual impacts.
- Chapter 12 provides a summary of impacts and mitigation.
- Chapter 13 sets out the proposed environmental management measures that will be implemented.

1.7 Assessment of Impacts

A number of criteria were used to determine whether or not a potential impact of the Project could be considered ‘significant’. These are outlined with reference to specific environmental and social issues in the subsequent topic chapters of this ESIA. Wherever possible, a quantitative assessment of the impacts was undertaken. Where this was not possible, a qualitative assessment of impacts was carried out, based on existing information available for the site and the surrounding study area, and experience with other wind farm developments.

The ESIA covers the direct impacts and any indirect, secondary, cumulative, short-, medium- and long-term, permanent and temporary, reversible and irreversible, beneficial and adverse impacts of the Project.
Where relevant, the anticipated impact was compared against appropriate legal requirements and standards. Where no such standards exist, assessment methods involving interpretation and the application of professional judgement were employed. The assessment of significance in all cases took into account the impact’s deviation from the established baseline conditions and the sensitivity of the environment.

The full assessment methodology has been described in Chapter 4 of the Tsetsii Wind Farm ESIA.
2 Description of the Project

The proposed 110kV OHL will run north from the wind farm for 20 km to join the existing OHL corridor running west for a further 14 km to the main Central Electricity Network substation at Tavan Tolgoi. The line will convey electricity from the wind park substation to Tavan Tolgoi. As noted above, about 10-15 workers will be required to construct the OHL during 2016 and 2017, and they will reside in the temporary construction compound. Local workers will provide at least part of the construction workforce. Figure 1-1 attached to this ESIA illustrates the proposed line and alternative route.

There will be approximately 113 transmission towers standing an average of 300 m apart. Each tower will be about 23 m high with a base covering about 36 square meters. The base will be anchored by an undercut pad and chimney foundation with four foundations per tower. Figure 2-1 overleaf shows an example of the type of tower that will be used. Tower corners will be anchored in concrete foundations.

Construction equipment will use the same routes as the equipment used for the main wind farm access road and will minimize disturbance to the land. Following construction of towers and installation of OHLs, all off-road areas disturbed by construction equipment will be reclaimed by planting native grasses until vegetation is well-established.

2.1 Technical Description of the Proposed OHL

All components of the planned OHL (towers, foundations, conductors, earth wires and insulators) and substations and all their elements will be designed, produced, tested and installed according to the relevant IEC standards and the conditions of the 110 kV grid in Mongolia. The entire equipment must be designed and constructed in the manner that will ensure safe operation in the ambient conditions that dominate in the area where the OHL is to be built, and under various energy burdens and voltages that might occur during the operation of the transmission grid.
2.1.1 Technical Characteristics of the Overhead OHL

The proposed OHL will be designed and constructed in compliance with the current international and national regulations i.e. EN 50341 or equivalent.

In general, the proposed OHL corridor follows, as much as practicable, the corridor of the existing OHL running east from the substation at Tavan Tolgoi.

An overview of the basic technical parameters of the OHL is presented in Table 2-1.
### Table 2-1: Overview of technical parameters of the proposed OHL

<table>
<thead>
<tr>
<th>Parameter</th>
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<tr>
<td>Nominal voltage</td>
<td>110 kV</td>
</tr>
<tr>
<td>Type of towers</td>
<td>Steel-lattice hot zinc-coated, single circuit self-supporting towers. Each tower will be about 23 m high with a base covering about 36 square meters.</td>
</tr>
<tr>
<td>Number of towers</td>
<td>There will be a total of 113 towers standing an average of 300 m apart on a 34 km line.</td>
</tr>
<tr>
<td>Foundation</td>
<td>Foundation type: Undercut pad and chimney foundation Foundation dimensions: Each pad circa 1,800 to 2,550 sq mm and 450 mm depth</td>
</tr>
<tr>
<td>Conductor</td>
<td>Number per phase: one Material: aluminium conductor steel reinforced. Six conductors in total per tower.</td>
</tr>
<tr>
<td>Protective wire</td>
<td>Single optical ground (OPGW) earth wires in horizontal configuration: between peak of each tower. 150-300 mm² cross section 16.25 mm to 24 mm in diameter approximately</td>
</tr>
<tr>
<td>Insulators</td>
<td>Type of cap and pin insulators: porcelain post-insulators Number of insulator sets: 113*6 = 678 sets</td>
</tr>
<tr>
<td>Tower earthing</td>
<td>Specific soil resistivity: Similar to Tsetsii site then in the range of 4-60 ohm. Material: Copper rods Dimensions: 4 of 2000 mm copper rods (one at each corner of base) connected by 4*4000 mm of copper * 113 towers</td>
</tr>
<tr>
<td>External temperature:</td>
<td>Maximum / min Min 10 min mean air temperature: -30.0°C Max 10 min mean air temperature: 36.8°C</td>
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2.1.2 Towers

The design of the towers must ensure safe operation in all working climatic conditions, in relation to the used phase conductors, earth wires and insulator sets and for the designed wind and weight spans.

Depending on their position in the OHL, the types of towers could be:

- Suspension towers, used for straight section of the line
- Angle (tension) towers, used where the line changes direction.

The towers will be steel lattice design. Each tower will have four legs and single foundation per leg, i.e. four foundations for each tower. Number of conductors and their disposition on each tower type is three lines in horizontal direction, each with two phase conductors and two lines in horizontal direction with two earth wire conductors.

Typical footprint area for the tower types is given in Table 2-1 above. This land area will be leased by CEA for the duration of the project in order to ensure safe operation and maintenance of the proposed OHL.

2.1.3 Foundations

The tower foundations will be undercut pad and chimney type constructed of reinforced concrete. The type of concrete should provide conditions for placing normal foundations and should be suitable to the specific carrying capacity of the terrain. In case of weak carrying capacity of the terrain at certain micro-locations and based on geo-technical investigations, relevant specific technical solutions will be designed and constructed.

2.1.4 Earthing

In the context of safety and protection at work (reducing the effects from electric shock, etc.) special emphasis will be given to the tower earthing. This procedure should be conducted in compliance with the requirements of the technical regulations.

Earthing of OHL towers will consist of two rings around each tower foundation, made from FeZn wire Ø 10 mm. These rings are connected between them and to the tower steel structure. In cases when earthing needs to be reinforced (e.g. for types of soil with lower conductivity), reinforcement is done by adding two legs (extensions) from FeZn wire or FeZn tapes to existing rings on each tower foundation. Finally, for sites with special earthing requirements (in principal case – near buildings or houses), additional FeZn wire ring is laid around entire tower structure, roughly 1 m away from existing rings and at depth of 0.8 to 1.0 m.
2.1.5 Phase Conductors

For the phase conductors for the planned OHL, pursuant to the current concept for this type of power lines in Mongolia, conductors ACSR will be used with normal cross section of 490/65 mm². Two conductors per phase are planned at a mutual distance of more than 400 mm.

2.1.6 Insulators

The proposed OHL will belong to the grid with a directly grounded neutral point and a degree of insulation for which the nominated lightning impulse withstand voltage is 1,425 kV. The insulator that is to be used will be of a type approved for such power lines and appropriate assembling procedures will be carried out for the various types of insulator chains.

2.2 Construction Works for the OHL

Transportation means used to transport towers to the construction sites mainly depend on the terrain conditions. In general, trucks or heavy tractors will be used. No use of helicopters for construction purposed is planned.

Use of existing access roads to tower location will be preferred. Thus, a combination of access options will be used, using existing roads and tracks to allow access to construction sites wherever possible and making new tracks where necessary. Roads for construction access will be prepared using standard road construction heavy machinery, mainly – bulldozers, by upgrading existing roads in order to accommodate construction needs and buildings new access roads. Once construction is completed it is intended to maintain access roads to enable maintenance activities. Any other access road disturbed by construction activities will be improved to better condition in comparison to its original stage.

It is assumed that tower sub-structures (segments of the steel lattice) will be pre-assembled at the main site compound located at Tsetsii Wind Farm and transported in pieces to the lay-down areas along the route of the OHL. These segments will be then assembled on site to construct final tower structure. For locations with difficult access, pre-assembled pieces will be smaller and accordingly number of pieces will be bigger. The tower assembly and lay-down areas will be organised for each 3-5 km long subsection (11-12 towers on average), which results in around 10-17 temporary lay-down areas in total. The area for each lay-down area will be around 100 x 40 m and will be located within the leased OHL corridor. They will be guarded, but not fenced. Average use of a single lay-down area is likely to be around two weeks.

2.2.1 Personnel requirements

For preparatory works (mainly construction of access roads) there will be one team consisting of approximately 10 staff.
For construction purposes, the working area at each tower will be up to 1000 m². After completion of the construction works, the remainder of the working area would be restored and returned to its original condition. Any previous land use type can continue after construction of the proposed OHL and during its operational stage.

Construction of towers along the OHL route differs mainly due to terrain profiles and accessibility patterns. Average duration of a tower construction, calculated at single crew basis, consists of:

- Time for preparation of foundations (excavation and concrete works),
- Time for construction of tower (assembly and erection), and
- Time for mounting electrical equipment.

The average time for construction of foundations for a single tower, i.e. for four foundations, is one tower per day for excavation and one tower per day for concrete works. The time for concrete works include half a day for preparation of reinforcement and half a day for concrete works. Reinforcement steel will be transported by tracks or heavy tractors, while the concrete by trucks for ready mix concrete (mixers). The crew number for foundation construction is expected to consist of 15 workers.

It is anticipated that the crew would be able to erect 1.5 towers per day. Erection of the tower segments will be done by the mobile construction crane with a crew of 12.

Average time for mounting electrical equipment is anticipated to be 4 – 5 km per month, resulting in a seven month installation window. This is roughly equal, as an average, to 1.7 towers per day. A single crew of 30 would be required for this phase of work.

Based on the above, the average total construction time per tower is likely to be 5.2 man-days, and consists of:

- 2 days for construction of foundations (one day for excavation and one day for concrete works)
- 1.5 days for erection of towers
- 1.7 days for electromechanical works

The total number of construction workers required for all phases of the OHL construction and installation would be 57. It should be noted that those workers would come from the overall construction workforce of the wind farm. The Wind Farm ESIA has estimated, based on the experience at Salkhit Wind Farm, that an average of 200 workers would be required for construction works reaching a peak of up to 350.

Above calculation is made for the estimated construction period of maximum of seven months.

The average number of truckloads per tower is 10 and would consist of:

- 1 x 6m³ truckload for ready mix concrete (mixers)
- 5 x truckloads for tower structure
- 2 x truckloads for equipment, tools, materials, etc.
- 2 x truckloads for electrical equipment (except for the conductor which is transported in large drums with special heavy vehicles).

The transportation impacts have been considered in Chapter 11.

Where the power line crosses public road or rail lines, the prescribed safety heights and distances will be followed.

For construction of the proposed OHL, there are no plans for opening new borrow pits to source rock for construction purposes. The concrete for the foundations of the steel towers will be batched at the main Tsetsii Wind Farm construction compound.

2.3 Access to Construction Sites of the OHL

Access to the works would be gained wherever feasible from the existing main road network. The use of certain unclassified roads would also be required. Those unclassified roads which may be used would be identified in subsequent project stages and during preparation of the project’s main technical design.

A combination of access options would need to be considered including making best use of existing roads and tracks as well as new temporary and permanent tracks to allow access to construction sites with the least environmental impact.

In general terms, the following principles would be used to define the route of new temporary and permanent access tracks:

- Best use would be made of existing road network - bridges, roads and tracks.
- Longer length of temporary routes would be used where use of public roads could cause major nuisance to the public and local population within settlements along the transport routes.

2.4 Operation and Maintenance

The project will be designed for continued operability (24 hours per day, 7 days per week) depending on the regime and parameters of Central Electricity Network. From the beginning of operations, the OHL will work without continuous presence of personnel.

Maintenance of the proposed OHL will be carried out by CEA and will be implemented in compliance to the national legislative requirements stipulated in by-laws on technical standards for operation and maintenance of electro-energy systems. Detailed maintenance activities would be set out in the CEA maintenance plans for the proposed OHL. These activities could include line inspection, tower painting, future upgrading, etc.
OHL towers often require maintenance painting 10-15 years following erection, depending upon their environment. In general, maintenance works include regular maintenance (visual inspections and routine annual maintenance works) and overhauls (detailed examination and elimination of eventual faults).

Visual inspection would be conducted twice a year and may be followed by certain actions in individual sections and/or on towers, such as replacement of insulators, bridges, strengthening of tension ropes, repair/replacement of tower lattices, etc. Four wheel drive vehicles and small trucks would be used for that purpose. Overhauls are to be done once in three to five years. These may require use of tracks and heavy tractors. Overhauls include physical inspection of each tower and removal of all registered faults on the OHL towers and electrical equipment (short circuits, ground faults, ground wire damages, etc.).

Maintenance access requirements could include:

- Storm damage - using suitable off road vehicles and trucks.
- Conductor damage – access requirements for conductor stringing equipment.

Maintenance of the 110 kV OHL would require access by a range of vehicles of varying size. These vehicles would use the public road system and those access tracks which are retained for permanent use following completion of construction. Operational traffic would be very light and no significant traffic related effects are predicted on any part of the public road system.

2.5 Decommissioning and Closure

The overall operational life of the proposed OHL is approximately 25 years matching the operational life of the wind farm, however the OHL would be technically viable for a period of 70 years. The eventual final termination of operations will involve activities for dismantling the infrastructure and equipment and their dislocation from the area of the corridor of the OHL. The location will be subject of restoration and returning the environment to its original condition.

2.6 Substations

All electricity generated by the WTGs will be exported to the grid via the substation at Tavan Tolgoi (see Error! Reference source not found.) therefore no new substations are proposed. See also Figure 2-2 and Figure 2-3 for further details.

The 110 kV busbars (I and II) are planned to be extended to allow capacity for this and any future extensions. The main equipment to be installed is as follows:

- Gas breakers (SF6) LTB 145D1/B
- Voltage transformers (110 kV) TYD110
- Current transformers (110 kV) LVB6-110W3
• Relay protection panel for 110 kV line

The detailed design for extension of Tavan Tolgoi 110/35/10 kV substation was developed in accordance with Technical condition No 38/2015 issued by the Policy Implementation and Coordination Department of the Ministry of Energy on May 12, 2015. The total area required for substation works will be 1,056.25 m², all of which would be located within the existing substation compound.

It is anticipated that construction would take up to a maximum of five months, consisting of:

• Equipment manufacturing and delivery to the site - 2.5 months
• Installation – 1 month
• Commissioning, testing and handing over – 1 month

Approximately 10-20 workers will be required, consisting of electric engineers, fitters/electricians, civil engineer, lifting mechanism drivers, relay protection engineers and erection workers.

Figure 2-2: Proposed connection point
Figure 2-3: Tavan Tolgoi substation
3 Consideration of Alternatives

3.1 ‘Do nothing’ option

The ‘Do nothing’ option is an alternative involving no development of the proposed OHL.

One of the main strategic goals identified in the Wind Farm ESIA is the target of generating 25% of Mongolia’s electricity from renewable sources.

In terms of meeting this strategic goal, the ‘Do nothing’ option has no positive argument in its favour, due to the lack of available infrastructure to connect new wind energy development to the Central Electricity Network. If the proposed 110 kV OHL was not built, the planned Tsetsii wind farm would not be able to be developed making it far more challenging for Mongolian national renewable energy targets to be met.

In a wider context, the ‘Do nothing’ option would limit overall economic development and possibilities for the improvement in the social welfare of the citizens in the region.

3.2 Potential OHL routes

The remaining options appraisal considered the potential OHL route between the wind farm site and the main substation.

A number of site visits have been undertaken by SgurrEnergy and CEA to identify potential routes for the OHL. Two potential routes were selected and are shown in Figure 3-1 below. The yellow line represents Route 1 and green represents Route 2. The blue boundary represents the wind farm option area and the existing OHLs are shown in light grey.

![Figure 3-1: OHL options](image-url)
During selection of potential routes a key consideration was to follow exiting corridors along with the existing lines where possible to minimize the impact on undeveloped land. The two existing corridors run west to east from the Tavan Tolgoi substation passing the north of the town of Tsogttsetsii. The second Ukhaa khudag 110kV corridor provides power to the Tavan Tolgoi mine and runs in an eastern then southerly direction from the substation to the mine. There is insufficient capacity at the mine substation to allow a direct connection therefore this option was discounted.

The length of the Route 1 and Route 2 are 34 km and 28.5 respectively.

The 110 kV busbar of the Tavan Tolgoi substation is located on the southern side, therefore line should approach to the substation from south side, which enables OHL connection to the busbar. This is illustrated in Figure 2-2 and Figure 2-3 above.

Following the completion of the site surveys it was concluded that connection to the grid through the proposed 110kV OHL is feasible and there are a number of available options. This study has considered two main options. Route 1 represents the more straightforward option as the route is far from current mining activities and there are less OHL crossings than Route 2. Whilst Route 2 is a shorter line, there may be issues regarding land leases between the wind farm and the corridor of the Ukhaa khudag 110kV OHL. In addition there are a number of OHL crossings which would need further detailed investigation.

The crossings over the main road, railway and other OHLs are feasible.

As a result route option 1 has been chosen as the most suitable.
4 Biological Diversity

4.1 Introduction

This chapter describes and evaluates the potential ecological effects of the Project and associated works on the biological diversity of the transmission line corridor and wider area of influence. Measures are put forward where appropriate to reduce adverse impacts and/or enhance benefits.

4.2 Assessment Methodology

4.2.1 Data Gathering

Baseline data was collected for the study area through a desk-based study and a site visit undertaken in October 2014 by SgurrEnergy, Turnstone Ecology and Nature Friendly. This has been put in context by additional detailed terrestrial ecology surveys which were undertaken by Mongolica between May 2014 and August 2015 focused on the wind farm area and within the Tsetsii Mountain Range. The following surveys were completed:

- Plants
- Bats
- Mammals
- Reptiles

The Mongolica survey report is included as a Technical Appendix to the Wind Farm ESIA. A synopsis of the results of each of these surveys are included in the relevant sections below.

4.2.2 Assessment of Effects

The assessment of the beneficial or adverse potential impact significance of the OHL line requires consideration of the sensitivity of the receptor and the magnitude of the impact. The Tsetsii Wind Farm ESIA (Chapter 6, Section 6.2) sets out the full methodology for the assessment of potential effects on biological diversity.

4.3 Baseline Conditions

4.3.1 Vegetation Features

The flora of the project area has been classified as the Alashaa Gobi (desert) within the Gobi Central Zone, within the Central Asian Greater Gobi Zone as set out in the Mongolian bio-geographic classification. Vegetation tends to be poor and sparse and it consists of feather grass (*Cleistogenes*, wild leek and *Ajania*).
The dominant shrubs are two Anabasis species: *Brachanthemum gobicum* and *Zygophyllum xanthoxylon*. *Anabasis brevifolia* is encountered in clayey-gravel hollows, particularly in the smaller foothills, while *Potaninia mongolica, Brachanthemum gobicum, Salsola arbuscula* and *Ceratoides papposa* are more prevalent in desert and sandy areas.

Other plants include *Kalidium gracile, Reumuria soongarica* and some species of yearling plants are observed in muddy and salty land areas.

Vegetation communities in the site area are divided into ecological zones as follows:

- Dry (xerophyte)
- Xero-petrophyte,
- Psemmophyte

Vegetation communities comprise of a relatively small number of drought-tolerant shrubs and thinly distributed low grasses. The dominant communities in the project area are *Stipa glareosa-Anabasis brevifolia-Allium polyrrizum, Salsola passerina-Reumuria soongarica-Allium polyrrizum, Anabasis brevifolia-Allium polyrrizum-Peganium nigellastrum*, and *Salsola passerina-Nitraria sibirica-Peganium nigellastrum*.

### 4.3.2 Ornithology

The habitat type along the proposed OHL route is fairly consistent and as a result the species present is also consistent and comprises primarily of smaller passerines. Please refer to the detailed assessment contained in the Wind Farm ESIA (Chapter 7) and the Mongolica survey reports for a full description of assessment method and results.

#### 4.3.2.1 Resident / Breeding Birds

It was noted during the 2014 site visit and subsequent surveys in 2015 that activity and species diversity of passerines increased with habitat quality and type (*i.e.* less species diversity and populations of birds in the Project area when compared to other parts of the study area). It is considered that the open steppe habitats to the north could support fairly large numbers of ground-nesting birds. It is considered that this assemblage is unlikely to include species of Global or National conservation concern. Breeding bird surveys were completed in 2015 and reported in the Tsetsii Wind Farm ESIA (Chapter 7).

#### 4.3.2.2 Resident and breeding passerines and non-passerines - excluding raptors

Thirty-seven species of resident passerine and non-passerine were recorded both within and outside of the Project area. Pallas’s Sandgrouse, Northern Raven and Horned Lark were the most common species encountered with the latter species, along with Greater Sand Plover considered to breed within the Project area. Neither of these
species are of global or regional conservation concern and as such are determined to be of low sensitivity.

4.4 Assessment of Effects

4.4.1 Construction

4.4.1.1 Impacts on Biological Diversity

Generally, the construction activities of the proposed 110 kV OHL will affect the biological diversity (vegetation, the autochthonous flora and fauna communities and natural habitats) in various ways. These impacts can be grouped as listed below:

- Degradation of certain plant communities and removal of vegetation.
- Wildlife disturbance and/or (temporary) migration caused by noise, and the presence of humans and mechanization.
- Disruption of nesting birds or breeding animals due to disturbance and noise during construction activities.
- Dust deposition and pollution on habitats.
- Pollution of habitats from construction waste.

Potential erosion processes on inclined habitats (mountain/hill slopes) leading to degradation of conditions needed to support biodiversity.

However, it should be noted that the impacts on biodiversity during the construction phase are short-term and will be reduced to minor with implementation of appropriate preventive measures and procedures as set out in the ESMP.

The impacts on biodiversity during the project construction stage are described in the following sections.

4.4.1.2 Impacts on protected areas

The identification of the OHL route alignment has sought to determine a line which bypasses all areas protected for their biodiversity interests in the project region and, consequently, avoids any eventual impact on their natural values or their protection status.

4.4.1.3 Impacts on fauna

Main impacts on different fauna groups from the construction of the proposed transmission line can be classified as disturbance and loss or fragmentation of habitats.
Construction involving clearing of vegetation, excavation of soils, movement of vehicles or equipment over roads and terrain, loading and unloading of materials and other activities can result in injury or mortality of animals. Such impacts can be significant if they involve large numbers of organisms, occur on a regular basis or affect animal populations that are particularly sensitive, unable to reasonably compensate the losses, or are already low in numbers.

Migratory pathways can be affected in a way that seasonal migration patterns can be interrupted or modified. On the other hand, habitat modifications can create positive effects: increasing the availability of forage area (at least for certain species) and improving overall habitat diversity.

Situations where workers can perform illegal activities in relation to use of biological resources (e.g. poaching) may appear during construction of the proposed OHL.

**Birds**

The proposed transmission line could enhance the increased temporary disturbance to birds during construction, due to the general presence of human activity in many areas that are otherwise subject to generally low human disturbance levels. More specifically, species that have a relatively high adult survival and low breeding rate for which even low levels of mortality or reduced breeding success could be significant.

During the breeding season, disturbance effects would be greater in open areas where construction workers and machinery would be visible from a wider area.

Levels of disturbance would also depend on the sensitivity of the species. Sensitivity to disturbance would depend on the stage of the breeding season, with birds being particularly prone to disturbance at egg-laying and chick-hatching stages.

Given the relatively small area in relation to the far wider area of similar habitat, the impact on birds during construction can be estimated as Minor and reversible.

**Mammals**

There is potential of direct loss of resting up sites through construction works, including: tower foundations; access track construction and woodland felling to create the transmission line corridor. Most mammal species would use a number of different resting up sites and bats would use a number of difference roost sites throughout the year. However the route survey did not identify any such sites, As a result the impact could be estimated as Minor and reversible.

**Herpetofauna**

Impacts during the construction activities for reptiles arise from construction activities and from the construction/upgrading of access roads, causing habitat loss. In addition, potential effect during construction concerns direct destruction of the populations of reptiles, as well as invertebrate fauna due to mortality from vehicles. The significance of the above impacts could be assessed as Minor.
4.4.2 Operation

4.4.2.1 Impacts on Biological diversity

No significant impacts are expected on the flora and the fauna in general, and on the endemic, rare or endangered species in particular, during operation stage.

The adverse impacts of the project on the biodiversity of the affected area are expected to be restricted to the OHL route, but they will be expressed on long term basis.

4.4.2.2 Impacts on flora

Plant species that will be affected during the project operation and maintenance are tree species directly below the proposed transmission line. No such species are present in the region therefore this impact will be Negligible and not significant.

4.4.2.3 Impacts on Fauna

*Birds*

Birds are potentially most vulnerable animal group vis-à-vis operational transmission lines, due to following risks:

*Bird collision with OHL conductors*

Mortality due to collision is considered potentially to represent the most important operational impact of transmission lines on birds. Birds can collide with power lines because they can be difficult to see, although the degree of risk depends on a number of factors. These relate both to the species and their behaviour, environmental factors and type and design of the power lines themselves.

The understanding of bird collisions has grown since 1994 and revolves around the following principles:

- Exposure to collisions is largely a function of behaviour. Specific behaviours (such as flushing, courtship displays, and aerial hunting) may distract birds from the presence of power lines.
- Exposure is increased for birds that make regular and repeated flights between nesting, feeding and roosting areas in proximity to power lines.
- Susceptibility to collisions is partially a function of wing and body size and vision. Larger, heavy-bodied birds with short wing spans and poorer vision are more susceptible to collisions than smaller, lighter-weight birds with relatively large wing spans, agility, and good vision.
- Environmental conditions (such as inclement weather and darkness) may distract birds from the presence of power lines or obscure their visibility.
Engineering aspects, including design and placement, can increase or decrease the exposure for collisions.\(^2\)

Collision is particularly a risk for larger species such as geese, ducks, swans, and birds of prey, as well as collision of smaller birds with OHL conductors during wanderings in larger flocks and migration.

Collisions are not thought to be random but are often concentrated in relatively short sections of a power line, where these factors interact to create a collision problem or “hotspot” (e.g. Morkill & Anderson 1991, Brown & Drewien 1995, Guyonne et al. 1998). The majority of bird collisions appear to be associated with earth wires (e.g. Scott et al. 1972). Therefore, birds seem to be generally capable of recognizing the supporting towers and conductors, but the earth wire can in certain situations appear almost invisible (APLIC 1994).

Also important is that birds may take avoiding action of the towers and conductors by increasing flight height, resulting in collision with the earth wire.

Besides darkness and low visibility at twilight, environmental conditions such as fog, dense clouds and several types of precipitation, reduce the visibility of power lines, which increases the collision risk for birds. Certain characteristics of the landscape, such as rivers and mountain valleys, concentrate birds into certain flight routes. Power lines crossing narrow rivers bordered by trees taller than the height of the power line have a lower collision risk than broad rivers because most birds will fly over the tree tops and cross the valley way above the power line. The placement of a power line close to areas where large numbers of birds congregate, can lead to a higher collision risk if these birds are regularly disturbed.

Empirical data regarding the population effects of collision mortality on most species are not available and predicting collision risk and therefore significance of this impact is difficult. However, APLIC (1994) states that most researchers agree that collisions are not a biologically significant source of mortality for thriving populations of birds. Having in mind size and ecological characteristics of aforementioned areas, overall impact on birds based on expected mortality due to collision hazard could be estimated as Minor to Moderate prior to mitigation.

**Electrocution**

This usually happens to the larger bird species, but may occur to some small species (the size of larks).

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There are several reasons for electrocution, mainly:

- Inappropriate locations of the transmission line conductors and isolators.
- Contact of the bird faeces in semi-solid state with the phase conductor, which is the cause for electrocution and death of birds. These cases are typical for rainy days.
- Contact of two phases or two conductors with different voltage, with larger birds.

Mortality due to power line electrocution is directly related to the spacing between elements that can comprise a phase-to-phase or phase-to-ground contact (e.g. via earth wires or towers).³

Electrocution of birds is primarily caused by direct contact involving simultaneous skin-to-skin or foot-to-skin with two conductors or a conductor and an earth wire. Large size (in terms of wingspan, length of reach and tail length) is by far the most important factor that makes birds susceptible to electrocution. Risk is also potentially increased when birds undertake display or territorial defence behaviour.

Most of the mentioned reasons that may lead to electrocution are of low probability and may not pose significant threat to the bird fauna. It is not expected that electrocution will happen during operation of the proposed transmission line since the distance between the conductors is large enough, more than 500 cm, even for the biggest known birds in Mongolia.

It should be stated that transmission lines, poles and towers may be of benefit to birds, such as storks, raptors and corvids, for nesting, roosting or perching, especially in areas where suitable natural nest sites and roosting substrates are rare. The potential impact during operation of the lines on birds is anticipated to be Minor.

**Other Fauna**

The proposed operational OHL could have minor impacts on other fauna groups including herpetofauna, invertebrates and mammals. After the completion of the construction phase, these animals will have adjusted their life cycle to new, partly changed living environment with new physical objects (towers, wires, access roads). It is therefore anticipated that impacts will be Minor and not significant.

³ Avian Power Line Interaction Committee – APLIC (www.aplic.org)
4.5 Mitigation

Generic mitigation is set out within the Ecology and Ornithology Chapters of the Wind Farm ESIA (see Chapters 6 and 7) and applies to the transmission line during construction and operation. The sections below set out further mitigation to be incorporated into the Project.

4.5.1 Construction

4.5.1.1 Biological diversity

To reduce the risk of loss of grassland / habitat it is proposed that roads the transmission line route is clearly demarcated before construction begins. Equipment should also be confined to the demarcated areas.

Towers will be micro-sited if required to avoid any sensitive vegetation.

Mitigation to reduce damage associated with off-road vehicle trafficking include prohibiting the use of vehicles and equipment off prepared roads and re-stabilizing existing eroded tracks with restoration of grass cover as required.

4.5.1.2 Fauna

Birds

Breeding birds are most vulnerable during egg-laying and incubation. If possible, works should be scheduled to avoid the breeding bird season. Prior to the commencement of construction a general ecological survey will be completed to check for active nests and if found construction activities are re-scheduled in the vicinity of the nest until natural cessation of breeding effort.

Herpetofauna

Mitigation measures concerning reptiles would centre on protection of individuals in order to comply with best practice procedures. All construction workers would be briefed upon the potential presence of reptiles and identification of species of concern. Should such species be encountered they would be physically moved outwith the construction area.
4.5.2 Operation

4.5.2.1 Birds

Breeding birds

Where significant maintenance activities are planned which have the potential to cause disturbance to breeding birds an initial breeding bird survey would be undertaken to confirm the presence or not of breeding birds. Should breeding birds be identified we would implement suitable mitigation to delay work until chicks have fledged.

Bird Collisions

The most adequate and modern methods to protect the birds from the damaging contact with OHL lines is the use of bird diverters. Birds have the ability to avoid a power line if seen early enough. Diverters can help warn or deter birds from contact with the line. There are a variety of diverters available and can incorporate fluorescent material allowing visibility at night and also in conditions of fog and low light.

A Spanish study on the effectiveness of marked wire on reducing collisions found that the presence of diverters was associated with a 78% decrease in bird collisions.\(^4\) Most collisions occur mid-span and so the focus is on marking shield wires. There are three types of line marking devices available: aerial marker spheres, spirals and suspended devices. A larger diameter wire can also improve visibility. Alternating colours can also make the diverters more effective. The preferred colour is international orange as this provides better contrast in poor light.\(^5\)

Spacing of diverters depends on a number of factors including species considerations, environmental conditions, line location and engineering specifications. In general, intervals of 5 to 30 m have been most commonly used. It is recommended that 60% of a span is marked, the central portion of the wires on transmission lines, since this is where most collisions occur.\(^5\)

Post-construction monitoring in the form of carcass searches should be undertaken in conjunction with markers to determine the effectiveness of mitigation and allow for revisions if required.

Perching

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Many raptor species use structures associated with power line infrastructure for nesting and perching. To mitigate this, the principle is not to prevent roosting but rather to prevent roosting on critical parts of the tower. The provision of alternative roosting space on the tower can enhance success. Perch-deterrent devices can be used to minimise raptor activity on certain parts of the tower however it is also important to consider the availability of alternative perches in the surrounding area. Cross-arm spikes and pole caps can be used on support structures. Studies have shown that these methods reduce activity significantly.\(^6\)

4.6 Residual Effects and Conclusion

Provided that the proposed mitigation measures are fully and successfully implemented, the overall effect of the Project on species and habitats will be Minor and not significant in the long-term. Following decommissioning, reinstatement will re-establish the ecosystem in the areas previously occupied by the OHL.

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5 Archaeology and Cultural Heritage

5.1 Baseline

There are no known archaeological sites, heritage sites, or large cemeteries located within the route of the OHL corridor.

Pre-construction archaeological surveys and excavations were carried out for Ukhaa Khudag mine in proximity to the Project. These were undertaken by the Archaeology Institute of the Mongolian Academy of Sciences. No significant cultural sites were identified, however 28 finds of high archaeological value were identified and excavated in the mining area. It is reasonable to assume a similar distribution on uncovered items would be present on the route of the OHL.

5.2 Impacts and Mitigation

During the construction works, the works contractor shall be obliged to develop and implement a “chance-find” procedure and to comply with national legislation on the protection of cultural heritage. Workers will be trained in the use of these procedures.

If an archaeological site or items of archaeological significance are found during execution of construction works, the work contractor / investor is obliged to:

(i) Inform immediately the competent public institution for protection of cultural heritage about the discovery
(ii) Cease operations and to secure the site against eventual any damaging and against unauthorized access, and
(iii) Maintain the uncovered items in the location and in condition they were found.

With the implementation of the proposed chance find procedure we do not anticipate any significant residual impacts.

7 Energy Resources (2014)
## 6 Air Quality

### 6.1 Dust and Particulate Matter during Construction Activities

During the construction of the proposed 110 kV OHL, there will be site preparation and construction activities, all of which have the potential to generate dust. Such emissions can be divided into dust and particulate matter (PM10).

Dust comprises of large airborne particles of material, which are resident in the atmosphere for short periods of time after release, as they are heavy enough to fall out of suspension in the air relatively quickly. Therefore, effects of these emissions will be localized and they do not cause long-term or wide spread changes to local air quality but their deposition on nearby properties causes soiling and may therefore result in complaints of nuisance, which is usually temporary.

The main sources of dust during the construction activities include:

- Construction vehicle movements and other project related traffic on unpaved roads
- Soil excavation, handling, storage, stockpiling
- Site preparation and restoration after completion
- Construction of towers and access roads
- Internal and external construction works on substations.

The majority of the dust emissions are likely to occur during the working hours of construction activity.

The precise behaviour of the dust, its presence in the atmosphere, and the distance it may reach would depend upon a number of factors. These include wind direction and strength, local topography and the presence of screening structures (buildings, trees etc.) that may intercept dust before it reaches sensitive locations. Each of these factors would differ along the route of the proposed OHL. The sections of the OHL in the hillier areas to the north of Tsogttsetsii would be exposed to stronger winds which can carry the dusts further.

However, these are areas with very low populations and there are few sensitive receptors. The mountainous areas also experience high annual average rainfalls which would prevent the transportation of the dust as rain has a dampening effect.

Depending on wind speed and turbulence during construction it is likely that the majority of dust will be deposited in the area immediately surrounding the source (up to 200 m away). Therefore properties within 200 m of the construction site are most likely to experience nuisance, without appropriate mitigation measures. However, the nuisance would be temporary, and provided that site specific mitigation measures are implemented, no significant dust effects are predicted. It should be noted that the closest permanent residential receptor is 1.3 km from the closest point of the OHL therefore impacts are expected to be negligible.
6.2 Emissions from Traffic

The main pollutants of concern associated with road traffic are NO$_2$, PM$_{10}$, CO, benzene (C$_6$H$_6$) and benzo[a]pyrene (C$_{20}$H$_{12}$). Of these pollutants, NO$_2$ and PM$_{10}$ are the emissions most likely to result in exceeding relevant air quality standards or objectives.

The greatest potential for impacts on air quality from traffic associated with construction of the proposed project would be in the areas immediately adjacent to the principal means of access for construction traffic. In construction zones, the dust generated by vehicle movements and local air pollutant emissions from vehicles may be temporarily elevated during the busiest periods of construction activity, however, given the relatively remote and open nature of much of the OHL route, no significant local air quality effects are predicted.

Air emissions during operation of the proposed OHL will be Minor and only occur during routine inspections and maintenance activities.

6.3 Mitigation

The general construction management and pollution prevention measures will be set out in the Project ESMP (see separate attachment). With the full implementation of those general measures the project should not have a significant impact on air quality.
7 Noise and Vibration

7.1 Introduction

The Mongolian standard MNS-4585-2007 has permitted noise limits of 60 dB(A) during daytime, and 45 dB(A) at night. However the WHO provide a more stringent standard of 55 dB(A) and 45 dB(A) which will be applied to this project.

7.2 Construction noise

In a general context, construction activities could be divided into a number of distinct processes. They may be described as follows:

- Construction of tower foundations
- Tower assembly and erection
- Attachment of the conductors
- General road improvements and other similar works.

Based on available project information, there are no blasting requirements during the construction process. Noise and vibration effects associated with blasting are therefore not expected during construction activities. However, any eventual requirement for blasting will be agreed in advance by the EPC contractor with the relevant local authority.

There are no plans to use helicopters during construction activities and, therefore no noise implications associated with helicopters are expected. However, any eventual requirement for use of helicopter would make noise audible to people within 2 km. The duration of the noise would be short-term, on the order of minutes to an hour, and over a very limited number of days.

Mechanical equipment which is planned to be involved in the construction of the proposed 110 kV OHL includes, but is not limited to: track loader, excavator, hydraulic hammer and breaker, mobile crane, air compressor, dump trucks, generators, concrete pump, etc.

The table below gives an overview of the noise levels at a reference distance of 16 m from the source for various machines that will be most frequently used in construction. The noise levels at distances of 30 and 1,300 m have been calculated based on the inverse square law and represent the likely levels experienced at the temporary ger to the north of the site and the closest permanent residential receptors in Tsogttsetsii. The values in the table are based on data from the available literature.
Table 7-1: Noise levels from construction equipment

<table>
<thead>
<tr>
<th>Noise source during construction</th>
<th>Level of noise (dB) at 16 m from the source</th>
<th>Level of noise (dB) at 30 m from the source</th>
<th>Level of noise (dB) at 1,300 m from the source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressor</td>
<td>81</td>
<td>75.5</td>
<td>42.8</td>
</tr>
<tr>
<td>Excavator</td>
<td>80</td>
<td>74.5</td>
<td>41.8</td>
</tr>
<tr>
<td>Ballast equalizer</td>
<td>82</td>
<td>76.5</td>
<td>43.8</td>
</tr>
<tr>
<td>Ballast tamper</td>
<td>83</td>
<td>77.5</td>
<td>44.8</td>
</tr>
<tr>
<td>Compactor</td>
<td>82</td>
<td>76.5</td>
<td>43.8</td>
</tr>
<tr>
<td>Concrete mixing</td>
<td>85</td>
<td>79.5</td>
<td>46.8</td>
</tr>
<tr>
<td>Pump for concrete</td>
<td>82</td>
<td>76.5</td>
<td>43.8</td>
</tr>
<tr>
<td>Vibrator for concrete</td>
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<td>Crane</td>
<td>88</td>
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<td>49.8</td>
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<td>Mobile crane</td>
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<td>77.5</td>
<td>44.8</td>
</tr>
<tr>
<td>Bulldozer</td>
<td>85</td>
<td>79.5</td>
<td>46.8</td>
</tr>
<tr>
<td>Generator</td>
<td>81</td>
<td>75.5</td>
<td>42.8</td>
</tr>
<tr>
<td>Machine for flattening</td>
<td>85</td>
<td>79.5</td>
<td>46.8</td>
</tr>
<tr>
<td>Circular saw (metal cutting)</td>
<td>76</td>
<td>70.5</td>
<td>37.8</td>
</tr>
<tr>
<td>Track loader</td>
<td>85</td>
<td>79.5</td>
<td>46.8</td>
</tr>
<tr>
<td>Track</td>
<td>88</td>
<td>82.5</td>
<td>49.8</td>
</tr>
</tbody>
</table>

Less populated parts of the proposed OHL, where the population is sparse, will have extremely low background noise levels and therefore the noise from construction or transport sources would be audible over a greater distance. However this in itself would not necessarily constitute a significant effect. In more urban areas, it is likely that the noise contribution from construction works would be less as a higher background noise level from other sources would mask the construction noise, reducing audibility at greater distances. The OHL route will be located at least 1.3 km from the nearest permanent residential receptor in Tsogttsetii therefore the impacts of construction noise are assessed to be within applicable limits therefore minor, temporary and not significant.
7.2.1 Construction vibrations

Planned construction activities and use of equipment and machinery will be a source of vibration. The response of people to vibrations on the ground is influenced by many factors. Some of those factors are physical, like amplitude, duration and frequency content of vibrations, while other factors like the type of population, age, gender and expectations are physiological. This means that people’s reaction to vibrations is subjective and differs for different people. It is generally accepted that for the majority of people, vibration levels in excess of between 0.15 and 0.3 mm/s peak particle velocity are just perceptible. Previous studies have shown that vibration tends to be perceptible at distances of up to 15 m from the source. Due to the fact that there are no permanent residential properties within 1.3 km of the proposed OHL, there would be no impacts on permanent residential receptors as a result of vibration from the construction of the proposed overhead OHL.

7.3 Operational Noise

7.3.1 Overhead OHL

An operational OHL can be a source of a phenomenon known as “corona discharge” (a limited electrical insulation breakdown of the air) which can also occur naturally during storms when highly charged clouds induce high electric fields around tall objects.

Whilst the conductor systems of overhead OHLs are designed and constructed to minimise corona and hence acoustic noise, surface irregularities on the conductors, caused by physical damage such as burrs, or debris such as insects, pollen, industrial pollution, raindrops or other forms of contamination, may locally enhance the electric field strength sufficiently for discharges to occur.

Any corona discharge would act as a source of audible noise i.e. a crackling sound occasionally accompanied by a low frequency hum in certain wet conditions.

Corona noise is generated only when the conductor surface electric stress exceeds the inception level for corona discharge activity. The OHL conductors are designed to operate below this threshold. Surface contamination of a conductor, resulting in a modification to its otherwise smooth profile, would cause a very local enhancement of electric stress that may initiate discharge activity. At each discharge site, a limited electrical breakdown of the air occurs. A proportion of the energy associated with the corona process is released as acoustic energy, which is launched into the air as sound pressure waves.

Highest noise levels generated by an OHL generally occur during rain. Water droplets collect on the surface of the conductor and may initiate additional corona discharges. Fog may also give rise to increased noise levels.
Fog noise is caused by droplets of water condensing onto the line and hence causing discharge activity in a similar way to rain.

Operational noise generated by an OHL increases noise levels in the surrounding environment and may cause nuisance to affected populations. The high variability in the response of individuals to identical noise sources makes the prediction of annoyance very difficult. Each individual's response to increased noise levels is subjective and highly personal.

OHL audible noise is generally categorised as "crackle" or "hum", according to its tonal content. Crackle may occur alone, but hum would usually occur only in conjunction with crackle. Hum is only likely to occur during rain when rates of rainfall exceed 1mm/hr. Crackle is a "broad band" noise containing a random mixture of frequencies, typically ranging from 1 kHz to 10 kHz.

No individual pure tone can be identified for any significant duration. Crackle has a generally similar spectral content to the sound of rainfall. Hum is a sound consisting of one or more pure tones. Generally 100 Hz is most dominant, but other harmonics of 50 Hz may also occur, to a lesser magnitude, as the harmonic increases in frequency, and only for the first few harmonics.

During dry weather conditions, noise due to corona effect will be in a range between 40 dB and 50 dB, in areas below the line conductors, while in wet weather conditions the noise level may rise up to 60 dB. The noise level changes along an OHL and depends on surface irregularities or physical damages on the conductors. The corona noise attenuates with the distance from the line and at approximately 20 m from the line it becomes unnoticeable.

The subjective response of individuals to increased noise levels is summarised in Table 7-2.

**Table 7-2: Estimated community response to noise exceeding the normal background noise level**

<table>
<thead>
<tr>
<th>Category</th>
<th>Response</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>none</td>
<td>No reaction</td>
</tr>
<tr>
<td>5</td>
<td>little</td>
<td>Sporadic complaints</td>
</tr>
<tr>
<td>10</td>
<td>medium</td>
<td>Widespread complaints</td>
</tr>
<tr>
<td>15</td>
<td>strong</td>
<td>Threats of community action</td>
</tr>
<tr>
<td>20</td>
<td>very strong</td>
<td>Vigorous community reaction</td>
</tr>
</tbody>
</table>
During the OHL routing process, CEA has sought to avoid acoustic effects from corona discharge by routing the proposed OHL a significant distance away from permanent residential areas. The route is over 1.3 km from the closest permanent residential property, however it is possible that seasonal gers are sited closer to the OHL. There are no permanent properties and other sensitive receptors along the OHL route at distances where the corona noise would cause nuisance effects and thus, it is not likely that impacts on people from corona noise will occur. The establishment of a 40 m sanitary zone along the OHL route (mirroring the leased OHL corridor) would restrict any future residential or other similar developments along the line and would ensure that no future acoustic impacts from the OHL corona may occur as result of any eventual urban development.

A recent review of the route found only one ger within 300 m of the line, at a distance of 90 m. The sound pressure level at that site has been predicted using a number of assumptions.

The sound power level assumed is as previously used for a 400 kV line. Arguably this could be reduced by 10 log (400/actual kV), though reliable data are hard to come by, so this is very much a worst-case assessment.

The noise impact in wet conditions uses “Miller curves” to assess the level of background noise due to rain on different types of terrain. In this case Miller Curve R1 is used:

*Essentially bare, porous ground (that is ploughed field or snow covered ground); no standing puddles of water. Relatively small-leaved ground cover vegetation, such as grass lawn, meadow, ha field shortly after mowing, field of small-leaved plants.*

A case could be made for the use of Miller Curve R2:

*Non-porous, hard, bare ground or pavement; falling raindrops splash on thin layers or puddles of collected water; or in or beside wooded area of deciduous trees without leaves or with only small leaves; or in or beside wooded area of coniferous trees or evergreens having needles rather than leaves; or thin-leaved ground cover or crop, such as hay, clover or grain.*

The difference is that R-2 has no drainage, leading to puddles and hence higher background rain noise from splashing. R-1 is the worst case.

Rainfall is assumed to be 50 mm/annum (the minimum for the Gobi Desert from [http://www.selenatravel.com/80/mongolia_climate](http://www.selenatravel.com/80/mongolia_climate)). Higher rainfall increases background noise and reduces the relative impact of the line noise, especially if there are puddles as per Miller Curve R2, but even at the maximum of 100 mm, the rainfall is so low as to make no difference.
Assuming background noise of 25 dB(A), which is a realistic worst case, the dry excess is -0.8 dB, the wet excess 7.8 dB. The dry figure indicates no adverse impact, the wet figure adverse impact (sporadic complaints), bordering on significant adverse impact (widespread complaints). But at a maximum of 100 mm rain per annum, this must be extremely rare, especially as all but one receptors are significantly further from the route of the line. However the lack of permanent receptors within 1.3km of the OHL would reduce the impact level to negligible.

7.3.2 Substation Audible Noise

In general, there are three basic sources of audible noise from substations. Each of these has its own characteristic spectrum and pattern of occurrence due to the nature of the noise-generating mechanisms involved:

(i) The transformer noise is approximately constant with a low frequency hum occurring at harmonics of the supply frequency (100 and 200 Hz are usually dominant).
(ii) The transformer coolers generate more broadband noise, although they are not in continual operation.
(iii) Switchgear noise is generated by the operation of circuit breakers and has short duration.

Noise generated by an operational substation increases noise levels in the surrounding environment and may cause nuisance to the affected population. The high variability in the response of individuals to identical noise sources makes the prediction of annoyance very difficult. Each individual's response to increased noise levels is subjective and highly personal.

However the distance of the closest residential properties at Tavan Tolgoi to the existing Tavan Tolgoi substation is more than 7 km and at this distance acoustic nuisance to residents will not occur.

7.4 Mitigation

Noise levels at permanent residential properties will be met during both construction and operations phases. However it is clear that there is a degree of uncertainty regarding the noise levels experienced by nomadic herders which would be dependent on the location of their ger in relation to construction works. CEA are unable to exclude herders from areas outwith the lease area which would be 40 m from the centre line of the OHL however information on noise levels will be provided to enable the herders to make an informed decision on whether to set up their ger in the vicinity of the works.
8  Hydrology and Soils

The hydrology and hydrogeology assessment examines any potential impacts resulting from the construction, operation and decommissioning of the Project on the water environment including surface water and groundwater conditions.

8.1  Hydrology Baseline

8.1.1  Surface Water

There are no perennial streams or permanent surface water bodies within the vicinity of the transmission line. The nearest surface water depression is Ulaan Nuur Lake approximately 15 km to the west.

A number of shallow watercourses and small dry erosion channels were noted during the site visit in October 2014 on the mountain slope and it is likely the water pools at the bottom for a time during and after severe precipitation events in spring following active snowfall winters and during periods of summer.

8.1.2  Precipitation

The mean annual precipitation in the area of the Project site is 99.4mm with 5.7% occurring in the winter months as snow and 94.3 % as rainfall in summer season.

8.1.3  Drinking water

A survey was carried out in April 2016 as part of a social mapping exercise which identified that nine of the households in proximity to the OHL use wells for their water supply whilst a further two households source their water from a borehole. An additional two households obtain their water from the public supply in Tsogtsetsii.

8.1.4  Hydrogeology

The occurrence of groundwater (and its quality) in the aquifers and its movement depends not only on type of formation but also on the recharge mechanisms. All groundwater must have had a source of recharge. This is normally rainfall but can also be seepage from rivers, canals, or lakes.

Infiltrating water percolates to the water table and flows from the points of recharge to the points of discharge. The aquifer flow regime depends on the hydraulic characteristics of the rocks (media) and the hydraulic gradient and may vary widely with the geology and the recharge conditions.

Groundwater systems are dynamic with groundwater continuously in slow motion from zones of recharge to zones of discharge. Tens, hundreds, or even thousands of years may elapse, especially in arid and semi-arid regions.
The geological formations that are particularly interesting for groundwater occurrence are the Permian, Triassic, Jurassic, Cretaceous, Paleogene, Neogene, and Quaternary rocks and sediments. They form a complex set of local aquifers at different depth, extension, and lithology and can be divided into two types of aquifers: intergranular with primary porosity) and fissured (with mainly secondary porosity). Aquifers in the South Gobi Region can be grouped into three classes of productivity:

- Locally highly productive aquifers.
- Low to locally moderately productive aquifers.
- Local limited groundwater resources or strata with no groundwater.

Productive (high or moderate) aquifers in the South Gobi region include the alluvial sand and gravel deposits in the wadis and bel areas of mountains. These aquifers are usually shallow (less than 50 m) and are the main source of drinking water and livestock water supply. At greater depth, the most productive aquifers are found in the sandstone containing deposits, of which the Upper Cretaceous sandstone complex is the most productive.

It is likely that aquifers on site fall under the former description however further study is recommended to be able to fully understand the aquifer characteristics and capacity.

It has been reported there were 50 springs near Tsogttsetsii just a few years ago but it has been suggested that number has now dropped to five. Furthermore, mineral concentration in the water at Tsogttsetsii is high. Having enough drinking water is viewed as a critical issue. Water costs MNT 2 a litre at the water pumps, which filter the water for drinking. Some complaints have been made that the water from privately owned wells outside the centre of town was brackish.

In order to preserve water resources, the Umnugobi Citizens’ Council restricted water usage from Balgasiin Ulaan Lake, due to come into force on 01 January 2016, but it is understood that the Citizens’ Council later rescinded the order due to objections raised by mining operators.

8.1.5 Flood Risk

There is minimal risk of flooding in the Project site area given the generally low rainfall in the region and sandy soil coverage. However, intense storms can occur that may lead to locally intense flows in some locations and shallower sheeting flows in others.

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8 Jadambaa and Buyanhishig (2007)
9 Batzaya (2014)
8.2  Geology Baseline

In terms of the regional geological character, the Project site belongs to the Gobi-Khyangan structured formation with wide spread volcanic pluton complexes of later Carboniferous and early Permian ages.

Dominants are the Quaternary deposits including continental sedimentary deposits bearing Upper Permian coal seam, volcanic sedimentary deposit of Lower Permian Tsogttsetsii formation, volcanic rocks of Upper Carboniferous and Lower Permian Dush-Ovoo formation and sedimentary volcanogenous of Lower Carboniferous Ikhshand formation and Mid-Upper Devonian Tssetsgershand formation volcanic sediments within the Project site respectively.

Ikh shand formation with sandy stone, alevrolite, gravellite, conglomerates, argillite, acid-and basis tuff and tuffs are widely distributed throughout the south section of the Project site. To north, Mid-Upper Devonian Tssetsgershand formation siliceous andesites, sandy stone and crystallic quarts are present.

Deposits in hollow areas and valleys were accumulated as a result of the geological revolution of structures for long term development beginning with the Mesozoic era. The accumulated deposits in the hollow lands and valleys have been caused by the intensified tectonic movement in the area.

For the lithological cross-sectional profile, mineralized sedimentary deposits are interlined within the site area. Sandy stones, alevrolite, conglomerate, clay and sand strata are interlined in the areas nearest to Tsogttsetsii soum center.

Escarments surrounded by depression areas and valleys within the Project area are composed of cliff rocks aged Palaeozoic era. It was observed that land surfaces were largely eroded by the intensive fractures and cracks.

Mesozoic sedimentary volcanic deposits are mostly spread in depression lands and valleys among the mountains like fillers of the valleys. In top side of profile, Quaternary loose deposits and harder Cretaceous binded sediment deposits are separately found associate with crack collectors. In some areas, clayey deposits are caused by phase larger alterations. The alluvial, provial-deluvial sediments were found in both bottom and downhill of mountains.

8.2.1  Seismic Conditions

The Project Site is identified as being located in an area with a moderate to high seismic hazard by the Global Seismic Hazard Assessment Programme.
Seismic activity of Mongolia is associated with the deformation induced by the collision front 2,000 km to the south between India and Eurasia, and extension tectonics associated with the Baikal extension structures on the eastern side of the Siberian craton to the north of Mongolia. The nearest tectonically active area in Mongolia to the Project site is the Mongolian Altai. These are tectonically active mountain ranges stretching some 1,700 km from south-west Siberia to the Gobi Desert. The easternmost extension of the Mongolian Altai is known as the Gobi Altai with fault systems.\(^{10}\)

**8.2.2 Soils**

Soil cover of the Project area is presented by sandy and clay-like sediments. Field observations revealed numerous traces of soil erosion and desertification, principally caused by vehicle traffic on unimproved tracks. The fine soil is subject to Aeolian transport and erosion in the dry season and water erosion during the wet season. In addition, there are some run-off channels on the hillsides of Tsetsii Uul, but there is no sign of severe erosion.

An initial ground investigation was undertaken by Sunny Trade LLC for the Client at the Project Site in May 2014, consisting of a number of shallow investigations. The investigation found that the upper soils consist of areas of sandy gravel and areas of clay. No significant depth of topsoil was found on the site.

A significant amount of ground investigation has also recently been undertaken in the area for the railway construction project and the Tavan Tolgoi Power Station project. Investigations for these projects have been undertaken by Soil Trade LLC, a Mongolian ground investigation company with offices and soil testing facilities in Ulaanbaatar.

SgurrEnergy and CEA representatives met with Soil Trade both in Ulaanbaatar and at one of their investigation sites close to the Project Site. Soil Trade LLC confirmed that the ground conditions in the region are relatively consistent, consisting of about 5 to 7 m of sandy gravel and clay overlying highly weathered rock (sandstone, siltstone and claystone) becoming more intact with depth. Inspection of borehole samples at the Tavan Tolgoi Power Station Project confirmed this understanding.

Figure 8-1 and Figure 8-2 show photographs of samples of soil extracted from boreholes at a site close to the Project Site. The soils observed in these borehole samples, and as described by Soil Trade LLC, are consistent with the brief investigations undertaken to date across the wider Project Site.

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\(^{10}\) Oyu Tolgoi LLC (2012)
The Gobian soils are easily eroded and dispersed by water and wind as well as being vulnerable to disruption (such as vehicle tracks) which break up the surface. Degradation of soils is often found around animal watering holes, informal vehicle tracks and herder camps.
Open cast coal mining is being carried out close to the site but there is no evidence of any deep mining inside or under the route of the proposed transmission line.

8.3 Impacts on Hydrology

During construction, earthworks and the use of heavy vehicles could alter surface drainage patterns. The removal of vegetation and compaction of soils will reduce infiltration and surface run-off will increase. The risk is greatest during severe precipitation events. The increased volume of water flowing down drainage channels and creeks is likely to cause additional soil erosion and increase the size of the channels. Surface run-off will also contain larger amounts of suspended sediments during construction than would otherwise be the case.

Since that there are no permanent streams along the transmission line route, the sensitivity of ephemeral drainage channels is assessed as low. The magnitude of the effect is also low, as changes to the channels will be localised, and the significance of the impact is assessed as negligible. Due to the elevation of the site and the local area, there is no significant flood risk.

Based on the estimates in Section 2.2.1, we expect a maximum of 57 people to be employed for the construction of the transmission line however this could be significantly lower. Table 8-1 provides an estimate of the total water requirement for the construction of the transmission line.

### Table 8-1: Predicted Water Requirements for Construction of Transmission Line

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Volume of Water (m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General worker requirements(^{11}) based on a total of 57 personnel</td>
<td>2,717</td>
</tr>
<tr>
<td>Water for cement batching</td>
<td>132</td>
</tr>
<tr>
<td>30% allowance for waste and washdown</td>
<td>40</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>2,889</strong></td>
</tr>
</tbody>
</table>

Therefore the water requirement will be 2,889 m³ over the course of a seven month construction window. This is the equivalent of 14 m³/day however this is heavily influenced by a worst case prediction in terms of construction personnel.

Table 8-2 below provides a breakdown of water requirements for cement batching.

**Table 8-2: Estimated Water Use for Cement Batching**

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions of foundation</td>
<td>1800 x1800 x 450 mm</td>
</tr>
<tr>
<td>Number of bases per tower</td>
<td>4</td>
</tr>
<tr>
<td>Volume of concrete per towers</td>
<td>5.832 m³</td>
</tr>
<tr>
<td>Density of concrete</td>
<td>2,400 kg/m³</td>
</tr>
<tr>
<td>Total weight of concrete for 113 towers</td>
<td>1,582 tonnes</td>
</tr>
<tr>
<td>Vol of water required for 113 bases at ratio of 0.2 m³ water/m3 concrete</td>
<td>132 m³</td>
</tr>
</tbody>
</table>

At this stage it is not proposed that a local groundwater well be installed to provide water for construction activities. All water will be sourced from Mongolia Mining Corporation’s nearby mine at Tavan Tolgoi. Here water is abstracted from a series of groundwater boreholes and is stored in two water reservoirs with a total storage volume of 56,000 m³, covered by synthetic membrane to prevent evaporation. In 2015, a total of 465 million litres of groundwater was extracted. The total water requirement for the wind farm is 0.01% of the total water extracted by the mine in 2015. The mine has a license to abstract 117 litres/second (3.7 billion litres/year) based on the projected growth for next 10 years. The total wind farm and OHL water required is 0.001% of the total allowable abstraction. Given the fact that no additional groundwater is currently proposed to be abstracted, the magnitude of the impact on groundwater is negligible and the impact is assessed as negligible.

Potential sources of pollution to groundwater during construction comprise leaks and spills of oils from machinery and discharge of sanitary waste and wastewater. During construction sanitary waste will be collected in containers below portable toilets and transported to a registered waste disposal facility for disposal. Storage and handling procedures for oils and other chemicals will be required to minimize risk of pollution. These measures should be incorporated into a Project ESMP. The magnitude of the impact on groundwater is low and is assessed as minor adverse.

A summary of the potential impacts on hydrology is provided in Table 8-3 below.
Table 8-3: Impacts on Hydrology

<table>
<thead>
<tr>
<th>Project Component</th>
<th>Potential Impact</th>
<th>Magnitude of Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tower Construction</td>
<td>Excavations and vehicle tracks can introduce new drainage channels and cause additional erosion and increase in sediment run off.</td>
<td>Negligible</td>
</tr>
<tr>
<td>Tower construction</td>
<td>Chemical spills are a potential source of pollution to groundwater</td>
<td>Minor</td>
</tr>
</tbody>
</table>

8.4 Impacts on Soils

The main impact on soils during construction will be the increase in vulnerability to erosion. The following types of construction activity could lead to potential soil erosion:

- Vehicle traffic along dirt tracks used during construction will cause soil compaction.
- Off-road vehicle traffic will damage vegetation and cause soil compaction.
- Any vegetation and some soil will be removed for the foundations of pylons and construction camps.
- The use of heavy equipment will cause soil compaction if used off of roads.

Soil compaction and loss of limited vegetation present increases the soils' vulnerability to erosion. Due to the short growing season it is difficult for vegetation to colonize bare areas of ground, so once vegetation is lost, the areas affected by erosion tend to spread through the effects of wind and rain. Soils will be particularly vulnerable during wet weather or after snow-melt, when vehicle traffic is likely to cause the greatest damage; since most precipitation falls in summer, one period of maximum vulnerability coincides with the construction season.

Where roads are un-surfaced, rutting and gully erosion eventually makes the roads impassable so that vehicles drive off the track and the area affected by erosion continually widens.

Damage to soils has further effects on land use. When soil is compacted, it cannot support the native grasses, and this in turn reduces the pasturage that can be used by the livestock of local herders. In addition, the loss of grass affects biodiversity, since grassland is a food source for small mammals, which in turn provide food for predators such as foxes and raptors (see Chapters 6 and 7 of the Wind Farm ESIA for further details).
The sensitivity of soils is high, and the magnitude of the impact is low, as the impacted area at the tower foundations is relatively small. The significance of the impact is therefore assessed as moderate adverse. The impact should be of relatively short duration, lasting only through construction of foundations. Once foundations have been complete a much smaller area will be affected, and previously disturbed areas will have been reclaimed.

A summary of the potential impact on soils is provided in Table 8-4 below.

Table 8-4: Impacts on Soils

<table>
<thead>
<tr>
<th>Project Component</th>
<th>Potential Impact</th>
<th>Magnitude of Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tower construction</td>
<td>Construction traffic can case soil compaction and loss of vegetation. Can result in a reduction of available pasture land.</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

8.5 Mitigation

8.5.1 Hydrology

The following measures are proposed during construction to mitigate potential hydrology impacts:

- It is recommended that an indicative buffer distance of 50m is applied to any hydrological features shown on background maps or discovered during survey.
- Tower foundations will be located and excavated wherever possible in the driest locations with well consolidated superficial geology.
- Where groundwater is encountered during excavations, appropriate dewatering procedures will be implemented.
- Where concrete transfers are required, measures will be implemented at the point of concrete transfer to prevent any accidental spillage.
- Any washing of vehicles will be carried out at the nearest construction compounds and chemicals/concrete disposed in a suitably bunded facility.

8.5.2 Soils

The following measures are proposed during construction to mitigate potential impact on soils:

- Vehicles and plant working at tower locations will be restricted to a designated construction compound to prevent compaction of adjacent areas of land. Temporary fencing will be erected and working areas will be clearly marked out.
8.6 Residual Effects

The assessment has identified areas of activity that have the potential to impact on the hydrology and hydrogeology of the site.

With the implementation of mitigation measures outlined in Section 8.5, it is considered that there will be no significant residual impacts on the water environment.
9 Landscape and Visual

9.1 Introduction

Landscape effects can be defined as the result of physical changes to the landscape arising as a result of new development, or from indirect effects such as poor management, resulting in the deterioration of a landscape. Such physical changes may include the addition, alteration or removal of trees and woodlands, structures (overhead transmission towers, buildings, walls, etc), or other features such as roads. Landscape effects may be positive (beneficial) or negative (adverse) or neutral (no overall change or a balance of positive and negative effects).

Visual effects relate closely to landscape effects but concern changes in views. Visual assessment relates to people’s perception and response to changes in visual amenity, i.e. the value of a particular area or view in terms of what is seen. Effects may result from new elements located in the landscape that cause visual intrusion (i.e. interference with or interruption of the view) or new features that physically obstruct views across the landscape. Visual effects may also occur where a new view results from the removal of trees or other existing obstructions. Visual effects may be positive (beneficial) or negative (adverse) or neutral (no overall change or a balance of positive and negative effects).

In a general context, the visibility of objects in the landscape relates to a range of factors. These are: (i) the distance from the viewer to the object; (ii) the extent to which landform, vegetation cover or structures such as buildings may interrupt, or screen all or part of the view; (iii) the degree of solidity of the object in question, and (iv) the extent to which the object differs in colour from its background. In addition, the extent to which the object ‘breaks’ the horizon is also important in affecting its visibility.

For OHL towers, the open lattice structure allows the background to be seen through the structure and the structure itself reduces in importance as the distance from the viewer increases. Therefore, the OHL towers are less visible than more solid structures of the same size. According to experience, in normal weather conditions, overhead line towers are not normally observed by an average viewer, at a distance greater than 10 km.

9.2 Baseline Landscape Conditions

9.2.1 Overview

The area is characterized by gently rolling desert plains with minor relief. The average altitude of the soum territory is 1,550 m above sea level (ASL), the highest point is Tsetsii Uul at 1,791 m ASL located with distance of 30 km to the south of Tsogttsetsii soum centre.
The whole area of the soum territories belongs to desert steppe regions where low amount of annual rainfall and strong dusty storms tends to occur in the spring. Vegetation coverage is relatively thin and sparse.

In terms of protected areas, the Gobi Gurvansaikhan National Park, an IUCN Category II Protected Area, is the closest National Park to the Project located approximately 250 km to the west-north-west of the site. It is possible that there are further local landscape designations in the area which will be determined following further studies.

The Project area, like much of the surrounding area, is open countryside with sparse vegetation.

Like much of rural Mongolia, the landscape is otherwise free from buildings and is dominated by the broad expanse of the sky. The mountain tops and ridges provide good vantage points from which to view the surrounding landscape. This open landscape provides an overwhelming sense of vast natural space.

9.2.2 Landscape Character Types (LCT)

The following landscape character types have been identified within the Project’s area of influence.

- Desert steppe
- Low mountain and hillocky steppe
- Tsogttsetsii town

These LCTs are described in more detail below and are shown in Figure 5.2 of Volume 2.

9.2.2.1 Desert Steppe

Geographically, the Project area belongs to the central Khalkh steppe of the Dry Mongolia Steppe zone (Mongolian classification).

As noted above, like much of rural Mongolia, the landscape is otherwise free from buildings and is dominated by the broad expanse of the sky, providing an overwhelming sense of vast natural space, as highlighted in Figure 9-1.
The ecosystem of the study area can be generally described as a low-level anthropogenically disturbed (through grazing), moderately moist meadow steppe. The vegetation is relatively thin and sparse and easily degraded. The only significant anthropogenic disturbance at the Project site other than Project-related wind measurement masts and associated tracks) are unimproved vehicle tracks and seasonal livestock grazing. Observation of the area indicates no arable agricultural activities in this LCT.

![Image](image_url)

**Figure 9-2: View from the north-eastern boundary of the site area south towards Tsetsii Uul**

The nearground landscape is generally flat and uniform with gentle undulations and small ridges dropping into a large flat depression between Tsetsii Uul and the town of Tsogttsetsii. At this point the land drops to a height of 1550 m above sea level before gently rising up to reach the base of the escarpment of Tsetsii Uul at a height of approximately 1700 m above sea level (Figure 9-2).

There are very few vertical features in this landscape although the main OHLs to Ulan Bator become increasingly visible to the north and west of Tsogttsetsii. The two existing meteorological masts form the only vertical features in this landscape character type but are visible only at relatively close range.
9.2.2.2 Low Mountain and Hummocky Steppe

The ecosystem of the study area can be generally described as moderately moist meadow steppe, situated on weakly, moderately or highly dissected low mountain / hummocky terrain underlain by automorphic and semi hydromorphic soils. As is the case for the Desert Steppe LCT above the vegetation is relatively thin and sparse and easily degraded.

This LCT is far more widespread that encountered in the Tsetsii Uul LCT particularly to the north and north east of the site boundary and comprises of smaller, more rounded hills although there are some smaller rocky outcrops. Although the vegetation is sparse there are a greater number of shrubs and grasses in this LCT. Within the LCT views are enclosed by the landform which limits the expansive views experienced except from the tops of the hills.

The hills are generally small in size reaching heights of up to 10-20 m above the level of the surrounding Desert Steppe LCT. The exception is the mountain to the immediate north of Tsogttsetsii town which is significantly higher. The dominance of this feature is further strengthened by the installation of the Soyombo (Mongolian national emblem) on the hillside as part of the Horse Honor Ovoo, providing a bold background to the town but also marking a transition from this LCT to the more urban LCT of Tsogttsetsii town itself.
Tsogttsetsii town

Tsogttsetsii soum forms a clustered settlement loosely centred on a group of apartment blocks and administration buildings (see Figure 9-5 below). However the town is very much characterised by a more scattered settlement pattern moving out from the centre. The majority of the residents live in gers located in small semi-permanent fenced landholdings, possibly reflecting the fact that many of the town’s residents have moved there due to the employment opportunities provided by the nearby coal mines.

There are a large number of vertical elements to the landscape character, these primarily being the large number of electricity pylons, the emissions stack from the power station (Combined Heat and Power) together with the central apartment blocks and the newly built hotel.
Figure 9-5: View of Tsogttsetsii looking northwest from south

Views from the town are screened to the north by the low mountain range and to the south by a more minor ridge which rises approximately 20-50 m. Views to the west and south west are dominated by coal mines and views to the south are constrained by the low mountain / hummocky steppe landscape character type.

As noted above the installation of the Soyombo and Horse Honor Ovoo on the hillside to the north provides a striking backdrop to the town.

The screening afforded by the surrounding landscape results in a relatively well contained landscape character type within the town, distinct from the adjacent LCTs.

9.3 Summary of Impacts on Landscape Character Types and Designations

The extent to which the Project would affect the existing landscape varies depending on the individual components of the Project and the ability of the existing landscape to accommodate these various components.

The following section provides an assessment of the impacts that the Project would have on landscape designations and the landscape character identified within the baseline. The assessment considers impacts during construction and also in the longer term during the operational phase, in accordance with the effect criteria outlined in Section 5.4.7 of the Tsetsii Wind Farm ESIA.
Landscape and visual impacts arising from the Project construction and operation are detailed below.

9.3.1 Desert Steppe

The Project is located predominantly in the Desert Steppe LCT which will experience two sources of impact to the LCT during construction. The first change is to the land, through topsoil stripping and earth-moving, and the second is the introduction of machinery and equipment to the LCT.

The main areas of landscape disturbance are described in Chapter 2. These include areas for temporary works, construction compounds, access road and on-site roads, areas for WTG and control centre foundations, on-site and off-site OHLs. New machinery and equipment will be introduced into the landscape, including a crane, trucks (usually 20-tonne trucks, but sometimes larger), excavators, bulldozers, and other heavy equipment.

The main source of impact to the LCT during operation is the erection of a line of 24 m high towers.

The key aspect of this LCT is vast space with a lack of vertical features therefore the sensitivity is assessed to be Medium as it is likely to be important in a local context, although not nationally designated. The magnitude of change to the LCT during construction is low, as only a small proportion of the local landscape will be affected by topsoil stripping and bare ground. The impact duration during construction is temporary and medium-term and likely to be screened by the surrounding topography. The significance of impact during construction is Slight and not significant.

The greatest impacts would be expected to be experienced during operation, particularly at distances of less than 10 km from the proposed OHL. However the presence of an existing 220kV OHL and the fact that the new line will follow that existing corridor reduces the level of impact. In addition the vastness of the LCT provides adequate capacity to absorb this level of impact without materially affecting the key characteristics of the LCT. Therefore the magnitude of impact is likely to be Low at distances of up to 10 km reducing to Negligible at further distances. As a result, the significance of the impact is Negligible and not significant.
9.3.2 Desert Steppe with coal mining

The main settlement and centre of this LCT is the town of Tavan Tolgoi, located a distance of 7 km from the substation and closest point of the OHL. The landscape here is dominated by the presence of two large scale open cast coal mines. The surrounding landscape has been further degraded by planned and unplanned roads and associated erosion of surrounding soils. As a result the sensitivity of this LCT is assessed as Low. Views to the proposed Project site from this LCT will be predominantly screened by the presence of large spoil heaps from the mines in the middle ground and the presence of the existing 220 kV OHL, roads, eroded bare earth and scattered plant and machinery in the foreground are the dominant features of this LCT. When viewed in this context the OHL will form an almost imperceptible feature in the overall LCT and as a result the magnitude is assessed as Negligible. Therefore the significance of the impact is Negligible and not significant during both construction and operation.

9.3.3 Tsogttsetsii

Tsogttsetsii town is located a distance of 1.5 km west of the closest point of the OHL. Views from this LCT are currently dominated by Tsogttsetsii Uul and the nearby coal mining at Tavan Tolgoi. The townscape is not assessed to be of particularly high quality therefore the sensitivity is assessed as Low. There is an existing OHL running to the northeast of the town together with distribution lines providing power in the town itself. These are shown in Figure 9-4 below. The proposed OHL will not represent a new feature in the landscape but will be an extension of existing features. As a result the magnitude of impact is assessed as Negligible during construction and Low during operation. Therefore the significance of the impact is Negligible and not significant during construction and Slight and not significant during operation.
9.3.4 Low mountain and hummocky steppe

Although this LCT is similar in many ways to the Desert Steppe LCT, the key difference of this LCT is the nature of the topography which gives the LCT its character but also provides a high degree of screening from the wider LCTs. When viewed from surrounding LCTs, this LCT does not contain or form a particularly dominant feature and appears more as a break in the much more expansive Desert Steppe LCT. As a result the sensitivity is assessed to be Low.

The impact duration during construction is temporary and medium-term and likely to be fully screened by the surrounding topography in this LCT. The magnitude of impact is therefore Negligible. The significance of impact during construction is Negligible and not significant.

The greatest impacts could be experienced during operation. However, the presence of the larger 220 kV line, the lack of receptors within this LCT, the screening offered by the surrounding topography, and the distance from the site to the LCT, are likely to mitigate any significant adverse impact. Therefore the magnitude of impact is likely to be Low. As a result, the significance of the impact is Slight and not significant.
9.4 Cumulative Visual Effects

Cumulative visual effects arise where it is possible to see more than one development of a similar type on the skyline. In general, such developments in a case of the proposed OHL would be other overhead lines or wind farms.

During the time this ESIA was carried out, there were no other OHL and wind farm development applications in the wider region of the project area.

There is an existing 220kV OHL which serves as the dominant feature along much of the route. As a result the presence if this line acts as a mitigating feature in the landscape.

9.5 Summary of Visual Effects

The paragraphs below provide a description of the existing visual context for each of the viewpoint receptors identified in the Wind Farm ESIA followed by an explanation of the implications that the introduction of the OHL would have on the existing view and evaluation of the significance of the impact on the view.

**VP1: Small hill on southern edge of Tsogttsetsii looking towards the mountain**

Located to the west of the Project, this slightly elevated viewpoint lies to the south of the town of Tsogttsetsii. The wind farm Project is situated approximately 18.8 km to the south of the viewpoint with the OHL running to the east of this VP. The new towers are likely to be visible at this location however would not be visible in the foreground between the VP and Tsetsii Uul. The sensitivity of the viewpoint is considered to be Medium due to the existing view of Tsetsii Uul and the presence of an ovoo in this location signifying its use by the local population. The magnitude of change is considered to be Low during both construction and operation (there will be no construction traffic visible from this location and WTGs will be screened by near-ground landform). The impacts during both construction and operation are therefore assessed as Slight and not significant.

**VP2: Southern edge of Tavan Tolgoi**

This viewpoint is located on the southern boundary of Tavan Tolgoi which lies to the north of the Project at a distance of approximately 15.9 km. The views here are dominated by the presence of two large scale open cast coal mines. The surrounding landscape has been further degraded by planned and unplanned roads and associated erosion of surrounding soils.
Views to the proposed Project site from this VP will be dominated by the presence of two large spoil heaps from the mines in the middle ground and the presence of roads, eroded bare earth and scattered plant and machinery in the foreground. WTGs will be visible in a gap between two spoil heaps. If a VP is considered at the northern edge of the town looking towards the substation (a distance of 7 km) there is unlikely to be any visibility of the proposed OHL and even at closer distances the view would be dominated by the presence of the existing 220 kV lines.

The sensitivity of the viewpoint is considered to be Low and the magnitude of change is considered to be Negligible during both construction and operation. The impacts during both construction and operation are therefore assessed as Negligible and not significant.

**VP3: Mine worker accommodation**

This viewpoint is located at worker accommodation serving the nearby mines, to the west of the Project at a distance of approximately 3.7 km. This viewpoint is also deemed to be representative of individual gers which may be present on a seasonal basis throughout the wider area. From this location, the OHL would be visible however the view would be dominated by the presence of the 20 WTGs which would be visible above the undulating ground in the mid-ground. However, the slight elevation in the ground level would screen the majority of the lower sections of the WTGs. The sensitivity of the viewpoint is considered to be Medium to Low given its association with the nearby mines and the magnitude of change is considered to be Low during both construction and operation. The impacts of the OHL during both construction and operation are therefore assessed as Slight and not significant.

**VP4: Informal road (and railway under construction)**

This viewpoint is located on the informal road which lies to the east of the Project at a distance of approximately 7.7 km. It has been chosen to represent the worst case view from the road and also to provide a representative view from the railway currently under construction. From this location, the OHL would cross the road and rail line perpendicularly at a single point. The view here would be transient and limited to the point where the lines intersect. Further afield, the view would be screened at various points along the road as a result of the surrounding topography. The sensitivity of the viewpoint is considered to be Low and the magnitude of change is considered to be Low during both construction and operation. The impacts during both construction and operation are therefore assessed as Slight and not significant.
VP5: Tarmac (toll) road

This VP is situated in a slightly more elevated location compared to the Project site over undulating steppe to the north of the Project, approximately 5 km. It has been chosen to represent the worst case view from the road. Again the OHL would be visible in the mid-ground, against the backdrop of Tsetsii Uul and the wind farm. Other features of the Project would not be visible from this location. From this location, the OHL would cross the road and rail line perpendicularly at a single point. The view here would be transient and would be screened at various points along the road as a result of the surrounding topography. The road is mainly used by mine traffic to transport coal from the mine to China. The sensitivity of the viewpoint is considered to be Low and the magnitude of change is considered to be Low during both construction and operation. The impacts during all phases are therefore assessed as Slight and not significant.

9.6 Conclusions

Overall, no receptors or receptor groups have been identified as experiencing a significant impact. Impacts on all five receptors are assessed to be Low and not significant. This is primarily due to the lack of visibility of the OHL together with the fact that the OHL follows the existing 220 kV line for much of its length.
10 Social Impact Assessment

A detailed assessment of social impacts has been provided in the wind farm ESIA document and should be referred to in relation to the OHL.

It is recognised that the population of Tsogttsetsii soum will be impacted by the OHL project however only one temporary ger was noted within the OHL corridor (as of 24 February 2016). As a result any impact is likely to be indirect. Figure 1-2 attached to this ESIA illustrates the location of residential receptors in the vicinity of the OHL.

This section describes the potential impacts of the Project on socio-economic conditions. One of the key purposes of the Social Impact Assessment (SIA) is to protect the well-being of Project affected communities, and to identify any potential enhancements to socio-economic conditions.

Generally, the Project will have either negligible or minor direct and indirect social and economic effects on the local community and on nomadic herders living in proximity to the Project area. These effects will commence during construction and continue throughout the operating life of the Project. In the short term, benefits will include additional employment and expenditures associated with construction of the Project. The same types of benefits would accrue during operation. The Project may also result in some increased visitation to the Project area by tourists interested in wind power and sightseeing. All of these results could have a beneficial effect on businesses in populated areas. The overall socioeconomic impacts of Project construction and operation are discussed in detail below.

10.1 General Approach

The assessment has utilised the assessment methodology as outlined in Chapter 4 and 13.3 of the Tsetsii Wind Farm ESIA. Social impacts can include changes to people’s way of life, employment opportunities, community services and facilities, the community environment, culture, health and well-being and / or community or personal property rights. The SIA has considered the existing social conditions at and surrounding the Project site, and assessed the impact on these baseline conditions, both positive and negative, as a result of the implementation of the Project. Social impacts may occur at all stages of the Project from construction through operation.

10.2 Baseline

A desk top study was undertaken to gather baseline data. Data was collected from published sources to include websites, reports, government and non-government organisations and Project documentation for other development projects being implemented in the region. The ESIA also collected baseline data during the site visit of October 2014 including meetings with local stakeholders within the Project area.
This ESIA Addendum has reported the social impacts resulting from the construction and operation of the OHL where they differ from the impacts reported in the Tssetsii Wind Farm ESIA. In particular, this assessment provides an analysis of the possible impacts from the proposed OHL on the people within their societal setting.

A survey of key stakeholders was conducted and individual stakeholders interviewed in order to gather pertinent information. A combination of methodologies was applied:

- Review of available technical specifications related to the proposed OHL to predetermine potential societal impacts and to identify individuals and groups likely to be affected.
- Analysis of the relevant legislation.
- On-site observations of land use in proximity to the proposed OHL.
- Stakeholder engagement via consultation meetings with representatives of various stakeholder groups.

10.2.1 Local Attitudes

A number of consultation meetings with residents of the settlements in the project region was held during the DEIA process in 2014. The results of the surveys and consultations identified that 60% of surveyed residents would support the project with 40% fully encouraging the project implementation. 80% of total surveyed local communities were aged between 45 and 54 years old. The predominant occupations were either self-employed or herders.

In terms of the general benefits of the overall wind farm project, 80% of respondents expected the project to have an overall benefit. In addition, 90% of total respondents expect the wind farm to have the positive effects, with 60% expecting that the project will have a positive benefit on their own livelihoods. As a result we do not consider there to be a significant negative public attitude towards the wind farm and OHL.

10.2.2 Residential Survey 2016

A further survey was undertaken on April 9, 2016 by CEA and Sunny Trade based on a methodology and questionnaire provided by SgurrEnergy. The survey focused on residents living within 500m from the OHL corridor on 35km route from Tavan Tolgoi Substation to Tsogttsetsii Wind Farm. The survey consisted of interview, survey, and consultation included research. The locations were mapped using GPS location and photographs were taken as a record of the survey. Given the low density of residents in close proximity to the OHL the survey area was widened to include all current residents (Tsogttsetsii excluded) within approximately 15 km of the site.

A total of 13 households were identified in the vicinity of the wind farm and OHL. are summarised in
Table 10-1
### Table 10-1: Residents in proximity to OHL

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Distance from OHL</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Herder B. Munkhbayar, household of 2.</td>
<td>300 m</td>
<td>The family has recently moved to near the Tavan Tolgoi substation. They plan to spend the warmer spring-fall months in the area.</td>
</tr>
<tr>
<td>2</td>
<td>A race-horse ranch owned by Sh. Dayanbat, located 0.27km from the OHL route.</td>
<td>690 m</td>
<td>Ranch owner Dayanbat bought land in the area to raise horses and has hired Amartuvshin family to provide care for the horses.</td>
</tr>
<tr>
<td>3</td>
<td>M.Khuubaatar is 86 years old and has a household of 2.</td>
<td>3 km</td>
<td>The resident’s winter settlement was previously on the west side of the Tsogttsetsii Mountain, in an area called “Black Stoop”. Construction of paved road through their land, forced the residents to move to the current location (White Stoop) 5 years ago.</td>
</tr>
<tr>
<td>4</td>
<td>No name provided - Nomgon Soum,</td>
<td>1.1 km</td>
<td>Currently residing in Tsogttsetsii soum and uses the area for local livestock grazing.</td>
</tr>
<tr>
<td>5</td>
<td>N.Tsogtgerel</td>
<td>2.4 km</td>
<td>Household of 6 people. The family own many camels. Many of the camels have given birth to baby camel.</td>
</tr>
<tr>
<td>6</td>
<td>N Nyamjav, age 37, from Siirst 1st Group, household of 4, (Coordinates 430 36/52.5// 1050 37/11.0//)</td>
<td>320 m</td>
<td>This family use to live in the “Rock water” for over 30 years but relocated as a result of the construction Energy Resources LLC roads and waste management center. They have moved to the present Gan Gashuun area. They consider this winter shelter location as inferior to the previous location. The wife of the family lives with his child in the soum center where their child goes to school, while Nyamjav stays all year round to tend to his livestock.</td>
</tr>
<tr>
<td>No.</td>
<td>Name</td>
<td>Distance from OHL</td>
<td>Description</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------</td>
<td>-------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>7</td>
<td>Herder B. Shagaibaatar</td>
<td>3.8 km</td>
<td>Lives in Tsogttsetsii, with his household of 5.</td>
</tr>
<tr>
<td>8</td>
<td>Herder Erdentsogt</td>
<td>5.2 km</td>
<td>Lives in Siirt Baag with his household of 5, living 6.6km away from the OHL route. (coordinates 43°30'30&quot;/31°31.3'/105°38'38&quot;/26°7&quot;/)</td>
</tr>
<tr>
<td>9</td>
<td>Herder T. Munkhbat</td>
<td>15.5 km</td>
<td>Lives in household of 7 including his parents and children.</td>
</tr>
<tr>
<td>10</td>
<td>O. Tsengeljargal</td>
<td>15.5 km</td>
<td>Lives in Siirt Group by himself.</td>
</tr>
<tr>
<td>11</td>
<td>No name supplied</td>
<td>3.3 km</td>
<td>Works as a contract delivery driver for coal company.</td>
</tr>
<tr>
<td>12</td>
<td>Herder R. Baatar, household of 3.</td>
<td>10.5 km</td>
<td>Herder R. Baatar lives over 10 km from the OHL route. Both husband and wife are national honored medal herd-ers and both have expressed their support of the OHL.</td>
</tr>
<tr>
<td>13</td>
<td>B. Bayarmagnai, household of 5 members.</td>
<td>7.3 km</td>
<td>B. Bayarmagnai is the son of R. Baatar. Bayarmagnai has a young family and takes care of livestock and grazing area.</td>
</tr>
</tbody>
</table>

10.2.2.1 Survey Results

The survey results show that there is a fairly even spread in terms of the length of time the residents have lived in the area with three households recently arriving, two have been there less than 5 years and eight having been in the area for longer. Four of those households have lived in the area for over 20 years. Of those households nine are permanent and four are temporary.

The main reasons given for living in the area were livestock grazing (4 households) or having been born in the area (7 households). When asked about the reasons for selecting each particular location, seven households cited availability of grazing as the key consideration while four chose the area due to proximity of services.
Of the people interview, one was retired whilst the remainder were employed or self-employed. Eight households were herders however 10 households stated that their main source of income come from livestock.

When asked about the impacts of the proposed wind farm and OHL, seven households did not anticipate there to be any impact on their livelihoods with six being unsure.

For those involved in farming/herding the most important issues were deemed to be low rainfall (four households) with the remaining nine not reporting any particular issue.

When asked in general about the main issues facing residents two households had concerns about a lack of grazing land, four were concerned about poor quality land for farming/livestock, one was concerned about dust from the nearby mines and six had no issues. Two households noted limited access to electricity.

10.2.3 Land Use

It was noted that the land leased by Newcom LLC (lot number 4608007277) for the purpose of constructing and operating a wind farm had overlapped with areas designated under special local protection by Decree 8/6 dated 2003 of the Provincial Citizens’ Representatives’ Meeting. However in 2015, by Decree 9/12 of the Provincial Citizens’ Representatives’ Meeting it was agreed that the land in question was no longer under special local protection.

Southgobi Province (Umnugobi Aimag) Land Relations, Construction, and Urban Planning Department confirmed by letter dated 26 February 2016 (№61) that the above mentioned lot for the purpose of a wind farm is located in the area which is no longer under special local protection. This exclusion also includes the route of the OHL. Therefore there are no special restrictions placed on the land.

10.3 Assessment of Impacts

10.3.1 Demographics and economics

10.3.1.1 Population and Employment

The Project will have direct positive impacts on employment in Tsogttsetsii soum although impacts are not likely to be significant at the regional and national level. Given the low level of employment in the area, the creation of a well-paid, high quality jobs will be a positive outcome of the Project. However, so that local people can benefit from these new job opportunities – especially long term operations jobs– investments in training will be required.

The anticipated employment related impacts are as follows:

• Temporary construction jobs during the first two years of the Project.
• Long Term high quality jobs created for the life of Project.
- Indirect job creation from service and supply jobs to meet demands from resident workforce.
- Potential to fail to meet community expectations for job creation due to a) lack of suitability of local candidates, especially during construction and b) during the transition from construction to operations.

Construction will employ up to 57 workers for the OHL although this number would be sourced from the overall Wind Farm construction workforce of 350 and would not represent an addition to that number. There will be a number of experienced foreign technicians and engineers however local labour will be utilised as so far as possible. All workers would live in a temporary construction workers camp, likely to consist of traditional gers on the main Wind Farm Project site (see Figure 2-3 of the Wind Farm ESIA). The worst-case impact would be an increase of <1% compared to the current population in the soum. As a result, there would be minimal change in overall population or housing demand and the impact is assessed to be minor. The increased employment opportunities are likely to be minor beneficial and temporary.

A possible indirect impact of this increased employment is of an additional influx population moving to Tsogttsetsi soum to seek jobs related to the Project. Based on past experiences and evidence from ADB\textsuperscript{12}, it is likely that there will be one influx job seeker for every permanent, non-rotational, job created by the Project. However there are no permanent job opportunities as a result of the OHL once it is operational therefore we do not anticipate any significant influx populations.

*Construction Camps*

Unsafe and non-compliant (with international norms) worker accommodation has potential negative impacts. This could include worker illness or death from unsafe or unsanitary living conditions, as well as disruptions in Project schedule as a result of incidents (riots, security breaches, etc.) at the camps. There will not be a separate camp for the OHL personnel and all will be based at the main Tsetsii construction camp. This will be designed and managed to meet the requirements set out by IFC and EBRD\textsuperscript{13}.

10.3.1.2 Economic Impact

During construction, the 57 construction employees will be paid an average of about US$5,000 to $10,000 per annum. The total effect on the local economy will be minor beneficial. CEA will pay at least an average wage, and likely somewhat higher. During the operational phase the OHL Project is not likely to provide any full-time employment.

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\textsuperscript{12} Asian Development Bank (2009)
\textsuperscript{13} IFC and EBRD (2009)
10.3.1.3 Land Use and Land Acquisition

In keeping with the vast majority of land in Mongolia, the project area is state-owned and used for nomadic herding. The route of the OHL falls within this land ownership model. Land acquisition (temporary and permanent) has been conducted in accordance with the relevant Mongolian legislation and EBRD requirements, specifically – EBRD's PR 5: Land Acquisition, Involuntary Resettlement and Economic Displacement. It should be noted that no land leases will result in voluntary or involuntary displacement. As a result we do not anticipate a requirement develop a land acquisition and compensation framework and plan.

If land acquisition causes economic displacement of people, as defined by EBRD’s PR 5, appropriate measures to assist with restoration of livelihoods and standards of living will be included in the land acquisition framework and plan. The key guiding factor will be to ensure that no person should emerge from the project process less well-off economically than at its beginning. The basic principle of PR5 is that land-based compensation or compensation in-kind is preferred over cash compensation, where feasible.

Following on from the above considerations in terms of the land acquisition process, it should be noted that no permanent residential properties are located within the OHL corridor. The closest properties are those located on the eastern edge of Tsogttsetsii, a distance of 1.3km from the OHL. However, three season properties were noted (during April 2016 visit) at a distance of 300 – 450 m from the proposed OHL route.

It should be noted that there is no private ownership of grazing lands in Mongolia. Limited private land ownership (0.07 ha) does occur in soum centres, where households can fence an area of permanent habitation. However, the vast majority of land is state-owned and used for nomadic herding. As such, in Umnogobi, the main economic assets that form the baseline for displacement are:

- Access to grazing lands.
- Ownership of permanent winter corrals.

In terms of access to grazing lands, there are regional and seasonal variations in how far herders travel on a daily basis to graze their herds. More herder movement occurs during summer months than during autumn, winter or spring. Based on distances travelled by herders and livestock, it is possible to establish the baseline conditions against which any displacement can be calculated. Because local peoples in the Project area of influence are largely nomadic, they would still be considered affected stakeholders even if they were situated distances greater than five kilometres.
However, increased dust in the air as a result of construction works and mining operations has been cited as a significant issue preventing livestock from grazing nearby. Therefore indirect impacts may be felt outwith the immediate Project area. It has been suggested that some herders are left with little other choice than to move to other areas.14

The construction of the railway linking Erdenes Resource’s Ukhaa Khudag mine and the Gashuun Sukhait customs zone is also cited as an additional factor limiting access to traditional grazing lands. Herders have raised concerns that the railway will restrict livestock grazing and should be constructed so that it circumvents traditional routes they use for their pastureland. There is the potential for the Project to form an additional barrier restricting access in a west to east direction.

To minimise economic displacement, the Project will not be fenced off allowing free movement. The construction camp site will be located only within the Wind Farm site and be serviced by the existing roads which will require to be upgraded. Project workers will be prohibited from driving off designated access tracks, reducing damage to pasture land.

Whilst it will be inevitable that construction works will cause some interruption to herder’s free movement across the Site area the conditions, particularly in the north west part of the route along the existing OHL corridor is currently degraded and offers poorer grazing potential. This, coupled with the fact that only 0.15% of the leased land area will be disturbed, should ensure that the impacts on local herders is assessed as Negligible. Further consideration of impacts of dust and air quality has been provided in Section 6.1 above.

10.3.1.4 Public perception

Due to the high profile this Project has achieved, it may be prestigious for Tsogttsetsii soum. As a result, it may help the soum in attracting additional funding and investments in local infrastructure and business development. In addition, it has been suggested that local residents may have a sense of pride in the presence of the overall Wind Farm Project which would include the OHL. If this were to be the case the overall effect would be Minor beneficial.

10.3.1.5 Social cohesion

There is a potential for conflicts between local herders and construction workers living at the construction camp, and a lesser potential for workers during operation. These could include such things as disputes over road accidents involving livestock, animal theft, threats to herders’ livestock (e.g., by guard dog), or noise and light from the

14 Batzaya (2014)
construction camp. Minor adverse impacts are predicted. These effects are likely to be short to medium term during construction and have been fully considered as part of the Wind Farm ESIA. Establishing clear rules for worker behaviour will avoid these issues.

10.3.2 Exposure to Electric and Magnetic Fields

Electric and magnetic fields (often referred to as EMFs) and the electromagnetic forces they represent are an essential part of the physical world. Their sources are the charged fundamental particles of matter (principally electrons and protons). Electric fields are measured in volts per meter (V/m) or kilovolts per meter (kV/m). Magnetic fields are measured in microteslas (μT) or nanoteslas (nT). The amplitude of the electric field modulation depends on the voltage of the OHL equipment, which remains more or less constant as long as the OHL equipment is under operation. The strength of the magnetic field modulation depends on the electrical current (the load) carried by the OHL equipment, which varies according to the demand for power at any given time.

A person standing in the electric field beneath an OHL would have an alternating surface charge induced on his or her body and an associated alternating current induced within the body. Over the past 20 years it has been suggested that exposure to power-frequency magnetic or electric fields of the magnitude encountered in the environment could be linked with various health problems, ranging from headaches to Alzheimer’s disease.

The most persistent of these suggestions relates to childhood cancers. A number of epidemiological studies have suggested an association between the incidence of childhood cancers and the proximity of homes to power transmission wires. However, no causal link has been established between cancer or any other disease and EMF and indeed there is no established mechanism by which these fields could cause or promote the disease.

In 1998, based on available information, the International Commission on Non-Ionizing Radiation Protection (ICNIRP) issued recommendations for low frequency fields exposure limits, listed in the "Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz)". ICNIRP recommendations are applicable both to the long-term exposure of the general public and the short-term exposure at the industrial sites. The exposure limits established in the recommendations are widely accepted all over the world. They were adopted in:

(i) the Recommendation of EU Council 1999/519/EC of 12 July 1999 Limiting the Public Exposure to Electromagnetic Fields (0 Hz to 300 GHz), and

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11) This document could be found at [www.icnirp.org](http://www.icnirp.org)

**Table 10-2: Limit values for exposure to electric and magnetic fields (ICNPR / EU), 1998**

<table>
<thead>
<tr>
<th>Exposure of public</th>
<th>Industrial exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric field</td>
<td>Magnetic field</td>
</tr>
<tr>
<td>5 kV/m</td>
<td>100 μT</td>
</tr>
<tr>
<td>Electric field</td>
<td>Magnetic field</td>
</tr>
<tr>
<td>10 kV/m</td>
<td>500 μT</td>
</tr>
</tbody>
</table>

In 2010, the ICNIRP issued a new guideline for Limiting Exposure to Time-Varying Electric and Magnetic Fields (from 1 to 100 KHz). The reference exposure levels of this new guideline are given in the table below. These limit values have not yet been adopted by the EC.

**Table 10-3: Limit values for exposure to electric and magnetic fields (ICNPR), 2010**

<table>
<thead>
<tr>
<th>Exposure of public</th>
<th>Industrial exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric field</td>
<td>Magnetic field</td>
</tr>
<tr>
<td>5 kV/m</td>
<td>200 μT</td>
</tr>
<tr>
<td>Electric field</td>
<td>Magnetic field</td>
</tr>
<tr>
<td>10 kV/m</td>
<td>1000 μT</td>
</tr>
</tbody>
</table>

10.3.2.1 Calculations of Magnitudes of Electric and Magnetic Fields

It is noted that no permanent properties are present within 1.3 km of the OHL and at these distances no impacts are predicted. There is one temporary ger located approximately 30 m from the proposed route and at this distance the calculated magnetic field is likely to be 0.28 μT\(^{16}\), well below the 100 μT exposure limit value with a safety factor of 10 applied.

10.3.2.2 Potential Impacts from Electric and Magnetic Fields

In terms of the potential impacts on human health from an operating OHL, based on the above calculated fields magnitudes, the intensity of an electric field is considered

as more dominant parameter than the intensity of a magnetic field.

In a case of the single circuit 110 kV OHL, the calculated EMF intensities are below limit values for exposure determined by the ICNIRP and EU regulations even at the location below the conductors. The attenuation of the EMF intensity with the distance from the OHL central axis is a very intensive phenomenon and outside of the 40 m wide OHL corridor, the health risk of human exposure to EMF is insignificant.

The planned protection zone for the proposed OHLs is 40 m wide. No residential or other developments would be allowed within the OHL protection zone. This, and the fact that the proposed OHL route does not pass close to permanent residential properties, result in EMF impacts which are insignificant on the general population.

10.3.3 Labour and Working Conditions

Occupational health and safety is a cross-disciplinary area concerned with the protection of the safety, health and welfare of people engaged in work or employment.

The goal of all occupational health and safety programs is to foster a safe work environment. As a secondary effect, it may also protect co-workers, family members, employers, customers, suppliers, nearby communities, and other members of the public who are impacted by the workplace environment.

It may involve interactions across many subject areas, including occupational medicine, occupational (or industrial) hygiene, public health, safety engineering, air quality, noise and other aspects.

Protection of employees is recognised as a key priority in the construction and operation of the proposed OHL and associated substations. Measures need to be outlined in terms of the protection of employees during the construction and operation of the project including: only qualified personnel undertaking tasks relevant to their duties, provision of suitable personal protection equipment, no activities to be undertaken in adverse weather conditions, provision of sanitary services and welfare amenities on site, and risk assessments and identification. These measures, together with the commitment to comply with Mongolian health and safety laws will provide the foundation on which the welfare of employees and workers health and safety would be based.

Working conditions and work camps will be set in compliance with relevant labour legislation. All contractors will be responsible for Occupational Health and Safety Plan(s) which provide workers with a safe and healthy work environment. CEA will review and approve these plans and will be responsible for overseeing contractor performance. All workers will be trained in proper safety rules and procedures.
The accommodation for workers shall be provided in a centralised facility at the Wind Farm site and will be clean, safe and, at a minimum, meet the basic needs of workers. In particular, the provision of accommodation shall meet national legislation and international good practice in relation, but not restricted, to the following: provision of minimum amounts of space for each worker; provision of sanitary, laundry and cooking facilities and potable water; provision of fire safety and safety from or other hazards; provision of first aid and medical facilities; and heating and ventilation.

10.3.4 Community Health, Safety and Security

10.3.4.1 Construction stage

The construction activities will bring limited changes to the way of life of local residents. Formerly free and unlimited movement of people on the roads and localities around the proposed OHL should be restricted due to the presence of trucks and machinery on the local roads. The same applies for livestock since they can also become a traffic-safety problem. During the construction period, local residents and property users may be forced to use specific roads.

Another important issue related to community safety is the distinction of construction sites from the local environment. This is a safety issue which needs to be carefully considered. Unauthorized approaches to the core construction sites by local people can cause serious consequences to the individuals concerned.

During the construction phase, there is minor or no opportunity for workers to suffer from certain infectious disease. Potential public health impacts from various disease vectors species are, at this point not considered to be a major factor affecting the implementation of the project.

The EPC Contractor will be obliged to develop and implement procedures to protect public health and safety. This will include an introduction of rules for workers and site security to prevent unauthorized access to active construction sites, workers camps, transport vehicles, construction machinery and equipment storage areas. The EPC Contractor will be required to prepare emergency response plans in order to respond to accidental and emergency situations in a manner appropriate to the construction risks. This plan will be based on the prior identification of major accident hazards, and will include measures necessary to prevent major accidents and to limit their consequences for local communities.

Transport safety practices will be adopted and implemented according to a Transport Management Plan in order to prevent eventual traffic incidents and nuisance impacts to local people.
10.3.4.2 Operational Stage

During the operational phase, the proposed OHL and associated substations will release electrical and magnetic fields and operational noise, which may be considered as a community health risk. During the operational phase the OHL will not release polluting and harmful substances in the environmental media (air, water and soil) and will not generate significant quantities of waste. In that respect the proposed project will not create environmental conditions which may lead to the deterioration of the health situation in the project area.

10.4 Mitigation and Enhancement Measures

A full suite of mitigation measures have been provided as part of the Wind Farm ESIA and those mitigation measures will be applied to the construction and operation of the OHL. These are summarise below.

Mitigation measures to reduce the potential impacts of community disappointment regarding availability of jobs include:

- Communicate employment estimates, timeframes and skills requirements clearly to the community on a continuous basis.
- Invest in skills training to enable greater employment of local population throughout Project life, for both construction and operations phases, to start as early as possible ensuring maximum employment during construction.
- Implement a local hiring plan in consultation with the community and in a way that meets long term operational needs of the Project as well as the short term construction needs, taking into account the relatively low skill base of the local population when it comes to wind power related jobs.

Enhancement measures to expand the positive, long-term, impacts of Project employment:

- Investigate local sourcing and procurement opportunities to promote sustainable small business development.
- Invest in capacity building for small businesses to enable them to meet standards for procurement required by the company and to service the needs of influx populations and indirect employees (through service industries).
- Work with local vocational training schools to develop curricula which will qualify local students to better meet the needs to the developing wind industry locally.

To mitigate the potential economic and physical displacement impacts from the Project, the following measures will be implemented:

- Physical displacement will not be required in order to develop the Project.
- Economic displacement will be compensated in accordance with internationally recognised standards.
• Further hydro-geological studies will be conducted to understand the extent of water availability in the affected area and associated economic displacement as a result of impacts to herder wells.

• Consultation activities will be conducted with local herders to disclose Project water use, address herder concerns and ensure that there is no net loss in water availability as a result of the Project;
  – Based on data from future hydro-geological studies, specific mitigations may include: (1) constructing new wells, (2) improving existing wells to reach greater depths, and (3) restricting Project access to herder wells.

• Designate and monitor travel routes of construction vehicles and maintain water availability to herders so as to minimise pasture degradation and ultimate reduction in herder livelihoods and continue working with local traffic police to manage and monitor transport activities, routes and road conditions.

• Construction activities will be conducted in such a way as to minimise the effects on physical and economic displacement wherever possible, for instance in implementing dust and noise mitigation measures, to reduce the impact on local herders.

• Reclamation of the land will be conducted to backfill and restore native vegetation.

• Provide detailed and regular information to local community members about Project activity to mitigate community concerns as a result of misinformation.

In addition, CEA is committed to providing economic benefits as part of the overall wind farm project to those who may be indirectly impacted by Project activities, and as such commits to the following enhancement measures:

• Continued investments in social infrastructure, made in conjunction with local government efforts and based on community consultation, implemented in a way that does not seek to supplant the role of the government as the primary social services provider.

• Provision of funding to allow local residents to access further education and hence gain employment in the developing wind energy sector. It is proposed that up to 3 scholarships will be funded per year by CEA.

• Development of improved wells and water access for herders in areas near to, but not directly impacted by, the Project.

• Use local procurement, where possible, to enhance herder livelihoods.
11 Construction Traffic and Transport

11.1.1 Introduction
This Chapter describes the likely effects of the OHL including a description of the access routes and the likely extent of highway works along the route, and presents the assessment of the significance of these effects. Where required, appropriate mitigation measures are outlined and any resultant residual effects assessed.

This chapter should be read in conjunction with Chapter 2 (Description of the Project).

11.2 Assessment Methodology
The assessment is based on the use of a number of different types of vehicles used during the construction and operation of the Project. These include:

- Light Goods Vehicles (LGVs) – contractors' vans, minibuses, private cars etc.
- Heavy Goods Vehicles (HGVs) – vehicles with a maximum rigid length of 12m and a maximum articulated length of 16.5 m.
- Abnormal loads – vehicles over 25 m in length or 3.6 m wide.

11.2.1 Guidance
The assessment has been carried out using the IEMA “Guidelines for the Environmental Assessment of Road Traffic 2003”. The guidelines suggest the following thresholds are adopted to assess whether particular links of the network are to be subject to assessment:

- Rule 1 – Include highway links where traffic flows will increase by more than 30% (or number of HGVs increasing by more than 30%).
- Rule 2 – Include any other specifically sensitive areas where traffic flows will increase by 10% or more.

11.2.2 Baseline Data Collection

11.2.2.1 Desktop Study
A desktop review has been undertaken to identify any key issues with regard to access.

HGV traffic count data, sourced from studies associated with the Ukhaa Khudag mine project, has been used to assess the potential impact of the OHL on the paved road proposed to be utilised to transport materials to the site. No traffic data has been sourced for roads between the site and Ulaanbaatar.
11.2.3 Assessment of Effects

The following sections set out the methodology which has been used to determine if the increased traffic flows during construction of the OHL are likely to be significant.

11.2.3.1 Sensitivity Criteria

The sensitivity of roads, their users and settlements along the proposed route has been assessed in accordance with the criteria set out in Table 11-1. The IEMA guidance details that sensitive locations are defined as receptors that are sensitive to traffic including amenities such as hospitals, places of worship, schools and historic buildings.

Table 11-1: Sensitivity Criteria

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Large rural settlement containing numerous amenities. Traffic management measures in place such as controlled crossings, signalled junctions etc. Minor / unclassified unpaved roads with low traffic flow volumes. These may not be suitable for large HGV vehicles.</td>
</tr>
<tr>
<td>Medium</td>
<td>Rural settlement with a number of amenities. Minor traffic management measures in place. Local road (paved / unpaved) suitable for HGV traffic / abnormal loads.</td>
</tr>
<tr>
<td>Low</td>
<td>Small rural settlement with few local amenities. Minimal traffic management measures in place. Paved road capable of large volumes of HGV traffic / abnormal loads.</td>
</tr>
<tr>
<td>Negligible</td>
<td>Scattered dwellings with no local amenities. No / little traffic management in place. Highway suitable for all types of vehicles and volumes.</td>
</tr>
</tbody>
</table>
Table 11-2 sets out the level of sensitivity of the different sections of roads along the proposed route considering the type of road, current traffic volumes and the presence of any sensitive receptors.
Table 11-2: Sensitivity Analysis

<table>
<thead>
<tr>
<th>Road</th>
<th>Receptor Details</th>
<th>Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road from Ukhaa Khudag mine to Gashuun Sukhait.</td>
<td>Paved road with medium daily traffic flows. HGVs make up around 80% of total traffic flow. Passes by a number of settlements and scattered dwellings.</td>
<td>Medium / Low</td>
</tr>
<tr>
<td>Track to Project site compound (currently unpaved)</td>
<td>Unpaved road with low daily traffic flows. Few dwellings along the route.</td>
<td>Low / Negligible</td>
</tr>
</tbody>
</table>

11.2.3.2 Magnitude of Change Criteria

The magnitude of impact on traffic flow is determined based on criteria set out in the IEMA guidelines. This is set out within Table 11-3 below.

Table 11-3: Magnitude of Change Criteria

<table>
<thead>
<tr>
<th>Magnitude of Change</th>
<th>Increase in Traffic Flow</th>
<th>Increase in HGVs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>Above 90%</td>
<td>Above 90%</td>
</tr>
<tr>
<td>Medium</td>
<td>Between 60% and 90%</td>
<td>Between 60% and 90%</td>
</tr>
<tr>
<td>Small</td>
<td>Between 30% and 60%</td>
<td>Between 30% and 60%</td>
</tr>
<tr>
<td>Negligible</td>
<td>Under 30%</td>
<td>Under 30%</td>
</tr>
</tbody>
</table>

11.2.3.3 Assessing Level of Effect

Using these definitions, a combined assessment of sensitivity and magnitude has been made to determine the level of the predicted effect on a receptor i.e. Negligible, Minor, Moderate or Major. All direct and indirect impacts causing Moderate or Major effects, as identified within Table 11-4, are considered to be significant in terms of the EIA Regulations.
Table 11-4: Matrix for Assessing Level of Effect

<table>
<thead>
<tr>
<th>Magnitude of Change</th>
<th>Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Negligible</td>
</tr>
<tr>
<td>Negligible</td>
<td>Negligible</td>
</tr>
<tr>
<td>Small</td>
<td>Negligible</td>
</tr>
<tr>
<td>Medium</td>
<td>Negligible</td>
</tr>
<tr>
<td>Large</td>
<td>Negligible</td>
</tr>
</tbody>
</table>

Where existing traffic levels are exceptionally low (e.g. on some unclassified / unpaved roads), any increase in traffic level is likely to result in a predicted increase in traffic levels which may exceed thresholds. It is important therefore to also consider the available road capacity.

The paved road from the Ukhaa Khudag mine to Gashuun Sukhait on the China-Mongolia border has daily capacity of 2,000 HGVs\(^{17}\).

Where the identified thresholds above are exceeded, the IEMA guidance sets out a list of effects which should be assessed. This includes:

- Accidents and safety.
- Driver delay.
- Pedestrian amenity.
- Severance.
- Air pollution.
- Dust and dirt.
- Ecological effects.
- Hazardous loads.
- Heritage and conservation.
- Noise.
- Pedestrian delay.
- Vibrations.
- Visual effects.

A number of these effects are covered elsewhere in the ESIA and so those considered within this chapter include:

---

- Accidents and safety.
- Severance.
- Driver delay.
- Pedestrian amenity.
- Pedestrian delay.

Accidents and safety

IEMA guidelines do not recommend the use of thresholds for identifying significance of impacts due to numerous local causation factors involved in personal injury accidents. However, it is recognised that a significant increase in overall traffic volumes and abnormal loads may raise concerns over road safety. Therefore measures to address road safety concerns will form a key part of the assessment methodology and development of mitigation options.

Driver delay

Driver delay occurs due to additional traffic present on the road network. IEMA guidelines note that additional delays are only likely to be significant if the traffic on the network is already at, or close to, capacity. Key areas where delays may occur include:

- At the site entrance due to turning of vehicles.
- On the highway passing the site.
- At key intersections along the highway.
- At junctions where the ability to find gaps in the traffic may be reduced, thereby lengthening delays.

Pedestrian amenity

This is broadly defined as the relative pleasantness of a journey and is considered to be affected by traffic flow, traffic composition and pavement width / separation from traffic. IEMA guidelines state that this may be significant where traffic is either halved or doubled.

Severance

IEMA guidelines state that severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery. The term is used to describe a complex series of factors that separate people from places and other people. Severance can also result from difficulty in crossing a heavily trafficked road. The guidance indicates that severance effects are considered ‘slight’ in cases that include:

- Pedestrian at-grade crossings on new roads carrying below 8,000 vehicles per day (AADT) (DoT, June 1993); or
- Changes of traffic flow of less than 30% (IEMA, March 1993).
Pedestrian delay

Changes in the volume and composition or speed of traffic on the road network may affect the ability of people to cross roads. In general, increasing traffic volumes will lead to an increase in pedestrian delay. Thresholds are not recommended for use to identify significance of potential effects due to the range of local factors and conditions which can affect delay.

11.3 Assumptions

It is assumed for the purposes of this assessment (and forecasted levels of traffic) that construction will commence in 2016. Should this not be the case, it is unlikely that the change in forecasted levels of traffic will be of such a level as to change the assessment outcomes.

All traffic associated with the OHL is assumed to follow the transportation route to the wind farm site. The wind farm compound area will be utilised for storage of equipment during the seven month construction period.

11.4 Baseline Conditions

11.4.1 Transportation of Components by Road

Road travel in Mongolia is often difficult and hazardous. The Mongolian highway system is a series of poorly maintained roads whilst off-highway access roads are little more than tracks and in most cases, dirt roads. The weather in the winter can drop temperatures to greater than -40°C and trucks can encounter icy roads, snow build-up and snow storms. Travel is long-distance and remote with very little traffic in remote areas.

In general, HGVs or heavy tractors will be utilised to transport towers to site. Use of existing access roads to tower location will be preferred.

Tower sub-structures (segments of the steel lattice) will be pre-assembled at the main site compound located at Tssetsii Wind Farm and transported in pieces to the lay-down areas. These segments will be then assembled on site to construct final tower structure. For locations with difficult access, pre-assembled pieces will be smaller and accordingly number of pieces will be bigger. The tower assembly and lay-down areas will be organised for each 3-5 km long subsection (11-12 towers on average), which results in around 10-17 temporary lay-down areas in total. The area for each lay-down area will be around 100 x 40 m and will be located within the leased corridor. They will be guarded, but not fenced.
11.4.1.1 Transport Route

A new 245 km hard-surface road parallel to the existing coal transport gravel road from Ukhaa Khudag to the Gashuun Sukhait border crossing has been completed and has been operational since October 2011. The road from the border to site handles trucks with load capacities of up to 100 tons.

Energy Resources LLC, the mine operator, transports coal daily along the road in up to 500 HGVs. Along with other mine operators, the number of HGVs along the route can reach 1,300 daily. The road has been designed with a capacity of up to 2,000 HGVs per day.

As the road route is state owned it will be necessary to gain approval from the road owner for use and make any attachments such as a spur road to access the wind farm site.

It is recommended that discussions are held with border authorities to gain advance approval for the shipment of components in order to reduce delay risk at the time of the transport of towers.

When on site, all drivers will be advised of site rules in relation to speed limits, traffic flow, restricted entry areas, parking areas and road hazards through a site-specific induction. All drivers will also be required to adhere to the site safety plan and follow any instructions from the management team.

11.4.1.2 Access Roads

Roads will be maintained to an acceptable standard. The sign-posting of roads will be consistent with the use of the road, the type of vehicle using the thoroughfare and the hazards and dangers associated with the proper and safe flow of traffic. Speed limits will also be displayed.

Roads utilized by pedestrians during hours of darkness will be adequately illuminated and equipment near roads will be protected from damage by vehicles.

11.5 Assessment of Effects

11.5.1 Construction Phase

11.5.1.1 Traffic Generation

The construction period for the Project is proposed to be over seven months. Activities to be undertaken with the sub-phases of construction, the total number of HGV / abnormal loads associated with the activities and predicted traffic generation are detailed in Table 11.5 below. Each delivery consists of two movements, into and out of the site.

Estimates of traffic generation during the construction phase have been developed based on estimates of the quantities of material and equipment required and previous experience of other OHL developments.

Table 11.5: Summary of Traffic during Construction

<table>
<thead>
<tr>
<th>Activity</th>
<th>Vehicle Type</th>
<th>Total Trips (Two Way)</th>
<th>Total Trips (One Way)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delivery of concrete</td>
<td>Road lorry</td>
<td>113</td>
<td>226</td>
</tr>
<tr>
<td>Delivery of towers.</td>
<td>Articulated HGV</td>
<td>565</td>
<td>1,130</td>
</tr>
<tr>
<td>Delivery of equipment and materials.</td>
<td>Articulated HGV</td>
<td>226</td>
<td>452</td>
</tr>
<tr>
<td>Delivery of crane.</td>
<td>Mobile crane and articulated HGV</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Delivery of electrical equipment.</td>
<td>Articulated HGV</td>
<td>226</td>
<td>452</td>
</tr>
<tr>
<td>Miscellaneous construction vehicles.</td>
<td>Various</td>
<td>55</td>
<td>110</td>
</tr>
<tr>
<td>Construction workers.</td>
<td>Various light vehicles</td>
<td>57</td>
<td>114</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>1,243</td>
<td>2,486</td>
</tr>
</tbody>
</table>

In total, a maximum of 57 workers will be involved in the construction of the OHL. It has been assumed that there will be a car occupancy rate of 1.2 people per light vehicle, however the figure may be reduced if minibuses are used to transport workers from the compound to site.

The number of vehicles associated with journeys by construction workers is likely to be relatively low due to accommodation provided on site for the duration of the Project’s construction programme. It is envisaged therefore that minibuses will be provided for workers to transport employees to and from the site as required.
Table 11.6: Trips per Month during the Construction Period

<table>
<thead>
<tr>
<th>Activity</th>
<th>Vehicle Type</th>
<th>Construction Month</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Delivery of concrete for bases</td>
<td>HGV</td>
<td>34</td>
</tr>
<tr>
<td>Delivery of towers</td>
<td>HGV</td>
<td>162</td>
</tr>
<tr>
<td>Delivery of equipment and materials</td>
<td>HGV</td>
<td>65</td>
</tr>
<tr>
<td>Delivery of crane / removal</td>
<td>HGV</td>
<td>1</td>
</tr>
<tr>
<td>Delivery of electrical equipment</td>
<td>HGV</td>
<td>65</td>
</tr>
<tr>
<td>Miscellaneous construction vehicles</td>
<td>HGV</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>LGV</td>
<td>8</td>
</tr>
<tr>
<td>Construction staff</td>
<td>Minibus, 4x4, car</td>
<td>16</td>
</tr>
<tr>
<td>Delivery of concrete for bases</td>
<td>HGV</td>
<td>34</td>
</tr>
<tr>
<td>TOTAL</td>
<td>HGV</td>
<td>335</td>
</tr>
<tr>
<td></td>
<td>LGV</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Minibus, 4x4, car</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>ALL</td>
<td>359</td>
</tr>
</tbody>
</table>

Table 11.6 illustrates the monthly traffic volumes over the seven month construction period. The figures show a slight peak in traffic at the start of the construction period however, in general, the traffic volumes generated by the OHL construction will be relatively consistent over the seven months.

Table 11.7 sets out the daily average traffic movements per month based on an average of 4.5 weeks per month and an average of five working days per week (rounded down to 22 days per month).

On average 20 vehicle movements per day is predicted to be generated on each working day (10 in and 10 out). It should be noted that the direction of traffic movements is dependent upon the source of the construction materials.
Table 11.7: Daily Average Movements per Construction Month

<table>
<thead>
<tr>
<th>Details</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HGVs</strong></td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td><strong>LGV</strong></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td><strong>Minibus, 4x4, Car</strong></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>19</td>
</tr>
</tbody>
</table>

11.5.1.2 Effects on the road network

Table 11.8 shows the predicted impact of HGVs on the proposed route at the monitored locations as a result of the Project.

Table 11.8: Predicted “Worst-Case” Percentage Impact

<table>
<thead>
<tr>
<th>Site</th>
<th>Location</th>
<th>Base HGVs</th>
<th>Construction HGVs</th>
<th>All Construction Traffic</th>
<th>% Impact from HGVs</th>
<th>% Impact of all Construction Traffic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Paved road from Ukhaa Khudag to Gashuun Sukhait.</td>
<td>1,300&lt;sup&gt;19&lt;/sup&gt;</td>
<td>15</td>
<td>20</td>
<td>1.15</td>
<td>1.54</td>
</tr>
</tbody>
</table>

As can be seen in Table 11.8, the impact of the Project HGV traffic during construction on the existing road is only 1.15% and considering all construction traffic this rises to 1.54%.

Considering the Medium to Low sensitivity of the road and Negligible magnitude of change, the overall level of effect is predicted to be Negligible. It should be noted that only HGV daily traffic statistics were available for the paved road and therefore it was not possible to assess the potential impact against the total daily traffic flow on the road.

11.5.1.3 Road works

No significant works are anticipated along the route to permit passage of exceptional load HGVs.

Damage to road edges and general ‘wear and tear’ of the road may occur through increased HGV movements. It is difficult to identify the extent to which this may occur however, it is likely that, at worst, there would be an impact of Moderate significance, pre-mitigation. The route is currently used by HGV traffic to the mine and is considered to be of an adequate condition to withstand the predicted construction HGV movements.

11.5.2 Operational Phase

The main transport impacts will occur during the construction phase. Once operating, the proposed project will be monitored and controlled in accordance to the technical requirements for the operation and maintenance of OHLs and substations.

The number of vehicles during operation is likely to be very low, with access required only for maintenance and servicing. The majority of these will be light vehicles with HGVs only required if components need replacing. The effects of traffic movements stemming from the operational phase are therefore considered negligible and so insignificant.

11.5.3 Decommissioning Phase

Decommissioning effects are likely to be similar to that during construction although reduced in magnitude. At this stage it is not possible to quantify the traffic effect during decommissioning of the Project as it is considered to be too far in the future to estimate any baseline traffic flows.

Prior to decommissioning, procedures will be agreed with relevant stakeholders for traffic management during this phase.

11.6 Further Work

During the next stage of the project development, the transportation route needs to be finalised and the route agreed with relevant authorities.

This information would be used in the development of the traffic and transport management plan which would ensure that appropriate traffic management and mitigation measures are employed on the principal access routes, and to minimize impacts on any communities affected by such traffic.

11.7 Mitigation

Transportation of towers is advised during April to June and August to September, in order to avoid wind, rain, snow and ice.
It is recommended that the efficiency of deliveries of construction materials to the site is closely monitored and if necessary sufficient storage provision is made available on site to prevent any delays to the construction process.

A Logistics Management Plan will be developed which will reduce risks to drivers and components being transported.

11.8 Residual Effects and Conclusions

The effect of the Project's construction HGV traffic on the existing road will be minimal at 1.54%. Considering all construction traffic, the impact would be Negligible. Effects would be short term, limited to the duration of the works in each location, and would be controlled through traffic management measures where appropriate.

Overall, the assessment concludes that there will be no residual effects associated with transportation of towers, materials and equipment during the construction and operation of the OHL.
12 Summary of Impacts

12.1 Introduction

This chapter provides a complete schedule of potential social and environmental impacts resulting from the Project. Table 12-1 provides a summary of impacts during construction and operation in the absence of mitigation (detailed in Chapter 15 (Environmental Management)). An overall constraints map has been provided in Volume 2, Figure 14.1. Note that the table below is not an exhaustive list of all impacts and mitigation measures. For this, each individual chapter of the ESIA should be consulted.
### Table 12-1: Summary of Impacts and Mitigation

<table>
<thead>
<tr>
<th>Environmental Receptor</th>
<th>Predicted Impact</th>
<th>Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Landscape and Visual Impact</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impacts on landscape character and visual amenity during construction</td>
<td>The main impacts on landscape character result from the excavation and construction of temporary works, construction compounds, access road and on-site roads, OHL tower footprint. New machinery and equipment will be introduced into the landscape, including a crane, trucks (usually 20-tonne trucks, but sometimes larger), excavators, bulldozers, and other heavy equipment. In addition, there will be temporary accommodation and storage areas. The impacts will be temporary and short term.</td>
<td>Limiting damage to any grassland by keeping the construction areas and roads to a minimum, and maintaining strict requirements for vehicles to remain on the roads at all times. Reinstating grassland where construction areas and roads are no longer required. This would reduce the duration of the visual impact. Provision of adequate facilities for the disposal of garbage. Training of the workforce in waste management. Reduce the amount of waste to the maximum extent possible. Collect all solid waste and store until transported to an appropriate waste disposal facility and disposed. Organization of clean-ups for existing garbage.</td>
</tr>
</tbody>
</table>

| Terrestrial Ecology | | |

Certified to ISO 9001 & ISO 14001 & OHSAS 18001
### Environmental Receptor

<table>
<thead>
<tr>
<th>Environmental Receptor</th>
<th>Predicted Impact</th>
<th>Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Habitat and flora</td>
<td>Direct loss of vegetation and habitat (including food sources). Areas of habitat and flora will be lost due to construction of the OHL however this would be limited to the footprint of the OHL base and would be approximately 0.4ha.</td>
<td>Roads, the control compound, the transmission line route and other site facilities are clearly demarcated before construction begins. Equipment should also be confined to the demarcated areas. During road construction, gravel will be placed on a 4 to 6 m wide access road that will accommodate vehicles and reduce soil erosion in adjacent areas. All vehicles confined to roadways. Road condition to be monitored regularly and damaged and rutted roads repaired rather than bypassing damaged sections. Monitoring of erosion controls and repair as needed. Maintenance of grass cover on berms and ditches. Prohibit the use of vehicles and equipment off prepared roads. Re-stabilize existing eroded tracks with restoration of grass cover as required.</td>
</tr>
</tbody>
</table>

### Ornithology

| Impacts during construction activities | Construction impacts are likely to include habitat loss and possible nest destruction for passerine and ground nesting bird species as well as disturbance impacts in the Project and adjacent areas. | Design and Planning. Mark overhead lines with bird deflectors to reduce the collision risk. Design overhead lines (including bird deflectors) to reduce or eliminate the electrocution risk to raptors or other large birds perching on them. |

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Certified to ISO 9001, ISO 14001 and OHSAS 18001

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### Environmental Receptor

<table>
<thead>
<tr>
<th>Predicted Impact</th>
<th>Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of birds from collision with OHL.</td>
<td>Installation of bird diverters on OHL (international orange) and installation of measures to discourage perching/nesting on the OHL towers.</td>
</tr>
<tr>
<td>Loss of birds from electrocution from perching on transmission lines.</td>
<td></td>
</tr>
</tbody>
</table>

### Hydrology and hydrogeology

<table>
<thead>
<tr>
<th>Surface water drainage</th>
<th>The route of the access tracks should be optimized to reduce the need for cut-and-fill material and run-off and erosion control features should be incorporated in designs. Buffer distance of 50m is applied to any hydrological features shown on background maps or discovered by survey. Installation of suitably sized culverts across identified drainage/run-off routes to maintain flow. Pollution prevention measures (applicable to all aspects) should be included in a Project ESMP.</th>
</tr>
</thead>
<tbody>
<tr>
<td>During construction earthworks, road construction and use of heavy vehicles could alter surface drainage patterns.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Water consumption, potentially affecting local water resources</th>
<th>Water to be sourced from existing supplies. Should groundwater sources be proposed, study of groundwater capacity should be undertaken prior to construction to ensure that aquifer has capacity to provide water for construction without impacting other users.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groundwater extraction potentially impacting on groundwater levels and reducing availability of groundwater for other users.</td>
<td></td>
</tr>
<tr>
<td>Environmental Receptor</td>
<td>Predicted Impact</td>
</tr>
<tr>
<td>------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Use of community water resources</td>
<td>Conflicts with local population as a result of Project employees using community wells and water resources.</td>
</tr>
<tr>
<td>Water pollution from leaks and spills</td>
<td>Water discharge and pollution. Risk of soil and water pollution from leaks and spills through storage of oil</td>
</tr>
<tr>
<td>Environmental Receptor</td>
<td>Predicted Impact</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Water pollution from sewage effluent          | Pollution of ground/surface water due to the inappropriate discharge of sewage effluent. | Sanitary waste collected in containers below portable toilets and transported for disposal.  
The waste will be disposed at a location agreed with the Tsogtsetsii soum respective officer or environmental officer.  
There will be a cooperation agreement with the public service office in Tsogtsetsii soum, Umnugovi aimag on waste collection and regular disposal during the construction period. |

**Geology and soils**
<table>
<thead>
<tr>
<th>Environmental Receptor</th>
<th>Predicted Impact</th>
<th>Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil erosion particularly as a result of loss of vegetation</td>
<td>Vehicle traffic along dirt tracks used during construction of on- and off-site roads and OHL lines will cause soil compaction. Off-road vehicle traffic will damage vegetation and cause soil compaction. The use of heavy equipment, including cranes for OHL erection, will cause soil compaction if used off of roads.</td>
<td>Clearly demarcate storage and staging areas and store all materials, equipment and vehicles in demarcated area to reduce soil damage. Furthermore, vehicles should be confined to demarcated roadways. Establish native grasses in erosion control channels and in other areas immediately after final disturbance. Salvage and store topsoil and subsoil before areas are excavated, with topsoil stripped and stockpiled separately. Segregate excavated soils into stockpiles dependent on material type and provide erosion control while stockpiled. Confine all vehicles and equipment to the roadway and, to extent possible, minimize activities during wet conditions. When activities must occur in wet conditions, control stormwater by using fabric, straw bales and other measures to impede stormwater flow and prevent erosion.</td>
</tr>
<tr>
<td>Environmental Receptor</td>
<td>Predicted Impact</td>
<td>Mitigation</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Soil erosion as a result of continued vehicle traffic during operational phase.       | Movement of staff and materials to and from the site along the access roads may result in degradation of tracks and erosion. Movements between the control centre and WTGs for operation and maintenance particularly if workers drive off designated tracks. Workers are expected to visit each WTG location least once per week for routine maintenance. | Confine all vehicles to roadways.  
Monitor road condition regularly; then repair damaged and rutted roads rather than bypassing damaged sections.  
Monitor erosion controls and repair as needed.  
Where possible, maintain grass cover on berms and ditches.  
Prohibit use of vehicles and equipment off prepared roads.  
Re-stabilize existing eroded tracks and restore grass cover as needed. |

**Archaeology and Cultural Heritage**

| Buried archaeological items | Damage to previously buried archaeological remains uncovered during construction works.                                                                                                                                  | In accordance with the requirements of IFC PS8, CEA will develop provisions for managing chance finds through a chance find procedure which will be applied in the event that cultural heritage is subsequently discovered.  
CEA or its contractors will not disturb any chance find further until an assessment by a competent professional is made and actions consistent with the requirements of PS8 are identified. |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
### Environmental Receptor | Predicted Impact | Mitigation
---|---|---
**Noise and Shadow Flicker**

- **Construction noise**
  - General nuisance to local population caused by construction activities.
  - Limiting the hours of operation for specific pieces of equipment or operations, especially mobile sources operating through community areas.
  - Re-locating noise sources to less sensitive areas to take advantage of distance and shielding.
    - Siting permanent facilities away from community areas if possible.
    - Taking advantage of the natural topography as a noise buffer during facility design.
    - Reducing Project traffic routing through community areas wherever possible.
    - Developing a mechanism to record and respond to complaints.

- **Operational noise levels at nearby receptors**
  - Elevated noise levels in close proximity to OHLs.
  - No specific mitigation proposed.

### Transportation and access

- **Abnormal loads during construction**
  - Increased total daily traffic flow on the local road network.
  - Efficiency of deliveries of construction materials to the site is closely monitored and if necessary sufficient storage provision is made available on site to prevent any delays to the construction process.
  - A Logistics Management Plan will be developed which will reduce risks to drivers and components being transported.
<table>
<thead>
<tr>
<th>Environmental Receptor</th>
<th>Predicted Impact</th>
<th>Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road works</td>
<td>Damage to road edges and general ‘wear and tear’ of the road may occur through increased HGV movements.</td>
<td>It is recommended that the HGV route for the transportation of components be verified through further assessment (including swept path analysis and route inspection). Further re-enforcement work undertaken as necessary.</td>
</tr>
<tr>
<td>Operational impacts</td>
<td>Increased loading on local roads during routine maintenance and servicing. The majority of these will be light vehicles with HGVs only required if OHL components need replacing.</td>
<td>The effects of traffic movements stemming from the operational phase are considered negligible and so insignificant. No mitigation is required.</td>
</tr>
<tr>
<td>Social Impacts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population and Employment</td>
<td>Physical displacement of local herders and other receptors. Economic displacement due to interference with traditional grazing areas. Temporary construction jobs during the seven month construction window. Indirect job creation from service and supply jobs to meet demands from resident workforce. Increased pressure on existing services.</td>
<td>Physical displacement will not be required in order to develop the Project. Economic displacement is not predicted but will be compensated in accordance with internationally recognised standards.</td>
</tr>
<tr>
<td>Environmental Receptor</td>
<td>Predicted Impact</td>
<td>Mitigation</td>
</tr>
<tr>
<td>-------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Worker accommodation and impact on local housing/hotels</td>
<td>Accommodation for this diverse workforce will need to take account of differences in language, diet, and other cultural sensitivities that exist between Mongolian and Chinese people, or there is potential for direct short term negative impacts on a local scale.</td>
<td>Worker accommodation will be provided on-site at the main Wind Farm compound and all workers will be required to stay there. Camps will be designed and managed to meet the requirements set out by IFC and EBRD.</td>
</tr>
<tr>
<td>Land Use and economic displacement</td>
<td>Reduced access to grazing lands and/or permanent winter corrals.</td>
<td>To minimize economic displacement, the area for the Project will not be fenced. The camp site will be located only within the wind farm site and be serviced by the existing roads which will require to be upgraded. Project workers will be prohibited from driving off designated access tracks, reducing damage to pasture land.</td>
</tr>
<tr>
<td>Social cohesion:</td>
<td>There is a potential for conflicts between local herders and construction workers living at the construction camp, and a lesser potential for workers during operation. These could include such things as disputes over road accidents involving livestock, animal theft, threats to herders’ livestock (e.g., by guard dog), or noise and light from the construction camp. Minor adverse impacts are predicted.</td>
<td>Establish clear rules for worker behaviour to avoid these issues.</td>
</tr>
<tr>
<td>Social Infrastructure</td>
<td>Impact on local road network</td>
<td>During operation the access road will provide a significantly improved route through the Project area for the seasonal nomadic herders, tourists, and others.</td>
</tr>
</tbody>
</table>
### Environmental Receptor | Predicted Impact | Mitigation
---|---|---
Human Health | Injury or death from traffic impacts is a direct negative impact that will be localised and short term, occurring during the construction and decommissioning phases. | Preparation of Traffic Management Plan comprising strategies to manage vehicles and equipment during the execution of the Project, including:
- Provide appropriate traffic safety training to all drivers (employees and contractors) as part of their induction and on an ongoing basis.
- As part of pre-construction engagement activities, ensure that traffic safety and “rules of the road” are discussed with local communities. Discuss and address community concerns. Special sessions may be required for particularly vulnerable groups such as children. At minimum communicate type, frequency and traffic risks before heavy traffic begins for the construction phase (as part of the PCDP).
- Use grievance mechanism and other means to monitor driver conduct.
- Implementation and compliance with the Community, Health and Safety Management Plan.
### Environmental Receptor

<table>
<thead>
<tr>
<th>Environmental Receptor</th>
<th>Predicted Impact</th>
<th>Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupational and Public Health and Safety</td>
<td>Movement or operation of passenger and construction vehicles, equipment, and materials could cause injury or death to humans (drivers, passengers, pedestrians) or animals (livestock or wildlife). Using hand tools or larger equipment could result in accidents that harm or kill workers. Falls from heights (transmission towers) could cause injury or death. Contact with electrical lines or transformers could cause injury or death.</td>
<td>CEA and its contractors will comply with international Occupational Health &amp; Safety regulations. A workforce manager in charge of all activities, and in charge of compliance with health and safety requirements reporting directly to the CEA project manager and will have independent lines of reporting to CEA upper management. Prior to beginning work on the site, the workforce manager will develop a safety program to cover construction and then operation of the site. On an annual basis, CEA will report to the lender on the status of the overall safety program.</td>
</tr>
</tbody>
</table>
13 Environmental Management

13.1 Introduction

This ESIA Addendum has summarised the EIA process undertaken to identify the impacts that will arise from the OHL Project construction and operation and the mitigation measures required to prevent or reduce these. During the detailed design stage, further consultations and surveys will be undertaken to refine the design and construction techniques. One of the key mechanisms for environmental management during the design and construction stages is the Environmental and Social Management Plan (ESMP) and associated subject plans which will be developed by CEA. These are summarized below.

13.2 Project Environmental and Social Management

13.2.1 CEA Environmental and Social Management Plan (ESMP)

This ESMP for the construction phase is provided as a separate document and sets the standards of environmental performance for the Project. CEA has overall control over all phases of development and the ESMP forms the overarching plan to guide the management of the both construction phase.

These standards form the basis against which the site will be measured during environmental audits. The primary purpose of this document is to act as the mechanism by which the project developer and sub-contractors will incorporate the requirements of the ESIA together with Equator Principles and IFC Performance Standards into the construction and operation of the wind farm.

This ESMP for the Project enables factors that affect wind farm construction, operation and decommissioning to be addressed. The ESMP will be further updated and expanded following the first construction site audit as well as finalization of the CEA Environmental and Social Management System.

The document sets a number of objectives to ensure that the site is operated in an environmentally acceptable manner through managing the site’s significant environmental aspects. The scope of this ESMP for the Project includes all activities, whether conducted by CEA and sub-contractors that are part of the construction, operation and decommissioning of the Project. It will be detailed in all contractor’s contracts that they will have to demonstrate compliance with the sections of this ESMP relevant to their activities.

Each significant aspect has one or more objectives, which are followed by mitigation measures to ensure that the objectives are met through operational controls.
An Environmental Manager will be established to communicate progress of site operations and report the internal environmental performance audit results during the construction phase.

13.2.1.1 Implementation of the ESMP
In order to successfully implement the ESMP, the following key tasks will be undertaken:

- Preparation of audit checklist based on the targets and objectives.
- Undertake inspection/audit of site and project operations, including records of training and waste management practises.
- Prepare a report detailing areas of compliance/non-compliance.
- Prepare a list of actions (action plan) to address non-compliances with associated timescales for completion.
- Audit the actions to ensure issues have been addressed.

It will be the responsibility of CEA to monitor the effectiveness of the Project ESMP and identify improvement actions as necessary.

13.2.1.2 Other Plans
A number of additional plans will be produced in support of the ESMP, these include:

- Waste Management Plan.
- Wastewater Management Plan.
- Dust Reduction Plan.
- Noise Pollution Plan.
- Biodiversity Plan.
- Cultural Heritage Management Plan.

These plans will provide a system against which to monitor and audit environmental performance. The plans will detail the practical methods required to ensure work is completed in accordance with current best practice, the mitigation measures in this ESIA Report and legislative and regulatory requirements.

13.2.2 Method Statements
In addition to the above, Project-specific Method Statements and a variety of detailed site-specific plans will be produced to cover the detailed construction methodologies to be employed for all main construction activities.

13.2.3 Health and Safety
CEA and its contractors will comply with international Occupational Health & Safety regulations and standards (for example, EU Directive 89/3918 and OSHA9 standards) in addition to Mongolian safety standards regarding construction works, electrical works, structural climbing and other hazards. In general, construction operations will be planned and implemented in accordance with these standards and with IFC safety guidelines.
There will be a workforce manager in charge of all activities, and in charge of compliance with health and safety requirements. This individual will report directly to the CEA project manager and will have independent lines of reporting to CEA upper management. Prior to beginning work on the site, the workforce manager will develop a safety program to cover construction and then operation of the site. The program will describe in detail the potential hazards and the ways in which they will be prevented or avoided. All construction workers (including contractors) will be required to complete a training program that covers the safety program, and training will cover hazard awareness, job- and site-specific hazards, emergency procedures for fire, illness or injury, and natural disaster.

Besides training, the safety program will include detailed requirements for inspecting, testing, and calibrating safety equipment, for monitoring the working environment for hazards, and for monitoring worker health. In addition, all incidents and accidents will be recorded if they resulted, or nearly resulted, in damage to equipment or injury or to humans or animals, will be recorded. On an annual basis, CEA will report to the lenders and shareholders on the status of the overall safety program, including information on training and on incidents.

Workplace inspections will be undertaken on a regular basis to monitor H&S aspects on site.

13.2.4 Environmental Notices

Posters and notices shall be used as appropriate to communicate nuisance abatement, environmental protection and waste management issues, such as the Contractor’s environmental policy, environmental objectives, site-layout plans, and good and bad environmental practices to the workforce and interested parties.

Notice boards shall be established at strategic locations within the site and at the boundary where it interfaces with the general public.

The project environmental coordinator or nominee will be responsible for maintaining the information on the notice boards up-to-date.

13.2.5 Environmental Audit

Environmental audits are fundamental to ensuring that the actions for each objective contained within the ESMP are established and maintained on the Project. Audits will take place provisionally every month from the start of the construction works.

Before an audit the following documents will be consulted in order to check conformance where applicable:

- Any discharge consents and abstraction licences.
- Planning Permission and conditions.
- Records of any previous environmental audits, non-conformance notices, complaints and environmental incidents.
The measures to control significant aspects outlined in the ESMP and their effective implementation will be checked during regular environmental audits of the site, during the site construction phase.

The local government environmental official, representatives from the local community and liaison committee members will be invited to attend the audits.

The results of the audit will be recorded on the environmental audit report and any non-conformances found will be formally recorded along with the action required.

Each non-conformance will be issued to the relevant person/s to take the corrective/preventative action detailed within an agreed timescale.

The Environment Manager will monitor the progress of actions and once action has been taken it will be checked and if satisfactory the non-conformance will then be closed out. If there are any outstanding actions at the next audit, these will be priority items to check.

The audit results will be reported at the site liaison committee.

13.2.6 Environmental Monitoring

A programme of Environmental and Social Monitoring will be undertaken in order to verify the effectiveness of the proposed mitigation measures in reducing impacts and also to allow mitigation measures to be refined or developed as needed to further address potential impacts or to develop plans for future development. More specifically, the objectives of the monitoring program are to:

- Record project impacts during construction and operation.
- Meet legal and community obligations.
- Evaluate the effectiveness of the mitigation measures and identify any shortcomings.
- Allow refinement and enhancement of mitigation measures to further reduce impacts.
- Allow identification unforeseen issues or changes in operations and provide information for development of mitigation measures to deal with those issues or changes.

The environmental and social monitoring program was developed in accordance with the best international practices for the wind energy sector.

Details of monitoring together with results will be summarised in a monitoring report which will be submitted to the Lenders for approval. Each monitoring report will cover a period of three months and will be submitted one month subsequent to the end of that monitoring period.
13.2.7 Review of ESMP

The ESMP will be reviewed periodically during construction. This is likely to occur on a two-monthly basis by the on-site HSE Manager. During the first year of operation, the ESMP will be independently audited every six months. Following this period, the ESMP will be audited annually.

The results of the review will be used to update the ESMP if deemed necessary to either ensure targets are met or to ensure continual improvements in environmental performance.

13.2.8 Summary

The most effective form of mitigation is to design the Project to avoid environmental impacts at source. Many environmental impacts have been avoided by sensitive layout and/or by commitment to the use of particular construction techniques and mitigation measures. In addition, construction and reinstatement techniques, that minimise environmental impacts, are well established.

The ESMP will ensure that the requirements detailed within this ESIA Addendum together with the Equator Principles, EBRD Performance Requirements and IFC Performance Standards are incorporated into the construction and operation of the Project.