ARCADIS | SENES Consultants India Pvt. Ltd.

3rd Floor, Tower B,

Logix Techno Park,

Sector – 127,

Noida – 201301,

Uttar Pradesh, India

T. +91 (120) 4368400

F. +91 (120) 4368401

Noida:

August 17, 2015

Contact:

Sumit Barat

sbarat@senesindia.com

Sanjukta Sarkar

ssarkar1@senesindia.com

Dhirendra Pratap Singh

dsingh@senesindia.com

www.arcadis.com

ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT REPORT

OSTRO 100 MW WIND POWER PROJECT, ANATAPUR, ANDHRA PRADESH

SUBMITTED TO:

OSTRO RENEWABLES PRIVATE LIMITED

SUBMITTED BY:

ARCADIS/SENES CONSULTANTS INDIA PRIVATE LIMITED

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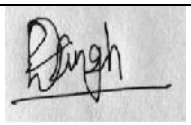
Document Control

Task	Title	Date	Signature
Prepared by	Sanjukta Sarkar Environmental Specialist SENES Consultants India Pvt. Ltd.	July 2015	
	Dhirender Pratap Singh Sociologist SENES Consultants India Pvt. Ltd.		
Reviewed & Authorized by	Deo Narayan Technical Head-SENES SENES Consultants India Pvt. Ltd.	Aug 2015	

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Abbreviation:

AC	Alternating Current
APTRANSCO	Transmission Corporation of Andhra Pradesh
CGWB	Central Ground Water Board
CSR	Corporate Social Responsibility
CTE	Consent to Establish
CTO	Consent to Operate
DC	Direct Current
E&S	Environmental and Social Risk
EIA	Environment Impact Assessment
EP	Equator Principle
EPFI	Equator Principles Financial Institutions
ESDD	Environment & Social Due Diligence
ESIA	Environment and Social Impact Assessment
ESMP	Environmental Social Management Plan
FI	Financial Institutions
GRM	Grievance Redressal mechanism
IFC	International Finance Corporation
IFC PS	International Finance Corporation Performance Standards
NREDCAP	New and Renewable Energy Development Corporation of Andhra Pradesh.
PAP	Project Affected People
PCU	Power Conditioning unit
PFI	Project Finance Institutions
PS	Performance Standard

1 Executive Summary

OSTRO Renewables Energy Pvt. Ltd is setting up a 100 MW wind energy project near Nimbagallu village in Uravakonda tehsil in Anantapur in Andhra Pradesh.The project is being developed by M/s Gamesa Pvt. Ltd for OSTRO Renewables Pvt. Ltd. The project comprises of 150 WTGs out of which 50 would be chosen for establishing 100 MW wind power project. ARCADIS SENES has been appointed as an independent environmental consultant to conduct an Environmental and Social Impact Assessment (ESIA) in accordance with IFC's Performance Standards.

The project is being developed on private land that will be purchased on willing to sell willing to buy basis. The land will be purchased on point basis (2-3 acres per WTG). The project is spread across an area of about 198 sq Km and is spread across 6-7 villages. The study area is a mix of agriculture and scrub land. There is a network of dry canal in the project area. There is no big water body on the project site except two big reservoirs near Nimbagallu village.

The WTGs are of Gamesa make G-97 type of 2MW each. APTRANSCO will be providing connectivity to this project for evacuating power from the proposed wind farm. Laying of 220 KV line will be done up to upcoming 400/200 KV Uravakonda substation from the proposed pooling substation. The project is going to be commissioned by March 2016.

The project is assessed on the basis of IFC performance standards. IFC PS 1 (Assessment & Management of Environmental & Social Impacts and Risks), IFC PS 2 (Labor and Working Conditions), IFC PS 3 (Resource Efficiency & Pollution Prevention), IFC PS 4 (Community, Health, Safety and Security) and IFC PS 6 (Biodiversity Conservation & Sustainable Management of Living Natural Resources) are applicable for the project. The project has limited environment and social impacts that can be mitigated through suggested mitigation measures as such the project is categorized as Category B, as per IFC categorization of projects.

SENES has assessed potential environmental and social risks and impacts arising from proposed project. Environmental and Social Management Plan for OSTRO has been drawn up that will mitigates the identified adverse risks and impacts. This Environmental and Social Management Plan will enhance the positive impacts of the project. Detailed management plan has been incorporated in the ESIA report.

2 Introduction

OSTRO has planned wind energy business to build 800MW of wind projects over the next 4 years. ACTIS[1] has committed to fund OSTRO's business plan with a funding commitment of US$230 million thereby ensuring availability of equity for all its projects. OSTRO will construct green field projects but at the same time will be open to acquiring operating projects that meet its performance standards. OSTRO has signed up 100 MW of Wind Projects so far continues to build up its pipeline to achieve its business plan target.

Proposed grid connected 100 MW wind power plant is located near Nimbagulla village in Anantapura District of Andhra Pradesh State. The project is being developed by M/s Gamesa Pvt. Ltd for OSTRO Renewables Pvt. Ltd. The former has completed various key activities with respect to the project viz. application to APTRANSCO for power evacuation, wind monitoring and C-WET certification, wind resource assessment, micro-siting, land survey etc. The proposed project involves construction and operation of 50 Wind Electric Generators (WEGs) of capacity 1500 KW each.

OSTRO has a 'zero-tolerance' approach when it comes to dealing with any violations of its standards and policies. OSTRO has a strong focus on Environment Social Safety and Governance aspects (ESSG) in its business and is committed to follow the highest standards across its operations. ARCADIS SENES has been appointed as an independent environmental consultant to conduct an Environmental and Social Impact Assessment (ESIA) in accordance with IFC's Performance Standards.

SENES has assessed potential environmental and social risks and impacts arising from proposed project. It has drawn an Environmental and Social Management Plan for OSTRO which will help in mitigating the adverse risks and impacts.

2.1 OVERVIEW OF THE PROJECT

The proposed wind power project is located near Nimbagulla village in Anantapura district of Andhra Pradesh state. The project will comprise of 150 WTGs each of model G-97 2000 kW capacity, access roads, transmission lines and other equipment laying yard. Out of 150 WTGs 50 WTGs would be selected and 100 MW of project will be established. Two numbers of 220/33 kV 63 MVA power transformers is planned to be installed at the wind farm pooling substation. All internal OH lines will be of 33 kV level with panther/dog conductors. Power will be evacuated from wind farm pooling substation to APTRANSCO's 220 kV Uravakonda substation which is at distance of 12 km from the proposed project site. Project location map is provided in **Fig 1.1.** Location of the WTGs on toposheet published by Survey of India is presented **in Fig 1.2.**

[1] ACTIS is a pan emerging market equity firm. It invests in various sectors including energy where it invest in distribution, power generation and transmission both for renewable and non renewable sources.

TABLE 2-1: PROJECT SNAPSHOT IN BRIEF

S. No	Particulars	Description
1	Project Site	Taggupparti, Honnura in Anantapur District
2	Tehsil	Uravakonda
3	District Name	Anantapura
4	Name of the State	Andhra Pradesh
5	Site Elevation	564 m AMSL
6	Latitude	14°53'20.08"N
7	Longitude	77°12'25.52"E
8	Road Accessibility	From Bangalore to Anantapur via NH-7 and from Anantapur to site via Kanekal Uravakonda Road
9	Nearest Airport	Bangalore (around 250 km)
10	Nearest Railway Station	Anantapur (around 70 km)
11	Type of Terrain	Generally flat terrain with some undulations
12	Ownership of land	Private land
13	Present land use	Mostly Agricultural (once cultivated) and barren land
14	Proposed arrangement of land	Point basis (2-3 acres per WTG)
15	Number of WTGs	150
16	Capacity of each turbine proposed	2000 kw
17	Model of wind turbine	G-97
18	Hub height of turbines	104 m
19	Rotor diameter of turbines	97 m
20	Rotational speed, rpm	9.6 to 17.8
21	Voltage	690

FIGURE 2-1: PROJECT LOCATION MAP

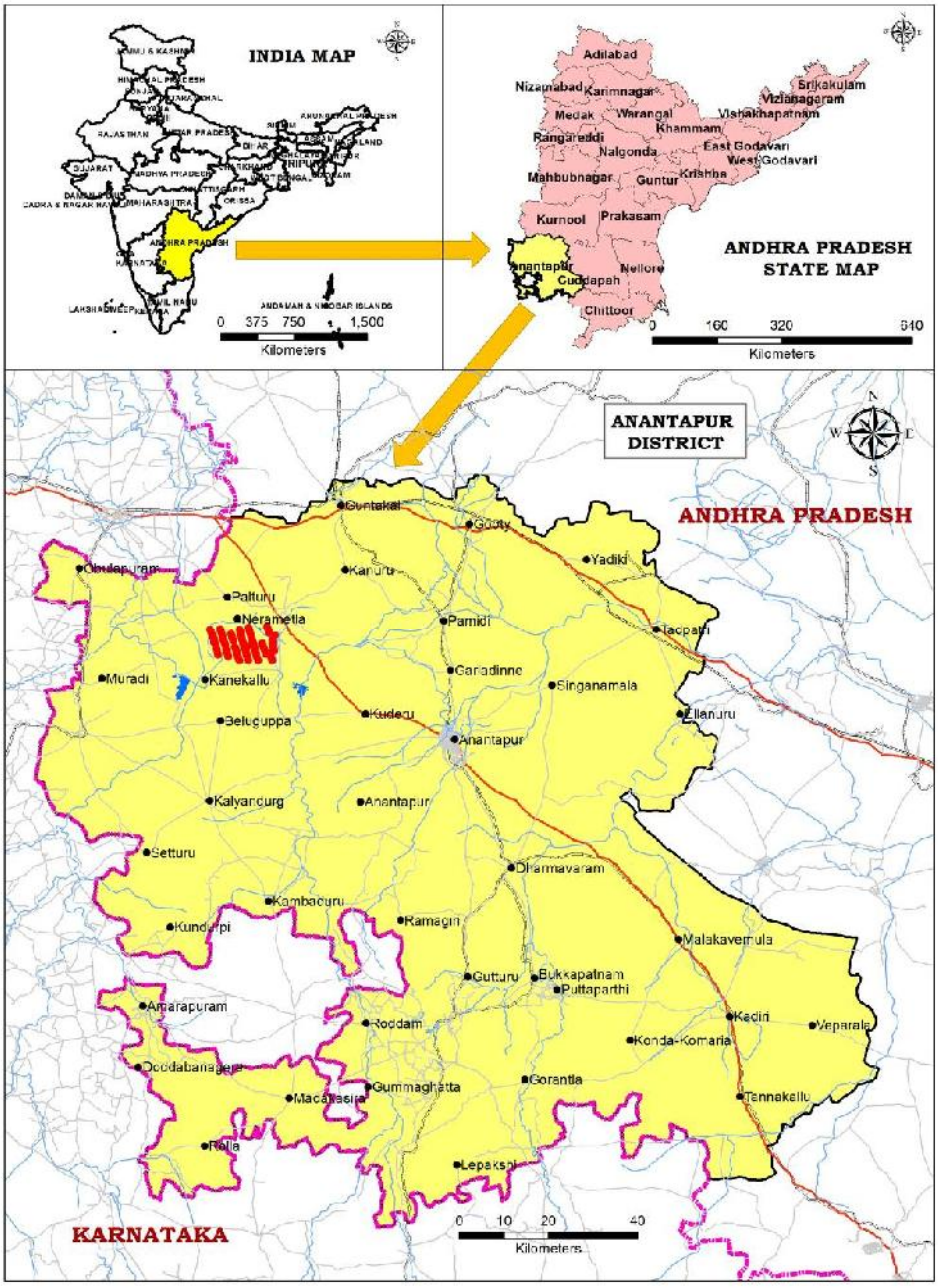
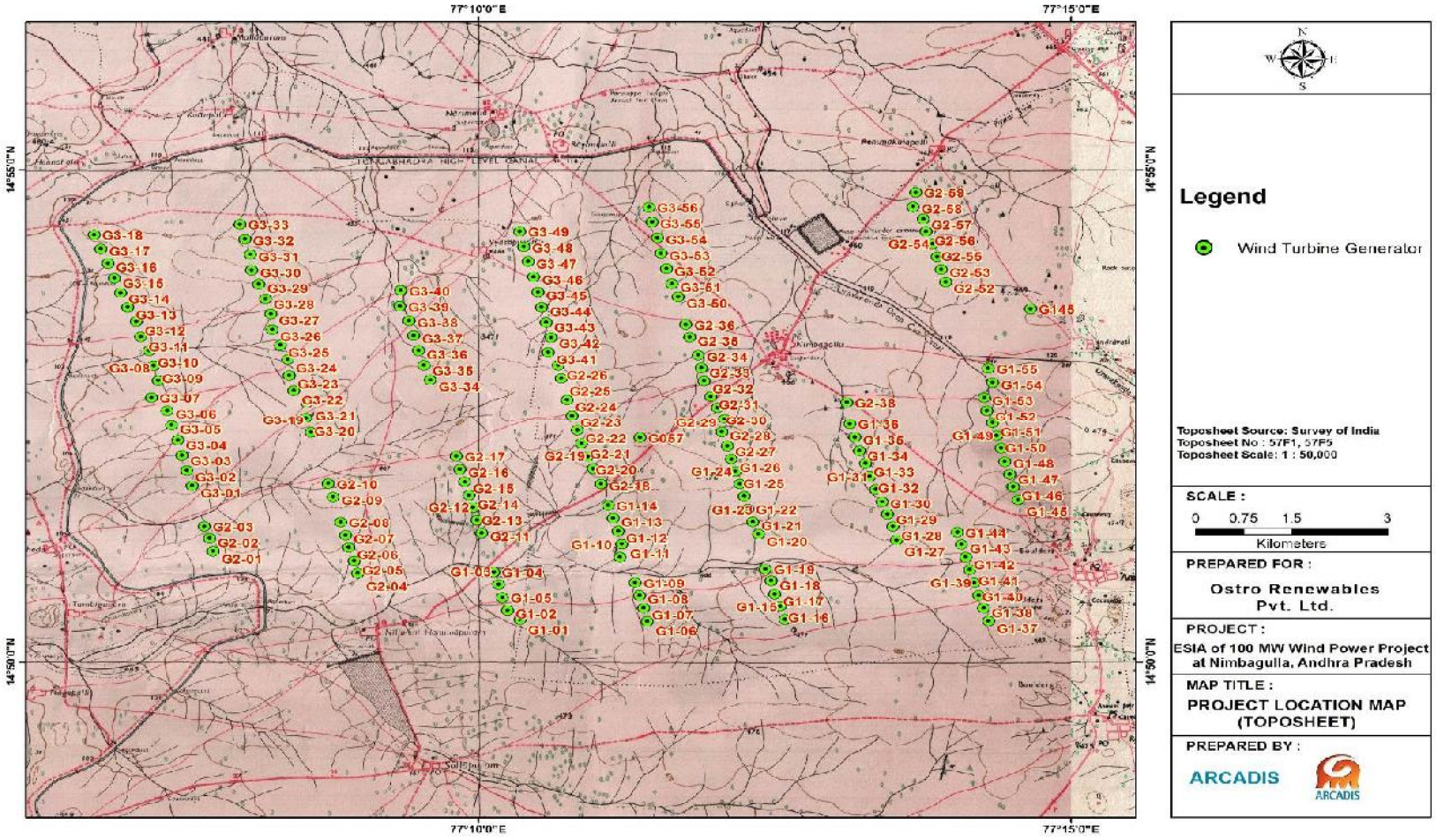


FIGURE 2-2: LOCATION OF WTG ON TOPOSHEET



2.2 BENEFITS OF THE PROJECT

This wind power project offers the following advantages:

- The technology of electricity generation from wind has been developed fully for smooth and trouble-free operation as well as for its economic viability.
- It is pollution free and eco-friendly;
- Low gestation period – less than six months from concept to commissioning, enabling fast bridging of power gap even in remote areas.
- With no fuel consumption, power generation becomes almost free after recovery of capital cost. O & M, cost is nominal.
- It can be developed in modular form with facilities for extension at a later date.
- No adverse social impact, such as resettlement and rehabilitation;
- Energy security – minimizing the dependency on fossil fuels for power generation;
- Availability of government incentives to renewable projects in India.

2.3 APPROACH & METHODOLOGY OF ESIA

2.3.1 Approach

The overall approach of this assignment is to understand the project activities through desktop review of project related documents like detailed project report, permits/clearances, maps etc. and undertake a reconnaissance survey of the surrounding area to gain adequate familiarization with the proposed location. This will be followed by identifying environmental and social risks associated with the project with respect to applicable national regulations and IFC performance standards. The review and findings will be assessed to identify gaps in addressing identified environmental & social risks and identifying additional risks (if any) due to planned project activities. The identified gaps will thereby lead to derive an environmental and social management and action plan (with timelines & responsibilities) to address these gaps. SENES has followed following steps to achieve the above mentioned approach:

- Reconnaissance survey of project site and its surrounding
- Desk review of the relevant project details, documentation
- Meetings and discussions with project personnel of OSTRO Renewables and EPC contractor i.e. M/s Gamesa Pvt. Ltd. other project stakeholders
- Collection and verification of primary & secondary information on baseline environmental and social aspects
- Desk analysis and impact identification
- Developing environmental and social management plan and report writing

2.3.2 Methodology

SENES has adopted following methodology to prepare the ESIA report:

- Formulation of a team of environmental and social experts
- Carrying out initial meetings with OSTRO to arrive at a common understanding and consensus on all important aspects, for efficient and effective delivery of the assignment's needs and objectives
- Review of basic project details and carry out reconnaissance survey of project site and its surroundings,
- Assessment of the project compliance with respect to IFC's performance standards
- Conducting detailed site visits, meetings, monitoring and consultations with project management & stakeholders, review and gather relevant documents and records
- Detailed desk review and analysis of all the information gathered during the site visits and consultations, meetings
- Discussion on identified tasks in Environment & Social Management Plan, resource needed for these tasks.
- Review the ESIA report along with relevant officials of OSTRO followed by incorporation of the suggestions and address the comments received.

2.4 LIMITATIONS

The study is based on the project planning information and document provided by the project proponent, community consultation and observation recorded during site survey. Time limitation along with project cycle schedule constrained the collection of long term localized baseline data, predictions for this ESIA is based on 'snapshot' picture. The baseline condition is an extrapolation of surrounding areas to site. Any significant change in the proposed activities may result in variation of outcomes. Presented information and fact has been analyzed and inferences has been drawn through professional judgment.

2.5 ESIA TEAM

ARCADIS has mobilized a diverse team of multidisciplinary experts for conducting the ESIA study. A number of these experts has accredited professionals by Quality Council of India to conduct regulatory EIA. These experts have provided consultancy services to over 75 wind power projects across India with over 750 MW in installed capacity. The experts have been continuously working with funding agency, who understand the modalities and procedures of evaluating and addressing environment and social risk associated with large scale investment.

2.6 STRUCTURE OF ESIA REPORT

Chapter 1: Introduction

Chapter 2**:** Project Description

Chapter 3**:** Applicable Policies, Legal and Administrative Framework

Chapter 4**:** Environmental and Social Baseline

Chapter 5**:** Analysis of Alternatives

***Chapter 6*:** Social and Environmental Impact Assessment

***Chapter 7*:** Environmental and Social Management Plan

3 Project Description

3.1 PROJECT SITE SETTINGS

The site is flat terrain with some undulations. The project area is mostly agricultural area cultivated once, during the monsoon. The soil is sandy in nature comprising of red and black soil. The project area is a mix of open scrub with agriculture land. There are other established wind power projects in the region are located 60 Km from the proposed site.

The district of Anantapur has a fairly good elevation which provides the district with pleasant climate throughout the year. It has a gradual fall from the south to north towards the valley of the Pennar in Peddavadugur, Peddapappur and Tadipatri mandals[2]. There is a gradual rise in Hindupur, Parigi, Lepakshi, Chilamathur, Agali, Rolla and Madakasira mandals in the south to join the Karnataka Plateau where the average elevation is about 2000 feet above the mean sea level. It is about 1100 feet at Anantapur and the lowest 900 feet at Tadipatri. Topographical map of the proposed project site is provided in **Figure 3.2**.

The district is geographically positioned in the driest part of the state, therefore agriculture conditions are more often precarious. Monsoons is also uncertain in this part due to its location. Being far from the east coast, it does not enjoy the full benefits of north east monsoons and being cut off by the high Western Ghats. South west monsoon are also prevented from penetrating this area.

Photo-Topography

Flat terrain within the project site

Scanty vegetation within the project site

3.2 SITE ACCESSIBILITY

The site can be approached from Bangalore by road via Anantapur (NH-7) and from Anantapur to site via Kanekal Uravakonda road. The nearest airport is at Bangalore at a

[2] *Mandal is another word for Tehsil, an administrative division used in Andhra Pradesh*

distance of around 250 km. Nearest railway station is located at Anantapur at a distance of around 60 km from the proposed site. Access to the site is presented in the **Fig 3.1** below.

FIGURE 3-1: ACCESSIBILITY MAP OF PROJECT SITE

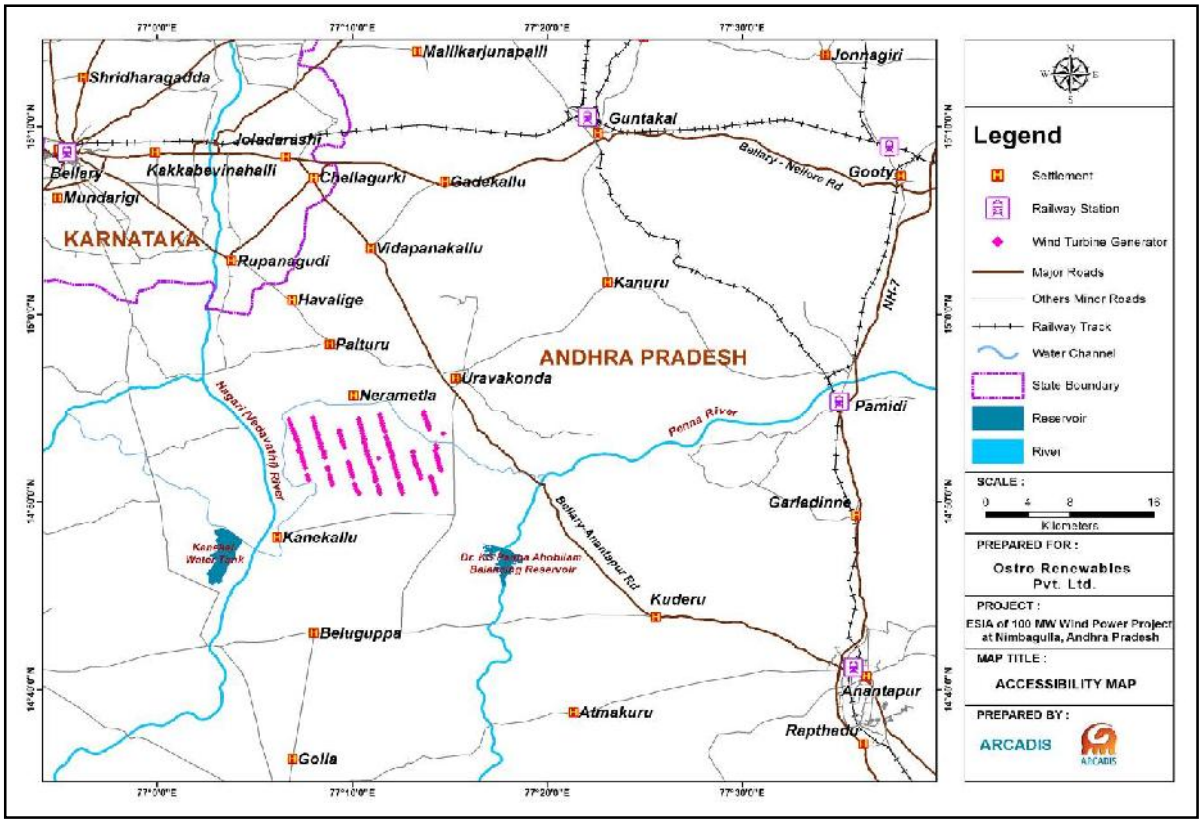
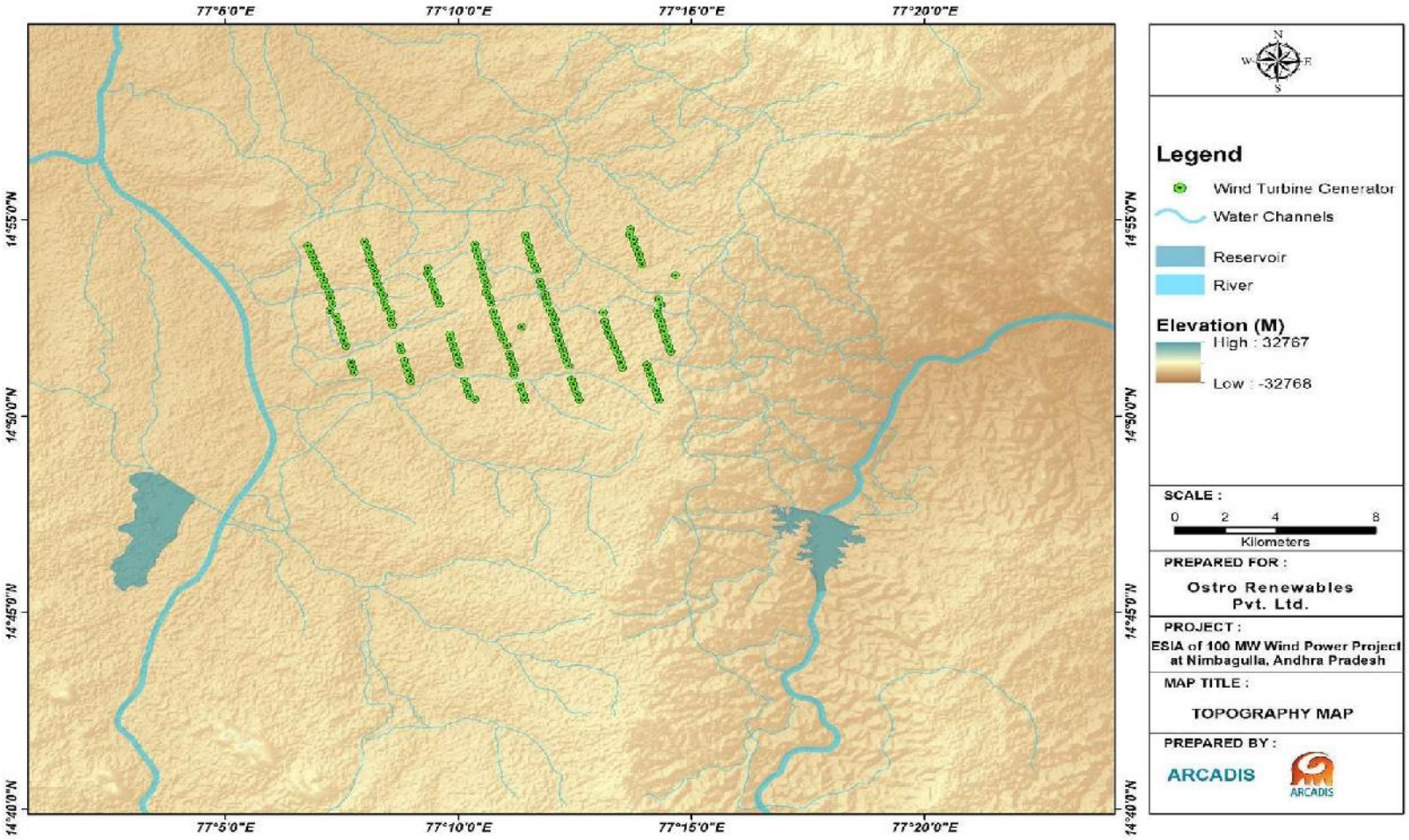


FIGURE 3-2: TOPOGRAPHY MAP OF PROJECT SITE



3.3 WIND POTENTIAL IN ANDHRA PRADESH

Based on the studies conducted through wind monitoring exercise, it is found that the southern part of Andhra Pradesh has got wind potential for setting up of wind farms. The areas in Anantapur, Cuddapah, Kurnool and parts of Nellore and Chittoor district have relatively better potential sites to set up wind power projects. As per the assessment of MNRE, the estimated gross potential is 8,968 MW in A.P. NREDCAP is the single window clearance agency to sanction projects up to 20 MW capacity in the State and so far 233.72 MW capacity of projects by various private developers has been established. Apart from these projects, NREDCAP has also established 7.55 MW capacity projects during the year 2011-12. The total installed capacity is 248.52 MWs as on June, 2012. In view of above, decision for establishment of wind power project by OSTRO in Andhra Pradesh is a timely and right step to avail advantage of growing wind power industry in India.

3.4 WIND POTENTIAL AT PROJECT SITE

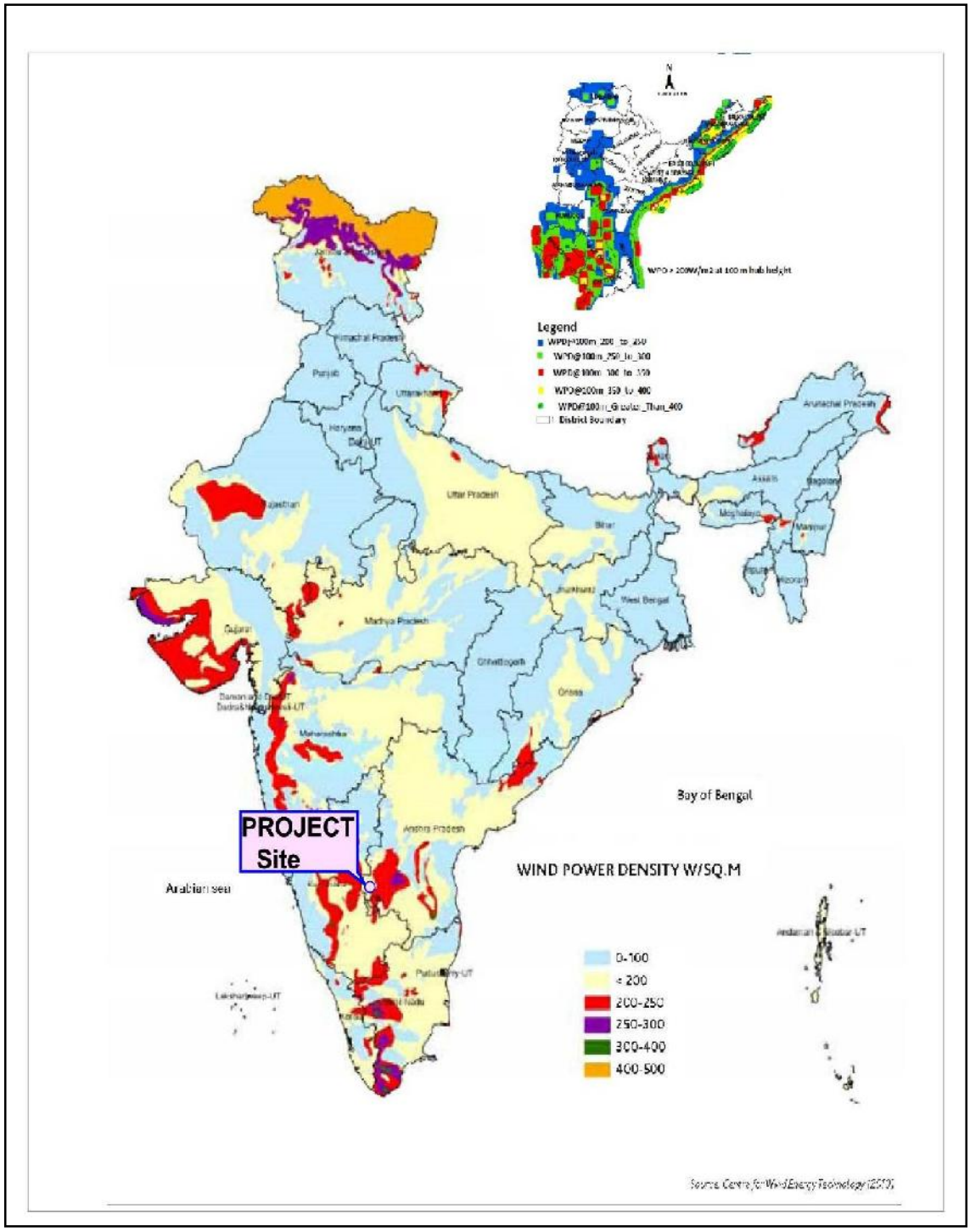
There is a wind mast location of C-WET in the immediate vicinity of the proposed site near Vyasapuram village. Gamesa has also installed their 85 m wind monitoring mast at the proposed site. Details of the proposed mast and wind summary data as per published C-WET has been given below:

TABLE 3-1: MEAN ANNUAL WIND SPEED & WPD AT PROJECT SITE

S. No	Item	At 50m above ground level	At 80m above ground level
CWET MAST			
1	Mean Annual Wind Speed At Vyasapuram	6.9 m/s	6.96 m/s
2	Mean Annual WPD at Vyasapuram	200.60 W/m^2	247.0 W/m^2
PRIVATE MAST			
1	Mean Annual Wind Speed At Amidala	6.25 m/s	-
2	Mean Annual WPD at Amidyala	219.5 W/m^2	-

The review of the aforesaid data (Refer **Table 2.1**) indicates a mean WPD of 200.60 W/m^2 at 50m above ground level which is above the earlier qualifying criteria of MNRE for wind power site selection thereby making it suitable for wind farm development. This is further substantiated by the Wind Power Density (WPD) Map of India as prepared by C-WET (February 2010) which reveals the WPD of the proposed site to generally vary within 200-250 W/m^2 (Refer **Figure 3.3**).

FIGURE 3-3: WIND POWER DENSITY MAP OF INDIA



3.5 WTG PROFILING & TECHNOLOGY

The project include 150 WTGs spread across a length of approximately 16 kms. The WTG locations were visited and profiling of surrounding area of 300 m around each WTG was carried out and sensitive receptors were identified. The project include one pooling substation (PSS) and one grid substation (GSS). Both the substation locations were visited and sensitive receptors were noted. Also, the land for transmission line has been identified and surveyed during site visit. WTG and other component profiling has been carried out using scientific equipment such as GPS, camera and satellite maps of the area was referred for the visit.

3.5.1 Wind Turbine - Technical Details & Design

The diameter of a rotor from the wind turbine Gamesa G97 is 97 meters and the rotor sweep is 7390 square meters. The rated power output is 2000 kW. The rotor consists of 3 rotor blades made of high quality epoxy glass fiber/carbon fiber. Manufacturer of the rotor blades is Gamesa, the type is 47.5 m, at a wind speed of 3 m/s the Gamesa G97 turbine joins the grid connection. The rated actual power output is at a wind speed of 11 m/s. The nacelle is equipped with a 3 stage spur/planetary gearbox with a ratio of 1:107. The generator of the Gamesa G97 is a Double Fed Asyn type. The Gamesa G97 has a Steel tube tower with a height of 78/90/100/120 meters.

The Gamesa G-97 model is covered in the list of wind turbine models possessing valid type approval/certificates as published by C-WET under "*Main List*" of "*Models & Manufacturers of Wind Turbines*". The type approval certificate is valid till 30th March 2017.

The technical concept and specification of the G-97, WTG model has been presented in **Table 3.2** below.

TABLE 3-2: WTG MODEL DETAILS FOR THE PROPOSED PROJECT

Properties of the model	
ROTOR	
Diameter	97 m
Swept area	7,390 m²
Rotational speed	9.6 - 17.8 rpm
BLADES	
Number of blades	3
Length	47.5 m
Airfoils	Gamesa
Material	Pre-impregnated epoxy glass fiber + carbon fiber

TOWER	
Type	Modular
Height	78, 90 m (120 m tower height under development)
GEAR BOX	
Type	1 planetary stage, 2 parallel stages
Ratio	1:106,8 (50Hz), 1:127,1 (60Hz)
GENERATOR 2.0 MW	
Type	Doubly-fed machine
Rated power	2.0 MW
Voltage	690 V AC
Frequency	50 Hz / 60Hz
Protection class	IP 54
Power factor	0.95 CAP - 0.95 IND throughout the power range

The details of the WTG model is attached in ***Annexure I.***

3.6 POWER EVACUATION

Power evacuation arrangement is required to feed electricity generated by wind power project to the State grid system of the Utility. APTRANSCO will be providing connectivity to this project for evacuating power for the proposed for the wind farm. Laying of 220 KV line up to upcoming 400/200 KV Uravakonda substation from the proposed pooling substation is under construction. Total length of the transmission line will be of approx. 7 kms comprising of 24 towers. Gamesa to construct the 200 KVA pooling substation on site that will directly connect to 400/200KV substation.

The land for the proposed transmission route will be purchased by Gamesa by providing one time compensation to the land seller. The land identification for the proposed route is under process.

M/s Gamesa Wind Turbines Pvt. Ltd entered in an agreement on 30th October 2013 with New & Renewable Energy Development Corporation of Andhra Pradesh Limited whereby NREDCAP has sanctioned the allotment of the wind power capacity of 200 MW at Anantapur district. As per the agreement the developer should enter in to a power purchase agreement with a DISCOM as per policy of Govt. of Andhra Pradesh. Hence forth Gamesa signed the power purchase agreement on 11th August 2014 with APTRANSCO for evacuation of power from this wind farm to the state grid.

Photo-Grid Substation under construction near to the project site

Power Evacuation Bay under construction

The grid substation near to the project site

3.7 RESOURCE REQUIREMENT

3.7.1 Land

The land for the proposed project has been identified and land purchasing is under process. The land to be purchased is private agriculture land, which is cultivated only once during monsoon as the area is very dry and devoid of rain during rest of the year. Village wise land requirement has not been identified when the site visit was undertaken. Land will be purchased through the land aggregator, as it was confirmed by project developer (Gamesa) during the site visit. It was also confirmed that, in the Uravakonda mandal schedule tribes land holding is negligible and will not be affected by the project. Existing other wind farm project developers are active in that area and land has been purchased through the private negotiation for other projects. As per the sub registrar office of Uravakonda tehsil, the following is the procedure for land uptake:

Procedure of land purchase

- Land has to be identified by project team based on micro siting
- The title of the property needs to be checked in sub-register office and verify the title of the seller. A search of the records at the sub-registrar's office may be carried out for documents that may affect the property and may have been registered.

- If land records are okay than developer or land team can go ahead for the private negotiation with owners
- If mutual negotiation is agreed by both side, then land registration at sub- registrar office, mandal level can be initiated.
- Land developer have to pay 7.5% stamp duty per acre
- The circle rate details in the proposed project area is provided in **Table 2.3.**

TABLE 3-3 MANDAL AND VILLAGE WISE CIRCLE RATE

Sl. No.	Mandal/Village Name	Circle rate/Acre (INR)
1	Uravakonda Mandal	20,000 – 4,00,000
2	Nimbagallu	60,000
3	Amidiyala	60,000
4	Renimapalle	60,000
5	Mopidi	60,000
6	Raketla	60,000
7	Indravathi	70,000
8	Lathavaram	70,000
9	Rayampalle	70,000
10	Chinnu Mustru	60,000

No Objection Certificate (NOC) should be obtained for the proposed project from the Gram Sabha/Panchayat.

3.7.2 Water

The volume of water used during project construction and operation is low. Water is required for plant civil works, will be sourced from local bore wells/ wells/lakes and supplied to the site via water tankers by contractors. During construction period, water requirement would be about 10.5 KLD to build foundation of tower and 2 KLD for domestic water use, once construction work is in full swing. In operational phase water will be used for the domestic use of project staff at the site, which is estimated to be around 2.7 KLD considering 30 security guards present on site in shift and about 10 skilled personnel present at the site office.

Water to be supplied through tankers by local water suppliers during construction phase of the proposed project to meet domestic and construction water requirements. Drinking water requirements of personnel in operational phase will be met by packaged drinking water.

3.7.3 Workforce

Approximate 150 nos. of workers to be deployed by the contractor on temporarily basis during construction phase. The contractor workforce is comprised of both skilled and

unskilled labours, which will be sourced from the nearby village settlements depending on their skills and capabilities. However during the operations phase approx. 50 nos. of workers will be deployed on site including security guards. These security guards, who will be hired locally.

3.8 PROJECT IMPLEMENTATION STATUS

During the site visit the proposed project was in its initial phase, where the land for the proposed project has been identified and yet to be purchased. The locations of the WTGs has been finalized through micro siting. Also the grid substation was under construction and the route for the transmission line has been identified.

Sr No.	Project Activity	Project Schedule
1	Procurement lead time + Production Plan	Completes by Dec 2016
2	Logistics	Completes by Dec 2016
3	Civil Works (EPC)	Completes by Feb 2017
4	Construction	Completes by March 2017 (2nd week)
5	Electrical	Completes by March 2017 (2nd week)
6	Project Commissioning	March 2017

4 SOCIAL & ENVIRONMENTAL COMPLIANCE REQUIREMENTS

This section describes the regulations, statutory guidelines and obligatory standards that are applicable to the social and environmental performance of the proposed project.

4.1 NATIONAL REGULATIONS AND SOCIAL & ENVIRONMENTAL PERFORMANCE STANDARDS OF IFC

The environmental and safety related national regulations and IFC performance standards that are applicable for the wind power plants are discussed below.

TABLE 4-1: APPLICABLE EHS REGULATIONS – SUMMARY TABLE

S. No	Act/Guidelines/Policy/Govt. Orders	Applicability
1	The Water (Prevention and Control of Pollution) Act 1974	Not Applicable As per Renewable Wind Power Policy 2015, order issued on 13th Feb 2015, wind power projects will be exempted from obtaining NOC/Consent for establishment under pollution control laws from Andhra Pradesh Pollution Control Board.
2	Air (Prevention and Control of Pollution) Act 1981	
3	The Water Cess Act 1977 and Rules	
4	Environment (Protection) Act, 1986 as amended	Applicable This is an Act to provide the protection and improvement of the environment. The EPA Act 1986 relate to the implementation of protection and improvement of environment and prevention of hazards to human beings, other living creatures, plants and property.
5	Hazardous Waste (Management, Handling & Transboundary Movement) Rules 2008 as amended	Applicable. Although nominal quantities of waste oil is likely to be generated during operation and maintenance of DG set, which need to be managed in accordance to the HWMH Rules. The generated waste managed to be disposed through State Pollution Control Board authorized recyclers.
6	Forest Conservation Act, 1980	Since forest land is not involved for the proposed project, therefore this act is not applicable here
9	Contract Labour (Regulation & Abolition) Act 1970 and Rules	Applicable It is the responsibility of EPC contractor to have valid license and ensure provision of appropriate welfare measures viz. arrangement for sanitation, drinking

S. No	Act/Guidelines/Policy/Govt. Orders	Applicability
		water, first aid etc for the onsite contractual workers/labourers. In addition Gamesa as principal employer who needs to obtain registration certificate from EPC contractor.
10	The Building and Other Construction Workers' (Regulation of Employment and Conditions of Service) Act 1996	This Act provides for the safety, health and welfare measures of building and construction workers in every establishment which employs or employed during the preceding year ten or more such workers. These measures include fixing hours for normal working day, weekly paid rest day, wages for overtime, provision of basic welfare amenities like drinking water, latrines, urinals, crèches, first aid, canteens etc. and provision of temporary living accommodation within or near work site. As discussed for the Contract Labour Act the provision for this Act also need to be complied by the EPC contractor for the project.
12	The Minimum Wages Act 1948	This Act provide for fixing minimum rates of wages in certain employments and requires the employer to provide to every worker engaged in a scheduled employment to be paid wages at a rate not less than the minimum rate of wages fixed by such notification for that class of employees in that employment without any deductions except as may be authorized within such time and subject to such conditions as may be prescribed. Applicable to the project.as Gamesa is going to employ laborers both for construction and operation phase of the project.
13	The Payment of Wages Act 1948	Applicable for the project.
14	Workmen Compensation Act 1923 and Rules	Applicable. The objective of this Act is that in the case of an employment injury compensation be provided to the injured workman and in case of his death to his dependents. Hence any injury or death of workmen that may arise under any accidental circumstance during the proposed project development need to be compensated under the provision of the is Act

S. No	Act/Guidelines/Policy/Govt. Orders	Applicability
19	Micro-siting Guidelines for Wind Power Projects	*Distance between WEGs* As per the new guidelines, the distance between the proposed WEG with adjacent existing WEG, if any, or an existing application with RERC, for a proposed WEG, formed in row should be at least five times (5D) the diameter of the rotor. Row should be formed in such way that it is perpendicular to the predominant wind direction. The distance between the rows should be at least seven times diameter (7D) of the Rotor, so that performance of the WEGs should not be affected in any manner. Considering a rotor diameter of 97m of the WEG the distance between two adjacent WEGs for the proposed need to be kept at least 485m while the distance between two WEG rows in maintained at 679 m.

TABLE 4-2 PERMITTING & COMPLIANCE FOR THE PROPOSED PROJECT

PERMIT	AUTHORITY	REMARKS
Approval for wind power development in the area	New & Renewable Energy Development Corporation, Andhra Pradesh (NREDCAP)	Agreement dated 30th October 2013.
Environmental Clearance	Ministry of Environment, Forest & Climate Change (MoEFCC)	Wind power projects are exempted from obtaining an environmental clearance (EC) from Ministry of Environment, Forest and Climate Change (MoEFCC), as per the EIA notification, 2006 and its subsequent amendments
Forest Clearance from MoEFCC/ State Government	Forest Department	No forest land involved.
Power evacuation approval	Transmission Corporation of Andhra Pradesh Limited (APTRANSCO)	Required for the project. Approval has been obtained by M/s Gamesa from APTRANSCO for evacuation of power, for the Project (400/220 kV Akal GSS)
Consent to Establish (CTE)	Andhra Pradesh Pollution Control Board (APPCB)	Not required for the project. As per Government Order issued by Energy, Infrastructure & Investment Department dated 13.02.2015 development of Wind Power in Andhra Pradesh-Andhra Pradesh Wind Power

PERMIT	AUTHORITY	REMARKS
		Policy-2008 & 2015.
Consent to Operate (CTO)	APPCB	Not required for the project. As per Government Order issued by Energy, Infrastructure & Investment Department dated 13.02.2015 development of Wind Power in Andhra Pradesh-Andhra Pradesh Wind Power Policy-2008 & 2015.
NOC state nodal agency	Industry Commissioner/R.O.	Required for the project. Change in land use from agriculture to industry.
NOC State Electricity Board	State Electricity Commission	Required for the project prior to grid connection.
Contractor permits	Project Developer	The contractor will need to abide by the following laws and M/s Gamesa will have to ensure that it is being done as they are the the principle employer: • The Workmen's Compensation Act, 1923; • The Maternity Benefit Act, 1961; • The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996; • The Contract Labour Act, 1970; • The Child Labour (Prohibition and Regulation) Act, 1986; • The Bonded Labour System (Abolition) Act 1976; • The Minimum Wages Act, 1948; and • The Equal Remuneration Act 1976.
Land procurement	Project Developer	Is under process
No Objection Certificate from the Gram Panchayat	Gram Panchayats	Need to be taken from the Gram Panchayats of the villages from whom land will be purchased for the development of the project.

IFC, a member of the World Bank Group, is the largest global development institution focused exclusively on the private sector in developing countries. The International Finance Corporation (IFC) Environmental & Social Performance Standards ("IFC Standards") have become the global benchmark for corporate social responsibility (CSR) and sustainability in project financing. While the IFC Standards originated in relation to projects financed by the World Bank, they are now used by all financial institutions around the globe that have signed up to the "Equator Principles", accounting for a substantial proportion of global project finance.

The IFC Standards (Performance Standards and Equator Principles) updated 2012 edition of IFC's Sustainability Framework applies to all investment and advisory clients whose projects

go through IFC's initial credit review process **after January 1, 2012. It** establish a private regulatory framework in respect of labour and working conditions; environmental practices; workplace health & safety; community health, safety and security; land acquisition and involuntary resettlement; relations with indigenous communities, and; preservation of cultural heritage. In addition to the express guidelines of the IFC Standards themselves, adherents must meet the requirements of local and international laws in these areas, regardless of whether such laws are regularly or consistently enforced by local governmental institutions. Hence the standard has been chosen to evaluate the project activity.

The International Finance Corporation has laid down a set of eight Performance Standards that the project developers need to comply with while establishing the project. The provisions of the Performance Standards relevant to the wind power project are summarized below:

TABLE 4-3: IFC PERFORMANCE STANDARDS & APPLICABILITY TO THE PROJECT

Title of Performance Standard	Objective	Applicability
PS 1: Social and Environmental Assessment and Management Systems	PS 1 establishes the importance of: • Integrated assessment to identify the E & S impacts, risks and opportunities of projects. • Effective community engagement through disclosure of project related information & consultation with local communities • Management of E & S performance throughout the life of the project by the project developer.	The PS 1 is applicable to projects with environment and/or social risks and/or impacts. The proposed project will have environmental and social impacts such as generation of noise and small quantities of hazardous wastes (operation of DG sets etc.). PS 1 is therefore applicable for the project which requires an Environmental and Social Impact Assessment (ESIA) study to be conducted before commencement of the project. OSTRO also needs to develop and implement an Environmental and Social Management System to manage the risks associated with its operations.
PS 2: Labour and Working Conditions	• To promote the fair treatment, non-discrimination, and equal opportunity of workers, • To establish, maintain, and improve the worker management relationships • To promote compliance with national employment and labor laws • To protect workers, including vulnerable categories of workers such as child workers, migrant workers, workers engaged by client or third party, • To promote safe and healthy working conditions and the health of workers and • To avoid use of forced labor	The PS is applicable for the project as the project developer is going to employ labors for both the phases-construction as well as operation. The labours would be temporarily employed by contractors abide by the companies rules and regulation for civil work during construction phase. During operation phase there will be around 50 security guards in shift and 7-8 skilled technical labour employed directly by the developer.
PS 3: Resource Efficiency and Pollution Prevention	• To avoid or minimize adverse impacts on human health and environment by avoiding or minimizing pollution from project activities, • To promote sustainable use of resources, including energy and water,	The PS is applicable as the project will utilize resources like land, water and power. Land has been purchased on point basis for erection of the WTGs. Water will be sourced via tankers from village borewells. Access road will be constructed for the movement of the vehicles like trailor trucks, equipment loaded trucks, tractors and other small

	• To reduce project related GHG emissions.	vehicles for loading, unloading and inspecting the erection of the WTGs during construction phase. This can generate some dust emission as the area is arid in nature which can be mitigated by adopting suitable mitigation measures.
PS 4: Community Health, Safety and Security	• To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances; and • To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.	The PS is applicable as the project will involve movement of vehicles on the approach road passing through villages, enter the site through access roads. The project also envisages influx of labors from different nearby villages. As such community health and safety need to be taken care by the project developer, who ensure safety measures to be put in place both during construction and operation phase of the project.
PS 5: Land Acquisition and Involuntary Resettlement	• To avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs; • To avoid forced eviction; • To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost4 and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected, • To improve or restore the livelihoods and standards of living of the displaced persons • To improve living conditions among physically displaced persons through provisioning of adequate housing with security of tenure at resettlement sites.	This PS is not applicable as land purchased for the project is based on willing to sell and willing to buy basis. The process do not involve any forceful acquisition of land. The land purchased for the project is private land.
PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	• To protect and conserve biodiversity • To maintain the benefits from the ecosystem service, • To promote the sustainable management of living resources through the adoption of practices that integrates conservation needs and development	This PS is applicable for the project. Though there is no protected area, wild life sanctuary or national park within 10 kms of the project site but there is a resident population of Black Buck in the project region which is protected and conserved under Indian Wildlife Protect Act. The nearest

	activities.	sanctuary is located about 105 kms south of the project site. The project site is a dry area devoid of water bodies. Migratory birds are not reported from the project site through secondary sources but all season study needs to be conducted to understand the presence of migratory birds in the study area.
PS 7: Indigenous Peoples	• To ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples; • To anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, to minimize and/or compensate for such impacts; • To promote sustainable development benefits and opportunities for Indigenous Peoples in culturally appropriate manner; • To establish and maintain an ongoing relationship based on Informed Consultation and Participation (ICP) with the Indigenous Peoples affected by a project throughout the project's life- cycle; • To ensure the Free, Prior, and Informed Consent (FPIC) of the Affected Communities of Indigenous Peoples when the circumstances described in this Performance Standard are present; and • To respect and preserve the culture, knowledge, and practices of Indigenous Peoples.	PS is not applicable as there are no indigenous people present within the study area.
PS 8: Cultural Heritage	• To protect cultural heritage from the adverse impacts of project activities and support its preservation; and • To promote the equitable sharing of benefits from the use of cultural heritage.	The PS is not applicable as there is no impact anticipated on the existing cultural heritage of the proposed project site due to the project activities.

5 Description of Environment

5.1 PHYSICAL ENVIRONMENT

5.1.1 Climate & Meteorology

The climate of Anantapur district is semi-arid climate, with hot and dry conditions for most of the year. A dry and mild winter starts in late November and lasts until early February; with little humidity. The nearest IMD monitoring station is Anantapur located at approx. 50 km South East from the project site.

Temperature

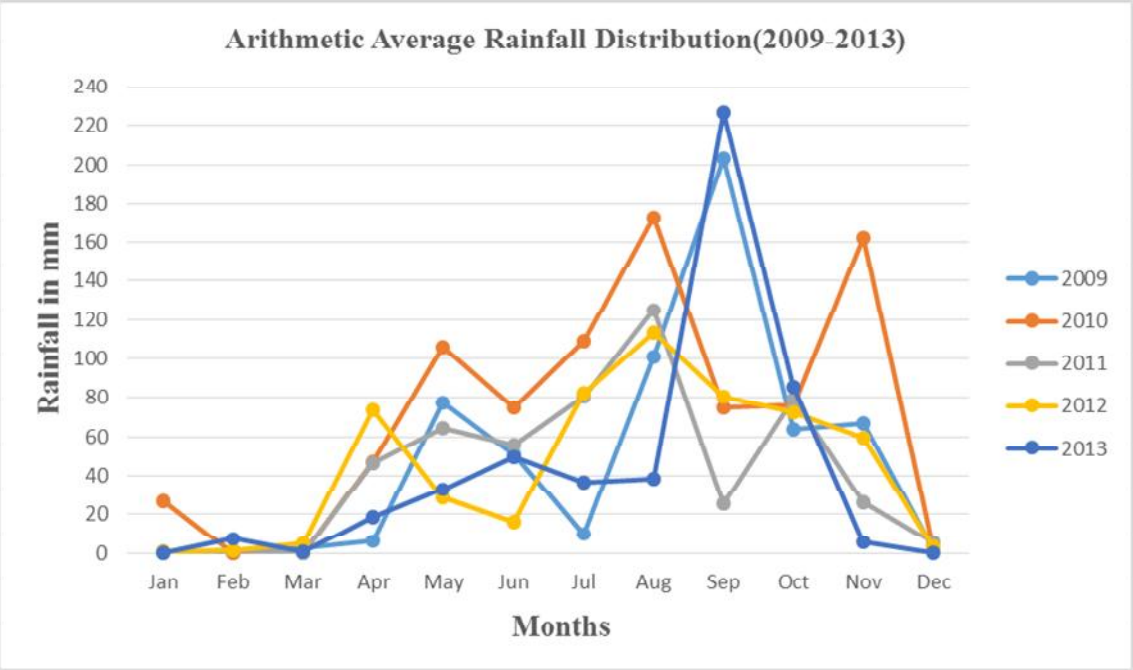
Summers start in late February and peak in May with average high temperatures around the 37 °C (99 °F) range. A dry and mild winter starts in late November and lasts until early February; with little humidity and average temperatures in the 22–23 °C (72–73 °F) range.

Rainfall

The average annual rainfall of the district is 535 mm, which ranges from no rainfall in February and March to 129 mm in September. September and October are the wettest months of the year. The mean seasonal rainfall distribution is 316 mm during southwest monsoon (June-September) 146 mm during northeast monsoon (Oct-Dec), 1 mm rainfall during winter (Jan-Feb) and 72 mm during summer (March-May). As per official district profile of Anantapur, the percentage distribution of rainfall season wise is 58.7% in southwest monsoon, 27.6% in northeast monsoon, 0.21 percentages in winter and 13.5% in summer. The rainfall analysis for the period of 30 years (1961-1990) reveals that the monthly rainfall in the study area varies from 0.3 mm – 135.1 mm. According to 30 years of IMD data, annual rainfall in the study area has been recorded as 551.3 mm.

Review of rainfall data of 5 years (2009-2013) Anantapur district available from Hydromet Division, India Meteorological Department (IMD) reveals June to September as the high rainfall months with maximum arithmetic average rainfall value generally recorded in the range of 226.8 mm. The rainfall distribution of Anantapur district for the five year period (2009-2013) has been presented in **Figure 5.1** below.

FIGURE 5-1: RAINFALL DISTRIBUTION OF THE DISTRICT (2009-13)

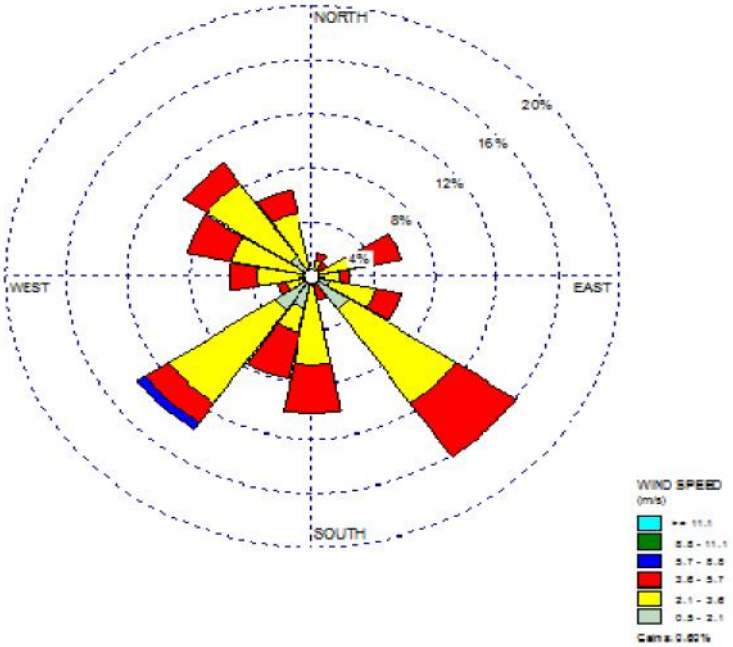


Wind Speed & Direction

Regional wind speed and direction in the study area has been established based on analysis of the micro-meteorological data available[3] for Anantapur IMD station located in Anantapur district. The wind speed of the district for the period (1961-90) generally varies in the range of 7.4-16.4m/sec with average wind speed recorded at 11.0 m/sec. High wind speed values were generally observed for the monsoon months i.e. June (16.4 m/sec) and July (16.5 m/sec). Micrometeorological data for 30 year period of the district indicates the predominant wind direction is west (W) followed by South West (SW). Primary meteorological data collected in the month of June demonstrates that the wind is predominantly flowing from south east to north west. The wind rose for the aforesaid period for Anantapur district is presented in **Figure 5.2** below.

[3] IMD Climatological Table (1961-90)

FIGURE 5-2: WINDROSE SHOWING PREDOMINANT WIND DIRECTION AT PROJECT SITE



5.1.2 Ambient Air Quality

The existing quality of the ambient air environment serves as an index for assessing the pollution load and the assimilative capacity of any region and forms an important tool for planning project activities in the area. A detailed assessment of the existing air environment was undertaken for the purpose mentioned above.

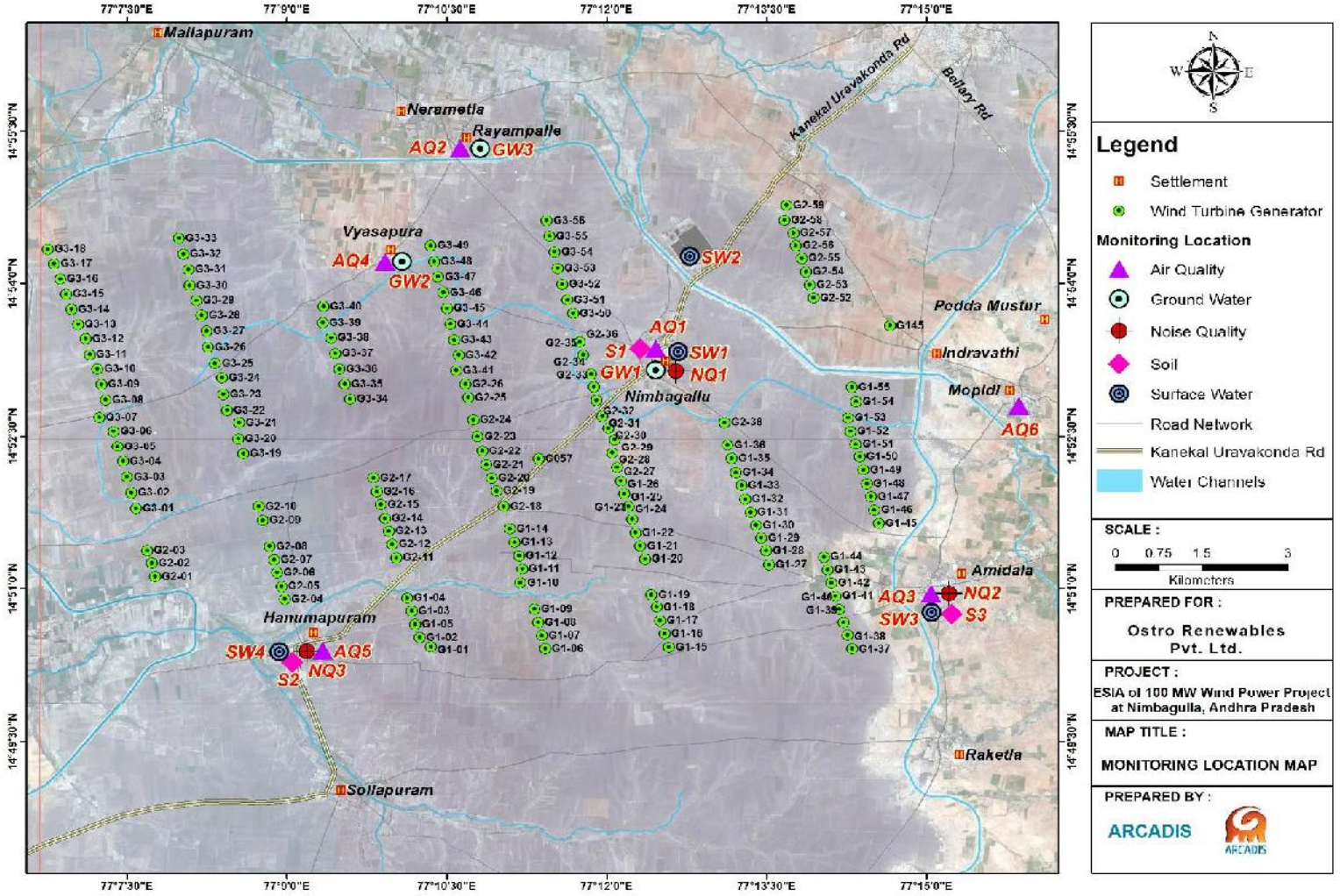
The ambient air quality monitoring was conducted at 6 representative locations during the period of June for one week. The baseline air quality status of the study area was primarily assessed by monitoring for particulates and gaseous pollutants at these stations (**Refer Figure 5.3**). The monitoring network was established based on the following key criteria;

Regional Meteorology

- Important receptor locations (e.g. proéminent villages, ecological sensitive areas etc.);
- Site reconnaissance survey and professional judgment

The ambient air quality monitoring was carried out in accordance with guidelines of Central Pollution Control Board (CPCB) of June 1998 and National Ambient Air Quality Standards (NAAQS) of CPCB of November 2009. Air quality monitoring was carried out for 24 hours a day twice a week for Particulate Matter (PM_{10} and $PM_{2.5}$), Sulphur Dioxide (SO_2) and Oxides of Nitrogen (NOx), 8 hours a day twice a week for Carbon Monoxide (CO) and Hydrocarbon

FIGURE 5-3: MONITORING LOCATION MAP OF THE STUDY AREA



(HC). The concentrations of various pollutants (PM_{10} & $PM_{2.5}$) at all the monitoring locations were processed for different statistical parameters like arithmetic mean, minimum concentration, and maximum concentration and percentile values.

Interpretation of Air Quality Results

Particulate Matter (PM_{10}): The arithmetic mean of 24 hourly PM_{10} at all the monitoring locations ranged between 50 to 75.5 μg/m^3. The average PM_{10} concentrations at all stations were found to be in compliance to the stipulated PM_{10} standards specified for residential area i.e. 100 μg/m^3. Low PM_{10} concentrations could be attributed to the rural setting of the sites. The PM_{10} level in the monitoring stations is represented in **Figure 5.4.**

Particulate Matter ($PM_{2.5}$): The arithmetic mean of 24 hourly $PM_{2.5}$ at all the monitoring locations ranged between 25 to 40.5 μg/m^3. The average $PM_{2.5}$ concentrations were found to conform stipulated $PM_{2.5}$ standards specified by CPCB for residential areas (60 μg/m^3) at all the air quality monitoring locations. The statistical results of $PM_{2.5}$ levels in the monitoring stations are represented in **Figure 5.5**

Oxides of Nitrogen (NO_x): The average NO_x values at all locations were observed in the range of 7.9 to 13.15 μg/m^3 which are in compliance to the NAAQS specified for Oxides of Nitrogen (80 μg/m^3). The concentration values of nitrogen oxide representative of each sampling station have been provided in **Fig 5.7**.

Sulfur dioxides (SO_2): Mean Sulfur dioxide concentration at all locations was found to be ranging between 4.2 to 8.85 μg/m^3 and in compliance with NAAQS for sulfur dioxide (80 μg/m^3). Low values of SO_x can be attributed to the rural setting of the area. SO_X values recorded as a part of primary monitoring is shown in **Fig 5.6**.

Carbon Monoxide & Hydrocarbon: CO levels were detected at two locations (Nimbagallu and Hanumapuram) but were undetected at other locations. The values obtained for CO is found to be negligible and therefore well within the NAAQS standard of (CO-2000 μg/m^3) and is presented in **Fig 5.8.**

Analysis result of air quality monitoring within the block reveals that all the parameters at all monitoring locations are well within the limit (as shown graphically from **Figure 5.4 to 5.8**) which can be primarily attributed to the rural setting of the study area.

FIGURE 5-4: PM_{10} LEVELS RECORDED AT AAQ STATIONS

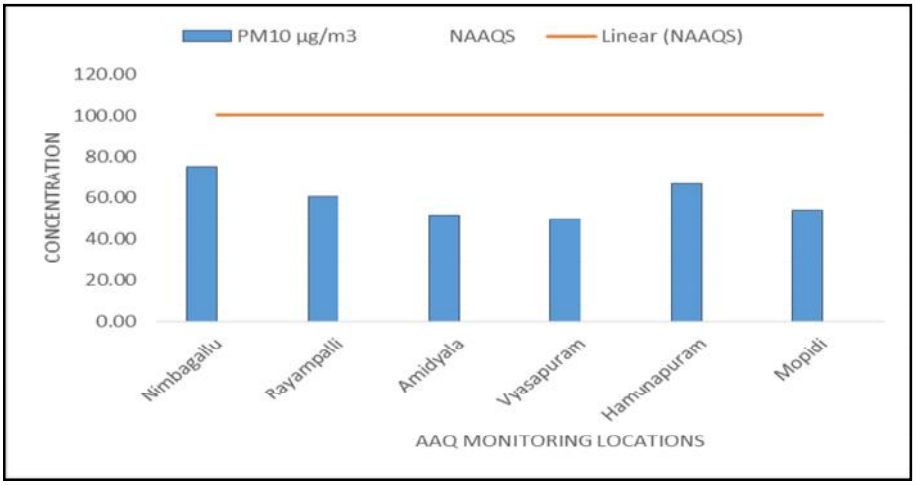


FIGURE 5-5: $PM_{2.5}$ LEVELS RECORDED AT AAQ STATIONS

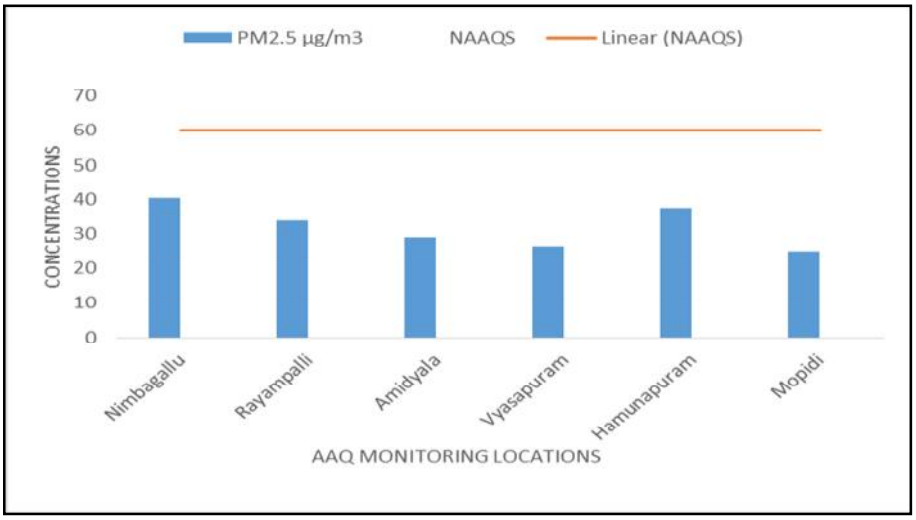


FIGURE 5-6: SO2 LEVELS RECORDED AT AAQ STATIONS

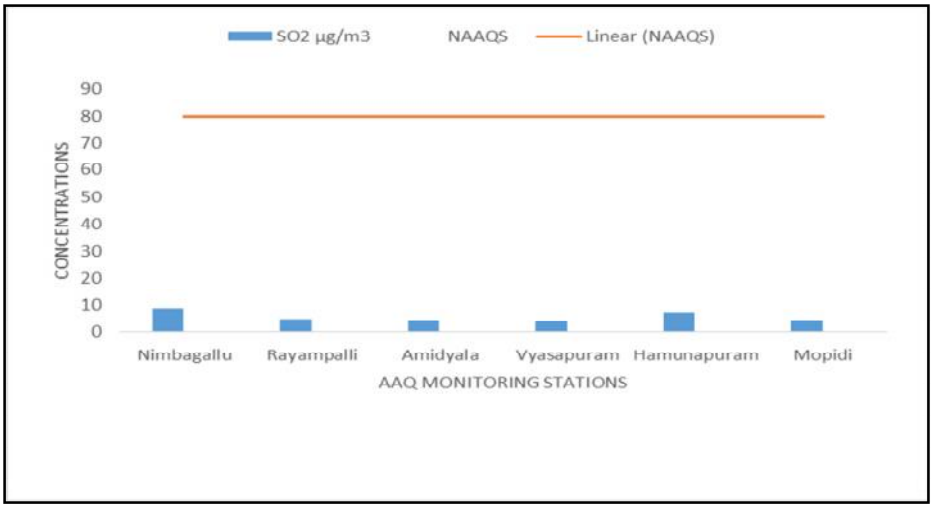


FIGURE 5-7: NOX LEVELS RECORDED AT AAQ STATIONS

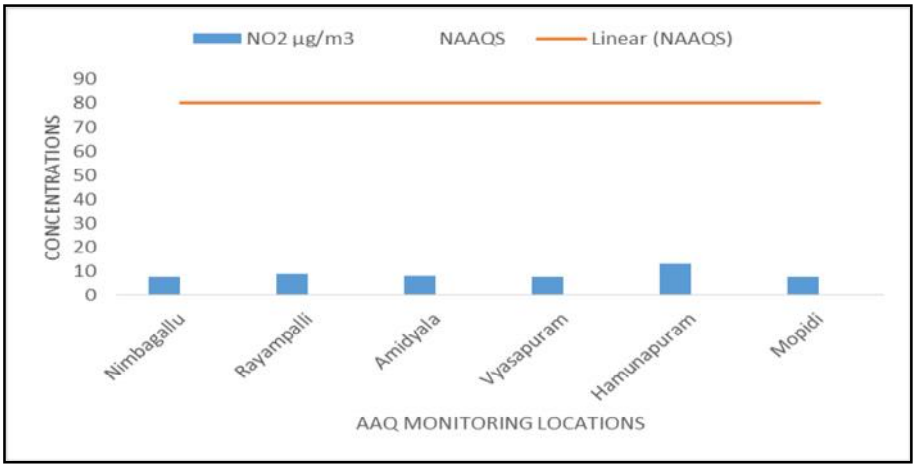
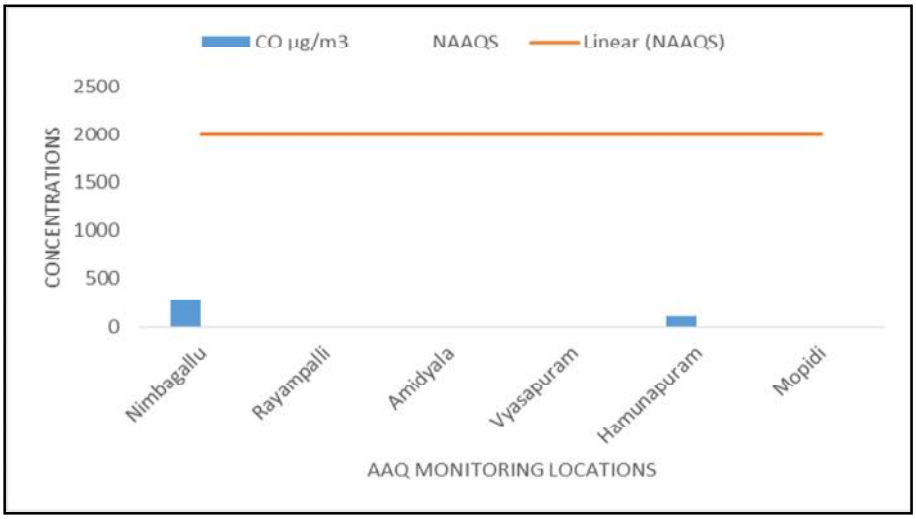


FIGURE 5-8: CO LEVELS RECORDED AT AAQ STATIONS



5.1.3 Ambient Noise Quality

The ambient noise monitoring was conducted during the month of June at 3 locations within the study area. The noise monitoring network was established based on the understanding of the proposed project activities and professional judgment. The location of the ambient noise quality stations have been represented in the **Figure 5.8** for reference.

Sound pressure level (SPL) measurements in dB(A) were recorded for every hour continuously for 24 hours at 15 minutes interval for the aforesaid monitoring stations and equivalent noise levels in the form of Leq day and Leq night was computed. The results so obtained were compared with the standard specified in *Schedule III, Rule 3* of Environmental Protection Rules. The summary of noise quality results are presented in **Table 5.1** below.

TABLE 5-1: AMBIENT NOISE MONITORING RESULTS (IN DECIBELS)

S. No.	Location		Leq(dBA)
NQ1	Nimbagallu village	day	53.8
		night	40.4
NQ 2	Amidayla villge	day	51.1
		night	36.6
NQ 3	N Hanumapuram village	day	50.8
		night	38.8

Interpretation of Noise Quality Results

The equivalent noise levels at all the monitoring stations at both day and night were found to be within the range of 55 dB (A) and 45dB (A) (CPCB noise standards for residential area) thereby within the standard by both day time and night time. The noise levels recorded therefore reveals the rural setting of the study region characterized by little higher vehicular movement and industrial operation/activities which are generally identified as potential noise sources during the day time.

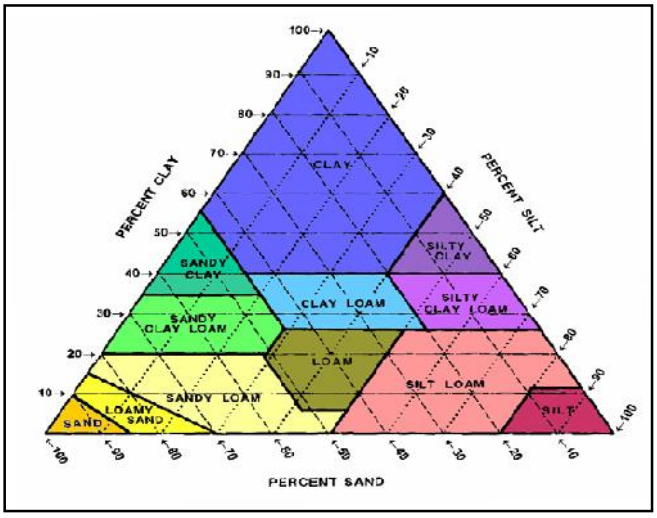
5.1.4 Soil Quality

The Soils in Anantapur district are predominantly red except in mandals Kanekal, Bommanahal, Vidapanakal, Uravakonda, Vajrakarur, Guntakal, Gooty, Pamidi, Peddavadugur, Tadipatri, Yellanur, Yadiki, Peddapappur, and Putlur. These mandals occur with red and black soils almost in equal proportion. Thus, are 76% red soils & 24% black soils. Basically, the soil in the division is more or less red-sandy ferruginous loam, and shallow in depth.

TABLE 5-2: SOIL MONITORING RESULTS

S.No.	Parameters		Unit	Results	
				Soil Sample (Agricultural Field) Nimbagallu Village (S-01) DOS-04/04/15, Time 11:00	**Soil Sample (Agricultural Field) N. HanumapuramVill. (S-02) DOS-04/04/15, Time 12:10**
1	pH (1:5 Ratio)		-	6.99	6.87
2	Salinity		PPT	0.0469	0.0362
3	Electrical conductivity		µS/cm.	89.9	65.6
4	Organic Carbon		%	0.8	0.95
5	Nitrogen (N)		%	0.0007	0.0003
6	Phosphorus (P)		%	0.08	0.11
7	Potassium (K)		mg/kg	1060.89	518.03
8	Sodium (Na)		mg/kg	360.34	179.45
9	Magnesium (Mg)		mg/kg	318.74	504.38
10	Calcium (Ca)		mg/kg	284.82	335.08
11	Chlorides (Cl)		%	0.053	0.019
12	Fluorides (F)		mg/kg	0.29	0.42
13	Particle Size Distribution	Sand	%	83	78
		Silt	%	13.2	15.9
		Clay	%	3.8	6.1
14	Texture		mg/kg	Loamy Sand	Loamy Sand
15	Colour		-	Blakish	Blakish

Interpretation of Primary Soil Monitoring Results



Based on the particle size distribution obtained from the soil analysis, the texture of soil of the study area is loamy sand type of soil. The soil sample contains high concentration of sodium and chloride ions, and soil is saline in nature. Soil sample also contain high concentration of other minerals like calcium, magnesium, nitrogen and phosphorous. As per the Soil Textural Triangle (USDA), a sandy loam has on an average about 60% sand, 10% clay and 30% silt. Water holding capacity and nutrient holding capacity are higher for clayey textured soil than sandy textured soil while drainage is better in case of sandy soil. As the clay content in the soil is very less at both the locations hence the water holding capacity of the soil is very low and the soil is loose and dry. Soil in the project is of medium to low fertility having low concentration of nitrogen and phosphorous.

5.1.5 Surface Water Quality

Among the various rivers running in the district, the most important is the river Penna. It has its origins in the Nandi Hills of the state of Karnataka and enters the Anantapur district from the extreme south of Hindupur mandal and flows through 12 mandals including Uravakonda. From the study area at Nimbagallu, river Pennar is flowing at a distance of about 11 km east. There is a network of canals within the project site. Uravakonda deep cut canal is 1.4 kms to the north of Nimbagallu village and is connected to Tungabhadra High Level Canal and Guntakal Branch Canal. The canal joins the Pennar river further downstream. The canal water is used for providing water to the villagers through overhead tanks.

Primary monitoring of surface water quality was given importance during scoping of the EIA study as the surface run off during construction phase is likely to be discharged to nearby surface water bodies or natural drainage channels.

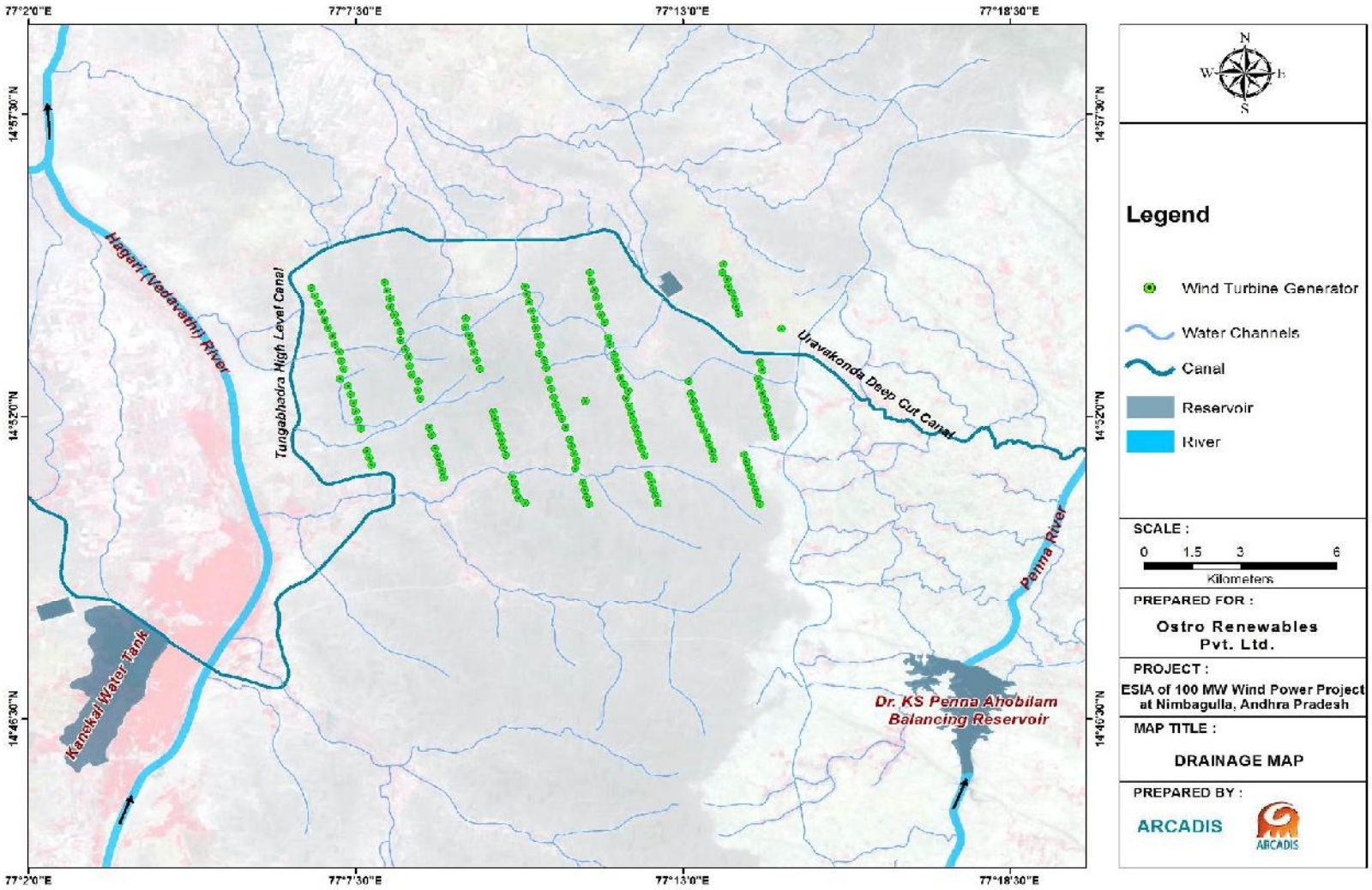
Three surface water sampling was carried out near the project site at four locations. Water sampling and analysis was done following CPCB[4] standard guidelines for physical, chemical and bacteriological parameters and the details of the monitoring results are presented in ***Annexure II.***

[4] CPCB Guidelines for Water Quality Monitoring - **MINARS/27/2007-08**

Interpretation of Surface Water Quality Results

Surface water characteristics were assessed against water quality criteria as per CPCB guidelines for water resources. The surface water samples were collected from four different sources (canal water sample collected from Nimbgallu, Amidalya and Hanumapuram, reservoir water from Nimbagallu. The results of the surface water sample collected from natural drainage channel near the project site have been discussed below. The DO levels value observed between 3.1 and 5.5 mg/l indicating favorable conditions for the growth and reproduction of normal population of fish and other aquatic organisms in the water bodies. BOD levels were below detection level and Total coliforms detected as 26 at Nimbagallu canal and 90 at other sampling locations. The surface water sample is analyzed to be slightly alkaline in nature having pH value of 7.1 and above. Hence, the best use class of the surface water bodies according to the CPCB Water Use Classification conforms to Class C (Drinking water source after conventional treatment and disinfection) inland surface water quality.

FIGURE 5-9: DRAINAGE MAP OF PROJECT SITE

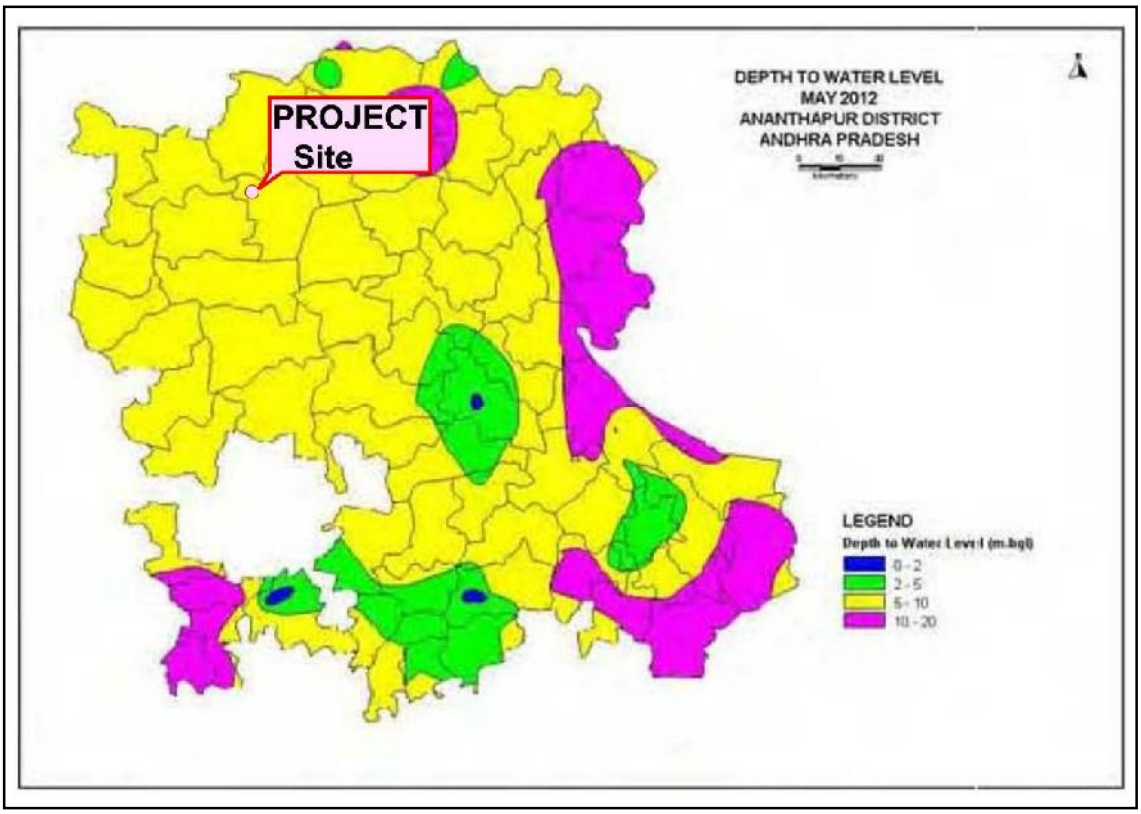


5.1.6 Ground Water Quality

Andhra Pradesh is characterized by various geological formations ranging in age from Archaean to Recent. Nearly 67percent of the State is underlain by hard rock formations consisting of granites, gneisses, metamorphics and intrusives (Archaeans), Precambrian quartzites, shales and limestones (Cuddapahs & Kurnools), Mesozoic Deccan Trap basalts etc., while the remaining area is underlain by Gondwana, Tertiary sedimentaries and Sub Recent-Recent alluvium. The occurrence and movement of ground water in hard rocks is chiefly controlled by thickness of weathering and structural features like fractures and solution cavities. In general, the depth of weathering varies from 5 to 20 m and occasionally upto 40 m. Ground water in the proposed project site is found at a depth of about 15-20 m and is high in salt content.

Pre-monsoon water levels:

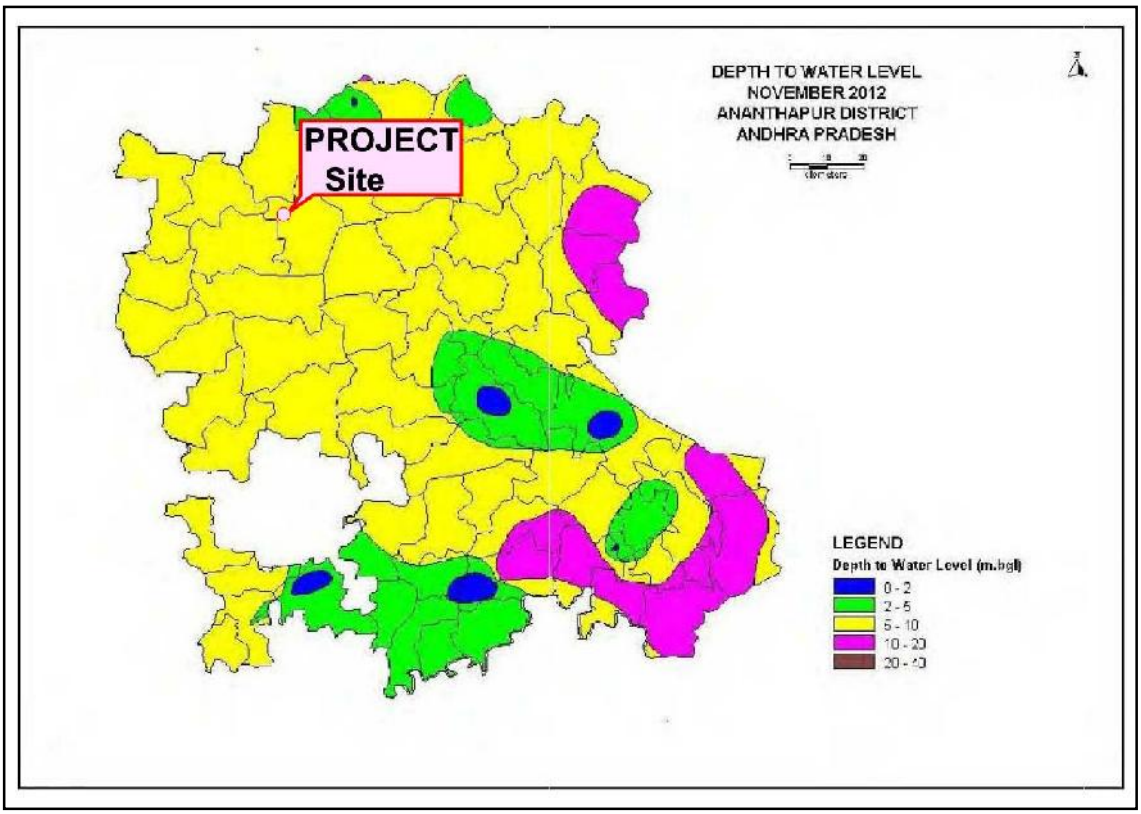
As per CGWB report the depth to water level in Anantapur district during pre-monsoon (May 2012) ranges from 0.65-11.97m bgl. The depth to water levels between 5-10 m is observed in majority of the area. Deeper water levels of >10 m bgl are observed in the North Eastern and South Eastern parts of the area



Post-monsoon:

The depth to Water level ranges from 0.37 to 15.26m bgl during the post monsoon period. The areas having water levels of <5m during pre-monsoon have come upto 2-5 m bgl with

minimum recharge and the area having water level of more than 10 m bgl have come upto 5-10 m bgl in southwestern and northern eastern part of the district.



Interpretation of Ground Water Quality Results

A total of 3 no. ground water samples were collected from Nimbagallu, Vayasapuram and Rayampalli villages respectively within the project site. The samples were analyzed for physicochemical and bacteriological parameters and results compared with IS: 10500 (2004) drinking water standards to identify and interpret any deviation in the statutory limits set for parameters under this standard. The results for relevant drinking water quality parameters have been discussed below.

pH and Turbidity

The pH and turbidity values of water sample collected were within the desirable limit of IS: 10500 drinking water standard thereby establishing its potable use.

Total Dissolved Solids

The concentration of total dissolved solids (TDS) in ground water is a measure of its suitability for domestic use. In general, TDS values at 500 mg/l or below is considered to be most desirable for such purpose being specified under IS: 10500 drinking water standard. The TDS values for the ground water samples analyzed were found to be Nimbagallu (2250 mg/l), Vayasapuram (616mg/l) and Rayampalli (744mg/l) thereby conforming to the

permissible limit but not the desirable limit as per ground water standard (IS: 10500). This is probably due to no or limited recharge of ground water as the area is devoid of good rainfall.

Chlorides

With respect to IS: 10500 standards, the desirable limit of chloride is 250 mg/l while the permissible limit of the said parameter (in absence of an alternate source) is 1000 mg/l. At concentration above 250 mg/l chlorides renders a salty taste to water which may be considered to be objectionable in terms of human consumption. The chloride concentration in the ground water samples were found to be Nimbagallu (1184.6 mg/l), Vayasapuram (95.0mg/l) and Rayampalli (150mg/l) which is well within the desirable limit specified for domestic consumption except for Nimbagallu where the TDS value is higher than the specified desirable limit.

Total Hardness

Hardness of water is considered to be an important parameter in determining the suitability of water for domestic uses particularly washing. Hardness of water is correlated to the presence of bivalent metallic ions viz. calcium and magnesium. Total hardness values for the ground water sample analyzed and were found as (Nimbagallu 582 mg/l), (Vayasapuram 195)and (Rayampalli 197 mg/l) which is within the stipulated standard of 300 mg/l specified under IS: 10500 but slightly higher than the standard at Nimbagallu. Further as discussed above, the hardness values recorded was found to be in correlation with the calcium and magnesium ions which are also within the desirable limit prescribe under IS:10500 except for Nimbagallu where the values area slightly higher than the limit..

Iron and Fluoride

Iron is considered to be an important ground water parameter since at higher concentration it interferes with laundering operations and imparts objectionable stains. The concentration of iron in ground water sample was observed to be below detection limits of 0.3mg/l for all the three locations. Fluoride content in the ground water samples was found to lie within the desirable limit of the potable drinking water standard of 1.0 mg/l at both villages (Vayaspuram & Rayampalli) while it is slightly higher in case of ground water of Nimbagallu village.

Heavy Metals

The presence of heavy metals like mercury, arsenic, copper, chromium and cadmium in the ground water samples were not detected.

Coliforms and E. coli

Coliforms, as an indicator of contamination from sewage and feacal matter were reported to be present in the ground water samples analyzed for three locations. Total coliform analyzed to be 34 & 30 per 100 ml of ground water samples at Vayasapuram and Rayampalli while it is <2 coliforms per 100 ml of ground water sample in Nimbagallu. Fecal coliform is absent in Nimbagallu and Rayampalli ground water samples while in Vasayapuram fecal coliform

were observed <8 per 100 ml of water sample. The detail monitoring results are presented in ***Annexure II.***

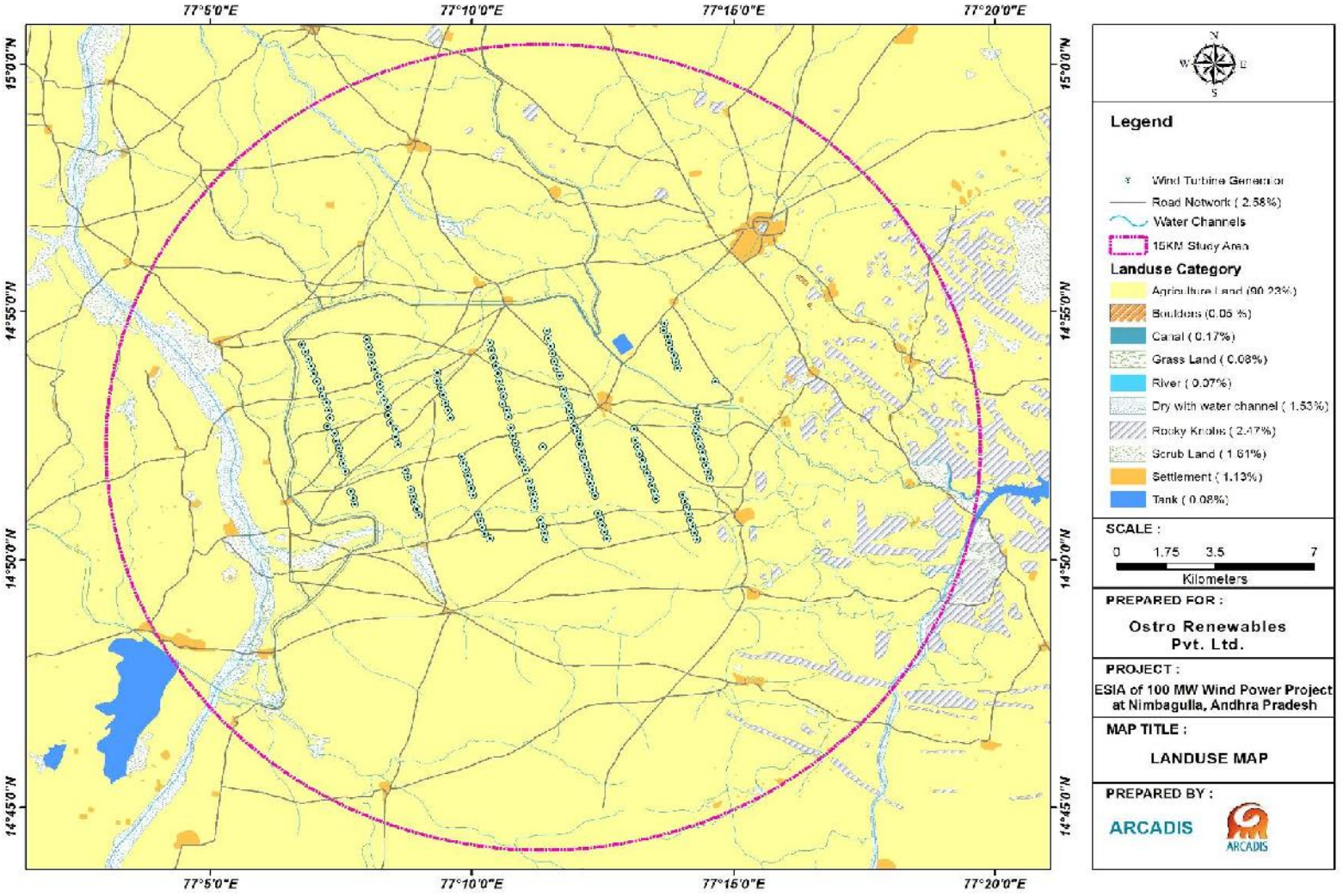
5.1.7 Geology

The Geological formations in Anantapur district can broadly be categorized into two distinct groups- an older group of archaean rocks and an younger one of sedimentary rocks equivalent in age relation to Kadapa and Kurnool Systems of Kadapa Basin. Rocks belonging to the later formations are pre-cambrian in age and covers the area of Yadiki, Peddapappapuru, Tadipatri, Putlur, Yellanur mandals and the eastern parts of Peddavadugur, Gooty, Pamidi, Guntakal, Vajrakarur, Vidapanakal, Narpala, Singanamala, Garladinne, and Kuderu mandals. The remaining parts of the district comprise the older arch can group of rocks which include schists, gneisses and granites

5.1.8 Land Use

Land use of the proposed project site is mainly a mix of scrub land and agricultural land cultivated once a year only during the monsoon season. A land use map is provided in **Fig 5.10** showing the land use pattern of the WTG locations as well land use of surrounding 15 kms of the proposed project site. The land use at the project site comprises mostly of agricultural land cultivated once a year (90.23%). Other land use in the project study area is characterized by i) Settlement (1.13%) ii) Canal (1.17%) iii) Roads (2.58%) iv) Scrub land (1.16&%) and v) Rocky Area (2.47%). Details of landuse with respect to individual WTGs is provided in ***Annexure III.***

FIGURE 5-10: LAND USE MAP OF THE STUDY AREA



5.2 BIOLOGICAL ENVIRONMENT

5.2.1 Flora & Fauna

The proposed project site is dry and arid in nature comprising of dry, thorny scrub land mixed with pockets of private agriculture land. Flora of the proposed project site comprises of thorny scrub vegetation. Few of the dominant vegetation observed on site is provided below:

Photo-Flora of the proposed project site

Calotropis Procera (Aak)

Cynodon dactylon (Bermuda grass)

Azardirachta indica (Neem)

Zizyphus nummularia (Jhar ber)

Typha elephantina (Elephant Grass)

Prosopis juliflora (Mesquite)

Achyranthes bidentata Blume (OxKnee)

Parthenium hysterophorus (Carrot Grass)

Prosopis cineraria (Khejri)

Delonix regia (Gulmohar)

Senna auriculata (Tanner's Cassia)

Chrysopogon zizanioides (Vetiver grass)

The proposed project site is reported to be home for about 50 families of black buck. The antelopes were found in groups of 4-5 individuals ranging almost the entire project site. These animals are protected as per **Schedule I** of WPA and as per IUCN classification it is classified as **'Near Threatened'** species. There is no protected area in Anantapur but the Jayamangali Black Buck Reserve is situated about 105 km south from Anantapur in Tumkur district of Karnataka. This area is a part of the plains of Deccan plateau and borders Anantapur district of Andhra Pradesh. It has the largest contiguous population of blackbuck (Antelope cervicapra) in Karnataka.

Photo-Families of Black Buck within the project site

A male black buck around the proposed project site

A family of black buck within the project site.

Family of black buck near the project site

Family of black buck near the canal

There are two reservoirs build on the canal that joins the Kanekal water tank about 16 km from project site. The reservoirs had been built by the Panchyat Raj system under Government of Andhra Pradesh in 1976 under the Comprehensive Protected Water Scheme for providing drinking water to 80 villages including Uravakonda. Few species of birds were observed around the reservoir striking among them was a flock of Painted Stork about 20-30 in number and Glossy Ibis about 7 individuals. The species of birds recorded in the project area during site visit is listed in the table below:

S.No.	Common Name	Scientific Name	IUCN status	WPA schedule	Migratory status
1	Glossy ibis	*Plegadis falcinellus*	LC	Schedule IV	Migratory
2	Comb duck	*Sarkidiornis*	LC	Schedule IV	Local Migratory

S.No.	Common Name	Scientific Name	IUCN status	WPA schedule	Migratory status
		melanotos			
3	Painted Stork	*Mycteria leucocephala*	Near Threatened	Schedule IV	Local Migratory
4	Purple Heron	*Ardea purpurea manillensis*	LC	Schedule IV	Local Migratory
5	Green bee-eater	*Merops orientalis*	LC	Schedule IV	Not migratory
6	Indian courser	*Cursorius coromandelicus*	LC	-	Resident
7	Little egret	*Egretta garzetta*	LC	Schedule-IV	Resident
8	Crested Tree swift	*Hemiprocne coronata*	LC	-	Resident
9	Little cormorant	Phalacrocorax Niger	LC	Schedule-IV	Local Migratory
10	Eurasian collared dove	*Streptopelia decaocto*	LC	Schedule-IV	Resident

LC: Least Concern.

Pond Heron and Black Comorant

Eurasian collared dove

Group of glossy ibis near to the reservoir

Flock of painted stork near to the reservoir

5.3 SOCIOECONOMIC ENVIRONMENT

This section describes the socioeconomic condition in the study area and relates the village level socioeconomic conditions with tehsil and district level. The objective of analysis of information at village, tehsil and district level is to identify the existing facilities and gaps at village level which can be considered as need of the study area.

Methodology

The social assessment was primarily based on the analysis of the secondary data obtained from the census survey (2001 and 2011), district portal website, community consultations and primary survey with the help of framed sample questionnaire for village profiling as referred in ***Annexure IV***. It was designed to capture occupational patterns, societal set up, access to basic amenities and socio - economic profiling of villages and communities. Considering the nature of the project operations and understanding of the demographic characteristics of the area from the secondary data.

Study Area

As the proposed project (wind power) is in Nimbagallu and other 17 villages which are spread out in two Mandal (tehsil) - Urvakonda and Kanekal, Anantapur district of the Andhra Pradesh. Although 150 WTG locations are spread out under 18 no. of villages though only 50 WTG will

be selected for establishing the proposed project. Total 18 villages have been considered as part of study area which are 2-5 km distance from the nearest WTG location as shown in **Table 5.3.**

TABLE 5-3: LIST OF VILLAGES SELECTED FOR SOCIO-ECONOMIC PROFILING

S. N.	State and District	Mandal/Tehsil/Block	Villages
1	**Andhra Pradesh, Anantapur**	**Uravakonda**	Nimbagal
2			Renimakulapalle
3			Amidala
4			Chinna Musturu
5			Indravathi
6			Raketla
7			Vyasapuram
8			Pedda Musturu
9			Mopidi
10			Nerimetla
11			Rayampalle
12			Lathavaram
13		**Kanekal**	Meenahalli
14			N.Hanumapuram
15			Bidurukontham
16			Garudachedu
17			Thumbiganur
18			Sollapuram

Demographic Profile

The demographic profile in terms of total population, number of households, household size and sex-ratio of the selected villages surveyed in study area has been discussed in section below and presented in **Table 6.2.**

Population & Sex ratio

As per census 2011, the total population of Andhra Pradesh is 84,580,777 of which male and female are 42,442,146 and 42,138,631 respectively. Sex ratio in Andhra Pradesh is 993 i.e. for each 1000 male, which is more than national average of 940 as per census 2011.

Anantapur district: As per census 2011, respect to the district level, Anantapur has population of 4,081,148 of which male and female are 2,064,495 and 2,016,653 respectively. With regards to sex ratio in Anantapur, it stood at 977 per 1000 male which is below state average of 993. As presented in as details referred in ***Annexure V.***

Uravakonda Tehsil (Mandal): As per census 2011, with respect to the tehsil level, total population of Uravakonda tehsil is 80,201 of which male and female are 40,235 and 39,966

respectively. With regards to sex ratio in Uravakonda, it stood at 993 per 1000 male which is similar to state average of 993 and highest to district average of 977.

Kanekal Tehsil (Mandal): As per census 2011, total population of Kanekal tehsil is 64,979 of which male and female are 32,908 and 32,071 respectively. With regards to sex ratio in Kanekal, it stood at 975 per 1000 male which is lowest to state average (993) and district average (977).

Study Areas Villages: As per census 2011, with respect to the study area villages, the total population of the area is 39,883 out of the 20,058 which are male and 19,825 females. Of the study area villages, Amidala has the highest population (6938), followed by Raketla (4405) and Indravathi has the lowest population (736) followed by Meenahalli (844) and Bidurukontham (982). The average sex ratio in the study area villages is 992 which is highest to average sex ratio of tehsil- kanekal (975), district (977) and lowest to tehsil-Uravakonda (993), state average sex ratio (993). The lowest sex ratio has recorded in Meenahalli (880) and followed by Renimakulapalle village (955) and highest sex ratio has recorded for Pedda Musturu (1087) followed by Rayampalle (1066).

Household Size

As per the district level household survey (2007, 2008), on average 4.5 people lived in the Andhra Pradesh. As per census 2011, an average house hold size of Uravakonda (4.4), Kanekal (4.7) and district Anantapur is 4.2 which is below the average house hold size of state (4.5). As well as in study area villages and average HH size is 4.5. The maximum house hold size observed for Meenahalli village (5.1) followed by N.Hanumapuram (4.9) and Thumbiganur (4.9) which are highest to average HH size of tehsil (4.4, 4.7) , district (4.3) and state level (4.5). The lowest HH size recorded for Indravathi and Raketla villages (3.9).

Schedule Caste (SC) and Schedule Tribes (ST)

The scheduled caste and schedule tribes constitutes 16.19 percent and 5.3 percent of the total population of Andhra Pradesh as per census 2011. With respect to Anantapur district SC and ST population constitutes 14.29 percent and 3.78 percent which is below the average of state as per census 2011.

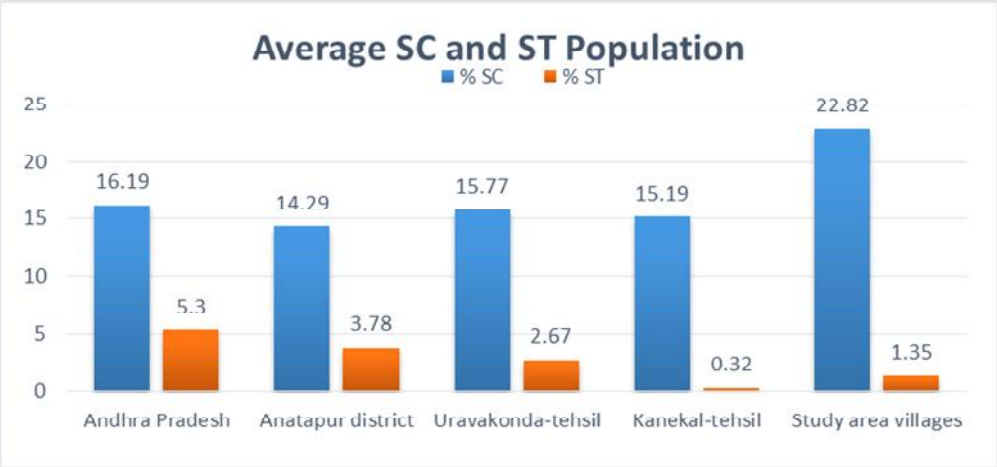
Uravakonda: As per census 2011, with respect to the tehsil level in Uravakonda, SC and ST constitutes 15.77 and 2.67 percent which is SC population more than to average district data and ST population below the average district (3.78) and state (5.3).

Kanekal: As per census 2011, with respect to the tehsil level in Kanekal, SC and ST constitutes 15.19 and .32 percent which is SC population more than to average district data and ST population below the average district (3.78) and state (5.3).

As per census 2011, with respect to the study area villages, an average 22.82% schedule caste and an average 1.35% schedule tribes population recorded as shown in Figure 6.1, SC population are higher than tehsil, district and state level statistic and ST population are lower than tehsil except from Kanekal (.32%), district and state level statistic. Of the total 18 villages ST population observed in only seven. ST population negligible in the study area villages which are

comes under Kanekal tehsil. Details scenario of SC & ST in study area presented in ***Annexure VI.***

Figure 5-11: Average SC and ST Population



Source- census data 2011

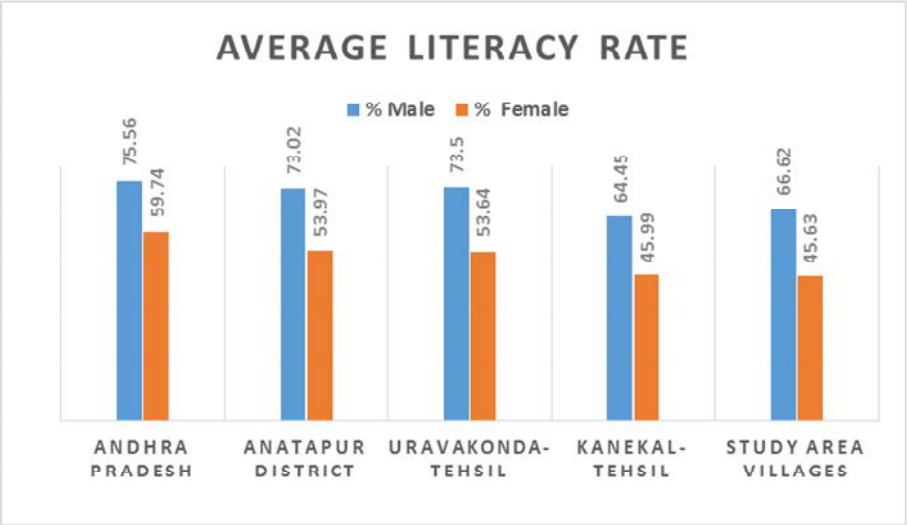
Education and Literacy

Literacy rate in Andhra Pradesh has seen upward trend and is 67.66 percent as per 2011 population census. Of that, male literacy stands at 75.56 percent while female literacy is at 59.74 percent. Literacy rates pertain to the population aged 6 years above.

As per census 2011, Average literacy rate of Anantapur district is 63.57 compared to 56.13 of 2001. Of that, gender wise, male and female literacy is 73.02 and 53.97 respectively. With respect to tehsil level, an average literacy rate of Uravakonda tehsil is 63.57 of that male and female literacy is 73.50 and 53.64. And an average literacy rate of Kanekal tehsil is 55.28 which are below the average literacy rate of District (63.57) and State (67.66).

As per census 2011, with respect to study area villages, an average literacy rates of 18 villages are 56.12% out at gender wise, male and female literacy are 66.62 and 45.63 which are below the average of tehsil, district and state level. As shown in **Figure 5.12** the maximum literacy rate recorded in Rayampalle (65.53%) followed by Lathavaram (64.94%), and lowest literacy recorded in Nerimetla (51.03%). Maximum female literacy rate recorded for Lathavaram (54.59) and lowest literacy rate recorded in Thumbiganur (37.99), followed by Meenahalli (40.11) and Nerimetla village (40.73).

Figure 5-12: Average literacy of male female within study area villages



Source- census data 2011

Workforce Participation

As per the agriculture department Anantapur, the population of the district is 40.81 lakhs. About 8.0 lakhs farmers and 6.71 lakhs agricultural labourers are there in the district. In all, 32% and 18% of the total population constitutes agricultural labour and cultivators. However, an average 27.61 % of other workers in the district indicates that labour work is also the main source of livelihood. Household workers in the district are 4.28 % which is below the average of agriculture and cultivators.

Tehsil/Mandal: as per census 2011, with respect to the tehsil/Mandal level, Agriculture labour (35.60%) and Cultivators (14.71 %) its reveal that major source of livelihood in Uravakonda Mandal. Other work force participation rates of Urvakonda is 26.68% it's also reveal that another main source of livelihood. Household workers in the district are 4.82 % which is above the average of district data. With respect to Kanekal Mandal- Agriculture labour (48.36%) and cultivator (22.60%) its reveal that main source of livelihood and which are highest to an average Anantapur district data and Uravakonda Mandal.

Study Area: as per census 2011, with respect to the study area villages shows that average percentage of agriculture, cultivators labours and other workforce participation are 44.84% , 22.76% and 9.90 % respectively. House hold workers in the study village's accounts for 1.20%. Comparative analysis of workforce participation data with the district and Tehsil data shows that major livelihood source in the study area is agriculture labour. Most of the population of study area villages depends on the land (agricultural practices), cultivator and other work force.

Stakeholder consultation

To engage the stakeholder, identification and consultation of stakeholder associated with the project is an essential requirement. It establishes a responsiveness relationship for successful management of environmental and social impact in project.

The OSTRO wind farm project spread out under 18 no. of villages for the total 150 WTG locations. However, the project will be executed with only 50 WTG out of the 150. Village wise land requirement and land owner list have not been identified when the site visit was undertaken. That's why villages have been selected for community consultation based on the nearest WTG location.

Community consultation has been carried out in six villages out of the total 18 villages in the study area and other stakeholder consultation was carried out which included village panchayats, Aganwadi, agriculture department, irrigation department, district water shed department, tehsildar, and sub- register office, community health Centre and NGO etc. the list of stakeholder consulted for the proposed project is provided in **Table 5.4.** The list of detail stakeholders and MoM provided as an ***Annexure VII.***

TABLE 5-4: CONSULTATION WITH DIFFERENT STAKEHOLDERS

S. No.	Stakeholder type	Name	Gender (M/F)	Designation	Department/Address	Date
1	Community	P- Varalakshmi/ Hanumappa	F	Sarpanch	Nimbagal village	22.05.15
2		Mr. Hunur swami	M		Renimakulapalle	22.05.15
3		B. Gangamma	F		Mopidi	22.05.15
4		Errama	M		Amidala	22.05.15
5		I. Nagamma/ Munnuru Swami	F		Vyasapuram	23.05.15
6		P- Surenda	M		N. Hanumanpuram	23.05.15
7	Local Govt. institution	Suresh babu	M	Mandal agriculture officer	Agriculture Department, Uravakonda	22.05.15
8		Vijay Baskaran	M	Jr. assistant, Sub- Registrar	Sub- Registrar office , Uravakonda	22.05.15
9		Raghu	M	P.A. DFO	DFO, Anantapur	

10		K. Ramana Reddy	M	Superintendent	District watershed dept. Anantapur	23.05.15
11		Ramasuba Reddy	M	Assit. Director	Archaeology department. Anantapur	23.05.15
12		Anjana Devi	F	Staff nurse	Community Health Centre, Uravakonda	23.05.15
13	NGO/Trust	Er. Kesava Reddy	M	Program manager (L&T)	Sathya Sri Sai Water trust, Anantapur	23.05.15
14	Project developer	A. Nagoor s.	M	Sr. Manager and other team	M/S Gamesa Wind Power	21.05.15

Livelihood

As per 2011 census, 71.93 % population of Anantapur districts lives in rural areas of villages. Agriculture sector plays an important role in the economy of the District. The 70 % of the District population depends on Agriculture for their livelihood. The share of Agriculture and allied sectors in Gross Domestic Product (GDP) of the district ranges from 24-25%. (Agriculture-16.88%, Livestock-6.30, Forestry & Logging-0.88%, Fishing-0.18%). During consultation it was observed that more than 20% marginal labour (less than 180 days of employment) lives in the study area. It was reported that many people migrate to other city like Hyderabad, Bangalore and other state from the study area for other jobs.

Women

The female work participation in Andhra Pradesh is lower than that of male but is the highest amongst all the states in India. However, the women workers in the state are not placed better economically since the workforce is concentrated in activities which are unorganized, informal, seasonal, insecure, menial and poorly paid. There is also significant wage disparity between the males and the females. However, during consultation it was observed that, equal wages pay to women's under taken of National Rural Employment Guarantee Scheme (NREGS) in the area (For male and female wage 150 Rs). Through SHGs, womens are participating as an agricultural labour.

SHGs concept

"According to the National Bank for Agriculture and Rural Development (NABARD), a self-help group is a small economically homogeneous and affinity group of rural poor voluntarily coming together: to save small amounts regularly; to mutually agree to contribute to a common fund; to meet their emergency needs; to have collective decision making; to solve conflicts through collective leadership and mutual discussion"

Many Self Help Groups (SHGs)/ Mahila Mandal formed in every consulted villages it was observed during community consultation as provided in **Table 5.5.** The Maximum SHGs were

linked with banks and taken loans for forming, livestock and small business purpose reported by community members. They also engaged in NRGES scheme in the area.

As per DRDA-IKP Anantapur district portal site, as on 2010-11 total SHGs no. 51,488 has been formed with total no. of SHG members are included 5, 74,488 and total 21,843 no. of SHGs are linked with different bank branches of district.

TABLE 5-5: VILLAGE WISE SHGS

Sl. No.	Village Name	Mahila Mandal (Sangam)/ Women Self Help Groups	Activity
1	Nimbagallu	40	Livestock/ Agriculture
2	Renimakulapalle	30	Agriculture
3	Mopidi	60	Agriculture
4	Amidala	124	Business/Agriculture
5	Vyasapuram	23	Agriculture
6	N. Hanumanpuram	37	Agriculture

Source: primary consultation

Vulnerability:

"Groups that experience a higher risk of poverty and social exclusion than the general population. Ethnic minorities, migrants, disabled people, the homeless, those struggling with substance abuse, isolated elderly people and children all often face difficulties that can lead to further social exclusion, such as low levels of education and unemployment or under employment."

During community consultation it was observed that, some vulnerable group like landless family, physically handicapped and widow are available in every consulted villages as shown in following **Table 5.6.** Government provides to them pension those comes in vulnerable group especially for widow and physically handicapped persons.

TABLE 5-6: VILLAGE WISE VULNERABLE GROUP

Sl. No.	Village Name	vulnerable group (lump sum)		
		Widows	physically handicapped	Landless HH/ homeless HH
1	Nimbagallu	50	34	15
2	Renimakulapalle	300	50	60
3	Mopidi	50	50	30
4	Amidala	300	50	40
5	Vyasapuram	50	20	20
6	N. Hanumanpuram	60	20	15

The project proponent should be identified vulnerable community members as above mentioned during land procurement process. The project proponent should also avoid or minimize land purchase from the vulnerable groups especially women (widow)/ disabled persons headed house hold and marginal farmers.

The project proponent may be required to focus on providing employment opportunity to the vulnerable community members and also the implementation of programme under CSR activity for them.

Agriculture in the study area

According to district portal site, Anantapur is the lowest rainfall receiving district in the state with a mean rainfall of 553 mm. The rainfall intensity, frequency, pattern and distribution is highly erratic. The dry spells and drought are very common. Therefore Groundnut is the predominant crop grown in an area of 8.5 lakh hectares, however, other crops include sunflower, rice, cotton, maize, chillies, sesame and sugarcane.

TABLE 5-7: MAJOR CROPPING PATTERNS IN THE DISTRICT

Season	Condition	Cropping pattern
Kharif	Rainfed	**a. Groundnut +Red gram** **b. Groundnut** **c. Jowar** **d. Maize** **e. Sunflower**
	Irrigated	**a. Paddy** **b. Sunflower** **c. Groundnut** **d. Cotton**
Rabi	Rainfed	**a. Bengal gram** **b. Sunflower.** **c. Jowar**
	Irrigated	**a. Paddy** **b. Groundnut** **c. Sunflower**

The cultivated area of the district is 11.14 Lakh Ha, out of which 9.82 Lakh Ha is under Kharif and 1.32 Lakh Ha is under Rabi Season during the Year 2011-12.The District occupies the lowest position in respect of irrigation facilities with only 15.43% of the gross cropped area.

Over the years the cropping pattern in rainfed areas has become more and more specialized in favor of groundnut crop 83% of the Kharif area is under groundnut crop. In rabi, paddy and groundnut were exclusively grown under irrigated condition. Majority of the areas under bengal gram, maize and jowar were grown under rainfed conditions. Again the yield differences between irrigated and rainfed areas are surprisingly low even in the rabi season.

Agriculture field within study area

Waste Paddy field within study area

During consultation confirmed that, cropping pattern fully dependent on rainfed from June- Sept. and mainly single cropping pattern in the area. Farmers are engaged during this period after that they works under NRGES and govt. programme which are running in the area and many persons migrates to other city like Bangalore, Hyderabad and other state.

Productivity and production of major food crops

TABLE 5-8: INFORMATION ON AREA, YIELD AND PRICE OF KHARIF CROP

Sl. No.	Crop	Kharif (Anantapur District)		Kharif (Consulted Villages)	
		Area in Ha	Productivity (Kg/ha)	Productivity (Kg/Acre)	Yield/Price/ Quintal
1	Rice	23655	2672	400	1500
2	Maize	4823	4138	-	-
3	Jowar	8299	433	-	-
4	Bajra	1368	806	-	-
5	Ragi	3203	1854	-	-
6	Red gram	33728	365	500	4000
7	Green gram	1139	394	-	-
8	Groundnut	801889	516	80	5000
9	Sunflower	21000	305	-	-
10	Cotton	5055	178	800	5500
11	Castor	2800	505	-	-

Source: Comprehensive District Agricultural Plan, Anantapur district and community consultation

Productivity and production of major food crops in the Anantapur district during rabi season (average of 04-05 and 05-06) is presented in Table below.

TABLE 5-9: INFORMATION ON AREA, YIELD AND PRICE OF RABI CROP, 2003-2005

S. No.	Crop	Rabi	
		Area in Ha	Productivity (Kg/ha)
1	Rice	19890	2821
2	Maize	1581	4200
3	Jowar	14808	619
4	Bengal gram	48963	528
5	Groundnut	22203	1296
6	Sunflower	29073	1044

Source: Comprehensive District Agricultural Plan, Anantapur

Livestock

Anantapur district is having rich source of livestock. As per the latest (18th) livestock census, the district had 7.3 % of cattle, 4.0% of buffaloes, 12.6% of sheep, 9.4% of goats and 5.4% of pig population of the state. The district ranks first in goat population in the state and is having highest livestock population next only to Mahabubnagar. About 57.6 % of the households in the district possess livestock. The district is having highest Hallikar breed cattle, which is used extensively for agricultural operations. Sheep and goat constitute 73% of the total livestock population of 58.10 lakh.

During community consultation, it was observed that, the consulted villages has large populations of livestock and small ruminants. i.e. Buffaloes, Cow, Sheep, goats and bull are primary livestock's. Consultation with local people reveals that, there is no demarcated grazing land in the most of the villages area expect from Mopidi village. Open shrub field use as a grazing and paddy gross collected for long time as a fodder for animal. Milk produced for mainly self - consumption purpose.

Land Holdings

The cultivable land in the district is mostly under occupation of small and medium farmers as shown in **Figure 5.13**. The category wise number and area of operational holdings in the district is as following **Table 5.10**

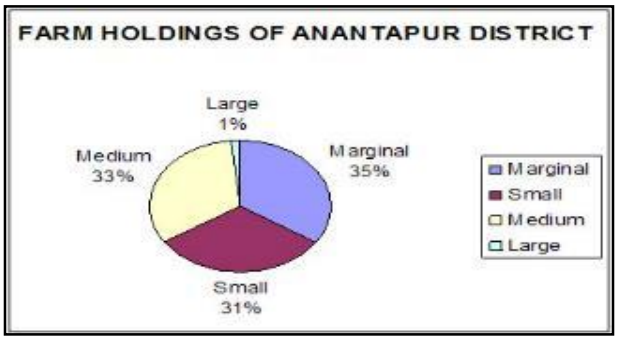
TABLE 5-10: ESTIMATED LAND HOLDING SIZE IN URVAKONDA, KANEKAL MANDAL AND ANANTAPUR DISTRICT.

Sl. No	Size group(ha)	Ananthapur Dist.		Uravakonda- Mand.		Kanekal- Mand.	
		Total holdings		Total holdings		Total holdings	
		Number	Area	Number	Area	Number	Area
1	Marginal Farmers (Below 1 Ha)	226411	133545	3910	2571	4534	2835
2	Small Farmers (1-2 Ha)	208185	302218	5039	7308	4248	6101

3	Semi-Medium (2.0 - 3.99)	161795	421152	3920	10272	4053	10821
4	Medium Farmers (2-10 Ha)	52899	307455	1620	9352	1687	9592
5	Large Farmers (>10 Ha)	7678	103426	251	4008	149	2020
	ALL GROUPS	**656968**	**1267796**	**14740**	**33511**	**14671**	**31369**

Source: http://agcensus.nic.in/2010-11

Figure 5-13: Land holding farmers in Anantapur district



Source: Agriculture Department, Anantapur

Irrigation

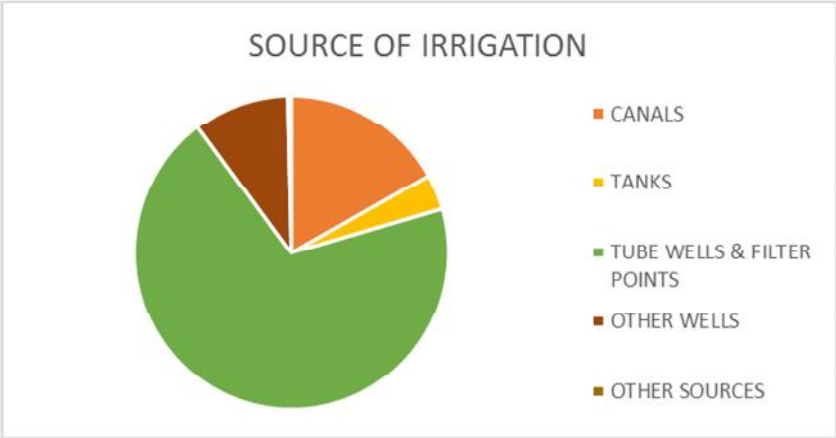
As per the ICAR report 2012, in the past decade the contribution of tanks and canals is declining. Irrigation from tanks accounted for 12 percent of net irrigated area in the early 1980s, which came down to 6% in 2010-11, irrigation from canals also decreased from 27 to 14 per cent in the same period. However the area under tube wells increased from 0 to 79 per cent and now is the major source. Anantapur is the second largest ground water exploited district followed by Ranga Reddy in Andhra Pradesh. The reliance on ground water is increasing, which is a matter of great concern as the ground water status is under semi-critical to over-exploited category.

The steep increase in tube well irrigation systems could impact groundwater status in the district.

The steep increase in tube well irrigation systems could impact groundwater status in the district.

During 2010-11, tube wells constituted 70% of the total irrigation source, followed by 20% through canals, 8% through tanks and 2% through other sources. During consultation it was observed that, there was no irrigation source or scheme. However, canal channels in the area which was developed by government and connected with Tungbhdra dam but it has not been used for irrigation purpose reported by farmers.

Figure 5-14: Source of irrigation in Anantapur



Source: Agriculture Department, Anantapur

Minor irrigation schemes in Anantapur District

The total area of Anantapur District 19,130 Sq. Km., forest area 196.97 Sq. Km and the total irrigation area is 26.27 lakhs Acres. There are 2711 Minor Irrigation sources and with 16 system tanks including spring channels and supply channels serving an ayacut of 1, 65,147 acres, spread over 63 Mandals of Anantapur district.

Socioeconomic Infrastructure

Village amenities data were not available as per census 2011 on census office and census portal website, however, on district level integrated educational amenities data of Anantapur available at district portal website as described in following the below section. Amenities data of study area villages and districts used in below section according to census 2001. Village wise amenities as per census 2001 provided as an ***Annexure VIII.***

Education

As per census 2011, in Anantapur district there are six Engineering Colleges; 12 B.Ed. Colleges; one Medical college; one Pharmacy college; two Polytechnic Colleges; 35 Degree Colleges; 96 Junior Colleges; 465 High Schools; 610 Upper Primary Schools and six Industrial Training Institutions. Oil Technological Research Institute only one of its type in the south and dry land agriculture research station are situated in Anantapur.

As per census data 2001, all 18 study area villages equipped with primary schools, eight villages have middle school and four villages have senior secondary school. Collages and vocational training institutes are located between 5 km and 10 km of a distance from the study area villages.

The Socio-Economics Survey report 2013-14 published by planning department, Andhra Pradesh, Drop-outs it has been observed that there is a problem of retention at different levels in enrolment of school aged group children into the schools. During 2013-14, dropouts at I-V

classes (Primary Level) were 3.20%, 19.6 % at I-VIII (Elementary Level) and 26.83% at I-X (Secondary Level). During consultation confirmed that, drop outs students reported by village sarpanch of Vyasapuram after the primary/middle class.

In the consulted villages observed that, every villages equipped with primary school. Three villages have middle school with some basic infrastructure like electricity and drinking water facility. Senior and Graduate colleges are available within 10 km distance from the consulted villages. Consultation with school staff has not been done due to summer vacation.

Health

As per health survey report 2010 conducted by Indian Institute of Public Health, Hyderabad, the Anantapur district has a vast network of public health services including 1 district hospital, 11 community health centres (CHCs), 75 primary health centers (PHCs), and 578 sub-centers.

As per census 2001, respect to the study area villages, eight villages have Health Sub Centre (HSC) and two villages have private nursing home available out of the 18 villages. Mostly PHC, HSC and other facilities like Maternity and child welfare centers, Nursing homes and Private medical practitioners are majority located between 5 kms and 10 kms or more than 10km of a distance from the villages.

In the consulted villages observed that, health care facility are not adequate in the villages. However, majority of villages have health sub Centre were there but Doctors were not regularly available and at some village ANM's visit at health sub Centre once a week or twice a month. Community Health Centre available at Uravakonda Mandal which is located at more than 10 km distance from the project area villages. Some key points observed during consultation with staff nurse are following -

CHC, Uravakonda

- 30 beds facility in hospital included six no. of MBBS doctor and one gynecologist
- Testing facilities i.e. Malaria, Typhoid, T.B., HBSG and HIV etc. are available
- This CHC is responsible for Around 45 villages
- One Ambulance (104) for village area and another Ambulance (108) for emergency are available. One ambulance which was donated by Raghvendra Trust, Anantapur
- General diseases cases are maximum examine in hospital
- Major diseases are observed - Malaria, skin problem, accidental, burn cases, T.B., HIV and Joint pain.
- Joint pain is common problem in that area due to drinking water has high fluoride content.
- Medicine facility available.

Drinking water facility:

As per village amenities census 2001, Tap water and hand pumps facilities are main source of drinking water in the study area villages. It has been found that there are some seasonal Canal channel, check dam constructed by govt. and ponds in the vicinity of the project site in the study area villages**.**During consultation confirmed that, tap water is main source of drinking water in the area, government constructed an overhead tank in every villages of Urvakonda and Kanekal Mandal under Comprehensive Protected Water Supply scheme to Uravakonda Mandal. In consulted villages water supplied by **Sri Sathya Sai Water Trust** after the treatment of water. Drinking water contaminated with high fluoride were major problem in the area reported by community. Some villages have not sufficient water for all villagers especially in Vyasapuram village. Ground water depth is more than 500 ft. to 1000 ft. in the consulted area villages.

*"The **Sri Sathya Sai Water Supply Project** for Anantapur district was undertaken during the years 1995-97. The Anantapur district is one of the most chronically drought affected areas in the country, where the available ground water has high fluoride content. It is in fact in the context of such high fluoride content that the project was designed to make use of surface water from the Tungabhadra Canal. Sathya Sai Baba's project, which brought water to more than 700 villages in the Indian state of Andhra Pradesh (where Prashanthi Nilayam is located). This project was directed by the Sri Sathya Sai Central Trust and carried out by Larsen & Toubro Limited, with the collaboration of the Government of Andhra Pradesh*."


Overhead tank and tap water facility in village

Sanitation

It was observed that, toilets facility is available in 30% in houses among consulted villages and rest of 70% house hold use open defecation. Sanitation scheme under Swach Bharat mission is ongoing in the area. An amount of INR 12,000 per household provision is provided there under this scheme.

Cooking source

It was observed that, cooking gas is preferred over fuel wood in the consulted villages. Around 42% wood fuel and more than 55% is LPG are medium of cooking source.

Communication and Transportation facilities

Village approach road

As per census 2001, transportation facilities are available in the 18 study area villages. And railway network is available at Anantapur district, which is around 30-40 kms away from the project site. During site visit & consultation it was observed that roads connectivity for all study area villages is good except in Vayasapuram and Meenahali villages where road was in poor condition (unpaved road). Local bus service is sole mode of transportation for the people of the study area villages. Post offices and phone connectivity are available in majority of the study area. However, availability of post offices is only in 9 out of the 12 study area villages.

Power Supply

As per annual report 2013- 2014 published by Power & Energy Division (Planning Commission Government of India), Andhra Pradesh state which has been declared as completely electrified 100 percent villages electrified. However, as per census 2001, in the all study area village's electricity facility available for domestic and agriculture purpose.During consultation it was observed that, power supply is there in the villages around 22 hrs.

Common Property Resources (CPR)

During consultation it was observed that, religious and cultural place presented in every consulted villages, community ponds and cremation ground available in two villages, community hall available in three villages and canal channel available within a km in 4 villages as provided in **Table 5.11**. It was also confirmed that, due to proposed project falling in the area CPR will not be affected.

TABLE 5-11: VILLAGE WISE COMMON PROPERTY RESOURCES

Sl. No.	Village Name	Common Property Resources (CPR)				
		Religious and cultural place	onds	Cremation ground	Community hall	Canal
1	Nimbagallu	12	-	1	1	Available
2	Renimakulapalle	10	1	-	-	Available
3	Mopidi	15	-	-	1	-
4	Amidala	75	-	-	1	Available
5	Vyasapuram	6	-	1	-	Available

6	N.Hanumanpuram	8	1	-	-	-

Source: primary consultation

Archeology sites in the District

As per archaeology department, Anantapur, total 46 protected monuments sites identified in the district has been provided as an ***Annexure IX***. Three protected monuments sites out of the 46 available in Budvagavi village of Uravakonda Mandal, Anantapur. Which are located at around 5-7 km distance from the proposed project affected village area. During consultation with Asst. Director, Archaeology department, Anantapur, it was confirmed that, there is no impact due to proposed project.

Some important schemes in District

Drought Prone area Programme and Desert Development Programme Schemes:

In Andhra Pradesh, the Drought Prone Area Programme (DPAP) and Desert Development Programme (DDP) are being implemented since 1995 in 6 districts. Watershed programmes are implemented in Srikakulam, Prakasam, Chittoor, Kadapa and Kurnool districts under DPAP and in Anantapur district under DDP Programme. Traditionally, the watershed approach was aimed at treating degraded lands with the help of low costs and locally accessed technologies such as in-situ soil & moisture conservation, afforestation etc by involving village communities in the implementation of watershed programme under DPAP and DDP to promote overall development of poorer sections of people inhabiting in the programme areas.

Activities:-

- Development of water harvesting structures such as low cost farm ponds, nalla bunds, Check dams, Percolation tanks and groundwater recharge measures to conserve and allow percolation of water.
- Desilting of village tanks for drinking/Irrigation/Fisheries development
- Afforestation including block plantations, Agro-forestry and Horticulture development, Pasture development.
- Land development including in-situ soil and moisture conservation measures like contour and graded bunds, nursery raising for fodder, timber, fuel wood, horticulture and non-timber forest product species
- Drainage line treatment with a combination of vegetative and engineering structures
- Crop demonstrations for popularizing new crops/varieties
- Repair, restoration and up-gradation of existing common property assets and structures in the watershed to obtain optimum and sustained benefits from previous public investments.

During consultation with superendent of District Watershed Management Agency (DWMA) it was informed that, micro watershed programme running in many villages of Uravakonda and Kanekal Mandal, Anantapur district under Integrated Wasteland Management Programme (IWMP) schemes. Some of details of micro watershed program in project area villages has been provided by DWMA department as provided in ***Annexure X.***

MNREGS Scheme in the district

MNREGA was set up on Feb 2, 2006 from district Anantapur in the state of Andhra Pradesh, India and originally protected 200 real "poorest" zones of the nation. MNREGA seeks to provide at least 100 days of guaranteed wage employment in a financial year to every rural household whose adult members volunteer to do unskilled manual work.

As per MGNREGS-AP Abstract Report under the implementation of this scheme in Anantapur district, the details of NREGA scheme, as on May'2015 overall 770796 cards issued in all 63 mandals and 198948 families were provided employment opportunity and nearly worth of Rs.15280 lakhs were spent in this scheme in the district.

During consultation confirmed that, MNRGES scheme ongoing in the study area villages Most of the household have MNREGA job card issued.

Pension schemes

Andhra Pradesh State Government Introduced NTR Bharosa Pension scheme to secure dignified life to all the poor and vulnerable, as specially the old people and infirm to support their minimum needs to bring happiness in their lives. In pursuit of this overarching goal, inspite of the challenging financial conditions, orders were issued vide G.O.Ms.No. 113 Dated: 19.06.2014 enhancing the NTR Bharosa Pension amount from Rs.200/- to Rs.1000/- per month to Old Age, Widow, Weavers, Toddy Tappers and AIDS patients and from Rs.500/- to Rs.1000/- per month to People With Disabilities (PWD) having 40% to 79% degree of disability and Rs.1500/- per month for PWDs having 80% and above degree of disability, and that the above enhanced scale of pension came into effect from 2nd October,2014 onwards.During consultation confirmed that, old age, widow and physically disabled persons are getting benefits in the study area village reported by the community members.

The key findings of consultation:

- Economy of the region is mainly dependent on agriculture and main workers are engaged as cultivators and agriculture labour
- Agriculture is dependent on rainfed in the area
- Groundnut is the predominant crop grown in an area and other crops are include sunflower, rice, ragi, cotton, maize etc.
- Significance no of SHGs/Mahila Mandals has been formed in every villages
- The consulted villages has large populations of livestock and small ruminants. Buffaloes, cow, sheep, goats and bull are the primary livestocks.
- There is no other irrigation sources. However, canal channel are available in some villages
- Tap water is main source of drinking water in the area and drinking water is contaminated with high volume of fluoride.
- Some villages have not sufficient water for all villagers
- Most villages have majority households practicing OD. low access to individual sanitary latrines
- Health care facilities are not adequate in the villages. The closest Community Health Centre available at Uravakonda which is 10 km distance from the project area villages

- Joint pain is common problem in that area due to drinking water has high fluoride content.
- Roads connectivity for all study area villages is good except in Vyasapuram and Meenahali villages.
- The land for the proposed project has not been purchased yet. Village wise land requirement have not been identified when the site visit was undertaken.
- Land will be purchased through the land aggregator. Proposed project
- There will not CPR and any other protected monuments site affected due to project

Needs/Gap Assessment

As per Backward Regions Grant Fund Programme (BRGF) annual report 2007-08, Anantapur district ranks 3rd in terms of backwardness in Andhra Pradesh. The district comprises 63 Revenue Mandals out of which more than 60% of the Mandals are highly backward due to several reasons i.e low irrigation facilities , no industries and less employment opportunities . In order to define backwardness baseline survey and comparative analysis of indicators like no. Of BPL family's road connectivity, literacy, Agriculture production percentage of migration was done. The existing medical and health facilities are not fulfilling the needs of the poor people particularly at sub center level. Analysis of above socio economics description and community consultation in project area villages reveals that concern of villagers are linked with the fulfillment of basic needs and improvement of infrastructural facilities at village levels. On the basis of discussion with villagers, Sarpanch, CHC staff, following gaps have been identified for the proposed project.

Key Needs/Gaps identified and recommendation for CSR activity

Key Areas	Gaps identified	Recommendation for CSR
Education	• Low female literacy rate compared to male • Drop out students reported after primary and middle school • Sr. secondary/collage are located at more than 10 km distance from the villages • Lack of vocational training in study area villages • Some villages have not sufficient water for all villagers • Lack of toilets separately for boys and girls,	• Awareness programme regarding female education at village level • Could be linked with vocational training programme of study area villages • Could be provision sanitation facility in school • Providing furniture (Chair/Benches) in the school

Key Areas	Gaps identified	Recommendation for CSR
	furniture in the school as reported by community members	
Health	• Health sub Centre available in 8 villages out of the 18 study area villages based on census 2001. • Lack of basic facility in health sub Centre • Doctors and ANM are not available regularly reported by community members • Lack of primary health Centre in the area • CHC constraints: more than 10 km from the village • Major diseases are observed - Malaria, skin problem, T.B., HIV and Joint pain. • Joint pain is common problem in the area due to drinking water has high fluoride content.	• Periodic health camps organized in the study area villages regarding Malaria, T.B. and joint pain etc. • Awareness programmes at village level regarding drinking water has contained
Drinking water and sanitation	• Tap and supply water is main source of drinking water. However, water has contaminated with high volume of fluoride observed during site visit. This is also confirmed from the laboratory report which has analyzed the water sample collected from Nimbagallu hand pump which shows that the fluoride concentration is above the desirable limit as prescribed by Indian drinking water standard. • Some villages have not sufficient water for all	• Providing R.O. system at least project influenced villages • Providing and ensured of drinking water supply for all villagers especially in Vyaspuram village • Organizing awareness camp on sanitation and to be linked with sanitation programme in the study area villages

Key Areas	Gaps identified	Recommendation for CSR
	villagers in Vyasapuram village • Most villages have majority households practicing Open defecation (OD). low access to individual sanitary latrines • Sanitation scheme ongoing in the area under Swach Bharat mission. However, not implemented in the villages as observed during consultation	
Agriculture/ Irrigation/ Watershed	• Agriculture is dependent on rainfed and single cropping pattern in the area • There is no irrigation sources. However, canal channel are available in study area villages but they are not in operational • Ground water depth is more than 500 ft. observed during consultation • Scarcity of pasture and water availability for cattle • Lack of watershed programme in the study area villages reported by DWMA, Anantapur	• Water harvesting programme at village level • Link with irrigation programme that can easy irrigation in the area • Link with watershed programme and enhancing cultivation in the area
Employments opportunities in the area	• Many SHGs/Mahila Mandal has been formed in the consulted villages. However, some SHGs were linked with banks and doing small business and engage as an agricultural labour • Many of SHGs effectively not active in the area	• Organizing training/capacity building programme for SHGs regarding entrepreneurship and linkages with bank • Awareness programme organizing for youth schemes which are ongoing in district

Key Areas	Gaps identified	Recommendation for CSR
	• Lack of employment generation programme among the SHGs • Lack of awareness on the ongoing programme for youth in the study area villages • Migration pattern observed in the study area villages	

6 Analysis of Alternatives & Site Selection

This section of the report presents the analysis of the alternatives considered for the Project. The following scenarios have been considered:

- Project versus No project Scenario;
- Alternate methods of power generation;
- Alternate Location for the proposed project; and
- Alternate routes for transmission lines

6.1 NO PROJECT SCENARIO

The current power supply scenario and the future forecasts indicate a progressive deficit in supply. In order to bridge this gap between the demand and supply, renewable/non-conventional sources of power are required to supplement the conventional sources. The proposed project being a non- conventional source of power generation intends to contribute towards bridging the demand supply deficit as projected. In Andhra Pradesh, existing renewable capacity is about 1,397 MW (Wind-777MW, Solar- 77MW, others- 543MW) as on June 2014. It is envisaged to add about 9,150 MW renewable capacities by FY 2018-19 mainly through solar and wind generation.

TABLE 6-1: RENEWABLE ENERGY INSTALLATION IN ANDHRA PRADESH

Particulars	Unit	Wind	Solar	Total
Existing capacity (As in June 2014)	MW	777	77	854
Envisaged Addition by (2018-19)	MW	4150	3000	7150
Total	MW	4927	3077	8004

The total assessed wind power potential in the country is about 48,000 MW. The Centre for Wind Energy Technology (C-WET) published the Indian Wind Atlas in 2010, showing large areas with annual average wind power densities of more than 200 Watts/m2 at 50 meter above ground level. The potential sites have been classified according to annual mean wind power density ranging from 200 W/m2 to 500 W/m2. Sites with Annual Mean Wind Density above 200 W/m2 are considered suitable for wind power projects. There are 233 such sites identified in the country, out of which about 8 sites are located in Andhra Pradesh.

About 2,846.12 MW capacity wind power projects have been sanctioned by the Non-conventional Energy Development Corporation of Andhra Pradesh Limited (NEDCAP), the sanctioning authority in the state, out of which projects of about 498.62 MW have been commissioned till June 30 this year. The proposed project presents an opportunity to utilize the potential for wind power generation. A “No Project Scenario” will not address the issue of

power shortage. An alternative without the project is undesirable, as it would worsen the power supply-demand scenario, which would be a constraint on economic growth.

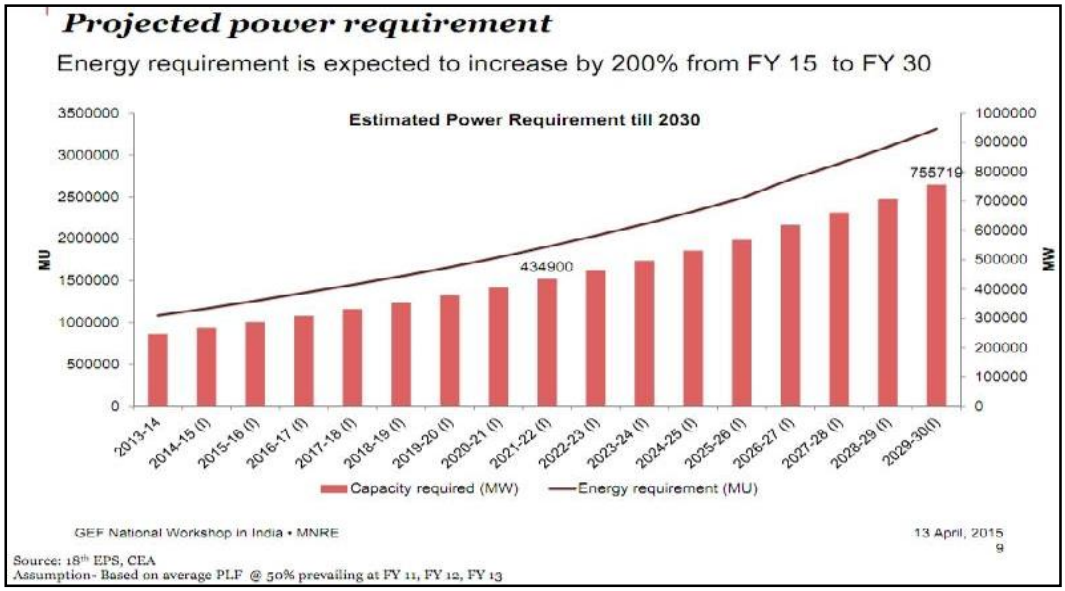
The Project being a wind power project will not lead in any CO2 and SO2 emissions during the operation phase. It does not deplete the natural resources and most importantly, only a small part of land will be permanently utilized by the turbines, ancillary facilities and access roads.

6.2 ENERGY SECURITY:

In 2007 the Ministry of Environment and Forests (MoEF), Ministry of power (Mop) and the Bureau of Energy Efficiency (BEE) issued a paper entitled 'India: Addressing Energy Security and Climate Change'. This was the first time that these agencies had come together to recognize climate change as a legitimate concern for policy makers and also linked it with energy security. Further a major portion of the proposed solution for integrating climate change concerns with traditional sustainable development included 'diffusion of RE and energy-efficient technologies'.

Currently, according to the Indian government, nearly 30% of India's total energy needs are met through imports. In May 2015 world crude oil prices are well over the $ 60 per barrel mark. Also building nuclear or thermal plants under a business-as-usual pathway will only increase India's exposure to market fluctuations and political risks of controlled supply chains. It is definitely more efficient to make investments in improved energy efficiency and harnessing RE sources to meet the current demand-supply gap. In India the need for expanding the role of domestic RE sources is a logical next step. Wind power is already in a position to provide a significant portion of India's planned capacity addition up to 2030, with simple regulatory and grid modernization initiatives. Unlike oil, coal or LNG, wind power is not subject to fluctuating fuel prices which drain India's limited foreign reserves, and in addition, wind power helps reduce the carbon footprint of the economy.

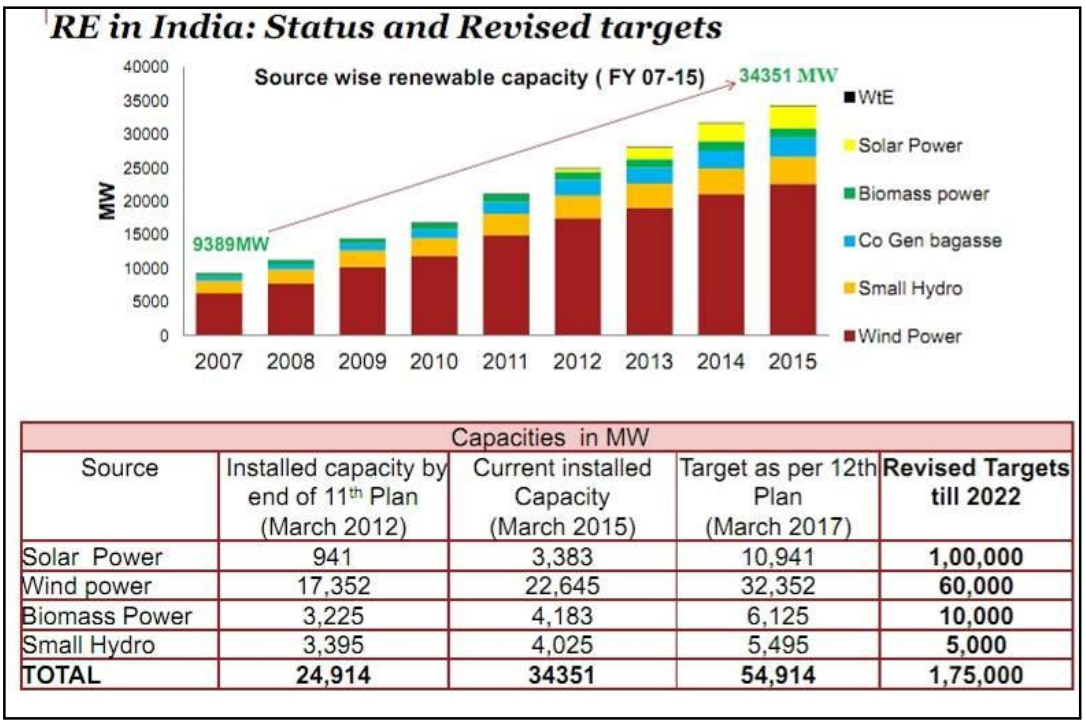
FIGURE 6-1: INDIA'S PROJECTED POWER REQUIREMENT



6.3 ALTERNATE METHODS OF POWER GENERATION

Wind energy is the most eco-friendly mode of power generation as it avoids any kind of emissions from the operation. There are no fuel requirements or large quantities of water for operation of the plant. The conventional sources of power (thermal power plants) have a very high environmental cost compared to non-conventional sources. The construction phase of thermal power plants are also longer than that of wind energy projects which requires short lead time to design, install, and start up a maximum of 2 months after micro siting, approvals and land purchase. As per MNRE, The installed capacity of wind power in India until March 2015 is 22645 MW.

FIGURE 6-2: INDIA'S INSTALLED WIND POWER CAPACITY



Capacities in MW				
Source	Installed capacity by end of 11th Plan (March 2012)	Current installed Capacity (March 2015)	Target as per 12th Plan (March 2017)	**Revised Targets till 2022**
Solar Power	941	3,383	10,941	**1,00,000**
Wind power	17,352	22,645	32,352	**60,000**
Biomass Power	3,225	4,183	6,125	**10,000**
Small Hydro	3,395	4,025	5,495	**5,000**
TOTAL	**24,914**	**34351**	**54,914**	**1,75,000**

The various power generation options as discussed in the earlier section can be evaluated on the leveled cost of power generation which includes the capital and O&M costs, reliability of power generation in terms of plant load factor and the greenhouse gas (GHG) emission. The comparative analysis of various power generation options based on these factors has been presented in **Table 6.2.**

TABLE 6-2: COST BENEFIT ANALYSIS OF ALTERNATIVE ENERGY SOURCES

Alternative	Cost (₹ /kWh) *	Plant Load Factor **	Average Lifecycle GHG Emission
Coal	2.5	65-85%	888
Natural Gas	3.9	70-85%	500
Hydro	3.8	30-50%	26
Nuclear power	2.5-5.7	65-85%	28
Wind Energy	4.2	25-40%	26

Solar	15.3-17.1	10-15%	85

*Source: * - LBNL, CERC, CSTEP & NPCIL*
***- Renewable UK*
**** - World Nuclear Association Report*

The power generation options using conventional sources offer advantages such as lower levelised costs of power generation and higher plant load factors. The operation and maintenance of wind farms does not typically involve air emissions or effluent discharges. There are no fuel requirements or large quantities of water required for the operation of the plant. GHG emissions and other environmental pollution (stack emissions, ash management etc) issues are also insignificant. Also, there are no significant social issues associated with wind energy projects. Every mode of electricity generation offers various advantages and disadvantages with respect to operational cost, environmental impact, and other factors. In relation to GHG emissions, each generation method produces GHGs in varying quantities through construction, operation (including fuel supply activities), and decommissioning.

6.4 ALTERNATE LOCATION FOR THE PROJECT

Wind energy projects are site specific and its feasibility depends on a number of factors which can be broadly categorized as wind resource assessment, land availability, cost of land and impact on community.

6.4.1 Identification of sites for WTG's

The Southern region of Andhra Pradesh comprising of Anantapur, Kadapa, Kurnool and Chittoor districts have good wind power potential. The estimated wind power potential in the State is around 13,000 MW out of which 1000 MW of wind projects will be developed in the 1st phase. In the second & third phases, the capacity planned is 1500 MW & 1650 MW respectively.

The key factors considered for the final selection of WTG sites included the following:

- All sites selected for WTG's comprise predominantly of arid agriculture land which are cultivated once a year.
- Land owners of private land are more likely to sell their land because it totally dependent on monsoon for farming activity and is not generating any significant income.
- The proposed sites for WTGs are located away from major settlements except 3 out of 150 WTGs hence care to be taken to change the location that fulfils the minimum distance requirement and cause minimal inconvenience in terms of visual intrusions, noise, and shadow flicker.
- The site surroundings do not comprise of any environmentally sensitive features such water bodies, forests, or archaeological sites in the immediate surroundings of the WTGs.

Therefore, considering all the above criteria, the identified sites were chosen as a suitable option for the project.

6.4.2 Alternate routes for transmission lines

Laying of transmission line comprises of 220 KV line up to upcoming 400/200 KV Uravakonda substation from the proposed pooling substation on site. Gamesa to construct the 200 KVA pooling substation that will directly connect to 400/200KV substation.

The route for the transmission line has been selected keeping in mind the following factors:

- Transmission line route is planned to avoid any habitations along the route;
- No house or community structures are located under the transmission line;
- Areas requiring extensive clearing of vegetation have been avoided;
- Selection of the transmission route avoids any environmental sensitive site;
- Right of way/access roads will be shared with the common user of the substation.

The shortest possible route after considering the above factors has been selected for the transmission lines to reduce the environmental and social footprint of the transmission lines.

6.5 CONCLUSION

Considering various factors such as wind resource potential in the project site, favorable environmental and social settings, lowest GHG emissions in the project life cycle, availability of land and other resources it can be said that the site is best location for development of wind power project. There are about three more wind power projects of other developers in operation in the same district due to the suitability of wind power generation.

7 Environmental And Social Impact Assessment

7.1 APPROACH

The assessment process has taken into consideration the impacts due to project sitting, land preparation, and construction and operation of the Wind Farm project. The Environmental & Social Impact Assessment (ESIA) has taken into consideration the following:

- Applicable National Regulations;
- IFC's Performance Standards;
- Outcomes of the community consultation and baseline environmental monitoring that was conducted by the SENES study team;
- IFC General EHS Guidelines.

7.2 IMPACT ASSESSMENT

Compared to the environmental effects of traditional energy sources, the environmental effects of wind power are relatively minor. Wind power consumes no fuel, and emits no air pollution, unlike fossil fuel power sources. Typical activities during the wind energy facility construction, decommissioning and operation phase include construction, excavation, turbine and facility removal, breaking up of concrete pads and foundations, recontouring the surface, and revegetation. Potential impacts on every environmental components from these activities are presented below:

7.2.1 Water

Construction Phase:

The volume of water to be used during project construction and operation is low. Water is required for plant civil works, will be sourced from local bore wells/ wells/lakes and supplied to the site via water tankers by contractors. During normal construction period, water requirement would be about 10.5 KLD to build foundation of tower and 2 KLD for domestic use in full capacity of workers. In operational phase water is being used for the domestic use of project staff at the site which is estimated to be around 2.7 KLD. This quantity has been considered for 10 security guards present on site in shift and about 10 skilled personnel present at the site office.

As per Central Ground Water Board the ground water in Uravakonda block where the proposed project site is located is falling in the safe zone. Therefore, the consumption of water impact is not anticipated on ground water.

During the construction works, there is a possibility of contaminated runoff from the site as the activities involve the installation of wind turbine foundation, underground cables, soil compaction, increased run off and sedimentation of surface waters. During site visit no water bodies were observed in the study area close to any of the WTGs. However, there is a

network of canal is located within the project site which is intermittently flowing at some places while dry at other places. Also portable toilets will be provided for the staff and workers working during the construction phase. Considering the negligible quantities of wastewater to be generated during the construction phase, the impact on water quality due to the construction activity is expected to be insignificant.

Operation Phase:

Groundwater contamination can occur if chemicals are not properly handled or are incorrectly disposed of and leach into the water table or if wastewater from plant activities is not properly disposed of. Very small volume of waste will be produced from the operation of the wind farm (e.g., used oil, paint cans), which will be disposed to authorized vendors. Minor volumes of sewage will be generated from toilet facilities at the site office. This will be disposed to septic tank, thus no significant impact is anticipated to surface or groundwater.

Mitigation measures

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

- Temporary paved areas shall be constructed to be used while refueling the machineries;
- Machinery and vehicles shall be thoroughly checked for the presence of leaks if any;
- Drip pans shall be provided with vehicles with leaks to prevent soil contamination; and
- Storage of oil shall be undertaken on paved impervious surface and secondary containment shall be provided for fuel storage tanks.

7.2.2 Air

Construction & Decommissioning Phase

Emissions coming from the construction activities of site clearance, road construction, foundation preparation will lead to dust generation and exhaust of construction machinery and equipment including generators (e.g., CO_2, NO_X, PM2.5, PM_{10}, SO_2, etc.). Emissions during this phase will be localized and temporary. Emissions will be substantially greater than emissions from project operation activities, but still limited in volume. Site dispersion of emissions is good due to the raised elevation of the site and higher than average wind speeds. Thus impact on local settlements will be negligible owing to the considerable distance from the turbines.

Operation Phase

Emissions during this phase will be limited to exhaust emissions and dust generation from a low number of vehicle movements for maintenance purposes. The main impact of the project on air quality will be the benefit provided by the replacement of conventional power generation with renewable energy. Wind energy will replace fossil fuel power energy generation (primarily coal powered), therefore carbon dioxide emissions into the atmosphere

will be reduced. Overall the project will have a beneficial impact on air quality due to the replacement of nonrenewable energy generation.

7.2.3 Noise

Construction & Decommissioning Phase

The construction activity will be mainly carried out during day time. Project construction involves activities such as road construction, grading, excavating and drilling of tower foundations, concrete batching, tower erection, construction of ancillary structures, operation of diesel generators, concreting, material movement and site cleanup.

Noise levels generated by construction equipment vary significantly depending on the type and condition of equipment, operation methods and schedule, will be generally in the range of in the range of 84–109 dB(A).

As the surrounding villages are located at the distance of more than 500 m, construction phase noise will not have a significant impact on existing ambient noise levels at receiving sites as noise generating activities are dispersed. The construction phase will last for 1 day at a single WTG. Therefore the impact from construction noise is deemed to be negligible.

Workers in close proximity to machines are prone to exposure of high levels of noise of machinery. This will be taken care by proving personal protective equipment like ear plugs/muffs and works will be rotated in shifts to avoid long term noise exposure. Noise levels from different machineries used for site purpose is presented below:

Table 7-1: Indicative noise from different equipment and vehicles

S. No	Type of Vehicle	Description	Typical Sound Power Level (dB)
1.	Passenger Vehicle	Passenger Vehicle	85
2.	Trucks	10 ton capacity	95
3.	Cranes	Overhead and mobile	109
4.	Mobile Construction Vehicles	Front end loaders	100
5.	Mobile Construction Vehicles	Excavators	108
6.	Mobile Construction Vehicles	Bull Dozer	111
7.	Mobile Construction Vehicles	Dump Truck	107
8.	Mobile Construction Vehicles	Water Tanker	95
9.	Stationary construction equipment	Concrete Mixer	110
10.	Compressor	Air compressor	100
11.	Compressor	Vibratory compactor	110

Operation Phase from Wind Turbines

The sources of noise generation from operating wind turbines can be divided into two categories, mechanical sounds, from the interaction of turbine components, and aerodynamic sounds, produced by the flow of air over the blades.

Noise from a wind turbine is typically made up of three distinct elements:

- A reasonably steady, broad-band noise of aerodynamic origin, which depends on the blade tip speed
- A tonal noise element from mechanical components within the nacelle
- A regular, pulsed element resulting from interaction between the mast and blades

Aerodynamic noise generation is very sensitive to the speed of translation at the very tip of the blade. To limit the generation of aerodynamic noise, modern wind turbines limit the rotor rotation speeds. Large variable wind turbines in general rotates at slower speeds in low winds and its rotational speeds increases with increase in wind speed until the limiting rotor speed reached. This result in much quieter operation in low winds than a comparable constant wind speed turbine. Recent improvement in mechanical design of wind turbines have resulted in significantly reduced mechanical noise from both broadband and pure tones. Thus the noise emission from modern wind turbines is dominated by broadband aerodynamic noise (Fegeant, 1999). Blades moving through the air produce an aerodynamic noise. This noise is detectable when it is greater than the background noise, generally at wind speeds up to 8 meters per second.

Wind Turbines for the proposed project will be of Gamesa make G97-2.0 MW. The model has aerodynamic design of the blade tip and mechanical components design minimize noise emissions. In addition Gamesa has developed the Gamesa NRS noise control system, which makes it possible to program the turbine to reduce noise emissions accordingly to such criteria as the date, time or wind direction. This operational mode and mechanical design improvement contributes considerably to the minimization of noise.

Noise Propagation

During noise propagation, initial energy in noise is distributed over a larger and larger area as the distance from the source increase which leads to reduction in noise pressure level. Thus assuming spherical propagation, the same energy that is distributed over a square meter at a distance of one meter from the source is distributed over 10,000 sq.m. at a distance of 100 m away from the source. (Anthony L. Roagers, march 2004). To estimate the sound pressure level at a desirable distance following simple model calculation is used.

$$L_p = L_w - 10 \log_{10} (2\pi R^2) - \alpha R$$

Here, Lp = sound pressure level (dB) at a distance of R from a noise source radiating at a power level,

Lw = sound pressure level (dB) at source

R = distance of receptor from source

α = frequency dependent sound absorption coefficient.

The above given equation can be used with either broadband sound power levels and a broadband estimate of the sound absorption coefficient (α = 0.005dB(A)/meter)

Using the above given equation, it is calculated that at a distance of 200 m from the single wind turbine of sound power level 102 dB(A) the estimated sound pressure level would be 47 dB(A) which is slightly higher than the ambient noise levels of 38 dB(A) level in the area.

Impact due to Wind Turbine Noise

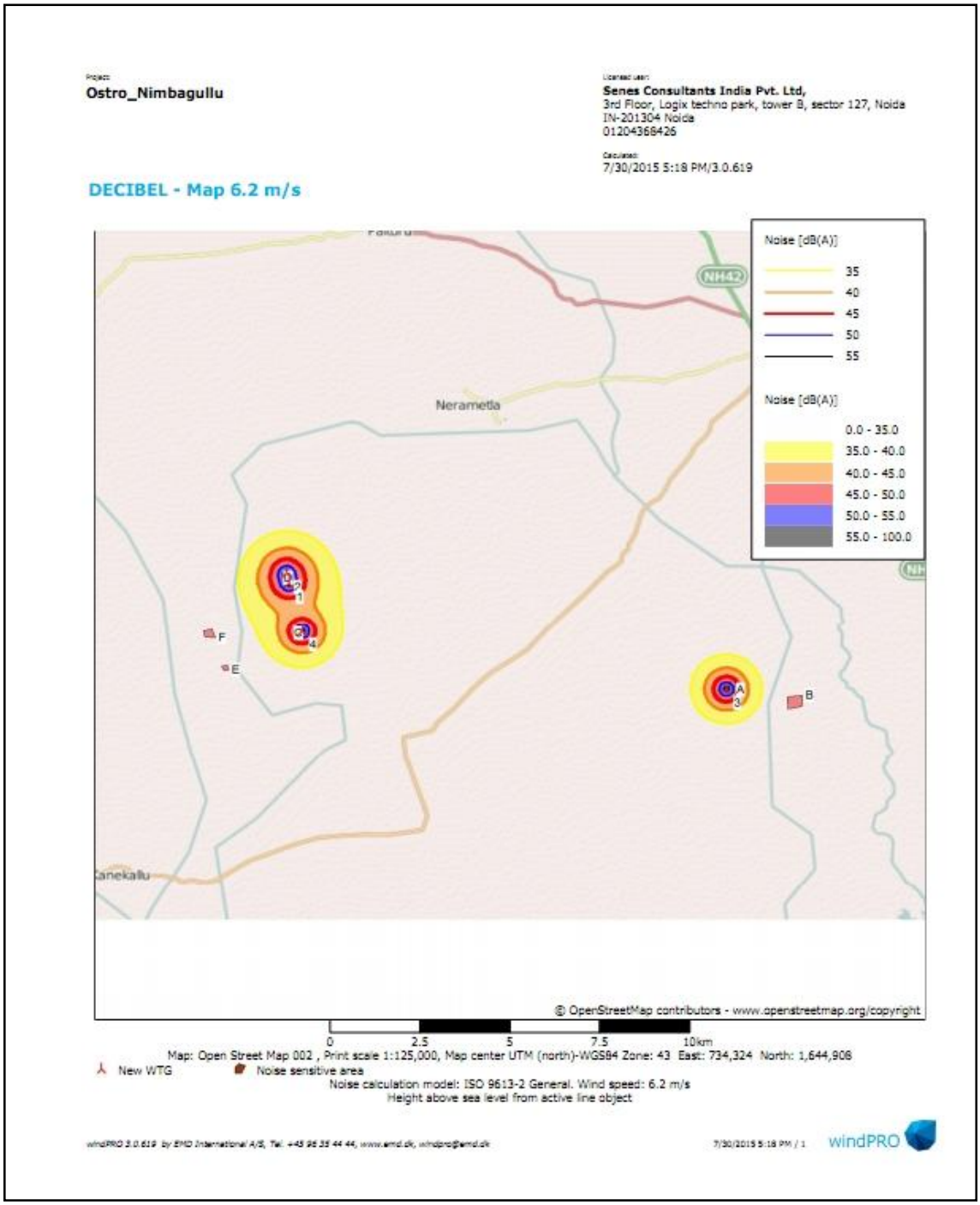
The ability to hear wind turbines noise depends on the ambient noise level. When the background noise level and wind turbine noise are of the same magnitude, the wind turbine noise gets masked by the background noise. Therefore wind turbine noise level of higher magnitude than background noise level can be considered as significant. In case of the proposed project, majority of the villages are located at minimum distance of 500 m from the WTG, however, at for three location minimum distance between WTG and human habitation are also recorded below 300 m from wind turbine. Considering the minimum distance of WTG and human habitation in the range of 300 m – 700 m the noise level estimated will be in the range of 43-33 dB(A). This noise level is further reduced by the aerodynamic design of the G-97 turbine having Gamesa NRS noise control system. Therefore noise impact on nearby communities is expected as low and insignificant.

Out of 150 WTGs 50 WTGs to be selected for developing 100 MW project. Out of the 150 WTGs 3 WTGs are observed to be within 250 m of nearest settlements and may get impacted due to shadow flickering. The nearest villages are Guradacheda (0.26 kms from G3-03) & Menahalli (0.25 kms from G3-08 & 0.20 kms from G3-09) from nearest WTGs. There is another location for WTG (G1-43) which is at a distance of 200 m from an isolated temporary structure within the field. Hence these WTGs are located close to sensitive receptors that can get impacted due to the noise generated by the WTGs. As such noise modelling has been carried out for the WTGs and the noise model map presented below. The assumptions made for modelling are:

- Noise modeling has been conducted using the fixed wind speed (at hub height level) of 6.2 m/s as provided
- Noise level at the source (hub height) has been taken as 105.8 dB(A) given in technical brochure of G-97 model of Gamesa.

The results of the modeling reveals that the impact of noise on the receptors are within the ambient noise range (29 decibels for the isolated structure near to G1-43, 28.2 decibels in Garudachedu and 28.9 decibels in Menahalli. Details modelling results are presented in ***Annexure XI.***

Figure 7-1: Noise Modelling for the WTGs nearest to the receptors



7.2.4 Land

The range of potential project impacts on land include land disturbance (creating erosion and sedimentation), disposal of excess spoil, and soil contamination.

Construction & Decommissioning Phase

Activities that cause land disturbance include installation of tower foundations, road preparation, excavation, etc. Excavation will be carried out to the minimum. The soil will be mainly excavated for laying foundation of towers, site leveling and road work. The soil structure of this area is rocky and loamy. This rocky excavated earth material be utilized on site for road soling and site leveling as per requirement.

The top soil excavated during construction, will be stock pilled and will be used for plantation. The roads will not be paved and only soling will be done with excavated earth & rock material, so land disturbance will be minimized. The cranes used for construction activities will be placed on hard, flat surface area and if required, ground leveling will be done.

Operation Phase

Care will be taken with regard to possible changes in soil quality due to human activities, such as disposal of waste material and domestic effluents on soil of the surrounding area. Waste water holding tanks / septic tank will be located at more than 500 m away from bore wells or any other underground water holding tanks in surrounding areas.

Very small quantity of solid waste will be generated by workers during project construction and operation, and this material will be handled and disposed of in an approved manner; therefore no soil contamination will result. Any hazardous waste like waste oil, paint containers will be disposed off to authorized vendors. Other waste will be disposed to local waste disposal area with permission of concerned authority/body.

7.2.5 Effect on Rainfall

Wind farms by their very design do not act as a solid obstruction to cloud. Therefore, they do not induce enough vertical velocities to result in any appreciable change in precipitation. The flow computations past the windmill blades show no perceptible change in temperature field. Hence, there would be no change in cloud morphology. Thus windmills have no effect on rainfall.

7.2.6 Ecology

Project construction involved land clearance, excavation, filling and leveling, causing the loss of vegetation. The clearance of vegetation will be restricted along a radius of 50 m around each wind turbine site and the entire area procured for each wind turbine may not be cleared.

Most of the locations identified for the wind turbine generators do not comprise of any trees in the immediate vicinity. The impact on ecological environment is assessed to be minor due to the project. Most of the site consists of agricultural land which remains fallow most of the year. As the proposed project is wind power project where land requirement is low, therefore, impacts due to site clearance activities in terms of loss of vegetation would be limited. Moreover, absence of site boundary and fencing in the wind project (excluding transformers) is beneficial and would not pose any restrictions on movement of animals.

The project is home to black buck families which freely move across the project region. As the construction phase of wind turbines will involve the movement of heavy and light vehicles, influx of workers within the project site and sound from the project equipment and D.G. sets may disturb the animals. Also, the antelopes may get impacted due to project activities like:

- Injury and death due to collision with project vehicles
- Injury and death may result by falling in pits dugged at project site
- Hunting of the antelopes
- Electrocution if get contacted with electric cables

During the site visit and social consultation it was confirmed that the local people are unaware about the conservation status of the antelope. There has been a record of conflicts between the farmers and black bucks in the region due to incidents of crop raiding else the antelope are found to reside peacefully in the area. The area is not declared as a protected area. Management plan for the black bucks during the construction and operation phase of the project has been incorporated in the Environment & Social Management Plan in **Table 7.1.**

7.2.7 Effect on Bird & Bats

A review of literature based on the impacts of wind farm on the birds and bats identified the main potential hazards as:

- Disturbance & displacement
- Collision mortality
- Loss of habitats resulting from wind turbines and associated infrastructure

Disturbance & displacement

According to Birdlife International's report on effect of wind farm impacts on birds, these effects are variable and species, season and site specific. Disturbance can lead to displacement and exclusion from areas. Human activity during the installation of wind turbine such as movement on access roads may also lead to disturbance. The presence and noise of turbines may affect birds from using an area close to these.

The effect of birds altering their migration flyways or local flight paths to avoid wind farm is another type of displacement. This effect depends on species, type of birds movement, flight height, distance to turbines, wind force and wind direction etc. This can be highly variable ranging from a slight check 'in flight direction, height or speed to significant diversions which may reduce the number of birds using areas beyond wind farm. Some study indicates alteration of flight line whereas some other studies says birds will fly between turbines rows, for example in the case of Common Eider at Nysted, where the turbines are 480 m apart although evidence of this type of response is limited (Christensen et al. 2004, Kahlert et al. 2004a).

The wind turbines are arbitrary located with a minimum distance of 300 m between consecutive turbines due to which cumulative barrier effect on local flight path is not envisaged in the area. Moreover, absence of any migratory flyways in the area lowers the impacts like disturbance and displacement of birds. Considering absence of established migratory flyway route near to the area of wind turbine location and availability of wide space between wind turbines to provide local fly path, potential significant adverse impact was not envisaged.

Collision Mortality

The collision mortality is another impact due to wind power project, especially in area of more bird usage i.e. important bird area. Direct mortality or lethal injury of birds can result from collision with rotor, towers, nacelles and associated infrastructure such as guy cables, power lines and meteorological masts. Although majority of studies indicates low mortality level from wind turbines (Painter et al. 1999, Erickson et al. 2001). Collision risk depends on a range of factors related to birds speices, numbers and behavior, weather condition, topography and scale of wind farm.

As per discussion with local villagers and forest official migratory flying path and identified location with large usage of birds on and around the project site is absent therefore obstruction to birds flyway is not envisaged here. However, effect of wind turbines on local birds cannot be overruled. Also, the site visit was conducted in summer season and few migratory birds were observed near to the reservoir in Nimbagallu village as such further study in other seasons is needed to ascertain the presence of migratory birds in the project region. Also, the presence of bats in the study area needs to be studied. As the project site is devoid of large trees the presence of bat is not anticipated but there are few patches near to the villages where large trees are present may harbor bat roosting sites. Impacts in terms of reduction in local bird's population around the wind turbines and chances of collision of birds and bat is anticipated which can be categorized as moderate risk.

Habitat loss

Habitat loss due to wind turbines and associated infrastructures viz., turbine bases, substation and access roads is anticipated from such type of project. As the land requirement to setup the

wind turbines is relatively low, therefore high risk in general not anticipated due to habitat loss. Moreover, project area is not a designated or qualifying site of national and international importance for biodiversity.

Thus the current project area and layout design of wind turbines for this project, exhibits the following characteristics:

- Absence of grid pattern (in siting turbines) that is typical to wind power projects in flat topography
- Spread of wind turbines over a fairly large area in comparison to any other typical wind power project of equivalent size
- Availability of sufficient flying space (for birds) between two adjacent wind turbines
- Absence of fly way route of migratory birds in the project area
- Absence of weather conditions relating to poor visibility in the area
- Absence of any designated or qualifying site of national and international importance of biodiversity in and around (within 50 km) project site, and

In view of the above assessment, the project is not expected to impact on habitat of birds, bats and their movement. However, the locally available bird species (like any other birds) are likely to exhibit a displacement behavior from the project area, once the wind turbines are operational. Therefore, further investigation studies would be required only during prior and post installation of the project to assess impacts of the project on birds and their movement.

Mitigation Measures

The following measures should be considered in the project design to mitigate the bird and bat impact due to the project:

- The project site layout provides adequate spaces between each turbine for movement of birds which reduces the potential for accidental collision;
- Presence of vultures and their roosting and nesting sites in the region needs to be checked;
- Above ground wiring, if any shall be insulated to avoid any chance of electrocution;
- Daytime visual markers shall be provided on any guy wires used to support towers to enhance visibility of towers for bird;
- Visibility enhancement objects such as marker balls, bird deterrents, or diverters shall also be installed along the transmission line to avoid avian collision;
- Any dead animals/carcass shall be removed in time from the site so that it does not attract movement of vultures;
- Appropriate storm water management measure shall be implemented to avoid flow of storm water to any water bodies, such as small ponds which may attract

birds and bats for feeding or nesting near the wind farm.

- Training of local staff, villagers for identification of any of the rare species and reporting of any bird carcasses. This will help to ensure the strategic actions, when the species are spotted in the region.
- A weekly record of bird and bat hit due to the operation of the WTGs should be carried out post commissioning of the proposed project for one year.
- If it is found that bird and bat hit is of high frequency[5] then a bird and bat study is recommended to ascertain the risk associated with the same.

7.2.8 Traffic

The road from Bellary to Uravakonda will be used for movement of trailor trucks carrying WTG parts and other heavy vehicles for the project activity. Village and village roads originating from this road will be utilized during construction and operation phase for vehicular movement and movement of labors and other project materials.

Construction Phase

The vehicular movement in construction phase will be more compared to operation phase. The village roads are well developed but proper access roads needs to be constructed to reach every WTG location. Also as the number of vehicles increases the noise in the surrounding area will increase and generation of dust will also slightly increase in the area. The risk of accidents increases as the construction phase will see movement of vehicles and local people using the same village roads. Although low movement of population in surrounding area due to lack of industrial areas and commercial activities, low traffic was observed on village roads but the movement of public buses and two wheelers were observed to be in good numbers. Addition of construction vehicles on local villagers is going to be of low impact due to shorter period but adequate preventive measures should be taken to mitigate the risks of accidents.

Mitigation Measures:

- During the development of roads and site preparation all the drainage courses should be properly channelized to maintain the drainage pattern of the area.
- 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.

[5] Greater than 5 carcasses a week during any of the season

- 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 minimize any potential disturbance to local traffic.
- Telegraph poles and overhead cables may be relocated where necessary.
- If any bottlenecks are identified appropriate measures will be taken to avoid congestion due to the project.
- Alternative access routes for the transport of project construction equipments and wind turbine parts to project site shall be identified whenever necessary.

Operational Phase

Vehicular movement in operation phase is negligible. Only maintenance staff and their vehicles are present and hence no significant impact is envisaged.

7.2.9 Seismic Hazard

The project site is located in seismic zones II as per the seismic zoning map of India (IS 1893–1975). Accordingly, this seismic hazard has been taken into account in the design of the turbine foundations to prevent tower failure in the event of shocks.

7.2.10 Socio-Economy

No resettlement of population is required for the project. Land requirement will be restricted to a relatively small area under WTG, project access roads, transmission lines,etc. The land will be purchased on willing to sell willing to buy basis.

OSTRO is committed to providing employment to locals in the project but due to the skilled and highly skilled manpower requirements for the setting up and operation of the WTG, local labor requirement may be limited to unskilled construction work and security staff. The project will provide direct employment where ever possible in the form of casual labor, skilled labor, office staff, primarily during project construction and operation, thus helping improvement of local economic conditions. No impact on the health and culture of local residents is predicted as the scale of construction is small and for a short duration of time. The site does not contain any archaeological monuments or sites as per the Archaeological Survey of India. No historical and cultural monuments will be affected by the project.

7.2.11 Aviation Hazard

No aviation hazard will be created by the Project as it is located about 230 km from Bangalore Airport. There are no small and large airports nearby.

7.2.12 Shadow Flicker

The light effect caused when the sun is positioned behind a rotating wind turbine has been described as shadow flicker. With the sun in the background, large moving shadows can be produced which some people may find distasteful. The Table 6.2 below shows the approximate sensitivity to shadow flicker at different RPM for three blade turbines, according to Stankovik et al.

TABLE 7-2: SHADOW FLICKER SENSITIVITY

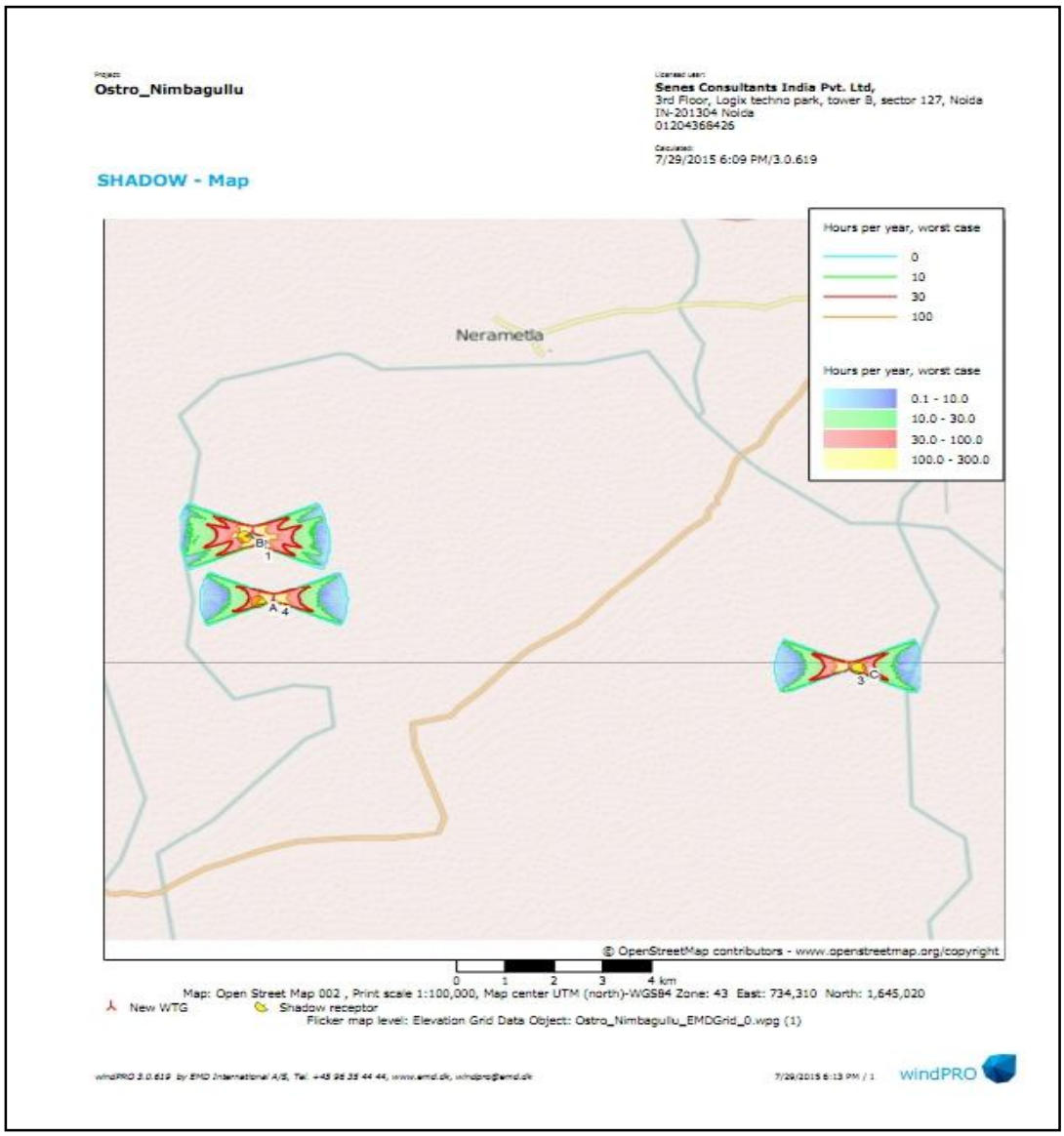
Flicker Rate (Hertz)	Human Perception	Equivalent RPM Rate for a 3-Bladed Turbine
< 2.5	Negligible Effect	<50
2.5 - 3	May Affect 0.25% of the Population	50-60
3 - 10	Effect is Perceptible	<200
10 - 25	Greatest Sensitivity	200-500
>50	Continuous Light Source	1000

Larger turbines generally operate between 18 and 45 RPM, while smaller turbines generally operate below 150 RPM (Stankovik et al., 2009, p.96). The present design of wind turbines for this project is designed with speed of 19.0 RPM. So the effect is expected to be negligible.
It has been stated that "*Flicker effects have been proven to occur only within ten rotor diameters of a turbine*". The greater the distance between the turbines and the observer the less noticeable the shadow flicker will be (Office of the Deputy Prime Minister, 2004, p.177)[6]. As the villages are located at least 500 m from project site, the shadow flicker effect is expected to be negligible but it will have to be weighted by detailed assessment. Out of 150 WTGs 50 WTGs to be selected for developing 100 MW project.

Out of the 150 WTGs 3 WTGs are observed to be within 250 m of nearest settlements and may get impacted due to shadow flickering. The nearest villages are Guradacheda (0.26 kms from G3-03) & Menahalli (0.25 kms from G3-08 & 0.20 kms from G3-09) from nearest WTGs. There is another location for WTG (G1-43) which is at a distance of 200 m from an isolated temporary structure within the field. Hence there are sensitive receptors around these WTGs and hence it is recommended that OSTRO may not select these WTGs out of 150 WTGs for their 100 MW project at Anantapur. The shadow flicker analysis has been carried out for the four WTGs located near to the sensitive receptors and presented in the Fig below.

[6] The Real Truth About Wind Energy, A Literature Review on Wind Turbines in Ontario, June 10, 2011, SIERRA Club Canada.

Figure 7-2: Shadow Flicker Map



The following assumptions were made for mapping the shadow flicker effect for the WTGs.

- Shadow flicker have been conducted for 4 wind turbines as identified above and result represent the cumulative impacts of four wind turbine only.
- Shadow flicker modeling has been conducted using worst case scenario.

The model shows that the worst case scenario for all the four WTGs. The different colored zones suggests the no. of worst case of shadow flicker occurrence (in hours) on the receptors in a year. The maximum no. of hours in a year of shadow flickering occurrence on nearest receptor is observed by the modelling is for WTGs located in Meenahalli village and WTG

G1-43 located near to the single isolated structure. Details modelling results are presented in ***Annexure XII.***

7.2.13 Visual Effects

Erection of the wind turbines will create significant built features in the landscape that will either be considered pleasing architectural additions or detractions from the appearance of the local landscape, depending upon the perception of the viewer. These turbines will be about 85 m high. Some other wind farm projects with similar height is present and also new similar projects are coming up in the area.

Mitigation Measures: Visual Aesthetics and Shadow Flicker

- Consider the landscape character during turbine siting;
- The wind turbines shall be painted in light colour (white) to reduce the visibility of the turbine when seen from farther distances;
- Plant trees around the household and ensure increase in dense vegetation coverage to screen the affected receptor locations from sun in case of households near to the WTG;
- Installation of blinds such as curtains at the concerned window facing the turbines
- Maintaining uniform size and design of turbines by having same direction of rotation, type of turbine and height;
- Maintaining a minimum distance (based on the formula: 'Height of the turbine + ½ x rotor diameter + 5 m') from residential settlement/place, highways, schools/building etc to minimize visual impacts and impacts due to shadow flicker and blade glint and prevent risks due to fall down of the turbines;
- Reducing the occurrence of impacts due to blade glint by application of non-reflective paints; and
- Ensuring absence of any auxiliary structures except the required ones such as access roads and transformer yards which accompany the turbines.

7.2.14 Electromagnetic Field (EMF)

Electro Magnetic Fields (EMF) surrounds us in modern society. All electronic devices, power lines, and generating stations produce EMFs. Wind turbines convert wind energy into electricity. The electricity is carried from the turbine by a cable, either underground or overhead, to the main electricity transmission grid for distribution, creating a small magnetic field. When a charged object, such as an animal, crosses the path of this magnetic field, a very small, momentary electric field may be created. There are four potential sources of electric and magnetic fields associated with the wind farm project. These are:

- Transmission line
- Wind turbine generator
- Generator transformer, and
- Underground cable

Though wind power produces EMFs like any other source of power and power transmission there are two major benefits to wind power in respect to safety. Wind turbines are ~85 meters above the ground the EMF[7]created by the production of energy is generally well above any people who may be in the area.

The electromagnetic fields produced by the generation and export of electricity from a wind farm do not pose a threat to public health. Grid connection is normally made at no more than 132 kilovolts (kV) [8], similar to the voltages used by utilities in existing residential distribution networks. In addition, project developers would design the entire electrical system to adhere to applicable state guidelines and industry standards to minimize EMF exposure from any new overhead transmission lines.

The grid connection lines are similar to other power lines and generate low levels of EMF, comparable to those generated by household appliances. Thus, it can be concluded that the electromagnetic fields produced by the generation and export of electricity from a wind farm do not pose a threat to public health.[9]

[7] Rideout, Karen & Constance Bos. January 2010. Wind Turbines and Health. National Collaborating Centre for Environmental Health. Vancouver, Canada & Sustainable Energy Australia (SEA) Pty. Ltd. The electromagnetic compatibility and electromagnetic field implications for wind farming in Australia. Melbourne and Canberra: Australian Greenhouse Office & Australian Wind Energy Association; 2004 [cited 2009 July 21].

[8] The Real Truth About Wind Energy, An Analysis of the Potential Impacts of Wind Turbine Development in Ontario. Sierra Club Canada, June 2010

[9] Evidence Review Wind Turbines and Health: A Rapid Review of the Evidence, National Health & Medical Research Council, Govt. of Australia

8 Environmental & Social Management Plan

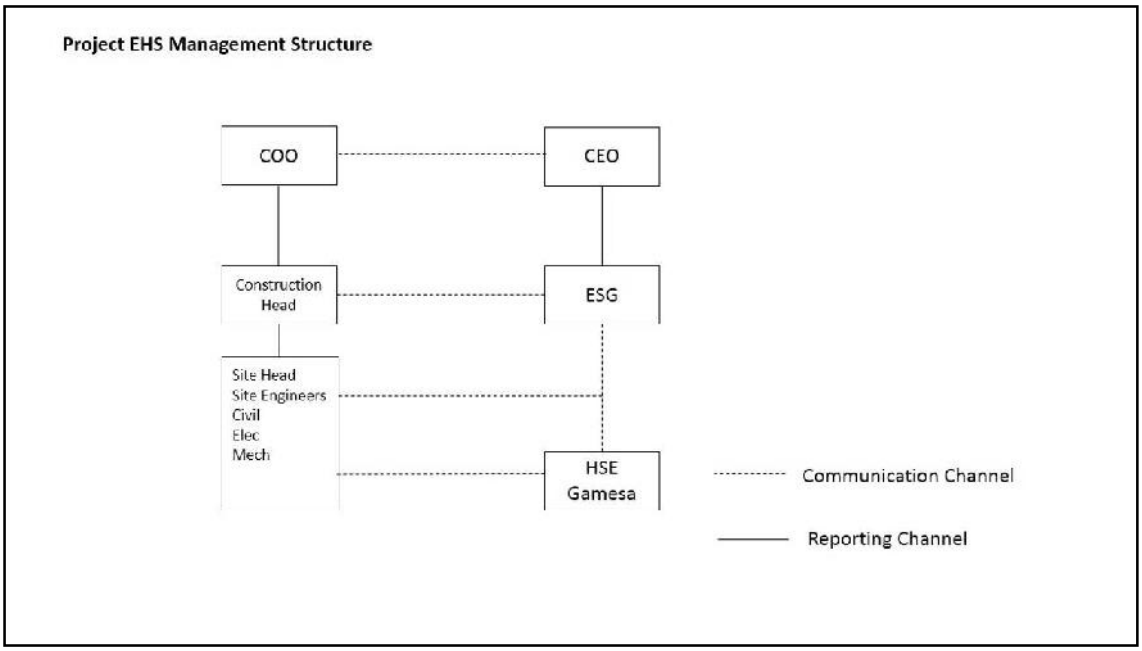
This chapter addresses the requirement of IFC Performance Standard-1 which highlights the importance of managing the social and environmental performance throughout the life of the project. OSTRO is committed to implement an effective Environmental and Social Management System (hereinafter referred as 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. The outcomes of the Environmental and Social Impact Assessment of the proposed project have been used to formulate a Social and Environmental Management & Monitoring Plan for the project, presented in **Table 8.1**. The Plan specifies measures for addressing the limited negative risks and impacts, for enhancing the beneficial impacts. In addition, organizational capacity and training requirements, required to check and ensure effectiveness of the plan throughout the lifecycle of the project, have also been discussed.

8.1 ORGANIZATIONAL STRUCTURE

The overall management and coordination of the Project will be managed by COO & CEO (OSTRO), who shall be supported by the Head (Construction) & Head ESG. The Construction Head is supported by site head, site engineers, civil, electrical and mechanical personnel, while the ESG head will be supported by the HSE personnel of Gamesa. The contractors shall work in co-ordination with the Site-In-Charge cum EHS Supervisor and be part of the Project management team. The construction contractor shall have an Environment Health and Safety (EHS) supervisor in their team.

Given the footprint of the project will be limited to the turbine sites and their immediate vicinity and the range of stakeholders dependent on the project site for various usages, OSTRO shall ensure that the EPC and O&M Contractor deploys a Social Officer or Site – In-charge to manage social (including labor and community) issues.

FIGURE 8-1: ORGANIZATION STRUCTURE



8.2 TRAINING OF PERSONNEL & CONTRACTORS

OSTRO 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 minimizing 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 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.

8.3 MONITORING

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, laborers, suppliers and the local community impacted by the project activities and associated facilities thereby increasing the effectiveness of suggested mitigations measures. OSTRO 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.

8.4 DOCUMENTATION & 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.

OSTRO is having its own Environment and Health & Safety policy which includes best standards for health and safety of all its employees and contractors. The policy (s) is attached in ***Annexure XIII***

8.5 ENVIRONMENTAL MANAGEMENT PLANS

Social and Environmental Management & Monitoring Plan for the project, presented in **Table 8.1**.

TABLE 8-1: ENVIRONMENT AND SOCIAL MANAGEMENT PLAN

S. No.	Environmental/ Social Issue	Mitigation Measures	Time frame/Phase	Responsibility	Remarks
1	Water Pollution	• Leak-proof holding tanks for sanitary waste water should be constructed to protect the contamination of shallow ground water level. • Waste water holding tanks / septic tank should be located at more than 500 m away from bore wells or any other underground water holding tanks. • It should be ensured that the waste water is not finding its way into surface waters or water wells.	During project development/ Operation phase	Project Developer/ Contractor	The ground and surface water sources will not be contaminated.
2	Soil Pollution	• Waste disposal grounds that are in use by the local people should be identified and permission from local administration for use of the same needs to be obtained for disposing domestic wastes. • Hazardous wastes, when accumulated, should be disposed off to facilities registered with the Central Pollution Control Board. • Spillage of hazardous materials e.g. paints, solvents, transformer oil, diesel on soil should be prevented by placing these materials on paved surfaces or impermeable liners during storage, handling and use. • Construction debris shall be reused in paving on site approach road to prevent dust generation due to vehicular movement	During project development/ Operation phase	Project Developer/ Contractor	Though solid waste generation is expected to be very negligible, care will be taken that no solid or liquid waste will contaminate site and surrounding areas.

S. No.	Environmental/ Social Issue	Mitigation Measures	Time frame/Phase	Responsibility	Remarks
3	Air Pollution	• Wherever using the unpaved road, they should be sprinkled with water, at least once a day or during the ongoing operations responsible for dust pollution, to control fugitive dust emissions. • It will be ensured that exhaust emissions of construction equipment adhere to emission norms as set out by MoEF/CPCB.	During project development	Project Developer/ Contractor	Fugitive dust and emissions will be minimized to the extent possible.
4	Noise Pollution	• Local communities need to be informed about the vehicular movement before start of heavy vehicle carrying materials and machines to site. Sensitive locations should be identified and avoided as far as possible from the route and if unavoidable, drivers should be informed to restrict speed at those locations. • It will be ensured that noise emissions of construction equipment adhere to emission norms as set out by MoEF/CPCB. • Diesel generator sets, if used; will adhere to noise standards of MoEF.	Before activity	Project Developer/ Contractor	Any nuisance due to vehicular movement and construction activity to villagers and sensitive locations such will be minimized.
5	Traffic Safety	• Traffic safety should be ensured during construction and operational phase. All the necessary measures such as provision of barricades, signs, markings, flags, light, as may require, will be taken. • A Traffic Management Plan shall be prepared to ensure safety with regards to road accidents and community safety. • Local communities shall be informed before initiating heavy	During construction / operation	Project Developer/ Contractor	All the precautions will be taken to avoid any traffic accident.

S. No.	Environmental/ Social Issue	Mitigation Measures	Time frame/Phase	Responsibility	Remarks
		vehicle movements carrying materials and machines to site • Sensitive locations such as schools, health centers shall be identified and inform drivers to restrict speed at those locations.			
6	Ecology	• Detailed trees survey should be carried out to identify any tree required to be cut within the project site before commencement of construction of access road, widening of existing road or dumping of construction material. • Compensatory plantation in line with concerned authority regulations and guidelines.	During construction	Project Developer/ Contractor	Tree cutting will be avoided, if there is any, shall be tried to preserve as far as possible.
7	Biodiversity (Black Buck)	• The developer should intimate the District Forest Officer about the project activity prior to the starting of the project. • Awareness programs should be conducted for all contractors and their workers regarding the presence of the species in the region and their conservation status. • The antelopes are protected under the Wild Life Protection Act and listed as endangered species as per IUCN red list. • The punishment includes punishable with imprisonment for a term which shall not be less than one year but may extend to six years and also with fine which shall not be less than five thousand rupees. • The presence of the antelopes need to be managed both during the construction and operation phase of the project • The movement of vehicles through access road (day and	During project development/ Operation phase	Project Developer/ Contractor	Resident Black buck population in the area needs to be protected as the species is important from ecological conservation point of view.

S. No.	Environmental/ Social Issue	Mitigation Measures	Time frame/Phase	Responsibility	Remarks
		night time) needs to be monitored constantly for presence of black buck herds in and around the road. • Signage's showing the antelopes should be placed within the project site and near to the approach roads for generating awareness amongst the vehicle drivers and labors. • Signages prohibiting the hunting or killing of the antelope should also be placed in and around the project site. • The construction area about 50 m surrounding a WTG location needs to be temporally barricaded to prevent the antelopes from entering the area while the work is on. • If pits are dug on the ground for any project activity it should be suitably barricaded and closed permanently after construction so that the animals are prevented from falling in the pit. • If the construction site is close to any water pit or water channel then special precautions should be taken to keep the antelopes away from the construction site as they may visit the water source for drinking. • Care should be taken to prevent the habitat of the antelopes. • The area around the WTGs should not be used for any other purposes other than the work specified both during and operation phase of the project. • The WTGs with associated facilities like generator, cables and transformer should be properly fenced to prevent accidental electrocution of the Black bucks.			

S. No.	Environmental/ Social Issue	Mitigation Measures	Time frame/Phase	Responsibility	Remarks
		• During operation phase the security guards should be periodically trained regarding the management of the antelopes around the WTGs. • Record should be maintained about the presence of the black bucks in and around the project area. • Dos & Don't s for managing Black Buck at the project site is presented in **Annexure XVI.**			
8	Change in drainage pattern of area	• Site preparation activities should be designed to avoid any significant elevation of the land or blocking or altering natural drainage channels in the project site. • Site preparation and development shall be planned only after a detailed drainage plan has been prepared for site. • If channels/drains get blocked due to negligence, it should be ensured that they are cleaned especially during monsoon season.	During construction	Project Developer/ Contractor	The drainage patterns of the area will be maintained.
9	Health & safety	• First aid box, sufficient fire extinguishers and hazard signs near energized components at site will be ensured along with adequate use of personal protective equipments; adequate procedures and training to prevent safety hazards at work. • Workers exposed to noise should be provided with earplugs/earmuffs. • Temporary Shelters at Workplace for resting of workers at periodic intervals, adequate drinking water dispenser and portable toilets shall be provided.	During construction and operation	Project Developer/ Contractor/Operator	Workers health & safety will be ensured.

S. No.	Environmental/ Social Issue	Mitigation Measures	Time frame/Phase	Responsibility	Remarks
		• Standard Operating Procedures for construction related machineries and for the operational phase shall be prepared and implemented at site.			
10	Accidents & Emergency	• Emergency Management Plan will be developed and followed to deal with emergencies such as natural disasters; display emergency numbers (viz. nearest police station, health center) at the site for use by staff. • Guidelines and procedure should be placed at site to the staff and security guards for the implementation of emergency plan.	During construction and operation	Project Developer/ Contractor/Operator	Workers will be trained to deal with all emergencies and procedural responsibilities.
11	Social welfare	• Maximum employment will be provided to local people, especially as construction workers and security guards wherever possible. • A Community Development Plan shall be prepared to address community needs and improve socioeconomic conditions of the local.	During construction and operation	Project Developer/ Contractor/Operator	Local bodies such as Panchayat, will be involved for employment of interested and eligible villagers.
12	Health & Sanitation	• Construction workers should be provided with requisite shelter, drinking water and sanitation in accordance with the requirements of the Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and the guidelines published jointly by International Finance Corporation (IFC) and the European Bank for Reconstruction and Development (EBRD).	During construction	Project Developer/ Contractor	Temporary shelters will be provided during construction and operational phase for workers.

8.6 ENVIRONMENTAL MONITORING PROGRAMME

Monitoring is one of the most important components of a management system. Continuous monitoring needs to be carried out for regulatory requirements, to monitor the environmental quality and to determine performance of proposed mitigation measures. Monitoring indicators have been developed for each of the activity considering the mitigation measures proposed. Indicators have been developed for ascertaining the environmental quality and the performance of the EMP implementation through Environmental Quality Indicators (EQI's) and Environmental Performance Indicators (EPI's) respectively. This focuses not only on quantifying or indexing activity-environment interactions but also may potentially impact the environment. At the same time it also help in comparing different components of environmental quality against previously established baseline status. Monitoring results would be documented, analyzed and reported internally to Head - HSE. Monitoring requirements (including monitoring frequency) have been presented in the following **Table 8.2.**

TABLE 8-2: PROPOSED MONITORING REQUIREMENTS FOR THE PROPOSED PROJECT

A. Environmental Performance Monitoring

EPI No.	Environmental Performance Indicator (EPI)	Monitoring Parameter	Location	Period & Frequency
A.	**CONSTRUCTION PHASE**			
A1	Air emissions from vehicles and machineries	CO, HC based on emission factors % of vehicles possessing valid PUCC Certificates	Exhausts	Monthly during construction phase
A2	Dust generated from site clearance / levelling	Visual observation of dust generation	Site & approach road	Monthly during site preparation
A3	Noise emissions from vehicles and machineries	Noise pressure level in dB(A) Compliance with CPCB noise limits specified for DG sets Check for valid certificates of Type Approval and also valid certificates of Conformity of Production for equipments particularly DG sets.	Near noise sources (5m)	Quarterly during site preparation
A4	Gaseous pollutant emissions from DG Set	Pollutant concentrations in gaseous emissions and maintenance parameters (air, fuel filters & air-fuel ratio) of DG sets influencing air emissions Emission rates of PM, NOx, SOx,	DG Stack	Quarterly during construction phase

EPI No.	Environmental Performance Indicator (EPI)	Monitoring Parameter	Location	Period & Frequency
		CO, HC based on emission factors		
A5	Sourcing of water	Volume of water sourced and consumed for construction work	Sourcing and usage areas	Daily during construction phase
A6	Fugitive emissions from handling and storage of raw materials	Visual observation	Material stockpiles	Daily during construction phase
A7	Community health and safety	Complaints registered by the local communities No. of. Accidents reported if any.	Grievance Records Safety Records	Monthly during construction phase.
A8	Occupational health and safety	Health surveillance of workers	Medical records	Monthly during construction phase
		Sanitation status of labors working during construction phase	Onsite records	
		Potable nature of drinking water viz. coliform, pH, TSS, Residual chlorine	Drinking water storage tanks	
		Usage of proper PPEs Safety performance indicators viz. LTIs. Near misses, fatalities etc	Construction site	Daily during construction phase
A9	Disposal of sewage	Visual observation of leaks, overflows etc and odour problems if any.	Septic tank and soak pits	Daily during construction phase
A10	Surface run-off discharge	Visual observation of water logging due to drainage disruption	Areas abutting construction site	One representative storm event every year
		CPCB Inland Water Discharge Parameters	Discharge point	
A11	Domestic waste generation, storage, handling and disposal	Quantity of waste generated and recycled Visual observation of waste segregation and storage conditions viz. usage of labelled and covered bins, insect repellents etc.	Waste generating areas viz. canteen, site office.	Weekly during construction phase
		Awareness level of onsite workers	Workers involved in waste handling and	

EPI No.	Environmental Performance Indicator (EPI)	Monitoring Parameter	Location	Period & Frequency
			storage	
A12	Hazardous chemicals and waste storage, handling and disposal	Quantity of fuel consumed	Chemical and fuel storage and consumption areas	Daily during construction phase
		Visual observation of fuel and chemical storage conditions viz. presence of spill kits, drip trays, fire extinguisher, etc		
		Quantity of waste oil and other hazardous waste generated and recycled to registered recyclers Awareness level of onsite workers	Hazardous waste storage areas Workers involved in waste handling and storage	Weekly during construction phase
B.	**OPERATIONAL PHASE**			
B1	Landscape Development	% of species survival	Landscape area	Monthly during operational phase
B2	Noise generated from operation of wind mill	Noise pressure level in dB(A)	Near noise sources (5m)	Monthly during operational phase
		Maintenance parameter check with respect to noise attenuation and control	Noise generating equipment	As per supplier manual
B3	Water sourcing and consumption	Volume of water sourced and consumed	Water usage areas	Daily during operational phase
B4	Surface run-off discharge	Visual observation of water logging due to any possible drainage disruption	Areas abutting plant site	One representative storm event every year
		CPCB Inland Water Discharge Parameters and Effluent Standards of IFC Thermal Power Plant EHS Guidelines	Discharge point	
B5	Domestic waste generation, storage, handling and disposal	Quantity of waste generated and recycled Visual observation of waste segregation and storage conditions viz. usage of labelled and covered bins, insect repellents etc.	Waste generating areas viz. canteen, site office etc.	Daily during operational phase
		Awareness level of operational workforce	Workforce involved in waste handling and	

EPI No.	Environmental Performance Indicator (EPI)	Monitoring Parameter	Location	Period & Frequency
			storage	
B6	Hazardous chemicals and waste storage, handling and disposal	Visual observation of chemical storage conditions viz. presence of spill kits, drip trays, fire extinguisher, display of MSDS etc.	Chemical and fuel storage and consumption areas	Daily during operational phase
		Quantity of waste oil and other hazardous waste generated and recycled to registered recyclers Awareness level of operational workforce	Hazardous waste storage areas Workforce involved in waste handling and storage	Weekly during operational phase
B7	Community health and safety	Complaints registered by the local communities No. of. Accidents to be reported	Grievance Records Safety Records	Monthly during operational phase
B8	Occupational health and safety	Health surveillance of workers	Medical records	Monthly during operational phase
		Sanitation status of onsite office building and canteen	Office building maintenance records	
		Potable nature of drinking water viz. coliform, pH, TSS, Residual chlorine	Drinking water storage tank	
		Usage of proper PPEs Safety performance indicators viz. LTIs. Near misses, fatalities etc	Operational sites	Daily during operational phase
B9	Bird and Bat Monitoring	Keeping records of bird and bat carcass observed every week	Operational WTGs	Once daily morning & evening on alternate turbines

B) Environmental Quality Monitoring

EQI No	Environmental Quality Indicator (EQI)	Monitoring Parameter	Location	Period & Frequency
A.	**CONSTRUCTION PHASE**			
A1	Ambient Air Quality	Measurement of $PM_{2.5}$, SOx, NOx, CO	Nearest receptor viz. villages, schools,	Once or twice during construction

EQI No	Environmental Quality Indicator (EQI)	Monitoring Parameter	Location	Period & Frequency
			ecological habitat	phase
A2	Ambient Noise quality	Measurement of Noise Pressure Level in dB(A)	Nearest receptor viz. villages, schools, ecological habitat	Once or twice during construction phase
A3	Ground Water quality	IS 10500 parameters	Nearby villages	Once during construction phase
A4	Surface Water quality	IS 10500 parameters	Nearby surface water body	Once during construction phase
A5	Soil Quality	Soil parameters viz. pH, SAR, Water holding capacity, Conductivity, Organic Carbon, NPK	Abutting village land & project site	Once during construction phase
B.	**OPERATIONAL PHASE**			
B1	Ambient Noise quality	Measurement of Noise Pressure Level in dB(A)	Nearest receptor viz. villages, schools, ecological habitat	Quarterly during operational phase
B2	Ground Water quality	Depth of ground water table IS 10500 parameters	Nearby villages	Quarterly during operational phase

8.6.1 Occupational Health & Safety Management Plan

Scope and Purpose

The occupational health & safety (OHS) plan is formulated to address the key occupational health and safety related concerns of contractor workers and site personnel during both construction and operational phase. OHS hazards specifically for the project primarily include the following:

- Work at height
- Work in confined spaces
- Lifting operations

M/s Gamesa has obtained permit for working at height for the proposed project. The certificate is attached as ***Annexure XIV***. 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. Mitigation methods may include, in this order:

- 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 such as 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.
- Collective protection systems such as edge protection or guardrails should be implemented before resorting to individual fall arrest equipment
- 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 following work permit system, 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.
- 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.

The OHS plan will also be serving as a reference document for finalization of safety procedures with respect to other construction and operational activities. The mitigation measures to be implemented both during construction and operational phase have been discussed below:

- The onsite workers shall be provided with proper personal protective equipment (PPEs) i.e. safety shoes & goggle, helmet, coverall, gloves, ear plugs, safety harness in case working at height etc during construction related activities to ensure health and safety of the workers at workplace.
- First aid and onsite sanitation arrangements will be made for drivers and other contractor workers during construction phase.
- Periodic health surveillance will be undertaken for personnel operating near high noise generating equipment viz. turbines, compressors etc. The audiometric records will be maintained for treatment for hearing loss if any
- All high noise generating areas and equipment will be identified and rotation of workers/site personnel including provision of proper PPEs for those operating in such areas.
- Adequate light and ventilation shall be provided for the workers working in confined spaces.
- Passageways for pedestrians and vehicles within and outside buildings should be segregated and provide for easy, safe, and appropriate access
- Equipment and installations requiring servicing, inspection, and/or cleaning should have unobstructed, unrestricted, and ready access
- Hand, knee and foot railings should be installed on stairs, fixed ladders, platforms, permanent and interim floor openings, loading bays, ramps, etc.
- Provision of first-aid kits at all work-areas onsite. Appropriately equipped first-aid stations should be easily accessible throughout the place of work
- Eye-wash stations will be provided close to all workstations where immediate flushing with water is the recommended first-aid response
- Safety signage and posters will be displayed at strategic locations within the site. Hazardous areas (electrical rooms, compressor rooms, etc), installations, materials, safety measures, and emergency exits, etc. should be marked appropriately.
- Monitoring weather forecasts for outdoor work to provide advance warning of extreme weather and scheduling work accordingly
- Providing temporary shelters onsite for protection of workers against extreme weather condition during working activities or for use as rest areas.
- Provisions should be made to provide OHS orientation training to all new employees to ensure they are apprised of the basic site rules of work at / on the site and of personal protection and preventing injury to fellow employees.

- Training should consist of basic hazard awareness, site specific hazards, safe work practices, and emergency procedures for fire, evacuation, and natural disaster, as appropriate. Any site-specific hazard or colour coding in use should be thoroughly reviewed as part of orientation training.
- Establishment of procedures and systems for reporting and recording occupational accidents and diseases. All reported occupational accidents; occupational diseases together with near misses should be investigated with the assistance of a person knowledgeable/competent in occupational safety.

8.6.2 Road Safety & Traffic Management Plan

Scope and Purpose

The plan encompasses the addressal of community safety related impacts that may arise from the increased vehicular traffic due to movement of heavy equipment/machineries and vehicles along the site access and approach roads particularly during construction phase. The plan will be regularly updated by the contractor with the project progress and as vehicle movement requirements are identified in detail. Designated traffic coordinator will be responsible for overall coordination of traffic management.

During Construction Phase

The following mitigation measures will be implemented during this phase:

- Project vehicular movement will be restricted to defined access routes.
- Proper signage will be displayed at important traffic junctions along the vehicular access routes to be used by construction phase traffic. The signage will serve to prevent any diversion from designated routes and ensure proper speed limits are maintained near residential areas.
- Any road diversions and closures will be informed in advance to the project vehicles accessing the above route. Usage of horns by project vehicles will be restricted near sensitive receptors viz. schools, settlements etc.
- Traffic flows will be timed wherever practicable during period of increased commuter movement in the day.
- Temporary parking facilities shall be provided within the work areas and the construction sites to avoid road congestion.
- Vehicular movement to be controlled near sensitive locations viz. schools, colleges, hospitals identified along designated vehicular transportation routes.
- Routine maintenance of project vehicles will be ensured to prevent any abnormal emissions and high noise generation.
- Adequate training on traffic and road safety operations will be imparted to the drivers of project vehicles. Road safety awareness programs will be organized in coordination

with local authorities to sensitize target groups viz. school children, commuters on traffic safety rules and signages.

- The contractor(s) shall frame and implement a "No Drug No Alcohol" Policy to prevent road accidents/incidents.

During Operational Phase

Since limited vehicular movement is anticipated during operational phase considering only the daily movement of project personnel any impacts arising from the same can be effectively addressed through implementation of mitigation measures as discussed during the construction phase. In addiction following measures will be emphasised.

- Use of horns near the villages along the access road to villages, main plant and internal roads shall be restricted.
- The vehicular movements along the access roads and highways shall be restricted during the night time.
- All the vehicles entering the access roads and plant shall have Pollution under Control (PUC) certificates.
- The speed limit in the internal roads shall be restricted to 25 km/hr. Proper warning signs and road safety awareness posters shall be displayed to create road safety awareness among the personnel accessing the site.
- Periodic Road Safety and Traffic Management campaigns and awareness sessions shall be carried out among the villagers and the plant workers/personnel to develop road safety awareness among the people likely to be impacted by the project.
- An emergency road safety plan shall be framed by the Proponent to combat any emergency conditions/accidents along the highways, access roads and within plant area.
- The Proponent shall frame and implement a "No Drug No Alcohol" Policy to prevent road accidents/incidents.
- The drivers shall be given an induction on road safety and traffic management policy.
- A permanent parking lot shall be provided within the main plant site (in individual work areas) and the associated facilities.
- Use of seat belts for both drivers and passengers shall be made compulsory to minimize death & injuries in the event of an accident.

8.6.3 Emergency Management Plan

Purpose

OSTRO will develop a site specific Emergency Management Plan for implementation at the proposed site in the event of an emergency situation so that the loss of life and damage to the properties & natural resources are minimized. This plan outlines a series of emergency actions that will be executed by OSTRO & its Contractors to ensure preparedness and response to emergency situations throughout the life-cycle of the project.

Definition(s)

Emergency - Any unplanned situation, which presents a threat to the safety of workers and/or damage to the properties and other natural resources deemed valuable at the project site.

Emergencies

The emergency situations that are probable to occur at the site and the probable causes are listed below:

- Fire at site during temporary construction phase which cannot be doused by fire extinguishers; Also fire due to short circuit at the plant and equipment during both construction & operation phase.
- Collapse of any structure
- Outbreak of endemic disease among a large section of construction workers due to contaminated drinking water, unhygienic conditions that have developed at workplace etc;
- Protests by the local community or other stakeholders at any point of the project lifecycle due to grievances;
- Serious injury or death of employee or sub-contracted worker at work, due to non-work related illness or work-related accident.
- Onset of any natural disaster like earthquake.

Emergency Management

The following steps shall be taken to ensure proper management of emergency or crisis situations:

The nearest civil hospitals, private health care centers or practitioner clinic shall be identified and a agreements shall be made with the aforesaid medical centers/practitioners to provide prompt health care services (including ambulance services) in the event of an emergency situation at site.

A list of important telephone numbers such as fire brigade, health care facility/practitioner, police station, EHS and Social Coordinator, project office, head offices etc shall be displayed at all the prime locations at site & the worker's camp (during construction phase).

Regular liaisoning with the police, Gram Panchayat, district administration shall be carried out to ensure that prompt assistance is readily available in the event of an emergency.

An Emergency Management (including Disaster Management) team comprising of 4-6 professionals both from the developer and contractors' side, during construction phase and 2-3 professionals during operation of the proposed project; shall be formed to combat any emergency situation and ensure safety of the life and property at site. For this purpose 2-3 personnel employed in the plant during operation phase shall be trained on Emergency scenarios and their management measures including their roles and responsibilities in case of an emergency situation.

The workers (staff & contractual workers from both OSTRO & Contractors) shall be trained on their duties and emergency preparedness during an emergency. In case of an emergency, all site personnel shall be trained to follow the communication lines given below:

a) Personnel at site affected by the emergency situations immediately inform the project office and the external agencies (such as police, fire brigade, ambulance services); In case, project office cannot be reached, the Coordinator will be informed directly;

b) The Social, Environment, Health & Safety Coordinator (SEHS) on being informed about the emergency by project offices or by the employee directly; reaches site if necessary, and also follows-up with the aforesaid external agencies for aid;

c) The SEHS Coordinator takes charge of the emergency response and direct further action and co-ordination, including escalating the matter to the CEO or other top-level managers as required.

Responsibilities

The SEHS Coordinator will be responsible for implementing this procedure, which includes

- Ensuring that the emergency preparedness measures are in place;
- Providing training to the personnel at site regarding reporting of the emergencies, and to site office personnel regarding response to emergency calls from the site personnel,
- Direct action-and co-ordination at the time of an emergency.

OSTRO has its Emergency Response Plan in place for addressing any emergency during project execution both during construction phase and operation phase and the same has been attached as ***Annexure XV.***

8.6.4 Community Health & Safety Plan

Community health and safety hazards specific to wind energy facilities primarily include the following:

Setback: Turbines must be sited at an acceptable distance ("setback") between wind turbines and adjacent users, including buildings, roads, and wildlife, in an effort to, among others, ensure acceptable noise levels and visual disturbance. In the proposed project the wind turbines are located beyond 300 m from the nearest settlements except three wind turbines which are close to the settlements (within 300 m) and one other wind turbine close to a single temporary structure located within a agriculture field.

Electromagnetic Interference and Radiation: Wind turbines could potentially cause electromagnetic interference with telecommunication systems (e.g., microwave, television, and radio). This interference could be caused by path obstruction, shadowing, reflection, scattering, or re-radiation. The nature of the potential impacts depends primarily on the location of the wind turbine relative to the transmitter and receiver, characteristics of the rotor blades, signal frequency receiver characteristics, and radio wave propagation characteristics in

the local atmosphere. Suitable mitigation measures to enhance the quality of the television signal and lower the impact of wind turbine on telecommunication need to be adopted.

Public Access: Safety issues may arise with public access to wind turbines (e.g., unauthorized climbing of the turbine) or to the wind energy facility substation. Any public rights of way located within and close to the wind energy facility site should be identified prior to construction to establish any measures that may be required to ensure the safety of their users. Prevention and control measures to manage public accesses include:

- Use gates on access roads.
- Where public access is not promoted to the site and/or there are no current rights of way across the site, consider fencing the wind energy facility site, or individual turbines, to prohibit public access to the turbine.
- Provide fencing of an appropriate standard around the sub-station with anti-climb paint and warning signs.
- Prevent access to turbine tower ladders
- Post information boards about public safety hazards and emergency contact information.

Blade Throw: A failure of the rotor blade can result in the "throwing" of a rotor blade, or part thereof, which may affect public safety. The overall risk of blade throw is extremely low. Blade throw risk management strategies include:

- Establish setback distances between turbines and populated locations. The minimum recommended setback distance is 2 x hub height, although it can vary with the size, shape, weight, and speed of the blades, and the height of the turbine.
- Minimize the probability of a blade failure by selecting wind turbines that have been subject to independent design verification/certification (e.g., IEC 61400-1), and surveillance of manufacturing quality.
- Ensure that lightning protection systems are properly installed and maintained.
- Carry out periodic blade inspections and repair any defects that could affect blade integrity.
- Equip wind turbines with vibration sensors that can react to any imbalance in the rotor blades and shut down the turbine if necessary.

Community Liaison Plan

Introduction

The Community Liaison Plan is a critical element of the overall Social Management Plans. Regular transparent communication between both the project and the communities and vice versa is crucial in building positive relationships between the two parties. This relationship should be crucial for managing unexpected situations which might arise during the course of the project.

This plan should be read with other social management plan because the liaison which needs to be done for the individual plan is detailed within the plan. The communication plan mainly focuses on the communication issues during the construction stage however it also includes some community Liaison measures for the operation phase as well.

Objectives

The Performance Standards mandates continuous communication between project and the different stakeholders e.g. Workers, local community. The onus of initiating the process of communication rests on the project proponent. The project proponent should ensure that disclosure of relevant project information that would help the affected communities understand the risks, impacts and opportunities of the project. The Community Liaison Plan is developed to ensure a clear communication channel between the project and the local community. Even though the focus of the plan is primarily on communication with the community areas where there are likely interactions between the community and the Contractors such areas have also been covered.

The community liaison plan would concentrate on the following aspects:

Communication with the Community: As mandated in the Performance standards OSTRO would disclose the project details to make the community aware of the important features of the project. A Project Information Booklet would be prepared and distributed in the project affected villages. This booklet should preferably be presented in local language. The booklet in addition to containing the salient features of the project should have a map depicting the boundaries of the plant and its ancillary facilities. The important landmarks e.g. the settlement, schools and the roads, etc. should also be demarcated so that it becomes easy for the people in the villages to relate to the ground conditions. In addition to the project information the booklet should also highlight the impacts on the community as presented in the ESA document and the commitments for the safeguards including the entitlement matrix. To ensure wide circulation of the Project Information Booklet the booklet would be made available at all the schools, Anganwadi centers, and other public facilities in the project affected village.

To ensure continuity of the flow of information to the community it is suggested that a quarterly **Community Information Booklet** should be published. During the construction

phase the booklet would contain the information about the progress of the project and also information which are pertinent to community e.g. disruption of the transportation links, outcome of consultation process on community development etc. It is proposed that the community Information Booklet be continued even during the operations stage where this also acts as a transfer of information from the project to the community. In addition it can also be used to share information between the communities e.g. achievement of a particular member of the community or any worker can be published in this booklet.

8.6.5 Grievance Redressal Mechanism

The IFC requires that the client will establish a grievance mechanism to receive and address specific concerns about compensation and relocation that are raised by displaced persons or members of host communities, including a recourse mechanism designed to resolve disputes in an impartial manner. If the client anticipates ongoing risks to or adverse impacts on affected communities, the client will establish a grievance mechanism to receive and facilitate resolution of the affected communities' concerns and grievances about the client's environmental and social performance. The grievance mechanism should be scaled to the risks and adverse impacts of the project. It should address concerns promptly, using an understandable and transparent process that is culturally appropriate and readily accessible to all segments of the affected communities, and at no cost and without retribution. The mechanism should not impede access to judicial or administrative remedies. The client will inform the affected communities about the mechanism in the course of its community engagement process.

In efforts to develop an effective two way communication a Grievance Redressal Mechanism would be developed by proponent. The broad outline of the mechanism is as follows:

- The decision on the grievance would be communicated to the aggrieved person within a time frame to be stipulated during the preparation of the ESAP.
- There should be a single point of contact between the community and proponent for the Redressal of grievance.
- All grievances should be documented and indexed for future reference. The proceeding and actions against each of the grievance should be documented and should also carry this index number for easy traceability.
- If required the aggrieved community member can also be made a part of the Redressal process so that he could place his point of view.
- The Grievance Redressal committee should meet at regular interval and discuss on the grievance for taking proper necessary action.

Communication with Contractor Staff: During the construction phase there would be an influx of people into the project area. As these people would have cultural differences with the resident population, which may lead to a potential of conflicts. This may arise because of issues related to safety and privacy issues of the women in the surrounding villages, spread of

various communicable diseases, nuisance caused by workers due to improper sanitation facilities, etc. It is thus proposed a **Community Interaction Brochure,** which would be prepared specifically stating the 'Dos' and 'Don'ts'. This will be implemented requesting the proper behavioural actions and discipline amenable to the local customs and traditions during their association with the project. The brochure would highlight the importance of any of nearby cultural place, that need to maintain the sanctity and dignity of the place. This Community Interaction Brochure would be made available to all employees during their induction, when they report back to the project after leave or absence. A record of the induction or refresher training on the community interaction would be maintained.

Responsibility

OSTRO (through the implementing agency) would prepare all the information disclosure booklets as discussed above. They would also ensure circulation of the booklet among the community in the project affected villages.

OSTRO would also ensure that the Grievance Redressal Mechanism is developed. It would also ensure that the system is made community friendly so that the people who have grievance are encouraged to come forward and register their grievance. It would also ensure that the grievance of the community is discussed and recorded. It would ensure that the issues are closed to the satisfaction of the community members.

During construction OSTRO and its contractors would ensure that each of the people working on the project is aware of the Do's and Don'ts of community interaction. OSTRO and also the Contractors would ensure that the record of the induction and refresher is maintained. All the resources required for the implementation of the different sub components of the plan would be provided by OSTRO and its Contractors.

8.6.6 Community Property Resource

During the project construction phase there might be some sharing of resources by the villagers and the workers working on the project. To an extent feasible this should be avoided to prevent potential conflicts between the project and the community. The movement of heavy vehicles and machineries might lead to conditions like disruption of electric wires and telephone wires in the project area and along transportation routes. All these damage utilities should be repaired/replaced to normal conditions, at the earliest. An account of the damage to the community resource should be documented and the root cause analysis should be carried out. The findings of the root cause analysis should also be documented and discussed with the agency/agencies found responsible for the incident. No water should be extracted from surface water bodies, which are used by the community for drinking or domestic purpose. Any vacant or barren land, not assigned for project, should not be used for storage of fill/construction material, wastes, etc

Responsibility

OSTRO would take responsibility for construction of the road before the existing road is diverted / closed for use by villagers. OSTRO (through the implementing agency) should start the process of dialogue with the community to decide on the alignment of the road and also fix up the likely time line for the construction.

OSTRO and its contractors should ensure that the sharing of community resource is minimized by organizing necessary support infrastructure/facilities within premises. However, in case where sharing would be essential OSTRO (including Contractors) should have an agreement with the Gram Sabha for the sharing of the resource. In case of damage to community property OSTRO including its contractors should ensure that it is repaired or replaced to the satisfaction of the community at the earliest. OSTRO should maintain documentation of all incidents of damages to the community property. All cost for repair/replacement should be borne by OSTRO/Contractor.

As part of the Environmental and Social Management System proposed, a system should also be developed for recording such incidents and tracking the incident till it is closed to the satisfaction of the community.

8.7 BUDGETARY PROVISIONS FOR ESMP IMPLEMENTATION

Environmental and social management plan will not be successful without a proper designated team and financial support for the same. The proposed team for implementation of environmental & social management plan is presented in **Fig 8.1.** Adequate budgetary provision will be made by OSTRO for execution of environmental management plan.

ANNEXURES

ANNEXURE I

DETAILS OF WTG MODEL

	G80-2.0 MW	G87-2.0 MW	G90-2.0 MW	G97-2.0 MW	G114-2.0 MW	G106-2.5 MW	G114-2.5 MW	G126-2.5 MW
ROTOR								
Diameter	80 m	87 m	90 m	97 m	114 m	106 m	114 m	126 m
Swept area	5,027 m^2	5,945 m^2	6,362 m^2	7,390 m^2	10,207 m^2	8,825 m^2	10,207 m^2	12,469 m^2
Rotational speed	9.0 - 19.0 rpm	9.0 - 19.0 rpm	9.0 - 19.0 rpm	9.6 - 17.8 rpm	7.8 - 14.8 rpm	7.7 - 14.6 rpm	7.7 - 14.6 rpm	7.1 - 12.9 rpm
BLADES								
Number of blades	3	3	3	3	3	3	3	3
Length	39 m	42.5 m	44 m	47.5 m	56 m	52 m	56 m	62 m
Airfoils	NACA 63.XXX + FFA-W3	DU + FFA-W3	DU + FFA-W3	Gamesa	Gamesa	Gamesa	Gamesa	Gamesa
Material	Pre-impregnated epoxy glass fiber	Pre-impregnated epoxy glass fiber	Pre-impregnated epoxy glass fiber	Pre-impregnated epoxy glass fiber + carbon fiber	Fiberglass reinforced with epoxy or polyester resin	Fiberglass reinforced with epoxy or polyester resin	Fiberglass reinforced with epoxy or polyester resin	Fiberglass reinforced with epoxy or polyester resin
TOWER								
Type	Modular	Modular	Modular	Modular	Modular	Modular	Modular	Modular
Height	60, 67, 78 and 100 m	67, 78, 90 and 100 m	55, 67, 78, 90 and 100 m	78, 90, 100, 104 and 120 m	80, 93, 125 m and site specific	72, 80, 93 m and site specific	80, 93, 125 m and site specific	84, 102, 129 m and site specific
GEAR BOX								
Type	1 planetary stage 2 parallel stages	1 planetary stage 2 parallel stages	1 planetary stage 2 parallel stages	1 planetary stage 2 parallel stages	1 planetary stage 2 parallel stages	2 planetary stages 1 parallel stage	2 planetary stages 1 parallel stage	2 planetary stages 1 parallel stage
Ratio	1:100.5 (50 Hz) 1:120.5 (60 Hz)	1:100.5 (50 Hz) 1:120.5 (60 Hz)	1:100.5 (50 Hz) 1:120.5 (60 Hz)	1:106.8 (50 Hz) 1:127.1 (60 Hz)	1:128.5 (50 Hz) 1:102.5 (60 Hz)	1:129.7 (50 Hz) 1:103.8 (60 Hz)	1:129.7 (50 Hz) 1:103.8 (60 Hz)	1:98 (50 Hz) 1:118 (60 Hz)
GENERATOR								
Type	Doubly-fed machine	Doubly-fed machine	Doubly-fed machine	Doubly-fed machine	Doubly-fed machine	Doubly-fed machine	Doubly-fed machine	Doubly-fed machine
Rated power	2.0 MW	2.0 MW	2.0 MW	2.0 MW	2.0 MW	2.5 MW	2.5 MW	2.5 MW
Voltage	690 V AC	690 V AC	690 V AC	690 V AC	690 V AC	690 V AC	690 V AC	690 V AC
Frequency	50 Hz / 60 Hz	50 Hz / 60 Hz	50 Hz / 60 Hz	50 Hz / 60 Hz	50 Hz / 60 Hz	50 Hz / 60 Hz	50 Hz / 60 Hz	50 Hz / 60 Hz
Protection class	IP 54	IP 54	IP 54	IP 54	IP 54	IP 54	IP 54	IP 54
Power factor	0.95 CAP - 0.95 IND throughout the power range*	0.95 CAP - 0.95 IND throughout the power range*	0.95 CAP - 0.95 IND throughout the power range*	0.95 CAP - 0.95 IND throughout the power range*	0.95 CAP - 0.95 IND throughout the power range*	0.95 CAP - 0.95 IND throughout the power range*	0.95 CAP - 0.95 IND throughout the power range*	0.95 CAP - 0.95 IND throughout the power range*

* Power factor at generator output terminals, on low voltage side before transformer input terminals.

ANNEXURE II

MONITORING RESULT-SURFACE WATER QUALITY & GROUND WATER QUALITY

SURFACE WATER MONITORING RESULTS

S.No	Parameters	Unit	Test Methods	**Surface Water (Canal) Nimbagallu Village (SW-01) DOS-04/04/15, Time 11:10**	**Surface Water (Reservoir) Near Nimbagallu Vill. (SW-02) DOS-04/04/15, Time 13:30**	**Surface Water (Canal) Amidyala Village (SW-03) DOS-04/04/15, Time 13:30**	**Surface water (Canal) N. Hanumapuram Vill. (SW-04) DOS-04/04/15, Time 12:20**	Detection limits
1	Taste	-	APHA 2160	Ageeable	Ageeable	Ageeable	Ageeable	
2	Odour	-	APHA 2150	Ageeable	Ageeable	Ageeable	Ageeable	
3	Colour	Hazen	APHA 2120 B	< 1	< 1	< 1	< 1	
4	pH	-	APHA 4500-H^+B	8.98	8.2	7.91	8.09	
5	Conductivity (25^{o}C)	µS/cm	APHA 2510-B	1445	567	1060	758	
6	Dissolved Oxygen (DO) (Min)	mg/L	APHA 4500 C	5.5	4.5	3.8	3.1	
7	BOD (3day, at 27^{o}C)	mg/L	APHA 5210-B, IS : 3025 (P-44)	BDL	BDL	BDL	BDL	0.1
8	Total Coliforms	MPN/100 mL	IS:1622,1981 (2003)	26	50	90	90	2
9	Total Dissolved Solids (TDS)	mg/L	APHA 2540 C	968	380	710	508	
10	Oil and Grease	mg/L	APHA 5520-B	BDL	BDL	BDL	BDL	1
11	Mineral Oil	mg/L	IS 3025 (P-39) 1999	BDL	BDL	BDL	BDL	0.1
12	Total Hardness (as CaCO3)	mg/L	APHA 2340-C	167	236	140	188	
13	Calcium Hardness (as $CaCO_3$)	mg/L	APHA 2340-C	102	154	90	114	
14	Magnesium Hardness (as $CaCO_3$)	mg/L	APHA 2340-C	65	82	50	75	
15	Chlorides (as Cl)	mg/L	APHA 4500-Cl-B	249.9	69.98	189.94	109.96	
16	Sulfates (as SO_4)	mg/L	IS :3025(P-24) : 2003	198.4	18.86	130.8	89.7	
17	Nitrates (as NO_3)	mg/L	IS 3025 (Part-34)	2.7	0.4	2.3	3.2	

S.No	Parameters	Unit	Test Methods	**Surface Water (Canal) Nimbagallu Village (SW-01) DOS-04/04/15, Time 11:10**	**Surface Water (Reservoir) Near Nimbagallu Vill. (SW-02) DOS-04/04/15, Time 13:30**	**Surface Water (Canal) Amidyala Village (SW-03) DOS-04/04/15, Time 13:30**	**Surface water (Canal) N. Hanumapuram Vill. (SW-04) DOS-04/04/15, Time 12:20**	Detection limits
18	Free CO_2	mg/L	APHA 4500 CO2-C	BDL	BDL	BDL	BDL	
19	Free NH_3 (as N)	mg/L	APHA 4500-NH3-C	BDL	BDL	BDL	BDL	
20	Fluorides (as F)	mg/L	APHA 4500-F^-.D	1.1	0.1	0.7	1	0.1
21	Calcium (Ca)	mg/L	APHA 3111	40.64	61.73	35.97	45.62	
22	Magnesium (Mg)	mg/L	APHA 3111	16.18	20.48	12.6	18.71	
23	Copper (Cu)	mg/L	APHA 3111	BDL	0.16	0.28	BDL	0.01
24	Iron (Fe)	mg/L	IS :3025(P-53): 1988 R.A 2003	BDL	BDL	BDL	BDL	0.3
25	Manganese (Mn)	mg/L	APHA 3111	BDL	BDL	BDL	BDL	0.002
26	Zinc (Zn)	mg/L	APHA 3111	BDL	BDL	BDL	BDL	0.2
27	Boron (B)	mg/L	APHA 4500 B-D	BDL	BDL	BDL	BDL	0.1
28	Barium (Ba)	mg/L	IS : 13428 : 2005	BDL	BDL	BDL	BDL	0.01
29	Silver (Ag)	mg/L	APHA 3111	BDL	BDL	BDL	BDL	0.01
30	Arsenic Total (As)	mg/L	IS : 3025 (P-37)	BDL	BDL	BDL	BDL	0.01
31	Mercury (Hg)	mg/L	EPA SW- 846 - 7470/7471	BDL	BDL	BDL	BDL	0.001
32	Lead (Pb)	mg/L	APHA 3111	BDL	0.67	0.67	BDL	0.01
33	Cadmium (Cd)	mg/L	APHA 3111	BDL	BDL	BDL	BDL	0.002
34	Chromium (VI)	mg/L	APHA 3500 Cr^{+6} - B	BDL	BDL	BDL	BDL	0.01
35	Selenium (Se)	mg/L	APHA 3111	BDL	BDL	BDL	BDL	0.01
36	Cyanide (CN)	mg/L	APHA 4500 -CN-	BDL	BDL	BDL	BDL	0.02

S.No	Parameters	Unit	Test Methods	**Surface Water (Canal) Nimbagallu Village (SW-01) DOS-04/04/15, Time 11:10**	**Surface Water (Reservoir) Near Nimbagallu Vill. (SW-02) DOS-04/04/15, Time 13:30**	**Surface Water (Canal) Amidyala Village (SW-03) DOS-04/04/15, Time 13:30**	**Surface water (Canal) N. Hanumapuram Vill. (SW-04) DOS-04/04/15, Time 12:20**	Detection limits
37	Phenolic compounds(as C_6H_5OH),	mg/L	APHA 5530-C	BDL	BDL	BDL	BDL	0.001
38	Anionic Detergents (as MBAS)	mg/L	Annex. K of IS 13428	BDL	BDL	BDL	BDL	0.1
39	Poly-Nuclear Aromatic Hydrocarbons(PAH)	µg/L	APHA 6440	BDL	BDL	BDL	0.006	0.1
40	Sodium (Na)	mg/L	APHA 3111	312.8	31.7	232.8	98.6	
41	Sodium Absorption Ratio (SAR)	-	APHA 3111	10.5	0.9	4.8	3.08	
42	Faecal Coliform	/100 ml	IS:1622,1981 (2003)	4	9	13	22	

GROUND WATER MONITORING RESULTS

S.No.	Parameters	Units	Test Methods	**Ground water (Hand Pump) Nimbagallu Village (GW-01) DOS-04/04/15, Time 11:25**	**Ground water (Borewell) Vasayapuram Village (GW-02) DOS-04/04/15, Time 10:40**	**Ground water (Hand Pump) Rayampalli Village (GW-03) DOS-04/04/15, Time 10:10**	**Detection limits**
1	Colour	Hazen	APHA 2120 -B	< 1	< 1	< 1	
2	Odour	-	APHA 2150 -B	Ageeable	Ageeable	Ageeable	
3	Taste	-	APHA 2160- B	Ageeable	Ageeable	Ageeable	
4	Turbidity	NTU	APHA - 2130 - B	< 1	< 1	< 1	

S.No.	Parameters	Units	Test Methods	Ground water (Hand Pump) Nimbagallu Village (GW-01) DOS-04/04/15, Time 11:25	Ground water (Borewell) Vasayapuram Village (GW-02) DOS-04/04/15, Time 10:40	Ground water (Hand Pump) Rayampalli Village (GW-03) DOS-04/04/15, Time 10:10	Detection limits
5	pH Value	-	APHA 4500- H+B	7.03	7.93	7.98	
6	Total Hardness (as $CaCO_3$)	mg/L	APHA 2340 - C	582	195	197	
7	Iron (as Fe)	mg/L	APHA -3111-B	BDL	BDL	BDL	0.3
8	Chlorides (as Cl)	mg/L	APHA 4500-CL-B	1184.6	95.0	150.0	
9	Residual Free Chlorine	mg/L	APHA 4500 Cl-B	BDL	BDL	BDL	0.1
10	Fluorides (F)	mg/L	APHA - 4500 - F-D	1.5	0.6	0.9	
11	Total Dissolved solids	mg/L	APHA -2540-C	2250	616	744	
12	Calcium (Ca)	mg/L	APHA -3111-B	102.5	58.1	32.4	
13	Magnesium (Mg)	mg/L	APHA -3111-B	81.5	12.5	28.9	
14	Copper (Cu)	mg/L	APHA -3111-B	BDL	BDL	BDL	0.01
15	Manganese (Mn)	mg/L	APHA -3111-B	BDL	BDL	BDL	0.002
16	Sulphate (as SO_4)	mg/L	APHA-4500-PS04-E	243.3	71.98	195	
17	Nitrate (as NO_3)	mg/L	IS 3025 P-34	3.6	1.7	2.3	
18	Phenolic compounds (as C_6H_5OH)	mg/L	APHA -3111-B	BDL	BDL	BDL	0.001
19	Mercury (as Hg)	mg/L	IS : 3025 (P-48)	BDL	BDL	BDL	0.001
20	Cadmium (as Cd)	mg/L	APHA -3111-B	BDL	BDL	BDL	0.002
21	Selenium (as Se)	mg/L	APHA -3111-B	BDL	BDL	BDL	0.01
22	Arsenic (as As)	mg/L	IS : 3025 (P-37)	BDL	BDL	BDL	0.01

S.No.	Parameters	Units	Test Methods	Ground water (Hand Pump) Nimbagallu Village (GW-01) DOS-04/04/15, Time 11:25	Ground water (Borewell) Vasayapuram Village (GW-02) DOS-04/04/15, Time 10:40	Ground water (Hand Pump) Rayampalli Village (GW-03) DOS-04/04/15, Time 10:10	Detection limits
23	Cyanide (as CN)	mg/L	APHA 4500-CN-C&E	BDL	BDL	BDL	0.02
24	Lead (as Pb)	mg/L	APHA -3111-B	BDL	BDL	BDL	0.01
25	Zinc (as Zn)	mg/L	APHA -3111-B	BDL	BDL	BDL	0.2
26	Anionic Detergents (as MBAS)	mg/L	APHA 5540 -C, Annex. K of IS 13428	BDL	BDL	BDL	0.1
27	Chromium (as Cr 6+)	mg/L	APHA 3500 - B	BDL	BDL	BDL	0.01
28	Polynuclear Aromatic Hydrocarbons (as PAH)	mg/L	APHA 6440	0.008	BDL	BDL	0.1
29	Mineral Oil	mg/L	IS 3025 (P-39) 1999	BDL	BDL	BDL	0.1
30	Pesticides	mg/L	AFLPL/CH/SOP-167	BDL	BDL	BDL	0.00005
31	Alkalinity	mg/L	APHA -2320-B	180	60	80	-
32	Aluminium (as Al)	mg/L	APHA -3111-B	BDL	BDL	BDL	0.01
33	Boron (as B)	mg/L	APHA - 45- B-B	BDL	BDL	BDL	0.1
34	Total Coliform	MPN/100 ml	IS:1622,1981 (2003)	< 2	34	30	
34	Faecal Coliform	/100 ml	IS:1622,1981 (2003)	Absent	8	absent	

ANNEXURE III

LAND USE DETAILS FOR 150 WTGs

Sr No.	WTG No.	Latitude	Longitude	Village	Distance from WTG (Km)	Land Use
1.	G3-1	14°51'47.23"N	77° 7'35.22"E	Garudachedu	0.69	Agricultural land
2.	G3-2	14°51'56.49"N	77° 7'32.48"E	Garudachedu	0.43	Agricultural land
3.	G3-3	14°52'5.78"N	77° 7'30.11"E	Garudachedu	0.27	Agricultural land
4.	G3-4	14°52'15.06"N	77° 7'27.88"E	Garudachedu	0.35	Agricultural land
5.	G3-5	14°52'23.99"N	77° 7'24.78"E	Garudachedu	0.59	Agricultural land
6.	G3-6	14°52'33.24"N	77° 7'22.62"E	Meenahalli	0.78	Agricultural land
7.	G3-7	14°52'41.31"N	77° 7'14.56"E	Meenahalli	0.48	Agricultural land
8.	G3-8	14°52'51.64"N	77° 7'18.01"E	Meenahalli	0.26	Agricultural land
9.	G3-9	14°53'0.82"N	77° 7'15.74"E	Meenahalli	0.20	Agricultural land
10.	G3-10	14°53'10.00"N	77° 7'13.48"E	Meenahalli	0.43	Agricultural land
11.	G3-11	14°53'18.39"N	77° 7'9.08"E	Meenahalli	0.68	Agricultural land
12.	G3-12	14°53'27.64"N	77° 7'6.89"E	Meenahalli	0.96	Agricultural land
13.	G3-13	14°53'36.21"N	77° 7'2.53"E	Meenahalli	1.27	Agricultural land
14.	G3-14	14°53'45.03"N	77° 6'58.90"E	Meenahalli	1.55	Agricultural land
15.	G3-15	14°53'54.02"N	77° 6'55.91"E	Bidurukontham	1.83	Agricultural land
16.	G3-16	14°54'2.95"N	77° 6'52.52"E	Govindwada	2.13	Agricultural land
17.	G3-17	14°54'11.81"N	77° 6'49.07"E	Govindwada	1.84	Agricultural land
18.	G3-18	14°54'20.48"N	77° 6'45.58"E	Govindwada	1.53	Agricultural land
19.	G3-19	14°52'19.70"N	77° 8'35.52"E	Garudachedu	2.29	Agricultural land
20.	G3-20	14°52'28.74"N	77° 8'32.75"E	Garudachedu	2.27	Agricultural land
21.	G3-21	14°52'38.39"N	77° 8'33.22"E	Garudachedu	2.36	Agricultural land
22.	G3-22	14°52'45.55"N	77° 8'26.52"E	Garudachedu	2.31	Agricultural land
23.	G3-23	14°52'54.88"N	77° 8'24.36"E	Meenahalli	2.21	Agricultural land
24.	G3-24	14°53'4.71"N	77° 8'23.60"E	Meenahalli	2.18	Agricultural land
25.	G3-25	14°53'13.20"N	77° 8'19.75"E	Meenahalli	2.12	Agricultural land
26.	G3-26	14°53'22.81"N	77° 8'15.72"E	Meenahalli	2.12	Agricultural land
27.	G3-27	14°53'32.25"N	77° 8'15.00"E	Meenahalli	2.22	Agricultural land
28.	G3-28	14°53'41.50"N	77° 8'12.26"E	Meenahalli	2.32	Agricultural land
29.	G3-29	14°53'50.32"N	77° 8'9.02"E	Meenahalli	2.40	Agricultural land
30.	G3-30	14°53'59.03"N	77° 8'5.32"E	Meenahalli	2.50	Agricultural land
31.	G3-31	14°54'8.57"N	77° 8'4.60"E	Meenahalli	2.73	Agricultural land
32.	G3-32	14°54'17.68"N	77° 8'1.86"E	Meenahalli	2.92	Agricultural land
33.	G3-33	14°54'26.86"N	77° 7'59.34"E	Govindwada	2.88	Agricultural land
34.	G3-34	14°52'52.20"N	77° 9'35.79"E	Vyasapura	2.59	Agricultural land
35.	G3-35	14°53'1.04"N	77° 9'32.62"E	Vyasapura	2.38	Agricultural land
36.	G3-36	14°53'9.95"N	77° 9'29.74"E	Vyasapura	2.16	Agricultural land
37.	G3-37	14°53'19.11"N	77° 9'27.36"E	Vyasapura	1.94	Agricultural land
38.	G3-38	14°53'28.25"N	77° 9'25.02"E	Vyasapura	1.75	Agricultural land
39.	G3-39	14°53'46.72"N	77° 9'20.73"E	Vyasapura	1.66	Agricultural land
40.	G3-40	14°53'46.65"N	77° 9'20.74"E	Vyasapura	1.47	Agricultural land

Sr No.	WTG No.	Latitude	Longitude	Village	Distance from WTG (Km)	Land Use
41.	G3-41	14°53'8.92"N	77°10'35.40"E	Vyasapura	2.20	Agricultural land
42.	G3-42	14°53'18.04"N	77°10'36.77"E	Vyasapura	1.97	Agricultural land
43.	G3-43	14°53'27.10"N	77°10'34.25"E	Vyasapura	1.72	Agricultural land
44.	G3-44	14°53'36.52"N	77°10'32.17"E	Vyasapura	1.45	Agricultural land
45.	G3-45	14°53'45.61"N	77°10'30.22"E	Vyasapura	1.19	Agricultural land
46.	G3-46	14°53'54.83"N	77°10'28.09"E	Vyasapura	0.95	Agricultural land
47.	G3-47	14°54'4.18"N	77°10'25.25"E	Vyasapura	0.75	Agricultural land
48.	G3-48	14°54'13.26"N	77°10'23.05"E	Vyasapura	0.63	Agricultural land
49.	G3-49	14°54'22.55"N	77°10'21.04"E	Vyasapura	0.65	Agricultural land
50.	G3-50	14°53'42.70"N	77°11'41.21"E	Nimbagallu	1.55	Agricultural land
51.	G3-51	14°53'50.65"N	77°11'37.96"E	Nimbagallu	1.74	Agricultural land
52.	G3-52	14°53'59.90"N	77°11'35.23"E	Nimbagallu	1.99	Agricultural land
53.	G3-53	14°54'9.28"N	77°11'32.50"E	Nimbagallu	2.21	Agricultural land
54.	G3-54	14°54'18.70"N	77°11'30.81"E	Rayampalle	2.52	Agricultural land
55.	G3-55	14°54'28.10"N	77°11'27.92"E	Rayampalle	2.25	Agricultural land
56.	G3-56	14°54'37.28"N	77°11'26.38"E	Rayampalle	2.00	Agricultural land
57.	G2-52	14°53'51.80"N	77°13'56.53"E	Indravathi	2.30	Agricultural land
58.	G2-53	14°53'59.40"N	77°13'54.37"E	Indravathi	2.47	Agricultural land
59.	G2-54	14°54'7.35"N	77°13'52.28"E	Indravathi	2.63	Agricultural land
60.	G2-55	14°54'15.08"N	77°13'50.01"E	Chinna Musturu	2.07	Agricultural land
61.	G2-56	14°54'22.77"N	77°13'46.64"E	Chinna Musturu	1.98	Agricultural land
62.	G2-57	14°54'30.03"N	77°13'45.23"E	Chinna Musturu	1.88	Agricultural land
63.	G2-58	14°54'37.78"N	77°13'40.16"E	Chinna Musturu	1.94	Agricultural land
64.	G2-59	14°54'46.34"N	77°13'41.37"E	Chinna Musturu	1.81	Agricultural land
65.	G1-06	14°50'24.77"N	77°11'25.59"E	Hanumanpuram	4.04	Agricultural land
66.	G1-07	14°50'32.55"N	77°11'23.71"E	Hanumanpuram	3.93	Agricultural land
67.	G1-08	14°50'40.32"N	77°11'21.59"E	Hanumanpuram	3.81	Agricultural land
68.	G1-09	14°50'48.20"N	77°11'19.39"E	Hanumanpuram	3.73	Agricultural land
69.	G1-15	14°50'25.77"N	77°12'35.21"E	Amidala	2.05	Agricultural land
70.	G1-16	14°50'33.83"N	77°12'32.68"E	Amidala	1.94	Agricultural land
71.	G1-17	14°50'41.41"N	77°12'30.12"E	Amidala	1.89	Agricultural land
72.	G1-18	14°50'49.41"N	77°12'28.37"E	Amidala	1.81	Agricultural land
73.	G1-19	14°50'56.42"N	77°12'25.38"E	Amidala	1.82	Agricultural land
74.	G1-20	14°51'17.61"N	77°12'21.82"E	Amidala	1.85	Agricultural land
75.	G1-21	14°51'25.21"N	77°12'19.04"E	Amidala	1.97	Agricultural land
76.	G1-22	14°51'32.91"N	77°12'16.45"E	Amidala	2.09	Agricultural land
77.	G1-27	14°51'14.24"N	77°13'31.60"E	Amidala	0.24	Agricultural land
78.	G1-28	14°51'22.51"N	77°13'29.87"E	Amidala	0.34	Agricultural land
79.	G1-29	14°51'29.86"N	77°13'27.19"E	Amidala	0.50	Agricultural land
80.	G1-30	14°51'37.46"N	77°13'24.35"E	Amidala	0.74	Agricultural land
81.	G1-31	14°51'44.98"N	77°13'21.15"E	Amidala	0.98	Agricultural land
82.	G1-32	14°51'52.74"N	77°13'18.09"E	Amidala	1.22	Agricultural land
83.	G1-33	14°52'0.80"N	77°13'16.00"E	Amidala	1.46	Agricultural land

Sr No.	WTG No.	Latitude	Longitude	Village	Distance from WTG (Km)	Land Use
84.	G1-34	14°52'8.39"N	77°13'12.80"E	Nimbagallu	2.58	Agricultural land
85.	G1-35	14°52'16.76"N	77°13'10.56"E	Nimbagallu	2.30	Agricultural land
86.	G1-36	14°52'24.98"N	77°13'8.04"E	Nimbagallu	2.08	Agricultural land
87.	G2-38	14°52'38.37"N	77°13'6.49"E	Nimbagallu	1.72	Agricultural land
88.	G1-37	14°50'24.91"N	77°14'18.42"E	Amidala	2.25	Agricultural land
89.	G1-38	14°50'32.76"N	77°14'15.76"E	Amidala	1.99	Agricultural land
90.	G1-39	14°50'40.31"N	77°14'13.38"E	Amidala	1.81	Agricultural land
91.	G1-40	14°50'47.95"N	77°14'11.00"E	Amidala	1.62	Agricultural land
92.	G1-41	14°50'55.87"N	77°14'8.92"E	Amidala	1.47	Agricultural land
93.	G1-42	14°51'3.61"N	77°14'6.68"E	Amidala	1.30	Agricultural land
94.	G1-43	14°51'11.53"N	77°14'4.54"E	Amidala	1.25	Agricultural land
95.	G1-44	14°51'18.80"N	77°14'2.44"E	Amidala	1.20	Agricultural land
96.	G1-45	14°51'38.60"N	77°14'33.33"E	Amidala	2.22	Agricultural land
97.	G1-46	14°51'46.41"N	77°14'30.88"E	Amidala	2.26	Agricultural land
98.	G1-47	14°51'54.28"N	77°14'29.00"E	Amidala	2.29	Agricultural land
99.	G1-48	14°52'1.82"N	77°14'26.52"E	Amidala	2.39	Agricultural land
100.	G1-49	14°52'9.92"N	77°14'24.68"E	Mopidi	2.88	Agricultural land
101.	G1-50	14°52'17.80"N	77°14'22.49"E	Mopidi	2.86	Agricultural land
102.	G1-51	14°52'25.54"N	77°14'20.33"E	Mopidi	2.83	Agricultural land
103.	G1-52	14°52'33.29"N	77°14'17.48"E	Indravathi	2.01	Agricultural land
104.	G1-53	14°52'41.21"N	77°14'16.01"E	Indravathi	1.89	Agricultural land
105.	G1-54	14°52'50.66"N	77°14'20.40"E	Indravathi	1.61	Agricultural land
106.	G1-55	14°52'59.09"N	77°14'18.13"E	Indravathi	1.58	Agricultural land
107.	G1-01	14°50'25.93"N	77°10'21.18"E	Hanumanpuram	2.22	Agricultural land
108.	G1-02	14°50'31.39"N	77°10'14.78"E	Hanumanpuram	1.97	Agricultural land
109.	G1-03	14°50'47.07"N	77°10'10.45"E	Hanumanpuram	1.70	Agricultural land
110.	G1-04	14°50'54.65"N	77°10'7.75"E	Hanumanpuram	1.56	Agricultural land
111.	G1-05	14°50'39.24"N	77°10'12.18"E	Hanumanpuram	1.81	Agricultural land
112.	G1-10	14°51'3.64"N	77°11'11.62"E	Hanumanpuram	3.47	Agricultural land
113.	G1-11	14°51'11.71"N	77°11'12.63"E	Hanumanpuram	3.53	Agricultural land
114.	G1-12	14°51'19.48"N	77°11'10.75"	Hanumanpuram	3.51	Agricultural land
115.	G1-13	14°51'27.47"N	77°11'8.23"E	Hanumanpuram	3.48	Agricultural land
116.	G1-14	14°51'35.28"N	77°11'5.75"E	Hanumanpuram	3.46	Agricultural land
117.	G1-23	14°51'40.87"N	77°12'14.58"E	Nimbagallu	3.06	Agricultural land
118.	G1-24	14°51'48.35"N	77°12'12.31"E	Nimbagallu	2.84	Agricultural land
119.	G1-25	14°51'55.92"N	77°12'10.04"E	Nimbagallu	2.63	Agricultural land
120.	G1-26	14°52'3.78"N	77°12'8.15"E	Nimbagallu	2.40	Agricultural land
121.	G2-01	14°51'7.26"N	77° 7'45.91"E	Garudachedu	1.97	Agricultural land
122.	G2-02	14°51'15.20"N	77° 7'44.00"E	Garudachedu	1.71	Agricultural land
123.	G2-03	14°51'22.54"N	77° 7'41.41"E	Garudachedu	1.46	Agricultural land
124.	G2-04	14°50'53.98"N	77° 8'59.01"E	N. Hnumanpuram	0.51	Agricultural land
125.	G2-05	14°51'1.49"N	77° 8'57.16"E	N. Hnumanpuram	0.57	Agricultural land
126.	G2-06	14°51'9.59"N	77° 8'54.56"E	N. Hnumanpuram	0.69	Agricultural land

Sr No.	WTG No.	Latitude	Longitude	Village	Distance from WTG (Km)	Land Use
127.	G2-07	14°51'17.16"N	77° 8'52.80"E	N. Hnumanpuram	0.86	Agricultural land
128.	G2-08	14°51'25.11"N	77° 8'50.32"E	N. Hnumanpuram	1.09	Agricultural land
129.	G2-09	14°51'40.42"N	77° 8'46.65"E	N. Hnumanpuram	1.53	Agricultural land
130.	G2-10	14°51'48.48"N	77° 8'44.16"E	N. Hnumanpuram	1.76	Agricultural land
131.	G2-11	14°51'18.31"N	77°10'1.77"E	N. Hnumanpuram	1.52	Agricultural land
132.	G2-12	14°51'26.30"N	77° 9'59.44"E	N. Hnumanpuram	1.57	Agricultural land
133.	G2-13	14°51'33.96"N	77° 9'57.46"E	N. Hnumanpuram	1.65	Agricultural land
134.	G2-14	14°51'41.60"N	77° 9'55.44"E	N. Hnumanpuram	1.77	Agricultural land
135.	G2-15	14°51'49.65"N	77° 9'53.15"E	N. Hnumanpuram	1.91	Agricultural land
136.	G2-16	14°51'57.35"N	77° 9'50.63"E	N. Hnumanpuram	2.06	Agricultural land
137.	G2-17	14°52'5.28"N	77° 9'48.82"E	N. Hnumanpuram	2.66	Agricultural land
138.	G2-18	14°51'48.42"N	77°11'2.15"E	Nimbagallu	3.80	Agricultural land
139.	G2-19	14°51'57.61"N	77°10'58.08"E	Nimbagallu	3.66	Agricultural land
140.	G2-20	14°52'5.19"N	77°10'55.35"E	Nimbagallu	3.58	Agricultural land
141.	G2-21	14°52'13.02"N	14°52'13.02"N	Nimbagallu	3.49	Agricultural land
142.	G2-22	14°52'21.44"N	77°10'50.13"E	Nimbagallu	3.40	Agricultural land
143.	G2-23	14°52'30.17"N	77°10'47.50"E	Nimbagallu	3.33	Agricultural land
144.	G2-24	14°52'40.05"N	77°10'45.02"E	Vyaspura	3.13	Agricultural land
145.	G2-25	14°52'53.10"N	77°10'42.14"E	Vyaspura	2.73	Agricultural land
146.	G2-26	14°53'1.05"N	77°10'40.55"E	Vyaspura	2.49	Agricultural land
147.	G2-27	14°52'11.40"N	77°12'5.98"E	Nimbagallu	2.17	Agricultural land
148.	G2-28	14°52'20.01"N	77°12'3.28"E	Nimbagallu	1.96	Agricultural land
149.	G2-29	14°52'28.21"N	77°12'4.68"E	Nimbagallu	1.71	Agricultural land
150.	G2-30	14°52'35.19"N	77°12'1.12"E	Nimbagallu	1.55	Agricultural land
151.	G2-31	14°52'42.05"N	77°11'57.59"E	Nimbagallu	1.43	Agricultural land
152.	G2-32	14°52'51.81"N	77°11'54.37"E	Nimbagallu	1.29	Agricultural land
153.	G2-33	14°52'59.51"N	77°11'52.91"E	Nimbagallu	1.18	Agricultural land
154.	G2-34	14°53'7.07"N	77°11'51.31"E	Nimbagallu	1.13	Agricultural land
155.	G2-35	14°53'18.26"N	77°11'46.97"E	Nimbagallu	1.21	Agricultural land
156.	G2-36	14°53'25.88"N	77°11'45.06"E	Nimbagallu	1.28	Agricultural land
157.	G057	14°52'16.62"N	77°11'21.84"E	Nimbagallu	2.73	Agricultural land

ANNEXURE IV

FRAMED SAMPLE QUESTIONNAIRE FOR VILLAGE PROFILING

Name of the village				*Panchayat*				
Taluka/Block				*District*				
Respondent					*Date:*			
Total Population		*Total Male*			*Total Female*	*HH No.*		
Religion	*Name*	*%*	*Name*	*%*				
Caste/Group	*Name*	*%*	*Name*	*%*				
	Name	*%*	*Name*	*%*				
Education Level	*Illiterate %*	*Primary %*	*Secondary %*	*H.S. %*	*Graduate %*			
Occupation	*Agriculture %*	*Business %*	*Service %*	*Labour %*	*Other %*			
Source Drinking water facility	*Tube well*	*Dug well*	*Stream*	*Piped water*	*Hand pumps*			
Sanitation facility	*Pit latrine %*	*Sanitary latrine %*	*Open defecation %*	*Other %*				
Electricity (Available %)			*Electricity availability in HH*					
Village road type/transport facility								
Schools (distance)	*Primary*	*Middle*	*H. S.*	*College*	*Anganwadi*			
Health Facility (distance)	*Health sub Centre*	*Primary*	*Hospital*	*Others*				
Major diseases								
Major crops cultivated	*Name*	*Period*	*Yield (q/acr)*	*Rate/q*	*Name*	*Period*	*Yield (q/acr)*	*Rate/q*
Irrigation Facility	*Ponds*		*River*	*Groundwater*	*Others*			
Average land holding size								
Land rights								
Livestock	*Cow*	*Buffalo*	*Goat*	*Pig*	*Fowl*			
	Duck	*Others*						

Grazing areas					
Cooking medium and source	***Fuel Wood***	***Kerosene***	***Cow Dung cake***	***Crop Residue***	***LPG***
	Others				
Common property Resources(CPR)	***Religious and cultural places***	***Sacred places***	***Community hall***	***community Ponds***	***Cremation ground***
	Streams	***canal***	***river***	***Others***	
Major rituals and festivals	***Name***	***Period***	***Name***	***Period***	
Fishing area		***Name of the***			
Forest	***Wood***	***Timber***	***NTFP***	***Others***	
Any Vulnerable Groups like- landless/homeless- people, Women headed HH, Orphans etc.					
Any program related to child / women health care program					
Any employment generation program					
HH & Cottage industries in the village / area					
Any proposed Scheme / Program related infrastructure / any amenities					
Occurrence any Natural Calamities / industrial / anthropogenic Hazard					

ANNEXURE V

DEMOGRAPHIC PROFILE OF THE STUDY AREA VILLAGES

Sl No	Particular	HH	Total Population	Ave. HH Size	Male Pop.	% M	Female Pop.	% F	Sex Ratio
A	**District level**								
1	Anantapur	968160	4081148	4.2	2064495	50.59	2016653	49.41	977
B	**Tehsil/Mandal/Block level**								
1	Uravakonda	18321	80201	4.4	40235	50.17	39966	49.83	993
2	Kanekal	13923	64979	4.7	32908	50.64	32071	49.36	975
C	**Study Area Villages**								
1	Nimbagal	657	2849	4.3	1405	49.32	1444	50.68	1028
2	Renimakulapalle	350	1666	4.8	852	51.14	814	48.86	955
3	Amidala	1543	6938	4.5	3525	50.81	3413	49.19	968
4	Chinna Musturu	481	1942	4.0	964	49.64	978	50.36	1015
5	Indravathi	191	736	3.9	368	50.00	368	50.00	1000
6	Raketla	1124	4405	3.9	2230	50.62	2175	49.38	975
7	Vyasapuram	319	1518	4.8	753	49.60	765	50.40	1016
8	Pedda Musturu	324	1409	4.3	675	47.91	734	52.09	1087
9	Mopidi	611	2462	4.0	1222	49.63	1240	50.37	1015
10	Nerimetla	456	2206	4.8	1100	49.86	1106	50.14	1005
11	Rayampalle	304	1339	4.4	648	48.39	691	51.61	1066

Sl No	Particular	HH	Total Population	Ave. HH Size	Male Pop.	% M	Female Pop.	% F	Sex Ratio
12	Lathavaram	535	2269	4.2	1141	50.29	1128	49.71	989
13	Meenahalli	165	844	5.1	449	53.20	395	46.80	880
14	N.Hanumapuram	407	2005	4.9	1055	52.62	950	47.38	900
15	Bidurukontham	212	982	4.6	494	50.31	488	49.69	988
16	Garudachedu	326	1566	4.8	793	50.64	773	49.36	975
17	Thumbiganur	559	2718	4.9	1373	50.52	1345	49.48	980
18	Sollapuram	413	2029	4.9	1011	49.83	1018	50.17	1007

Source: Census 2011

ANNEXURE VI

DETAILS SCENARIO OF SC & ST IN STUDY

S. No	Particular	Total Population	SC Population	% SC	ST Population	% ST
A	**District level**					
1	Anantapur	4081148	583135	14.29	154127	3.78
B	**Tehsil/Mandal/Block level**					
1	Uravakonda	80201	12647	15.77	2139	2.67
2	Kanekal	64979	9872	15.19	205	0.32
C	**Study Area Villages**					
1	Nimbagal	2849	471	16.53	0	0.00
2	Renimakulapalle	1666	333	19.99	0	0.00
3	Amidala	6938	1121	16.16	54	0.78
4	Chinna Musturu	1942	402	20.70	0	0.00
5	Indravathi	736	125	16.98	0	0.00
6	Raketla	4405	720	16.35	393	8.92
7	Vyasapuram	1518	305	20.09	0	0.00
8	Pedda Musturu	1409	682	48.40	40	2.84
9	Mopidi	2462	129	5.24	0	0.00
10	Nerimetla	2206	430	19.49	1	0.05
11	Rayampalle	1339	409	30.55	0	0.00
12	Lathavaram	2269	377	16.62	264	11.64
13	Meenahalli	844	406	48.10	0	0.00
14	N.Hanumapuram	2005	275	13.72	2	0.10
15	Bidurukontham	982	265	26.99	0	0.00
16	Garudachedu	1566	527	33.65	0	0.00
17	Thumbiganur	2718	421	15.49	1	0.04
18	Sollapuram	2029	521	25.68	0	0.00

Source: census 2011

ANNEXURE VII

MOM STAKEHOLDER MEETING

Minutes of Meeting

Date: 23/5/15 Time: 10:30 AM- 12:30 PM

Venue: Forest Department/DWMA/ Archaeology and Sathya Sri Water trust-Anantapur

List of Participant:

1. P.S. raghawandra — DFO, Anantapur
2. Raghu — Data operator, DFO office
3. Ramasuba Reddy — Asst. Director, Archaeology Dept. Anantapur
4. K. Raman Reddy — Supreendente , District Water Management Agency
5. Er. Kesava Reddy — El. Er. L&T- Sathya Sri Water Trust, Anantapur

ARCADIS

6. D. Swega - Environmentalist
7. Mr. Dhirendra P. Singh — Sociologist

The primary agenda of the meeting was to i) discuss the approach and methodology to be undertaken by ARCADIS team for the ESIA study Proposed Wind Project seismic II) Socio – economics data required for the ESIA

The important issues which were discussed include

- Forest department confirmed that, some wildlife animals available in the Uravakonda Mandal
- Forest dept. has been provided district working plan and protected forest are maps.
- Archaeology department informed that, total 46 protected monuments sites identified in the district
- District Watershed Management Agency (DWMA) it was informed that, micro watershed programme running in many villages of Uravakonda and Kanekal Mandal, IWMP schemes.
- Sathya Sri Water Trust Anantapur, treated water supply in many villages of Urravakonda and Kanekal Mandal with the collaboration of L & T and Government of Andhra Pradesh.

STAKEHOLDERS PARTICIPANT LIST

Stakeholder holder's participation list

Sr. No.	Person Name	Designation	Village/township/local govt. institution	Date
1	A. NAGOOR SHEK (M)	Sr. MANAGER	GMDA, Gangavaram	21/5/15
2	A.B. Appa Prasad (M)	Manager - CSR	Gangavaram	21/5/15
3	Kalisetty (M)	Safety officer	Gangavaram	21/5/2015
4	Chetan (M)	E.H.S. Head	Ostro, Gangavaram	21/5/2015
5	S. MARIMUTHU (M)	Sr. ENGINEER (E&I)	Gangavaram	22/5/15
6	MAHENDRAN (M)	Sr. ENGINEER (C&I)	"	22/5/15
7	Hanumanthu (M)	Sarpanch	Ramakulapalle village	22/5/15
8	Gangamma (F)	House wife farmer	Ramakulapalle	22/5/15
9	Sungamma (F)	House wife farmer	Ramakulapalle	22/5/15
10	Thippaya (F)	House wife	Ramakulapalle village	22/5/15
11	Sri Lakshmi (F)	House wife farmer	Ramakulapalle	22/5/15
12	Munamma (F)	House wife/ Farmer	Ramakulapalle	22/5/15
13	Lakshmi (F)	House wife/ Farmer	Ramakulapalle	22/5/15
14	Srinivasulu (M)	Farmers	Ramakulapalle	22/5/15
15	Ellapa (M)	Farmer	Ramakulapalle	22/5/15
16	Maruthi Prasad (M)	Farmer	Ramakulapalle	22/5/15
17	Rajasekhar (M)	Farmer	Ramakulapalle	22/5/15
18	Hanumanthu (M)	farmer	Ramakulapalle	22/5/15
19	Jaya Raju (M)	Field Asst. MNREGS Programme	Ramakulapalle	22/5/15
20	Seremanth (M)	Farmer	Ramakulapalle	22/5/15
21	Hanumanthu (M)	Farmer	Ramakulapalle	22/5/15
22	Vamsi Swamy (M)	Farmer	Ramakulapalle	22/5/15

R Singh

Sr. No.	Person Name	Designation	Village/township/local govt. institution	Date
23	P. Vasalakshmi (F)	Sarpanch	Nimbagallu	22/5/15
24	Hemamappa (M)	Sarpanch Rep	Nimbagallu village	22/5/15
25	Sidramma (F)	Farmer	Nimbagallu village	22/5/15
26	B. Gangamma (F)	Sarpanch	Mapidi village	22/5/15
27	B. Ramesh (M)	Farmer	Mapidi village	22/5/15
28	B. Vennaswamy (M)	Farmer	Mapidi village	22/5/15
29	B. Ramesh jeyalal (M)	Farmer	Mapidi village	22/5/15
30	Raffic (M)	Farmer	Mapidi village	22/5/15
31	B. Anantesh (M)	Farmer	Mapidi village	22/5/15
32	K. Malleppa (M)	Farmer	Mapidi village	22/5/15
33	Sidramappa (M)	Agriculture labour	Mapidi village	22/5/15
34	Bandappa (M)	Agri. labour	Mapidi village	22/5/15
35	P Venkateswar (M)	Agri. labour	Mapidi village	22/5/15
36	Eswar Swamy (M)	Agri. labour	Mapidi	22/5/15
37	P Eranna (M)	Sarpanch	Amidyala village	22/5/15
38	Manilavanta (F)	Shopkeeper	Amidyala village	22/5/15
39	Saraganma (F)	Shopkeeper	Amidyala village	22/5/15
40	Prasad (M)	Farmer	Amidyala village	22/5/15
41	P Ravi (M)	Farmer	Amidyala village	22/5/15
42	Eswar Swamy (M)	Farmer	Amidyala village	22/5/15
43	Mahesh (M)	Farmer	Amidyala village	22/5/15
44	Abdul Basheer (M)	Farmer	Amidyala village	22/5/15
45	Hanumanth Naidu	Farmer	Amidyala village	22/5/15

R Singh

Sr. No.	Person Name	Designation	Village/township/local govt. institution	Date
46	Suresh (M)	Farmer/Labour	Amidyala Village	22/5/15
47	Ram (M)	Agri labour	Amidyala Village	22/5/15
48	Sambayya (M)	Agri labour	Amidyala Village	22/5/15
49	Narasimha (M)	Agri labour	Amidyala Village	22/5/15
50	Satyamurthy yadav (M)	Agri labour	Amidyala Village	22/5/15
51	Raj shekhar (M)	Dy. Tehsildar	Mandal - Uravakonda	22/5/15
52	D. Mathu Swamy (M)	Sr Clerk	Tehsil office Uravakonda	22/5/15
53	Adam Khan (M)	Sr. Accountant Agri	Uravakonda mandal	22/5/15
54	Suresh Babu (M)	Agriculture officer	Uravakonda mandal	22/5/15
55	Vijay Balaram (M)	Sr. Assistant	Sub Registar office Uravakonda mandal	22/5/15
56	Rathi (M)	Data operator	DFO office Anantapur	23/5/15
57	P S. Raghavendra (M)	D.F.O	Anantapur	23/5/15
58	Gangadhara Reddy (M)	Asst Director	Archaeology Dept. Anantapur	23/5/15
59	K. Raman Reddy (M)	Superintendent	District watershed management Agency Anantapur	23/5/15
60	I. Nagamma (F)	Sarpanch	Vyasapuram Village	23/5/15
61	Muramurthy Swamy (M)	Sarpanch Addl charge	Vyasapuram Village	23/5/15
62	Lakshamma (F)	Ward member	Vyasapuram)	23/5/15
63	Kalthamma (F)	Ward member	Vyasapuram	23/5/15
64	Tikkanna (M)	farmer	Vyasapuram	23/5/15
65	Tipendra (M)	farmer	Vyasapuram	23/5/15
66	Veerangada (M)	farmer	Vyasapuram	23/5/15
67	Gangi Reddy (M)	farmer	Vyasapuram	23/5/15

P Singh

Sr. No.	Person Name	Designation	Village/township/local govt. institution	Date
68.	Kanyaka (M)	Sarpanch	N. Hanamapuram Village	23/5/15
69.	P. Timappa (M)	Ex Sarpanch	N. Hanamapuram Village	23/5/15
70.	H. Kattamma (F)	ward member	N. Hanamapuram Village	23/5/15
71	G. Hanumantha (M)	farmer	N. Hanamapuram	23/5/15
72	N. Ravi (M)	farmer	N. Hanamapuram	23/5/15
73	B. Lakpa (M)	farmer	N. Hanamapuram	23/5/15
74	D. Lala Swamy (M)	farmer	N. Hanamapuram	23/5/15
75	K. Sanappa (M)	farmer	N. Hanamapuram	23/5/15
76	Sanjukta Sarkar (F)	Environment Expert	ARCADIS Noida	23/5/15
77	D. Sunga (F)	Environment Expert	ARCADIS Hyderabad	23/5/15
78	Dhirendra Singh (M)	Social Expert	ARCADIS, Noida	23/5/15

ANNEXURE VIII

VILLAGE WISE AMENITIES AS PER CENSUS 2001

Sr. No.	Village	Educational Institution	Health Facilities	Drinking water supply	Communication (PO&PH)	Transportation (Bus & Rail)	Approach Road	Power Supply
District: Anantapur								
Tehsil: Uravakonda, Kanekal								
1	Nimbagal	P(1), M(1), SS(1)	HSC(1)	HP, TPW	PO, PH(15)	BS	APR	ED, EA
2	Renimakulapalle	P(1)		HP, TPW	PO	BS	APR	ED, EA
3	Amidala	P(2), M(1), SS(1)	HSC (1)	HP, TPW	PO	BS	APR	ED, EA
4	Chinna Musturu	P(1)	HSC (1)	HP, TPW	PO, PH(6)	BS	APR	ED, EA
5	Indravathi	P(1)		HP, TPW		BS	APR	ED, EA
6	Raketla	P(2), M(1)	HSC (1), PNH (1)	HP, TPW	PO	BS	APR	ED, EA
7	Vyasapuram	P(1)	PNH (1)	HP, TPW	PO	BS	APR	ED, EA
8	Pedda Musturu	P(1), M(1), SS(1		HP, TPW	PO, PH(7)	BS	APR	ED, EA
9	Mopidi	P(3), M(1)		HP, TPW	PO, PH(1)	BS	APR	ED, EA
10	Nerimetla	P(1), M(1), SS(1	HSC (1)	HP, TPW		BS	APR	ED, EA
11	Rayampalle	P(1)		HP, TPW	PO	BS	APR	ED, EA
12	Lathavaram	P(2)		HP, TPW	PO, PH(1)	BS	APR	ED, EA
13	Meenahalli	P(1)		HP, TPW, TBW		BS	APR	ED, EA

Sr. No.	Village	Educational Institution	Health Facilities	Drinking water supply	Communication (PO&PH)	Transportation (Bus & Rail)	Approach Road	Power Supply
14	N.Hanumapuram	P(1), M(1)	HSC (1), CWC 2)	HP, TPW, TW	PO, PH(1)	BS	APR	ED, EA
15	Bidurukontham	P(1)		HP, TPW, TW		BS	APR	ED, EA
16	Garudachedu	P(2)	HSC (1), DIS(1)	HP, TPW, TW	PO, PH(1)	BS	APR	ED, EA
17	Thumbiganur	P(2)	HSC (1), CWC (2)	HP, TPW, TW	PH(1)	BS	APR	ED, EA
18	Sollapuram	P(1), M(1)	CWC (1)	HP, TPW	PO	BS	APR	ED, EA

Source: census 2011

ANNEXURE IX

PROTECTED MONUMENTS SITES IDENTIFIED IN ANATAPUR DISTRICT

PROTECTED MONUMENTS
IN
ANANTHAPUR DISTRICT UNDER THE **A.P.** ANCIENT AND HISTORICAL **MONUMENTS** AND **ARCHAEOLOGICAL SITES** AND REMAINS **ACT (VII OF 1960)**

S.No	Name of the Monument	Village	Mandal	Period	G.O. Ms. No.	R. Dis No.
1.	Sri Ranganayani Fort (Belongs to Renati chola period)	Patnam	Kadiri	10th C.A.D	986 03-05-1968	3490/67
2.	Gaganmahal (Summer palace of Vijayanagara Raja's)	Penukonda	Penukonda	15th C.A.D	De-protected by A.S.I.	H1/746/64
3.	Hill fort known as Pallikonda Kambam Narasimhaswamy Konda, Rallagutta	Konakondla	Vajrakaruru	15th – 16th C.A.D.	1155 07-07-1972	E1/4890/66
4.	Jaina temple	Kambadur	Kambadur	16th C.A.D	456 15-04-1976	H1/4556/75
5.	Sri Kona Ranganatha swamy temple	Allurkona	Tadipatri	16th C.A.D	980 04-06-1976	H1/2920/73
6.	Sri Chennakesava swamy temple	Chukkaluru	Tadipatri	16th C.A.D	980 04-06-1976	H1/2920/73
7.	Sri Chennakesava swamy temple	Patnam	Kadiri	16th C.A.D	980 04-06-1976	H1/2920/73
8.	Akkammavarigudi	Kambaduru	Kambaduru	16th C.A.D	1728/76 12-10-1976	E1/5516/74 or E1/5515/74
9.	Laxminarasimha swamy temple	Kadiri	Kadiri	16th C.A.D	2068 17-12-1976	7218/75
10.	Pasupathinatha temple	Chadam (Bondakal)	Rayadurg	16th C.A.D	1768 02-12-1977	E1/9536/75
11	Jain Basadi temple	Amarapuram	Amarapuram	6th C.A.D.	480 31-03-1978	E1/10042/76

S.No	Name of the Monument	Village	Mandal	Period	G.O. Ms. No.	R. Dis No.
12	Chennakesava swamy temple	Kodavakallu	Putluru	16th C.A.D	484 30-03-1978	E1/2879/76
13	Maheswaraswamy temple	Sivaram	Amarapuram	16th C.A.D	479 30-03-1978	E1/9308/73 or 79
14	Kundurpi Fort	Kundurpi	Kundurpi	13th C.A.D	112 27-01-1979	E1/9308/73
15	Bheemalingeswara swamy temple	Gadekallu	Vidapanakallu	16th C.A.D	1210 24-07-1979	
16	Ancient Well	Nittur	Yadiki	16th C.A.D.	1739 12-11-1979	555/78
17	Chennakesava swamy temple	Kummeta	Peddapappuru	16th C.A.D	1891 27-12-1977	E1/9308/73
18	Sri Lakshmi Narsimha swamy temple	Penna Ahobilam	Uravakonda	16th C.A.D	112 or 117 27-01-1979	E1/9050/77
19	Kodandarama swamy temple	Kundurpi	Kundurpi	13th C.A.D	112 27-01-1979	E1/9308/73
20	Narsimha swamy temple	Kundurpi	Kundurpi	13th C.A.D	112 27-01-1979	E1/9308/73
21	Veerabhadra swamy temple	Kundurpi	Kundurpi	16th C.A.D	112 27-01-1979	E1/9308/73
22	Anjaneyaswamy temple	Kundurpi	Kundurpi	16th C.A.D	112 27-01-1979	E1/9308/73
23	Ballepalli matam and Kundurpi Fort	Kundurpi	Kundurpi	16th C.A.D.	112 27-01-1979	E1/9308/73
24	Lakshmichennakesava swamy temple	Yadiki	Yadiki	16th C.A.D	512 03-04-1978	

S.No	Name of the Monument	Village	Mandal	Period	G.O. Ms. No.	R. Dis No.
25	Anjaneya swamy temple	Budvagavi	Uravakonda	16th C.A.D	80 17-01-1978	E1/9308/73
26	Jaina Matha temple	Ratnagiri	Rolla	16th C.A.D	1300 20-08-1981	H1/9995/78
27	Sri Kodanda Rama swamy temple	Singanamala	Singanamala	16th C.A.D	1296 20-08-1981	5691/80
28	Ash mounds	Budidgaddapalli	Gorantla	25th C.B.C	739 27-04-1985	H1/401/80
29	Malle Obula Narsimha swamy temple	Pampanuru	Atmakuru	16th C.A.D	941 05-06-1985	H1/2183/84
30	Mallappakonda Site	Hulikallu	Kalyandurg	25th C.B.C.	736 27-04-1985	
31	Patigadda Site (Early Historic site)	Sasanikota	Paragi	10th C.B.C.	854 08-06-1984	H1/8007/80
32	Megalithic cist burials	Mudgal	Kalyandurg	10th C.B.C.	484 15-04-1988	H1/997/80
33	Samadhi of Yogi Vemana (The great poet Yogi)	Katarupalli	Gandlapenta	18th C.A.D.	80 27-01-1995	H1/309/90
34	Gangaraju Kota (Gootibayalu) (Built by Sri Gangaraju Palegar of Vijayanagara)	Thimammamarrima nu	Nambulapulak unta	16th C.A.D.	545 15-04-1995	H1/600/91
35	Sri Ranganatha swamy temple	Vepulaparthi	Brahmasamudr am	16th C.A.D	291 18-02-1978	
36	Rasasiddula Gutta	Konakondla	Vajrakaruru	6th C.B.C.	1155 07-07-1972	
37	Kambhjam Narsimha swamy konda	Konakondla	Vajrakaruru	16th C.A.D.	1155 07-07-1972	

S.No	Name of the Monument	Village	Mandal	Period	G.O. Ms. No.	R. Dis No.
38	Sri Ramalingeswara swamy temple	Budagavi	Uravakonda	16th C.A.D	80 17-01-1978	E1/9308/73
39	Ancient Hill (Neolithic Rock Paintings)	Budagavi	Uravakonda	25th C.B.C.	80 17-01-1978	E1/9308/73
40	Sri Varagiri Venkata Ramana Swamy temple	Bukkapatnam	Bukkapatnam	15th -16th C.A.D	31 21-02-2012	
41	Sri Chennakesava Swamy temple	Komali	Tadipatri	14th-15th C.A.D	38 23-02-2012	
42	Sri Ranganatha Swamy temple	Srirangapuram	Beluguppa	16th C.A.D	28 16-02-2012	
43	Sri Chennakeseva Swamy temple	Pullalarevu	Raptadu	18th C.A.D	41 05-03-2012	
44	Sri Chennakesava Swamy temple	Kallumadi	Singanamala	16th C.A.D.	26 26-02-2013	
45	Sri Sangameswara Swamy temple	Chennarayapatnam	Bathalapalli	16th C.A.D.	28 27-02-2013	
46	Sri Chenna Kesava Swamy Temple	85 Nittoor	Yellanuru		47 13-8-2013	

Source: Archeological Department, Anantapur

ANNEXURE X

MICRO WATERSHED PROGRAM IN PROJECT AREA VILLAGES

IWMP Scheme funds position

IWMP-2010-11 (Batch-II)

Sl. No	Micro watershed	Project Amount	Area in Ha	NRM Particulars			4% EPA Particulars			REMARKS
				NRM	Already sanctioned amt	Balance to be sanctioned	4% EPA	Already sanctioned	Balance to be sanctioned	
	Uravakonda									
	Amidala									
1	Amidala	111.0000	925.00	62.16000	27.04661	35.11339	4.44000	4.29790	0.14210	
2	Chinnamustury	43.5600	363.00	24.39360	24.30863	0.08497	1.74240	1.73900	0.00340	
3	Lathavaram	66.0000	550.00	36.96000	36.76646	0.19354	2.64000	2.49800	0.14200	
4	Mopidi	98.2800	819.00	55.03680	29.87647	25.16033	3.93120	3.76305	0.16815	
5	Pedda Mustury	45.0000	375.00	25.20000	7.67191	17.52809	1.80000	1.73900	0.06100	
6	Shaiksanipalli	131.2800	1,094.00	73.51680	66.69420	6.82260	5.25120	5.21350	0.03770	
	Total	495.1200	4,126.00	277.26720	192.36428	84.90292	19.80480	19.25045	0.55435	
	Raketla									
7	Pedda Kowkuntla	285.1500	1,901.00	159.68400	37.63833	122.0456	11.40600	1.10196	10.30404	
8	Raketla	183.0000	1,220.00	102.48000	-	102.4800	7.32000	-	7.32000	
9	Raketla Thanda	135.3000	902.00	75.76800	-	75.76800	5.41200	-	5.41200	

SL No	Micro watershed	Project Amount	Area in Ha	NRM Particulars			4% EPA Particulars			REMARKS
				NRM	Already sanctioned amt	Balance to be sanctioned	4% EPA	Already sanctioned	Balance to be sanctioned	
10	Y.Ramapuram	115.6500	771.00	64.76400	29.99524	34.76876	4.62600	0.91830	3.70770	
	Total	**719.1000**	**4,794.00**	402.69600	67.63357	335.06243	28.76400	2.02026	26.74374	
	Grand Total	1,214.22000	8,920.00	679.96320	259.99785	419.96535	48.56880	21.27071	27.29809	

ANNEXURE XI

DETAILS OF NOISE MODELLING RESULTS FOR THE IDENTIFIED WTGs

Project:
Ostro_Nimbagullu

Licensed user:
Senes Consultants India Pvt. Ltd,
3rd Floor, Logix techno park, tower B, sector 127, Noida
IN-201304 Noida
01204368426

Calculated:
7/30/2015 5:18 PM/3.0.619

DECIBEL - Main Result

Noise calculation model:
ISO 9613-2 General
Wind speed:
6.2 m/s
Ground attenuation:
General, terrain specific
Ground factor for porous ground: 0.0
Meteorological coefficient, C0:
0.0 dB
Type of demand in calculation:
1: WTG noise is compared to demand (DK, DE, SE, NL etc.)
Noise values in calculation:
All noise values are mean values (Lwa) (Normal)
Pure tones:
Pure and Impulse tone penalty are added to WTG source noise
Height above ground level, when no value in NSA object:
0.0 m Don't allow override of model height with height from NSA object
Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:
0.0 dB(A)

Scale 1:250,000
New WTG
Noise sensitive area

WTGs

	Easting	Northing	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Noise data Creator	Name	Wind speed	Status	LwA,ref	Pure tones
			[m]					[kW]	[m]	[m]			[m/s]		[dB(A)]	
1	728,267	1,646,251	460.8	GAMESA G97 2000 97.0 IO I...	Yes	GAMESA	G97-2,000	2,000	97.0	104.0	USER	Level 0 - Estimated - - 07-2012	6.2	User value	105.8	No h
2	728,196	1,646,533	458.8	GAMESA G97 2000 97.0 IO I...	Yes	GAMESA	G97-2,000	2,000	97.0	104.0	USER	Level 0 - Estimated - - 07-2012	6.2	User value	105.8	No h
3	740,451	1,643,284	481.9	GAMESA G97 2000 97.0 IO I...	Yes	GAMESA	G97-2,000	2,000	97.0	104.0	USER	Level 0 - Estimated - - 07-2012	6.2	User value	105.8	No h
4	728,641	1,644,848	467.7	GAMESA G97 2000 97.0 IO I...	Yes	GAMESA	G97-2,000	2,000	97.0	104.0	USER	Level 0 - Estimated - - 07-2012	6.2	User value	105.8	No h

h) **Generic octave distribution used**

Calculation Results

Sound Level

Noise sensitive area

No.	Name	Easting	Northing	Z	Demands Imission height	Demands Noise	Sound Level From WTGs	Sound Level Distance to noise demand	Demands fulfilled ? Noise
				[m]	[m]	[dB(A)]	[dB(A)]	[m]	
A	Noise sensitive area: Demands defined in calculation setup. (1)	740,639	1,643,271	478.9	0.0	55.0	50.4	117	Yes
B	Noise sensitive area: Demands defined in calculation setup. (2)	742,149	1,643,085	480.4	0.0	55.0	29.0	1,636	Yes
C	Noise sensitive area: Demands defined in calculation setup. (3)	728,325	1,644,781	454.6	0.0	55.0	46.1	254	Yes
D	Noise sensitive area: Demands defined in calculation setup. (4)	728,024	1,646,402	449.2	0.0	55.0	51.3	118	Yes
E	Noise sensitive area: Demands defined in calculation setup. (5)	726,568	1,643,841	459.7	0.0	55.0	28.2	2,230	Yes
F	Noise sensitive area: Demands defined in calculation setup. (6)	726,128	1,644,984	452.1	0.0	55.0	28.9	2,443	Yes

Distances (m)

	WTG			
NSA	1	2	3	4
A	12726	12863	188	12100
B	14239	14373	1709	13622
C	1471	1756	12219	323
D	286	216	12813	1676
E	2949	3146	13857	2304
F	2539	2645	14286	2420

ANNEXURE XII

DETAILS OF SHADOW FLICKER MODELLING RESULTS FOR THE WTGs

Project:
Ostro_Nimbagullu

Licensed user:
Senes Consultants India Pvt. Ltd,
3rd Floor, Logix techno park, tower B, sector 127, Noida
IN-201304 Noida
01204366426

Calculated:
7/29/2015 6:09 PM/3.0.619

SHADOW - Main Result

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

The calculated times are "worst case" given by the following assumptions:
- The sun is shining all the day, from sunrise to sunset
- The rotor plane is always perpendicular to the line from the WTG to the sun
- The WTG is always operating

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: Elevation Grid Data Object: Ostro_Nimbagullu_EMDGrid_
Obstacles used in calculation
Eye height: 1.5 m
Grid resolution: 10.0 m

All coordinates are in
UTM (north)-WGS84 Zone: 43

Scale 1:200,000
New WTG
Shadow receptor

WTGs

	Easting	Northing	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
1	728,267	1,646,251	460.8	GAMESA G97 2000 97.0 IOI hub: 104.0 m ...	Yes	GAMESA	G97-2,000	2,000	97.0	104.0	1,500	0.0
2	728,196	1,646,533	458.8	GAMESA G97 2000 97.0 IOI hub: 104.0 m ...	Yes	GAMESA	G97-2,000	2,000	97.0	104.0	1,500	0.0
3	740,452	1,643,284	481.9	GAMESA G97 2000 97.0 IOI hub: 104.0 m ...	Yes	GAMESA	G97-2,000	2,000	97.0	104.0	1,500	0.0
4	728,642	1,644,845	467.7	GAMESA G97 2000 97.0 IOI hub: 104.0 m ...	Yes	GAMESA	G97-2,000	2,000	97.0	104.0	1,500	0.0

Shadow receptor-Input

No.	Easting	Northing	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
A	728,325	1,644,781	463.9	1.0	1.0	1.0	0.0	90.0	"Green house mode"
B	728,024	1,646,402	460.6	1.0	1.0	1.0	0.0	90.0	"Green house mode"
C	740,644	1,643,271	485.1	1.0	1.0	1.0	0.0	90.0	"Green house mode"

Calculation Results

Shadow receptor

Shadow, worst case

No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
A	103:36	128	1:05
B	108:02	101	1:17
C	220:23	198	1:34

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
1	GAMESA G97 2000 97.0 IOI hub: 104.0 m (TOT: 152.5 m) (1)	108:02	
2	GAMESA G97 2000 97.0 IOI hub: 104.0 m (TOT: 152.5 m) (2)	0:00	
3	GAMESA G97 2000 97.0 IOI hub: 104.0 m (TOT: 152.5 m) (3)	220:23	
4	GAMESA G97 2000 97.0 IOI hub: 104.0 m (TOT: 152.5 m) (4)	103:36	

ANNEXURE XIII

ENVIRONMENT POLICY & H&S POLICY OF OSTRO

OSTRO

ENVIRONMENTAL POLICY

We, at Ostro, are committed to safeguarding our environment. We believe that our operations have a limited environmental impact, which is an integral part of the value we deliver to our stakeholders. This policy demonstrates Ostro's commitment to sustainable development through application of best environmental practices in our business. We are committed-

- *To adopt a systematic approach for mitigating the limited environmental impacts of our operations.*
- *To voluntarily establish, maintain and practice a certifiable environmental management system (ISO: 14001).*
- *To ensure that all our activities are in compliance with applicable environmental regulations.*
- *To provide training and resources to accomplish our environmental commitments.*
- *To make efficient use of resources required for our operations, dispose and recycle waste from our operations in an environmentally sound manner.*

This policy is applicable to all business and project related activities of Ostro Energy. All employees and contractors of Ostro are required to adhere with this policy.

Ranjit Gupta-Chief Executive Officer
Date: May 2015

OSTRO

HEALTH AND SAFETY POLICY

We, at Ostro, firmly believe that health & safety of our employees and contractors is of utmost importance. Ostro is committed to practice, promote and inculcate best possible standards of health and safety in its business. We believe that Safety is Everyone's Responsibility and Line Management has a leadership role in implementation of, and ensuring compliance with HSE policies and standards. In pursuit of our belief and commitment, we strive -

- *To ensure that all employees and contractors work in safe working conditions.*
- *To identify and eliminate all risks by taking adequate preventive measures.*
- *To provide health and safety training to all relevant persons.*
- *To establish, maintain and practice a certifiable occupational health and safety management system (OHSAS: 18001).*
- *To ensure that all activities are in compliance with applicable health and safety regulations.*

Ostro is committed to develop a culture of safety through active leadership at all levels and making sure that resources are made available to implement this policy.

This policy is applicable to all business and project related activities of Ostro Energy. All employees and contractors of Ostro are required to adhere to this policy.

Ranjit Gupta-Chief Executive Officer
Date: January 2015

ANNEXURE XIV

WORK PERMIT-GAMESA

Special Risk Work Permit

Gamesa

SRWP Code: DP-022

Organizational Unit: G. SARAVANAN

GENERAL DATA

Name: G SARAVANAN		Company: (1)	PRV		
Name and Position of GCT Supervisor: (1)	G. SARAVANAN - ENGINEER				
Proposed execution date:	3.2.15	Estimated duration	8 HRS	Participating personnel (nr.)	6

Work description: E. Equipment earthing work

Work Area: GRCOP-03

Affected work equipment: NIL

RISK ANALYSIS

WORK WITH SPECIAL RISK

- ☑ Work at heights
- ☐ Work in explosive atmospheres
- ☐ Load elevation operations
- ☑ Work with electrical risk
- ☐ Use of hazardous chemicals
- ☐ Intervention in hazardous equipment
- ☐ Work in confined spaces
- ☐ Hot work

Others:

WORK EQUIPMENT AND CHEMICALS

- ☑ Welding / cutting equipment
- ☐ Pressurised equipment
- ☑ Ladders
- ☐ Scaffolding and platforms
- ☐ Mobile maintenance equipment
- ☐ People elevation equipment
- ☐ Heavy machinery
- ☐ Cranes
- ☐ Flammable products
- ☐ Toxic products

Others:

OPERATIONAL CONTROLS

APPLICABLE INSTRUCTIONS

- ☑ Work at heights
- ☐ Mobile equipment safety
- ☐ Load elevation
- ☑ Electrical risk
- ☐ Chemical storage
- ☐ De-energisation, signals and testing (LOTOT)
- ☐ Work in confined spaces
- ☐ Others (indicate)

AUTHORIZATIONS

- ☐ Not applicable
- ☑ Authorised workers
- ☐ Qualified workers

WORK SURVEILLANCE

- ☑ Yes
- ☐ Not applicable

Remarks:

SPECIFIC MEASURES

SPECIFIC H&S PLAN

- ☑ N/A
- ☐ Carried out

H&S Approval (Date and signature)

OTHER SAFETY MEASURES

PERSONAL PROTECTION EQUIPMENT (PPEs)

SKULL FACE AND EYES

- ☑ Safety helmet
- ☐ Face shield
- ☐ Universal frame glasses/goggles
- ☐ Integral frame glasses/goggles
- ☑ Welding shield

AUDITORY APPARATUS

- ☐ Ear protection

RESPIRATORY TRACT

- ☐ Self-filtering mask
- ☐ Half mask
- ☐ Full mask

Type of filter:

- ☐ Semi self-contained equipment
- ☐ Self-contained equipment

EXTREMITIES

Protective gloves against:

- ☐ Mechanical attacks
- ☐ Chemical attacks
- ☐ Attacks of an electrical origin
- ☐ Attacks of a thermal origin
- ☑ Safety footwear
- ☐ Rubber boots

FALLS FROM A HEIGHT

- ☐ Sliding fall-arrest devices
- ☑ Harnesses
- ☐ Fastening belts
- ☐ Fall-arrest dev. with damper

FULL BODY PROTECTION

- Protective clothing
- Signal accessories and clothing

Others:

AUTHORISATIONS AND VERIFICATIONS

SPECIAL RISK WORK AUTHORIZATION

Approver's signature: V. Balamurugan — Name / Title

The work execution is authorised after having established and verified the safety measures indicated in this work permit

Permit validity — From: Date: 3.2.15 Time: 10 AM — To: Date: 3.2.15 Time: 6.20 PM

VERIFICATION OF SAFETY CONDITIONS

Signature of Work Head / GCT Supervisor: G. Saravanan — Name / Title

The safety measures indicated have been established and verified so the work can be begun.

Date: 3.2.15 Time: 10 AM

Understood and agreed Contractor (1): Rajkumar

WORK PERMIT CLOSE

Approver's signature: V. Balamurugan — Name / Title

Date and time of closure: Date: 03.02.15 Time: 06.45 PM

EXTENSION AUTHORISATION ☐ Applicable ☐ NOT applicable

Approver's signature — Name / Title

New permit validity — To: Date: Time:

Note (1): Complete in case of work carried out by Contractors

y Conditions Checklist

Gamesa

PTRE Code:

PERSONNEL	NAME [1]	COMPANY	AUTHORIZATIONS
	Rol Sox Tejr attached	PRV	PRV

Note (1): If necessary, attach list of personnel.

OPERATIONAL CONTROLS AND SAFETY MEASURES

GENERAL MEASURES

	YES	N/A		YES	N/A		YES	N/A
The applicable operational control instructions are known	☑	☐	The correct PPE is available	☑	☐	Work area signalled	☐	☐
The specific H&S Plan is known	☑	☐	Emergency measures prepared	☑	☐	Work area marked / delimited	☑	☐
Information has been given about the general risks of the area	☑	☐	The necessary authorizations have been given	☑	☐	The Preventive Resources have been named	☑	☐

Other verifications made:

Note (2): In case of change of shift, must be reflected in the incidents paragraph and record in the same the data and signature of the preventive resources.

APPOINTMENT PREVENTIVE RESOURCES [2]

Name: Raskumar

Company: PRV

G. Pais Jr. Signed. Preventive Resources

WORK AT HEIGHTS

	YES	N/A		YES	N/A		YES	N/A
Auxiliary equipment: ladders, scaffolding	☑	☐	Rigid opening protection elements	☐	☐	Use of nets	☐	☐
Mobile people elevation platforms	☐	☐	Use of fall-arrest devices	☑	☐	Wind speed	☐	☐
Use of anchor devices	☐	☐	Use of lanyard	☐	☐		☐	☐

Other verifications made:

ELECTRICAL RISK

	YES	N/A		YES	N/A		YES	N/A
Voltage-free verification	☑	☐	Verify single-wire diagram	☐	☐	Circuit-breakers	☐	☐
Conductor earthing	☑	☐	Section control and power	☐	☐	Use of safety voltage	☑	☐
Use of insulating stool	☑	☐	Lock with padlock	☐	☐	Installation of insulating screens	☐	☐
Use of insulating poles	☐	☐	Visible cut	☐	☐		☐	☐

Other verifications made::

LOAD ELEVATION

	YES	N/A		YES	N/A		YES	N/A
Pedestrian/vehicle traffic condition	☐	☐	Crane well placed	☐	☐	Qualified crane operator	☐	☐
Crane elements condition (cable, structure...)	☐	☐	Stabilizers extended	☐	☐	Authorized signaller and strobe operator	☐	☐
Load stability	☐	☐	Manoeuvring space verified	☐	☐	Communication means (walkie-talkies...)	☐	☐
Use of certified appliances	☐	☐	Maximum height available verified	☐	☐	Aid to guide load	☐	☐
Elevation elements (slings, chains, rockers...)	☐	☐	Load-hook space verified	☐	☐	Weather conditions	☐	☐

Other verifications made:

CONFINED SPACES

	YES	N/A		YES	N/A		YES	N/A
Auxiliary equipment (ladders, lighting...)	☐	☐	Wash confined space	☐	☐	Block intake valves	☐	☐
Adequate ventilation	☐	☐	Block energy sources	☐	☐	Communication means (walkie-talkies...)	☐	☐

Environmental checks: YES ☐ N/A ☐

Gas measuring reference [.....]

PARAMETER	READING	PARAMETER	READING
☐ Level of oxygen O_2 [%]		☐ Explosive gases [% LIE]	
☐ Level of CO [ppm]		☐ Temperature [ºC]	
☐ Hydrogen sulphide (H_2S) [ppm]		☐ Relative humidity [%]	
☐ Others [.....]		☐ Others [.....]	

Other verifications made:

CUTTING/WELDING

	YES	N/A		YES	N/A		YES	N/A
Flammable products away (recommended at least 10 meters)	☑	☐	Holes in floors, ceilings and walls covered (recommended at least in 10 meters)	☑	☐	Cutting and welding equipment in good conditions	☑	☐
Dangerous Works stopped	☑	☐	Suitable Fire extinguishers in the proximity ready to work	☑	☐	Protection of the surrounding with non combustible covers.	☑	☐
Fire Works monitoring planned	☑	☐	Check-up the end of the work/s after 30 min. [3]	☑	☐	Check-up the end of the work/s after 1 hour. [3]	☑	☐

Another checking performed:

Note (3): After the end of the works, will be performed two more punctual verifications to check that in the work area doesn't appear risk of fire.

LOTOT

	YES	N/A		YES	N/A		YES	N/A
Provide personal padlocks	☐	☐	Signaling with personal card	☐	☐	Placement of blank flange	☐	☐
De-energise equipment	☐	☐	Proof of blocked equipment	☐	☐		☐	☐

Other verifications made:

INCIDENTS AND IMPROVEMENT PROPOSALS

Tool Box Talk Register

No 3
Contractor Name: P.R.V Construction P.V.T. LTD

Date: 3/2/2015
Work Description: DT yard welding earthing pits and mesh welding and Tefuel

DP – Foundation & Erection

1. Specific Task risk & Safe Work Practices				2. Availability of ID card/ Vehicle control Card	✓
a. Manual Digging		b. Barricading	✓	3. PPE'S – Helmet / Shoes/ Gloves / Safety Belt	✓
4. Availability & Positioning of clamp (Around 55cm)		5. Rope Condition		8. Handling of Mechanical / Electrical Equipment	✓
6. Tools: Welding (Checking of Tools & Material)	✓			9. Painting Dress	
a. Torque		d. Flashback Arrestor		10. Site cleanliness	✓
b. NRV		e. Generator	✓	11. First Aid	✓
c. Welding Shield with Helmet	✓				
7. Gas cutting Equipment		c. Flashback Arrestor		e. Generator	✓
a. Torque		d. Goggles	✓		
b. NRV					

Remarks: * DG must be earthed
* Use all PPES properly

S.NO	NAME	NATURE OF WORK	SIGNATURE	REMARKS
1	J. Nageswara	Supervisor	J. Nageswara	
2	Manik Hussion	DT yard Earth	मानिक	
3	Pabli Hussion	mesh welding work	पबित्र हुसेन	
4	Chandan	mesh welding "	चांदन	
5	Thapan	"	थापन	
6	Mojibar Rahaman	"	मोजिबर रहमान	
7				
8				
9				
10				
11				
12				
13				

Gamesa Supervisor

Contractor's Supervisors J. Nageswara

ANNEXURE XV

EMERGENCY RESPONSE PLAN

EMERGENCY RESPONSE PLAN

WIND FARM: "Uravukonda "

Author:	Reviewed by:
M.Kaliraj Officer- Safety Date: 10.05.15	DAMODARAN KANDAPERUMAL Dty.Manger Safety Date: 10.05.15
Authorized by:	**Approved by:**
M.C. MalliKarjuneGodwa GM-H&S **Date:** 10.05.15	**A.Nagoorsheik** Area Manager **Date:** 10.05.15

CONTENTS

1. WIND FARM INDENTIFICATION INFORMATION

- WIND FARM NAME: Uravukonda Wind Farm.
- LOCATION: - Uravukonda,AnantapurDIST,Telungana,INDIA.
- CUSTOMER: - **OSTRO Power**
- MODEL AND NUMBER OF MACHINES: - 50 Pieces(Each 2MW capacity) Gamesa G104 type wind turbine generators

2. INFORMATION ON RISKS PERTAINING TO THE WORK CENTRE DECTECTED BY GAMESA

Description	Risk
33KV lines and rural line crossing on Material movement Road Owner: Telungana State Electricity Board	

The condition of the road & surface may change along the length of the road.

OTHER RISKS

- Bomb threat
- Storms
- Traffic
- Civil Disturbance
- Floods
- High Voltage lines
- Agricultural areas
- Fire
- Reptile (Snake bite) bite

3. EMERGENCY ORGANISATION IN THE CENTRE - Uravukonda wind Farm

CHARGE	COMPANY	NAME	CONTACT TELEPHONE
Site Controller	Gamesa India	J.SUBRAMONIAN	7032708040
Incident Controller	Gamesa India	Kaliraj M	09632219940
Communications	Gamesa India	Nagoor sheik A	08008504664

4. EMERGENCY TELE PHONE NUMBER:

EMERGENCY CONTACT NUMBERS FOR TAGUPARTHI WIND FARM			
	DEPARTMENT		
	FIRE BRIGADE Uravakonda	101	08496 – 257099
	AMBULANCE	102/108	
	POLICE STATION Uravakonda	100	08496 – 257033
	HOSPITAL Uravakonda		08496 – 257101
	Mr.J.SUBRAMONIAN SITE MANAGER	7032708040	

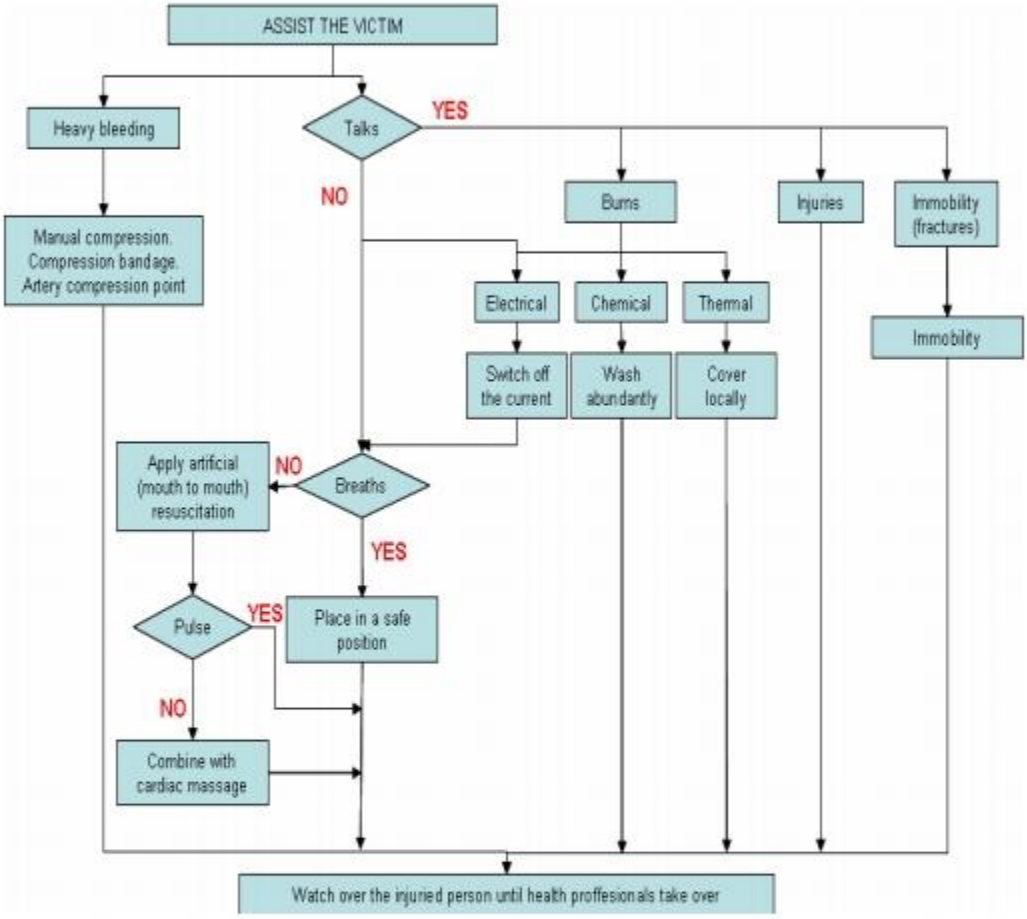
Gamesa	M.KALIRAJ SITE SAFETY	9632219940	

5. Action Diagram in the case of Emergency

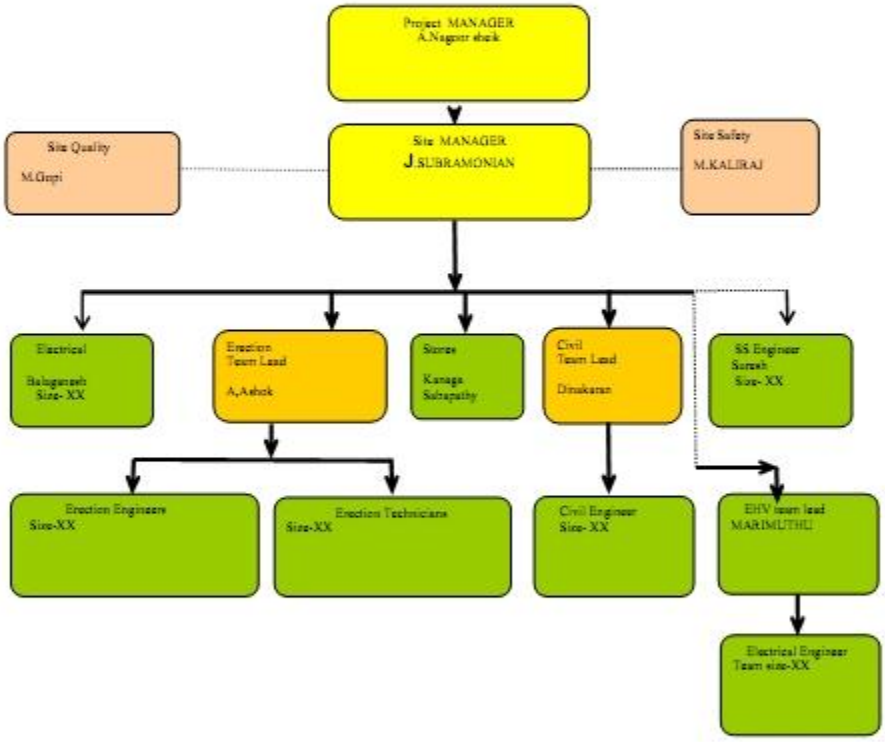
If people are injured, proceed as follows:

ACTION DIAGRAM IN THE CASE OF EMERGENCY

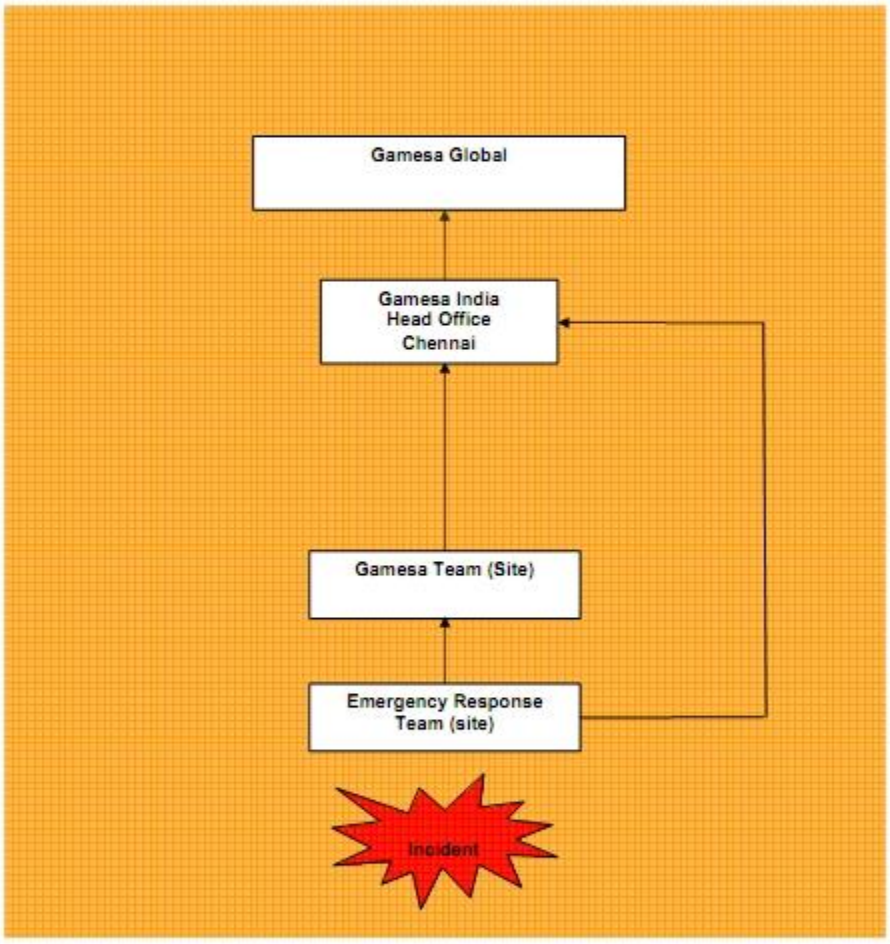
HELPING THE VICTIM


ASSIST THE VICTIM
Heavy bleeding
Talks
YES
NO
Burns
Injuries
Immobility (fractures)
Manual compression. Compression bandage. Artery compression point
Electrical
Chemical
Thermal
Immobility
Switch off the current
Wash abundantly
Cover locally
Apply artificial (mouth to mouth) resuscitation
NO
Breaths
YES
Pulse
YES
Place in a safe position
NO
Combine with cardiac massage
Watch over the injuried person until health proffesionals take over

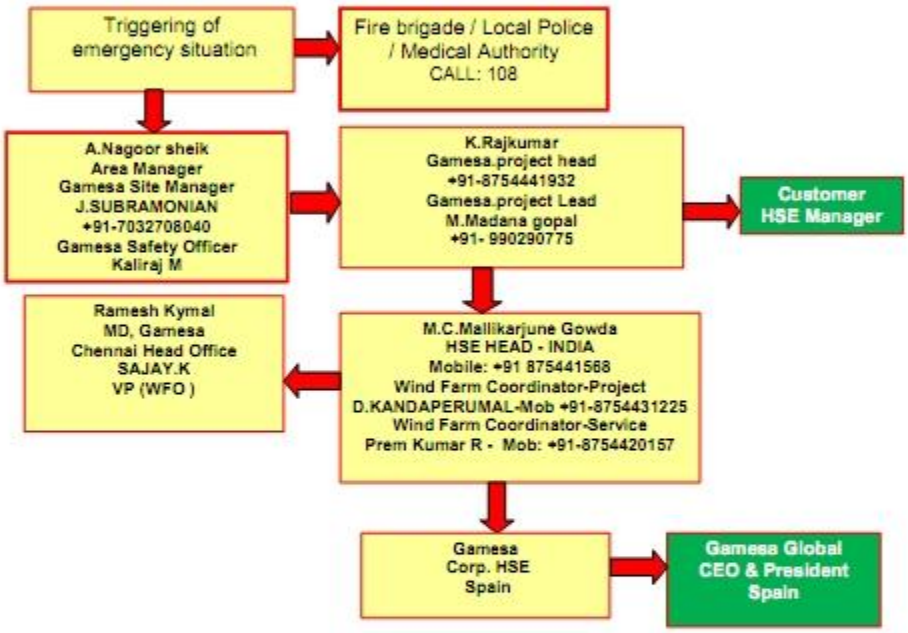
6.0 Uravukonda Site Organisation Chart



7. Emergency Response notification



8. EMERGENCY REPSONSE ACTION



ANNEXURE XVI

Does & Don’t for Black Buck Management

DOs

- The developer should intimate the District Forest Officer about the project activity prior to the starting of the project.
- Awareness programs should be conducted for all contractors and their workers regarding the presence of the species in the region and their conservation status.
- The presence of the antelopes need to be managed both during the construction and operation phase of the project
- The movement of vehicles through access road (day and night time) needs to be monitored constantly for presence of black buck herds in and around the road.
- Signage's showing the antelopes should be placed within the project site and near to the approach roads for generating awareness amongst the vehicle drivers and labors.
- Signages prohibiting the hunting or killing of the antelope should also be placed in and around the project site.
- The construction area about 50 m surrounding a WTG location needs to be temporally barricaded to prevent the antelopes from entering the area while the work is on.
- If pits are dug on the ground for any project activity it should be suitably barricaded and closed permanently after construction so that the animals are prevented from falling in the pit.
- If the construction site is close to any water pit or water channel then special precautions should be taken to keep the antelopes away from the construction site as they may visit the water source for drinking.
- The area around the WTGs should not be used for any other purposes other than the work specified both during and operation phase of the project.
- The WTGs with associated facilities like generator, cables and transformer should be properly fenced to prevent accidental electrocution of the Black bucks.
- About 50 m around the WTGs should be kept free of grasses and shrubs to keep the antelopes away from nearing WTGs.
- During operation phase the security guards should be periodically trained regarding the management of the antelopes around the WTGs.
- Record should be maintained about the presence of the black bucks in and around the project area in all seasons during operation phase.

Don’ts

- Hunting or killing of black bucks is totally prohibited under Wild Life Protection Act and the punishment includes punishable with imprisonment for a term which shall not be less than one year but may extend to six years and also with fine which shall not be less than five thousand rupees.
- No construction activity should start without an awareness program regarding the presence of the antelopes and their management.
- No injury to the antelopes should result due to any sort of construction activities on site.
- The workers should not be allowed to throw stones or wood or any other weapon to ward off the antelopes from the site.
- DG sets without acoustic cover should not be used during project construction phase.
- No pits should be left uncovered near to the WTGs during construction and operation phase of the project.
- Fencing of the WTG area should be properly insulated so that electrocution can be avoided.
- No electric cables should be loosely hanged or left above the ground during operation phase of the project.
- Construction activity should preferably continue during day time and should not be allowed during night time.