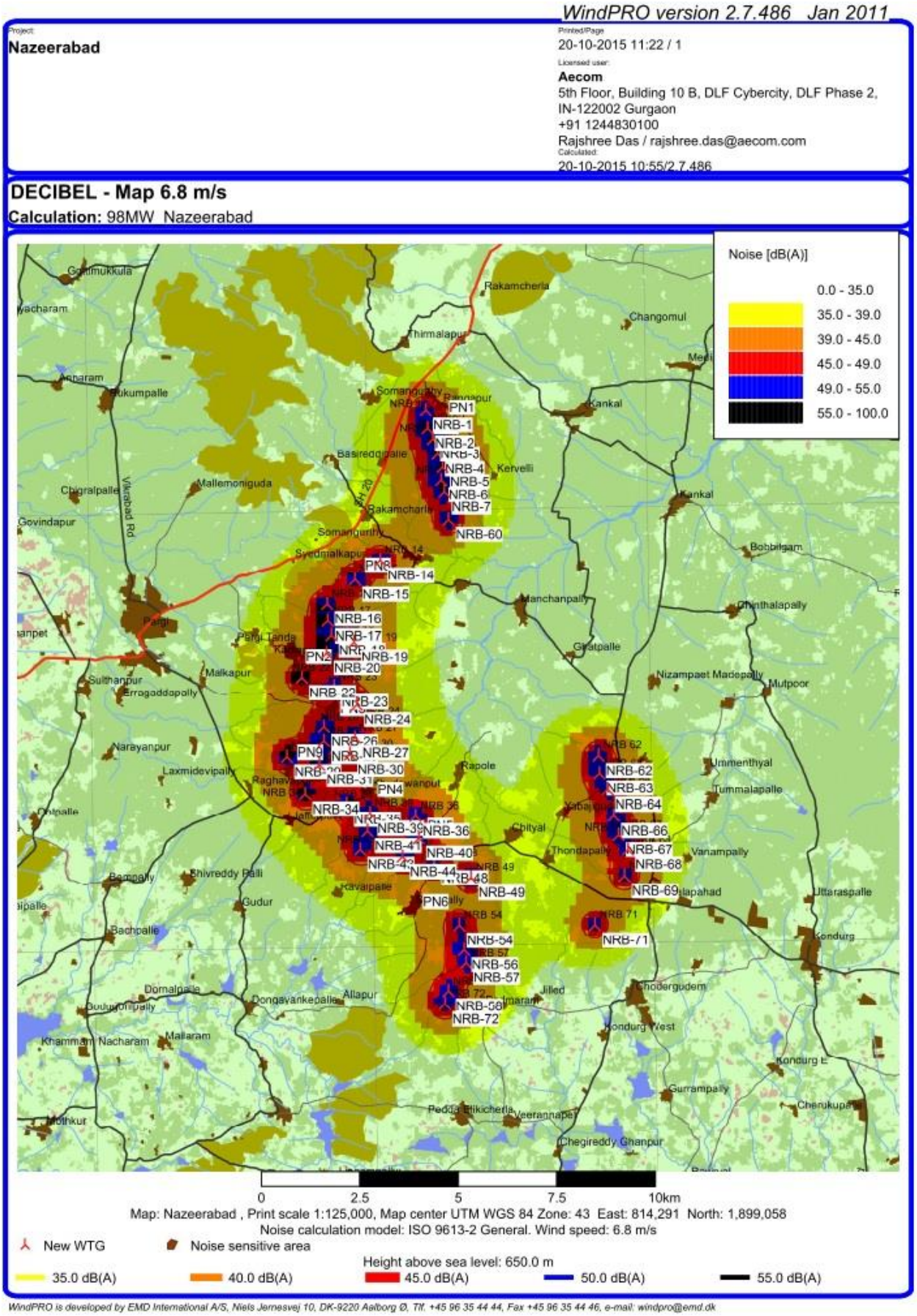
| | | | |
|---|---|---|---|
| | | NRB 23 | 1013 |
| | | NRB 24 | 1714 |
| | | NRB 26 | 1651 |
| | | NRB 28 | 1992 |
| 3 | PN 3 | NRB 18 | 1684 |
| | | NRB 19 | 1579 |
| | | NRB 20 | 1241 |
| | | NRB 22 | 954 |
| | | NRB 23 | 368 |
| | | NRB 24 | 466 |
| | | NRB 26 | 368 |
| | | NRB 27 | 802 |
| | | NRB 28 | 730 |
| | | NRB 29 | 1485 |
| | | NRB 30 | 1105 |
| | | NRB 31 | 1326 |
| 4 | PN 4 | NRB 26 | 1814 |
| | | NRB 27 | 1262 |
| | | NRB 28 | 1518 |
| | | NRB 29 | 1886 |
| | | NRB 30 | 899 |
| | | NRB 31 | 1142 |
| | | NRB 34 | 1085 |
| | | NRB 35 | 46 |
| | | NRB 36 | 1185 |
| | | NRB 39 | 377 |
| | | NRB 41 | 794 |
| | | NRB 43 | 1214 |
| | | NRB 44 | 1730 |
| 5 | PN 5 | NRB 35 | 1911 |
| | | NRB 36 | 258 |
| | | NRB 39 | 1280 |
| | | NRB 40 | 324 |
| | | NRB 44 | 903 |
| | | NRB 48 | 1035 |
| | | NRB 49 | 1877 |
| 6 | PN 6 | NRB 36 | 1883 |
| | | NRB 40 | 1315 |
| | | NRB 41 | 1966 |
| | | NRB 43 | 1742 |
| | | NRB 44 | 916 |
| | | NRB 48 | 804 |
| | | NRB 49 | 1362 |
| | | NRB 54 | 1089 |
| | | NRB 56 | 1514 |
| | | NRB 57 | 1764 |
| 7 | PN 7 | NRB 1 | 429 |
| | | NRB 2 | 91 |
| | | NRB 3 | 380 |
| | | NRB 4 | 763 |
| | | NRB 5 | 1117 |
| | | NRB 6 | 1421 |
| | | NRB 7 | 1730 |
| | | NRB 14 | 620 |

| | | | |
|---|---|---|---|
| 8 | PN 8 | NRB 15 | 353 |
| | | NRB 16 | 1227 |
| | | NRB 17 | 1586 |
| | | NRB 18 | 1880 |
| | | NRB 19 | 1946 |
| 9 | PN 9 | NRB 22 | 1918 |
| | | NRB 26 | 1105 |
| | | NRB 27 | 1726 |
| | | NRB 28 | 941 |
| | | NRB 29 | 120 |
| | | NRB 30 | 1559 |
| | | NRB 31 | 839 |
| | | NRB 34 | 1145 |
| | | NRB 35 | 1979 |

**Figure 7-5: Noise Map- Output of Noise Modelling Exercise**



**Noise from Transmission lines**

Once operational, noise from energised overhead lines can be produced by a phenomenon known as 'Corona Discharge' (a limited electrical breakdown of the air). Conductors are designed and constructed to minimise corona effects, although, under certain conditions this can be audible as a 'hissing' sound, sometimes accompanied by a low frequency hum. However, noise due to Corona Discharge is negligible if WTGs are designed in accordance with the international acoustic design standards.

### *Mitigation Measures*

Following mitigation measures are suggested to be implemented during operation phase of the proposed Project:

- Wind turbines shall be designed in accordance with the international acoustic design standards and maintained throughout the operational life so as to limit noise generation;
- Minimal clearance of ground vegetation such as shrubs and bushes during site clearance activities and ensure re-vegetation of cleared areas;
- Increase in dense vegetation coverage around the said receptor point location which shall act as noise barrier;
- The wind turbines shall be maintained in good running conditions throughout the operational life of the project through routine maintenance;
- Consult with the locals periodically to assess noise generation and set up a procedure to locate source of noise and steps taken to minimize them;
- Implement a complaint resolution procedure to assure that any complaints regarding operational noise are promptly and adequately investigated and resolved;
- Operation and Maintenance staff to be provided with personal protective equipment (PPEs) such as ear plugs, gloves and ear muffs when working close to turbine in operation;
- Undertake ambient noise level monitoring on an annual basis in order to understand the increase in noise levels due to the project operation; and
- The micro-siting guidelines recommended by National Institute of Wind Energy (NIWE), under the Ministry of New and Renewable Energy (MNRE), suggests wind farm developers to maintain a minimum distance of WTGs from sensitive receptors such as residential settlement/ house, highways, schools, religious structure[31], to ensure minimization of potential noise, shadow flicker and blade throw risks. Based on the formula, 173.5 m is the minimum distance between the project turbines (Suzlon S97, hub height of 120 m and rotor diameter of 97 m) and receptors. Therefore it is recommended to maintain a minimum distance of 173.5 m as a best industry practice for the project.

### *Impact Value*

The noise related impacts due to project operation will be felt throughout the operation phase but will have localised impact and low intensity after mitigation measures are employed. Hence the overall significance of the impact with mitigation measures will be minor.

**Table 7-8: Impact Value- Noise Quality during Operation Phase**

[31] Minimum distance = Height of the turbine + ½ x rotor diameter + 5 m

| Aspect | Scenario | Spread | Duration | Intensity | Overall |
|---|---|---|---|---|---|
| Noise Quality | Without Mitigation | Local | Long | Moderate | Moderate |
| | With Mitigation | Local | Long | Low | Minor |

# 8. ECOLOGICAL ENVIRONMENT

This section provides a summary of the terrestrial ecology assessment undertaken for the project. It outlines the survey methodology used and describes the project area's existing ecological baseline conditions. This section also predicts the potential impacts of the proposed project on the ecology of the project area and suggests mitigation measures to ameliorate the predicted impacts.

The area encompassed within an imaginary line joining the outermost wind-turbine locations, along with an area extending outward up to a distance of approximately 500 m from this line, was delineated as the "Study Area", and is hereinafter referred to as such.

The terrestrial ecological survey was carried out from 14$^{th}$ to 18$^{th}$ September, 2015. The area was under the influence of southwest monsoon at the time of survey. On the basis of this ecological assessment, specific mitigation measures have been recommended to ameliorate the potential ecological impacts of the proposed project.

## 8.1 Methodology of Ecological Assessment

A phased approach has been followed to carry out the present terrestrial ecological assessment. Successive phases of the assessment include (i) Reconnaissance survey (ii) Onsite data collection for determining ecological baseline setup (iii) Secondary data collection through desktop review of available literature, and (iv) Identification, prediction and evaluation of impacts and possible mitigation.

### *Secondary Data Collection*

An extensive desktop review of available published literature (books, websites, scientific papers, articles etc.) was conducted. The Forest Working Plans of the Forest Divisions falling in the project area were also referred to for secondary information. Additional information was sourced from the project proponent, governmental institutions and local residents of the survey-area. The secondary data was appropriately supplemented by a field survey for primary data collection.

### *Reconnaissance Survey*

To get an overview of the overall ecological setting of the project area, a reconnaissance survey of the proposed 47 WTG locations and associated facilities, such as the proposed pooling substation, was carried out. Accessible turbine locations were covered using a vehicle, while inaccessible areas were covered on foot. The survey was focussed on evaluating existing land use and vegetation of the site and its surroundings. Based on this survey, thirteen sites were identified for quadrat studies within the project area, such that they represent the different habitats and associated land-use types observed in the .

### *Onsite Data Collection*

**Flora**

Primary data on the flora of the study area was generated through quadrat-based quantitative surveys at thirteen (13) locations. At each location, a quadrat of approximately 20 m x 20 m was marked for recording the tree species as well as the number of individuals of each species, falling within the quadrat.

Similarly, a quadrat of approximately 5 m x 5 m for recording data on shrubs and quadrats of 1 m x 1 m for recording data on herbs were marked within the bigger quadrat.

The data recorded through the quadrat-studies was analysed to estimate the percentage frequency, abundance and density of each floristic species. Species richness was also calculated, separately for the woody and non-woody plants. The following formulae were used for calculating the percentage frequency, abundance and density, as applicable, of the species identified in the nine quadrats studied:

$$\%\ \text{Frequency of species A} = \frac{\text{Number of quadrats of occurrence of species A}}{\text{Total number of quadrats studied}} \text{x } 100$$

$$\text{Abundance of species A} = \frac{\text{Number of individuals of species A in total quadrats studied}}{\text{Number of quadrats of occurrence of species A}}$$

$$\text{Density of species A} = \frac{\text{Number of individuals of species A in total quadrats studied}}{\text{Total area studied}}$$

Due to time and resource constraints, and given the preliminary nature of this survey, the emphasis of the studies was kept limited to the higher flora.

**Fauna**

Primary data on the fauna of the study area was generated through both, direct evidence, in the form of visual sightings, and indirect evidence, such as calls, nests, burrows, droppings, scats, moults, tracks, etc. These were observed generally, in course of a brief walk-over of the site.

Following the walk-over, the site was scanned with standard bird-watching binoculars for approximately fifteen-minutes to record bird-species in particular.

The survey was conducted during most of the diurnal faunal activity-period, from mid-morning till early evening. Due to time and resource constraints, and given the preliminary nature of this survey, the emphasis of the studies was kept limited to the higher and diurnal fauna.

In view of the known vulnerability of certain faunal groups, mainly avifauna and bats, to wind-farm impacts, a special focus was maintained on these during the survey.

## 8.2 Ecological Diversity of the Area

### 8.2.1 Floristic Diversity of the Study Area

#### *Forest Types*

According to the Champion and Seth Classification of Indian Forests, the natural vegetation of the survey area represents the following forest-types:

- **Type (5A/C3) Southern Tropical Dry Mixed Deciduous Forest**

This type of forest is attributed to relatively low rainfall and lower altitude. Many species growing in this forest type are common to the moist deciduous forests. The canopy is comparatively open allowing good percentage of grass and herb to grow.

Species associated with this type include:

Top Canopy: *Tectona grandis, Madhuca indica, Anogeissus latifolia, Pterocarpus marsupium, Terminalia tomentosa, Dalbergia paniculata, Terminalia bellerica, Boswellia serrata*

Middle Canopy: *Diospyros melanoxylon, Chloroxylon swietenia, Buchnania lanzan, Lannea coromandelica*

Lower Canopy: *Albizia amara, Wrightia tinctoria, Alangium salvifolium, Emblica officinalis, Annona squamosa, Calophyllum inophyllum, Diospyros chloroxylon, Zizyphus glabrata*

Ground flora: *Caesalpinia lacerans, Gymnosporia spinosa, Randia spinosa, Butea monosperma, Lantana camara, Cynodon dactylon, Cymbopogon martinii, Cymbopogon schoenanthus*

- **Type 6A/C2 Southern Tropical Dry Thorn Forest**

This type of forest may represent open forest in which thorny and usually hardwood species predominates. The trees have short boles and low branching crowns. Their usual height is up to 8 meters. There is usually a mixture of relatively few species. There is an ill-defined second storey of smaller trees and large crowned shrubs. The vegetation is mostly spiny and often with xerophytic character, extending down to low shrub growth. There is usually a thin grass growth which may appear during the short rainy season but more or less the soil is bare and devoid of any grass growth. Climbers are few, showing xerophytic adaptations. Stunted trees of the dry deciduous forest occur throughout the forest, notable among them being *Anogeissus latifolia* and *Soymida febrifuga*.

Species associated with this type include:

Top Canopy and Middle Canopy: *Lagerstroemia parviflora, Diospyros chloroxylon, Albizia amara, Acacia sundra, Chloroxylon swietenia*, etc.

Lower Canopy: *Zizyphus, Maytenus senagalensis, Dodonea viscosa, Randia dumetorum, Lantana camera* and a few climbers are also present.

### *Quadrat Data*

Table 8-1 below gives the details of the thirteen locations at which quadrat studies were carried out.

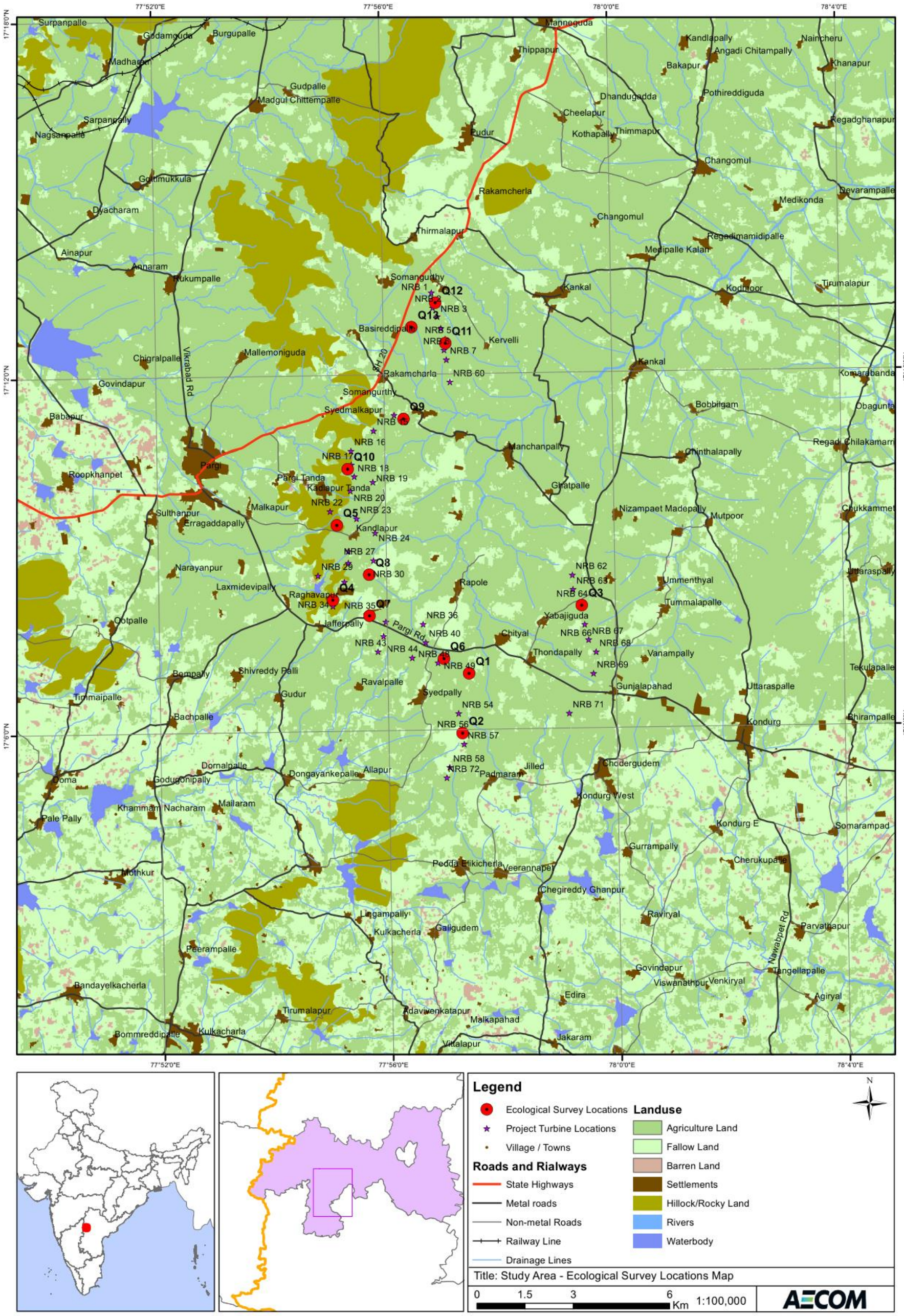
**Table 8-1: Details of Quadrat Locations**

| Quadrat No. | Location | Nearest WTG point |
|---|---|---|
| 1 | 17° 06'56.80"N, 77°57'25.00"E | 49 |

| Quadrat No. | Location | Nearest WTG point |
|---|---|---|
| 2 | 17° 05'56.50"N, 77°57'17.10"E | 56 |
| 3 | 17° 08'04.13"N, 77°59'24.60"E | 64 |
| 4 | 17° 08'13.00"N, 77°55'02.90"E | 34 |
| 5 | 17° 09'28.60"N, 77°55'08.10"E | 22 & 23 |
| 6 | 17° 07'12.10"N, 77°56'58.60"E | 48 |
| 7 | 17° 07'56.40"N, 77°55'41.10"E | 35 |
| 8 | 17° 08'38.00"N, 77°55'41.40"E | 30 |
| 9 | 17°11'15.20"N, 77°56'19.80"E | 14 |
| 10 | 17°10'25.20"N, 77°55'20.20"E | 17 & 18 |
| 11 | 17°12'31.08"N, 77°57'04.96"E | 5 & 6 |
| 12 | 17°13'12.04"N, 77°56'55.09"E | 1 & 2 |
| 13 | 17°12'47.70"N, 77°56'29.60"E | 3 |

*Source: AECOM Primary Survey*

**Figure 8-1: Map showing Ecological Survey Quadrat Locations**



### 8.2.2 Floristic Species recorded in the Study Area

Table 8-2 below presents the floristic data recorded during the quadrat-studies carried out at the nine aforementioned locations. The data on woody and non-woody flora is given in separate sections, along with percentage frequency, abundance and density of each species.

**Table 8-2: Floristic Species Recorded in the Study Area**

| Sr. No. | Species | Habit | % frequency | Abundance | Density/ Ha |
|---|---|---|---|---|---|
| **Woody Flora** | | | | | |
| 1. | *Acacia auriculiformis* | Tree | 7.69 | 2.00 | 3.85 |
| 2. | *Aegle marmelos* | Tree | 7.69 | 1.00 | 1.92 |
| 3. | *Agave americana* | Shrub | 7.69 | 2.00 | 61.54 |
| 4. | *Anona squamosa* | Tree | 15.38 | 2.50 | 9.62 |
| 5. | *Azadirachta indica* | Tree | 76.92 | 1.60 | 30.77 |
| 6. | *Butea monosperma* | Tree | 46.15 | 3.50 | 40.38 |
| 7. | *Buchanania lanzan* | Tree | 7.69 | 1.00 | 1.92 |
| 8. | *Catunaregam spinosa* | Tree | 7.69 | 1.00 | 1.92 |
| 9. | *Calotropis procera* | Shrub | 7.69 | 2.00 | 61.54 |
| 10. | *Caesalpinia bonduc* | Climber | 7.69 | 1.00 | 30.77 |
| 11. | *Cascabella thevetia* | Shrub | 7.69 | 2.00 | 61.54 |
| 12. | *Cassia fistula* | Tree | 15.38 | 1.00 | 3.85 |
| 13. | *Cissus woodrowii* | Shrub | 15.38 | 2.00 | 123.08 |
| 14. | *Cryptostegia grandiflora* | Climber | 7.69 | 2.00 | 61.54 |
| 15. | *Dodonaea viscosa* | Shrub | 23.08 | 2.00 | 184.62 |
| 16. | *Eucalyptus* | Tree | 7.69 | 2.00 | 3.85 |
| 17. | *Ficus benghalensis* | Tree | 30.77 | 1.50 | 11.54 |
| 18. | *Ficus racemosa* | Tree | 7.69 | 1.00 | 1.92 |
| 19. | *Grewia flavescens* | Tree | 7.69 | 1.00 | 1.92 |
| 20. | *Grewia tiliaefolia* | Tree | 7.69 | 1.00 | 1.92 |
| 21. | *Gymnosporia spinosa* | Tree | 7.69 | 2.00 | 3.85 |
| 22. | *Holoptela integrifolia* | Tree | 30.77 | 1.00 | 7.69 |
| 23. | *Ipomea carnea* | Shrub | 7.69 | 2.00 | 61.54 |
| 24. | *Jasminum auriculatum* | Climber | 7.69 | 1.00 | 30.77 |
| 25. | *Jatropha curcas* | Shrub | 7.69 | 1.00 | 30.77 |
| 26. | *Lantana camara* | Shrub | 53.85 | 1.86 | 400.00 |
| 27. | *Lagerstroemia parviflora* | Tree | 7.69 | 3.00 | 5.77 |
| 28. | *Leea asiatica* | Shrub | 7.69 | 1.00 | 30.77 |
| 29. | *Mangifera indica* | Tree | 15.38 | 2.00 | 7.69 |
| 30. | *Maytenus senegalensis* | Shrub | 7.69 | 2.00 | 61.54 |
| 31. | *Maytenus sp.* | Shrub | 7.69 | 1.00 | 30.77 |
| 32. | *Melia azedarach* | Tree | 7.69 | 1.00 | 1.92 |
| 33. | *Phoenix sp.* | Tree | 7.69 | 2.00 | 3.85 |
| 34. | *Pongamia pinnata* | Tree | 30.77 | 1.00 | 7.69 |
| 35. | *Prosopis juliflora* | Tree | 7.69 | 3.00 | 5.77 |
| 36. | *Santalum album* | Tree | 15.38 | 1.00 | 3.85 |
| 37. | *Senna auriculata* | Shrub | 23.08 | 1.67 | 153.85 |
| 38. | *Tectona grandis* | Tree | 15.38 | 1.00 | 3.85 |
| 39. | *Tephrosia purpurea* | Herb | 7.69 | 2.00 | 1538.46 |
| 40. | *Tamarindus indica* | Tree | 15.38 | 1.00 | 3.85 |
| 41. | *Terminalia catappa* | Tree | 7.69 | 1.00 | 1.92 |

| | | | | | |
|---|---|---|---|---|---|
| 42. | *Tylophora indica* | Climber | 7.69 | 1.00 | 30.77 |
| 43. | *Ziziphus oenoplia* | Shrub | 38.46 | 1.40 | 215.38 |
| **Non-Woody Flora** | | | | | |
| 1. | *Achyranthes aspera* | Herb | 7.69 | 2.00 | 1538.46 |
| 2. | *Alternanthera sessilis* | Herb | 7.69 | 1.00 | 769.23 |
| 3. | *Andrographis paniculata* | Herb | 7.69 | 2.00 | 1538.46 |
| 4. | *Asparagus racemosus* | Herb | 7.69 | 2.00 | 1538.46 |
| 5. | *Boerhavia diffusa* | Herb | 7.69 | 5.00 | 3846.15 |
| 6. | *Cassia tora* | Herb | 15.38 | 2.50 | 3846.15 |
| 7. | *Catharanthus pusillus* | Herb | 7.69 | 1.00 | 769.23 |
| 8. | *Celosia argentea* | Herb | 7.69 | 2.00 | 1538.46 |
| 9. | *Cenchrus sp.* | Grass | 15.38 | 2.00 | 3076.92 |
| 10. | *Clerodendrum serratum* | Herb | 7.69 | 2.00 | 1538.46 |
| 11. | *Commelina forsskalaei* | Herb | 15.38 | 1.50 | 2307.69 |
| 12. | *Commelina sp.* | Herb | 15.38 | 2.50 | 3846.15 |
| 13. | *Cuscuta reflexa* | Herb | 23.08 | 1.33 | 3076.92 |
| 14. | *Cyanotis cristata* | Herb | 15.38 | 1.00 | 1538.46 |
| 15. | *Cyanotis fasciculata* | Herb | 7.69 | 2.00 | 1538.46 |
| 16. | *Cyperus sp.* | Herb | 15.38 | 2.00 | 3076.92 |
| 17. | *Dactyloctenium aegypytium* | Grass | 23.08 | 1.67 | 3846.15 |
| 18. | *Datura metel* | Herb | 7.69 | 1.00 | 769.23 |
| 19. | *Euphorbia heterophylla* | Herb | 7.69 | 1.00 | 769.23 |
| 20. | *Euphorbia hirta* | Herb | 23.08 | 1.67 | 3846.15 |
| 21. | *Evolvulus alsinoides* | Herb | 7.69 | 2.00 | 1538.46 |
| 22. | *Gloriosa superba* | Climber | 15.38 | 1.00 | 61.54 |
| 23. | *Impatiens balsamina* | Herb | 7.69 | 1.00 | 769.23 |
| 24. | *Hyptis suaveolens* | Herb | 7.69 | 2.00 | 1538.46 |
| 25. | *Indigofera cordifolia* | Herb | 15.38 | 2.00 | 3076.92 |
| 26. | *Lagascea mollis* | Herb | 7.69 | 1.00 | 769.23 |
| 27. | *Leucas sp.* | Herb | 7.69 | 1.00 | 769.23 |
| 28. | *Martynia annua* | Herb | 15.38 | 1.00 | 1538.46 |
| 29. | *Mukia maderaspatana* | Climber | 7.69 | 1.00 | 30.77 |
| 30. | *Parthenium hysterophorus* | Herb | 53.85 | 3.57 | 19230.77 |
| 31. | *Pentanema indicum* | Herb | 7.69 | 1.00 | 769.23 |
| 32. | *Persicaria glabra* | Herb | 7.69 | 1.00 | 769.23 |
| 33. | *Rungia repens* | Herb | 7.69 | 2.00 | 1538.46 |
| 34. | *Sida cordifolia* | Herb | 7.69 | 2.00 | 1538.46 |
| 35. | *Sopubia delphinifolia* | Herb | 7.69 | 2.00 | 1538.46 |
| 36. | *Spermacoce pusilla* | Herb | 7.69 | 3.00 | 2307.69 |
| 37. | *Spermacoce articularis* | Herb | 7.69 | 2.00 | 1538.46 |
| 38. | *Striga densiflora* | Herb | 7.69 | 2.00 | 1538.46 |
| 39. | *Stylosanthes fruticosa* | Herb | 15.38 | 2.50 | 3846.15 |
| 40. | *Tribulus terrestris* | Herb | 7.69 | 3.00 | 2307.69 |
| 41. | *Tridax procumbens* | Herb | 69.23 | 2.78 | 19230.77 |
| 42. | *Vernonia cinerea* | Herb | 7.69 | 1.00 | 769.23 |
| 43. | *Vitex negundo* | Herb | 7.69 | 2.00 | 1538.46 |
| 44. | *Xanthium indicum* | Herb | 15.38 | 2.50 | 3846.15 |

### *Species Richness*

The Species Richness of the woody flora of the project site is **43** and that of the non-woody flora is **44**.

## 8.2.3 Faunal Diversity of the Study Area

This section presents the faunal species reported from the study area and/or recorded during the field survey, along with their conservation status of each species as per the IUCN Red Data List and the Schedule under which the species is protected by the Wildlife (Protection) Act (1972) of India.

### *Avifaunal*

Table below lists the resident avifaunal species associated with the study area. (The migratory avifaunal species associated with the study area are listed later in this report, in **Table 8-7**.)

**Table 8-3: Resident Avifauna associated with the Study Area**

| Sr.No. | Scientific Name | Common Name | IUCN Status | WPA Schedule |
|---|---|---|---|---|
| 1 | *Francolinus pictus* | Painted Francolin | LC | IV |
| 2 | *Francolinus pondicerianus* | Grey Francolin | LC | IV |
| 3 | *Coturnix chinensis* | King Quail | LC | IV |
| 4 | *Perdicula asiatica* | Jungle Bush Quail | LC | IV |
| 5 | *Perdicula argoondah* | Rock Bush Quail | LC | IV |
| 6 | *Galloperdix spadicea* | Red Spurfowl | LC | IV |
| 7 | *Galloperdix lunulata* | Painted Spurfowl | LC | IV |
| 8 | *Gallus sonneratii* | Grey Junglefowl | LC | II |
| 9 | *Pavo cristatus* | Indian Peafowl | LC | I |
| 10 | *Dendrocygna javanica* | Lesser Whistling- duck | LC | IV |
| 11 | *Nettapus coromandelianus* | Cotton Pygmy-goose | LC | IV |
| 12 | *Anas poecilorhyncha* | Indian Spot-Billed Duck | LC | IV |
| 13 | *Tachybaptus ruficollis* | Little Grebe | LC | IV |
| 14 | *Mycteria leucocephala* | Painted Stork | NT | IV |
| 15 | *Ciconia episcopus* | Woolly-necked Stork | VU | IV |
| 16 | *Threskiornis melanocephalus* | Black-headed Ibis | NT | IV |
| 17 | *Pseudibis papillosa* | Red-naped Ibis | LC | IV |
| 18 | *Platalea leucorodia* | Eurasian Spoonbill | LC | I |
| 19 | *Nycticorax nycticorax* | Black-crowned Night Heron | LC | IV |
| 20 | *Butorides striata* | Striated Heron | LC | IV |
| 21 | *Ardeola grayii* | Indian Pond Heron | LC | IV |
| 22 | *Ardea cinerea* | Grey Heron | LC | IV |
| 23 | *Ardea purpurea* | Purple Heron | LC | IV |
| 24 | *Bubulcus ibis* | Cattle Egret | LC | IV |
| 25 | *Casmerodius albus* | Great Egret | LC | IV |
| 26 | *Egretta garzetta* | Little Egret | LC | IV |
| 27 | *Falco chicquera* | Red-necked Falcon | NT | I |
| 28 | *Falco jugger* | Laggar Falcon | NT | I |
| 29 | *Elanus caeruleus* | Black-winged Kite | LC | IV |
| 30 | *Milvus migrans* | Black Kite | LC | IV |
| 31 | *Haliastur indus* | Brahminy Kite | LC | IV |
| 32 | *Pernis ptilorhynchus* | Oriental Honey-buzzard | LC | IV |

| Sr.No. | Scientific Name | Common Name | IUCN Status | WPA Schedule |
|---|---|---|---|---|
| 33 | *Neophron percnopterus* | Egyptian Vulture | EN | IV |
| 34 | *Gyps bengalensis* | White-rumped Vulture | CR | I |
| 35 | *Gyps indicus* | Indian Vulture | CR | I |
| 36 | *Sarcogyps calvus* | Red-headed Vulture | CR | IV |
| 37 | *Circaetus gallicus* | Short-toed Snake Eagle | LC | IV |
| 38 | *Spilornis cheela* | Crested Serpent Eagle | LC | IV |
| 39 | *Accipiter badius* | Shikra | LC | IV |
| 40 | *Butastur teesa* | White-eyed Buzzard | LC | I |
| 41 | *Aquila rapax* | Tawny Eagle | LC | IV |
| 42 | *Aquila fasciata* | Bonelli's Eagle | LC | I |
| 43 | *Nisaetus cirrhatus* | Crested Hawk-eagle | LC | IV |
| 44 | *Ardeotis nigriceps* | Great Indian Bustard | CR | I |
| 45 | *Sypheotides indicus* | Lesser Florican | EN | I |
| 46 | *Turnix sylvaticus* | Small Buttonquail | LC | IV |
| 47 | *Amaurornis akool* | Brown Crake | LC | IV |
| 48 | *Amaurornis phoenicurus* | White-breasted Waterhen | LC | IV |
| 49 | *Turnix suscitator* | Barred Buttonquail | LC | IV |
| 50 | *Fulica atra* | Eurasian Coot | LC | IV |
| 51 | *Gallinula chloropus* | Common Moorhen | LC | IV |
| 52 | *Porphyrio porphyrio* | Purple Swamphen | LC | IV |
| 53 | *Burhinus (oedicnemus) indicus* | Indian Thick-knee | LC | IV |
| 54 | *Esacus recurvirostris* | Great Thick-knee | NT | IV |
| 55 | *Hydrophasianus chirurgus* | Pheasant-tailed Jacana | LC | IV |
| 56 | *Metopidius indicus* | Bronze-winged Jacana | LC | IV |
| 57 | *Vanellus malarbaricus* | Yellow-wattled Lapwing | LC | IV |
| 58 | *Vanellus indicus* | Red-wattled Lapwing | LC | IV |
| 59 | *Charadrius dubius* | Little Ringed Plover | LC | IV |
| 60 | *Rostratula benghalensis* | Greater Painted-Snipe | LC | IV |
| 61 | *Cursorius coromandelicus* | Indian Courser | LC | - |
| 62 | *Glareola lactea* | Small Pratincole | LC | - |
| 63 | *Sterna aurantia* | River Tern | NT | - |
| 64 | *Pterocles exustus* | Chestnut-bellied Sandgrouse | LC | IV |
| 65 | *Pterocles indicus* | Painted Sandgrouse | LC | IV |
| 66 | *Columba livia* | Common Pigeon | LC | IV |
| 67 | *Streptopelia decaocto* | Eurasian Collared Dove | LC | IV |
| 68 | *Streptopelia tranquebarica* | Red Collared Dove | LC | IV |
| 69 | *Streptopelia chinensis* | Spotted Dove | LC | IV |
| 70 | *Streptopelia senegalensis* | Laughing Dove | LC | IV |
| 71 | *Treron phoenicopterus* | Yellow-footed Green Pigeon | LC | IV |
| 72 | *Psittacula eupatria* | Alexandrine Parakeet | NT | IV |
| 73 | *Psittacula krameri* | Rose-ringed Parakeet | LC | IV |
| 74 | *Psittacula cyanocephala* | Plum-headed Parakeet | LC | IV |
| 75 | *Hierococcyx varius* | Common Hawk-Cuckoo | LC | IV |
| 76 | *Cuculus micropterus* | India Cuckoo | LC | IV |
| 77 | *Cacomantis passerinus* | Grey-bellied Cuckoo | LC | IV |
| 78 | *Eudynamys scolopaceus* | Asian Koel | LC | IV |
| 79 | *Taccocua leschenaultii* | Sirkeer Malkoha | LC | IV |
| 80 | *Rhopodytes viridirostris* | Blue-faced Malkoha | LC | IV |
| 81 | *Centropus parroti* | Southern Coucal | LC | IV |

| Sr.No. | Scientific Name | Common Name | IUCN Status | WPA Schedule |
|---|---|---|---|---|
| 82 | *Tyto alba* | Barn Owl | LC | IV |
| 83 | *Otus bakkamoena* | Indian Scops Owl | LC | IV |
| 84 | *Athene brama* | Spotted Owlet | LC | IV |
| 85 | *Glaucidium radiatum* | Jungle Owlet | LC | IV |
| 86 | *Bubo bubo* | Eurasian Eagle Owl | LC | IV |
| 87 | *Ketupa zeylonensis* | Brown Fish Owl | LC | IV |
| 88 | *Strix ocellata* | Mottled Wood Owl | LC | IV |
| 89 | *Caprimulgus asiaticus* | Indian Nightjar | LC | IV |
| 90 | *Caprimulgus affinis* | Savanna Nightjar | LC | IV |
| 91 | *Tachymarptis melba* | Alpine Swift | LC | - |
| 92 | *Cypsiurus balasiensis* | Asian Palm Swift | LC | - |
| 93 | *Apus affinis* | Little Swift | LC | - |
| 94 | *Upupa epops* | Common Hoopoe | LC | - |
| 95 | *Coracias benghalensis* | Indian Roller | LC | IV |
| 96 | *Halcyon smyrnensis* | White-throated Kingfisher | LC | IV |
| 97 | *Alcedo atthis* | Common Kingfisher | LC | IV |
| 98 | *Ceryle rudis* | Pied Kingfisher | LC | IV |
| 99 | *Merops orientalis* | Green Bee-eater | LC | - |
| 100 | *Ocyceros birostris* | Indian Grey Hornbill | LC | - |
| 101 | *Megalaima haemacephala* | Coppersmith Barbet | LC | IV |
| 102 | *Megalaima zeylanica* | Brown-headed Barbet | LC | IV |
| 103 | *Dendrocopos nanus* | Brown-capped Pygmy Woodpecker | LC | IV |
| 104 | *Dendrocopos mahrattensis* | Yellow-crowned Woodpecker | LC | IV |
| 105 | *Dinopium benghalense* | Lesser Goldenback | LC | IV |
| 106 | *Tephrodornis pondicerianus* | Common Woodshrike | LC | - |
| 107 | *Artamus fuscus* | Ashy Woodswallow | LC | - |
| 108 | *Coracina macei* | Large Cuckooshrike | LC | IV |
| 109 | *Aegithina tiphia* | Common Iora | LC | IV |
| 110 | *Pericrocotus erythropygius* | White-bellied Minivet | LC | IV |
| 111 | *Pericrocotus cinnamomeus* | Small Minivet | LC | - |
| 112 | *Lanius vittatus* | Bay-backed Shrike | LC | - |
| 113 | *Lanius schach* | Long-tailed Shrike | LC | - |
| 114 | *Dicrurus paradiseus* | Greater Racket-tailed Drongo | LC | IV |
| 115 | *Dicrurus macrocercus* | Black Drongo | LC | IV |
| 116 | *Dicrurus caerulescens* | White-bellied Drongo | LC | IV |
| 117 | *Lanius meridionalis* | Southern Grey Shrike | LC | - |
| 118 | *Oriolus xanthornus* | Black-hooded Oriole | LC | IV |
| 119 | *Rhipidura aureola* | White-browed Fantail | LC | - |
| 120 | *Rhipidura (albicollis) albogularis* | White-spotted Fantail | LC | - |
| 121 | *Dendrocitta vagabunda* | Rufous Treepie | LC | IV |
| 122 | *Corvus (macrorhynchos) culminatus* | Indian Jungle Crow | NA | V |
| 123 | *Corvus splendens* | House Crow | LC | V |
| 124 | *Parus major* | Great Tit | LC | IV |
| 125 | *Ptyonoprogne concolor* | Dusky Crag Martin | LC | - |
| 126 | *Hirundo smithii* | Wire-tailed Swallow | LC | - |
| 127 | *Hirundo fluvicola* | Streak-throated Swallow | LC | - |
| 128 | *Ammomanes phoenicura* | Rufous-tailed Lark | LC | IV |
| 129 | *Eremopterix griseus* | Ashy-crowned Sparrow | LC | IV |

| Sr.No. | Scientific Name | Common Name | IUCN Status | WPA Schedule |
|---|---|---|---|---|
| | | Lark | | |
| 130 | *Galerida deva* | Sykes's Lark | LC | IV |
| 131 | *Alauda gulgula* | Oriental Sky Lark | LC | IV |
| 132 | *Pycnonotus cafer* | Red-vented Bulbul | LC | IV |
| 133 | *Pycnonotus luteolus* | White-browed Bulbul | LC | IV |
| 134 | *Prinia hodgsonii* | Grey-breasted Prinia | LC | - |
| 135 | *Prinia sylvatica* | Jungle Prinia | LC | - |
| 136 | *Prinia socialis* | Ashy Prinia | LC | - |
| 137 | *Prinia inornata* | Plain Prinia | LC | - |
| 138 | *Cisticola juncidis* | Zitting Cisticola | LC | - |
| 139 | *Orthotomus sutorius* | Common Tailorbird | LC | - |
| 140 | *Dumetia hyperythra* | Tawny-bellied Babbler | LC | IV |
| 141 | *Turdoides affinis* | Yellow-billed Babbler | LC | IV |
| 142 | *Turdoides malcolmi* | Large Grey Babbler | LC | IV |
| 143 | *Turdoides caudatus* | Common Babbler | LC | IV |
| 144 | *Turdoides striata* | Jungle Babbler | LC | IV |
| 145 | *Chrysomma sinense* | Yellow-eyed Babbler | LC | IV |
| 146 | *Zosterops palpebrosus* | Oriental White-eye | LC | IV |
| 147 | *Acridotheres tristis* | Common Myna | LC | IV |
| 148 | *Sturnia pagodarum* | Brahminy Starling | LC | IV |
| 149 | *Zoothera citrina* | Orange-headed Thrush | LC | - |
| 150 | *Saxicoloides fulicatus* | Indian Robin | LC | IV |
| 151 | *Copsychus saularis* | Oriental Magpie Robin | LC | IV |
| 152 | *Saxicola caprata* | Pied Bush Chat | LC | IV |
| 153 | *Chloropsis jerdoni* | Jerdon's Leafbird | LC | - |
| 154 | *Chloropsis aurifrons* | Golden-fronted Leafbird | LC | - |
| 155 | *Dicaeum agile* | Thick-billed Flowerpecker | LC | IV |
| 156 | *Dicaeum erythrorhynchos* | Pale-billed Flowerpecker | LC | IV |
| 157 | *Cinnyris asiaticus* | Purple Sunbird | LC | IV |
| 158 | *Leptocoma zeylonica* | Purple-rumped Sunbird | LC | IV |
| 159 | *Passer domesticus* | House Sparrow | LC | - |
| 160 | *Gymnoris xanthocollis* | Chestnut-shouldered Petronia | LC | - |
| 161 | *Ploceus philippinus* | Baya Weaver | LC | IV |
| 162 | *Euodice malabarica* | Indian Silverbill | LC | IV |
| 163 | *Amandava amandava* | Red Avadavat | LC | IV |
| 164 | *Lonchura malacca* | Black-headed Munia | LC | IV |
| 165 | *Lonchura punctulata* | Scaly-breasted Munia | LC | IV |
| 166 | *Motacilla madaraspatensis* | White-browed Wagtail | LC | IV |
| 167 | *Anthus rufulus* | Paddyfield Pipit | LC | IV |

** Status assigned by the International Union for Conservation of Nature and Natural Resources, where - CR – Critically Endangered; EN – Endangered; LC – Least Concern; NA – Not Assessed; NT – Near Threatened; VU – Vulnerable*

*Sources: R. Grimmett, C. Inskipp & T. Inskipp, Birds of the Indian Subcontinent; Salim Ali, Book of Indian Birds; IUCN Red Data List*

### *Mammals (other than Bats)*

Table 8-4 below presents mammals associated with the study area.

**Table 8-4: Mammals associated with the Study Area**

| Sr.No. | Scientific Name | Common Name | IUCN Status* | WPA Schedule |
|---|---|---|---|---|
| 1 | *Macaca mulatta* | Rhesus Macaque | LC | II |
| 2 | *Macaca radiata* | Bonnet Macaque | LC | II |
| 3 | *Semnopithecus entellus* | Northern Plains Langur | LC | II |
| 4 | *Panthera pardus* | Common Leopard | LC | I |
| 5 | *Melursus ursinus* | Sloth Bear | VU | I |
| 6 | *Vulpes bengalensis* | Indian Fox | LC | II |
| 7 | *Hyaena hyaena* | Striped Hyena | LC | III |
| 8 | *Canis aureus* | Jackal | LC | II |
| 9 | *Muntacus muntjak* | Indian Muntjac | LC | III |
| 10 | *Rusa unicolor* | Sambar | VU | III |
| 11 | *Axis axis* | Spotted Deer | LC | III |
| 12 | *Boselaphus tragocamelus* | Nilgai | LC | III |
| 13 | *Tetracerus quadricornis* | Four-horned Antelope | VU | I |
| 14 | *Gazella benettii* | Indian Gazelle | LC | I |
| 15 | *Antilope cervicapra* | Blackbuck | NT | I |
| 16 | *Sus scrofa* | Indian Wild Pig | LC | III |
| 17 | *Canis lupus* | Grey Wolf | LC | I |
| 18 | *Felis chaus* | Jungle Cat | LC | II |
| 19 | *Prionailurus rubiginosus* | Rusty-spotted Cat | VU | I |
| 20 | *Viverricula indica* | Small Indian Civet | LC | II |
| 21 | *Paradoxurus hermaphroditus* | Common Palm Civet | LC | II |
| 22 | *Herpestes smithii* | Grey Mongoose | LC | IV |
| 23 | *Herpestes edwardsii* | Grey Mongoose | LC | IV |
| 24 | *Mellivora capensis* | Honey Badger | LC | I |
| 25 | *Tetera indica* | Indian Gerbil | LC | - |
| 26 | *Manis crassicaudata* | Indian Pangolin | EN | I |
| 27 | *Lepus nigricollis* | Indian Hare | LC | IV |
| 28 | *Anathana ellioti* | Madras Tree Shrew | LC | - |
| 29 | *Suncus murinus* | House Shrew | LC | - |
| 30 | *Suncus etruscus* | Pygmy Shrew | LC | - |
| 31 | *Hystrix indica* | Indian Crested Porcupine | LC | IV |
| 32 | *Funambulus palmarum* | Three-striped Palm Squirrel | LC | - |
| 33 | *Bandicota indica* | Large Bandicoot-rat | LC | V |
| 34 | *Bandicota bengalensis* | Lesser Bandicoot-rat | LC | V |
| 35 | *Rattus rattus* | House Rat | LC | V |
| 36 | *Millardia meltada* | Soft-furred Field Rat | LC | V |
| 37 | *Madromys blanfordi* | White-tailed Wood Rat | LC | V |
| 38 | *Golunda ellioti* | Indian Bush Rat | LC | V |
| 39 | *Vandeleuria oleracea* | Asiatic Long-tailed Climbing Mouse | LC | V |
| 40 | *Mus musculus* | House Mouse | LC | V |
| 41 | *Mus booduga* | Little Indian Field Mouse | LC | V |
| 42 | *Mus phillipsi* | Wroughton's Mouse | LC | V |
| 43 | *Mus platythrix* | Spiny Field Mouse | LC | V |
| 44 | *Mus terricolor* | Pygmy Field Mouse | LC | V |

** Status assigned by the International Union for Conservation of Nature and Natural Resources, where - EN – Endangered; LC – Least Concern; NT – Near Threatened; VU – Vulnerable*

*Sources: Forest Working Plan for the Forest of Hyderabad and Rangareddy District; Vivek Menon, A Field Guide to Indian Mammals (2014); IUCN Red Data List*

### *Bats*

Species of bats associated with the study are presented in Table 8-5 below.

**Table 8-5: Bat associated with the Study Area**

| Sr.No. | Scientific Name | Common Name | IUCN Status* | WPA Schedule |
|---|---|---|---|---|
| 1 | *Pteropus giganteus* | Indian Flying Fox | LC | V |
| 2 | *Rousettus leschenaultia* | Fulvous Fruit Bat | LC | V |
| 3 | *Cynopterus sphinx* | Greater Short-nosed Fruit Bat | LC | V |
| 4 | *Taphozous nudiventris* | Naked-rumped Tomb Bat | LC | - |
| 5 | *Taphozous longimanus* | Long-winged Tomb Bat | LC | - |
| 6 | *Rhinolophus rouxii* | Rufous Horseshoe Bat | LC | - |
| 7 | *Rhinolophus lepidus* | Blyth's Horseshoe Bat | LC | - |
| 8 | *Rhinolophus pusillus* | Least Horseshoe Bat | LC | - |
| 9 | *Hipposideros speoris* | Schneider's Leaf-nosed Bat | LC | - |
| 10 | *Hipposideros fulvus* | Fulvous Leaf-nosed Bat | LC | - |
| 11 | *Hipposideros galeritus* | Cantor's Leaf-nosed Bat | LC | - |
| 12 | *Megaderma lyra* | Greater False Vampire | LC | - |
| 13 | *Rhinolophus beddomei* | Lesser Woolly Horseshoe Bat | LC | - |
| 14 | *Tadarida plicata* | Wrinkle-lipped Free-tailed Bat | LC | - |
| 15 | *Scotophilus heathii* | Asiatic Greater Yellow House Bat | LC | - |
| 16 | *Murina cyclotis* | Round-eared Tube-nosed Bat | LC | - |
| 17 | *Pipistrellus coromandra* | Indian Pipistrelle | LC | - |
| 18 | *Pipistrellus abramus* | Japanese Pipistrelle | LC | - |
| 19 | *Pipistrellus tenuis* | Indian Pygmy Bat | LC | - |
| 20 | *Pipistrellus ceylonicus* | Kelaart's Pipistrelle | LC | - |
| 21 | *Pipistrellus dormeri* | Dormer's Bat | LC | - |
| 22 | *Pipistrellus javanicus* | Javan Pipistrelle | LC | - |
| 23 | *Pipistrellus affinis* | Chocolate Pipistrelle | LC | - |
| 24 | *Hesperoptenus tickelli* | Tickell's Bat | LC | - |
| 25 | *Eonycteris spelaeaLesser* | Dawn Bat | LC | V |
| 26 | *Kerivoula picta* | Painted Bat | LC | - |

** Status assigned by the International Union for Conservation of Nature and Natural Resources, where - LC – Least Concern*
*Sources: Vivek Menon, A Field Guide to Indian Mammals (2014); IUCN Red Data List*

### *Reptiles*

Species of reptiles associated with the study area are presented in Table 8-6 below.

**Table 8-6: Reptiles associated with the Study Area**

| Sr.No. | Scientific Name | Common Name | IUCN Status | WPA Schedule |
|---|---|---|---|---|
| 1 | *Ramphotyphlops braminus* | Common Worm Snake | NA | IV |
| 2 | *Grypotyphlops acutus* | Beaked Worm Snake | LC | IV |
| 3 | *Python molurus* | Indian Rock Python | VU | I |
| 4 | *Gongylophis conicus* | Common Sand Boa | NA | IV |
| 5 | *Eryx johnii* | Red Sand Boa | NA | IV |
| 6 | *Coelognathus helena helena* | Indian Trinket Snake | NA | IV |
| 7 | *Ptyas mucosa* | Indian Rat Snake | NA | II |
| 8 | *Argyrogena fasciolata* | Banded Racer | NA | IV |
| 9 | *Oligodon taeniolatus* | Streaked Kukri Snake | LC | IV |
| 10 | *Oligodon arnensis* | Banded Kukri Snake | NA | IV |
| 11 | *Dendrelaphis tristis* | Common Bronzeback Tree | NA | IV |

| Sr.No. | Scientific Name | Common Name | IUCN Status | WPA Schedule |
|---|---|---|---|---|
| | | Snake | | |
| 12 | *Lycodon striatus* | Barred Wolf Snake | NA | IV |
| 13 | *Lycodon aulicus* | Common Wolf Snake | NA | IV |
| 14 | *Dryocalamus nympha* | - | NA | - |
| 15 | *Sibynophis subpunctatus* | Common Black-headed Snake | NA | IV |
| 16 | *Xenochrophis piscator* | Checkered Keelback Water Snake | NA | IV |
| 17 | *Amphiesma stolatum* | Buff-striped Keelback | NA | IV |
| 18 | *Macropisthodon plumbicolor* | - | NA | - |
| 19 | *Boiga trigonata* | Indian Gamma Snake | LC | IV |
| 20 | *Ahaetulla nasuta* | Common Vine Snake | NA | IV |
| 21 | *Bungarus caeruleus* | Indian Krait | NA | IV |
| 22 | *Naja naja* | Spectacled Cobra | NA | II |
| 23 | *Daboia russelli* | Eastern Russell's Viper | NA | II |
| 24 | *Echis carinatus* | Saw-scaled Viper | NA | IV |
| 25 | *Calotes versicolor* | Indian Garden Lizard | NA | - |
| 26 | *Psammophilus dorsalis* | South Indian Rock Agama | LC | - |
| 27 | *Sitana ponticeriana* | Fan-throated Lizard | LC | - |
| 28 | *Chamaeleo zeylanicus* | South Asian Chamaeleon | - | II |
| 29 | *Calodactylodes aureus* | Indian Golden Gecko | LC | I |
| 30 | *Geckoella nebulosa* | Clouded Ground Gecko | - | - |
| 31 | *Hemidactylus bowringii* | Bowring's Gecko | NA | - |
| 32 | *Hemidactylus frenatus* | Asian House Gecko | LC | - |
| 33 | *Hemidactylus leschenaultii* | Bark Gecko | NA | - |
| 34 | *Ophisops leschenaultii* | Leschenault's Lacerta | NA | - |
| 35 | *Eutropis carinata* | Keeled Indian Mabuya | LC | - |
| 36 | *Mabuya macularia* | Bronze Grass Skink | NA | - |
| 37 | *Varanus bengalensis* | Common Indian Monitor | LC | I |
| 38 | *Geochelone elegans* | Indian Star Tortoise | LC | IV |

** Status assigned by the International Union for Conservation of Nature and Natural Resources, where - LC – Least Concern; NA – Not Assessed; VU – Vulnerable*

*Sources: Indraneil Das, Snakes & other Reptiles of India; Romulus Whitaker & Ashok Captain, Snakes of India; IUCN Red Data List*

## 8.3 Findings on Habitat

### 8.3.1 Natural Habitat

The study-area represents degraded Southern tropical dry mixed deciduous forest and Southern Tropical Thorn Forest, with their natural vegetation profile modified to varying extents from place to place.

Near pristine patch of vegetation were also observed near hillocks and seasonal streams

The terrain is mostly undulating with low hills interspersed with plain areas. Project area forms the catchment area of Musi River. Natural water-bodies in the survey-area comprise a number of shallow seasonal streams and a few seasonal ponds. Two seasonal ponds were observed in the study area.

### 8.3.2 Modified Habitat

Much of the study area is a modified habitat, mainly in the form of farmlands, roadside plantations, pasturelands, scattered villages and roads.

There exist small one or two patches of natural vegetation on hillocks in some part of study area, their extent ranging from a single tree to dense copses composed of diverse native plant species. However, most of the uncultivated and open areas are covered by large patches of *Lantana camera* and invasive alien species

### 8.3.3 Critical Habitat

The survey-area is likely to be containing habitats that are of significant importance to species of critical conservation-value. This section lists such species.

#### *Migratory and/or Congregatory Species*

The entire Indian subcontinent, including study-area, is situated within the limits of the Central Asian Flyway (CAF), one of the eight major flyways identified worldwide. The CAF connects a large swathe of the Palaearctic region with the Indian subcontinent and contains well-established routes along which a number of bird-species migrate annually.

Thus, the study-area is very likely to fall in the flight-path of the various winter, summer and passage visitor-birds migrating either to, or through, the region in which it is situated.

No congregatory avifaunal species has a recorded range that includes the study-area.

**Table 8-7** below lists the migratory avifaunal species associated with the study area. It also gives the season of migration, the conservation status as per the IUCN Red Data List and the schedule under which the species is protected by the Wildlife (Protection) Act (1972) of India, for each species.

**Table 8-7: Migratory Avifauna associated with the Study Area**

| Sr.No. | Scientific Name | Common Name | Migratory Status | IUCN Status | WPA Schedule |
|---|---|---|---|---|---|
| 1 | *Conturnix conturnix* | Common Quail | Winter | LC | IV |
| 2 | *Conturnix coromandelica* | Rain Quail | Winter | LC | IV |
| 3 | *Anser indicus* | Bar-headed Goose | Winter | LC | IV |
| 4 | *Tadorna ferruginea* | Ruddy Shelduck | Winter | LC | IV |
| 5 | *Anas strepera* | Gadwall | Winter | LC | IV |
| 6 | *Anas penelope* | Eurasian Wigeon | Winter | LC | IV |
| 7 | *Anas clypeata* | Northern Shoveler | Winter | LC | IV |
| 8 | *Anas acuta* | Northern Pintail | Winter | LC | IV |
| 9 | *Anas querquedula* | Garganey | Winter | LC | IV |
| 10 | *Anas crecca* | Common Teal | Winter | LC | IV |
| 11 | *Netta rufina* | Red-crested Pochard | Winter | LC | IV |
| 12 | *Aythya ferina* | Common Pochard | Winter | LC | IV |
| 13 | *Aythya fuligula* | Tufted Duck | Winter | LC | IV |
| 14 | *Ciconia ciconia* | White Stork | Winter | LC | IV |
| 15 | *Anastomus oscitans* | Asian Openbill | Winter | LC | IV |

| Sr.No. | Scientific Name | Common Name | Migratory Status | IUCN Status | WPA Schedule |
|---|---|---|---|---|---|
| 16 | *Plegadis falcinellus* | Glossy Ibis | Winter | LC | IV |
| 17 | *Phoenicopterus roseus* | Greater Flamingo | Winter | LC | IV |
| 18 | *Egretta intermedia* | Intermediate Egret | Winter | LC | IV |
| 19 | *Anhinga melanogaster* | Darter | Winter | NT | IV |
| 20 | *Microcarbo niger* | Little Cormorant | Winter | LC | IV |
| 21 | *Phalacrocorax fuscicollis* | Indian Cormorant | Winter | LC | IV |
| 22 | *Phalacrocorax carbo* | Great Cormorant | Winter | LC | IV |
| 23 | *Falco tinnunculus* | Common Kestrel | Winter | LC | IV |
| 24 | *Falco peregrinus* | Peregrine Falcon | Winter | LC | IV |
| 25 | *Pandion haliaetus* | Osprey | Winter | LC | I |
| 26 | *Circus aeruginosus* | Eurasian Marsh Harrier | Winter | LC | IV |
| 27 | *Circus macrourus* | Pallid Harrier | Winter | NT | IV |
| 28 | *Circus pygargus* | Montagu's Harrier | Winter | LC | IV |
| 29 | *Hieraaetus pennatus* | Booted Eagle | Winter | LC | IV |
| 30 | *Porzana pusilla* | Baillon's Crake | Winter | LC | IV |
| 31 | *Turnix tanki* | Yellow-legged Buttonquail | Winter | LC | IV |
| 32 | *Grus virgo* | Demoiselle Crane | Winter | LC | IV |
| 33 | *Himantopus himantopus* | Black-winged Stilt | Winter | LC | IV |
| 34 | *Philomachus pugnax* | Ruff | Winter | LC | - |
| 35 | *Gallinago gallinago* | Common Snipe | Winter | LC | IV |
| 36 | *Gallinago stenura* | Pin-tailed Snipe | Winter | LC | IV |
| 37 | *Limosa limosa* | Black-tailed Godwit | Winter | NT | IV |
| 38 | *Numenius arquata* | Eurasian Curlew | Winter | NT | IV |
| 39 | *Tringa erythropus* | Spotted Redshank | Winter | LC | IV |
| 40 | *Tringa tetanus* | Common Redshank | Winter | LC | IV |
| 41 | *Tringa stagnatilis* | Marsh Sandpiper | Winter | LC | IV |
| 42 | *Tringa nebularia* | Common Greenshank | Winter | LC | IV |
| 43 | *Tringa ochropus* | Green Sandpiper | Winter | LC | IV |
| 44 | *Tringa glareola* | Wood Sandpiper | Winter | LC | IV |
| 45 | *Actitis hypoleucos* | Common Sandpiper | Winter | LC | IV |
| 46 | *Calidris temminckii* | Temminck's Stint | Winter | LC | IV |
| 47 | *Calidris minuta* | Little Stint | Winter | LC | IV |
| 48 | *Chroicocephalus ridibundus* | Black-headed Gull | Winter | LC | - |
| 49 | *Gelochelidon nilotica* | Gull-billed Tern | Winter | LC | - |
| 50 | *Chlidonias hybrida* | Whiskered Tern | Winter | LC | - |
| 51 | *Clamator jacobinus* | Jacobin Cuckoo | Summer | LC | IV |
| 52 | *Asio flammeus* | Short-eared Owl | Winter | LC | IV |
| 53 | *Merops philippinus* | Blue-tailed Bee-eater | Passage | LC | - |
| 54 | *Jynx torquilla* | Eurasian Wryneck | Winter | LC | IV |
| 55 | *Coracina melanoptera* | Black-headed Cuckooshrike | Passage | LC | IV |
| 56 | *Lanius cristatus* | Brown Shrike | Winter | LC | - |
| 57 | *Dicrurus leucophaeus* | Ashy Drongo | Winter | LC | IV |
| 58 | *Oriolus kundoo* | Indian Golden Oriole | Winter | LC | IV |
| 59 | *Terpsiphone paradisi* | Asian Paradise-Flycatcher | Winter | LC | IV |
| 60 | *Cecropis daurica* | Red-rumped Swallow | Winter | LC | - |
| 61 | *Hirundo rustica* | Barn Swallow | Winter | LC | - |
| 62 | *Acrocephalus stentoreus* | Clamorous Reed-Warbler | Winter | LC | - |
| 63 | *Acrocephalus dumetorum* | Blyth's Reed-Warbler | Winter | LC | - |
| 64 | *Iduna rama* | Sykes's Warbler | Winter | LC | - |

| Sr.No. | Scientific Name | Common Name | Migratory Status | IUCN Status | WPA Schedule |
|---|---|---|---|---|---|
| 65 | *Iduna caligata* | Booted Warbler | Winter | LC | - |
| 66 | *Phylloscopus humei* | Hume's Leaf Warbler | Winter | LC | - |
| 67 | *Phylloscopus trochiloides* | Greenish Warbler | Passage | LC | - |
| 68 | *Phylloscopus (trochiloides) nitidus* | Green Warbler | Passage | LC | - |
| 69 | *Sylvia curruca* | Lesser Whitethroat | Winter | LC | - |
| 70 | *Sylvia althaea* | Hume's Whitethroat | Winter | LC | - |
| 71 | *Sturnia malabarica* | Chestnut-tailed Starling | Winter | LC | IV |
| 72 | *Pastor roseus* | Rosy Starling | Winter | LC | IV |
| 73 | *Luscinia svecica* | Bluethroat | Winter | LC | IV |
| 74 | *Phoenicurus ochruros* | Black Redstart | Winter | LC | IV |
| 75 | *Saxicola torquatus* | Common Stonechat | Winter | LC | IV |
| 76 | *Monticola solitarius* | Blue Rock Thrush | Winter | LC | IV |
| 77 | *Muscicapa dauurica* | Asian Brown Flycatcher | Summer | LC | IV |
| 78 | *Ficedula parva* | Red-breasted Flycatcher | Winter | LC | IV |
| 79 | *Ficedula albicilla* | Taiga Flycatcher | Winter | LC | IV |
| 80 | *Ficedula superciliaris* | Ultramarine Flycatcher | Winter | LC | IV |
| 81 | *Cyornis tickelliae* | Tickell's Blue Flycatcher | Winter | LC | IV |
| 82 | *Motacilla flava* | Yellow Wagtail | Winter | LC | - |
| 83 | *Motacilla cinerea* | Grey Wagtail | Winter | LC | - |
| 84 | *Motacilla alba* | White Wagtail | Winter | LC | - |
| 85 | *Anthus godlewskii* | Blyth's Pipit | Winter | LC | IV |
| 86 | *Anthus trivialis* | Tree Pipit | Winter | LC | IV |
| 87 | *Emberiza buchanani* | Grey-necked Bunting | Winter | LC | IV |
| 88 | *Emberiza bruniceps* | Red-headed Bunting | Winter | LC | IV |

** Status assigned by the International Union for Conservation of Nature and Natural Resources, where - LC – Least Concern; NT – Near Threatened*

*Sources: R. Grimmett, C. Inskipp & T. Inskipp, Birds of the Indian Subcontinent; Salim Ali, Book of Indian Birds; IUCN Red Data List*

### *Critically Endangered or Endangered Species*

**Table 8-8** and **Table 8-9** list the faunal species associated with the study-area which are designated as either 'Critically Endangered' or 'Endangered' as per the IUCN Red Data List. The Schedule under which each species is protected under the Wildlife (Protection) Act (1972) of India is also given.

#### Mammals

Table below presents the crtitically endangered / endangered mammals within the study area.

**Table 8-8: Critically Endangered/Endangered Mammals associated with the Study Area**

| Sr. No. | Scientific Name | Common Name | IUCN Status* | WPA Schedule |
|---|---|---|---|---|
| 1 | *Manis crassicaudata* | Indian Pangolin | EN | I |

** Status assigned by the International Union for Conservation of Nature and Natural Resources, where - EN – Endangered*

*Sources: Vivek Menon, A Field Guide to Indian Mammals; IUCN Red List*

#### Avifauna

Table below presents the critically endangered/ endangered birds associated with the study area.

**Table 8-9: Critically Endangered/Endangered Birds associated with the Study Area**

| Sr.No. | Scientific Name | Common Name | IUCN Status* | WPA Schedule |
|---|---|---|---|---|
| 1 | *Neophron percnopterus* | Egyptian Vulture | EN | IV |
| 2 | *Gyps bengalensis* | White-rumped Vulture | CR | I |
| 3 | *Gyps indicus* | Indian Vulture | CR | I |
| 4 | *Sarcogyps calvus* | Red-headed Vulture | CR | IV |
| 5 | *Ardeotis nigriceps* | Great Indian Bustard | CR | I |
| 6 | *Sypheotides indicus* | Lesser Florican | EN | I |

** Status assigned by the International Union for Conservation of Nature and Natural Resources, where - CR – Critically Endangered; EN – Endangered*
*Sources: R. Grimmett, C. Inskipp & T. Inskipp, Birds of the Indian Subcontinent; Salim Ali, Book of Indian Birds; IUCN Red Data List*

### Endemic/Restricted Range Species

**Table 8-10** below lists the species that are endemic to, or have restricted ranges that include, the study-area.

**Table 8-10: Endemic / Restricted Range Species associated with the Study Area**

| Sr. No. | Scientific Name | Common Name | Range |
|---|---|---|---|
| **Birds** | | | |
| 1 | *Perdicula argoondah* | Rock Bush Quail | Central & Western India |
| 2 | *Galloperdix spadicea* | Red Spurfowl | Peninsular India |
| 3 | *Galloperdix lunulata* | Painted Spurfowl | Peninsular India |
| 4 | *Strix ocellata* | Mottled Wood Owl | Peninsular India |
| **Mammals** | | | |
| 1 | *Pipistrellus abramus* | Japanese Pipistrelle | Andhra Pradesh, Arunachal Pradesh, Meghalaya & Uttar Pradesh |
| **Reptiles** | | | |
| 1 | *Calodactylodes aureus* | Indian Golden Gecko | Rocky outcrops of Telangana, Andhra Pradesh & Tamil Nadu |
| 2 | *Geckoella nebulosa* | Clouded Ground Gecko | Hills of India's East Coast & Deccan Plateau of Telangana & Andhra Pradesh |

Sources: *Vivek Menon, A Field Guide to Indian Mammals; R. Grimmett, C. Inskipp & T. Inskipp, Birds of the Indian Subcontinent; Salim Ali, Book of Indian Birds; Indraneil Das, Snakes & other Reptiles of India; Romulus Whitaker & Ashok Captain, Snakes of India*

## 8.3.4 Invasive Alien/Non-native Species

Table below lists a few invasive alien/non-native plant species recorded in the study area.

**Table 8-11: Invasive Alien/Non-native Species of the Study Area**

| Sr. No. | Species | Habit | Vernacular Name |
|---|---|---|---|
| 1 | *Prosopis juliflora* | Tree | Jammi |
| 2 | *Parthenium hysterophorus* | Herb | Chatak Chandani |

## 8.4 Designated Area

Naskal Reserve Forest and Somangurti Reserve Forest, which are around 4 km north-west of the proposed study area, are the nearest protected areas. Mrugavani National Park, located approximately 42 km from the project area, is the nearest National Park. Manjira wildlife sanctuary, a reservoir located approximately 56 km from the project area, is the nearest Important Bird Area (IBA).

Kasu Brahmananda Reddy National Park, located around 54 km from the project area, and Jawahar Deer Park, also known as Shamirpet Deer Park, located around 75 km from the project area, are other designated areas nearby.

## 8.5 Ecosystem Services

### *Provisioning Services*

- ***Crops***

The natural flows of the survey-area carry nutrients from the relatively higher lands and slopes to the lowest-lying plains which are cultivated by the local residents. Table 8-12 lists some of the seasonal crops grown in the study-area.

**Table 8-12: Crops associated with the Study Area**

| Sr.No. | Species | Common Name | Type of Crop |
|---|---|---|---|
| 1 | *Arachis hypogea* | Groundnut | Nut, Oil-seed |
| 2 | *Gossypium herbaceum* | Cotton | Fibre |
| 3 | *Curcuma longa* | Turmeric | Spice |
| 4 | *Helianthus annuus* | Sunflower | Oil-seed |
| 5 | *Oryza sativa* | Paddy | Grain |
| 6 | *Tagetes patula* | Marigold | Flower |
| 7 | *Zea mays* | Corn | Grain |
| 8 | *Lycopersicum esculentum* | Tomato | Vegetable |
| 9 | *Capsicum frutescens* | Chili | Spice |

- ***Fodder***

The pasturelands and fallow fields of the survey-area support plants that serve as fodder for the domestic cattle (including buffaloes, cows and plough and draught oxen), sheep and goats of the area. Crop residue is also an important source of fodder for this livestock.

- ***Fuel / Timber wood***

Villagers living with in the vicinity of project area are dependent on trees and shrubs growing in the area for fuel, even fallen twigs are gathered by the local community for use as fuel. They are also dependent of forest to meet timber requirement for construction of their hutment, cattle sheds and agricultural implements etc. Thorny plants are removed and used for fencing. Some of the tree species in the project area are reported to be used by the local communities for various purposes. A

list of some commonly occurring species recorded during the survey with their miscellaneous uses is given in **Table 8-13**.

**Table 8-13: Useful Species associated with the Study Area**

| Sr.No. | Species | Habit | Common Name | Uses |
|---|---|---|---|---|
| 1 | *Aegle marmelos* | Tree | Bhelphal , maredu | Fruit, Medicinal |
| 2 | *Anona squamosa* | Tree | Seetaphal | Fruit |
| 3 | *Azadirachta indica* | Tree | Neem, Vepa | Timber, Medicine |
| 4 | *Butea monosperma* | Tree | Palash | Leaves |
| 5 | *Ficus racemosa* | Tree | Pepal | Fuel |
| 6 | *Lagerstroemia parviflora* | Tree | Chennagi | Poles |
| 7 | *Santalum album* | Tree | Chandan | Essential Oil |
| 8 | *Ziziphus oenoplia* | Shrub | Pariki | Fruit |

***Source:*** Working Plan for the Forest of Ranga Reddy Division (2003-2004), Ranga Reddy District Forest Deptt., Govt. of Andhra Pradesh

## 8.6 Impact Assessment

The impact of wind turbines on wildlife, most notably on birds and bats, has been deaths from collisions with wind turbines and due to changes in air pressure caused by the spinning turbines, as well as from habitat disruption.

The potential impacts during the construction and operation phase of the project are outlined in the following sections:

### 8.6.1 Construction Phase

#### *Impacts*

The construction activities for the project will involve clearing of land at the turbine-sites and along access-roads. This will directly cause the loss of microhabitats and overall habitat-area, as well as, fragmentation of habitats. The microhabitats and habitats involved are likely to be providing feeding grounds, breeding areas and/or roosting sites to resident faunal species. Thus, the construction-related site-clearance activities may potentially lead to death or degradation in the quality of life of the organisms' dependant on the project area.

Apart from this, the affected area is also likely to be supporting species that serve the food, medicinal, fodder, fuel, and fibre and timber needs of the local community. The construction-related site-clearance activities may potentially destroy or damage such living natural resources.

Most of the study area consists of agricultural and fallow land, very few trees exist on the site hence no forest cover will be lost.

**Displacement due to disturbance**

The displacement of birds from areas within and surrounding wind farms due to visual intrusion and disturbance can amount effectively to habitat loss. Displacement may occur during both the construction and operational phases of windmills, and may be caused by the presence of the turbines themselves through visual, noise, and vibration impacts, or because of vehicle/vessel and personnel movements related to site maintenance.

### *Mitigation Measures*

The following mitigation measures shall be adopted:

- The site clearance for tower erection, access road and ancillary facilities shall be restricted to the necessary footprint area around WTGs;
- No vegetation shall be removed from land which are not directly required for any construction activity;
- Cutting or lopping of trees shall be avoided. Mature trees and standing dead trees shall not be cut or lopped under any circumstances;
- The crane staging area, intervening areas, overhead clearance for suspended turbine components shall be planned in such a way that minimum tree-felling is required;
- Every effort must be taken to avoid and contain environmental pollution in any form. Solid or liquid waste generated by the project, or by project-related activities, should not be allowed to contaminate soil, ground-water or surface water-bodies.
- Areas around the turbine shall be rehabilitated at the earliest and emphasis should be given on increasing the green-cover in and around the project-site to ameliorate project-induced disturbances and enhance the ecological value of the area. Project proponent should use only native species for plantations. No exotic or non-native species should be planted in the area.

### *Impact Significance*

The impact of the project on the ecological environment is assessed to be minor with mitigation measures.

**Table 8-14: Impact Value – Construction Phase**

| Aspect | Scenario | Spread | Duration | Intensity | Overall |
|---|---|---|---|---|---|
| Ecology | Without Mitigation | Local | Short | Moderate | Low |
| | With Mitigation | Local | Short | Low | Minor |

## 8.6.2 Operation Phase

The impact of wind turbines on wildlife during operational phase, most notably on birds and bats, has been deaths from collisions with wind turbines and due to changes in air pressure caused by the spinning turbines, as well as from habitat disruption. The potential impacts of wind projects during operational phase may include the following:

- Collision of birds with rotating blades or static elements of turbines, leading to death or bodily damage;

- Barotrauma, internal haemorrhaging induced in bats flying through the low-pressure zone around an operational turbine, leading to disruption of natural life-processes and eventual death;
- Barrage effect, inducing migrating bird-flocks to change their natural flight route, thereby increasing the energy-expense entailed;
- Shooing effect, inducing some birds to maintain a distance from wind turbines, thereby modifying their natural behaviour and access to resources;
- Barriers in the pathway of migration can force the birds to divert from their usual trajectory, thereby increasing energy expenditure;
- Disturbance due to noise from turbines in operation, also, the sound can disrupt animal vocal communication or impair the animals' ability to hear approaching predators;
- In addition the wind masts are supported by very thin steel wires that are not visible from a distance, which lead to avian collisions and subsequent mortality. It is recommended that the supporting wires of the wind mast and the mast itself should be marked in bright colours or flags to make them prominently visible from a distance.

Bird species associated with the study-area include members of groups considered especially vulnerable to collision-risk from wind turbines, namely raptors and migratory waterfowl. Some of the species concerned are designated as globally threatened or near-threatened by the IUCN.

The entite Indian subcontinent, including study-area, is situated within the limits of the Central Asian Flyway (CAF), one of the eight major flyways identified worldwide. The CAF connects a large swathe of the Palaearctic region with the Indian subcontinent and contains well-established routes along which a number of bird-species migrate annually.

Thus, the study-area is very likely to fall in the flight-path of the various winter, summer and passage visitor-birds migrating either to, or through, the region in which it is situated.

### *Mitigation Measures*

The following measures have been considered in the project design. A few additional mitigation measures have also been recommended:

- The layout provides adequate spaces between each turbine for movement of birds which would reduce the potential for accidental collision;
- Wind Turbines be painted with Orange/ Red strips to prevent bird hitting;
- It is suggested to restrict the wind-turbine operation during low wind-speed periods at night i.e., from sunset till sunrise to reduce collision-risk of nocturnal migrants and bat-fatalities;
- Daytime visual markers shall be provided on any guy wires used to support towers to enhance visibility of the wires to birds;
- Visibility enhancement objects such as marker balls, bird deterrents, or diverters shall also be installed along the transmission line to avoid avian collision;
- Native vegetation must be planted or allowed to grow around the wind-turbines, such that their canopy screens potential prey on the ground from raptors flying overhead;

- Potential rodent-habitats such as heaps of rocks or earthen mounds shall be moved away from the wind-farm-area to avoid attracting raptor bird-species into the area;
- Move potential rodent-habitats such as heaps of rocks or earthen mounds away from the wind-farm-area to avoid attracting raptor bird-species into the area;
- Appropriate storm-water management measure shall be implemented to avoid creating ponds which can attract birds and bats for feeding or nesting in the windfarm area;
- It is recommended that a long-term programme, designed to monitor avifaunal activity with reference to wind-turbines, be instituted at the project-site. The main purpose of such a monitoring programme should be to generate the base-line data required for prediction of collision-risk for the bird-species utilizing the wind-turbine envelope around the year, and, assessment of the significance of such risk to the concerned bird-populations.

Some of the native species that can be used for restoration of project site are as following:

- Tree: *Acacia nilotica, Albizzia lebbek, Annona squamosa, Azadirachta indica, Cassia fistula, Dalbergia sissoo, Derris indica, Emblica officinalis, Feronia elephantum, Pongamia pinnata, Parkinsonia aculeata*.
- Shrubs: *Maytenus senagalensis, Dodonea viscosa, Randia dumetorum*.
- Grasses: *Cynodon dactylon, Cymbopogon martinii, Heteropogon contortus, Paspalidium flavidum*.

### *Impact Significance*

The impact of the project on the ecological environment is assessed to be minor with mitigation measures.

**Table 8-15: Impact Value – Operation Phase**

| Aspect | Scenario | Spread | Duration | Intensity | Overall |
|---|---|---|---|---|---|
| Ecology | Without Mitigation | Local | Long | Moderate | Moderate |
| | With Mitigation | Local | Long | Low | Minor |

# 9. OCCUPATIONAL HEALTH AND SAFETY

This section of the report identifies the possible occupational hazards associated with the construction and operation of the proposed project and suggests appropriate mitigation measures that should be taken in order to prevent and/or minimize the impact of such hazards. The risks have been identified for the construction and operation and maintenance phase of the Project.

## 9.1 Construction Phase

The proposed wind farm is currently in construction phase and impacts envisaged during construction phase have been detailed out in section below:

### 9.1.1 Impacts

The broad activities involved in construction phase are:

- Clearing of Vegetation;
- Construction of access roads and modification of existing roads;
- Excavation of foundations;
- Construction of wind turbine foundations;
- Grid connection installation;
- Excavation of trenches and laying the power and instrumentation cables;
- Assembly/Erection of Wind Turbine Generators (WTGs)

The occupational risks associated with the aforementioned activities have been classified as following:

***Transport and Traffic***

The hazards associated with the transport of wind turbine components include:

- In case of heavy load transfer, there is a possibility that the vehicle can become unbalanced and overturn, posing health and safety risk to drivers.
- Collison risk: While transporting the components through the minor roads, there is a possibility of collision with vehicle coming from the opposite direction and hence posing a risk to life of both the drivers.

***Working at height***

This generally involves workers engaged in activities at height ≥ 2 m, e.g., assembly of wind tower components, transmission towers etc. The workers engaged in such activities can fall or slip from the scaffolding or ladders which may result in minor injuries such as muscle sprain or major ones such as ligament tear, fractures, haemorrhage depending on the height at which they are working. The hazard can also be associated with use of tools and equipment that can contact power lines.

***Electrical work***

This kind of work includes welding activities (e.g., fixing turbine components) and electrical operations (such as laying down transmission lines, connecting the power lines to grid substations etc.). Such activities pose the risk of occupational hazards like eye injuries (from sparks emanating from the welding arc), electrical shocks, electrical burns and fire hazard (due to short-circuiting of power lines).

***Other Hazards***

The workers involved in activities such as loading and unloading of turbine components, crane operation, storage and placing of components etc. are susceptible to risks viz., physical injuries. Inadequate planning and implementation can lead to the following issues:

- ***Physical injuries***: These can occur when workers involved in loading/unloading activities don't adhere to proper ergonomics discipline. Injuries like muscle strain, ligament tear, slip disc can occur which may prove to be fatal.
- ***Trip and fall hazards:*** The injuries are similar to those discussed under working at height. They occur when workers trip over/fall when debris etc. lies in the walkway/passages.
- ***Accident/injury*** due to vehicle collision/slip along terrain: Such incidents can occur during transportation of turbine components onsite. Accident and injury from crane failure during handling of wind turbines.

### 9.1.2 Mitigation Measures

The following mitigation measures should be incorporated:

***Transport and Traffic***

- Turbine components should be carried on low loaders (low deck height) to avoid collision of the blade parts with overhead transmission lines;
- The contractor should also ensure that no person is engaged in driving or operating lifting appliances unless he is sufficiently trained and medically fit;
- Emergency contact numbers should be displayed on all the project vehicles and any incidence of breakdown or accident should be immediately reported;
- Maintaining clear traffic ways and avoid driving of heavy equipments over loose scrap;
- Planning and segregating the location of vehicle traffic, machine operation and walking area and controlling vehicle traffic through establishment of speed limit and on-site trained flag people wearing high visibility vests or outer clothing to direct traffic; and
- Loading and unloading operation of equipment should be done under the supervision of a trained professional.

***Material Handling and Storage:***

- All the turbine components should be stored in a designated location in the material storage yard proposed to be developed in the substation area. The material should be arranged in a systematic manner with proper labelling and without any protrusion or extension onto the access corridor. These should be carried to individual locations as per requirement;
- Storage area should be provided with proper lighting;

- Worksite layout to be planned such as to minimize the need for manual transfer of heavy loads;
- Appropriate packing, safe loading procedures, proper fleet management practices to be developed and implemented onsite to minimize chances of damage to equipment and human life.

***Concrete Work, Erection and Installation Activities:***

- *Provision of training*: It should be ensured that the labour engaged for working at height should be trained for temporary fall protection devices and use of personal fall arrest. All the workers should be made aware of the possible occupational risks/hazards by the way of an Occupational, Health & Safety (OHS) training/awareness programme.
- *Usage of Personal Protective Equipments (PPEs):* All the required safety measures based on the individual's job profile should be provided for construction workers through the contractors. The use of personal protective equipments like
    - shock resistant rubber gloves
    - safety helmets
    - ear muffs
    - safety belts
    - safety shoes

  Periodic inspection of PPEs should be done to ensure that they are in proper condition by keeping records. All work at height should be undertaken during daytime only with sufficient sunlight.
- *Contractor's Role*: The contractor should ensure that no person is engaged in driving or operating lifting appliances unless he is sufficiently trained, competent and reliable, possesses the knowledge of inherent risks involved in the operation and is medically examined periodically. The contractor should ensure that machinery is equipped with a legible, durable load chart that shows the manufacturer's recommended load configurations and maximum load weights.
- Administrative control processes such as job rotation and rest or stretch breaks to be implemented into work processes.

***Lift Operation:***

Lifting operations are an integral component of the construction of any wind energy facility. During the construction phase, components are typically assembled and transported to the site where assembly will take place. This involves using large, complex pieces of lifting equipment to lift loads of varying dimensions and weights numerous times.

The management of lifting operations requires the use of competent personnel, thorough planning, effective communication, and a high level of supervision when carrying out a lift. Consideration should be given to the following:

- Ensure all relevant information is known about the load, e.g., the size, weight, method of slinging, and attachment points.

- Ensure all lifting equipment (including load attachment points) is suitable, capable of supporting the load, in good condition, and in receipt of any statutory inspections required.
- Ensure all supervisors, equipment operators, and slingers are trained and competent in the lifting equipment and intended lifting techniques.
- Where possible, exclusion zones are to be established and maintained in order to prevent any unauthorized access to lifting areas.
- When lifting large loads, ensure weather conditions are favourable for the task. Heavy lifting equipment typically has safe operating parameters included in its operating manual and these parameters should not be exceeded at any time.

Meeting between all parties involved in the lift should be carried out and should include the following:

- Details of the lift;
- Roles of each party involved in the operation;
- Methods used to communicate instructions among the parties.

***Site Safety:***

- Effective work permit system for hot work, electrical work, working at height should be ensured;
- All the lifting appliances should be equipped with a durable chart that shows manufacturer's recommended load configurations and maximum load weights. The chart must be securely attached to the cab and easily visible to operators when they are seated at the control station;
- All lifting appliances should be thoroughly examined by a competent person, prior to engagement with the project;
- Training of workers to be conducted in lifting and material handling techniques including the placement of weight limits;
- Fire extinguishing equipment should be provided in adequate number on site to handle any possible fire outbreaks;
- Hazardous and non-hazardous waste to be stored separately at designated place and should be disposed in environmentally safe manner;
- Implementing good housekeeping practices such as sorting and placing loose construction material or debris in established area away from foot paths;
- Excess waste debris and liquid spills should be cleaned up regularly to avoid slips and falls;
- Display of phone numbers of the city/local fire services, etc. at site should be done;
- An accident reporting and monitoring record should be maintained. The objective should be to minimize such occurrences in the future and attain zero accidents.
- Practice of safety pledge, safety talk and experience sharing for workers to be conducted.

### 9.1.3 Impact Significance

The impact on health and safety is expected to be of local spread, short duration and high intensity and has been assessed to have moderate impact without mitigation measures and minor impact with incorporation of mitigation measures.

**Table 9-1: Impact Value- Occupational Health & Safety – Construction Phase**

| Aspect | Scenario | Spread | Duration | Intensity | Overall |
|---|---|---|---|---|---|
| Occupational Health and Safety | Without Mitigation | Local | Short | High | Moderate |
| | With Mitigation | Local | Short | Moderate | Minor |

## 9.2 Operation and Maintenance Phase

### 9.2.1 Impacts

The health and safety aspects to be considered during operation and maintenance phases of the proposed wind farm at Nazeerabad include:

**Working at height and protection from falling objects**

Working at height occurs frequently throughout all phases of operation at any wind farm, and is especially relevant for maintenance purposes. The main focus when managing working at height should be the prevention of a fall. However, additional hazards that may also need to be considered include: falling objects and adverse weather conditions (wind speed, extreme temperatures, humidity, and wetness). Managing working at height activities requires suitable planning and the allocation of sufficient resources.

**Working in Remote Location**

Wind farm being located in remote location will have less connectivity and poor means of communication may also have occupational health and safety impacts during the operation and maintenance phase of the wind farm.

**Electrical/Fire Hazards**

Turbine maintenance activities like motor/wire repairing will involve electrical work. The workers involved in such activities are susceptible to risks viz., electrical shocks, electrical burns, and fire and/or explosion hazards. The risks have been discussed elaborately in the earlier section.

### 9.2.2 Mitigation Measures

The following mitigation measure to be implemented:

**Working at Height & Protection from Falling Objects**

Preferred mitigation methods may include:

- Eliminate or reduce the requirement to work at height. During the planning and design phases of an installation, specific tasks should be assessed with the aim of removing the need to work at height, if practicable. This would include assembling structures and carrying

out ancillary works at ground level, then lifting the complete structure into position to the extent that is feasible and cost effective;
- If working at height cannot be eliminated, use work equipment or other methods to prevent a fall from occurring. Collective protection systems, such as edge protection or guardrails, should be implemented before resorting to individual fall arrest equipment. In addition, safety nets or airbags can be used to minimize the consequences of a fall should it occur.

In addition to the above, the following points to be considered as method of preventing working at height and falling object incident:

- Ensure all structures are designed and built to the appropriate standards, and have the appropriate means of working-at-height systems fitted;
- Suitable exclusion zones should be established and maintained underneath any working-at-height activities, where possible, to protect workers from falling objects;
- Ensure all employees working at height are trained and competent in the use of all working-at-height and rescue systems in place;
- Provide workers with a suitable work-positioning device; also ensure the connectors on positioning systems are compatible with the tower components to which they are attached.
- Ensure that hoisting equipment is properly rated and maintained and that hoist operators are properly trained;
- When working at height, all tools and equipment should be fitted with a lanyard, where possible, and capture netting should be used if practicable;
- Signs and other obstructions should be removed from poles or structures prior to undertaking work;
- An approved tool bag should be used for raising or lowering tools or materials to workers on elevated structures;
- Avoid conducting tower installation or maintenance work during poor weather conditions and especially where there is a risk of lightning strikes; and
- An emergency rescue plan should be in place detailing the methods to be used to rescue operatives should they become stranded or incapacitated while at height.

**Working in Remote Location**

Areas to consider when planning for remote working include:

- Suitability of communication equipment available for the work crew;
- The training and competence of personnel working remotely and the readiness of all necessary safety equipment in the location;
- Supervision by competent personnel empowered to make decisions based on events and conditions at the work location;
- Means for managers to track the exact location of the working crew;
- Local emergency plan in place; and
- Provision of suitably qualified first-aid-trained personnel in the work crew.

**Electrical and Fire Hazards**

- Wind turbines shall be equipped with an earthing system;
- Personal Protective Equipments (PPEs) e.g., shock resistant rubber gloves, shoes, other protective gear etc. should be provided to workers handling electricity and related components;
- The transformer yard should be provided with fire extinguishers and sand buckets at all strategic locations to deal with any incident of fire;
- Employees involved in electrical works shall be trained in and familiar with the safety-related work practices, safety procedures and other safety requirements that pertain to their respective job assignments; and
- An accident reporting and monitoring record shall be maintained.

### 9.2.3 Impact Value

The impact on health and safety has been assessed to be minor without incorporation of mitigation measures and insignificant with mitigation measures.

**Table 9-2: Impact Value- Occupational Health & Safety – Operation Phase**

| Aspect | Scenario | Spread | Duration | Intensity | Overall |
|---|---|---|---|---|---|
| Occupational Health and Safety | Without Mitigation | Local | Short | Moderate | Minor |
| | With Mitigation | Local | Short | Low | Insignificant |

# 10. WATER, AIR AND SOIL ENVIRONMENT

This section illustrates the baseline settings of the land, air and water environment in the Project area, the potential impacts on them associated with the construction and operation of the Project and suggests specific mitigation measures to avoid/reduce the identified impacts. A study area of radius 5 km around the project site was considered for establishing the baseline conditions and identifying the potential impacts.

## 10.1 Land Use

### 10.1.1 District

The major land use of the Rangareddy district and Mahbubnagar district is agricultural which is spread throughout the district. As per Andhra Pradesh State Remote Sensing Application Centre (2011-2012), major land use of Rangareddy district is agriculture (45.36%) followed by fallow (21.57%). Major land use of Mahbubnagar is also agriculture (61.79%) followed by forest land (15.24%). Table showing land use/ land cover of Rangareddy district and Mahbubnagar district is presented below as **Table 10-1**.

**Table 10-1: Land Use / Land Cover of Project Districts**

| Land use category | Rangareddy | | Mahbubnagar | |
|---|---|---|---|---|
| | Area (Sq km) | Percentage (%) | Area (Sq km) | Percentage (%) |
| Built up area | 857.6 | 11.43 | 315.4 | 1.72 |
| Built up/ Industrial/ Mines | 179.1 | 2.39 | 61.0 | 0.33 |
| Aquaculture | 0.00 | 0.00 | 0.00 | 0.00 |
| Fallow | 1618.9 | 21.57 | 1776.9 | 9.66 |
| Agriculture | 3404.8 | 45.36 | 11364.3 | 61.79 |
| Forest | 663.7 | 8.84 | 2802.1 | 15.24 |
| Waste Land | 533.4 | 7.11 | 1020.2 | 5.55 |
| Water Bodies | 248.7 | 3.31 | 1050.7 | 5.71 |
| Wetlands | 0.00 | 0.00 | 0.1 | 0.00 |
| **Total Geographical Area** | **7506.2** | **100** | **18390.6** | **100** |

*Source: Andhra Pradesh State Remote Sensing Application Centre (2011-2012)*

**Figure 10-1: Land Use/ Land Cover of Rangareddy District**

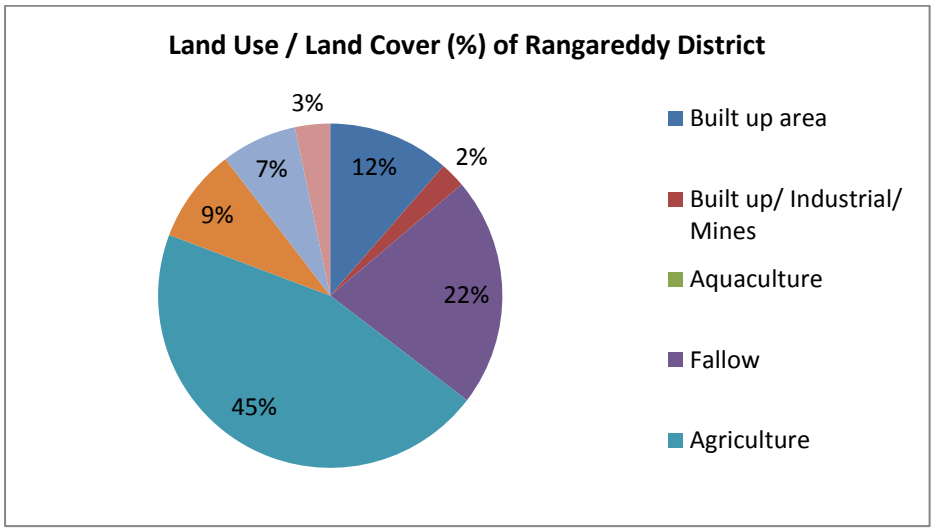
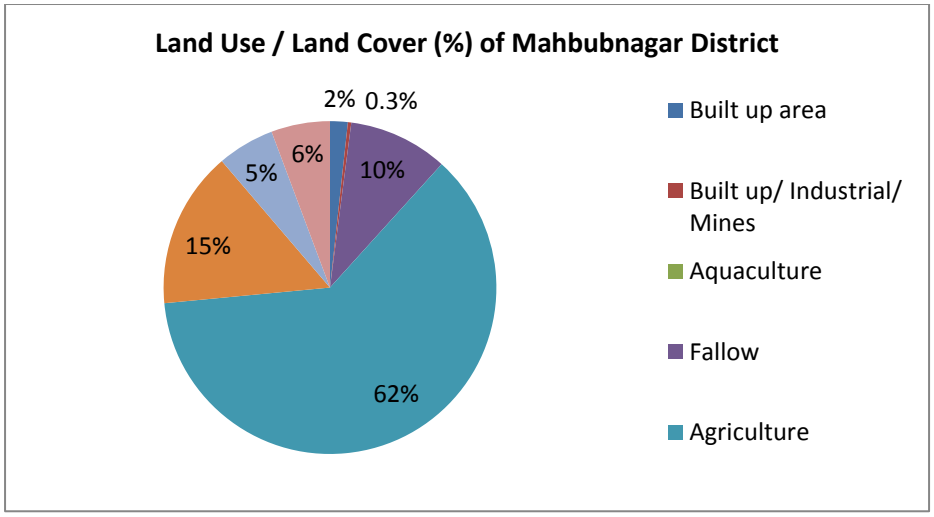



Figure 10-2: Land Use/ Land Cover of Mahbubnagar District




## 10.1.2 Study Area

The study area is characterized by almost flat land with an average elevation of 650 to 700 m above mean sea level (amsl) and comprises predominantly of private agricultural land. Proposed site is located in rural set up and land use pattern of the surrounding area comprises of agricultural land followed by fallow land (rain-fed agricultural land). Fallow land is being used for grazing by locals. The land use pattern of the study area is presented in ***Table 10-2*** and ***Figure 10-3***. The land use analysis depicts that the major land use of the study area is agriculture land (55.89%) followed by fallow land (31.67%) and Hillock/Rocky Land (7.05 %). Settlement, barren land and water bodies constitute 2.23%, 1.45% and 1.37% of the total land respectively.

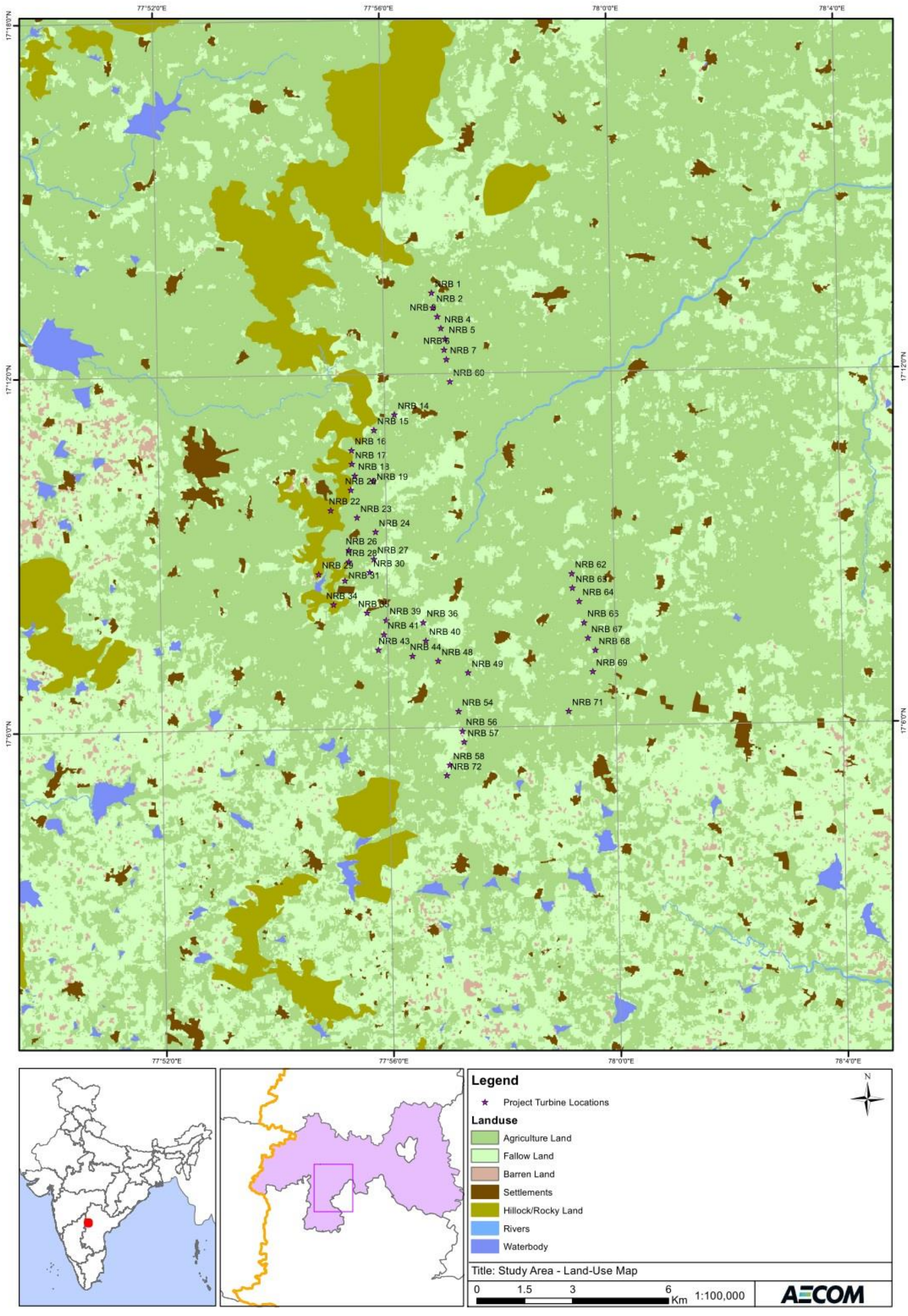
Table 10-2: Land use Pattern in the Study Area

| S. No | Type of land use | Area (Sq. km) | Percentage (%) |
|---|---|---|---|
| 1 | Agriculture Land | 561.82 | 55.89 |
| 2 | Barren Land | 14.612 | 1.45 |
| 3 | Fallow Land | 318.39 | 31.67 |
| 4 | Settlements | 22.41 | 2.23 |
| 5 | Hillock / Rocky Land | 70.83 | 7.05 |

| S. No | Type of land use | Area (Sq. km) | Percentage (%) |
|---|---|---|---|
| 6 | Rivers | 3.45 | 0.34 |
| 7 | Waterbody | 13.78 | 1.37 |
| **Total area** | | **1005.30** | **100** |

*Source: AECOM*

**Figure 10-3: Land-Use Map of Study Area**



## 10.2 Soil profile

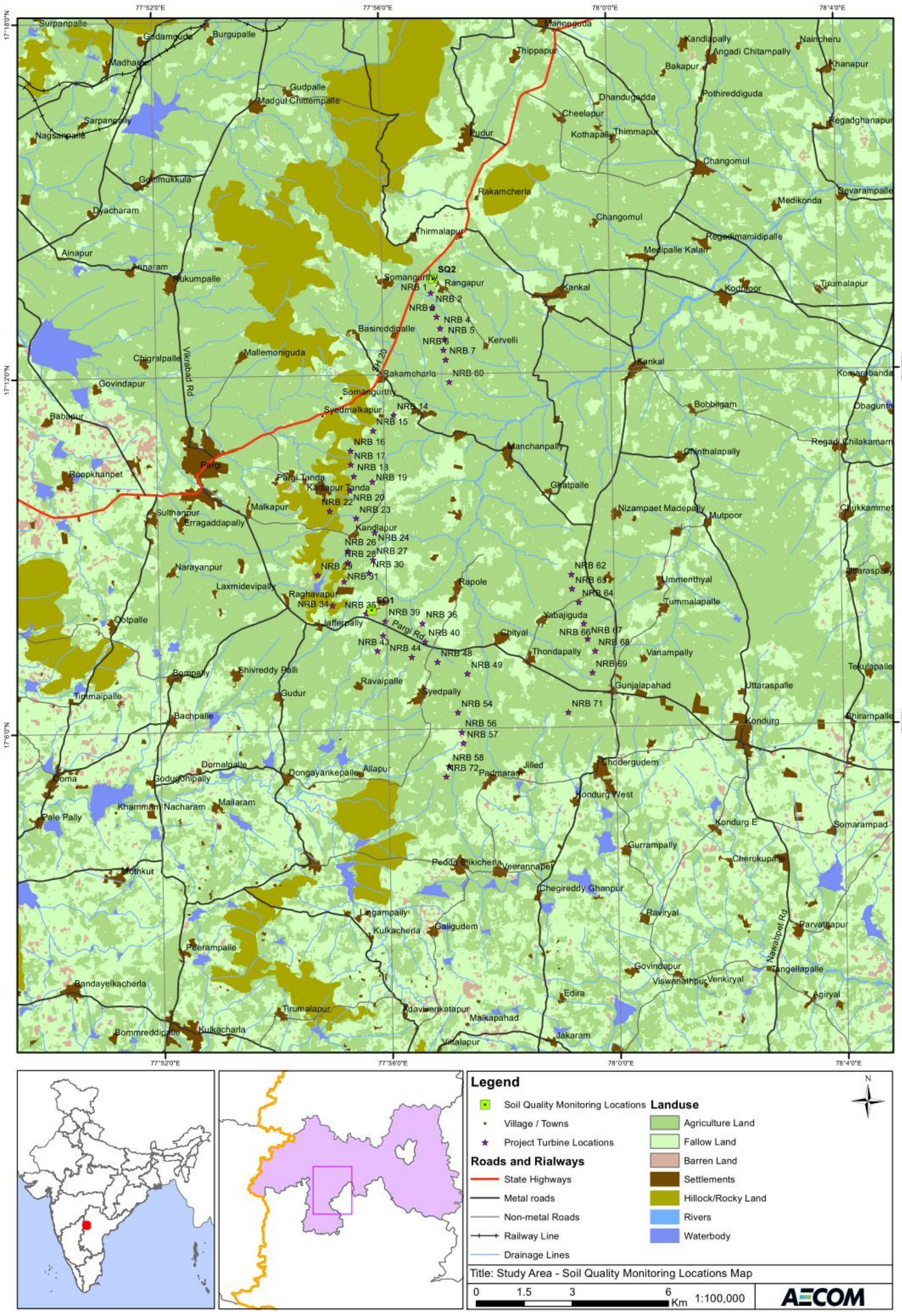
The proposed project site falls in Rangareddy and Mahbubnagar District in Telangana which falls in the Central Part of the Deccan Plateau. Soils of both the districts are of similar quality. Red soil predominates in both the project districts. As per Ground Water Brochure of the project districts (September 2013); Mahbubnagar district is mainly covered by three types of soils viz. red sandy soil (Dubbas and Chalkas), red earth (with loamy sub-soils and Chalkas) and black cotton soils and Rangareddy district is covered also covered by three types of soils, i.e. red soil, medium black and mixed soil. Red sandy soils and red earth are permeable and well drained.

In order to analyse the soil potential of the study area, assessment of the baseline soil quality was carried out. Two sampling locations were selected to assess the existing soil conditions in and around the project area. The physical, chemical and heavy metal concentrations were determined. The details of the sampling locations selected for soil sampling is given in Table below. Map showing soil monitoring locations is presented as **Figure 10-4**.

**Table 10-3: Details of Soil Sampling Locations**

| S. No. | Sampling Locations | Location Code | Geographical Location |
|---|---|---|---|
| 1. | Kervelly Village | SQ1 | 813560.00 m E, 1907038.00 m N |
| 2. | Khudawanpur Village | SQ2 | 811646.00 m E, 1896708.00 m N |

**Figure 10-4: Map showing Soil Quality Monitoring Locations in the Study Area**



### Table 10-4: Results of the Soil Quality Analysis

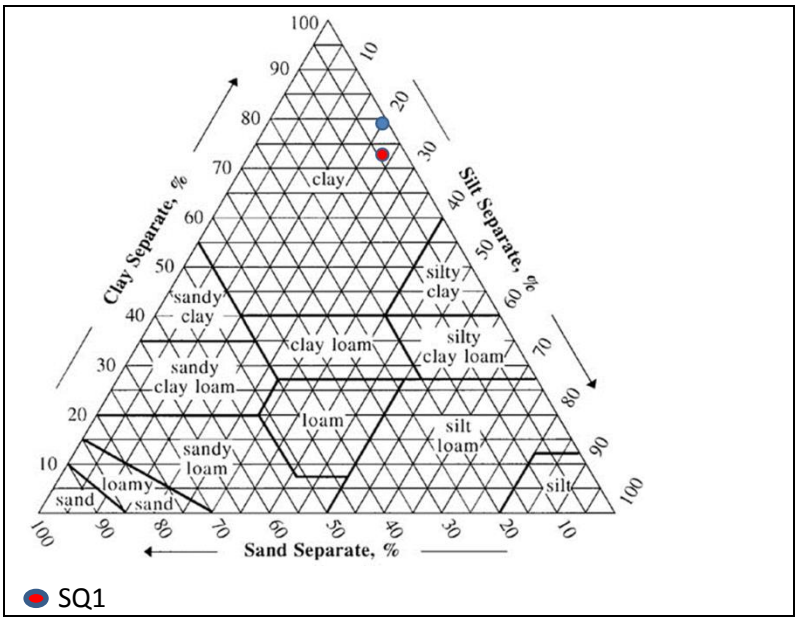
| S. No | Parameter | SQ1 | SQ2 |
|---|---|---|---|
| 1 | pH @ 25°C | 5.49 | 8.32 |
| 2 | Electrical Conductivity @ 25°C in µ mhos/cm | 38 | 177 |
| 3 | Particle Size Distribution in % | | |
| | a) 10 mm | Nil | Nil |
| | b) 4.75 mm | 0.3 | 0.5 |
| | c) 2 mm | 0.8 | 1.0 |
| | d) 425 micron | 42.5 | 40.8 |
| | e) 75 micron | 56.4 | 57.7 |
| 4 | Phosphorous as P in µ g/g | 3.2 | 3.7 |
| 5 | Sodium as Na(Soluble) in meq/100g | BDL (DL: 0.05) | BDL (DL: 0.05) |
| 6 | Potassium as K(Soluble) in meq/100g | BDL (DL: 0.05) | BDL (DL: 0.05) |
| 7 | Total Nitrogen as N in % | 0.52 | 0.48 |
| 8 | Cation Exchange Capacity in meq/l | 0.2 | 0.4 |
| 9 | Texture | | |
| a | Percent Clay | 72 | 78 |
| b | Percent Silt | 22 | 20 |
| c | Percent Sand | 6 | 2 |
| 10 | Permeability in % | 48 | 46 |
| 11 | Porosity in % | 24 | 26 |

*BDL: Below Detection Limit*

*DL: Detection Limit*

Both the soil samples collected from Kervelly Village and Khudwanpur village are from agricultural land. The texture of the soil is observed as clay with 72% clay, 22% silt, 6% sand and 78% clay, 20% slit, 2% sand in Kervelly and Khudwanpur villages respectively. The pH of the samples is observed to be 5.49 and 8.32 respectively. Porosity is 24% in Kervelly and 26% in Khudwanpur village. Permeability is 48% in Kervelly and 46% in Khudwanpur village. Sodium (Na), Potassium (K) in the soil samples are below detection limits.

### Figure 10-5: Soil Texture



SQ2

The soils in general are good in fertility status and agricultural is the main occupation in both the districts. Despite of unfavourable climatic conditions, the project districts are identified as ideal place for cultivating crops such as cotton, maize.

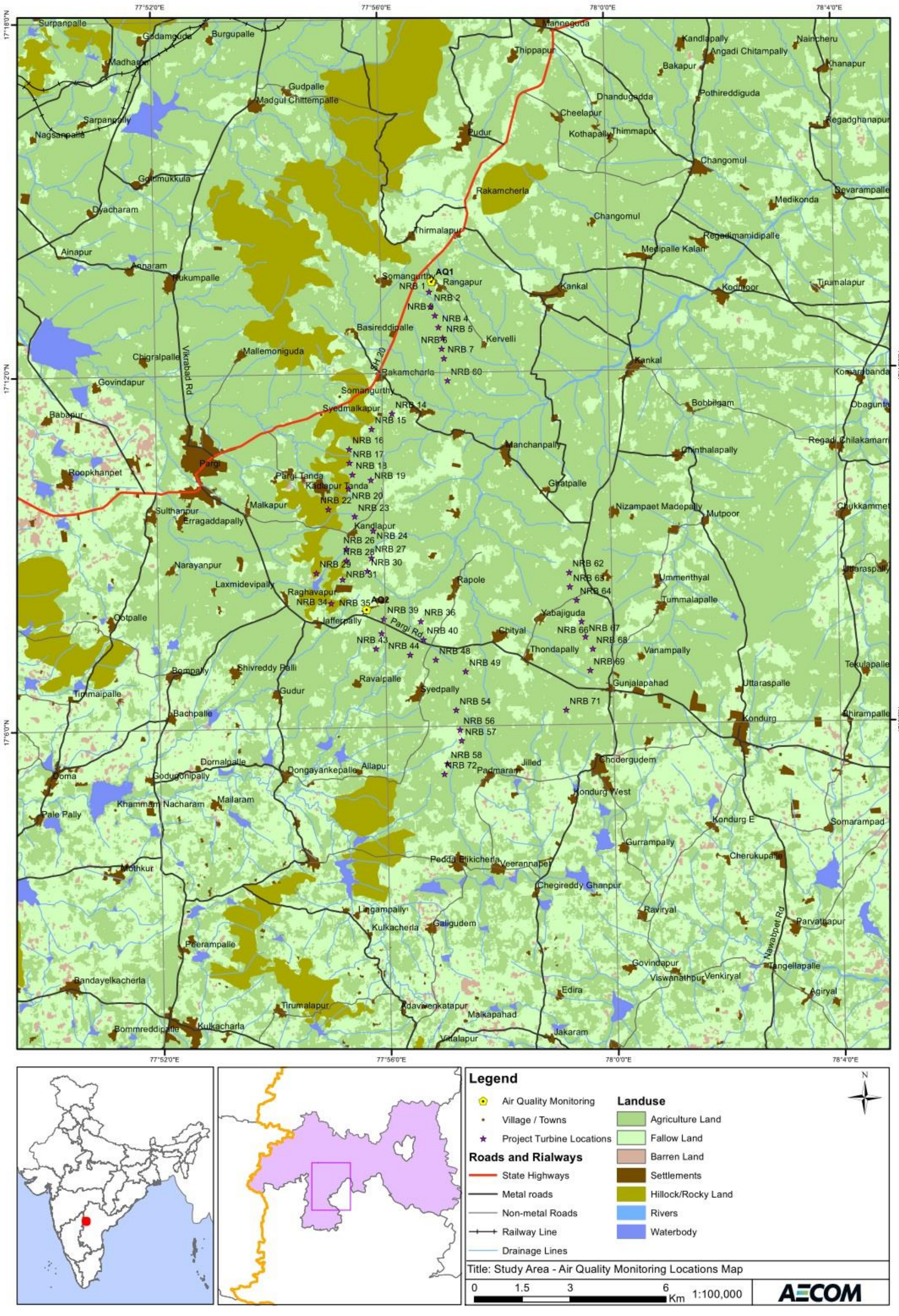
## 10.3 Air Environment

Ambient air quality was monitored at two locations in the study area during September month of 2015. Environmental monitoring was undertaken by Eco Services India Private Limited (Eco Services). The selection of the sampling locations was based on the consideration of predominant wind direction, topography of the area, habitation locations and their accessibility. The principal objective of the ambient air quality monitoring is to access background environment status and to check the conformity to standards of ambient air quality. 24-hourly samples were collected twice a week for 2 weeks from each location. The ambient air monitoring locations selected and the geographical coordinates has been provided in the **Table 10-5** below. Monitoring location map showing air monitoring location is shown in **Figure 10-6** below.

**Table 10-5: Details of Ambient Air Monitoring Locations**

| S. No. | Sampling Locations | Location Code | Geographical Location |
|---|---|---|---|
| 1. | Kervelly Village | AQ1 | 813556.00 m E, 1906930.00 m N |
| 2. | Khudawanpur Village | AQ2 | 811530.00 m E, 1896664.00 m N |

**Figure 10-6: Map showing Air Quality Monitoring Locations in the Study Area**



The sampling and analysis of ambient air quality parameters was carried out as per the procedures detailed in relevant Parts of IS-5182 (Indian Standards for Ambient Air Quality Parameters). The results of the air monitoring are presented in **Table 10-6** below.

**Table 10-6: Air Quality Monitoring Result in Study Area (µg/m$^3$)**

| Location | | (AQ1) | (AQ2) | NAAQS (Industrial / Residential / Rural and Other Area) |
|---|---|---|---|---|
| PM10 | Maximum | 50.8 | 54.8 | 100 |
| | Average | 49.9 | 52.55 | |
| | Minimum | 48.8 | 51.4 | |
| PM2.5 | Maximum | 11.2 | 13.5 | 60 |
| | Average | 10.5 | 12.72 | |
| | Minimum | 9.8 | 11.8 | |
| SO2 | Maximum | 6.6 | 6.8 | 80 |
| | Average | 6.27 | 6.1 | |
| | Minimum | 5.8 | 5.6 | |
| NOx | Maximum | 15.9 | 16.9 | 80 |
| | Average | 14.4 | 14.67 | |
| | Minimum | 13.8 | 12.9 | |

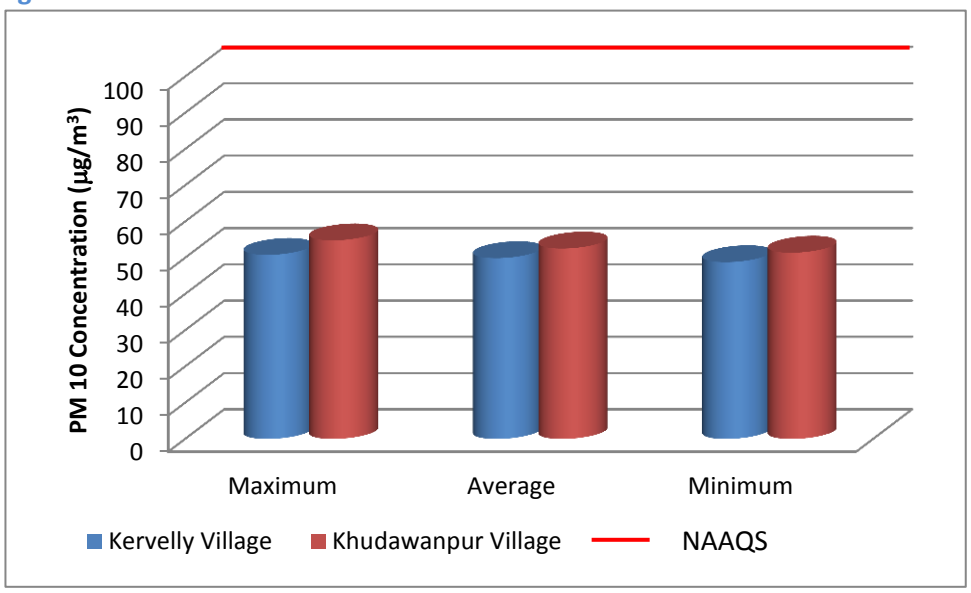
*NAAQS: National Ambient Air Quality Standards*

The analysis of the above result shows that all the monitored values are well within the limits prescribed by Central Pollution Control Board (CPCB) for residential/ rural areas. The summary of results is presented in the following sub sections.

### *Particulate Matter – PM-10*

The PM-10 concentration recorded at both the sampling locations was within the National Ambient Air Quality Standards (NAAQS). The minimum value recorded was 48.8µg/m$^3$ at Kervelly. The maximum value recorded was 54.8µg/m$^3$ at Khudwanpur. The average values varied from 49.9µg/m$^3$ to 52.55µg/m$^3$. The graphical representation is presented below.

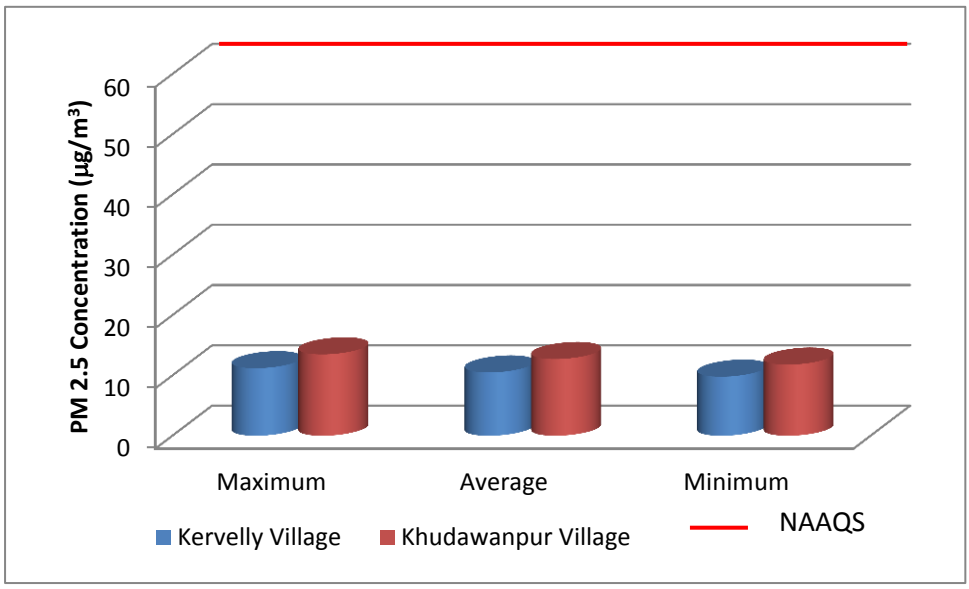
**Figure 10-7: Particular Matter – PM10**



### *Particulate Matter – PM-2.5*

The PM-2.5 concentrations as observed in the study area varied from a minimum of 9.8 µg/m$^3$ recorded at Karvelly to maximum of 13.5 µg/m$^3$ at Khudwanpur. The average values of PM-2.5 ranged from 10.5µg/m$^3$ to 12.72µg/m$^3$. All the values were observed to be within the prescribed NAAQS standards (60µg/m$^3$). The observations of PM-2.5 are presented graphically in **Figure 10-8** below.

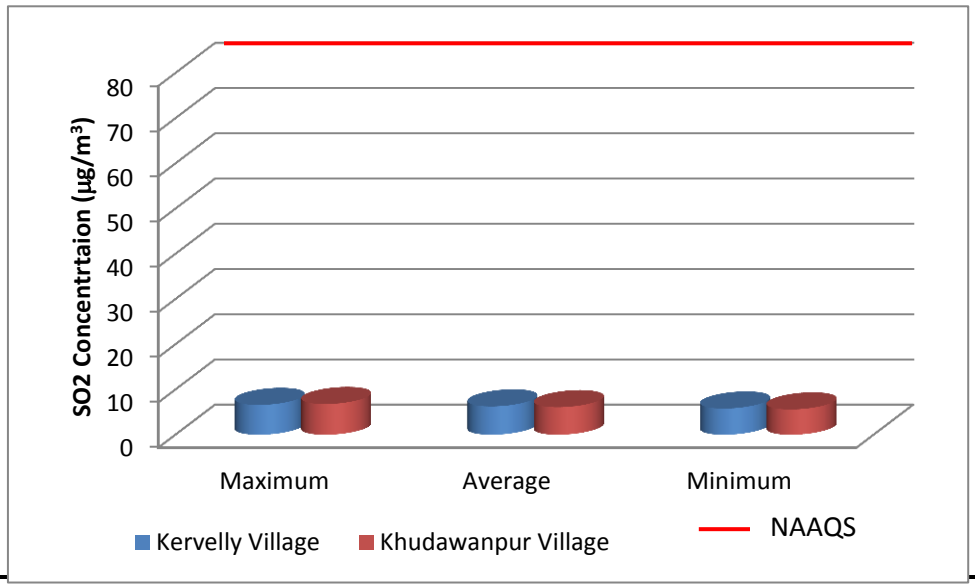
**Figure 10-8: Particular Matter – PM2.5**




### *Sulphur Dioxide ($SO_2$)*

The minimum concentrations of sulphur dioxide in the study were observed to be in the range of 5.6µg/m$^3$ to 5.8µg/m$^3$. The maximum value of $SO_2$ was recorded at Khudwanpur village (6.8µg/m$^3$). The average values ranged from 6.1µg/m$^3$ to 6.3µg/m$^3$. The graphical representation of observations is presented below in **Figure 10-9**.

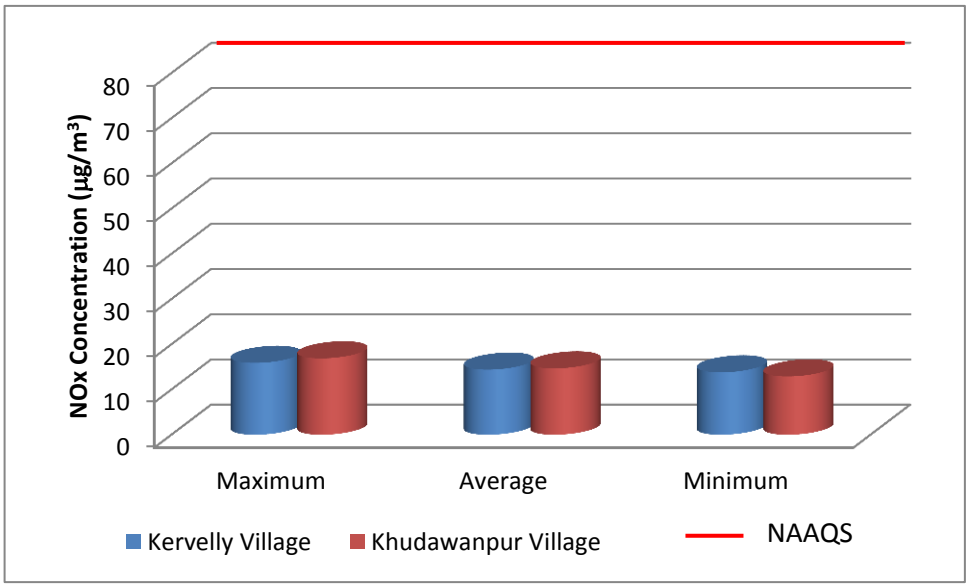
**Figure 10-9: Sulphur Dioxide ($SO_2$)**



### *Oxides of Nitrogen (NOx)*

The maximum $NO_x$ concentration observed was 16.9µg/$m^3$ at Khudwanpur. The minimum value recorded was 12.9µg/$m^3$ at Khudwanpur. The average values ranged from 14.4µg/$m^3$ to 14.6µg/$m^3$. The $NO_x$ concentrations were within the prescribe norms of 80 µg/$m^3$ as per NAAQS guidelines. The observations of $NO_x$ are presented graphically in **Figure 10-10** below.

**Figure 10-10: Oxides of Nitrogen ($NO_X$)**




The ambient air quality observed in the area is good as all the parameters observed are considerably below the required standards and guideline values. The site and surrounding is predominantly rural with no identified major sources of pollution in the area. The movement of traffic was also observed to be limited in the area.

## 10.4 Water Environment

The depth to water levels observed during pre-monsoon (2011) by Central Ground Water Board (CGWB) for Rangareddy district was between 1.4-33.50 m and depth to water levels observed during post-monsoon (2012) are between 0.20-28.32 m.

For Mahbubnagar district the depth to water level ranges from 3 to 20 m during pre-monsoon season and water level between 2 and 5 m below ground level (bgl) is found during post monsoon.

As per the groundwater resource quality assessment by Central Ground Water Board (CGWB), the water quality in the project districts is suitable for both domestic and irrigation purposes.

In order to establish the baseline status of water quality in the project area, water quality monitoring was undertaken by collection and analysing water sample collected from Kervelly and Khudawanpur village. In the study area, source of drinking water is groundwater and piped supply by Government.

The geographical coordinates of the water sampling location are given in the Table 10-7. Water monitoring locations are presented in Figure 10-11 below.

**Table 10-7: Details of Water Sampling Location**

| S. No | Sampling Location | Location Code | Geographical Coordinate | Type of Sample |
|---|---|---|---|---|
| 1. | Khudwanpur Village | WQ1 | 811646.51 m E 1896708.21 m N | Bore well Water |
| 2. | Kervally Village | WQ2 | 813560.61 m E 1907038.32 m N | Bore well Water |

The water sample was analysed for parameters as per IS: 10500 standards and the analysis was undertaken as per IS 3025 and relevant APHA standard methods. The results of the analysis are presented in **Table 10-8**. The summary of results is presented in the following sub sections.

**Table 10-8: Water Quality Monitoring Results**

| S. No | Parameters | Unit | IS 10500* specification for Drinking water (Desirable limit/ Permissible limit) | WQ1 | WQ2 |
|---|---|---|---|---|---|
| 1 | pH Value | Unit | 6.5-8.5 (No relaxation) | 7.07 | 7.17 |
| 2 | Turbidity | NTU | 1 (5) | BDL (DL:1.0) | BDL (DL:1.0) |
| 3 | Colour | Hazen units | 5 (15) | BDL (DL:5.0) | BDL (DL:5.0) |
| 4 | Total Dissolved Solids | mg/L | 500 (2000) | 900 | 350 |
| 5 | Total Alkalinity (as $CaCO_3$) | mg/L | 200 (600) | 386 | 134 |
| 6 | Nitrate | mg/L | 45 (No relaxation) | BDL (DL:0.5) | BDL (DL:0.5) |
| 7 | Chlorides (as Cl) | mg/L | 250 (1000) | 248 | 86 |
| 8 | Sulphate | mg/L | 200 (400) | 43 | BDL (DL:1.0) |
| 9 | Calcium (as Ca) | mg/L | 75 (200) | 174 | 64 |
| 10 | Magnesium (as Mg) | mg/L | 30 (100) | 60 | 22 |
| 11 | Fluorides (as F) | mg/L | 1.0 (1.5) | 1.0 | BDL (DL:0.1) |
| 12 | Total Hardness (as $CaCO_3$) | mg/L | 200 (600) | 680 | 252 |
| 13 | Arsenic (as As) | mg/L | 0.01 (0.05) | BDL (DL:0.005) | BDL (DL:0.005) |
| 14 | Iron (as Fe) | mg/L | 0.3 (No relaxation) | BDL (DL:0.1) | BDL (DL:1.0) |
| 15 | Copper (as Cu) | mg/L | 0.05 (1.5) | BDL (DL:0.03) | BDL (DL:0.03) |
| 16 | Mercury(as Hg) | mg/L | 0.001 (No relaxation) | BDL (DL:0.0005) | BDL (DL:0.0005) |
| 17 | Zinc (as Zn) | mg/L | 5 (15) | 8.6 | 5.6 |
| 18 | Total Chromium (as Cr) | mg/L | 0.05 (No relaxation) | BDL (DL:0.03) | BDL (DL:0.03) |
| 19 | Barium (as Ba) | mg/L | 0.7 (No relaxation) | 6.15 | BDL (DL:1.0) |
| 20 | Cadmium (as Cd) | mg/L | 0.003 (No relaxation) | BDL (DL:0.005) | BDL (DL:0.005) |
| 21 | Conductivity | mS/cm | -- | --- | --- |
| 22 | Total Suspended Solids (TSS) | mg/L | --- | BDL (DL:2.0) | BDL (DL:2.0) |
| 23 | Salinity | mg/L | --- | 0.68 | 0.25 |
| 24 | Oil & Grease | mg/L | --- | BDL (DL:2.0) | BDL (DL:2.0) |
| 25 | Dissolved Oxygen (DO) | mg/L | --- | 6.3 | 6.1 |

| | | | | | |
|---|---|---|---|---|---|
| 26 | COD | mg/L | --- | BDL (DL:4.0) | BDL (DL:4.0) |
| 27 | BOD | mg/L | --- | BDL (DL:2.0) | BDL (DL:2.0) |
| 28 | Phosphate | mg/L | --- | BDL (DL:0.1) | BDL (DL:0.1) |
| 29 | Lead | mg/L | 0.01(No relaxation) | BDL (DL:0.005) | BDL (DL:0.005) |
| 30. | Total Coliform | MPN/100mg | 10 (No relaxation) | 30 | <2 |
| 31. | Faecal Coliform | MPN/100mg | --- | 17 | <2 |

** IS 10500:2012 Drinking Water Specifications (Second Revision) by Bureau of Indian Standards (BIS)*

*BDL- Below Detection Limit & DL- Detection Limit*

*The figures in the brackets indicated permissible limit in absence of alternate source*

*Above permissible limit*

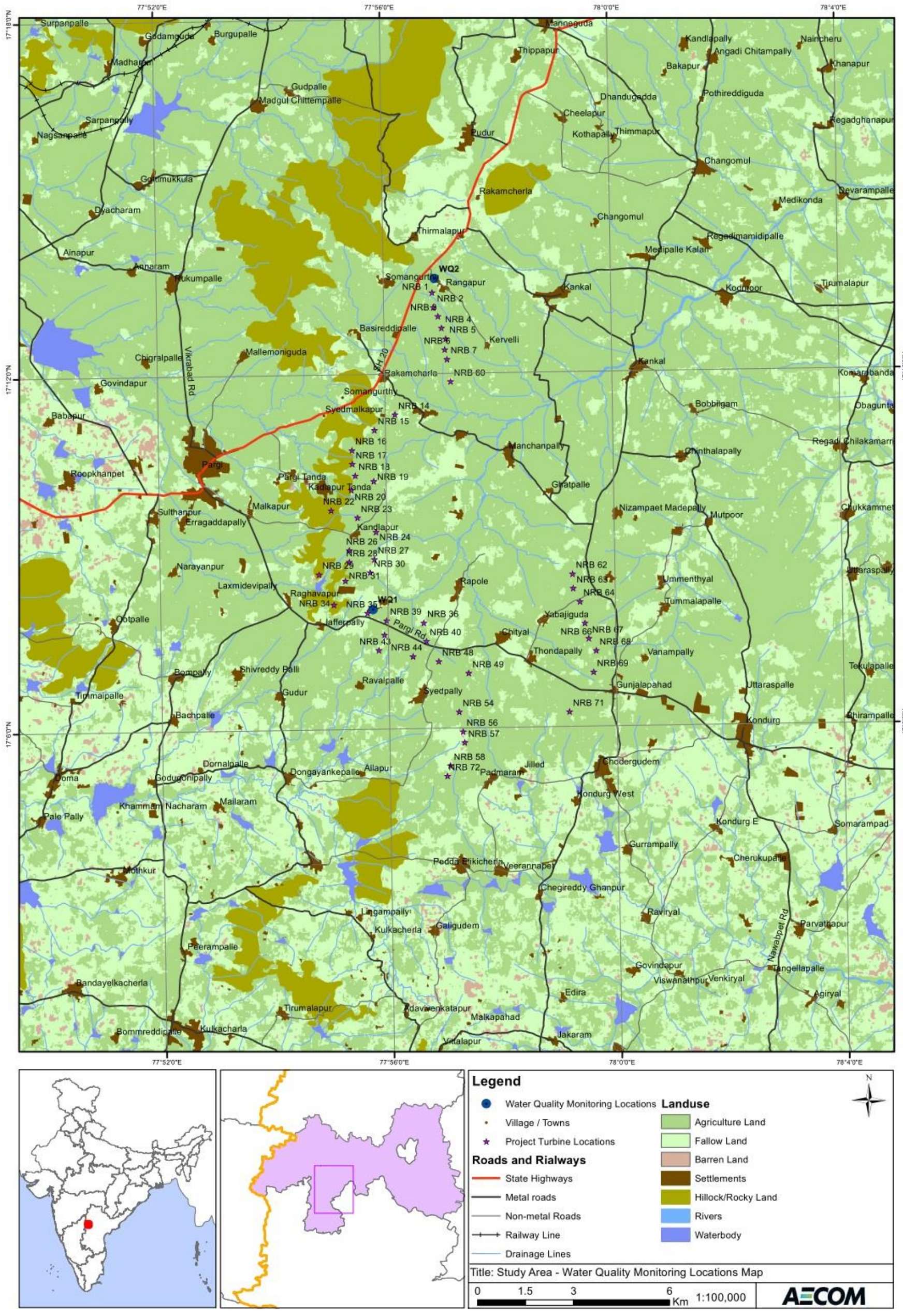
*Above desirable Limit*

It can be inferred from the monitoring results that most of the parameters are well within the desirable limits for drinking water as per IS 10500:2012, drinking water specifications by Bureau of Indian Standards (BIS) except for Total Dissolved Solids, Total Alkalinity, Calcium, Magnesium, Total Hardness, Zinc and Barium. Total Coliform is also found to exceed the specified limits.

It is observed that in water sample from village Khudwanpur (WQ1); levels of Total Dissolved Solids, Total Alkalinity, Calcium, Magnesium and Zinc are above the desirable limits. However the value of Total Hardness, Barium and Total Coliform exceeds the permissible limits. Higher value of Total Hardness is due to presence of minerals like Calcium and Magnesium and also due to presence of other minerals like Barium and Zinc. Barium in water comes primarily from natural sources. The highest levels in drinking-water are likely to be associated with groundwater from granite-like igneous rocks, alkaline igneous and volcanic rocks and manganese-rich sedimentary rocks. Higher value of total coliform may be attributed to contamination of water with surface water, human and animal wastes.

Levels of Total Hardness and Zinc are above desirable but are within permissible limit for drinking water in sample collected from village Karvelly (WQ2).

**Figure 10-11: Map showing Water Quality Monitoring Locations in Study Area**



## 10.5 Impact Assessment - Construction Phase

### 10.5.1 Land Use

The proposed project will comprise of 47 WTGs and an area of about 57 ha will be required all the wind turbines. The land identified for the project comprises entirely of private agricultural land. No forest land or government land is being diverted for the project. Site surroundings of turbine locations comprises of mix of agricultural land and fallow land. Fallow land was seen being used for grazing by locals.

The land required for access road and transmission line will also comprise of private land only, as reported by the project proponent. Land requirement for transmission line will be limited to the area for the foundation of pylons.

It is anticipated that loss of agricultural or grazing land due to installation of WTGs and access roads will have an impact on land use of the project site. It may be noted that the wind farm layout for the proposed project was finalised taking into consideration the following:

- Wind resource assessment;
- Environmental factors so as to avoid forest land, sanctuaries or other environmentally sensitive or protected areas;
- Social factors so as to identify land owners who are willing to sell and who in the process would not be rendered landless.

Upon selecting general wind intensive area, specific WTG locations were finalized after accounting for individual land use. Following types of land use were encountered, with respective land use impacts as detailed below.

- *Loss of Agricultural Land*: It may be noted that due to limited water availability, in majority of the project area, rain fed agriculture is practiced for few months during the year. Therefore, no significant loss of livelihood and impact on land use is anticipated.
- *Loss of private land used for Grazing purpose*: Loss of private fallow land used for grazing purposes will not have any significant impact, as only a small portion of the procured land for the project is cordoned off by fences, while the remaining portion will be available for grazing.

Since no forest land or ecologically sensitive areas are involved, no major impacts on land use are anticipated.

#### Mitigation Measure

Adequate measures have been incorporated during the planning phase itself as indicated below:

- The site clearance for tower erection, access road and ancillary facilities shall be restricted to the necessary footprint area;
- The land use of the project area used as grazing will not be altered to a large extent as only a small area occupied by WTG and the transformer will be fenced and the remaining open area may be used for grazing land.
- Similarly, care will be taken to locate wind turbine at edges of agricultural fields, thus minimising agricultural land lost.

- Additionally, the layout for access roads and transmission lines shall consider minimum land requirement and shall avoid procurement of agricultural land as far as possible and will stick on grazing land.

**Impact Value**

The impact on land use has been assessed to be moderate without mitigation measures and will reduce to minor with the incorporation of mitigation measures.

**Table 10-9: Impact Value – Land Use**

| Aspect | Scenario | Spread | Duration | Intensity | Overall |
|---|---|---|---|---|---|
| Land Use | Without Mitigation | Medium | Short | Moderate | Moderate |
| | With Mitigation | Medium | Short | Low | Minor |

## 10.5.2 Soil Quality

Construction activities like site clearance, construction of roads and installation of WTGs, storage of fuel at site and waste generation and disposal has potential impact on soil quality of the area. Some of them are as followed:

- Removal of vegetation will result in loose soil at site which may lead to loss of soil and generation of dust. Alternately, arable land will be lost along with fertile top cover;
- Dispersal of construction material due to wind, leading to contamination of soil in the areas in proximity to wind farm and along the access road. This is a concern since agricultural land was observed in the vicinity;
- Soils and sub soils will be extracted out during the construction activities which will lead to generation of significant quantities of loose soils hence disturbing the original topography of the area which can further lead to soil erosion;
- Oil spills from construction machinery and vehicles during refueling at construction site can contaminate the soil;
- Oil spillage from the storage of fuel at project site can cause contamination of soil. Soil contamination can also result from leaks and drips from machinery and vehicles at site.

**Mitigation Measures**

The following steps shall be taken to avoid/reduce the impact on the soil quality during the construction phase:

- 
- All construction material shall be stored in a designated/demarcated storage area within the site and covered with tarpaulin sheet to avoid dispersal with wind;
- Construction debris and excavated material shall be cleared up at regular intervals and used for filling up low lying areas and/or road construction purposes;
- Access road gradient to be limited to reduce runoff induced erosion;
- Temporary paved areas shall be constructed to be used while refuelling the machineries. In case of any accidental spill, the soil will be cut and stored securely for disposal with hazardous waste;

- Re-vegetation shall be done in the area after the completion of construction, in order to reduce the risk of soil erosion;
- Excavated material will be stock piled and used for backfilling of foundations, trenches etc;
- Solid waste material from construction and human activities shall be collected and disposed of properly.

#### Impact Value

The impact on soil quality has been assessed to be moderate without mitigation measures and will reduce to minor with the incorporation of mitigation measures.

**Table 10-10: Impact Value – Soil Quality**

| Aspect | Scenario | Spread | Duration | Intensity | Overall |
|---|---|---|---|---|---|
| Soil Quality | Without Mitigation | Medium | Short | Moderate | Moderate |
| | With Mitigation | Medium | Short | Low | Minor |

### 10.5.3 Air Quality

Air pollutant emissions in a wind power projects can be predominantly associated with the construction phase. Dust generated during dry spells and exhaust emissions from construction vehicles are the main emission sources. The activities associated with wind farm projects, such as operation of diesel generators during construction phase, transportation of construction materials, storage of construction material, other construction works like excavation activity, hot mix plant (if any), etc. will also generate some amount of greenhouse gases (GHG), though in negligible quantities. Given the short term nature of the construction phase and limited nature of emissions, the impact has been assessed to be minor.

#### Mitigation Measures

The following mitigation measures shall be incorporated:

- Covered transportation of loose construction material will aid in mitigation of fugitive emissions in transit;
- Cover stockpiles of loose construction material on-site to minimize dust generation;
- Implementation of dust suppression techniques like localized sprinkling of water at areas shall be undertaken for the entire duration of construction;
- Loose excavated soils shall be kept covered or kept wet in designated storage areas to prevent dust generation;
- Regular maintenance of vehicles shall be carried out and Pollution under Control (PUC) certificates shall be maintained;
- Idling time of vehicles will be reduced to the extent possible;
- All construction equipments shall be maintained in good condition as per manufacture's recommendations and regular maintenance shall be carried out.
- In case hot mix plants are used during construction phase, they shall be placed at least 500 m away from human settlements and preferably located on leeward side of most dominant wind direction. The construction contractor shall have the necessary Consents from State Pollution

Control Board to establish (CTE) and operate (CTO) such plants. All conditions stipulated in the consents shall be implemented/ complied with.

### Impact Value

The impact on air quality has been assessed to be moderate without mitigation measures and will reduce to minor with the incorporation of mitigation measures.

**Table 10-11: Impact Value - Air Quality**

| Aspect | Scenario | Spread | Duration | Intensity | Overall |
|---|---|---|---|---|---|
| Air Quality | Without Mitigation | Medium | Short | Moderate | Moderate |
| | With Mitigation | Medium | Short | Low | Minor |

## 10.5.4 Water Quality

Erection and commissioning of the WTG's shall involve construction activities like establishment of foundation for the tower support, construction of transformer pad, welding of tower components, installing the turbine components and erection of towers. Similarly construction of roads will involve levelling, excavation and compacting activities which may have an impact on water quality. Prior to start of construction activity, transportation and storage activities of all materials required for construction phase have a potential to cause water pollution. Also disposal of wastewater has the potential impacts on water quality.

Hazardous waste generated during construction of wind farms requires adequate disposal measures as per the requirements of Hazardous Waste Management Handling and Transboundary Movement Rule 2008. Improper disposal of hazardous waste can also lead to contamination of ground water, which could result in indirect impacts to humans, flora and fauna.

Two seasonal ponds, one close to NRB 48 near Syedpally village and one check dam approximately 600 m in southeast direction of the pooling substation and NRB 22, were seen in the surrounding area at the time of site visit, therefore there is a possibility of contaminated runoff from construction activities and temporary construction workers toilets. Also situations like ground water contamination and water stagnation cannot be ruled out. Therefore, following mitigation measures are suggested:

### Mitigation Measures

The following mitigation measures shall be incorporated to avoid/reduce the potential impacts:

- The portable toilets shall be provided with septic tank and soak pits;
- The natural drainage pattern of the area will not be disturbed during construction to the extent possible;
- The access roads will be provided with adequate storm water drainage facilities;
- Temporary paved areas shall be constructed to be used while refuelling the machineries;
- Storage of oil shall be undertaken on paved impervious surface and secondary containment shall be provided for fuel storage tanks;
- In case of any leaks, vehicles and machinery will be maintained and repaired immediately;

- Drip pans shall be provided with vehicles with leaks to prevent contamination of soil.

**Impact Value**

**Table 10-12: Impact value - Water Quality**

| Aspect | Scenario | Spread | Duration | Intensity | Overall |
|---|---|---|---|---|---|
| Water Quality | Without Mitigation | Medium | Short | Moderate | Moderate |
| | With Mitigation | Medium | Short | Low | Minor |

## 10.6 Impact Assessment - Operation Phase

The operation phase for wind energy generation is relatively cleaner and poses limited environmental threats. It is to be noted that impacts on air environment have been envisaged to be associated with construction phase of the project only; hence impact on soil and water quality is discussed in the following sections.

### 10.6.1 Soil quality

During the operational phase of the wind farm project, some quantities of hazardous waste in the form of lubricant oil, transformer oil, oily rags, containers holding oil and paints that may be generated during maintenance and general upkeep activities is envisaged to be generated. This waste requires adequate disposal as per the requirements mandated under the Hazardous Waste (Management, Handling and Trans-boundary Movement) Rules, 2008 (hereinafter referred as HWR, 2008). Improper disposal of hazardous waste can lead to contamination of both soil and ground water.

**Mitigation Measures**

The following mitigation measures shall be incorporated in the operational phase of the project:

- Generation of waste to be minimised as far as practicable;
- Waste oil generated shall be stored separately in containers in a secured location. The storage location and the containers shall be properly marked;
- The waste/used oil storage area shall be provided with adequate weather protection. The area shall accessible to authorised personnel only;
- The waste/used oil from the turbines shall be disposed off to a CPCB/TSPCB authorized vendor;
- Secondary containment for fuel storage tanks and for temporary storage of other fluids such as lubricating oils and hydraulic fluids;
- Transformer oil shall be returned to the manufacturers as per the agreement of purchase;
- A hazardous waste inventory shall be maintained as per the provisions of the HWR, 2008;
- Documentation (i.e., various forms) as prescribed under HWR shall be properly maintained.

**Impact Value**

The impact on soil quality has been assessed to be minor with the incorporation of mitigation measures.

**Table 10-13: Impact Value - Soil Quality**

| Aspect | Scenario | Spread | Duration | Intensity | Overall |
|---|---|---|---|---|---|
| Soil Quality | Without Mitigation | Local | Long | Moderate | Moderate |
| | With Mitigation | Local | Long | Low | Minor |

### 10.6.2 Water Quality

The proposed wind farm will have 25-35 technical and support staff at site during the operation phase. Hence at the rate of 45 litres per capita per day, it is estimated that 1.57 $m^3$/day of water per day will be required for the site office.

#### Mitigation Measures

As per the best industrial practices it is recommended not to use ground water and water from surface water bodies for any project related activities. The water requirement during the operation phase of the project shall be met through supply from authorised tanker. The drinking water requirement for the site personnel shall be met through packaged drinking water. With respect to generation of wastewater from site office, adequate number of septic tanks shall be provided. Use of water shall be done efficiently and discharge of wastewater if any, shall be done in compliance to national and local standards.

#### Impact Value

The impact on water quality due to the proposed project during operation phase has been assessed to be minor.

**Table 10-14: Impact Value - Water Quality**

| Aspect | Scenario | Spread | Duration | Intensity | Overall |
|---|---|---|---|---|---|
| Water Quality | Without Mitigation | Local | Long | Moderate | Moderate |
| | With Mitigation | Local | Long | Low | Minor |

# 11. ENVIRONMENT AND SOCIAL MANAGEMENT PLAN

## 11.1 Introduction

This chapter addresses the requirement of IFC Performance Standard-1 which highlights the importance of managing the social and environmental performance throughout the life of the project. Mytrah/MVGoPL is committed to implement an effective Environmental and Social Management System (hereinafter referred as ESMS) to continuously manage and communicate the potential social and environmental impacts and risks imposed on the project employees (direct and indirect) and the local communities residing in the immediate vicinity of the project area.

## 11.2 Environmental and Social Management System

The ESMS describes the mitigation measures for all the identified potential impacts associated with the proposed project during its construction and operation phases. The environment and social management plan (ESMP) shall delineate the monitoring and management measures to avoid and/or minimize such impacts by allocating management responsibility and suggesting skill requirement for implementation of these measures. Also the ESMP shall ensure a continuous communication process between MVGoPL, their workers (including sub-contractors), local community and other stakeholders.

MVGoPL has an obligation to ensure compliance to all the commitments towards Environment, Social, Health and Safety Standards while executing all the project related activities for the proposed wind power project. This ESMP shall be applicable to all the employees of MVGoPL and its sub-contractors. Also, MVGoPL shall ensure that Suzlon, the EPC and O&M contractor of this project is brought under the umbrella of the ESMS and it shall implement the provisions of this Environment and Social Management Plan.

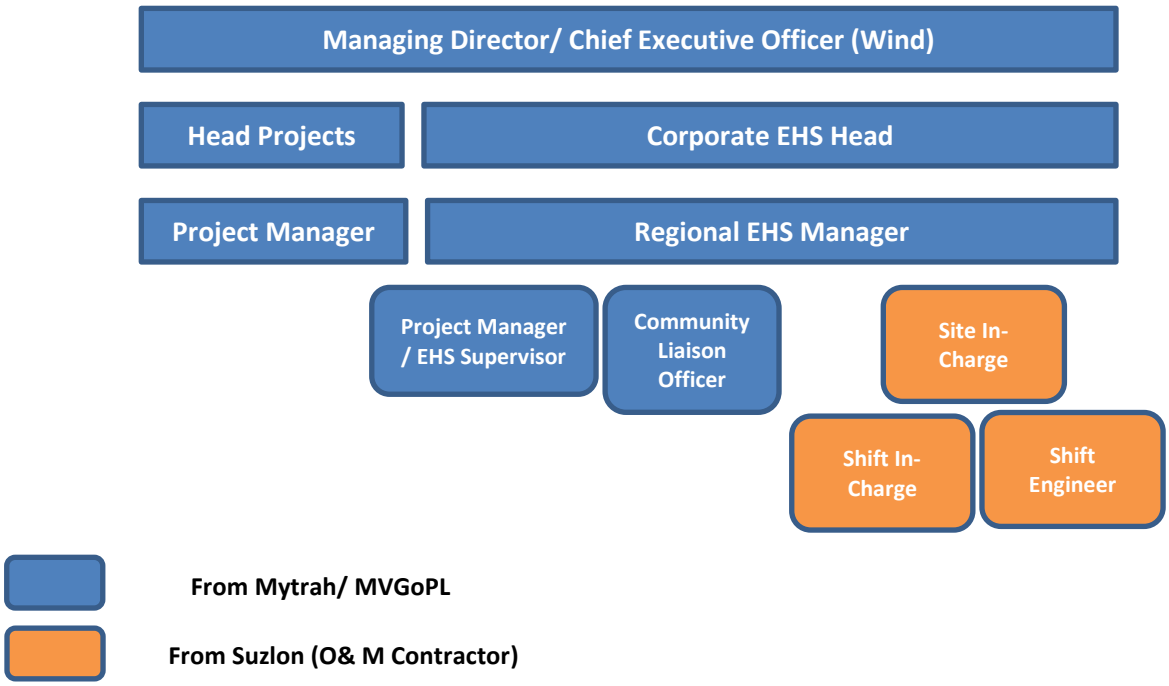
## 11.3 Organisational Structure (Environmental, Social, Health & Safety)

The overall management and coordination of the project will be managed through Managing Director / Chief Executive Officer (Wind) who will be supported by the Head of various departments like Business development, projects, asset management, finance & accounts and human resource. The Head –Projects will overview, monitor and control the activities of Site Manager and the EHS supervisor at the site. The contractors will be controlled by the site manager during operation phase.

The project does not attract any significant adverse social impacts or risks as indicated in the previous sections. The project footprint area is limited to its immediate vicinity and a particular range of stakeholders. It is proposed that MVGoPL appoints a qualified EHS/ HSE supervisor for supervising the environment, health and safety issues at the project site. The EHS supervisor shall work in coordination with the EHS staff of Suzlon and report to the Regional EHS manager of Mytrah. Similarly, a Community Liaison Officer needs to be appointed by MVGoPL at project level for managing the social (including workers and neighbouring community) issues.

An organization structure proposed for implementation of the ESMP during various phase of wind farm project at Nazeerbad site is as presented in **Figure 11-1**.

Figure 11-1: Proposed Organisational Structure




### 11.3.1 Roles and Responsibilities

#### *EHS Supervisor*

The EHS supervisor will have the following responsibilities:

- Ensure availability of resources and appropriate institutional arrangements for implementation of ESMP;
- Compliance of legislative, IFC PS and ADB SPS requirements;
- Carry out audits, and inspection of all the project activities;
- Conduct training programs and awareness activities on health and safety for site staff and community;
- Preparation of necessary documents and record keeping system; and
- Review and updating of ESMP for its effective implementation.

#### *Community Liaison Officer*

The community liaison officer will have the following responsibilities:

- Managing all grievances of the project and their outcomes;
- Implementing, monitoring and updating the ESMP;
- Undertaking community development initiatives in the project villages;
- Keep record of all the CSR activities being undertaken for the project;
- Keep the Regional EHS Manager informed on the progress of CSR activities undertaken at project site;

- Conduct periodic meetings with local community for understanding their grievances and outcomes of the CSR activities;
- Inform the local community about the Grievance Redressal Mechanism and ensure effective implementation; and
- Manage all grievances of the project and record the actions taken.

## 11.4 Training of Personnel and Contractor

MVGoPL shall ensure that the job specific training and EHS Induction training needs are identified based on the specific requirements of ESMS and existing capacity of site and project personnel (including the Contractors and Sub-contractors). Special emphasis shall be placed on traffic management, operation of cranes, stakeholder's engagement and grievance redressal.

General environmental awareness shall be increased among the project's team to encourage the implementation of environmentally sound practices and compliance requirements of the project activities. This will help in minimising adverse environmental impacts, ensuring compliance with the applicable regulations and standards, and achieving performance beyond compliance. The same level of awareness and commitment shall be imparted to the contractors and sub- contractors prior to the commencement of the project.

An environmental and social management training programme shall be conducted to ensure effective implementation of the management and control measures during construction and operation of the project. The training programme shall ensure that all concerned members of the team understand the following aspects:

- Purpose of action plan for the project activities;
- Requirements of the specific action plans;
- Understanding of the sensitive environmental and social features within and surrounding of the project areas; and
- Aware of the potential risks from the project activities.

A basic occupational training program and specialty courses shall be provided, as needed, to ensure that workers are oriented to the specific hazards of individual work assignments. Training shall be provided to management, supervisors, workers, and occasional visitors to areas of risks and hazards.

Workers with rescue and first-aid duties must receive dedicated training so as not to inadvertently aggravate exposures and health hazards to themselves or their co-workers. Through appropriate contract specifications and monitoring, the employer shall ensure that service providers, as well as contracted and subcontracted labour are trained adequately before assignments begin.

## 11.5 Monitoring and Audit

In order to implement the ESMP, the on-site team shall adhere to a time-bound and action-oriented Environmental and Social Action Plan to implement the mitigation measures provided for each of the identified environmental and social impacts. This ESMP shall be monitored on a regular basis,

quarterly or half-yearly and all outcomes would need to be audited in accordance with existing EHS commitments.

The monitoring process shall cover all stakeholders including contractors, labourers, suppliers and the local community impacted by the project activities and associated facilities thereby increasing the effectiveness of suggested mitigations measures. MVGoPL shall ensure that all the contractors comply with the requirements of conditions for all applicable permits, suggested action plans and scheduled monitoring. The inspections and audits shall be carried out by an internal trained team and external agencies/experts. The entire process of inspections and audits shall be documented and key findings of which shall be implemented by the proponent and contractors in their respective areas.

## 11.6 Documentation and Record Keeping

Documentation and record keeping system has to be established to ensure updating and recording of requirements specified in ESMP. Responsibilities have to be assigned to relevant personnel for ensuring that the ESMP documentation system is maintained and that document control is ensured.

The following records shall be maintained at site:

- Documented Environment Management System;
- Legal Register;
- Operation control procedures;
- Work instructions;
- Incident reports;
- Emergency preparedness and response procedures;
- Training records;
- Monitoring reports;
- Auditing reports; and
- Complaints register and issues attended/closed.

## 11.7 Proposed Environmental and Social Management Plan

An Environment and Social Management Plan has been developed following the delineation of impacts and mitigation measures. These measures shall be adopted by MVGoPL and imposed as conditions of contract of the sub-contractor(s) employed for respective phases of the proposed wind power project. The mitigation measures suggested during operation will be made part of the regular maintenance and monitoring schedule. The ESMP includes the following:

- Mitigations suggested for adverse environmental and social impacts and associated risks;
- Institutional arrangement - management tools and techniques for the implementation of environmental impacts and risk mitigations;
- Monitoring and reporting of requirements and mechanisms for the effective implementation of the suggested mitigations;
- Monitoring arrangements for effective implementation of suggested mitigations for the proposed project; and

- Reporting requirement to the regulatory agencies and funding institutes.

Table 11-1: Environmental and Social Management Plan

| S. No. | Aspects | Potential Impacts | Suggested Mitigation/Management Measures | Monitoring/training Requirement | Management Responsibility |
|---|---|---|---|---|---|
| **Construction Phase** | | | | | |
| 1. | **Social/Livelihood Pattern** | • Loss of Land;<br>• Increase of Traffic Movement; and<br>• Migrant Labour Engagement. | ***Loss of Land*:**<br>• The site clearance for tower erection, access road and ancillary facilities should be restricted to the necessary footprint area. The remaining area should be accessible for grazing or cultivation once the construction activities are completed.<br>• A formal consultation should be undertaken to apprise the villagers of the project activities on a regular basis.<br>• The EPC contractor should map access roads and implement strict driving instructions to adhere to such roads without going off-road thus destroying agricultural activities.<br><br>***Increase of Traffic Movement*:**<br>• Transportation through community areas shall be avoided to the extent possible.<br>• Transport routes for construction material shall be planned after survey of existing road conditions.<br>• Shoulder widening and road development shall be discussed with community and executed only after addressing all concerns.<br>• High noise generating activities shall not be carried out at night as far as possible.<br>• All public utilities viz. transmission cables, telephone cables etc. falling within road land shall be inventoried and arranged for | • All vehicles engaged for transportation shall be verified for fitness.<br>• Regular training of drivers shall be undertaken.<br>• Construction contractors shall adhere to social obligations, labour laws and international commitments.<br>• Water usage shall be monitored and controlled to minimise the wastewater generation.<br>• MVGoPL shall ensure that no child labour and non-discrimination, payment of wages laws are complied with by the contractors. | MVGoPL's Community Liaison Officer |

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| | | | relocation/ shifting to adjacent areas in consultation with community/agencies.<br><br>***<u>Migrant Labour Engagement</u>*:**<br>• Sourcing of construction labour to be done from local region to the extent possible.<br>• Ensure local contracting and vendor opportunities as far as possible.<br>• MVGoPL through the contractor agreement shall ensure that the construction contractors commit and adhere to social obligations including community relations, handling complaints and grievances, adherence to labour laws and international commitments etc.<br>• The contractor shall provide adequate information to workers on expected social behaviour and hygiene practices to be followed at site. | | |
| 2. | **Ambient Noise Levels** | • Vehicular noise from heavy vehicles utilised to deliver construction materials and WTG parts<br>• Noise from D.G. sets<br>• Construction noise from using mobile equipment, cranes and concrete mixing | • Construction activities shall be planned in consultation with local communities, whenever potential impacts are predicted;<br>• Regular maintenance of construction machinery and equipment shall be carried out to ensure noise emissions are maintained at design level;<br>• Integral noise shielding to be used where practicable and fixed noise sources to be acoustically treated, for example with silencers, acoustic louvers and enclosures;<br>• Provision of rubber padding/noise isolators at equipment/machinery used for construction;<br>• Construction vehicles shall be well | • Verify the licenses, permits and consents issued to construction material supplier at least once in 6 months.<br>• Randomly inspect the vehicles used for transporting construction materials to see if they are complying with mitigation measures recommended here. | MVGoPL's EHS Supervisor/ Suzlon's Site Incharge |

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| | | | maintained and idling time will be minimized for vehicles when not in use;<br>• Noise prone activities will be restricted to the extent possible during night time 2200 to 0600 hours to reduce the noise impact;<br>• Site workers working near high noise equipment use personal protective equipment's (PPEs) to minimize their exposure to high noise levels. | | |
| 3. | **Ecology** | • The construction activities may lead to loss of natural resources and vegetation;<br>• Disturbance to local livestock population | • The site clearance for tower erection, access road and ancillary facilities shall be restricted to the necessary footprint area around WTGs;<br>• Vegetation shall not be removed from areas falling in land not required for any construction activity;<br>• The crane staging area, intervening areas, overhead clearance for suspended turbine components shall be planned in such a way that minimum tree felling is required;<br>• Areas around the turbine shall be re-vegetated at the earliest. | The entire workforce shall be sensitized (by the construction contractor) to possible adverse ecological impacts during the construction phase by conducting awareness programs. | MVGoPL's EHS Supervisor/ Suzlon's Site Incharge |
| 4. | **Occupational Health and Safety (OHS)** | • Material handling and storage<br>• Possible injuries associated with working at height (≥ 2m)<br>• Electrical work injuries (eye injuries, shocks, burns, fires /explosion)<br>• Other | • All material will be arranged in a systematic manner with proper labelling and without any protrusion or extension onto the access corridor. The construction material for transmission tower will be kept at site and carried to individual towers as per requirement;<br>• Loading and unloading operation of equipment shall be done under the supervision of a trained professional;<br>• All work at height to be undertaken during daytime with sufficient sunlight; Proper PPEs shall be provided to workers handling | • The labour engaged for working at height shall be trained for temporary fall protection devices and use of personal fall arrest systems shall be ensured;<br>• All the workers shall be made aware of the possible occupational risks/hazards by the way of an OHS training/awareness programme;<br>• Periodic inspection of PPEs shall be done to ensure that they are in proper condition by keeping | MVGoPL's EHS Supervisor/ Suzlon's Site Incharge |

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| | | occupational hazards | welding, electricity and related components;<br>• Fire extinguishing equipment shall be provided in adequate number on site to handle any possible fire outbreaks;<br>• Effective work permit system for hot work, electrical work, working at height shall be ensured;<br>• Excess waste debris and liquid spills shall be cleaned up regularly to avoid slips and falls;<br>• Clear traffic ways shall be made to avoid driving of heavy equipments over loose scrap.<br>• Controlling vehicle traffic through use of one way traffic route, establishment of speed limits, and on site trained flag people wearing high visibility vests or outer clothing covering to direct traffic. | records;<br>• The contractor shall ensure that machinery is equipped with a legible, durable load chart that shows the manufacturer's recommended load configurations and maximum load weights;<br>• The contractor shall ensure that no person is engaged in driving or operating lifting appliances unless he is sufficiently trained, competent and reliable, possesses the knowledge of inherent risks involved in the operation and is medically examined periodically;<br>• An accident reporting and monitoring record should be maintained. The objective shall be to minimize such occurrences in the future and attain zero accidents. | |
| 5. | **Soil Quality** | • Excavation can disturb the original topography of the area which can further lead to soil erosion;<br>• Soil contamination due to dispersion of construction material and Oil | • Re-vegetation shall be done in the area after the completion of construction in order to reduce the risk of soil erosion;<br>• Excavated material will be stock piled and used for backfilling of foundations, trenches etc.;<br>• Temporary paved areas shall be constructed to be used while refuelling the machineries. In case of any accidental spill, the soil will be cut and stored securely for disposal with hazardous waste;<br>• All construction material shall be stored in a designated/demarcated storage area within the site and covered with tarpaulin | • The workforce shall be sensitized to handling and storage of hazardous substances viz. fuel oil, machine oil/fluid etc.<br>• The workers engaged in handling of hazardous substances shall be briefed about the possible hazards and the need to prevent contamination. | MVGoPL's EHS Supervisor/ Suzlon's Site Incharge |

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| | | leaks/spillages from vehicles and machinery operating at site. | sheet to avoid dispersal with wind. | | |
| 6. | **Ambient Air Quality** | • Dust generation and subsequent dispersal by wind during site preparation activities;<br>• Pollutant (SOx, NOx, PM) discharge into surrounding air from exhaust emission of construction vehicles. | • Localized sprinkling of water at areas if possible shall be undertaken for the entire duration of construction;<br>• Loose excavated soils shall be kept covered or kept wet in designated storage areas to prevent dust generation;<br>• Regular maintenance of vehicles shall be carried out and Pollution under Control (PUC) certificates shall be maintained.<br>• Idling time of vehicles will be reduced the extent possible. | • Monitoring of dust deposition in the adjoining areas on a regular basis;<br>• The employees shall be made aware of the dust minimisation measures;<br>• A monitoring record/register shall be maintained for all the vehicles. It shall contain details of the vehicle PUC status, repair/maintenance schedules, etc. | MVGoPL's EHS Supervisor/ Suzlon's Site Incharge |
| 7. | **Water Quality** | • Possibility of contaminated runoff from the site entering the nearby water bodies;<br>• Domestic water runoff from the portable toilets into neighbouring water bodies | • Temporary paved areas shall be constructed to be used while refuelling the machineries;<br>• Machinery and vehicles shall be thoroughly checked for the presence of leaks if any;<br>• Drip pans shall be provided with vehicles with leaks to prevent soil contamination;<br>• Storage of oil shall be undertaken on paved impervious surface and secondary containment shall be provided for fuel | • The entire workforce shall be sensitized to optimal use of water;<br>• Storm water drains shall be checked regularly to prevent clogging;<br>• A record for daily supply and consumption of water shall be maintained in order to assess usage and wastage of water; and<br>• Housekeeping activities (e.g., clearing of debris) shall be supervised on a regular basis. | MVGoPL's EHS Supervisor/ Suzlon's Site Incharge |

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| | | can lead to degradation of water quality. | storage tanks; and<br>• Adequate drainage of road based on road width, surface material, compaction and maintenance. | | |
| **Operation Phase** | | | | | |
| 1. | **Social/Livelihood Pattern** | • Land Use<br>• Visual Aesthetic<br>• Electromagnetic Field (EMF) interference<br>• Shadow flicker<br>• Potential of Blade Throw | • The entire land use in the project area shall not be altered since only a small area (0.1%) is occupied by WTGs;<br>• The land in the project area should be made available for alternative uses like agriculture, grazing and other activities;<br>• MVGoPL shall hold negotiations with farmers providing area for transmission poles/ towers and consider possible adjustment of the pole/ tower locations towards convenience of the farmers;<br>• The layout for access roads and transmission lines shall be developed considering the minimum land requirement as needed;<br>• Consider the landscape character during turbine sitting;<br>• Maintaining uniform size and design of turbines by having same direction of rotation, type of turbine and height.<br>• Maintaining a minimum distance of 173.5 m between WTGs and receptors.<br>• Formulate a complaint resolution procedure for the local community so that any issues or concerns associated with shadow flicker are reported to the site staff.<br>• Planting trees and ensure increase in dense vegetation coverage to screen the affected | • Review and inspect the mitigation measures undertaken for addressing land use, aesthetic and visual impact aspect on environment. | MVGoPL 's Community Liaison Officer |

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| | | | receptor locations from sun; Installation of blinds such as curtains at the concerned window facing the turbines;<br>• Reducing the occurrence of impacts due to blade glint by application of non-reflective paints.<br>• Ensuring absence of any auxiliary structures except the required ones such as access roads and transformer yards which accompany the turbines.<br>• The WTGs to be equipped with vibration sensors that can react to any imbalance in the rotor blades and automatically shut down the turbine if necessary, to avoid any chance of blade throw. | | |
| 2. | **Ambient Noise Levels** | • Noise generation due to operation of wind turbines. | • Wind turbines shall be designed in accordance with the international acoustic design standards and maintained throughout the operational life so as to limit noise generation;<br>• The wind turbines shall be maintained in good running conditions throughout the operational life of the project through routine maintenance;<br>• Consult with the locals periodically to assess noise generation and set up a procedure to locate source of noise and steps taken to minimize them;<br>• Operation and Maintenance staff to be provided with personal protective equipment (PPEs) such as ear plugs and ear muffs when working close to turbine in operation;<br>• It is recommended to maintain a minimum | • Undertake ambient noise level monitoring on an annual basis in order to understand the increase in noise levels due to the project operation | MVGoPL 's EHS Supervisor/ Suzlon's Site Incharge |

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| | | | distance of 173.5 m between the project turbines (Suzlon S97, hub height of 120 m and rotor diameter of 97 m) and receptors in order to adopt an industry best practice | | |
| 3. | **Ecology** | • Bird Collision<br>• Barrage effect<br>• Modification of habitat | • Adequate space between each turbine;<br>• Wind turbines be painted with orange/ red striped to prevent bird hit;<br>• Daytime visual markers on transmission lines;<br>• The vane tips of the wind turbine shall be painted with orange colour to avoid bird hits;<br>• Visibility enhancement objects such as marker balls, diverters on transmission lines; and<br>• Minimal clearance of ground vegetation such as shrubs and bushes during site clearance activities and ensure re-vegetation of cleared areas. | • Periodic Bird/Bat carcass survey to be undertaken during operation phase | MVGoPL 's EHS Supervisor/ Suzlon's Site Incharge |
| 4. | **Occupational Health and Safety** | • Possible injuries associated with working at height (≥ 2m)<br>• Electrical work injuries (eye injuries, shocks, burns, fires/explosion)<br>• Other occupational hazards | • Work permit system shall be implemented for working at height (typically when working over 2m) and also for hot jobs;<br>• The use of safety belt and need for safety net as required shall be ensured;<br>• All work at height shall be undertaken during daytime with sufficient sunlight;<br>• Integrity of structures shall be checked prior to undertaking work;<br>• Fixtures shall be installed on tower components to facilitate the use of fall protection systems;<br>• Only those workers who are trained in climbing techniques and use of fall protection measures shall be engages for | • Suzlon shall provide instructions and procedures to all the workers involved in service repair of wind turbines, which will consider wind speeds and other external conditions in such a manner that service, maintenance and repair work on the wind turbine can be performed safely;<br>• Acquaint all workers and make them thorough with operation and maintenance manuals of model of installed WTGs;<br>• Employees involved in electrical works shall be trained in and shall | MVGoPL 's EHS Supervisor/ Suzlon's Site Incharge |

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| | | | working at height;<br>• Regular inspection, maintenance, and replacement of fall protection equipment to be undertaken;<br>• Wind turbines shall be equipped with an earthing system;<br>• Personal Protective Equipments (PPEs) e.g., shock resistant rubber gloves, shoes, other protective gear etc. should be provided to workers handling electricity and related components; and<br>• The transformer yard should be provided with fire extinguishers and sand buckets at all strategic locations to deal with any incident of fire. | be made familiarize with the safety-related work practices, safety procedures and other safety requirements that pertain to their respective job assignments;<br>• An accident reporting and monitoring record shall be maintained at site. | |
| 5. | **Soil Quality** | • Soil contamination due to improper disposal or spillage of hazardous waste (waste/used oil)<br>• Open excavated area susceptible to water logging and subsequent nesting of birds | • Waste oil generated shall be stored separately in containers in a secured location in the maintenance room. The storage location and the containers shall be properly marked;<br>• The waste/used waste oil from the turbines shall be disposed of through CPCB/TSPCB authorized vendor;<br>• Transformer oil shall be returned to the manufacturers as per the agreement of purchase;<br>• A hazardous waste inventory shall be maintained as per the provisions of the HWR, 2008. | • Site engineers and maintenance staff need to be aware and trained about the procedure for proper storage and disposal of waste oil and how to act in case of accidental oil spillage;<br>• Ground water sample and soil sample testing needs to be undertaken at the waste oil handling and storage location once in every three years. | MVGoPL 's EHS Supervisor/ Suzlon's Site Incharge |
| 6. | **Water Resources and Quality** | • Burden on local ground/surface water resources due to water demand of | • The water requirement during the operation phase of the project shall be met through water tankers from suppliers' authority by government.<br>• The drinking water requirement for the site | • Ground water sample testing at the project site once in every 6 months. | MVGoPL 's EHS Supervisor/ Suzlon's Site Incharge |

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|---|---|---|---|---|---|
| | | onsite personnel;<br>• Wastewater generated from site office. | personnel shall be met through packaged drinking water.<br>• Adequate number of septic tanks shall be provided for treatment of wastewater generated. | | |
| **Demobilisation Phase** | | | | | |
| 7. | • **Socio Economic**<br>• **Waste generation**<br>• **Health and safety** | • Issue of loss of job when the workers will be asked to leave after end of construction phase;<br>• Improper disposal of demolition waste and obsolete machineries will lead to contamination of soil and discontent of community;<br>• Demolition activity will lead to generation of dust which can be carried downwind to habitations in the surrounding area;<br>• Deconstruction activities are | • The proponent shall inform the workers and local community about the duration of work;<br>• The workers shall be clearly informed about the expected schedule and completion of each activity;<br>• The reduction in workers shall be done based only on the requirement of his/her skill set and not guided by any other factor;<br>• A transparent mechanism shall be prepared wherever choice is to be made between individuals of similar capability;<br>• All waste generated from demobilization phase shall be collected and disposed off at the nearest municipal disposal site; and<br>• All necessary Personal Protection Equipment (PPE) shall be used by the workers during demolition work. | Inspect all the demobilised sites for satisfactory compliance to mitigation measures. | MVGoPL 's EHS Supervisor/ Suzlon's Site Incharge |

| | | | | | |
|---|---|---|---|---|---|
| | | associated with health and safety issues such as structural collapse, trip and fall, electrical hazard etc. | | | |

## 11.8 Management Plans and Procedures

The section below gives an overview of the various management plans/procedures required to manage the key aspects of the proposed project. These management plans sets out the actions for monitoring and evaluation of the project during its various phases of life cycle. Following plans and procedures are described in detailed below:

- Traffic Management Plan;
- Crane Safety Plan;
- Stakeholder Engagement Plan; and
- Grievance Redressal Mechanism

### 11.8.1 Traffic Management Plan

The WTG locations in the Nazeerabad wind farm are well connected by motorable roads which are further connected through arterial roads to the State Highway and National Highway.

**Potential Impacts**

The traffic density on the roads in the proposed Project area is low. However, with the commencement of the construction activities for the Project, the traffic movement will increase due to transportation of turbine components and site personnel. Two locations for storage of equipments and material (i.e. zero point/storage yard) have been finalised, one in village Laxmidevipally at a distance of ~4 km from wind farm and second in village Jafferpally at a distance of about 1.5 km from site. The turbine components such as blades, tower nacelle will be brought to the yard site and will then be sent to the individual turbine location as per the requirement.

On an average, about 7-8 trucks/trailers will be required to bring the components of one turbine. Considering that at a particular instant of time, construction works for 10 turbines will be carried out simultaneously, a maximum of 70-80 trucks/trailers will ply on these roads. This kind of traffic movement may disturb the local people/ livestock population in the area and also poses increased risks of road accidents. The possible impacts associated with road traffic movement during the construction phase of the project include the following:

- increase in traffic movement on the road network linked to the project leading to traffic congestion and delays;
- short term closure of existing transport routes during proposed construction/widening of access roads thereby causing disruption and delays in traffic;
- increase in traffic related noise and emissions;
- damage to existing roads due to heavy vehicular/ equipment movement; and
- increased probability of road accidents which may result in injury, fatalities or environmental damage.

**Purpose and Objective of the Traffic Management Plan**

The Traffic Management Plan (herein after referred as TMP) sets out a framework for managing the movement of construction traffic to minimise the effects of traffic travelling to and from the site

during the construction period of the wind farm. All contractors shall be informed about this document and shall be required to conform to restrictions, mitigations and obligations contained herein. The key objectives of the TMP are to:

- Utilise the existing roadways in an efficient manner;
- Minimise traffic congestion and consequent delays;
- Ensure safety of employees, contractors, local users including general public;
- Ensure timely completion of the proposed construction/widening of access roads; and
- Minimise disturbance to the social environment.

**Applicability of TMP**

This plan shall be taken in action by MVGoPL, all contractors and sub-contractors or any other third parties associated with the construction phase of the project. The plan shall be reviewed by MVGoPL as the construction phase progresses and modified if necessary.

### *A. Preliminary Assessment*

MVGoPL shall carry out a preliminary assessment of the proposed access routes which will be used to deliver the wind turbine components and other construction equipments/materials to the proposed project sites. It should include:

- Potential of the existing road infrastructure along the identified route to accommodate the transportation of components and construction equipments/materials;
- Improvements that may be required along the identified route to enable the safe passage of load deliveries and plans to reduce the delay and disruption caused to network traffic flows during the installation of the wind turbines; and
- Forecast traffic flow for construction phase.

The methodology suggested for preliminary assessment of roads is outlined below:

- Survey for assessment shall be scheduled once in a weekday and weekend each (in total-twice a week) for a month on the roads under consideration so that representative traffic flow data can be collected;
- Average traffic (traffic flow) data on daily basis will be collected at 3-5 locations in terms of the following traffic composition:
    - Two Wheelers - Motor Cycles, Scooters
    - Three Wheelers - Auto Rickshaw
    - Light Commercial Vehicles (LCV's) - Car, Jeep, Mini Cab, Matador
    - Heavy Commercial Vehicles (HCV's) - Truck, Bus
    - Non-Motorized- Bicycle, Bullock - Cart
- Width of road falling in the route will be measured;
- Existing Bridges, natural drains and culverts (if any) will be identified; and
- Information will be collected on right-of-way available, carriageway width and surface type.

### *B. Review and Considerations on the Basis of Preliminary Assessment*

On the basis of the assessment undertaken, the existing infrastructure available for the project will be reviewed and adequate measures will be taken.

- If the widths of roads are found to be inadequate for the transport requirements of turbine blades and other large construction equipments, permission shall be taken from the respective authorities for required widening;
- Signage shall be erected to identify site access routes and to inform motorists that local roads will be accommodating construction traffic;
- Signage warning for the site access junction locations and an advisory speed restriction of 30 kmph shall be erected;
- Widening and strengthening of the carriageway shall be undertaken where necessary, to accommodate the turbine delivery vehicle wheel tracks;
- When practicable, construction traffic movements (equipment and materials) shall be scheduled to avoid the peak traffic periods at the beginning and end of each day and other sensitive periods, in order to minimise any potential disturbance to local traffic;
- Telegraph poles and overhead cables will be relocated where necessary;
- Appropriate speed limits for various motor vehicles and construction equipments shall be determined as part of the traffic management based on type of roads available;
- If any bottlenecks are identified appropriate measures will be taken to avoid congestion due to the project; and
- Alternative access routes for the transport of project construction equipments and wind turbine parts to project site shall be identified.

### *C. Traffic Management Planning*

Traffic planning and management can efficiently mitigate the impacts associated with the project related road traffic. The efficient management and planning of transport will require the implementation of following measures:

- Impose and enforce speed limits on all haulage vehicles operating on roads;
- Establishment of safe sight distances including within construction areas;
- The movement of heavy, wide or slow-moving loads will be planned at times when traffic volume on the roads concerned is least;
- Vehicles shall enter and exit project area in a forward direction, so far as is possible and reversing if required will not be done unattended;
- Signage around the construction areas to facilitate traffic movement;
- Regular inspection of access roads conditions and whenever, necessary, repair of construction traffic related damages will be done;
- Appropriate supervision will be provided to control flow of traffic when machinery needs to cross roads;
- Information will be provided to local authorities relating to the construction period, including abnormal load traffic movement schedules;

- Wheel washing on site and road sweeping will be carried out to keep the local highway clear of mud and debris;
- Training and testing of heavy equipment operators and drivers, including vision tests, with records kept of all trainings;
- Create traffic awareness among the local people and inform parents to keep children from exposing themselves to the traffic in the construction area. Vehicle traffic will be minimized during the periods when children are travelling to and from schools falling on traffic routes;
- Maintaining records of all accidents involving project vehicles and implementing a traffic complaint and corrective action procedure;
- If road closures are required, diversions shall be planned and communicated to the authorities and affected communities in advance. All diversion will be constructed to the specifications of the applicable road authority and will be maintained in good drivable conditions until the completion of the re-instatement work;
- Most construction equipment and vehicles would be brought to the wind farm site at the beginning of the construction process during construction mobilization and would remain on site throughout the duration of the construction activities for which they were needed;
- The project traffic or any project activity will not obstruct the access to neighbouring properties;
- Ambulance and fire services will be consulted regarding road diversions. Road diversions will not increase the response time of these services to local communities.

Where there is the potential for cumulative impacts from congestion and related impacts from construction traffic to settlements near or en route to the project component locations, transport movement will be carefully considered in order to minimise disturbance impacts.

### *D. Parking Facilities*

A working plan for provision of signage, parking facilities, safety advice and warnings will be prepared. All signs shall be posted in both English and local language.

Provision for dedicated parking area will be made near the project office for parking the vehicles.

Temporary concrete paved areas will be provided at parking to avoid any accidental spill of oil or fuel during parking or whenever the vehicle is idling.

### *E. Driver Training*

The project EHS requirements and Indian regulatory requirements specify the requirements for driver training. MVGoPL and Suzlon are required to ensure that all drivers are suitably trained in accordance with driver training requirements. The training shall be conducted in language mostly understood by drivers and following issues are to be addressed during driver training.

- Daily pre-use vehicle inspection by the driver;
- Safety kit in vehicle; and
- Health and Safety Standards and Practices.

Unauthorised passengers in project related vehicles will be strictly prohibited. All the personnel who drive vehicles as a part of contract will have to be in possession of a driving license and will adhere to the general Driver's Safety code and Passenger's Safety code.

### *F. Documents to be in possession of driver*

At all times, the following documents shall be in the possession of the driver and/or available in the vehicle:

- Driver's valid license-ORIGINAL
- Vehicle insurance policy
- R.C (Registration Certificate) book
- Periodic servicing of vehicle record
- P.U.C (Pollution Under Control) record
- Vehicle owner's name, address and phone number

### *G. Vehicle Management & Maintenance*

In order to minimise the accident rates and the overall transport fuel consumption, it will be ensured that the vehicle fleet working is maintained according to the manufacturers' specifications. This shall include the compliance of all vehicles with manufacturer specifications (such as the fitting of the correct tyres, with adequate reserves of tread, safe for movement in snow areas, inflated to manufacturer recommended levels).

Suzlon will ensure the following in respect to vehicle maintenance, noise and emission standards:

- All vehicles shall be maintained so that their noise and air emissions do not cause nuisance to workers or local people;
- An up to date database of all vehicles and construction equipments deployed across various project component locations will be maintained. The database will contain details about the periodical maintenance, schedule of maintenance, vehicular emission and noise emission testing done as per Indian regulatory requirements, copy of PUC certificates etc.;
- New vehicles/equipment purchased 'as new' after contract award shall comply with emission standards in force on the purchase date;
- Older vehicles/equipment not purchased 'as new' after contract award shall be maintained so that noise and air emissions levels are no greater than when the vehicle/ equipment was new.
- Avoidance of passage through and near settled areas during night time hours;
- Oil and fuel leaks must be addressed within 24 hrs of observation or reporting on any vehicle or construction equipment;
- Vehicle maintenance and management parameters will form a critical component of key performance indictor for the contractor responsible to maintain their vehicles;
- All heavy vehicles like cranes, battery operated trolleys etc. will be provided with reversing siren.

### *H. Roles and Responsibilities*

The effectiveness of TMP depends on how well it's implemented by the management and adhered to by the employees. The roles and responsibilities specific to the plan have been described below. Both, MVGoPL and Suzlon need to take up the roles and responsibilities as defined for effective implementation of the plan.

**MVGoPL's and Suzlon's Responsibilities**

- Develop the proposed TMP to implement commitments and contractual requirements relevant to traffic management;
- Communicate the contents and requirements of TMP to all the associated personnel and contractors managing transport operations and fleet;
- Coordinate the preparation of management plans at micro-level, if required and, review and approve the contractor plans before allowing the commencement of work;
- Secure from the project contractors and maintain an updated list containing details of transport vehicle fleet and its corresponding environmental regulatory compliance details with respect to emission and noise;
- Conduct workforce training programmes and ensure that all personnel are aware of their responsibilities;
- Coordinate internally with contractors to minimize traffic generation;
- Implement appropriate inspection and monitoring programme; and
- Determine corrective action for non-compliance and identify opportunities for continuous improvement.

### 11.8.2 Crane Safety Plan

A crane is a type of machine, generally equipped with a hoist, wire ropes or chains, and sheaves, that can be used both to lift and lower materials and to move them horizontally. It is mainly used for lifting heavy things and transporting them to other places. In the proposed wind farm project cranes will be used during the erection and commissioning phase of the WTG's and for installing the turbine components while erecting the towers.

Cranes are designed and tested for lifting heavy loads to great height. Hence, they involve a risk of catastrophic accidents if safe operating practices are not adhered to. The possible consequences of a crane failure include:

- Loss of life;
- Short/Long term disruption in the project;
- Payment of insurance and compensation costs by the project proponent/crane manufacturer;
- Litigation costs (if any).

Crane safety measures are project specific and the safety measures/guidelines that must be implemented with respect to this project have been described in the following section.

**Table 11-2: Crane safety Plan**

| S. No. | Safety Aspect | Precautions/Safety Measures to be taken |
|---|---|---|
| 1. | Equipment | • It shall be ensured that every crane is equipped with a legible, durable load |

| S. No. | Safety Aspect | Precautions/Safety Measures to be taken |
|---|---|---|
| | Requirements | chart that shows the manufacturer's recommended load configurations and maximum load weights.<br>• The chart must be securely attached to the crane and easily visible to operators when they are seated at the control station.<br>• The crane shall be equipped with an automatic safe load indicator and every crane shall be clearly marked for its safe working load.<br>• Crane operator cabin shall be provided with suitable seat, foot rest and protection from vibration.<br>• The cabin shall have adequate ventilation and be equipped with a suitable fire extinguisher. |
| 2. | Operator Training and Certification | • The crane operators must be physically fit and thoroughly trained and competent enough to operate the specific type of crane.<br>• The operators must possess certificates indicating their competence or they shall be trained/tested for the operation of the specific crane used in the project prior to commencement of construction. |
| 3. | Wind/Weather Considerations | • It shall be ensured that recommendations pertaining to wind (speed, direction) as mentioned in component/crane manufacturer's chart is strictly adhered to.<br>• Wind speeds at the time of operation shall be determined using a boom tip anemometer.<br>• A lightning safety plan shall also be in place. |
| 4. | Communication | • It shall be ensured that qualified, designated people are assigned the responsibilities required to safely and properly signal the crane to components into place.<br>• Proper methods/ tools (e.g. hand signals, radio) shall be used for signalling purposes. |
| 5. | Ground Pressures and Travel Routes | • The bearing capacity of the ground shall be determined prior to lifting of heavy loads.<br>• During all major component lifts, crane mats shall be placed on top of the crane pad to minimise the damages to be incurred. |
| 6. | Crane Travel Limits | • All cranes shall have a published chart indicating the operating guidelines for moving the crane.<br>• Considerations for the maximum percent grade, side slope and boom position shall be accounted for when planning the roadways and especially when moving the crane.<br>• All overhead obstacles shall be discussed prior to marking the safe travel route for the cranes. |
| 7. | Lift Area Control | • A safe zone for all non-essential personnel shall be established once the crane is ready to make a lift.<br>• Essential personnel operations shall be planned and supervised so that no one is working under the boom or lifting component. |
| 8. | Lift Plans | • Lift plans shall be provided for each major component lift to the crane operator prior to performing the work.<br>• Operator shall keep the lift plans on hand to ensure that each lift falls within the plans made.<br>• Lift plans shall have basic information such as crane configuration, component weights, rigging requirements and weights, crane capacities, crane pad requirements etc. |

**Employer's Responsibility**

The employer/construction contractor has the following responsibilities with respect to crane safety:

- Implement all the safety measures as mentioned in the crane safety plan;
- Supervise the crane operations to ensure that the safety measures are strictly adhered to;
- Conduct periodic inspection of the cranes employed in the project.

During inspection, the inspecting officer must check that:

- All the cranes deployed in the project have a valid *Certificate of Fitness* as prescribed under *Section 56 of The Central Motor Vehicles Rules, 1989*;
- The certificates of fitness are as per the format prescribed under Form 38 of the aforementioned rules;
- The crane has been provided with a Load Safety Certificate;
- The equipments/components of the deployed cranes are in good condition and not subjected to loads greater than the limits mentioned in the load chart;
- The safety measures mentioned in the plan are strictly adhered to.

### 11.8.3 Stakeholder Engagement Plan

Stakeholders are persons or groups who are directly or indirectly affected by a project, as well as those who may have interests in a project and/or the ability to influence its outcome, either positively or negatively. They can comprise individuals, communities, social groups, organizations etc. It is often observed that the poor and the marginalized are often ignored either due to the fact that they are unaware or do not have a forum to voice their opinion.

The purpose of the Stakeholder Engagement Plan (SEP) is to ensure that the direct and indirect impacted stakeholders of the project are regularly apprised of the project activities. The plan has been developed in order to draw out an outline wherein the communication process associated with the activities of the project cycle is to be undertaken.

#### *A. Stakeholder Engagement*

The stakeholders in the project were identified based on their level of interest and influence over the project activities. The stakeholders were primarily divided into direct and indirect and further regrouped as internal and external. In **Table 11-3**, the types of stakeholders as per their level of interest and influence have been provided.

**Table 11-3: Types of Stakeholders as per their interest and influence**

| S. No. | Types of Stakeholders | Description | Groups + Individuals |
|---|---|---|---|
| 1 | Direct Internal Stakeholders | Direct internal stakeholders comprise the parent company or the project proponent and the employees of the company that are directly controlled by the parent company. | • Mytrah (Project Owner)<br>• Suzlon (EPC Contractor) |
| 2 | Direct External Stakeholders | Direct external stakeholders comprise the project affected people/families, contractors, supply chain and financial intermediary who are directly affected by the project activities but are not directly controlled by the project | • Project Affected Persons/Families (Land Owners)<br>• Telangana State Power Transmission Corporation Limited (TSTRANSCO) |

| S. No. | Types of Stakeholders | Description | Groups + Individuals |
|---|---|---|---|
| | | proponent. | • Telangana Southern Power Distribution Company Limited<br>• Financial Intermediary<br>• Contractors<br>• Vendors |
| 3 | Indirect Internal Stakeholders | Indirect internal stakeholders consist of the secondary stakeholders who would have a more indirect interest but within the direct influence of the project. | • Families of Direct Employees |
| 4 | Indirect External Stakeholders | Indirect external stakeholders comprise of those stakeholders who might be not be involved directly in the day to day operation of the project but have an interest in the activities of the project. | • Local Community residing within the 15 villages of the project area<br>• Opinion Leaders of local communities residing within the 15 villages of the project area<br>• Local Government Institutions of 15 Villages<br>• Telangana State Pollution Control Board<br>• Centre for Wind Energy Technology<br>• New & Renewable Energy Department Corporation of AP limited (NREDCAP)<br>• Local Media |

## *B. Stakeholder Analysis*

Stakeholder analysis takes a more comprehensive view of the stakeholder's group interests, how they would be affected and to what extent and influence they could have on the project. These aspects cumulatively provide the basis for constructing the stakeholder engagement strategy. The key stakeholders identified in the previous section have been categorised into four major groups: Government Agencies, Positively Influenced Stakeholders, Critical to Engage and Donors. The categorisation list of key stakeholders has been provided in the following **Table 11-4.**

**Table 11-4: Categorization List of Key Stakeholders**

| Categorisation | Key Stakeholders |
|---|---|
| Government Agencies | • Telangana State Power Transmission Corporation Limited (TSTRANSCO)<br>• Telangana Southern Power Distribution Company Limited<br>• Telangana State Pollution Control Board<br>• Centre for Wind Energy Technology<br>• New & Renewable Energy Department Corporation of AP limited (NREDCAP) |
| Positively Influenced Stakeholders | • Project Affected Persons/Families (Land Owners)<br>• Families of Direct Employees<br>• Mytrah (Project Owner)<br>• Suzlon (EPC Contractor) |

| Categorisation | Key Stakeholders |
|---|---|
| | • Local Community residing within the 15 villages of the project area<br>• Contractors<br>• Vendors |
| Critical to Engage | • Opinion Leaders of local communities residing within the 15 villages of the project area<br>• Local Government Institutions of 15 Villages<br>• Local Media |
| Lenders | • Financial Intermediary |

In order to map the interest/influence of the stakeholders on the project activities, a matrix showcasing the stakeholders and their interest/influence has been developed. This step is to assess the interest/influence into high, medium and low levels. In ***Table 11-5*** the interest matrix has been provided.

**Table 11-5: Interest Matrix of Stakeholders**

| Categorisation | Key Stakeholders | Influence Power to facilitate or impede project | Interest in the Project |
|---|---|---|---|
| Government Agencies | • Telangana State Power Transmission Corporation Limited (TSTRANSCO) | High | High |
| | • Telangana Southern Power Distribution Company Limited | High | High |
| | • Telangana State Pollution Control Board | High | High |
| | • Centre for Wind Energy Technology | High | High |
| | • New & Renewable Energy Department | High | High |
| | • Corporation of AP limited (NREDCAP) | High | High |
| Positively Influenced Stakeholders | • Project Affected Persons/Families (Land Owners) | Low | High |
| | • Families of Direct Employees | Low | High |
| | • Mytrah (Project Owner) | Low | High |
| | • Suzlon (EPC Contractor) | Low | High |
| | • Local Community residing within the 15 villages of the project area | Low | High |
| | • Contractors | Low | High |
| | • Vendors | Low | High |

| Categorisation | Key Stakeholders | Influence Power to facilitate or impede project | Interest in the Project |
|---|---|---|---|
| Critical to Engage | • Opinion Leaders of local communities residing within the 15 villages of the project area | Low | High |
| | • Local Government Institutions of 15 Villages | Low | High |
| | • Local Media | Low | Medium |
| Lenders | • Financial Intermediary | High | High |

### *C. Communicative Method*

Stakeholder engagement becomes a successful exercise when proper and participatory communicative methods are used. This ensures that the stakeholders are kept engaged and well informed of the project development at every stage. A combination of communicative methods is usually used to engage with the stakeholders. To determine which option is best suited to the various stakeholders, a benefit analysis of each option has been carried out. The communicative methods are:

- General Information consisting of the project's various activities, the operation stage and impacts that might arise shall be made available:
  - on information board of the Gram Panchayat's office within the project area
  - on information board of Mytrah's site office
  - on Mytrah's website
  - in local newspaper

- Detailed information including documents like ESIA report; Environment, Health & Safety and Social Policy, Environment Management Plan, Social Management Plan including environmental decisions shall be in hard copies and disseminated to:
  - Mytrah's site office at Pargi
  - Electronic version of these documents will be made available at Mytrah's website.

- In addition to this, a host of tools and techniques can be adopted to engage with the stakeholders in a transparent and accountable manner. Below a list of the tools and techniques which can be adopted are mentioned:
  - Public Meeting: This tool can be used to disclose information on a large scale involving the stakeholders of a particular village. A schedule of the meeting can be circulated well in advance and discussions can involve feedback session from the stakeholders. The meeting can be conducted in the premise of the village school for proximity and familiarity purposes. Once the meeting concludes, minutes of the same should be kept as a record with the site office and a copy given to the village head. Schedules of future meetings should be discussed and finalised so that the stakeholders can gauge the seriousness of the project proponent in continuing the engagement process.

- Focus Group Discussion (FGDs): FGDs are important when gauging with a particular group of stakeholder on issues related to the project activities. It can be used to understand the needs, perceptions and concerns of the group. The discussion will give space for the members to voice their concerns and suggestions. The moderator of the discussion should be impartial in his/ her view and should encourage everyone present to participate in the discussion. Records of the FGDs should be maintained and updated regularly.
- Participatory Workshops: Participatory workshops are meetings which enable local people to analyse, share and enhance their knowledge to plan, manage and evaluate development projects and programmes. Visual aids – such as mapping, videos, illustrations, timelines, card sorting and ranking, Venn diagrams, seasonal calendar diagramming and body maps are often used in participatory workshops to engage participants and capture knowledge. They are often an effective means of getting participants to reflect on issues and their own personal experiences. These workshops also pay particular attention to group dynamics and breaking down distinctions between 'uppers' – those with power, standing, influence etc. within a community – and 'lowers' – those with less power, influence and standing within a community. To initiate such a workshop, an expert familiar with participatory tools and conducting such workshops shall be engaged.
- Participatory Rural Appraisal (PRA) Techniques: PRA techniques are usually adopted to emphasize local knowledge by enabling local people to make their own appraisal, analysis and plan. PRA uses group animation and exercises to facilitate information sharing, analysis and action among stakeholders. This process can be useful when the project proponent initiates any developmental activities in the area and uses the local knowledge to plan and strategise so that they feel responsible for delivery of the objectives.

### *D. Stakeholder Engagement Program*

The consultation with the stakeholders will be conducted by the Community Liaison Officer/Social Officer (MVGoPL) and Social/CSR Officer (Suzlon) who will work in collaboration with the nominated (Grievance Officer) and Site Incharge (Suzlon) and Project Manager (MVGoPL) at the site level. Any grievances from the community relating to any issues that might arise from the project activities will be managed by the nominated Grievance Officer based at the Site Office. The Community Liaison Officer is to report directly to the Project Manager based at the Site level.

Consultations with the government agencies will be conducted as per the schedule that will be created with the Community Liaison Officer and Project Manager. These stakeholders will be informed in advance of the planned project activities. The development of the facilities will be based on the EIA procedures and mitigation issues once an ESIA study has been completed.

Consultations with the direct internal stakeholders will involve meetings, information boards announcements and an Intranet system to apprise the direct employees of MVGoPL and Suzlon regarding the procedures of emergency response system, incident/accident reporting, grievance redressal mechanism, HR Policies and Procedures, welfare measures etc. In addition, communication of general employment conditions, company's code of conduct for work site, EHS concerns, use of PPEs, information and awareness about the requirements of labour laws and minimum wages,

working hours, grievance redressal, retrenchment process etc. should be also be conducted with workers engaged with contractors.

Project related information will be posted on the informational boards at the site office as well as at the Corporate Level. Information on the project milestones will be published in advance on the company's website to be available for the public and non-governmental organizations in the area to comprehend the attitude of the external stakeholders. In addition, the company will publish information on the project in the local newspapers.

In turn, if any issues are raised by the stakeholders, the project proponent management comprising of the Grievance Redressal Committee at the Site Level will respond accordingly in the shortest possible time. Details of which have been provided in the Grievance Redressal Mechanism section of the report.

The responsibility for the SEP implementation will be held by the Community Liaison Officer (MVGoPL) based at the Site Office. He will be supported by the Project Manager (MVGoPL), Social/CSR Officer (Suzlon), Site Incharge (Suzlon) and nominated Grievance Officer at the site level.

A summary of the consultation activities that the project proponent shall undertake as part of the Engagement Plan pertaining to the villages around the project area and other stakeholders have been provided in **Table 11-6**.

**Table 11-6: Summary of the Consultation Activities**

| Stakeholder | Objective and Consultation Method | Proposed Timeline | Responsibility |
|---|---|---|---|
| Local Community, Opinion Leaders, Local Media at Project Site | • Disclosure of the project at all 15 village within the project area and progress of the work to be displayed at the Information Board of Gram Panchayats office within the project area.<br>• Website of the Company | Before the commissioning of the Project | Community Liaison Officer from the Company and Local Leaders of the 15 villages. |
| Government Authorities | Information meetings and consultations | On-going on a permanent basis (every six monthly) | Company: Head-Projects (Mytrah), Project Manager / HSE Supervisor (MVGoPL), EHS Officer (Suzlon) and Community Liaison Officer (MVGoPL) |
| Direct Employees | • Internal meetings of direct employees and managers | • On-going process on a permanent basis: monthly | • Company: Project Manager/ EHS Officer & Community Liaison |

| Stakeholder | Objective and Consultation Method | Proposed Timeline | Responsibility |
|---|---|---|---|
| | • Day to day contact | • On-going on a permanent basis | Officer<br>• EHS Officer |
| Contractors (Third Party) | • Meetings with contractors and their respective managers | On-going on a permanent basis: monthly basis | EHS Officer, Project Manager and Community Liaison Officer |
| Lenders | • Information on project status<br>• Submission of annual reports, information on any project-related events that could potentially create an increased risk of the project | On-going process on a permanent basis | Company: Project Manager; designated person from Mytrah, EHS Officer and Community Liaison Officer. |

The stakeholder engagement process should be carried out at two levels, namely, local community and local governing bodies. A summary of the proposed plans that is to be initiated by MVGoPL have been described below in **Table 11-7**.

**Table 11-7: Summary of the Proposed Plan of Activities**

| S.N | Key Stakeholders | Proposed Plan of Activities |
|---|---|---|
| 1 | Positively Influenced Stakeholders/ Local Communities | • Announcement of vacancies (skilled/unskilled) at proposed site<br>• Announcement of contract work for small scale work associated with the proposed project<br>• CSR Activities as per BAIF's Proposal for Community Development<br>• Consultation with village panchayats about movement of heavy vehicles<br>• Information on route and timing of vehicle movement to be provided to village administrations<br>• Set up a grievance redress mechanism and inform the community about the procedure<br>• Discuss the management plan with the community and incorporate the comments |
| 2 | Local Governing Bodies | • Compliance with legal requirements<br>• Involvement of various CSR Activities |
| 3 | Lenders | • Compliance with International Guidelines (IFC Sustainability Framework, ADB Safeguard Policy Statement & other national and local legal requirements)<br>• Regular Reporting |

It is to be noted that the proposed plan of activities relating to the stakeholder engagement can change as per the future planning of activities by MVGoPL.

### *E. Monitoring and Reporting*

Monitoring: Monitoring of project activities is necessary to cater to the stakeholder's concerns by ensuring transparency in guaranteeing the project proponent's commitment in implementing the mitigation measures that addresses the environmental and social impacts arising from the project.

Through this information flow, the local stakeholders feel the sense of responsibility for the environment and welfare in relation to the project and feel empowered to act on issues that might affect their lives.

Internal monitoring of project related activities as well as associated activities involving the local communities should be contemplated upon on a regular yearly basis (by identified staff from the Corporate level) to bring in openness in the company's commitment. In addition, external monitoring of a company's environmental and social commitments can strengthen stakeholder engagement processes by increasing transparency and promoting trust between the project and its key stakeholders.

MVGoPL should undertake a commitment in undertaking internal audits every once in a year. All related information shall be readily maintained at the site office and produced at the time of the audits.

Audit reports shall be accordingly created after every yearly audit and submitted to Head-Projects. All records of these reports shall be maintained at the site office as well as the Corporate Office. In addition, an external auditor shall be engaged every six monthly to assess the activities of the project and its mitigation measures. The auditor shall accordingly submit a report to the company for review and this should be forwarded to the lender financing the project as well.

Reporting: Performance of MVGoPL will be reviewed yearly against the Stakeholder Engagement Plan. The report will include, but not be limited to, the following:

- Informative materials disseminated, its types, frequency, and location
- Place and time of formal engagement events and level of participation
- Activities of community welfare undertaken
- Feedback on CSR initiatives
- Other interactions with the community; and
- Numbers and types of grievances (both from the community and workers) and the nature and timing of their resolution.

### 11.8.4 Grievance Redressal Plan

Grievance Redressal Mechanism (GRM) is an important criterion for development projects wherein ongoing risks and impacts of projects are probable. The GRM provides a way to reduce risks for projects, offer communities an effective avenue for expressing concerns and achieving remedies and promote a mutually constructive relationship.[32] It is an important tool through which the communities concerns and complaints are registered and addressed. This mechanism is a significant

[32] A Guide to Designing and Implementing Grievance Mechanisms for Development Projects by The Office of the Compliance Advisor/ Ombudsman for IFC and MIGA, 2008.

pillar of the stakeholder engagement process as it creates opportunities for the project proponent and communities to identify problems and determine solutions together. The mechanism tends to meet the requirements of stakeholder engagement process, prevent and address community concerns, reduce risk, and assist the processes that create positive social change.

The GRM has been developed with an intention of it being an effective tool for early identification, assessment and resolution of complaints during project implementation. It is a means through which acceptance, assessment and resolution of community complaints concerning the performance or behaviour of the project proponent are ascertained and addressed. The GRM prepared should be implemented to the entire life cycle of the proposed project.

### *A. Steps for Developing a Grievance Mechanism*

MVGoPL/ Suzlon while developing the Grievance Mechanism are required to adhere to the following steps:

- **Development of Procedures**: MVGoPL/Suzlon should ensure that procedures for lodging and registering of grievances are in place before the plan is implemented at the site level. The procedures of Grievance Mechanism should comprise of identifying the personnel (Grievance Officer at Site level) who will be responsible for receiving and addressing the grievances at the site level and handle the cases at the escalation level. The procedures to be developed should include assessment procedures, procedure to determine the appropriate resolution process, procedures for making decisions on proposed settlements, appropriate time frames for each step in the grievance resolution process and notification procedure to the complainant about eligibility, assessment results, proposed settlements and the like.
- **Develop Resolution Options and Response:** Once MVGoPL/Suzlon developed procedures, formal and informal resolution options should also be developed along with preparation of formulating a response. General approaches to grievance resolution many include proposing a solution, reaching a resolution through discussion or negotiation, using a third party to either informally or formally resolve the matter through mediation and through traditional and customary practices.
- **Publicise the Grievance Mechanism**: Once the procedures for Grievance Mechanism has been developed by MVGoPL/Suzlon, it has to be publicised through various stakeholder engagement activities as detailed out in the Stakeholder Engagement Plan. MVGoPL /Suzlon should inform the local community in the first instance and then remind them of this mechanism on a regular basis during the project construction and operation phases. Various communicative methods can be adopted in disseminating the information like printed materials, displays, face to face meetings and website updation. The grievances redress mechanism (GRM) shall be documented in English and Telugu and copies shall be kept at the project site office and corporate office. The GRM is also to be displayed at notice board at the project site office and training on the GRM shall also be provided during induction. MVGoPL /Suzlon is to ensure that the contractor would keep the workers informed about the grievance mechanism at the time of recruitment and make it easily accessible to them. All the relevant contact numbers to be made available to them.
- **Training/ Workshops on Grievance Redressal Mechanism**: A separate training/ workshop should be undertaken by MVGoPL / Suzlon at the community and worker level to discuss the

process of how a grievance gets registered, the local contact person's/grievance officer details of receiving grievances, the significance of grievance boxes, the timelines for addressing the grievances and the personnel involved in the redressal process. These trainings should be held every half yearly and feedback/suggestions from the community should be acknowledged and changes to the GRM should accordingly be undertaken to make it more user friendly.

- **Recording of Grievances:** Once the stakeholders are aware of the mechanism and access it to raise grievances, MVGoPL / Suzlon is required to acknowledge the same and keep the complainant's identity anonymous. Consequently, MVGoPL /Suzlon is required to collect grievances by checking the grievance boxes once every fifteen days, record and register the grievances that have come in as per the identified formats and track them throughout the redressal process to reflect on their status and important details. A Grievance Log or database emphasising the records and status of the grievance is to be maintained by the identified Grievance Officer at the site level. The Grievance Log can be used to analyze information about grievance and conflict trends, community issues and project operations to anticipate the kinds of conflicts that the project proponents might expect in the future both to ensure that the grievance mechanism is set up to handle such issues and to propose organizational or operational changes.[33]
- **Appeal:** If the grievance redressal solution is not acceptable or agreed by the project proponent, the complainant should be offered to an appeal process. Circumstance revolving around when an appeal can be made should be set by MVGoPL /Suzlon so that accountability and transparency is promoted by them in every step. National Court or convening of a senior and independent panel of individuals to seek appropriate resolution of the case with representation from both government and civil society is often encouraged. This panel may also play the role of providing strategic oversight and assurance of the mechanism through review monitoring and tracking data.
- **Resolve and Follow Up:** Once the corrective action has been agreed upon, a good practice is to collect proof of those actions in terms of taking photographs, documentary evidence, getting confirmation from the complainant and filing the same within the case documentation. In addition, monitoring and follow up on the resolution agreed upon should be conducted once to close the case accordingly. MVGoPL /Suzlon are required to provide regular (yearly) reports to the public that track the number of complaints received, resolved, not resolved and referred to a third party. In addition, the funding agency also needs to be constantly apprised of the yearly reports in order to support MVGoPL /Suzlon in early identification of developing risks.

### *B. Proposed Grievance Redressal Mechanism for MVGoPL/Suzlon*

MVGoPL /Suzlon in order to implement the Grievance Redressal Mechanism are required to identify the contact person/grievance officer involved at the site level for registering the grievances, the process of registering and action taken thereon for the resolution of the grievance, the timeline required in each step and criteria in escalation of the case to the higher level.

[33] A Guide to Designing and Implementing Grievance Mechanisms for Development Projects by The Office of the Compliance Advisor/ Ombudsman for IFC and MIGA, 2008.

A site level approach is proposed to be developed for redressal of all cases of grievances. The steps of grievance redressal for MVGoPL /Suzlon have been provided below:

**Receive and Register a Complaint**

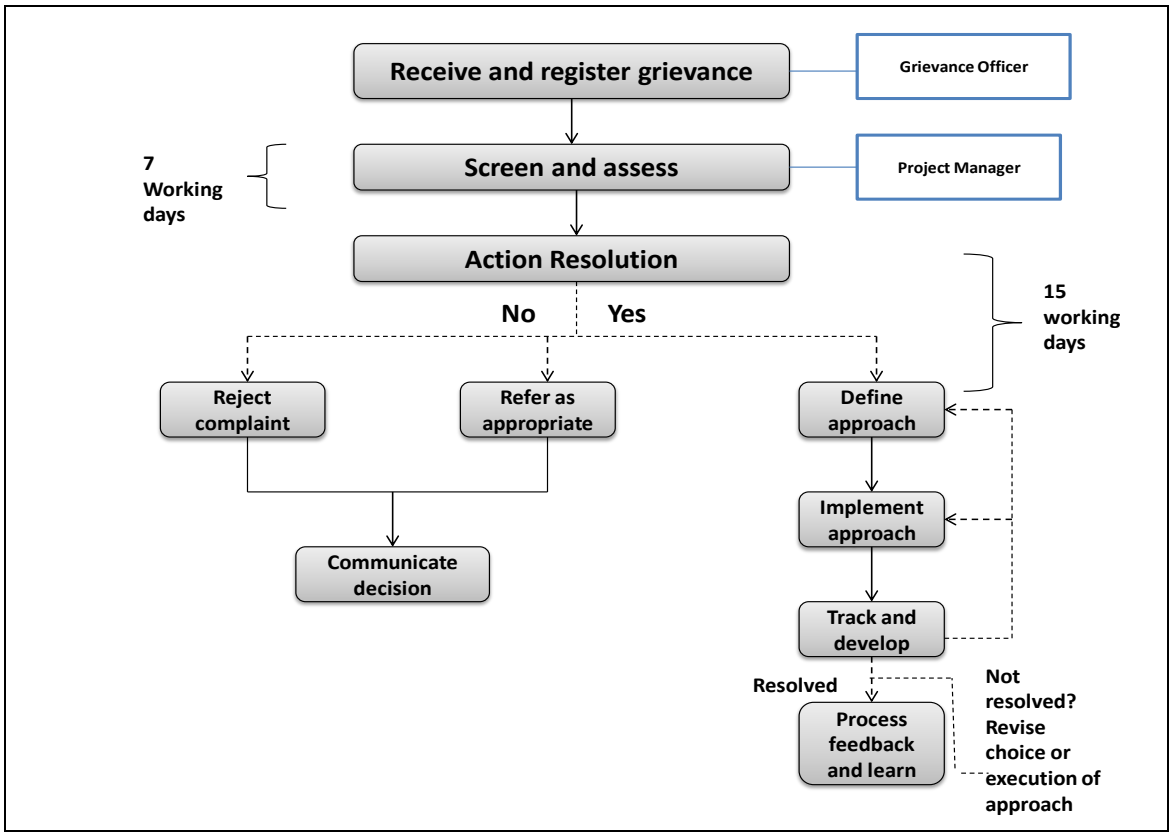
- Any stakeholder with concerns pertaining to onsite work such as community health and safety, local employment, community risk, migrant labour etc. may register their complaint in writing to the nominated person/grievance officer at site level;
- Secured grievance boxes shall be placed at the entrance of the site office;
- If any stakeholder or community member wishes to remain anonymous, he/she can write down the grievances and drop in the available complaint box;
- Once a complaint has been received it shall be recorded in the grievance log register or data system.

**Assessment and Addressal of Complaint**

- The identified Grievance Officer will open the complaint boxes every fifteen (15) days and forward the grievances to the Project Manager for further action;
- The grievance will be assessed by the Project Manager within seven (7) working days to determine if the issues raised by the complaint fall within the mandate of the grievance mechanism or not;
- During the assessment of complaints, the GRC team (Site Incharge, EHS Officer, Project Manager, Community Liaison Officer and CSR Officer of Suzlon) will gather information about the key issues and concerns and helps determine whether and how the complaint might be resolved;
- The grievances will be redressed at the Site Level by the GRC within 15 working days;
- If the grievance fails to be addressed at this level the complainant will have the option to approach the appropriate court of laws for redress;
- The complainant will have the opportunity to be present at the committee meetings and discuss the grievance faced by him/her.

The Grievance Mechanism proposed for MVGoPL/Suzlon to consider and implement has been provided in ***Figure 11-2***.

**Figure 11-2: Proposed Grievance Mechanism Structure for MVGoPL/Suzlon**




***Source:*** Adapted from CAO's Guide to Designing and Implementing Grievance Mechanisms for Development Projects

## *C. Resources Required for Grievance Mechanism Implementation*

A Grievance Mechanism becomes successful if adequate resources are assigned in its implementation. Adequate resources here refer to people, systems and processes and associated financial resources. In order to incorporate the responsibility of designing, implementing and monitoring the grievance mechanism, the senior management at the corporate level of Mytrah should be involved in executing the various tasks.

For a grievance mechanism to function effectively, it is important to establish a governance structure and assign responsibilities for the mechanism's implementation. The following roles and responsibilities have been identified for grievance mechanism implementation:

***Nominated Grievance Officer***

The Community Liaison Officer (MVGoPL) based at the Site Level is to be nominated as the Grievance Officer. The incumbent is to work in tandem with the Project Manager, EHS Officer, CSR Officer and Site Incharge. They cumulatively form the Grievance Committee at the site level.

## *D. Engagement of Third Party*

To maintain ultimate transparency and accountability for the grievance mechanism process, third parties such as local governments, local community etc. can at times be involved in the grievance redressal process. These parties can serve as process organizers, places to bring a complaint to be passed on to the company or as facilitators, witnesses, advisors or mediators. Third parties can assist

in enhancing the trust level from communities as well as overcome limitations of project-level mechanism.

Through the involvement of third parties as facilitators, the community's confidence in project level grievance mechanism can be increased and the project proponent can gain a better reputation with and greater trust from stakeholders. In addition, cost-efficiency and supplement of internal resources can also be achieved if this step is contemplated upon.

### *E. Monitoring and Reporting*

Monitoring and reporting are requisite tools of measuring the effectiveness of the grievance mechanism, the efficient use of resources, determining broad trends and acknowledging recurring problems so that they can be resolved before they reach a higher level of contention. They also create a base level of information that can be used by the project proponent to report back to the stakeholders.[34]

#### *Monitoring*

Depending on the extent of project impacts and the volume of grievances, monitoring measures like internal (by identified Corporate level staff) and external audits (third party consultants) every once in a year based on the complexity of the nature of grievances can be adopted by MVGoPL. Grievance records maintained should provide the background information for these regular monitoring exercises. Through the review of each grievance and analysis of its effectiveness and efficiency, MVGoPL can draw on the complaints to evaluate systematic deficiencies. In addition, monitoring of the grievance mechanism helps to ensure that the design and implementation of the mechanism is adequately responding to stakeholder's comments in a cost effective manner.

#### *Reporting*

All grievances registered have to be recorded and regularly updated. The site management or Grievance Officer is responsible to discharging this responsibility and he should be able to produce this document whenever any audits take place. All minutes of meetings with stakeholders, complainants and Grievance Committee are to be recorded and documented regularly for reference purposes. In addition, through the process of monitoring and the reports produced thereafter, assurance of continual improvement of the company's operations is guaranteed. The company can also use these monitoring reports to report back to the community on its implementation of the mechanism and the modification/ changes proposed to make it more user-friendly.

[34] IFC's Good Practice Note on Addressing Grievances from Project-Affected Communities

# 12. CONCLUSION AND CATEGORISATION

The ESIA has assessed the overall impacts on Environmental and Social components as a result of construction and operation of proposed 98.7 MW wind power project at Nazeerabad site falling in Rangareddy and Mahbubnagar Districts of Telangana. The impacts due to the project is minimal, site specific and has reversible impacts on the micro environment of the project site owing to the construction activities, shadow flickering and noise generation from the wind turbine generators and involvement of agricultural land.

The project is assessed to generate some environmental and social impacts due to construction, operation and establishment of associated facilities. Mitigation measures for potential impacts on air environment, water quality, Land, Soil, Noise, Traffic, Ecology, and Socio-economic have been specified through proper:

- follow up of best practice of public disclosure about the project to the local community, and grievance management;
- Planning & designing of wind farm sites, WTG location preparation and access route, construction, drainage, traffic movement etc.;
- Application of standards for Health and Safety; and
- Clearances and permits required for each sub activity.

This ESIA study together with mitigation measures and follow up of recommendations on management actions will help MVGoPL in complying with national/state regulatory framework; and meet the requirements of IFC performance standard and ADB safeguard policies.

Based on the ESIA study conducted the proposed project can be categorized as ***Category B*** (as per IFCs categorisation of projects), as the social and environmental impacts are limited, site specific, largely reversible and can be readily addressed through the proposed mitigation measures.

With respect to ADB Classification, the proposed project can be categorised as ***Category B*** for Environment since the project is expected to have adverse environmental impacts that are less in number, generally site specific and readily addressed through mitigation measures and ***Category C*** for safeguards related to Involuntary Resettlement and Indigenous Peoples.

The rationale for categorisation is provided below:

- The land for the proposed project comprises of private agricultural land and does not involve any involuntary resettlement;
- Private land required for the project has been procured on willing seller/willing buyer basis with individual negotiation with the land owners and locals expressed their desire to sell their land during consultations due to erratic rainfall in the area;
- The project is not located in an ecologically sensitive area;
- The operation of turbine will have limited environmental and social impacts;
- There are no indigenous communities in the project area;

- There are no cumulative impacts associated with the project, this being the first wind farm in the area;
- Any adverse environmental and social impacts may be readily addressed with mitigation measures as outlined in Environmental and Social Management Plan.

# Annexure