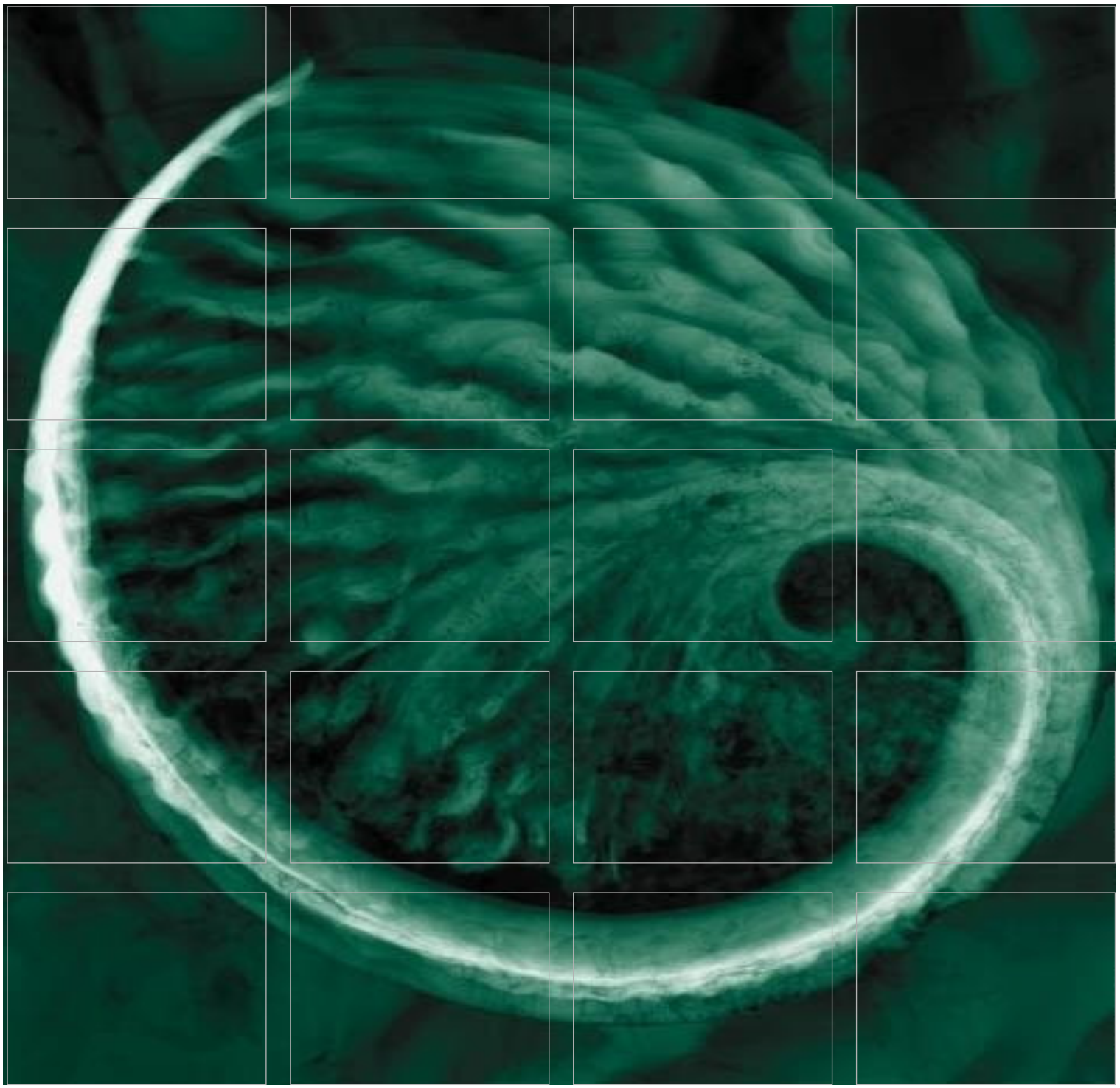

Environmental and Social Impact Assessment (ESIA) of Proposed 100 MW Solar PV Power Project: *Veltoor, Telangana, INDIA*

Transform Sun Energy Private Limited
(A subsidiary of Shapoorji Pallonji Infrastructure Capital Company Private Limited)

Draft Final Report

March 2017

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DRAFT FINAL REPORT

Transform Sun Energy Private Limited (A subsidiary of Shapoorji Pallonji Infrastructure Capital Company Private Limited)

Environmental and Social Impact Assessment (ESIA) of Proposed 100 MW Solar PV Power Project: Veltoor, Telangana, INDIA

3 March 2017

Reference # 0382236/ I12219

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ABBREVIATIONS

AC	Alternating Current
BC	Backward Cast
BOD	Biochemical Oxygen Demand
CGWB	Central Ground Water Board
CPCB	Central Pollution Control Board
CPR	Common Property Resources
CUM/day	Cubic meter /day
DC	Direct Current
DEM	Digital Elevation Map
DG	Diesel Generator
EC	Electrical conductivity
EHS	Environmental Health and Safety
EPC	Engineering Procurement and Construction
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
GSS	Gird Sub Station
IEC	International Electro technical Commission
IFC	International Finance Corporation
IMD	India Meteorological Department
IREDA	Indian Renewable Energy Development Agency Limited
KL	Kilo Litter
Km	Kilometre
KVA	Kilo Volt Ampere
kV	Kilo Volt
L	Litter
LT	Low Tension
MPPT	Maximum Power Point Tracking
MVA	Mega Volt Amp
MW	Mega Watt
NABL	National Accreditation Board for Laboratory
NFPA	National Fire Protection Authority
NH	National High Way
NOC	No objection Certificate
O&M	Operation and Maintenance
OC	Other Cast
PCU	Passenger Car Unit
PPA	Power Purchases Agreement
PSS	Pooling Sub Station
PUC	Pollution under Control
PV	Photovoltaic
ROW	Right of Way
S&WPL	Starling and Wilson Private Limited
SC	Schedule Cast

SECI	Solar Energy Corporation of India
SPP	Solar Power Plant
SPV	Special Purpose Vehicle
ST	Schedule Tribe
TDS	Total Dissolve Solid
TSEPL	Transform Sun Energy Private Limited
TSPCB	Telangana State Pollution Control Board
TSSPDCL	Telangana State Southern Power Distribution Company Limited
VRO	Village Revenue Officer

1 INTRODUCTION

1.1 PRELUDE

Shapoorji Pallonji Infrastructure Capital Company Pvt. Ltd. (hereinafter referred to as '*SP Infra*" or '*Company*'), was incorporated in 1997 by Shapoorji Pallonji Group, with the vision of developing world class infrastructure assets. The company is exploring opportunities in the renewable energy sector in segments such as solar and wind. The company is currently developing a 100 MW Solar PV Project in Mahbubnagar District in the State of Telangana, India (henceforth referred to as '*Project*'). A Special Purpose Vehicle (SPV) has been formed for the execution of this Project, which is "Transform Sun Energy Private Limited" (hereinafter referred to as "TSEPL").

The Company has signed an agreement with Starling and Wilson Private Limited (hereinafter referred to as "S&WPL") for development of this Project. S&WPL is responsible for construction and commissioning of the project.

SP Infra intends to undertake an Environmental and Social Impact Assessment (ESIA) for the project in order to understand the environmental and social sensitivities associated with the solar farm and to implement mitigation measures in order to avoid adverse impacts during the Project's lifecycle as well as to meet the prospective lenders' requirement. For this purpose, ERM India Private Limited (ERM) has been commissioned to undertake the ESIA study of the project.

1.2 OVERVIEW OF THE PROJECT

A snapshot of the project has been summarised in ***Table 1.1.***

Table 1.1 100 MW Solar Power Project - a Snapshot

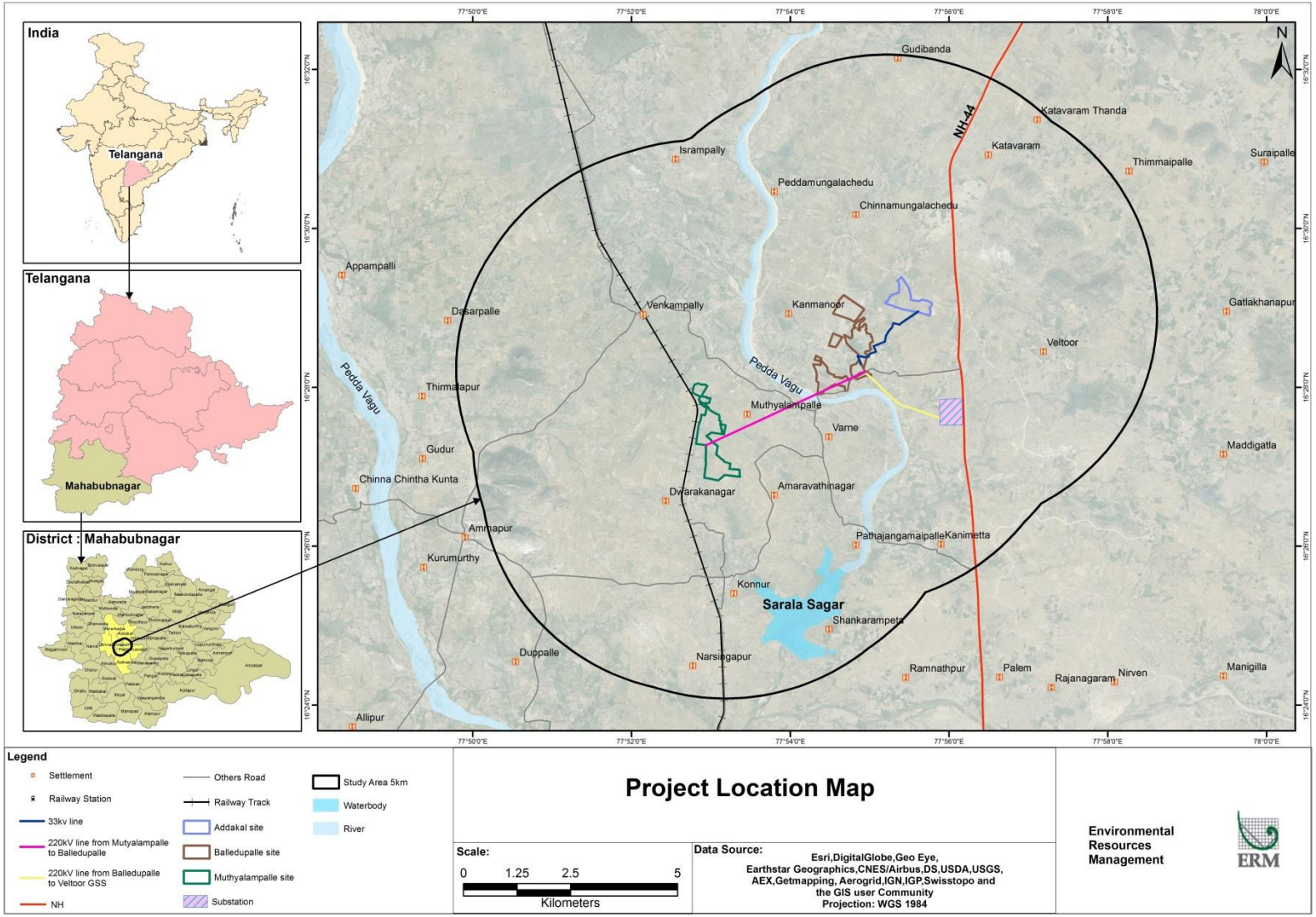
Detail	Description
Location	• 100 MW solar power project is spread into three sites viz. Addakal site, Mutyalampalle site and Balledupalle site. • Addakal site is located in Addakal village in Addakal Mandal; Mutyalampalle site is located in Mutyalampalle village in Devarkadra Mandal (Mutyalampalle) and Balledupalle site is located in Balledupalle village in Peddamandadi Mandal, in Mahbubnagar District in Telangana State. • All three sites are located close by. Mutyalampalle site is approx. 2.17 km from Balledupalle site, whereas Addakal site is approx. 0.52 km from Balledupalle site. • Installed capacity at Addakal site, Mutyalampalle site and Balledupalle site is 12 MW, 54 MW and 34 MW respectively.
PV Modules	• Type of module- Poly-crystalline Silicon; • Number of module- o *Addakal site*- 46,452; o *Mutyalampalle*- 206,241; and o *Balledupalle*- 130,179

Detail	Description
Power Evacuation	Power from the project (Addakal site, Mutyalampalle and Balledupalle) will be evacuated to 400 KV Veltoor substation, located at 1.2 km from Balledupalle.
Land Requirement	Total land measuring approximately 550 acres is required for installing the project, with site office and inverter room, stock yard etc. Area break-up of three sites of the project is as follows: • Addakal site – 67 acres; • Mutyalampalle site – 293 acres; and • Balledupalle site – 190 acres.
Project Status	• Power purchase agreement signed on 25th February 2016 • Land procurement for the project site is completed; • Construction work (site clearance, fencing, piling etc.) under progress; and • Anticipated commissioning date is May, 2017.

Source: Discussion with project team during ERM Site visit from 13th to 15th February 2017

Figure 1.1 highlights the location of the project site, which is further elaborated in **Section 2** of this report.

Figure 1.1 Map Showing Location of the Project Site



1.3 OBJECTIVE AND SCOPE OF THE ASSESSMENT

1.3.1 Objective

The main objective of the ESIA study is to assess social and environmental impacts and develop social and environmental management strategies to comply with the reference framework (***Section 1.3.3***) for the project. The specific objectives are to:

- Screen the project with respect to environmental and social sensitivities and define the scope for ESIA study;
- Develop a baseline environmental and social profile of the Project and its surrounding areas;
- Assess environmental and social impacts from the Project on the established environmental and social baseline;
- Provide mitigation and enhancement measures and prepare an Environmental and Social Management Plan (ESMP); and
- Determine the requirements for any specific additional study.

1.3.2 Scope of Work

In order to meet the objectives mentioned above, the scope of work for the ESIA entails:

- **Regulatory Review:** The study assesses the regulatory framework within which the project will operate by reviewing applicable local, state, national and international environmental and social legislation;
- **Environmental and Social Baseline Generation:** Baseline data collected during the field study with respect to land use, socio-economic profiles and ecology. The baseline supplemented by secondary data obtained through document review with respect to meteorology, soil quality, land-use, geology, geomorphology, hydrology, ecology and socioeconomic profiles in the study area;
- **Identification, prediction and evaluation** of potential aspects and impacts on various environmental and social sensitivities due to the project activities envisaged during land acquisition, construction, operation and decommissioning stages;
- Ascertain whether project footprint or its immediate environment is considered to be ecologically sensitive regarding endangered or protected species;
- Recommendation of appropriate mitigation/enhancement measures for identified environmental, ecological and social impacts;
- Comparison and analysis of alternatives considered for the project with respect to location and power generation technology; and
- Formulation of an Environmental and Social Management Plan (ESMP).

1.3.3 Applicable Reference Framework

ERM has conducted the ESIA study to meet the requirements of the specified framework as follows:

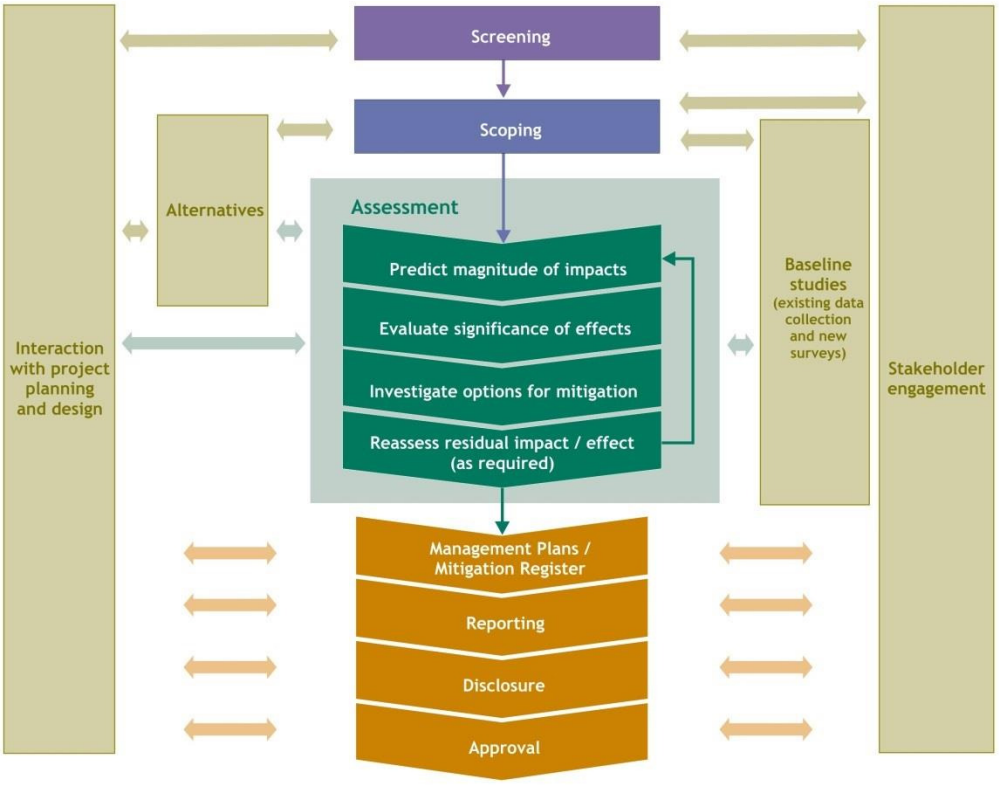
- Applicable local, national and international laws and regulations;
- International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability (2012);
- The applicable IFC/World Bank Guidelines:
    - General Environment, Health and Safety (EHS) Guidelines (2007),
    - Guidelines for Electric Power Transmission and Distribution (2007) [for construction and operation of transmission lines in solar farms].

Note: Solar energy projects in India at present do not require an Environmental Clearance under the EIA Notification, 2006. The ESIA is thus being undertaken as an internal management tool for SP Infra. ERM is not preparing the ESIA for any regulatory requirements; hence, if any deliverable is used for the same purpose, ERM needs to be notified by the Client.

1.4 ESIA METHODOLOGY

The ESIA methodology follows the overall ESIA approach illustrated in ***Figure 1.2***. The ESIA has been undertaken following a systematic process that predicts and evaluates the impacts the project could have on aspects of the physical, biological, socio-economic and cultural environment, and identifies measures that the project will take to avoid, minimise/reduce, mitigate, offset or compensate for adverse impacts; and to enhance positive impacts where practicable. The stages of the ESIA process are described below

Figure 1.2 The ESIA Process



1.4.1 Screening

Screening is conducted through a desktop study of the site prior to the site visit to gain a high level understanding of the project site and to determine applicable impact assessment requirements. The screening for the project is provided in ***Section 4*** of this ESIA report.

1.4.2 Scoping

The main objective of the scoping is to ascertain the environmental issues associated with the project on which the ESIA study will be focused by reviewing the project information and ascertaining likely environmental issues associated with the project activities. This process helps in ensuring that all the relevant issues are identified and addressed in an appropriate manner in the ESIA study.

For this ESIA study, scoping has been undertaken to identify the potential Area of Influence for the project (and thus the appropriate study area), to identify potential interactions between the project and resources/receptors in the Area of Influence and the impacts that could result from these interactions, and to prioritize these impacts in terms of their likely significance. This stage is intended to ensure that the impact assessment focuses on issues that are most important decision-making and stakeholder interest.

The details of scoping exercise are also reported in ***Section 4*** of this ESIA report.

1.4.3 Project Description

In order to set out the scope of the project features and activities, with particular reference to the aspects which can impact on the environment, a project description is prepared. This is based on information as provided by the project proponent. The project description has been provided in ***Section 2*** of this ESIA report.

1.4.4 Baseline Conditions

Environmental baseline data has been collected through baseline surveys of the study area of 5 km distance from project area. Secondary information through literature surveys and consultation with stakeholders was also collected for the study area.

The detailed baseline characterisation for the project is provided in ***Section 5*** of this ESIA report.

1.4.5 Stakeholder Analysis and Consultations

An effective ESIA process requires engagement with relevant stakeholders throughout the key stages. This assists in understanding stakeholder views on the project and in identifying issues that should be taken into account in the prediction and evaluation of impacts.

ERM identified/profiled the various stakeholders of the project, such as the affected families, the village-level key informants, the line departments (revenue, land, agriculture and forest), state/district administration and civil society organisations as well as developed an understanding of their stakes, interests and influences on the project.

Details of the Stakeholder Engagement activities undertaken for these projects to date are presented in ***Section 6*** of this ESIA report.

1.4.6 Impact Identification/Prediction

Impact identification and assessment starts with scoping and continues through the remainder of the ESIA Process. It is an iterative process and completes only when the effects of all identified impacts arising out of the project, including residual impacts, have been assigned a mitigation strategy. The IA comprises of four sequential steps:

- Impact Prediction;
- Impact Evaluation;
- Mitigation and Enhancement; and
- Residual Impact Evaluation.

The detailed IA is presented in ***Section 7*** of this ESIA report.

1.4.7 Environmental and Social Management Plan (ESMP)

The results of the ESIA study form the basis of the project ESMP. The ESMP will incorporate measures and procedures for the short and long-term environmental and social management of the project during its various stages. The ESMP in tabular format with defined roles and responsibilities for implementation and supervision is developed for the Project and is presented in ***Section 8*** of this ESIA report.

1.5 LIMITATIONS

This report has been developed based on the project level information provided by SP Infra, TSEPL and S&WPL and is based on certain scientific principles and professional judgment to certain facts with resultant subjective interpretation. Professional judgment expressed herein is based on the available data and information. If information to the contrary is discovered, the findings in this ESIA may need to be modified accordingly.

ERM is not engaged in the impact assessment and reporting for the purposes of advertising, sales promotion, or endorsement of any client's interests, or other publicity purposes. The client acknowledges that any report prepared by ERM are for the exclusive use of the client and agrees that ERM's reports or correspondence will not be used or reproduced in full or in part for such promotional purposes, and may not be used or relied upon in any prospectus or offering circular for commercial purposes.

1.5.1 Uses of this Report

ERM is not engaged in consulting or reporting for the purpose of advertising, sales promotion, or endorsement of any client interests, including raising investment capital, recommending investment decisions, or other publicity purposes. Client acknowledges this report has been prepared for their and their clients' exclusive use and agrees that ERM reports or correspondence will not be used or reproduced in full or in part for such purposes, and may not be used or relied upon in any prospectus or offering circular. Client also agrees that none of its advertising, sales promotion, or other publicity matter containing information obtained from this assessment and report will mention or imply the name of ERM.

Nothing contained in this report shall be construed as a warranty or affirmation by ERM that the site and property described in the report are suitable collateral for any loan or that acquisition of such property by any lender through foreclosure proceedings or otherwise will not expose the lender to potential environmental or social liability.

1.6 LAYOUT OF THE REPORT

The structure of the report will be as given in ***Table 1.2.***

Table 1.2 Structure of the ESIA Report

Chapter	Title	Description
Section 1	Introduction	(*this section*) Introduction to the Project and ESIA scope and methodology adopted.
Section 2	Project Description	Technical description of the Project & related infrastructure and activities.
Section 3	Applicable Legal and Regulatory Framework	Discusses the applicable environmental and social regulatory framework and its relevance for the Project
Section 4	Screening and Scoping	Discusses the project screening with respect to environmental and social risks and scoping outcomes undertaken as part of the ESIA process.
Section 5	Environmental, Ecology and Social Baseline	Outlines Environmental, Ecology and Social Baseline status in the study area of the project
Section 6	Stakeholder Engagement	Provides an overview of the stakeholder engagement activities undertaken during the ESIA
Section 7	Impact Assessment and Mitigation Measures	This section includes details of identified environmental impacts and associated risks due to project activities, assessment of significance of impacts and presents mitigation measures for minimizing and /or offsetting adverse impacts identified
Section 8	Environmental and Social Management Plan	Outline of the ESMP taking into account identified impacts and planned mitigation measures and monitoring requirements.
Section 9	Conclusion	Summary of impacts identified for the project and conclusion of the study.

2 PROJECT DESCRIPTION

2.1 INTRODUCTION

This section provides a description of the project in terms of location, facilities and associated project infrastructure and activities during the project lifecycle and facilitates a comprehensive identification of the potential impacts on resources and receptors that could result from Project activities during the pre-construction, construction, operation and decommissioning stages.

2.2 LOCATION AND SITE SETTING

The project is divided into three sites *viz.* Addakal site, Mutyalampalle site and Balledupalle site. Addakal site is falls in Addakal village, Mutyalampalle site falls in Mutyalampalle village and Balledupalle site falls in Balledupalle village in Mahbubnagar District in Telangana State. The topography of these sites is undulating with elevation ranging from with elevation ranging from 341 m to 359 m above mean sea level. The land-use around these sites is mainly private agricultural land with occurrence of scrub land and stony waste land. One rain fed river (Peddavagu River) passes approximately 1.9km, 0.7km and 0.05 km away from Addakal site, Mutyalampalle site & Balledupalle site, respectively.

The closest town to the project site is Mahbubnagar, which is located about 28 km north of the project. There is one 100MW solar power project (of Suzlon) approximately 5 km away of the project. Also there are number of small industries (two spinning mills, one rice mill, and one chicken processing mill) close to the project.

Location of the project on satellite imagery is provided in ***Figure 1.1***, and location of the project site on topographic sheet (scale- 1: 50000) is provided i***n Figure 2.2***.

2.2.1 *Accessibility*

Project site can be accessed from Hyderabad by National Highway (NH) 44. NH 44 traverses close to the project site and connects the project site by bituminous road. Also, from Mahbubnagar town one can reach the site by taking Bhoothpur road which is further connected with NH 44. Project site accessibility has been provided in ***Table 2.1*** and ***Figure 2.3.***

Table 2.1 Site Accessibility

S.N.	Nearest Access	Detail	Aerial Distance and direction w.r.t project site
1.	Town	Mahbubnagar	28 km North of Addakal site
2.	Road	NH 44	2 m East Balledupalle site

S.N.	Nearest Access	Detail	Aerial Distance and direction w.r.t project site
3.	Railway Station	Konnur	2.2 km West of Mutyalampalle site
4.	Airport	Hyderabad	100 km North East of Balledupalle site

All the three project sites (Addakal site, Balledupalle site and Mutyalampalle site) are well connected with NH 44 by village roads. Some images of the village roads connecting NH 44 with the project sites have been presented in ***Figure 2.1.***

Figure 2.1 Village roads

Source: ERM Site visit from 13-15 February 2017

Figure 2.2 Location of Project Site (on Survey of India toposheet)

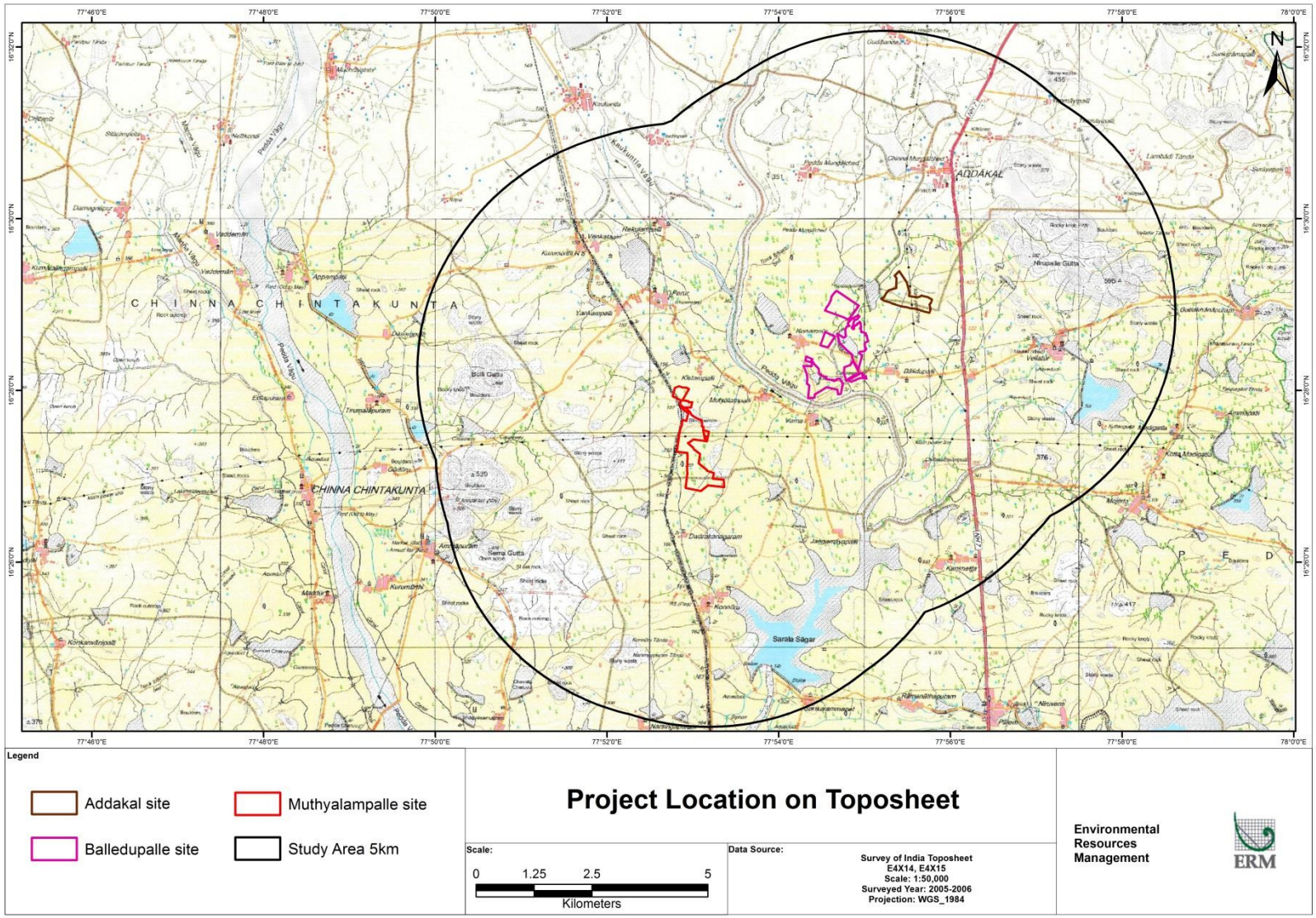
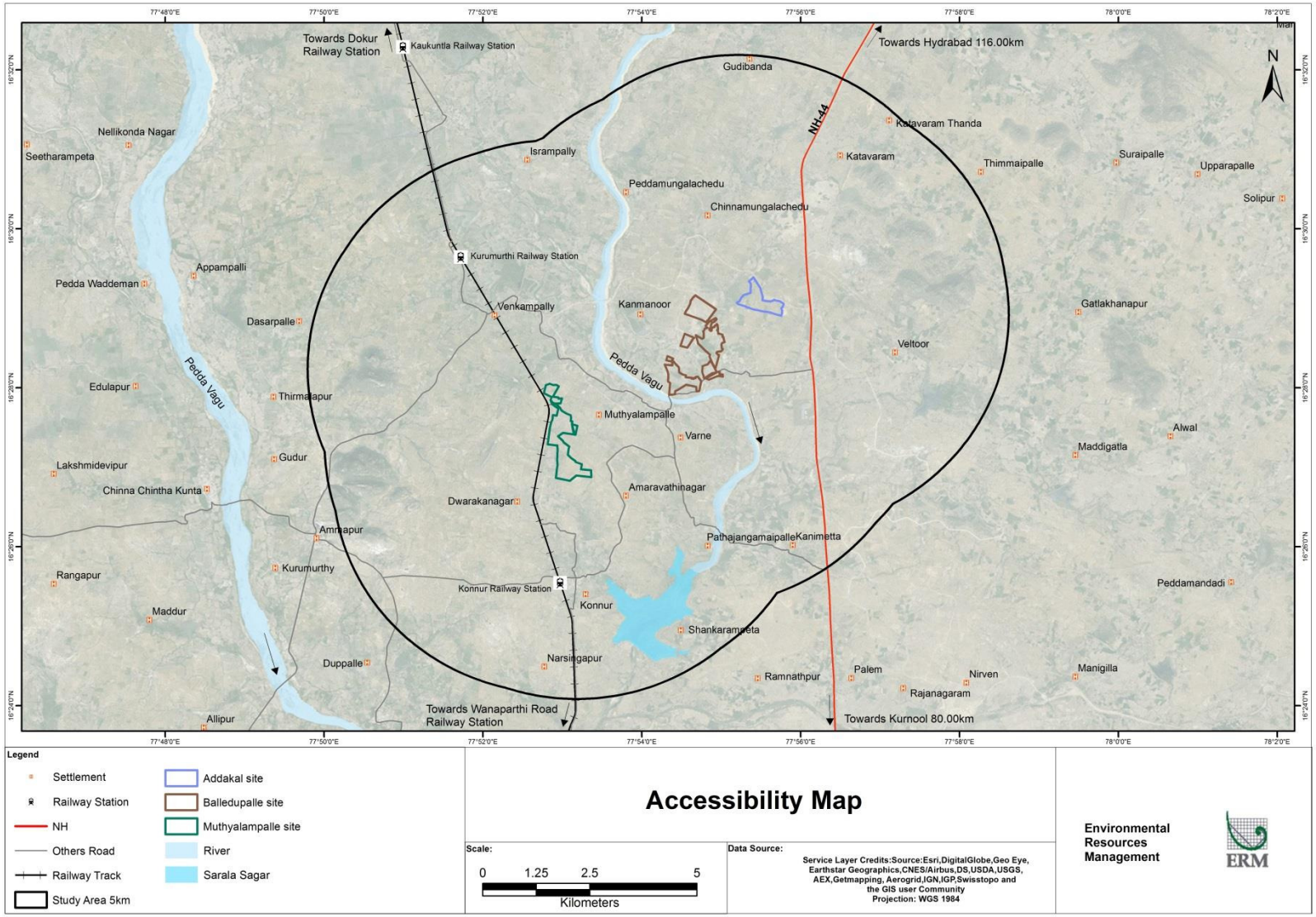


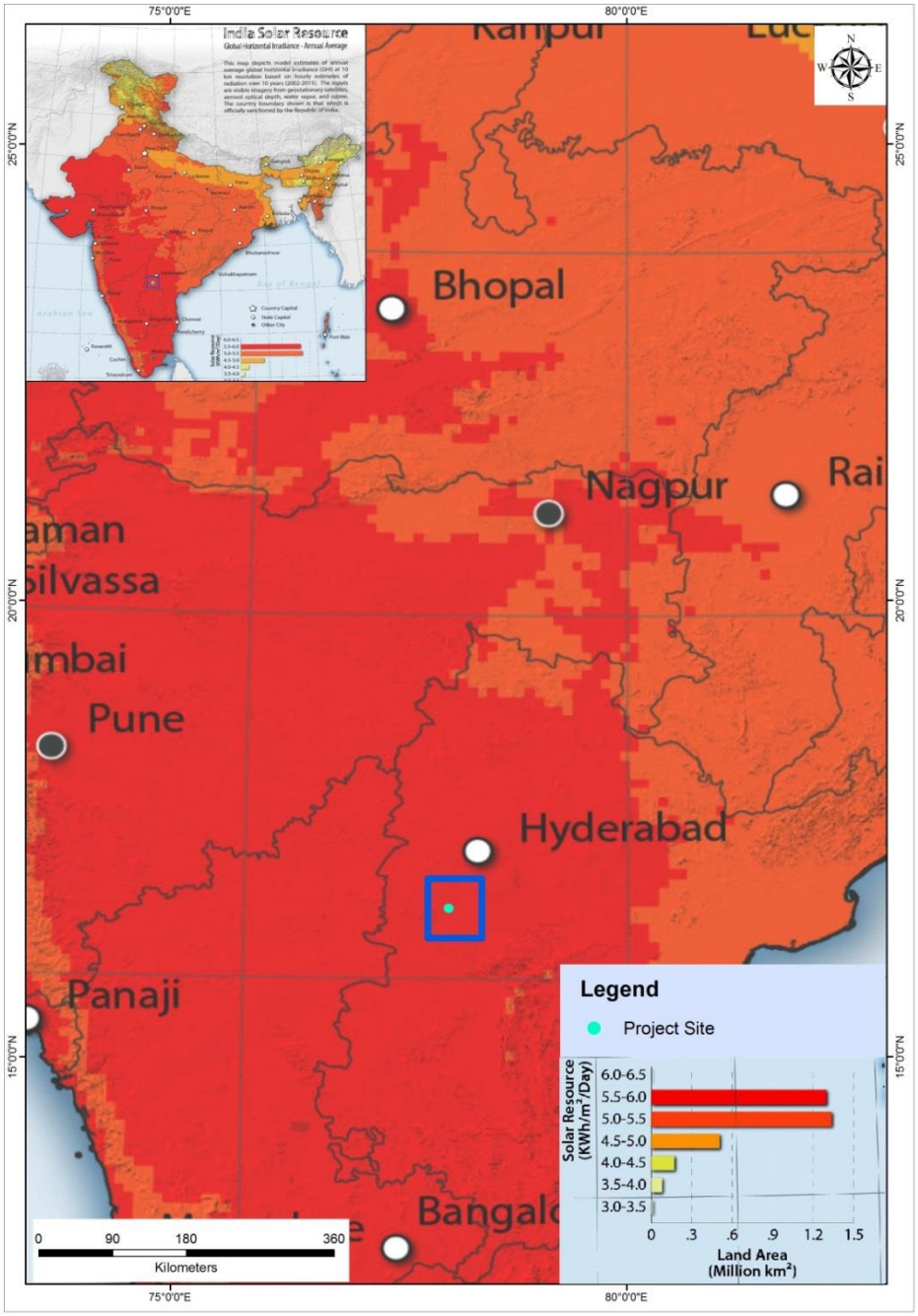
Figure 2.3 Project Site Accessibility Map



2.3 PROJECT ALTERNATIVES

Solar projects are non -polluting energy generation projects which are site specific and dependent on the availability of solar irradiance resource. Solar irradiance mapping done by Solar Energy Corporation of India (SECI) through National Renewable Energy Laboratory (NREL), based on which potential areas are notified by SECI. The current site selected is a high solar power potential site with irradiation of 5-5.5 kWh/m²/day and availability of 300 sunny days (***Figure 2.4***). The final selection of the project site depends upon availability of a contiguous patch of land that is willingly sold by land owners. Hence, the option of choosing an alternative area is not available to a project developer.

Figure 2.4 ***Horizontal Solar Resource map of India***



Source: Ministry of New and Renewable Energy, GoI

The proposed project site has the following location advantages:

- Site with high solar irradiation;
- No ecological sensitive receptor such as national Parks, Wildlife Sanctuary, within 10 km radius;
- No reserve or protected forest within 5 km radius;
- No cultural property of archaeological importance within 5 km radius;
- There exists no obstacles around the site in the form of trees, buildings etc. that could lead to near shading; and
- The substation is located at Veltoor, which is at distance of 1.2 km away from the Balledupalle site.

2.4 DESCRIPTION OF PROJECT FACILITIES, COMPONENTS AND ACTIVITIES

2.4.1 Generation Yield

As per the horizontal solar resource map of India, produced by National Renewable Energy Laboratory, the solar irradiation value of the project site lies from 5 to 5.5 kWh/m^2/day (***Figure 2.4***). The average solar radiation at the Addakal, Mutyalampalle & Balledupalle site is 5.51 kWh/m^2/day. Annual energy yield is computed at approximately 23,959 MWh/year for Addakal site, 108,366 MWh/year for Mutyalampalle site and 68,601 MWh/year for Balledupalle site.

2.4.2 Project Features

Project will utilize Polycrystalline Silicon modules on fixed structures. The modules will be fixed type. The type of modules and mounting systems used is as follows:

Table 2.2 PV Modules, Inverter and Mounting system

S. No.	Main Equipment	Solar Modules
1.	PV Module Type	Poly-crystalline Silicon
2.	Mounting Type	Fixed
3.	Number of modules	Addakal site- 46452; Mutyalampalle- 206241; and Balledupalle- 130179.
4.	PV Module Make	Addakal site- Talesun or equivalent; Mutyalampalle- Talesun, JA Solar or equivalent; and Balledupalle- Talesun, JA solar or equivalent.
5.	Rating	Addakal site- 310Wp; Mutyalampalle- 310/315Wp; and Balledupalle- 310/320Wp.
6.	Strings per inverter	Addakal site- 369 nos (*184nos/ 8 Inverters and 185nos/4 Inverters*); Mutyalampalle- 854 nos (*178 nos/9 Inverters, 179 nos/25 Inverters, 191 nos/18 Inverter, 192 nos/1 Inverter and 114 nos/1 Inverter*); and Balledupalle- 551 (*190 nos/1 Inverters, 191nos /19 Inverters and 170 nos/14 Inverters*).

S. No.	Main Equipment	Solar Modules
7.	Total no. of Inverters	Addakal site- 12; Mutyalampalle- 54; and Balledupalle-34.
8.	Inverter power	1000 kW
9.	Peak power of plant	Addakal site- 14.4 MWp; Mutyalampalle- 64.9 MWp; and Balledupalle- 40.8 MWp.
10.	Estimated energy generation	Addakal site- 23959 MWh/year (P50) & 22250 MWh/year (P75); Mutyalampalle- 108366 MWh/year (P50) & 100639 MWh/year (P75); and Balledupalle- 68601 MWh/year (P50) & 63709 MWh/year (P75).

Source: Detail Project Report

2.4.3 Project Components

Key project components of this project are given in ***Table 2.3***.

Table 2.3 Key Project Components

Component	Application	Details
Solar PV Modules	Polycrystalline Silicon Module is being used for capturing solar energy.	• Fixed type. • Module tilt angle has been computed to be 14° (modules facing true south) • Adhere to International Electro technical Commission (IEC) specifications for Crystalline Silicon modules.
Power Conditioning Unit (PCU) or Inverter	• Convert the incoming DC received from PV modules into AC with suitable power quality. The inverter produces sinusoidal AC waveforms with low harmonic distortion. • The inverter also has to act as a protective device of the system. It needs to trip if the voltage, current or frequency goes outside acceptable ranges.	• Used in grid-connected solar PV systems consist of an inverter and other electronics for Maximum Power Point Tracking (MPPT), Synchronization and remote monitoring. • As the PV array output varies with the solar radiation the inverter has to effectively interface with the grid to remain synchronized.
DC Cables	PV Module is interconnected, with these cables, in series to form a string of 20 modules by MC4 connectors.	• Robust and resist high mechanical load and tension along with the UV rays of the sun. • High temperature resistance and weather proofing characteristics provide long life.
LT Cables	The LT cables are used to connect inverter output to primary side of 2MVA transformers to step up inverter output voltage of 380V to 33kV.	• 1.1 kV, Single Core, XLPE insulated, PVC sheathed, armoured cable, confirming to IS 7098 Part 2 standard Aluminium conductor size 7R/PhX1CX300 sq.mm

Component	Application	Details
Transformer	To step up inverter voltage level of 380 V to 33 kV and from 33 kV to 220 kV	• 50 transformers of 2 MVA capacity • 2 transformers of 55 MVA capacity • 2 transformers of 200 KVA capacity • 24 transformers of 20 KVA capacity
HT Cables	HT cables carry power from the transformer output to the control room MV panel, and from MV panel to the switching yard.	• From Transformer to RMU: 33kV, Three Core Cable • From RMU to MV Panel: 33kV, Three Core Cable • From MV Panel to Stitching Yard
MV Panel	Interface between the transformers and grid providing the protection required for the system	Consisting of: • Circuit breaker and accessories • Instrument transformer • Isolators • Control and Relay Panel • Numerical Relays
Transmission Line	Evacuating power from the project site to the Veltoor GSS	• 2 km long 33 kV transmission line comprising of 55 poles will evacuate power from Addakal site to PSS and switching yard at Balledupalle site. • 4 km long 220 kV transmission line comprising of 15 poles will evacuate power from Mutyalampalle site to Balledupalle site. • 2 km long 220 kV transmission line comprising of 10 poles will connect metering station of Balledupalle site with 400 kV Veltoor substation.

Source: Detail Project Report

Substation

The electricity generated from the project will be delivered at 400/220KV Veltoor substation of Telangana State Southern Power Distribution Company Limited (TSSPDCL) located at a distance of 1.2 km from the Balledupalle site.

Figure 2.5 Substation at Veltoor

Source: ERM Site visit from 13-15 February 2017

Transmission Line

- Addakal site will be connected with PSS and switching yard at Balledupalle site by 2 km long 33 kV transmission;
- Mutyalampalle project site will be connected with the metering station located at Balledupalle site by 4 km long 220 kV transmission line; and
- Metering station at Balledupalle site will be connected with 400 kV Veltoor substation by 2 km long 220 kV transmission line for evacuation of power.

220 kV transmission line is presently being constructed by Suzlon Energy connecting 100 MW solar power plant of Suzlon Energy with Veltoor substation will be used for this project. Only 33 kV transmission connecting Addakal site with Balledupalle site will be constructed under this project.

Figure 2.6 220 kV Transmission Line

Source: ERM Site visit from 13-15 February 2017

Access Road

Accessibility to the project site is discussed in detail in ***Section 2.2.1***.

2.4.4 Summary of Project Activities

The activities for the Project can be divided into four phases as follows: a) planning; b) construction; c) operations and maintenance and d) decommissioning. Key project activities during these phases of the Project have been summarised below:

Planning Phase

The planning phase includes the following components:

- Identification of land area and site;
- Site surveys as topographic, geo-technical investigations, solar radiation and yield study, electrical grid studies, etc.;
- Obtaining all necessary approvals/clearances; and
- Design and finalization of contractors;

In this phase, the identification and purchase of land is a key component of the planning and pre-construction phase. The process of purchasing land can be divided into two phases (a) land title verification and (b) purchase of land. The pre-construction phase was already completed prior to the ERM's site visit.

S&WPL is the engineering procurement and construction (EPC) contractor for this project.

Construction Phase

Construction phase of project activities will include the following:

- Contractor mobilization;
- Site Preparation including fencing, clearing of bushes, pit filling, levelling and grading;
- Construction of site office and internal roads;
- Construction of temporary storage facilities;
- Foundation laying for ground mounted structures;
- Storage of PV modules delivery and their installation;
- Laying of internal electrical connections;
- Construction of sub-station and office buildings;
- Installation of inverter and transformers;
- Excavation foundation and erection of transmission line towers; and
- Stringing of transmission lines.

During ERM site visit (13th to 15th February 2017), construction work was in progress and is likely to be completed by May 2017.

Operation and Maintenance

The list of activities to be carried out in the operation and maintenance phase would be:

- Monthly cleaning of PV modules;
- Control of vegetation viz. weeds, bushes etc. within the site and those immediately surrounding it;
- Routine inspection of all PV modules and associated structures viz. cables, transformers, inverters, mounting structures etc.;
- Operation and maintenance of ancillary facilities such as power substation;

- Inspection and maintenance of transmission lines; and
- Inspection and maintenance of internal site pathways/access roads.

TSEPL will be having a dedicated operations and maintenance (O&M) team comprising of technical staff to conduct the aforesaid maintenance activities. This will also require additional resources in the form of water (for module cleaning), consumable spares and insurance.

Decommissioning

The average life span of the solar modules is 25 years. At the end of this life cycle, the solar modules will either be revamped or replaced and continue with its operation. If decommissioned, all components including foundations and internal roads of the project will be removed and the site will be restored to its pre-construction state. The concrete pedestals of the ground mounted structure foundations will be demolished and removed from the sub-surface. The associated infra-structures will be returned to the government for use.

2.5 CONTRACTORS

S&WPL is the main EPC contractor and is responsible for construction of the project. S&WPL has appointed and managed several subcontractors for the construction process, and electrical installations.

A list of subcontractors and their responsibilities has been provided in the table below.

Table 2.4 Subcontractor allocation for site activities

S.N.	Subcontractor	Responsibility	Workforce
1.	S&WPL	EPC Contractor	46
2.	Maruti Construction	Civil and Electrical Work	15
3.	MDP	Civil and Electrical Work	10
4.	MKS Construction	Civil and Electrical Work	25
5.	Star Delta	Civil and Electrical Work	10
6.	Mars Control	Civil and Electrical Work	12
7.	Star Electrical	Electrical Work	40
8.	Chola Electrical	Electrical Work	30
9.	Prabhu Electrical	Electrical Work	30
10.	Sai Establishment	Electrical Work	50
11.	Local Land Aggregator	Land Procurement	25

Source: Discussion with Sterling and Wilson during site team, February, 2017

2.6 RESOURCE REQUIREMENTS

2.6.1 Land requirement and procurement process

Based on discussion with TSEPL, project components for which land is required during construction and operation phase of the project includes:

- Installation of Solar Modules;
- Site office;
- Inverter Room;
- Stock yard; and
- Transmission line

The land required for solar modules is approximately 5 acres/MW and the present project capacity is 100 MW. Hence total land measuring approximately 550 acres is required for installing 100 MW solar power plant, with site office and inverter room, stock yard etc. This project is divided in three sites i.e. Baleedupalle, Muthyalampalle and Addakal. Details of land requirement of three sites are presented in the ***Table 2.5.***

Table 2.5 ***Land Requirement for Three Solar Power site***

Solar Power Site	Land Requirement
Baleedupalle	190 acres
Muthyalampalle	293 acres
Addakal	67 acres
Total	***550 acres***

Source: TSEPL

Transmission line will use the ROW of existing Road and extra land requirement for transmission line is under progress.

Land details

TSEPL has appointed local land aggregators for procuring land for the project. He is responsible for negotiating and procuring identified land parcels. As per the personnel from TSEPL and land aggregator, total land requirement for project is 550 acres and it has been procured from 166 land owners form Baleedupalle, Muthyalampalle and Addakal (79 land owners from Baleedupalle, 59 land owners from Muthyalampalle and 28 land owners from Addakal) on mutually agreed price. Land procurement process for the project started in September 2015 and was completed in June 2016. As per the document received from TSEPL, process of mutation of land in the name of SPV is going on till date.

The available information on total land requirement for each of the project components, type of land, village from which land is being procured is captured in ***Table 2.6.***

Table 2.6 Summary of land required for the project

S. N.	Project components	Land area Required (In acres)	Type of land	Village	Status of procurement
Balledupalle					
1	Solar module, site office and inverter room	190 acres	Private Agricultural Land	Baleedupalle in Peddamandadi Block of Mahbubnagar District	Land procurement was completed in the month of June, 2016
2	Internal roads				
3	Transmission line	This will use the existing transmission line of Suzlon Energy Limited			
Muthyalampalle					
1	Solar module, site office and inverter room	293 acres	Private Agricultural Land	Muthyalampalle in Peddamandadi Block of Mahbubnagar District	Land procurement was completed in the month of June, 2016
2	Internal roads				
3	Transmission line	This will use the existing transmission line of Suzlon Energy Limited			
Addakal					
1	Solar module, site office and inverter room	67 acre	Private Agricultural Land	Addakal in Peddamandadi Block of Mahbubnagar District	Land procurement was completed in the month of June, 2016
2	Internal roads				
3	Transmission line	RoW of the transmission line up to Baleedupalle site is under process.			

Solar module, site office and inverter room

The land required for installation of solar modules, site office and inverter room is approximately 550 acres. As reported by TSEPL staff, this amount of land has been procured from 166 land owners on mutually agreed price.

Access roads

All three sites of the project are accessible through a metal road from NH 44. As reported by TSEPL staff, no additional land is required for this purpose.

Transmission line

The power generated by the 100MWAC PV plant at 220kV shall be fed into Veltoor substation located approximately 2.0km from the Balledupalle project site. As per the TSEPL personnel, power generated by the Mutyalampalle site and Addakal site will be evacuated to the pooling substation in Balledupalle site. TSEPL will use the existing transmission towers of Suzlon Energy Limited for stringing of their 4 km 220kV transmission line for evacuating power from Mutyalampalle site to Pooling substation at Balledupalle. It was reported that TSEPL will only construct 55 poles for 2 km long 33 kV transmission line from Addakal site to pooling substation at Balledupalle and it will use the existing ROW of the village road. After that TSEPL will use existing transmission towers of Suzlon Energy Limited for their 220 kV

transmission line to Veltoor substation. Additional land requirement for the transmission line from Addakal site to Balledupalle site was under progress.

Temporary labour camps

It was reported that that during the construction phase, the project would employ approximately 100, 200 and 300 labourers (skilled, semi-skilled and unskilled) in Addakal, Balledupalle and Mutyalampalle site, respectively during peak construction period. TSEPL would have various sub-contractors during the construction phase and the sub-contractors are expected to bring in their own skilled labourers from other states and unskilled labourer will be hired form local villages. No Separate labour camp will be set up for the accommodation of the migrant labour. EPC contractor and their sub-contractor will arrange the hired accommodation for the labourer in the nearby villages.

Project related land procurement and specific issues

Land procurement process

As indicated earlier, land for the project is being procured by TSEPL on mutually agreed price.. The procedure adopted for land procurement was discussed in detail with the representative of TSEPL. It was reported that private land was being purchased through Willing Seller – Willing Buyer negotiations.

Market rate

It was also reported that compensation paid to landowners varied from INR 300,000 to INR 600,000 per acre whereas circle price of land is INR 100,000 to INR 120,000 per acre as per the Sub-register office of Mahbubnagar district. Compensation is calculated based on one to one negotiation basis with land owners. The factors determining the compensation rate include; type of land (cultivated or uncultivated), distance of the land from the nearest approach road, existing circle rate and prevailing market valuation (determined through an analysis of the recent registration rates) of the land parcel. Sample of sale deed in between land owner and TSEPL, and document related to circle rate of the land are presented in ***Annex A*** and ***Annex B.***

On the basis of the information available presently, some of the observations especially with respect to the project related land procurement are mentioned below.

Schedule V Area[1]

All the three sites (Balledupalle, Mutyalampalle and Addakal) of the project do not fall under Schedule V area of the Telangana State.

Forest land

The project is being developed on private agricultural land. As reported by the personnel from TSEPL no forest land has been used for the project.

Tribal (Scheduled Tribe) land[2]

As reported by the TSEPL personnel no tribal land has been purchased for the project and all 166 land owners from whom land has been purchased not belong to schedule tribal community.

Landlessness

As reported by TSEPL, 550 acres of land was procured from 166 land owners and none of the land owner can be categorised as marginal and small farmers[3] and even after the sale they would have enough land left with them. As indicated above the mentioned land owners will also not become landless due to the sale of land. Consultation with land owners also revealed that most of the land owners also purchased better quality of land using the compensation money. It has also been reported by the TSEPL personnel that as per specific requirement of very few land owners they also have arranged same amount of land to the land owners in exchange of the land, which was purchased for the project.

Encroachment

No encroachments were observed in the purchased land parcels during the site visit. The land was reported to belong to individual farmers with the necessary title deeds.

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1. In the Constitution of India, the expression "Scheduled Areas" means such areas as the President may by order declare to be Scheduled Areas. The criteria followed for declaring an area as Scheduled Area are preponderance of tribal population; compactness and reasonable size of the area; under-developed nature of the area; and marked disparity in economic standard of the people. These criteria are not spelt out in the Constitution of India but have become well established. (Source: Official website of the Ministry of Tribal Affairs (MoTA), Government of India (GoI). URL: http://tribal.nic.in/Content/DefinitionofScheduledAreasProfiles.aspx.
2. Article 366 (25) of the Indian Constitution defines scheduled tribes as "such tribes or tribal communities or parts of or groups within such tribes or tribal communities as are deemed under Article 342 to be Scheduled Tribes for the purposes of this constitution". The criterion followed for specification of a community, as scheduled tribes are indications of primitive traits, distinctive culture, geographical isolation, shyness of contact with the community at large, and backwardness. This criterion is not spelt out in the Constitution but has become well established. (Source: Official website of the Ministry of Tribal Affairs (MoTA), Government of India (GoI). URL: http://tribal.nic.in/Content/DefinitionpRrofiles.aspx. Accessed on 07.11.2016).
3. The agricultural census of India has divided farmers under five heads based on the size of their landholding. The categorization is as follows;
   - Marginal – Farmers having less than one hectare of land;
   - Small – Farmers having between one and two hectares of land;
   - Semi-medium – Farmers having between two and four hectares of land;
   - Medium – Farmers having between four and ten hectares of land; and
   - Large – Farmers having more than 10 hectares of land

   URL: http://www.fao.org/fileadmin/templates/ess/documents/meetings_and_workshops/APCAS23/documents_OCT10/APCAS-10-23_-Agri-census_India.pdf. Accessed on 07.11.2016.

Common Property Resources (CPR)[1]

The project is located on private land. Hence no common property resources will be used for the project activity.

NOC from Panchayat

The State of Telangana does not require solar power projects to take a NoC (No Objection Certificate) from the Gram Panchayat of the impacted villages prior to initiation of construction activities.

Cultural Heritage

There are no designated archaeological sites near to the project site. This is typical of rural Indian settlements and each village in the study area has some cultural sites or sites of religious significance, like temples, mosques, graveyards etc. Sometimes their significance is related to specific seasons/or time of the year. Only in case of Baleedupalle site one temple is coming under the project site and TSEPL purposefully left that area outside the project boundary for the local community. One grave was also found within the Baleedupalle project site (refer to ***Figure 2.7***) However, as per the consultation with local villagers and the TSEPL personnel, though this grave has no community significance and no one among local villagers has personal attachment with that grave company will consult the local community and relocate that grave at suitable location within the plant boundary as per the local customs and ritual suggested by the local community.

Figure 2.7 Cultural Sites/ Sites of Religious Significance Observed at Baleedupalle Site

Source: ERM Site visit from 13-15 February 2017

Land use change

This solar power project of TSEPL is being set up on 550 acres of private land procured on a willing seller-willing buyer basis from individual farmers. All the land parcels are reported to be under single cropped cultivation. Under such circumstances, the setting up of the solar power project will result in permanent land use change of the concerned land parcels from agriculture/ fallow to industrial category.

1. Common Property Resources (environmental) are natural resources owned and managed collectively by a community or society rather than individuals

Mutation

The land is being purchased in the name of SPV (TSEPL). It was also reported that the mutation process of land will be undertaken prior to start of any project-related construction activities on site.

Telangana Solar Policy, 2015

As per Telangana Solar Power Policy-2015, it is the responsibility of the project developer to purchase the land required for the project.

Land acquired for grid-connected SPPs for sale to DISCOMs/ captive use/ third party sale or for Solar parks shall be deemed to be converted to Non-agricultural land status on payment of applicable conversion charges to the SPC and no further conversion procedures need to be followed by the developers in respect of such land. The conversion charges would be as per the Agricultural Land (Conversion for Non-agricultural Purposes) Act, 3 of 2006 amended from time to time.

The ceiling limit as per the land ceiling act will not be applicable for any land acquisition for Solar Power Projects and Solar Parks. However, this exemption is available only against firm orders/ PPAs/ successful bids to the extent of land required. Land requirement would be computed at rate of 5 acres/ MW or any lower limit based on the advancement of technology.

Development charges and layout fee of INR 25,000 per acre basis shall be levied payable to the respective Panchayat. The land in fraction would be rounded to the next integer for calculating the development charges. On payment of such amount, the Gram Panchayat will accord necessary approvals for setting up of the Solar power project/ Solar parks including permission for bore wells. No further permission is required at the panchayat. For this purpose, a separate category will be created under the Panchayat rules. Gram Panchayat will give permission within 14 working days from the date of making payment of development charges failing which permission will be deemed to have been accorded.

The state has a solar power policy - the Telangana Solar Power Policy 2015. The policy does not mention any specific procedure to be adopted for land procurement for solar power projects in the state. Clauses indicating the procedures to be adopted for land conversion and exemption of solar power projects set up in the state from Land Ceiling Act are as follows;

Clause relating to conversion of agricultural land

- **Clause 11 (b):** It is the responsibility of the project developer to acquire land for solar project. Land acquired for grid-connected SPPs for sale to DISCOMs/ captive use/ third party sale or for Solar parks shall be deemed to be converted to Non-agricultural land status on payment of applicable conversion charges to the SPC and no further conversion

procedures need to be followed by the developers in respect of such land. The conversion charges would be as per the Agricultural Land (Conversion for Non-agricultural Purposes) Act, 3 of 2006 amended from time to time.

Clause relating to exemption from Land Ceiling Act

- **Clause 11 (c):** The ceiling limit as per the land ceiling act will not be applicable for any land acquisition for Solar Power Projects and Solar Parks. However, this exemption is available only against firm orders/ PPAs/ successful bids to the extent of land required. Land requirement would be computed at rate of 5 acres/ MW or any lower limit based on the advancement of technology.

Land acquired for grid-connected SPPs for sale to DISCOMs/ captive use/ third party sale or for Solar parks shall be deemed to be converted to Non-agricultural land status on payment of applicable conversion charges to the SPC and no further conversion procedures need to be followed by the developers in respect of such land. The conversion charges would be as per the Agricultural Land (Conversion for Non-agricultural Purposes) Act, 3 of 2006 amended from time to time.

The ceiling limit as per the land ceiling act will not be applicable for any land acquisition for Solar Power Projects and Solar Parks. However, this exemption is available only against firm orders/ PPAs/ successful bids to the extent of land required. Land requirement would be computed at rate of 5 acres/ MW or any lower limit based on the advancement of technology.

Development charges and layout fee of INR 25,000 per acre basis shall be levied payable to the respective Panchayat. The land in fraction would be rounded to the next integer for calculating the development charges. On payment of such amount, the Gram Panchayat will accord necessary approvals for setting up of the Solar power project/ Solar parks including permission for bore wells. No further permission is required at the panchayat. For this purpose, a separate category will be created under the Panchayat rules. Gram Panchayat will give permission within 14 working days from the date of making payment of development charges failing which permission will be deemed to have been accorded.

Grievance redressal process and stakeholder engagement

TSEPL does not have a formal grievance redressal mechanism to address the concerns of the land sellers and local community. However, it is understood that TSEPL frequently interact with the farmers for negotiation. However, no systematic process for stakeholder engagement is being followed at site. Stakeholders in the form of landowners, local youth and government officials are being engaged in a need-based manner.

2.6.2 *Manpower Requirement*

Construction Phase

Peak labour requirement during construction phase of the project is summarised below.

Table 2.7 Labour requirement during construction phase of the project

S.N.	Project site	Current requirement	Peak requirement
1.	Addakal site	40	100
2.	Balledupalle site	180	200
3.	Mutyalampalle site	40	300

Source: SP Infra

Operation Phase

Manpower requirement during operation phase of the project is given below:

- 01 O&M Head;
- 04 Engineers; and
- 14 Technicians

Approximately 10 unskilled workers will be involved during operation phase of the project for grass cutting and module cleaning. Also, approximately 25 security guards will be engaged during O&M phase of the project.

2.6.3 *Water Requirement*

Construction Phase

It has been estimated that approximately 19 KL of water will be required per day for civil works during construction stage. Further, water will be required for workers at project site. Considering peak worker requirement of 600 workers, daily water requirement will be about 6 KL. However, this quantity of water requirement will vary depending upon the mobilisation of construction workers at site.

Table 2.8 Total water requirement during construction phase

S.N.	Area	Approximate Quantity	Source
1.	Construction activities	19 KLD	Tanker Water
2.	Domestic and portable water requirement	6 KLD	Tanker Water

Source: TSEPL

As reported by S&WPL, the water for the construction phase is presently being supplied through water tanker by local vendor.

Operation Phase

The water required during operation phase of the project will be mainly for washing the face of the solar modules. From discussion with project team it is understood that approx. 2 L of water will be required per month for cleaning of one module. Considering 382,872 modules, approx. 766 KL of water will be required per month for module cleaning. Daily water requirement for module cleaning is approximately 26 KL.

Water requirement during operational phase of the project will be met from ground water. For this purpose, bore well available at Muthyalampalle site and Baleedupalle site will be used. Also, one bore well will be constructed at Addakal site. For abstraction of ground water from existing bore well at Baleedupalle and Muthyalampalle site, permission from ground water department of Telangana Government has already been obtained. Also, for construction of bore well at Addakal site, permission from ground water department of Telangana Government is obtained. Permitted withdrawal limit of ground water at Baleedupalle, Muthyalampalle and Addakal site is 10 KLD, 12 KLD and 8 KLD respectively. Refer ***Annex C*** for ground water withdrawal permission from Telangana Government.

Approximately, 54 employees (direct and contractual) will be working during operation phase. For this workforce, approximately 2 – 2.5 KLD of water will be required for domestic consumption.

2.6.4 Raw Materials Requirement

Construction Phase

The major raw materials required for the construction phase are fencing material, construction materials like cement, sand, aggregate that is sourced from local areas. Solar Modules for the project along with associated structures are obtained from China.

Operations Phase

There will not be major requirement of raw materials during operation except for maintenance purpose viz. consumable spares.

2.6.5 Power Requirement

Construction Phase

Power requirement during the construction phase will be met through Diesel Generator (DG) sets. Six DG sets have already been procured for the project – (i) 2 nos of 20 KVA DG set and (ii) 4 nos of 30 KVA DG set. Approx. 100 L of high speed diesel is being consumed per day for these DG sets.

Operation Phase

The power requirement during daytime will be met through own generation and during night time power requirement will be met through State Electricity Supply. Also, a 20 KVA DG set will be kept at the control room for emergency power backup.

2.7 POLLUTION STREAMS DURING CONSTRUCTION PHASE

Pollution streams during construction phase will include air emissions, wastewater generation and solid waste generation.

2.7.1 Air Emissions

Construction Phase

There will be impact on air quality due to onsite construction activities. The likely emissions from construction activities would include the following:

- Fugitive emissions from site clearing, material handling, transportation, piling, use of construction machinery, etc.;
- Fugitive dust emissions from unpaved roads;
- Vehicular emissions from increased traffic volume from vehicles used for transport of construction material; transportation of PV modules and accessories; and
- Exhaust emissions from operation of diesel generators.

To control air emission during construction phase from operation of DG sets, adequate stack height as per CPCB norms should be provided. Fugitive dust emission arising from various activities such as piling, transportation of material (loading and unloading), vehicular movement (on unpaved roads) should be minimized through sprinkling of water and maintaining vehicular speed to 10-15 km/hr. Vehicular emission should be controlled through proper maintenance of vehicles and vehicles with proper PUC will be operated at project site.

Operation Phase

Under normal operations there will be no gaseous emissions from the operating areas. There will be gaseous and fugitive dust emissions owing to plying of maintenance vehicles. It will be ensured that well maintained vehicles with proper PUC are used for maintenance purposes.

2.7.2 Solid Waste Generation

Construction Phase

The key solid waste that is expected to be generated during construction phase is the following:

- Domestic soil waste from temporary site office; hazardous waste like waste oil, lubricants, oil contaminated rags; electronic waste like broken PV module etc.;
- The hazardous wastes will be stored onsite at separate designated covered area provided with impervious flooring and secondary containment. The storage containers/ bins/ drum will be clearly marked and identified for their hazards. Before completion of 90 days, hazardous waste materials will be sent to TSPCB/CPCB authorised vendor disposal;
- The broken solar panels if any, will be sent back to the vendor as part of buyback arrangement;
- Domestic solid waste will be disposed at disposal ground of local municipality;
- The transformer oil drums will be disposed through an authorized hazardous waste recycles; and
- All non-recyclables waste will be collected and disposed of by the contractor at designated landfill sites.

Operation Phase

During operation phase, waste generated from the project will include domestic waste at site office, scrap materials like scrap tools, damaged PPEs etc.; hazardous waste like waste oil, lubricants, used transformer oil; damaged batteries; electronic waste like damaged PV modules etc. Following measure will be adopted for disposal of solid waste;

- The hazardous wastes will be stored temporarily onsite at separate designated covered area provided with impervious flooring and secondary containment and will be disposed in accordance with Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016;
- The broken solar panels if any, will be sent back to the vendor as part of buyback arrangement; and
- Domestic solid waste generated form the site office will be disposed at disposal ground of local municipality.

2.7.3 Wastewater Generation

Construction Phase

The liquid effluents generated during the construction phase will include domestic sewage from temporary site office. As part of the site preparation stage, septic tank will be constructed for the camp and site office. Sewage disposal trucks should be used to periodically remove the sludge/sewage from the septic tank.

Operation Phase

The operational phase will have negligible wastewater generation at site office. Septic tank and soak pits will be provided at the site office for disposal of sewage.

2.7.4 Noise Emissions

Construction Phase

Noise emission generated from piling, movement of vehicle and other construction machinery and operation of DG set. Noise from DG sets will be minimised through provision of acoustic enclosures. Also, other noise generating activities will be restricted to day time only.

2.7.5 Fire Safety and Security

Construction

Appropriate firefighting system and equipment shall be provided throughout the construction period. The fire extinguishers will be placed at all strategic locations such as site office, storage yard etc. Besides this, emergency contact numbers shall also be displayed onsite.

Operations

Suitable fire protection and fighting systems viz. portable fire extinguishers, fire buckets and automatic fire detection system to be made available at the entire PV array area, inverter stations, main control room and switchyard. The aforesaid systems and equipment's will conform to National Fire Protection Authority (NFPA) fire safety standards and local fire authority requirements. Firefighting arrangements for electrical utilities like transformers etc. will be in accordance to tariff advisory committee, CBIP, IS 10028, NFPA 70 and NFPA 15.

3.1 INTRODUCTION

This section encompasses the environmental and social legal framework applicable for the proposed solar project in Telangana.

- Applicable Environmental Regulations
- Applicable Social Regulations
- Applicable Permits (Licences, approvals and consents) and permitting agencies;
- International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability (2012);
- The applicable IFC/World Bank Guidelines:
    - General Environment, Health and Safety (EHS) Guidelines (2007),
    - Guidelines for Electric Power Transmission and Distribution (2007) [for construction and operation of transmission lines in solar farms].

3.2 NATIONAL ADMINISTRATIVE REQUIREMENTS

A brief description of the relevant enforcement agencies with respect to the institutional framework is described in the following ***Table 3.1***

Table 3.1 Enforcement Agencies relevant to the Project

Agency	Functions	Relevance & Applicability to the project
Telangana State Pollution Control Board (TSPCB)	The TSPCB is a statutory authority entrusted to implement environmental laws and rules within the jurisdiction of the State of Telangana, India.	As per Telangana Solar Power Policy 2015, solar power plants using photovoltaics or solar thermal technology being a part of green energy will be given required clearances such as CTE/CTO under Pollution Control Laws within a week. However as per the CPCB circular dated 7 March 2016 and TSPCB circular dated 28 May 2016 specifies that all solar power generation through photovoltaic cells is categorised under "White Category" and is exempted from obtaining Consent for Establish (CFE) and Consent for Operate (CFO) from TSPCB. Only a formal intimation to the aforesaid authority will suffice. Thus the project is exempted from obtaining a CTE /CTO only TSEPL needs to provide a formal intimation to TSPCB.

Agency	Functions	Relevance & Applicability to the project
TSSPDCL	It is the electricity transmission/distribution company of Telangana Government.	The proposed project will evacuate power at a substation of TSSPDCL for which it has to submit and get approval for route of transmission of the solar power generated from the site to the grid i.e. sub-station. Reportedly, grid connection approval is obtained from TSSPDCL. Refer ***Annex D*** for approval of 220 KV bay at Veltoor Substation.
Energy, Infrastructure and Investment Department (EII Dept.)	High Level Committee under EII Dept. which monitors the progress of implementation of the Solar Power Projects	The proposed project will be developed as per the Solar Policy, 2015 issued by EII department of Telangana Government. The progress of the proposed project will be monitored by this committee
Solar Energy Corporation of India (SECI)	• Research & Development • Solar Resource Assessment Unit: • Standards and Certification Unit: • R&D Testing unit	The Project will be developed under Jawaharlal Nehru National Solar Mission and other applicable guideline of SECI.
Indian Renewable Energy Development Agency Limited (IREDA)	The main objectives of IREDA is to promote, develop and extend financial support to specific projects and schemes for generating electricity and / or energy through new and Renewable sources and conserving energy through energy efficiency.	Proposed projects should be developed based on the IREDA guidelines for Renewable energy
Panchayats	The local Panchayats are empowered with management of local resources like forests, groundwater, common land and infrastructure like roads, buildings etc.	No Objection Certificates are required to be taken form the Panchayats at the time of initiating a project in local area. Panchayats are also empowered to levy and collect local taxes on land, property and provisioning of facilities. For the proposed project, TSEPL is in the process of obtaining NOC from the concerned panchayat.
State Labour Department	All issues pertaining to implementation of labour laws in any establishment, shop or factory.	Labours to be involved during the construction phase and few in the operation should be provided with wages and other facilities with state as well as local and migrant labour laws and acts.
Telangana State Water, Land and Trees State Level Authority	The Authority is primarily responsible for promoting water conservation and	The sourcing of ground water and tree felling, if any for the proposed project will be

Agency	Functions	Relevance & Applicability to the project
	enhancement of tree cover in the State and in regulating the exploitation of ground and surface water in the State.	subjected to permission and supervision by the concerned authority.
District Administration (Collector's Office)	Private land purchase process will be regularized by the state government under Andhra Pradesh Land Reforms (Celling on Agricultural Holdings) Act, 1973 (including rules for land conversion) through District collector and revenue department as mentioned in The Andhra Pradesh Reorganisation Act, 2014	Land purchase process for the various components of the Project to be followed as per State Land revenue code and land registration act of Andhra Pradesh.
National Green Tribunal	The tribunal will have jurisdiction over all civil cases relating to implementation of the following regulations: • The Water Act, 1974; • The Water Cess Act, 1977; • The Forest Conservation Act, 1980; • The Air Act, 1981; • The Environment Protection Act, 1986; • The Public Liability Insurance Act, 1991; and •	U/s 17, any person responsible for any untoward incidents (defined in Schedule II of the Act) is liable to pay relief or compensation as determined by the tribunal, failing which a penalty (u/s 26 and 27) is imposable which may lead to imprisonment up to 3 years or fine up to Rs. 10 Crores or both and an additional fine of Rs 25,000 per day for any delay, which may further be increased to one lac per day.

3.3 APPLICABLE REGULATORY/POLICY FRAMEWORK

The ***Table 3.2*** summarizes the key regulations that are relevant to the project across its lifecycle. This table should be used to update/develop a comprehensive legal register for the Project.

Table 3.2 Applicability of Key Legislations in India and Reference Framework in the different phases of life cycle of Project

Applicable Indian Legislation/Guidelines/International Guidelines	Pre-construction	Construction	Operations	Decommissioning	Agency Responsible	Remarks
Land Purchase						
Andhra Pradesh Land Reforms (Celling on Agricultural Holdings) Act	√	√	X	X	District collector and revenue department	Land required for the Project is private land. The land has been purchased on willing buyer and willing seller basis.
The Electricity Act 2003	√	√	√	√	Central Electricity Authority	Generating company deemed to obtain a licence under this Act and also to comply with all safety requirement as per rule 29 to 46 under chapter 6.
Central Electricity Authority (Technical Standards for Connectivity of the Distributed Generation Resources) Regulations, 2013	X	√	√	X	Central Electricity Authority	These regulations shall be applicable to all power generating companies owning distributed generation resource, which are connected to or seeking connectivity with the electricity system. Under this regulation, TSEPL shall be responsible for planning, design, construction, reliability, protection and safe operation of its own equipment for the project.
Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006	X	√	√	X	Central Electricity Authority	For proponent involved in the generation, transmission and/or distribution of electricity, this regulation provide for type, standards, ownership, location, accuracy class, installation, operation, testing and maintenance, access, sealing, safety, meter reading and recording, meter failure or discrepancies, anti-tampering features, quality assurance, calibration and periodical testing of meters.
Environmental Protection						
Environmental Protection Act, 1986 and as amended later	√	√	√	√	TSPCB MoEFCC CPCB	Permissible limits for ambient air quality, water quality, noise limits has been laid down by CPCB under EP Act, 1986 which requires to be complied with.
Telangana Water, Land and Trees Rules, 2004	X	√	√	X	Telangana State Water, Land and Trees State Level Authority	All ground water wells (existing and proposed) and waterbodies within the site which is to be owned by TSEPL is required to be registered under the provision of this Act. The regulation also requires TSEPL to comply with any guidelines issued by the authority pertaining to construction of rain water harvesting structures at the same time prohibiting any contamination of ground water.

Applicable Indian Legislation/Guidelines/International Guidelines	Pre-construction	Construction	Operations	Decommissioning	Agency Responsible	Remarks
						In addition to the above, the Act prohibits felling of the trees or branches without the prior permission of the designated officer. In case when a tree is to be felled, not less than two seedlings should be planted and when such planting is not possible, cost of raising seedlings and their maintenance to be recovered from the concerned organisation or other persons for raising plantations in public places by the authority. This is of significance as the project will be involving felling of few trees during the construction phase.
The Noise (Regulation and Control) Rules, 2002 and as amended later	√	√	√	√	TSPCB	Per the Act, ambient noise levels are to be maintained as stipulated in the rules for different categories of areas such as residential, commercial, and industrial and silence zones. Considering the context of the project, TSEPL and its contractors will need to abide by the limits prescribed for residential zones.
Ambient Noise Standards	X	√	√	x	TSPCB, MoEFCC	As the project is in rural/residential set up, noise standards for residential area will be applicable for the project.
Storage , Handling & Disposal of Waste & Chemicals						
Construction and Demolition Waste Management Rules 2016	X	√	√	√	TSPCB	Waste in the form of debris, rubble etc. generated during the project construction, remodelling/repair of office buildings during operations and demolition during decommissioning will be managed in accordance the provision of this Rules.
Solid Waste Management Rules 2016	X	√	√	√	TSSPCB/local municipal bodies	All bio-degradable, non-biodegradable and domestic hazardous wastes generated from the project will be managed by TSEPL (the waste generator) in accordance to the relevant provision of this Rule.
Hazardous and Other Wastes (Management and Trans-boundary Movement) Rules, 2016	X	√	√	√	TSPCB	Generation of waste oil and transformer oil at site attracts the provisions of Hazardous Waste Rules, 2016. The hazardous wastes have to dispose through TSPCB approved recyclers only for which necessary authorisation is required to be obtained by TSEPL as generator of hazardous waste
The Batteries (Management and	X	√	√	X	TSPCB	Rules will be applicable during construction and

Applicable Indian Legislation/Guidelines/International Guidelines	Pre-construction	Construction	Operations	Decommissioning	Agency Responsible	Remarks
Handling) Rules 2001 as amended later						operation phases as the project will use Batteries for power back up. Filing of Half Yearly return by bulk consumers and auctioneers of batteries to State Pollution Control Board as per Form 8 and 9 under Rules10 (2) (ii) and 11 (ii) respectively
E-waste (Management) Rules, 2016	X	X	√	√	TPSCB	Rules will be applicable as electrical and electronics as listed in the Schedule I of the aforesaid rules will be used and will require replacement within the lifecycle of the whole project as well during decommissioning.
Manufacture, Storage & Import of Hazardous Chemical Rules, 2000	X	√	√	X	TSPCB	Storage and handling of hazardous chemicals in the form of diesel and transformer oil will be carried out in accordance to the relevant provision of this Rule. All chemical storage to be appropriately labelled with Material Safety Data Sheets (MSDS) available and displayed.
Labour and Working Conditions						
The Factory's Act, 1948 and AP Factory's Rules 1950	X	√	√	X	Deputy Chief Inspector of Factories	TSEPL and its contractors will need to comply to all requirement of factories rules and participate in periodic inspection during the Operations Phase
Building and Other Construction Workers Act, 1996; Inter-state Migrant Workers Act, 1979; Contract Labour Act, 1970	X	√	X	√	State Labour Department, Telangana	TSEPL and its contractors will need to comply to the requirements of these regulations TSEPL need to obtain necessary license for the Interstate Migrant Workers in case the total migrant workmen at the site exceeds five
The Child Labour (Prohibition and Regulation) Act, 1986; Bonded Labour (Abolition) Act 1976; Minimum Wages Act, 1948; Equal Remuneration Act 1976; Workmen's Compensation Act, 1923; Maternity Benefit Act, 1961.	X	√	√	√	Department of Inspector of Factories, Telangana	TSEPL and its contractors will need to comply to the requirements of these regulations
Applicable International Conventions						
Conventions on the Conservation of Migratory species of wild animals and migratory species	√	√	√	√	State Forest Department	

Applicable Indian Legislation/Guidelines/International Guidelines	Pre-construction	Construction	Operations	Decommissioning	Agency Responsible	Remarks
Kyoto Protocol: The 3rd Conference of the Parties to the Framework Convention on Climate Change (FCCC) in Kyoto in December 1997 introduced the Clean Development Mechanism (CDM) as a new concept for voluntary greenhouse-gas emission reduction agreements.	√	√	√	√	NCDMA (national CDM Authority), MoEFCC, Government of India	
IFC/World Bank Guidelines						
IFC Performance Standards, 2012	√	√	√	√	EPFI	The methodology of the ESIA for TSEPL has been developed on the basis of the IFC Performance Standards, 2012.
IFC/World Bank General EHS Guidelines,2007	X	√	√	√	EPFI	During the construction, operation and eventual decommissioning of the site, the following guidelines will need to be followed.
IFC Guidelines for Power Transmission and Distribution,2007	X	√	√	√	EPFI	

4 SCREENING & SCOPING

4.1 SCREENING METHODOLOGY

For the screening exercise, ERM undertook discussions with the project team and a review of the documents available. The following sub sections provide an understanding of the methodology followed.

4.1.1 Kick-off Meeting

The ERM team had a brief kick-off meeting with the SP Infra team prior to site reconnaissance visit. A discussion was also held with regard to the expectations from this assessment in terms of scope of work, deliverables, timeline and the methodology to be followed for the same.

4.1.2 Document Review

Desk based review of the relevant documents of the project and its surroundings were undertaken to have a clear understanding of the Project and their impacts. Further, review of the secondary information available on the project areas, the administrative block, the district and the state was undertaken to substantiate the primary data.

4.2 PROJECT CATEGORIZATION

4.2.1 Equator Principles and IFC

IFC's Environmental and Social Review Procedure Manual (1) has provided a provisional categorization tool for projects. The tool assigns an E&S category based on risk inherent to the particular sector, as well as on the likelihood of a development taking place and on what can be reasonably ascertained about the environmental and social characterization of the Project's likely geographical setting. The categories are defined as follows:

1. **Category A:** Projects with potential significant adverse environmental or social risks and/or impacts that is diverse, irreversible or unprecedented.
2. **Category B:** Projects with potential limited adverse environmental or social risks and/or impacts that is few in number, generally site-specific, largely irreversible and readily addressed through mitigation measures.
3. **Category C:** Projects with minimal or no adverse environmental or social risks and/or impacts.

(1) Environmental and Social Review Procedures Manual: Environment, Social and Governance Department (2012): http://www.ifc.org/wps/wcm/connect/190d25804886582fb47ef66a6515bb18/ESRP%2BManual.pdf?MOD=AJPERES. Accessed on 06.09.2016.

The proposed Project has been categorized as falling under **Category B** as per the guidelines.

4.2.2 Category Justification

Selection of **Category B** is based on similar reasoning:

- **Potentially limited risks/impacts and reversible**: Environmental and social impacts of the project are anticipated during the construction phase and will encompass changes in land-use, increased noise levels, changes in air quality, use and changes in water quality, impacts on terrestrial ecology, occupational health & safety, etc. Further, there is no physical displacement involved in this project. Thus, most of these impacts are limited to the project sites and their immediate vicinity and can be minimized through application of mitigation measures as proposed in the ESMP.

- **Unprecedented**: Development of solar power projects is occurring in large numbers in the last decade and therefore several such projects are located across India. A solar power project can therefore not be considered an unprecedented activity. Furthermore, another 100 MW solar power project of Suzlon is located within the 5 km radial zone of the project.

- **Limited adverse impacts on the baseline**: Solar based energy development is a non-polluting source of energy and thus is not likely to lead to any adverse impacts on the baseline environment during the operation phase. In terms of social impacts the land required is composed of private agricultural land. The 3 sites of the project do not involve any anticipated settlements and physical displacement.

4.3 SCOPING METHODOLOGY

For this ESIA study, scoping has been undertaken to identify the potential Area of Influence for the project to identify potential interactions between the project and resources/receptors in the Area of Influence and the impacts that could result from these interactions, and to prioritize these impacts in terms of their likely significance. This stage is intended to ensure that the impact assessment focuses on issues that are most important decision-making and stakeholder interest.

The scoping exercise was undertaken on the basis of the information available on the project, the discussions with the project team and the prior understanding of ERM of solar power projects. Potential impacts have been identified through a systematic process whereby the features and activities (both planned and unplanned) associated with the operation and maintenance and decommissioning phases of the project have been considered with respect

to their potential to interact with resources/ receptors. Potential impacts have each been classified in one of three categories:

- **No interaction**: where the project is unlikely to interact with the resource/ receptor (e.g., wholly terrestrial projects may have no interaction with the marine environment);
- **Interaction likely, but not likely to be significant**: where there is likely to be an interaction, but the resultant impact is unlikely to change baseline conditions in an appreciable/detectable way; and
- **Significant interaction**: where there is likely to be an interaction, and the resultant impact has a reasonable potential to cause a significant effect on the resource/receptor.

As a tool for conducting scoping, the various project features and activities that could reasonably act as a source of impact were identified, and these have been listed down the vertical axis of a Potential Interactions Matrix. The resources/receptors relevant to the Baseline environment have been listed across the horizontal axis of the matrix.

Each resulting cell on the Potential Interactions Matrix thus represents a potential interaction between a project feature/activity and a resource/ receptor.

The solar power project will involve key activities during its life cycle which will include planning and pre-construction, construction, operation and maintenance and decommissioning phases as detailed in ***Section 2*** of this report.

4.3.1 Scoping Matrix

All environmental and social impacts and risks described in IFC's Performance Standards and E&S Guidelines have been considered for the interaction matrix. The Potential Interactions Matrix for Project activities and likely impacted resources/ receptors is presented in ***Table 4.1***.

The interaction matrix has been colour coded to indicate those interactions that are relevant to the Project (coloured in black), possible (coloured in grey) or scoped-out (coloured in white). Those interactions that are grey are 'scoped out', but the ESIA report includes a discussion that presents the evidence base (e.g., past experience, documented data, etc.) used to justify the basis upon which this decision was made.

Interactions that are likely to lead to significant impacts are presented in ***Table 4.2*** and will be the focus of the impact assessment. Owing to site conditions there are certain possible interactions that will not take place. As a result these interactions have been "scoped out" and are presented in ***Table 4.3***

Table 4.1 Activity-Impact Interaction Matrix for Planning, Construction, Operation & Maintenance and Decommissioning Phases

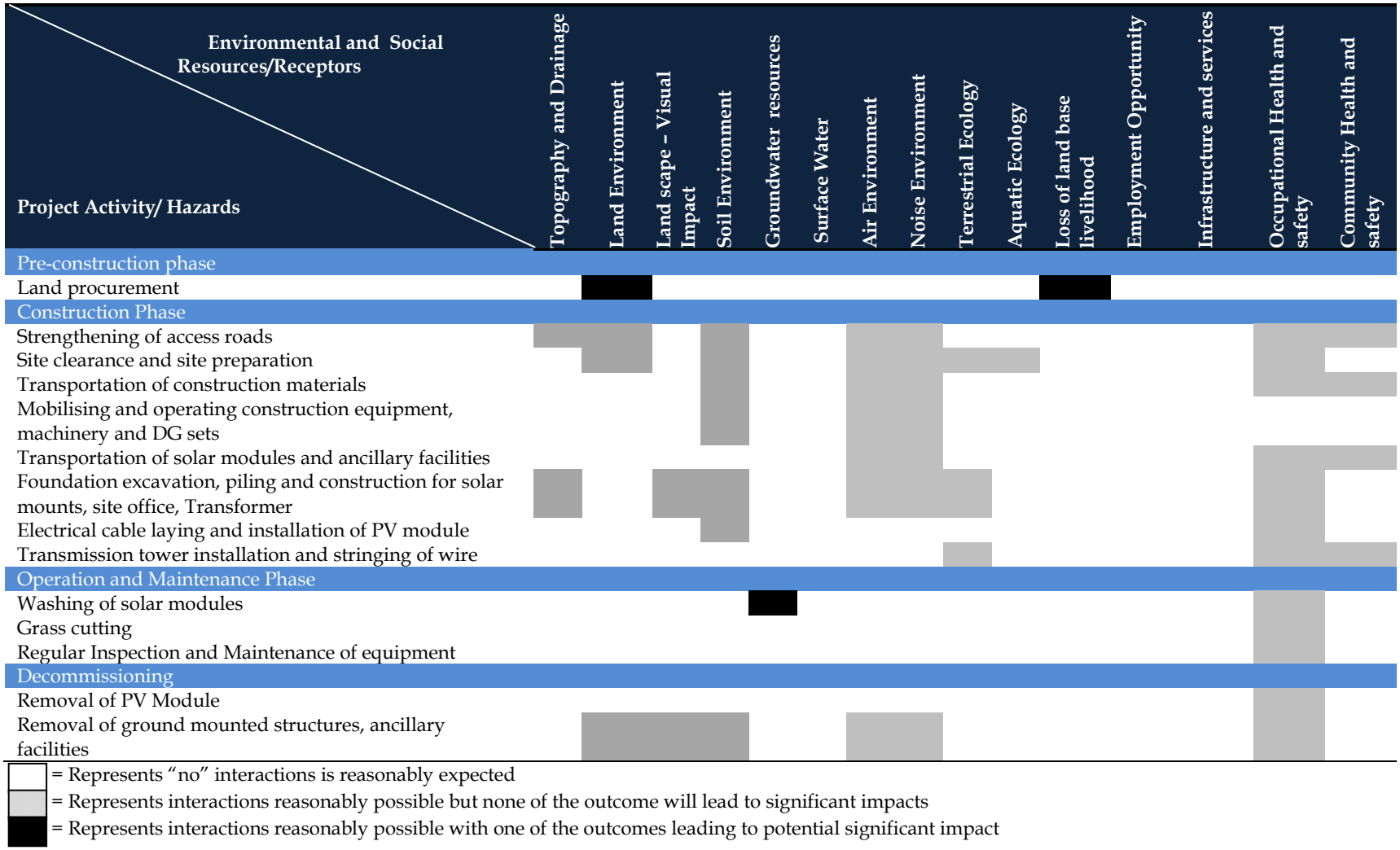


Table 4.2 Identified interactions that are likely to result in significant impacts

S. No	Interaction (between project activity and Resource/Receptor)	Justification for Expectation of Potentially Significant Impacts
1	Changes in Land Use	Only private agricultural land will be utilized for the project and therefore there will be a change in land use from agriculture to non-agricultural purpose.
2	Alteration of Topography and drainage	Study area of the project site exhibits undulation with several micro drainage channels. Also, one river passes close to the project site (Balledupalle site). Project activities (e.g., site development, construction of access roads) may lead to alteration of the topography and drainage of this area.
3	Impact on Soil / Land Environment	Vegetation clearance and construction can change the soil properties and negatively affect soil stability in the area. Vehicle movement can compact or erode soil further. Improper waste disposal can contaminate soil and groundwater.
4	Impact on Air Quality	Operation of DG sets, vehicular movement and construction activities can cause fugitive and point source emission. The loss of tree cover because of site preparation can also contribute to a deterioration of air quality.
5	Impact on Water Environment	Construction of the project will require water from local sources to carry out its activities. Further, PV module cleaning will require large quantity of water. Therefore, there can be impact on surface/ground water resource. Surface and ground water quality can also be impacted due to improper waste disposal or leaks/spills and runoff.
6	Increased Ambient Noise Levels	Operation of construction equipment, machinery, piling, DG sets, vehicular movement and maintenance activities would increase the ambient noise levels. Local communities may be disturbed due to higher than anticipated noise.
8	Ecology	Impact on habitats and species may result from vegetation clearance, construction of site and access roads. Impact to avifauna may also occur due to electrocution with the transmission lines.
9	Occupational Health and Safety	Occupational health and safety hazards can include construction machinery, handling of electricals, noise pollution and dust pollution. In the case of spills/leaks there is a potential for fire hazards and some hazardous substances.
10	Local Economy and Employment	Solar Power Plant will generate employment opportunity for local people mostly during construction phase as well as for module cleaning, grass cutting and security related works during operation phase.
11	Land Based Livelihoods	Land based livelihood may be hampered due to land purchase for the project.
12.	Community Health and Safety	Community health and safety hazards include noise pollution, increased traffic, dust pollution and any effects due to structural damage. In the case of spills/leaks, there is a potential for fire hazards and soil/water contamination.

Table 4.3 Scoped-out Interactions

S. No	Impact Title	Reason for Scoping-Out
1	Cultural Heritage	There is no significant cultural heritage site around the 2 km of the three sites. There is only one temple was found during site just beside the Baleedupalle site. But TSEPL left this area outside their boundary fencing for community use though this land parcel is belongs to TSEPL In addition to that one grave present within Balledupalle site is not of any importance, as per the information shared by TSEPL and local people. As per the TSEPL personnel that grave will be relocated in a suitable place within the project site as per the local customs and rituals suggested by local community.
2	Demography (Influx and Displacement)	EPC contractor will bring migrant labour during construction phase for very limited time and most of unskilled and semi-skilled works will be given to local people. Displacement of local people is not envisaged for the proposed solar power plant
3	Indigenous People	Presence of indigenous people is not found in and around the project. ST population in the study area villages is very low and as per the personnel of TSEPL, Company is not buying any tribal land for their project.

5 ENVIRONMENTAL, ECOLOGY AND SOCIAL BASELINE

5.1 CONTEXT

This section establishes the baseline environmental and socio economic status of the project site and surrounding area to provide a context within which the impacts of the Project are to be assessed.

Establishing baseline helps in understanding the prevailing environmental and socio economic status of the study area. It provides the background environmental and social conditions for prediction of the future environmental characteristics of the area based on the operation of the new/ expansion activity of the project during its life cycle. It also helps in environmental and social management planning and strategy to minimise any potential impact due to the Project activities on surrounding environment.

5.2 METHODOLOGY

The environmental and social baseline has been assessed covering an area of 5 km zone (hereinafter referred to as the *study area*) from the Project boundary. A reconnaissance survey of the study area was conducted to identify environmental and social sensitive spots located within the study area.

Environmental and social baseline data was collected through primary surveys as well as secondary sources by literature survey and discussions with the concerned stakeholders. The data collected is consequent to the scoping done for the project as given in *Section 5.2*. Details of data collected is summarised in subsequent sections.

5.2.1 *Primary Baseline Data Collection*

M/s Mitra S K Private Limited (recognized by National Accreditation Board for Laboratory (NABL) and Ministry of Environment and Forests and Climate Change (MoEF&CC), Govt. of India) was engaged to collect and analyse baseline ground water, surface water, soil quality and to study existing traffic condition on the project site approach road. Rapid ecological surveys and consultations were conducted to collect the information related to the biological environmental conditions of the study area. Stakeholder consultations were carried out by ERM to collect information on socio-economic status of the study area. The primary baseline data was collected for various baseline components as detailed out in ***Table 5.1.***

Table 5.1 Primary Baseline Data Collection

S.N.	Environmental Attribute	No. of Locations	Remarks
1.	Ground water	3	Ground water sample collected from three villages within the study area.
2.	Surface water	1	Surface water sample was collected from Sarala Sagar within the study area.
3.	Soil	4	Soil sample was collected from four villages in the study area
4.	Traffic	2	Traffic survey was conducted at two location on project site approach road.
5.	Flora and fauna survey of the study area to • Identify endangered or protected or endemic floral species prevailing in the study area. • Identify any endemic fauna in the study area. •Identify vegetation cover and current status of natural habitats or species. •Identify and assessing ecological resources within the study area.	Study area of 5 km radius	Ecological survey was undertaken to assess the biodiversity aspects of the area.

5.2.2 Secondary Baseline Data Collection

Secondary baseline data collection involved identifying and collecting available published material and documents. Information's on various environmental aspects (like soil, geology, hydrogeology, hydrology, drainage pattern, ecology etc.) meteorology. Type of secondary data and their different sources is as given in ***Table 5.2.***

Table 5.2 Source of Secondary Data Collection

S.N	Attribute	Source
1	Long term meteorological data	• India Meteorological Department (IMD) • District Statistical Handbook, Medak
2	Geology, Hydrogeology and hydrology	• District Resource Map • Geological Survey of India • Central Ground Water Board
3	Land use	• Satellite Imagery
4	Flora and Fauna	• Department of Forest, Telangana
5	Natural Hazards	• Building Material and Technology Promotion Council of India (BMTPC) • India Meteorological Department (IMD)

5.2.3 Approach and Methodology for Socio Economic Study

The socio-economic baseline for this project has been developed on the basis of a combination of a secondary literature review, as well as the inferences drawn from the consultations with different stakeholders including the local community.

Review of secondary information

A review and assessment of the available secondary data and information for the study area was undertaken in order to substantiate and corroborate the understanding gained through stakeholder consultations, understand the performance of the area on socio-economic parameters as well as allow for a comparative assessment of the project area vis-à-vis the block and district level socio economic baseline information. For the purpose of the desk based assessment, following documents and literature have been reviewed:

- Primary Census Abstract data 2011;
- Village Directory Data (2011);
- District Statistical Handbook - 2011 for Mahbubnagar District; and
- Published research papers, articles and other information available in public domain on aspects such as irrigation, drinking water supply system, livelihood pattern, land, local governance and decentralisation, civil society and NGOs as well as economic policies and regional development plans the state is pursuing.

Stakeholder Mapping and Consultation

The stakeholders for this project differ in terms of the degree of impact, interest, and influence over the project. The stakeholder mapping and its analysis was conducted with the objective of identifying each stakeholder group; studying their profile, characteristics and the nature of their stakes; gauging their influence on the project; and understanding the specific issues, concerns as well as expectations of each group from the project.

Key groups of stakeholders who were consulted during the study process were land sellers, local community, Village Revenue Officer (VRO) etc. Consultations and discussions with the above stakeholders were conducted so as to gain a better understanding of the developmental and historical context of the area, as well as the development needs of the area in general and of the specific stakeholder groups in particular.

Primary data/information collection

Under this phase, local community, consultation of key informants in study area and VRO were undertaken with the objective of building ground level understanding of the concerned issues and also gather primary data wherever feasible to support the observations gained through these consultations.

5.3 PHYSICAL ENVIRONMENT

5.3.1 Topography

Topography of the project site is moderately undulating with elevation ranging from 341 m to 359 m above mean sea level. Slope of Mutyalampalle

site is towards south and north-east. Slope of Addakal and Balledupalle site is towards south. The Digital Elevation Map (DEM) of the study area is presented in ***Figure 5.1.***

5.3.2 Geology

The main geological rock formation of the district is peninsular granite complex of the Archean gneisses. The pink grey granite are seen as boulder packed together or precariously poised and occur in the forms of hills scattered over a flat or undulating country all over the district[1].

5.3.3 Land Use

The land uses of the study area have been studied using satellite imagery dated 10th January 2017 and subsequently ground checked during the field surveys. Land use- Land cover map of study area is provided in ***Figure 5.2***.

Land use- land cover in the Study Area (based on Satellite Imagery)

The predominant land use-land cover of the study area within 5 km includes agricultural land (65.57%) followed by scrub land (24.39%), rocky knob (4.45%), settlement (2.17%), river (1.38%), water body (1.24%), Industry (0.23%), substation (0.18%), railway track (0.06%), road network (0.31%) and stone crusher (0.04%). Land use-land cover within the study area as mentioned above is given in ***Table 5.3.***

Table 5.3 Land use- land cover within Study Area

Land use Type	Within 5 km (Area in Sq. Km.)	Percentage distribution
Agriculture	113.50	65.57%
Substation	0.30	0.18%
Industry	0.39	0.23%
River	2.39	1.38%
Railway Track	0.10	0.06%
Road Network	0.54	0.31%
Rocky Knob	7.70	4.45%
Water body	2.14	1.24%
Scrub land	42.22	24.39%
Settlement	3.75	2.17%
Stone Crusher	0.07	0.04%

Source: ESRI World Imagery

[1] http://www.cgwb.gov.in/Regions/GW-year-Books/GWYB-2014-15/GWYB%2014-15%20Telangana.pdf

Figure 5.1 Digital elevation map of the study area

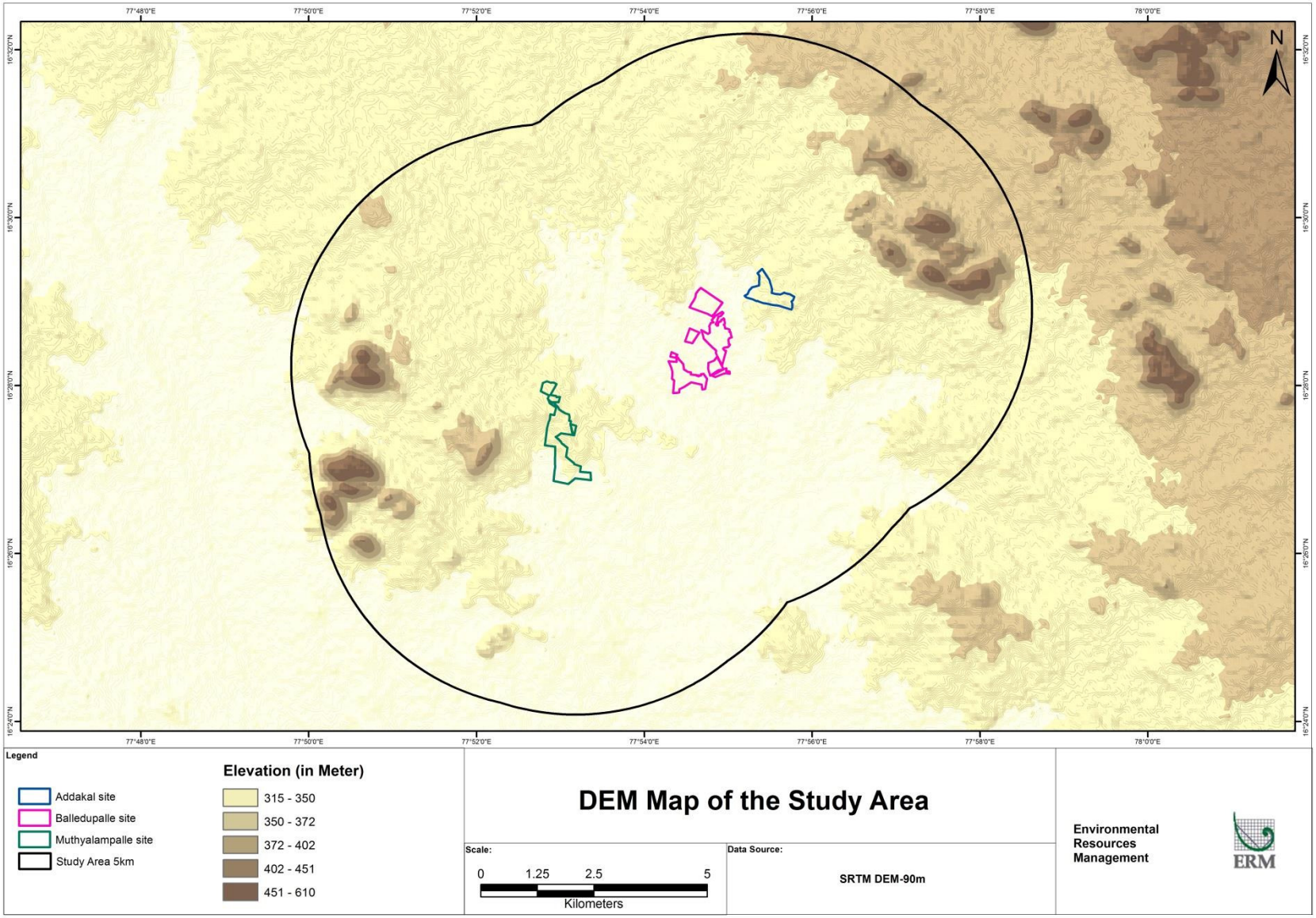
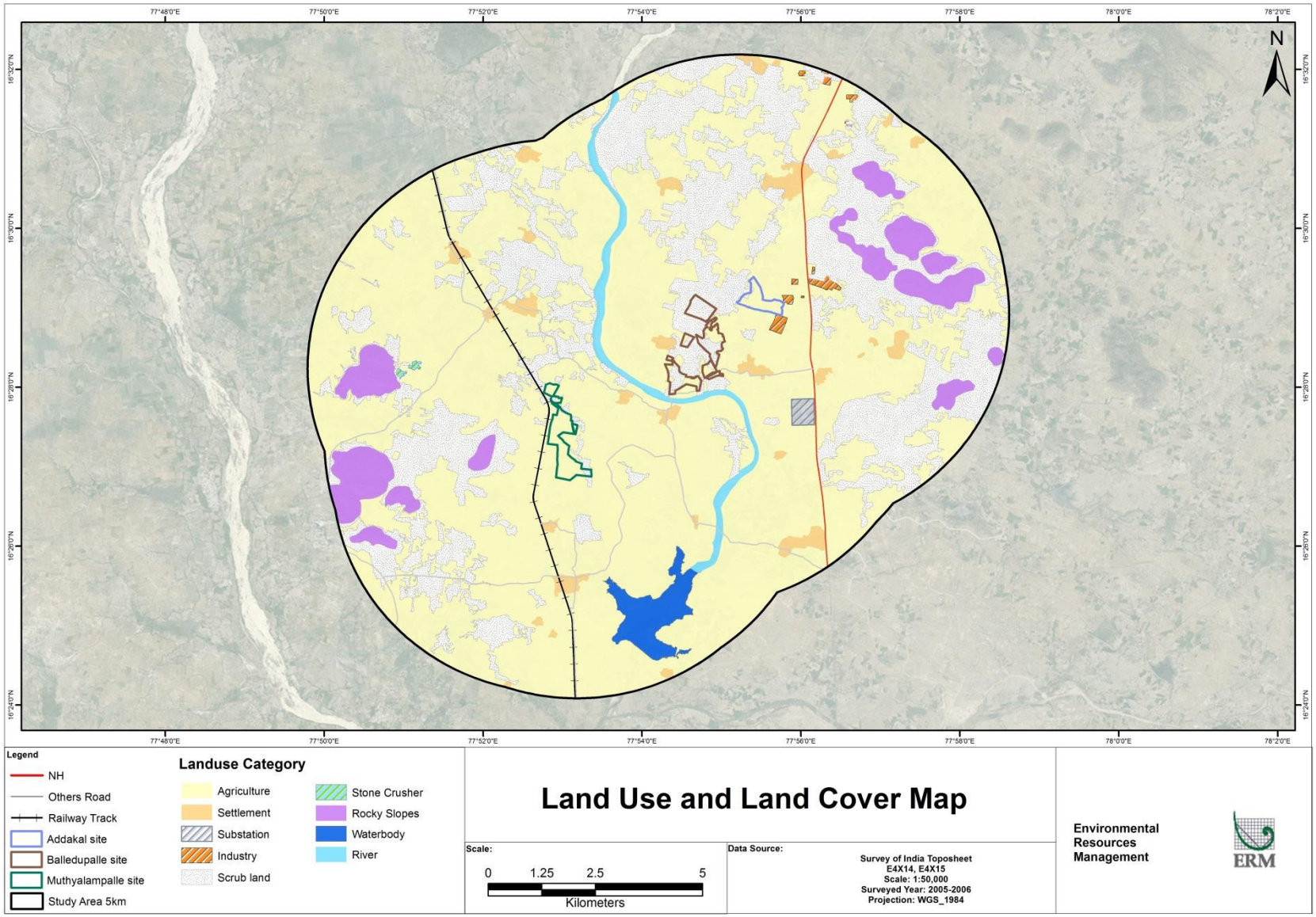


Figure 5.2 Land use and Land Cover Map of the Study Area based on Satellite Imagery and SOI Toposheet



5.3.4 *Soil Quality*

The district is mainly covered by three types of soil viz. red sandy soil (Dubbas and Chalkas), red earth (with loamy sub-soils and chalkas) and black cotton soils. Red sandy soils and red earth are permeable and well drained. Principal crops cultivated in this area are paddy, jowar, bajra and grams that are also rainfed. The commercial crops are chillies, cotton and groundnut and are grown under irrigation.

Soil Quality Monitoring and Analysis

The soil characteristics within the study area, especially the physical quality and fertility of the soil have been characterized by analysing soil samples collected from four (4) locations in February 2017. Soil sampling location is shown in ***Figure 5.4.*** Primary soil monitoring also includes analysis of the heavy metals with the objective of establishing baseline values for such contaminants (if present in the soil).

Table 5.4 Soil Sampling Locations in the Study Area

Location Code	Location	Land Use Type	Geographical Location	Selection Criteria
SQ-1	Balledupalle Village	Agricultural land	60m S of Balledupalle site	Understand the existing soil quality and assess impacts on soil quality due to proposed project.
SQ-2	Addakal village	Agricultural land	160m NW of Addakal site	Understand the existing soil quality and assess impacts on soil quality due to proposed project.
SQ-3	Dwarkanagar Village	Agricultural land	60m SE of Mutyalampalle	Understand the existing soil quality and assess impacts on soil quality due to proposed project.
SQ-4	Parur Village	Agricultural land	62m S of Mutyalampalle	Understand the existing soil quality and assess impacts on soil quality due to proposed project.

The soil quality analysis results are presented in ***Table 5.5*** and described in the further subsections.

Table 5.5 Result of Soil Analysis

Sl. No	Parameters	Units	SQ-1	SQ-2	SQ-3	SQ-4
1.	pH value	None	8.78	7.91	7.92	7.49
2.	Boron (as B)	mg/kg	<0.25	1.1	1.06	1.44
3.	Calcium (as Ca)	mg/kg	952	2762	2381	2476
4.	Chloride (as Cl)	mg/kg	88.2	58.8	49	176
5.	Copper (as Cu)	mg/kg	4.6	12.4	14.2	11.4
6.	Iron (as Fe)	mg/kg	<5	<5	<5	22
7.	Magnesium (as Mg)	mg/kg	743	686	1257	1600

Sl. No	Parameters	Units	SQ-1	SQ-2	SQ-3	SQ-4
8.	Sulphate (as SO4)	mg/kg	86.4	<12	<12	113
9.	Alkalinity (as CaCO3)	mg/kg	365	115.2	134.4	285
10.	Bulk Density	gm/cc	1.25	1.19	1.2	1.16
11.	Sodium (as Na)	mg/kg	230	180	800	900
12.	Specific gravity	None	2.42	2.47	2.48	2.52
13.	Texture	None	Sandy Loam	Clay	Clay	Clay
14.	Electrical conductivity	us/cm	1058	303	218	1204
15.	Potassium (as K)	mg/kg	70	80	70	130
16.	Sodium Adsorption Ration (as SAR)	None	0.66	0.39	1.6	1.68
17.	Zinc (as Zn)	mg/kg	15.8	5.8	17.4	14.2
18.	Permeability	Cm/hr	2.32	0.047	0.046	0.043
19.	Water Holding capacity	%	42.5	52.9	54.1	56.4
20.	Cation Exchange Capacity	meq/100 gm	11.6	19.3	21.4	26.2
21.	Phosphorus (as P)	mg/kg	7.9	<3.0	3.3	16.5
22.	Porosity	%	48.3	51.8	51.6	54
23.	Moisture	%	11.2	12.7	16.6	19.1
24.	Particle Size Distribution	%	Sand-66.7, Silt-14.8, Clay-18.5	Sand-23.6, Silt-21.1, Clay-55.3	Sand-20.3, Silt-21.6, Clay-58.1	Sand-18.7, Silt-13.0, Clay-68.3
25.	Nitrogen (as N)	mg/kg	194	199	231	242
26.	Acidity	mg/kg	Nil	Nil	Nil	Nil
27.	Carbonate	mg/kg	76.8	Nil	Nil	Nil
28.	Infiltration Capacity	mm/Hr	26.6	4.2	3.8	3.3

Source: Primary Monitoring, 2017

The above results have been compared with the standard soil classification given in below table.

Table 5.6 Standard Soil Classification

S.N.	Soil Test Parameters	Classification
1	pH	<4.5 Extremely acidic 4.51-5.00 Very strongly acidic 5.00-5.50 slightly acidic 5.51-6.0 moderately acidic 6.01-6.50 slightly acidic 6.51-7.30 Neutral 7.31-7.80 slightly alkaline 7.81-8.50 moderately alkaline 8.51-9.0 strongly alkaline 9.01 very strongly alkaline
2	Salinity Electrical Conductivity (mmhos/cm) (1 ppm = 640 mhos/cm)	Upto 1.00 Average 1.01-2.00 harmful to germination 2.01-3.00 harmful to crops (sensitive to salts)
3	Organic Carbon	Upto 0.2: very less 0.21-0.4: less 0.41-0.5 medium, 0.51-0.8: on an average sufficient 0.81-1.00: sufficient >1.0 more than sufficient

S.N.	Soil Test Parameters	Classification
4	Nitrogen (kg/ha)	Upto 50 very less 51-100 less 101-150 good 151-300 Better >300 sufficient
5	Phosphorus (kg/ha)	Upto 15 very less 16-30 less 31-50 medium, 51-65 on an average sufficient 66-80 sufficient >80 more than sufficient
6	Potash (kg/ha)	0-120 very less 120-180 less 181-240 medium 241-300 average 301-360 better >360 more than sufficient

Source: Handbook of agriculture, Indian Council of Agricultural Research, New Delhi

Interpretation of Results

Texture: The texture of soil samples analysed at three locations (SQ-2, SQ-3 and SQ-4) was found to be Clay, whereas soil texture was found sandy loam at SQ-1.

pH: Generally, soil pH in the range of 6.50-7.00 is considered to be best suited for growing most crops. The pH level in soil samples varied from 7.49 to 8.78 indicating slightly alkaline to strongly alkaline soil as per standard soil classification.

Electrical conductivity: EC is used to estimate the soluble salt concentration in soil, and is commonly used as a measure of salinity. The EC value of soil samples varied from 218 (SQ-3) to 1204 micro-siemens/cm (SQ-4).

Metals: Iron, copper and zinc are important soil micronutrients considered essential for the normal growth of plants. Deficiencies of micronutrient drastically affect plant growth and metabolism. The level of iron in the soil samples were found below detectable limit (5 mg/kg) at SQ-1, SQ-2 and SQ-3. At SQ-4, level of iron was 22 mg/kg. Level of zinc in the soil sample varied from 5.8 mg/kg (SQ-2) to 17.4 mg/kg (SQ-3).

SAR: The sodicity hazard of soil usually is expressed as the Sodium Adsorption Ratio (SAR). Soil with high level of exchangeable sodium may cause dispersion of soil particles leading to the replacement of major cations (calcium and magnesium) adsorbed on the soil. This could possibly lead to deterioration of soil structures and water infiltration problems. The SAR value in the soil samples varied from 0.39 (SQ-2) to 1.68 (SQ-4), which is suitable for cultivation.

NPK: Nitrogen, phosphorous and potassium are essential plant macronutrient elements that indicate productivity of soil. The nitrogen content in all the soil samples ranged from 194 mg/kg (SQ-1) to 242 mg/kg (SQ-4). Level of

phosphorous in three soil samples (SQ-1, SQ-3 and SQ-4) varied from 3.3 to 16.5 mg/kg. At SQ-2, level of phosphorous was found below detectable limit (<3 mg/kg). Potassium content in four soil samples varied from 70 mg/kg (SQ-1 and SQ-3) to 130 mg/kg (SQ-4). Phosphorous and potassium content of the soil samples were found to be very low.

5.3.5 Water Environment

Drainage and Surface Water Resource

The drainage of Mahabubnagar district is dendritic to sub-dendritic. The whole district falling in Krishna river basin and consisting of 13 sub- basins like Koilsagar, Dindi , Jurala, Saralasagar, Thungabhadra, Krishna-I, Krishna-II, Srisailam, Kagna, Kothur, Alwanpally, Chinnavagu, and Amrabad. Krishna and Thungabhadra are two major rivers traversing the district.

The project site falls in Peddavagu River basin. Peddavagu is a small tributary of Krishna River and passes close to project site. Distance of Addakal site, Mutyalampalle site & Balledupalle site from Peddavagu River is approximately 1.9km, 0.7km and 0.05km respectively. One water reservoir (Sarala Sagar) is located on Peddavagu River at approximately 6.5 km downstream from the project site (Balledupalle site).

Waterbody present within the study area are shown in ***Figure 5.3*** and drainage map of the study area is presented in ***Figure 5.5.***

Figure 5.3 Waterbody within study area

Sarala Sagar

Peddavagu River

Source: ERM Site visit from 13-15 February 2017

Figure 5.4 Ground Water, Surface Water, Soil and Traffic Sampling Locations Map

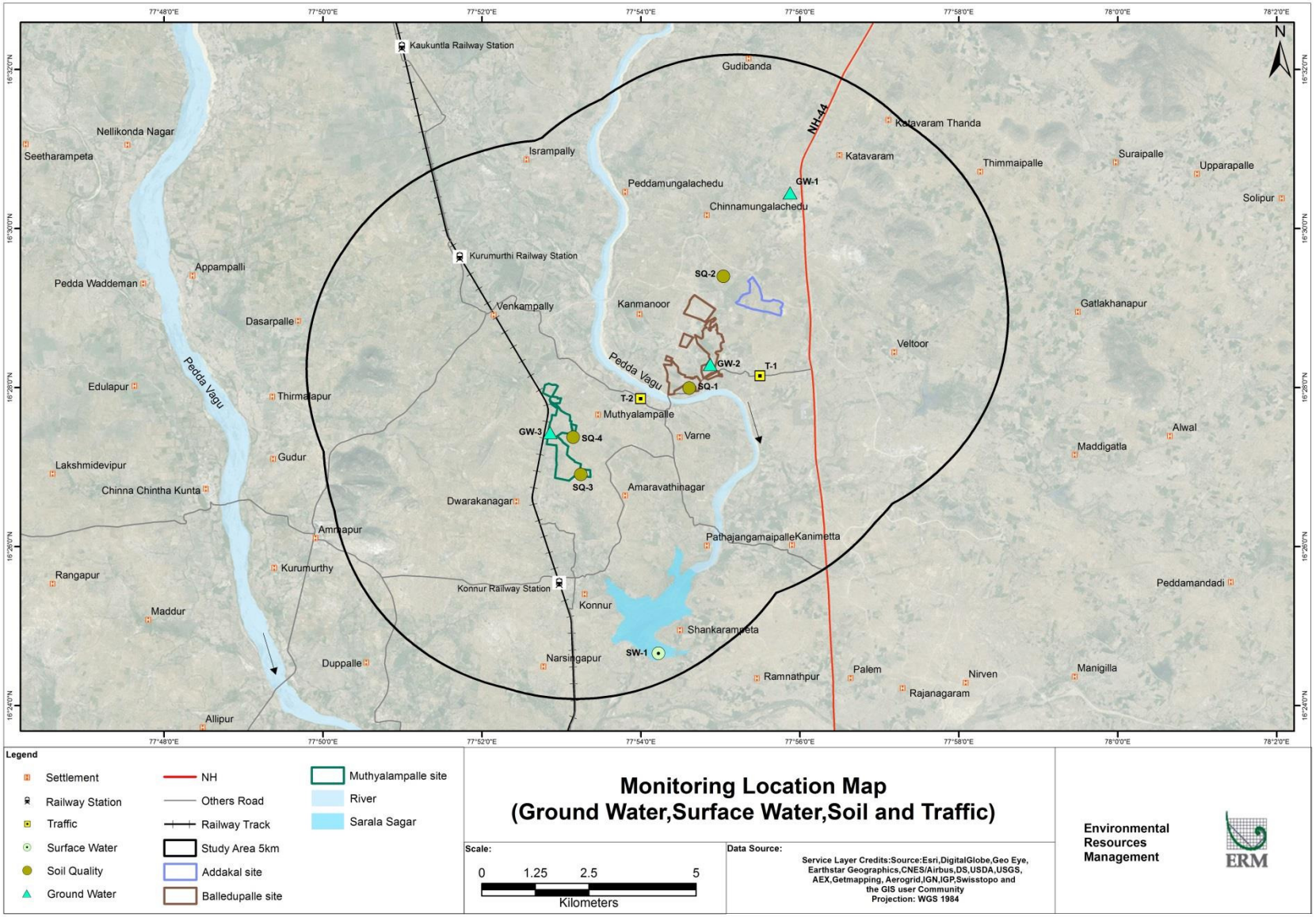
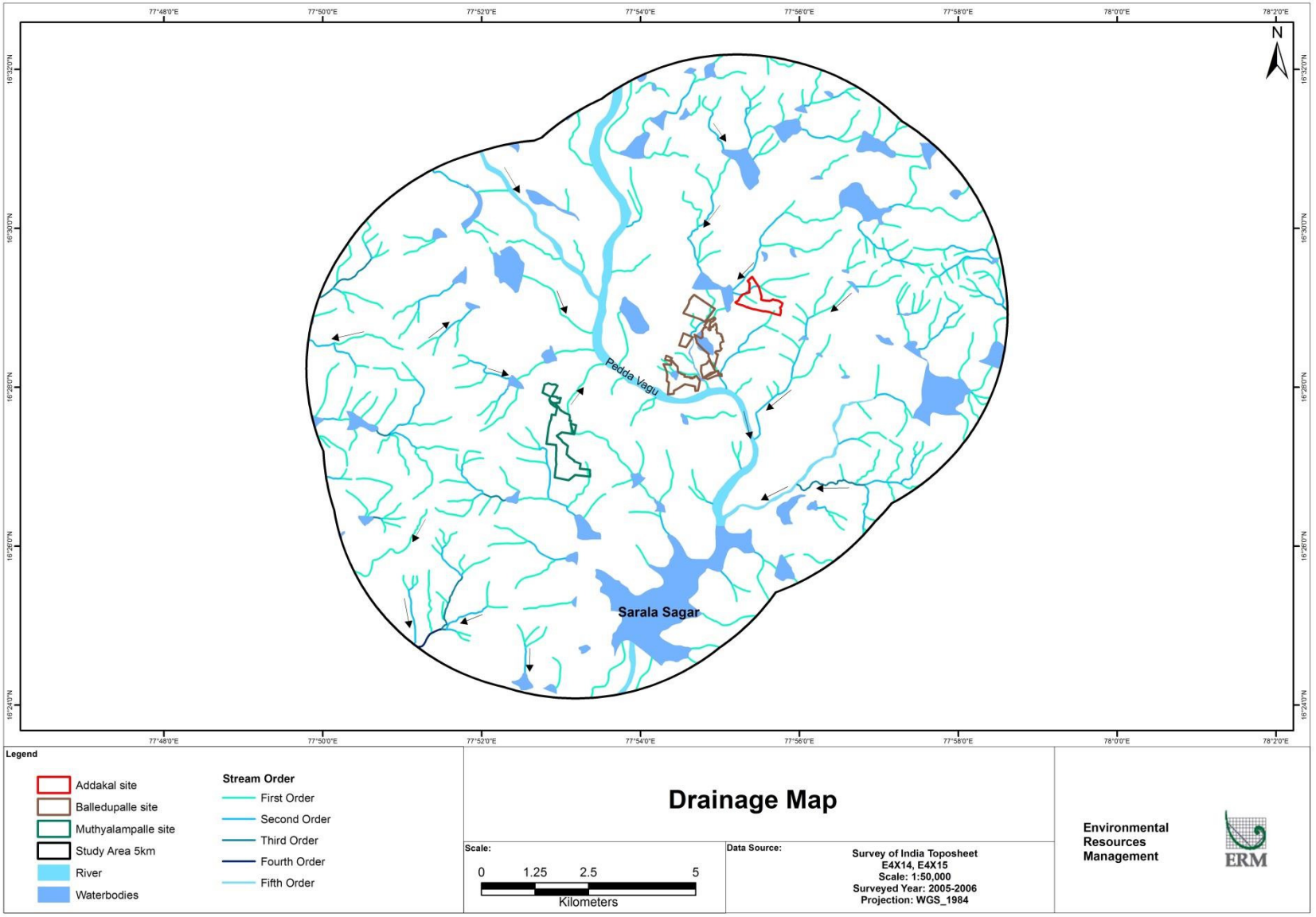


Figure 5.5 Map showing Drainage Pattern within the Study Area



Hydrogeology

As reported by Central Ground Water Board (CGWB) in 2013 ground water occurs in all the geological formations under unconfined to confined condition in hard rock (Archean and Deccan trap ages) and recent alluvial formation. The occurrence of ground water in Archaean formation is controlled by the depth and degree of weathering and fracturing. In general, the thickness of weathering of these rocks ranges from 10m to 30m. The depth of dug wells in weathered zone, Archean rock varies from 6 to 20m with 2-3m column of water retained during summer months. The yields of the wells range between 250 and 350 cu.m/day. The deeper aquifers are developed by constructing bore wells generally down to depth of 100m. However, generally major aquifer zones are encountered between the depth of 40 to 80m. Beyond the depth of 80m, potential zones are rare except along lineaments and valleys.

The Deccan trap formations are not favourable for shallow aquifers. However, contact zones with the underlying lime stones, shales and granites are favourable for deep bore wells.

Ground Water Resource

In Addakal, Peddamandadi and Devarkadra Mandal, net annual ground water availability is 1445 ham (hectare meter), 1314 ham and 1869 ham. Based on the stages of ground water development, Addakal Mandal is categorised as semi-critical. However, based on the stages of ground water development, Peddamandadi and Devarkadra Mandal is categorized as safe. Detail of the stages of ground water development in Mahabubnagar district and Addakal taluka is provided in ***Table 5.7***.

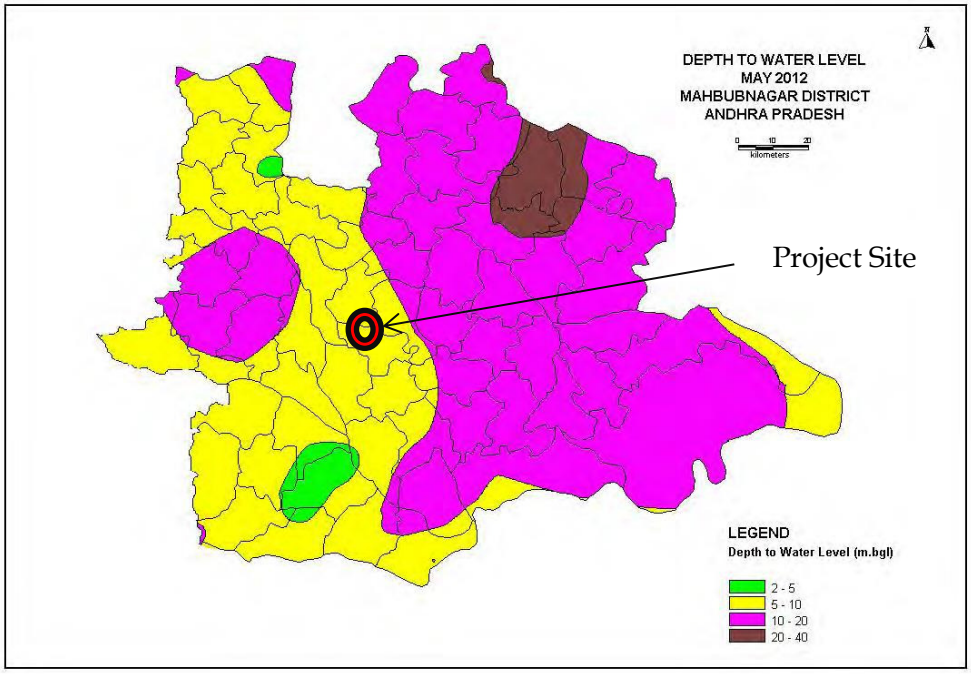
Table 5.7 Dynamic ground water resource of Mahabubnagar district and Addakal, Peddamandadi and Devarkadra Mandal

Assessment Unit	Recharge from rainfall during monsoon season (ham)	Recharge from other sources during monsoon season (ham)	Recharge from rainfall during non-monsoon season (ham)	Recharge from other sources during non-monsoon season (ham)	Total annual ground water recharge [1+2+3+4] (ham)	Provision for natural discharge (ham)	Net annual ground water availability (%)
	1	2	3	4	5	6	7
Mahabubnagar district	79746	26429	29150	29135	164460	15628	148832
Addakal Mandal	895	172	293	245	1605	160	1445
Peddamandadi Mandal	689	194	301	276	1460	146	1314
Devarkadra Mandal	1216	199	382	280	2077	208	1869

Source : Ground Water Information Booklet of Mahabubnagar District, CGWB, 2013

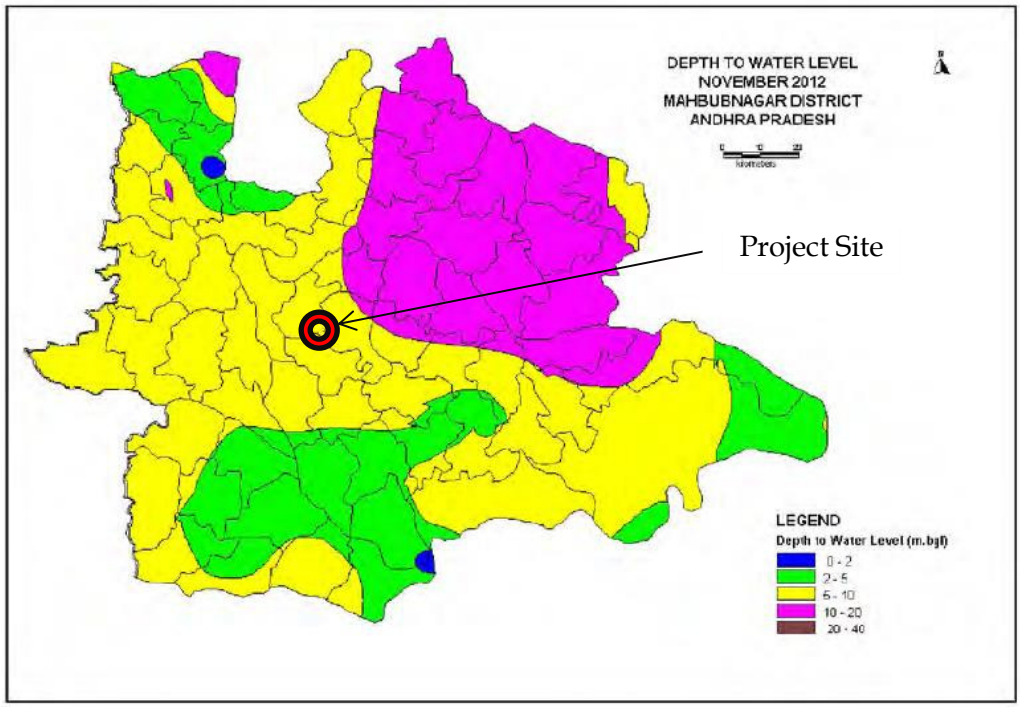
In 2012, during pre-monsoon, depth to water level near the project site has been reported to be 5 to 10m bgl (***Figure 5.6***). During post-monsoon depth to water level is reported to be 5 to 10m bgl (***Figure 5.7***). Thus, fluctuation in water level was not observed in this area.

Figure 5.6 ***Depth to Water Level in Mahabubnagar District in Pre Monsoon (May-2012)***



Source: Groundwater brochure, Mahabubnagar District, Central Ground Water Board, September2013

Figure 5.7 ***Depth to Water Level in Mahabubnagar District in Post Monsoon (Nov-2012)***



Source: Groundwater brochure, Mahabubnagar District, Central Ground Water Board, 2013

The common groundwater abstraction structures are dug wells, dug-cum bore wells. Bore wells and their yields mainly depending on the recharge

conditions in the area. Water required for agricultural activities forms the major user of groundwater.

Surface Water Quality

Surface water samples were collected from one location. Surface water quality characteristic were assessed against CPCB water quality criteria[1]. The detail of the sampling locations is presented in ***Table 5.8*** and ***Figure 5.4***.

Table 5.8 Primary Monitoring Location for Surface Water Quality

Location Code	Location	Geographical Location	Selection Criteria
SW-1	Sarala Sagar	16°24'39.57"N 77°54'13.24"E	Understand the existing surface water quality and assess any impacts due to surface runoff from the project site.

Results of surface water samples have been discussed below and presented in ***Table 5.9***.

Table 5.9 Surface Water Quality in the Study Area

Parameter	SW-1 (Sarala Sagar)	Unit
Colour	<1	Hazen
Odour	Unobjectionable	None
pH value	9.45	None
Total Dissolved Solids (as TDS)	560	mg/l
Boron (as B)	<0.5	mg/l
Chloride (as Cl)	108	mg/l
Copper (as Cu)	<0.02	mg/l
Iron (as Fe)	1.48	mg/l
Manganese (as Mn)	0.09	mg/l
Nitrate (as NO3)	5.5	mg/l
Sulphate (as SO4)	104	mg/l
Lead (as Pb)	<0.005	mg/l
Arsenic(as As)	<0.01	mg/l
Electrical conductivity	845	us/cm
Sodium Adsorption Ration (as SAR)	6.4	None
Zinc (as Zn)	<0.02	mg/l
Total Suspended Solid (as TSS)	67.2	mg/l
Temperature	25.4	Deg C
Dissolved Oxygen	6.2	mg/l
Biochemical Oxygen Demand (as BOD)	10	mg/l
Chemical Oxygen Demand (COD)	52	mg/l
Oil and Grease	<1.4	mg/l
Free Ammonia	0.21	mg/l
Dissolved Phosphate (as P)	0.18	mg/l

Source: Primary Monitoring, 2017

[1] Guide Manual: Water And Wastewater Analysis, CPCB, 2012; http://www.cpcb.nic.in/Water_Quality_Criteria.php

Interpretation of Results

The pH level of the surface water was found to be 9.45, which is alkaline in nature[1]. The DO level of the water sample was 6.2 mg/l, indicating favourable conditions for the growth and reproduction fish and other aquatic organisms in this water body. Biochemical Oxygen Demand (BOD) value of surface water sample was 10 mg/l.

Electrical conductivity (EC) of the surface water sample was recorded as 845 µs/cm.

The presence of contaminants in the form of oil and grease in both the surface water samples were found to be below detectable limit (<1.4 mg/l). Iron content in the surface water sample was found to be 1.48 mg/l.

Ground Water Quality

A monitoring network consisting of three (3) locations for ground water was selected within the study area. Ground water samples collected from tube well were and analysed for physicochemical and bacteriological parameters and the results were compared with IS: 10500, 2012 drinking water standards to identify and interpret any deviation in the statutory limits set for parameters under this standard. The detail of sampling location is presented in ***Table 5.10*** and ***Figure 5.4.***

Table 5.10 Ground Water Quality Sampling Location

Stn. Code	Location	Geographical Coordinate	Selection Criteria
GW-1	Addakal	16°30'27.10"N 77°55'52.50"E	Understanding the existing ground water quality in the nearby habitation and assess any impact on ground water quality due to proposed project
GW-2	Balledupalle	16°28'17.49"N 77°54'52.11"E	Understanding the existing ground water quality in the nearby habitation and assess any impact on ground water quality due to proposed project
GW-3	Mutyalampalle	16°27'26.02"N 77°52'51.31"E	Understanding the existing ground water quality in the nearby habitation and assess any impact on ground water quality due to proposed project

Interpretation of Results

The detailed results of physicochemical characteristics of groundwater samples collected within the study area are presented in ***Table 5.11.***

[1] Department of Zoology of Sarojini Naidu Vanitha Mahavidyalaya had monitored physical and chemical parameters of Saralasagar reservoir water. Finding of the monitoring work published in August 2016, in a report titled "Water quality studies of Saralasagar Reservoir with reference to Physio-Chemical Parameters" has reported high level of pH in reservoir water. During this monitoring work level of pH of the reservoir water was recorded as 8.29 in February.

pH: pH of the groundwater samples were found in the range of 6.85 to 7.47, which are in compliance to the IS 10500 standard of 6.5 to 8.5.

TDS: Total dissolved solids (TDS) in the groundwater samples were found to be 3520 mg/l for Addakal sample (GW-1), 1240 mg/l for Balledupalle sample (GW-2) and 695 mg/l for Mutyalampalle sample (GW-3). Thus, TDS level in ground water sample collected from GW-1 exceeded the permissible limit of IS 10500 standard (2000 mg/l). TDS level in ground water samples collected from GW-2 and GW-3 though exceeded the acceptable limit of IS 10500 standard (500 mg/l), it was incompliance to the permissible limit of IS 10500.

Hardness: Hardness of water is considered to be an important parameter in determining the suitability of water for domestic uses particularly washing. Total hardness of water is correlated to the presence of bivalent metallic ions *viz*. calcium and magnesium. Total hardness values in the groundwater samples were found to be 1824 mg/l at GW-1, 200 mg/l at GW-2 and 320 mg/l at GW-3. Value of total hardness in ground water sample collected from GW-1 and GW-3 exceeded the permissible limit of IS 10500 i.e., 600 mg/l. However, ground water sample collected from GG-2 from the study area was observed to be in compliance to the permissible limit of IS 10500.

Alkalinity: Total Alkalinity values of the ground water samples were found to be 576 mg/l at GW-1, 864 mg/l at GW-2 and 461 mg/l at GW-3. Total alkalinity values were found to be exceeding the acceptable limit of IS 10500 (200 mg/l). However, alkalinity level in ground water sample from GW-1 and GW-3 were incompliance to the permissible limit of IS 10500 i.e., 600 mg/l.

Chloride: Chloride concentrations at GW-1 (231 mg/l), GW-2 (106 mg/l) and GW-3 (41 mg/l) were found to be in compliance to the acceptable limit of IS 10500 (250 mg/l).

Fluoride: Concentration of fluoride in groundwater samples were found to be 0.77 mg/l at GW-1, 2.5 mg/l at GW-2 and 1.3 mg/l at GW-3. Thus, level of fluoride in ground water sample at GW-1 was in compliance with the acceptable limit of IS 10500 (1 mg/l), whereas fluoride concentration in ground water sample at GW-3 was in compliance to the permissible limit of limit of IS:10500 (1 mg/l). Level of fluoride at GW-2 (Balledupalle) was significant.

Metals: Concentration of iron in ground water samples were found in the range from 0.19 (GW-3) to 5.61 (GW-1). Concentration of iron in ground water sample at GW-3 was in compliance to the IS 10500 standard (0.3 mg/l). In other two sampling location (GW-1 and GW-2), iron concentration in ground water samples exceeded the IS 10500 standard. Concentration of heavy metals viz. cadmium, chromium, mercury and nickel were found to be below the detection limit in all the ground water samples. Concentration of lead in

ground water sample was found below detectable at GW-2 and GW-3. At GW-1, concentration of lead in ground water sample (0.12 mg/l) exceeded the IS 10500 limit i.e., 0.01 mg/l.

Table 5.11 Results of Groundwater Quality in the Study Area

Parameter	Unit	GW-1	GW-2	GW-3	IS:10500, 2012	
					Acceptable limit	Permissible limit
Colour	Hazen	<1.0	<1.0	<1.0	5	15
pH value	None	6.85	7.47	7.1	6.5-8.5	No Relaxation
Turbidity	N.T.U.	18	<1.0	<1.0	1	5
Total Dissolved Solids (as TDS)	mg/l	3520	1240	695	500	2000
Calcium (as Ca)	mg/l	573	19.2	68.8	75	200
Chloride (as Cl)	mg/l	231	106	41	250	1000
Fluoride (as F)	mg/l	0.77	2.5	1.3	1	1.5
Iron (as Fe)	mg/l	5.61	0.32	0.19	0.3	No Relaxation
Magnesium (as Mg)	mg/l	94	36	36	30	100
Manganese (as Mn)	mg/l	0.8	<0.02	<0.02	0.1	0.3
Nitrate (as NO3)	mg/l	158	11.6	2.72	45	No Relaxation
Sulphate (as SO4)	mg/l	406	42.2	30.1	200	400
Total Hardness (as CaCO3)	mg/l	1824	200	320	200	600
Cadmium (as Cd)	mg/l	<0.001	<0.001	<0.001	0.003	No Relaxation
Lead (as Pb)	mg/l	0.12	<0.005	<0.005	0.01	No Relaxation
Mercury (as Hg)	mg/l	<0.001	<0.001	<0.001	0.001	No Relaxation
Nickel (as Ni)	mg/l	<0.02	<0.02	<0.02	0.02	No Relaxation
Arsenic(as As)	mg/l	<0.01	<0.01	<0.01	0.01	0.05
Total Chromium (as Cr)	mg/l	<0.01	<0.01	<0.01	0.05	No Relaxation
Nitrite (as NO2)	mg/l	1.7	0.57	0.11	45	No Relaxation
Sodium (as Na)	mg/l	650	550	140	-	-
Potassium (as K)	mg/l	100	1	2	-	-
Total Nitrogen (as N)	mg/l	275	2.9	1.23	-	-
Zinc (as Zn)	mg/l	1.87	0.07	<0.02	5	15
Total Iron (as Fe)	mg/l	5.61	0.32	0.19	-	-
Total Suspended Solid (as TSS)	mg/l	16.8	3.8	5.9	-	-
Temperature	Deg C	30.9	30.8	29.9	-	-
Salinity	None	3.78	1.13	0.57	-	-
Phenol	None	<0.001	<0.001	<0.001	-	-
Total Alkalinity (as CaCO3)	mg/l	576	864	461	200	600
Phosphate	mg/l	0.24	0.23	0.22	-	-

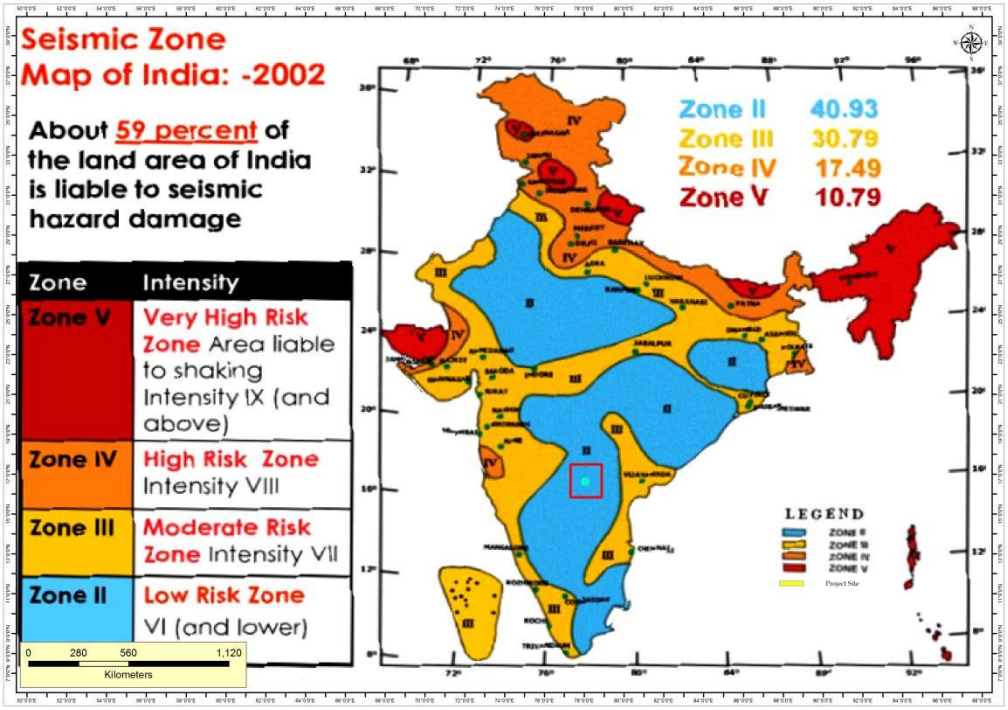
Source: Primary Monitoring, 2017

5.3.6 *Natural Hazards*

Earthquake

As per, National Institute of Disaster Management (NIDM), the project site lies in Seismic Zone II that is a low risk area. Location of project site in Seismic Zone map of India is presented in ***Figure 5.8.***

Figure 5.8 Location of Project site shown on Seismic Zones of India



Source: http://nidm.gov.in/safety_earthquake.asp

Flood

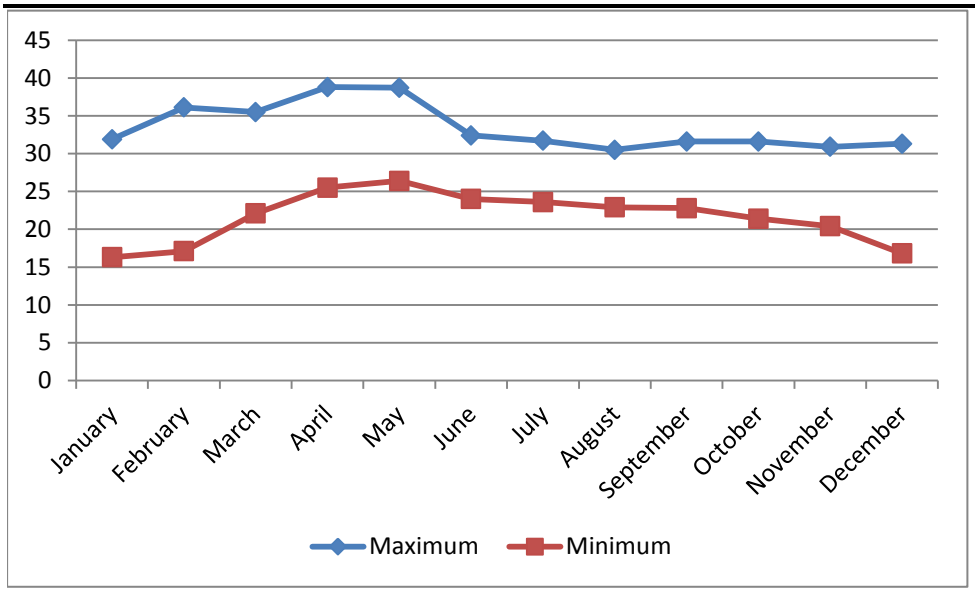
Project site (Balledupalle site) is located close to rain fed river. However, discussion with local villagers of the area reveals that the project sites and study area is not flood prone. Also, it was reported from the consultation that the river was dry for past several years.

5.3.7 *Climate and Meteorology*

Temperature

The mean maximum and mean minimum monthly temperature data of 2005-2006 as reported in Handbook of Statistics, Mahbubnagar District, 2011 was analysed. The mean monthly maximum temperature ranged between 30.55 °C in August to 38.8°C (April) and mean monthly minimum temperature ranges from 16.3°C (January) to 26.4°C (May).

Figure 5.9 Monthly variation in Temperature in Mahabubnagar District (2005-06)

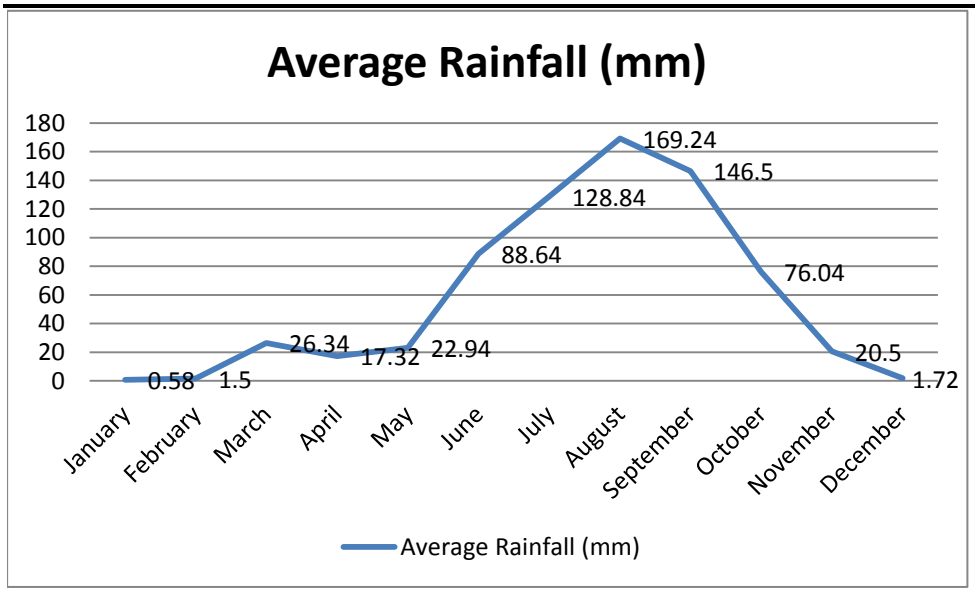


Source: District Statistical Handbook, Mahabubnagar

Rainfall

The annual rainfall of the district between 2007-2011 ranged between 504.4 and 847.5mm. The maximum rainfall occurred between June and October. August was the wettest month with an average rainfall of 169.24 mm between 2007-2011.

Figure 5.10 Average Monthly Rainfall in Mahabubnagar District 20007-2011



Source: District Statistical Handbook, Mahabubnagar

5.3.8 Traffic and Transport

National Highway 44(NH 44) traverses approx. 580m east of Addakal site and approx. 2km east of Balledupalle site. Addakal and Balledupalle site are

connected with NH 44 by village road. Also, approach road to Balledupalle site connects the Mutyalampalle site.

Two traffic monitoring station was selected; one on the access road to Balledupalle site (T1) and the other one on access road to Mutyalampalle site (T2) (refer ***Figure 5.4***). At these two location traffic survey was conducted continuously for 24 hours, one time during the study period. The traffic survey was done for movement of heavy motor vehicles (truck, bus, dumper, tanker and trailer), light motor vehicle (car, jeep, van, matador, tractor, tempo and mini bus), two/three wheelers (scooter, motor cycle, auto, moped) and non-motorized vehicles (bicycle, tricycle). Summary of traffic observed in the study area is given in ***Table 5.12***.

Table 5.12 Traffic Values observed in the Project study area

Description	Traffic Volume at T1	Traffic Volume at T2
Heavy Motor Vehicles (PCU)	117	82
Light Motor Vehicle (PCU)	395	326
Two/Three Wheelers (PCU)	942	563
Non-motorized Vehicles (PCU)	35	17
Total PCU (Nos.)/24 Hours (To & From)	1283	898
Average PCU Flow/Hr	53	37
Max PCU (Nos)/Hr	169	90
Min PCU (Nos)/Hr	0	0
Minimum PCU Hours	From 1.00 hrs to 4.00hrs	From 12.00 hrs to 5.00hrs
Maximum PCU Hours	From 11.00 hrs to 12.00hrs	From 10.00 hrs to 11.00hrs

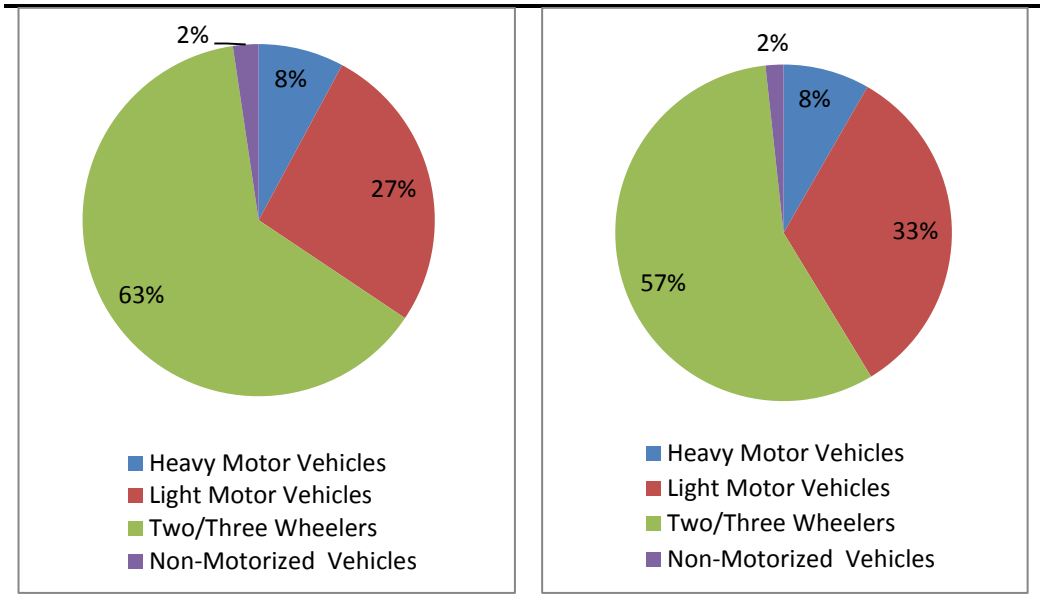
Source: Primary Monitoring, 2017

Interpretation of Traffic Survey Results

At T1 maximum traffic was observed to be 169 PCU between 11.00 hrs to 12.00 hrs, while minimum traffic observed is 0 PCU between 1.00 hrs to 4.00hrs. At T2 maximum traffic was observed to be 90 PCU between 10.00 hrs to 11.00 hrs, while minimum traffic observed is 0 PCU between 12.00 hrs to 5.00 hrs.

Figure 5.11 illustrates contribution of different type of vehicle towards total vehicular traffic at T1 and T2. At both the locations, contribution of two wheeler/three wheelers is significant. Also, heavy vehicle (truck, bus, dumper, tanker and trailer) contributes only 2% at both these locations.

Figure 5.11 Contribution of Different Type of Vehicle at T1 and T2



T1- Balledupalle site access road **T2- Mutyalampalle site access road**

Source: Primary Monitoring, 2017

5.4 ECOLOGICAL BASELINE

5.4.1 Study Area

The study area for the ecological study ranges for 5 km radially from the site boundary. The phyto-geographic classification of the study area is provided in ***Table 5.13***.

Table 5.13 Vegetation Classification of the Region

Area Type	Classification
Biogeographic Zone/Province of India	Deccan Peninsula/Eastern Plateau
Agro Ecological Sub Region (ICAR)	Deccan (Telangana) Plateau and Eastern Ghats Hot semi-arid
Agro-Climatic Region (Planning Commission)	Southern Plateau and Hills Region (X)
Agro Climatic Zone (NARP)	South Telangana Zone (AZ-118)[1]

5.4.2 Habitats

Within Project Site

Habitats within the three sites of the project consist primarily of agricultural land and scrubland. Few trees are located within the project site along with shrubs and herbs. Trees within the site include species as *Butea monosperma, Tamarindus indica, Prosopis cineraria, Acacia nilotica, Cocos nucifera, Azadirachta indica* etc. Shrubs primarily include *Calotropis procera, Cassia tora, Lantana camara, Zizyphus* sp., *Hyptis suaveolens* etc., while herbs and grasses primarily include *Cynodon dactylon, Celosia argentea* etc.

[1] http://agricoop.nic.in/Agriculture%20Contingency%20Plan/AP/AP9-Nizamabad%2031.1.2011.pdf

Figure 5.12 The project site

Project Site

Source: Site and surrounding areas survey by ERM during 13-15 February 2017

Within Study Area

The major habitats in the study area are following:

Open Scrub

Open scrub vegetation mostly comprising of trees like *Butea monosperma, Azadirachta indica, Prosopis juliflora*, *Acacia nilotica*, *Phoenix sylvestris* etc. Shrubs primarily include *Calotropis procera, Zizyphus* sp., *Hyptis suaveolens* etc., while herbs and grasses primarily include *Celosia argentea*, *Cynodon dactylon*, *Cassia tora* etc.

Vegetation patches around Villages

The vegetation around village boundary of Balledupalle, Muthyampalle etc. or used as shade trees in agricultural fields are *Acacia auriculofirmis, Pongamia pinnata, , Cassia siamea, Prosopis cinerarea, Tamarindus indica, Phoenix sylvestris, Mangifera indica, , Ficus benghalensis, Ficus religiosa, Butea monosperma, Albizzia lebbeck, Azadirachta indica, Ailanthus excelsa*, *Borassus flabellifer* etc.

Agricultural Land

The agricultural produce in the study area adjacent to the proposed site was observed to cultivate, paddy, cotton, groundnut, maize etc. The dominant tree species found in the agricultural lands are *Azadirachta indica, Prosopis cinerarea Acacia nilotica, Phoenix sylvestris* etc. which are mainly used as shade trees. The dominant shrub species are *Lantana camara, Calotropis procera, Hyptis suaveolens* etc.

Waterbodies

Waterbodies in proximity to the sites were mostly found dry. Sarala Sagar a large dam was found at about 2.5 km south of the Muthayampalle site was found to contain water. Aquatic macrophytes associated with these water bodies include *Eichhornia crassipes, Lemna minor*, *Ipomea carnea, Ipomea aquatica, Alternanthera* sp., *Wolffia arrhiza* etc.

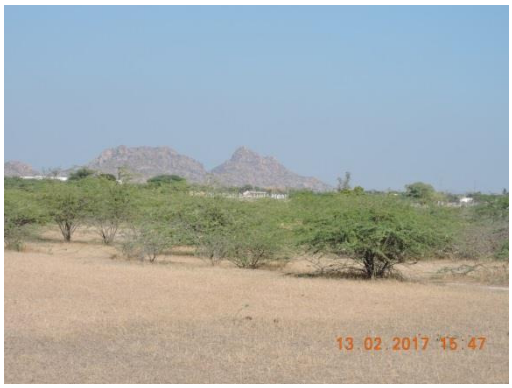
Figure 5.13 Habitat within study area

Agricultural land near Mutyalampalle

Agricultural land near Baleedupalle

Fallow Land

Sarala Sagar Dam



Open Scrub

Open scrub

Vegetation patch near Addakal village

Vegetation patch near Baleedupalle village

Source: Site and surrounding areas survey by ERM during 13-15 February 2017

5.4.3 Faunal Assessments

Faunal species from the study area were recorded based on direct sightings, indirect evidences such as dung, droppings, scats, pugmarks, scratch signs,

burrows, nests etc. and consultation local community. During consultation with communities, pictorial representations of species were used in form of Field guides and other literatures of the faunal species of India. The species occurring within the study area are discussed in the following sections:

Amphibians

A total of two (02) species were observed from the study area. None of the species bear any conservational significance. The details of the species are given in ***Table 5.14***.

Table 5.14 Amphibians observed from the Study Area

Sn	Common Name	Zoological Name	Source	WPA Schedule / IUCN Status
1	Common Indian Toad	*Duttaphrynus melanostictus*	PS	-/ LC
2	Indian Pond Frog	*Euphlyctis hexadactylus*	PS	-/LC

Notes: LC-Least Concern; PS-Primary Survey; CC-Community Consultation

Reptiles

A total of seven (7) species were observed or reported from the study area. Bengal monitor (*Varanus bengalensis*) listed in Schedule I of the Indian Wildlife Protection Act was reported in the area. Checkered Keelback (*Xenochropis piscator*), Indian Rat Snake (*Ptyas mucosa*) and Spectacled Cobra (*Naja naja*) are listed as Schedule II species in Wildlife Protection Act, 1972. All the species observed/reported from the study area are Least Concerned as per IUCN list (IUCN (ver. 2016-3).The details of reptiles are given in ***Table 5.15.***

Table 5.15 Reptiles observed/reported from the Study Area

Sn.	English / Popular Name	Scientific Name	Sources	WPA Schedule / IUCN Status
1.	Checkered Keelback	*Xenochrophis piscator*	CC+PS	II/ LC
2.	Spectacled Cobra	*Naja naja*	CC	II/LC
3.	Indian Rat Snake	*Ptyas mucosa*	CC	II/NA
4.	Keeled Grass Skink	*Eutropis carinata*	CC+PS	-/ LC
5.	Indian Garden Lizard	*Calotes versicolor*	CC+PS	-/NA
6.	Fan-throated lizard	*Sitana ponticeriana*	CC+PS	-/LC
7.	Bengal Monitor	*Varanus bengalensis*	CC	I/LC

Notes: LC-Least Concern, NA- Not Assessed; PS-Primary Survey; CC-Community Consultation

Avifauna

A total of 62 species of birds were recorded from the study area during the field visit. A total of 3 species namely Black Kite (*Milvus migrans*), Black Winged Kite (*Elanus caeruleus)* and Indian Peafowl *(Pavo cristatus),* were listed under Schedule I of Wildlife Protection Act, 1972, and are thus protected from killing and hunting. Three species viz. River Tern (Sterna aurantia), Painted Stork (*Mycteria leucocephalia*) and Black Headed Ibis (*Threskiornis melanocephalus*) is listed as Near Threatened (NT) as per the IUCN classification (version 2016-3).

Identified avifaunal species from the study area are shown in ***Figure 5.14*** and the detailed list provided in ***Table 5.16.***

Figure 5.14 Avifaunal Species observed within the Study Area

Ashy Crowed Sparrowlark

Little Green-Bee eater

Great Cormorant

Intermediate Egret

Indian Spotbilled Duck

Black Headed Ibis

Garganey

Pied Bushchat

Eurasian Collared Dove

Common Stonechat

Black Winged Stilt

Painted Stork

Great Egret

Grey Heron

Source: Site and surrounding areas survey by ERM during 13-15 February 2017

Table 5.16 Avifaunal Species observed in the Study Area

S. No.	Common Name	Scientific Name	IUCN Red List (2016-3)	IWP Schedule	Migratory Status
1.	*Acridotheres tristis*	Common Myna	LC	IV	R
2.	*Actitis hypoleucos*	Common Sandpiper	LC	IV	WV
3.	*Alcedo atthis*	Common Kingfisher	LC	IV	R
4.	*Anas penelope*	Eurasian Wigeon	LC	IV	WV
5.	*Anas poecilorhyncha*	Indian Spot-billed Duck	LC	IV	R
6.	*Anastomus oscitans*	Asian Openbill	LC	IV	R
7.	*Apus nipalensis*	House Swift	LC	IV	R
8.	*Ardea cinerea*	Grey Heron	LC	IV	R
9.	*Ardeola grayii*	Indian Pond Heron	LC	IV	R
10.	*Bulbulcus ibis*	Cattle Egret	LC	IV	R
11.	*Centropus sinensis*	Greater Coucal	LC	IV	R

S. No.	Common Name	Scientific Name	IUCN Red List (2016-3)	IWP Schedule	Migratory Status
12.	*Ceryle rudis*	Pied Kingfisher	LC	IV	R
13.	*Chlidonias hybrida*	Whiskered Tern	LC	IV	WV
14.	*Cinnyris asiaticus*	Purple Sunbird	LC	IV	R
15.	*Columba livia*	Common Pigeon	LC	NE	R
16.	*Coracias benghalensis*	Indian Roller	LC	IV	R
17.	*Corvus splendens*	House Crow	LC	V	R
18.	*Cypsiurus balasiensis*	Asian Palm Swift	LC	NE	R
19.	*Dendrocitta vagabunda*	Rufous Treepie	LC	IV	R
20.	*Dicrurus macrocercus*	Black Drongo	LC	IV	R
21.	*Egretta garzetta*	Little Egret	LC	IV	R
22.	*Elanus caeruleus*	Black Winged Kite	LC	I	R
23.	*Eremopterix griseus*	Ashy crowned Sparrow Lark	LC	IV	R
24.	*Eudynamys scolopaceus*	Asian Koel	LC	IV	R
25.	*Euodice malabarica*	Indian Silverbill	LC	IV	R
26.	*Francolinus pondicerianus*	Grey Francolin	LC	IV	R
27.	*Galerida cristata*	Crested Lark	LC	IV	R
28.	*Gallinula chloropus*	Common Moorhen	LC	IV	R
29.	*Glareola lactea*	Small Pratincole	LC	IV	R
30.	*Halcyon smyrnensis*	White Throated Kingfisher	LC	IV	R
31.	*Himantopus himantopus*	Black Winged Stilt	LC	IV	WV
32.	*Hirundo smithii*	Wire-tailed Swallow	LC	NE	R
33.	*Lanius schach*	Long tailed Shrike	LC	IV	R
34.	*Larus ridibundus*	Black-headed Gull	LC	IV	WV
35.	*Megalaima haemacephalus*	Coppersmith Barbet	LC	IV	R
36.	*Merops orientalis*	Green Bee-eater	LC	IV	R
37.	*Mesophoyx intermedia*	Intermediate Egret	LC	IV	R
38.	*Microcarbo niger*	Little Cormorant	LC	IV	R
39.	*Milvus migrans*	Black Kite	LC	I	R
40.	*Motacilla alba*	White wagtail	LC	IV	WV
41.	*Motacilla madaraspetensis*	White-browed Wagtail	LC	IV	R
42.	*Mycteria leucocephalia*	Painted Stork	NT	IV	R
43.	*Passer domesticus*	House Sparrow	LC	IV	R
44.	*Pavo cristatus*	Indian Peafowl	LC	I	R
45.	*Phalacrocorax carbo*	Great Cormorant	LC	IV	WV
46.	*Ploceus phillipinus*	Baya Weaver	LC	IV	R
47.	*Prinia inornata*	Plain Prinia	LC	IV	R
48.	*Psittacula krameri*	Rose-ringed Parakeet	LC	IV	R
49.	*Pycnonotus cafer*	Red vented Bulbul	LC	IV	R
50.	*Saxicola torquatus*	Common Stonechat	LC	IV	R
51.	*Saxicola caprata*	Pied Bushchat	LC	IV	R
52.	*Saxicoloides fulicatus*	Indian Robin	LC	IV	R
53.	*Spilopelia chinensis*	Spotted Dove	LC	IV	R
54.	*Spilopelia senegalensis*	Laughing Dove	LC	IV	R

S. No.	Common Name	Scientific Name	IUCN Red List (2016-3)	IWP Schedule	Migratory Status
55.	*Sterna aurentia*	River Tern	NT	IV	WV
56.	*Streptopelia decaocto*	Eurasian Collared Dove	LC	IV	R
57.	*Sturnia pagodarum*	Brahminy Starling	LC	IV	R
58.	*Threskiornis melanocephalus*	Black-headed Ibis	NT	IV	R
59.	*Tringa stagnatilis*	Marsh Sandpiper	LC	IV	WV
60.	*Turdoides malcolmi*	Large Grey Babbler	LC	IV	R
61.	*Upupa epops*	Common Hoopee	LC	IV	R
62.	*Vanellus indicus*	Red Wattled Lapwing	LC	IV	R

NT-Near Threatened, LC-Least Concern (IUCN Version 2016.2), Schedule – I, IV (Indian Wildlife Protection Act -1972); R= Resident; WV= Winter Visitor

Mammals

A total of 10 species were observed/ reported from the study area. Two Schedule I species viz. Black Buck (*Antilope cervicapra*) and Chinkara (*Gazella gazelle bennetti*) as per Wildlife Protection Act, 1972 were reported from the study area. A list of species observed/reported from the study area is presented in ***Table 5.17.***

Table 5.17 Details of Mammals observed/ reported from the Study area

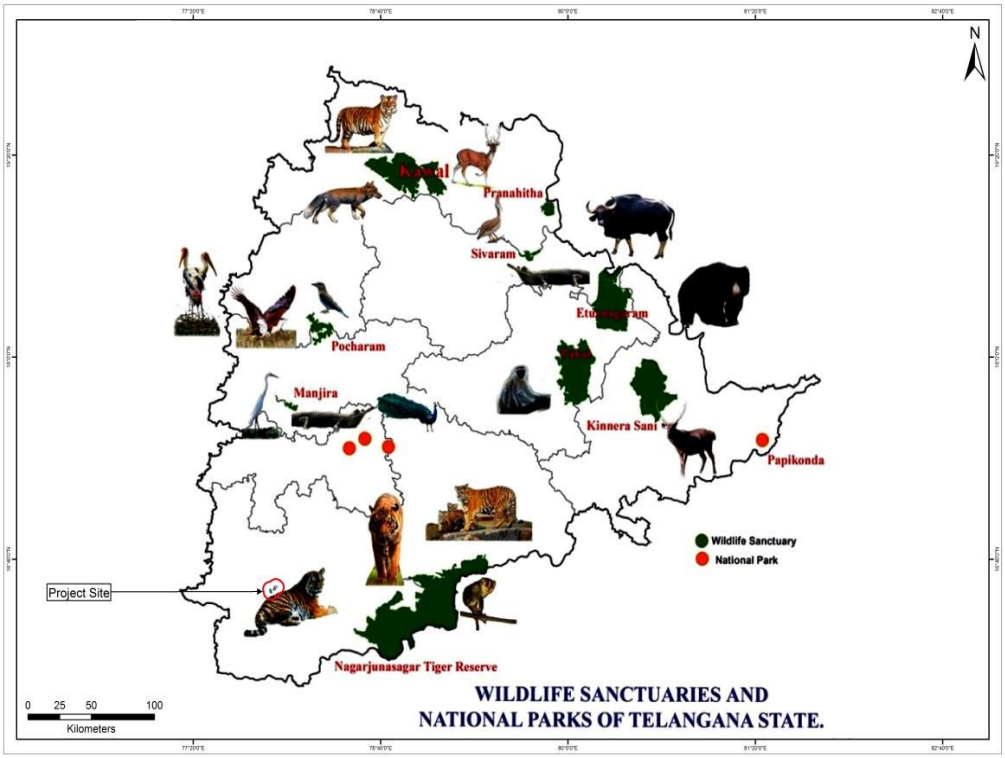
Sn.	English Name	Scientific Name	Sources	WPA Schedule / IUCN Status
1.	Jackal	*Canis aureus*	CC	II/LC
2.	Rhesus Macaque	*Macaca mulatta*	CC	II/LC
3.	Indian Grey Mongoose	*Herpestes edwardsii*	CC+PS	II/LC
4.	Five Striped Squirrel	*Funambulus pennantii*	CC+PS	IV/LC
5.	Bandicoot rat	*Bandicota indica*	CC+PS	V/LC
6.	Indian Hare	*Lepus nigricollis*	CC	IV/LC
7.	Black Buck	*Antilope cervicapra*	CC	I/NT
8.	Chinkara	*Gazella gazella bennetti*	CC	I/LC
9.	Small Indian Civet	*Viverricula indica*	CC	II/LC
10.	Wild Boar	*Sus scrofa*	CC	III/LC

Notes: IUCN-International Union for Conservation of Nature, WPA-Wildlife Protection Act, 1972, LC-Least Concern; PS-Primary Survey; CC-Community Consultation

5.4.4 Protected Areas

There is no protected forests viz. National Park, Wildlife Sanctuary, Tiger Reserve within 10 km of the project site. There is also no Biosphere Reserve, Tiger Reserve, Elephant Reserve and Important Bird Area (IBA) within 10 km of the project site. The protected area map of Telangana is shown in ***Figure 5.15***.

Figure 5.15 Protected Areas in Telangana



Source: www.forests.telengana.gov

5.5 SOCIO-ECONOMIC BASELINE CONDITIONS

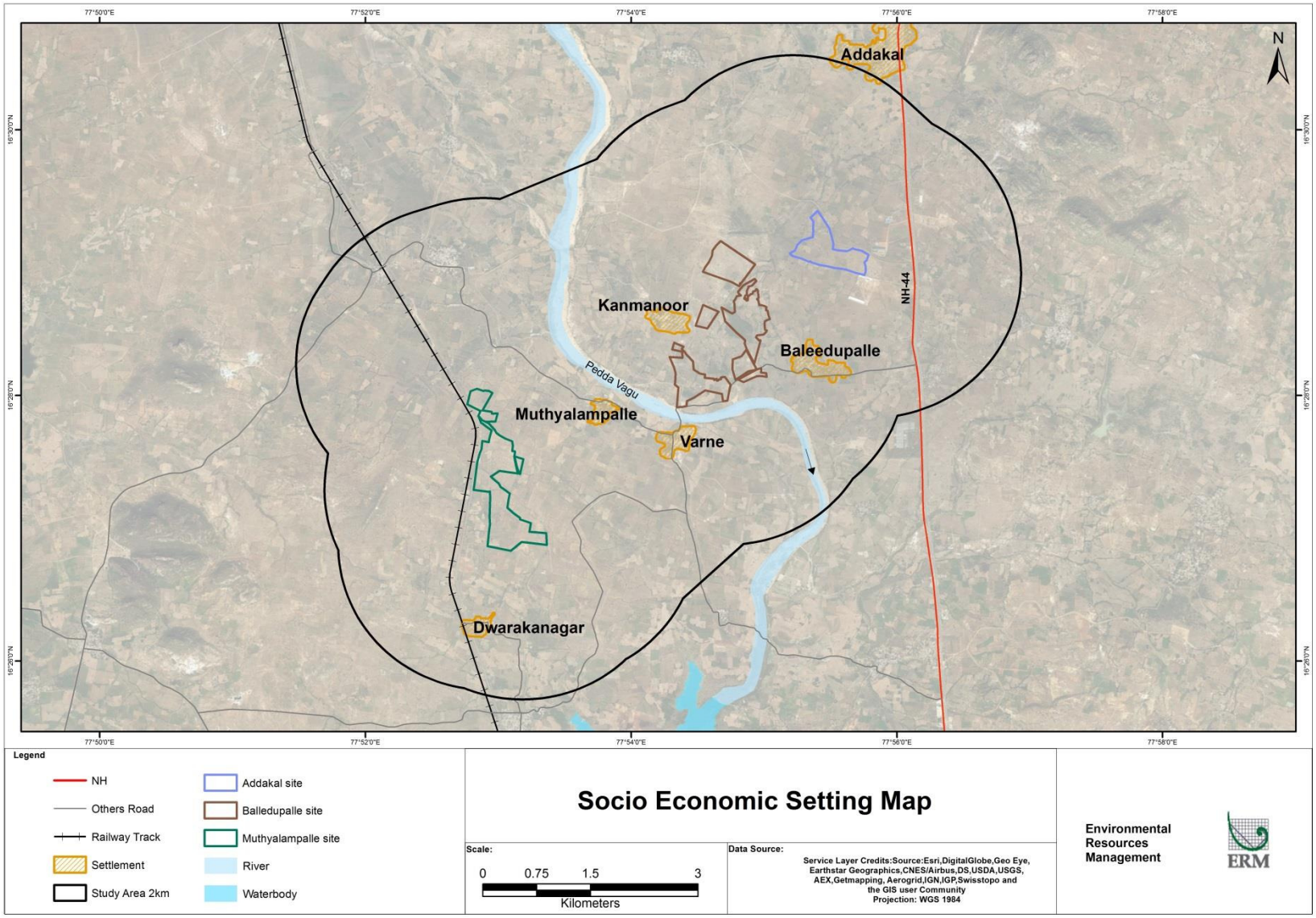
This section provides an understanding of the administrative set up of the district, the demographic profile of the villages in the project area, the social groups present, the vulnerable groups identified, the livelihood profile of the community, the land use patterns in the area, the social and physical infrastructure available in terms of the education and health infrastructure, the water supply for irrigation and drinking purposes, sanitation facilities and connectivity.

This understanding will be based on the secondary information available on the state, district and block level as well as the primary consultations undertaken in the study area by ERM during the site visit. Due to the nature of the study area, the following discussion will be concentrated on the study area with comparisons being drawn to the block and district where appropriate.

5.5.1 Study Area

The social baseline has been assessed covering distance up to 2 km from project boundary designated as the study area. The distance up to 2 km from project boundary has been considered as study area based on the observation that magnitude of impact in this Influence area is likely to be more visible. The study area includes only six villages *(Mutyalampalle, Varne, Addakal, Dwarakanagar, Kanmanoor, and Balledupalle)*. Map below illustrates the study area in blue line.

Figure 5.16 Map of the Study area

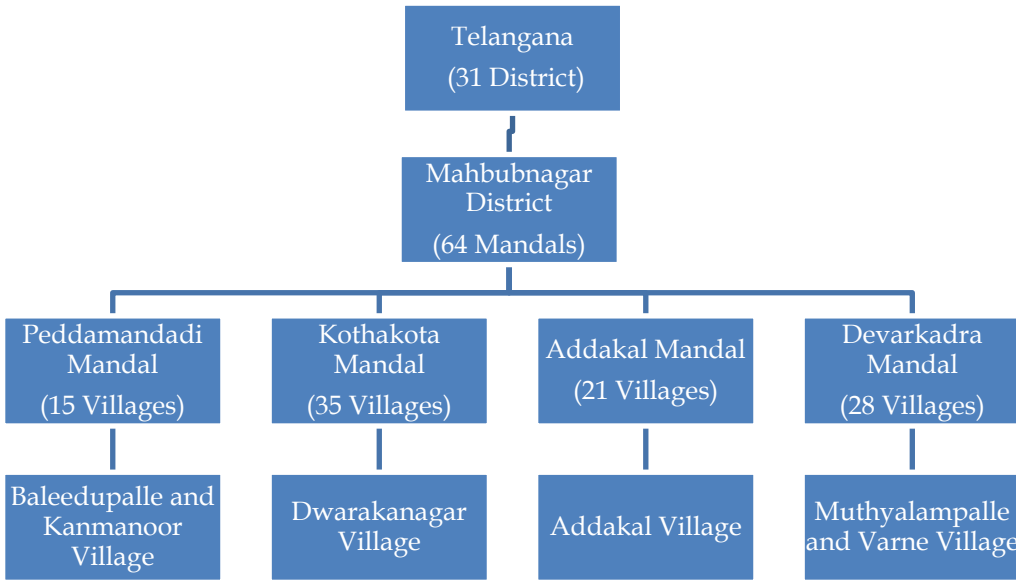


Source: ERM

5.5.2 *Administrative set up of the Study Area*

District Mahbubnagar is administratively managed by 64 mandals. Study area for the project falls under Peddamandadi Mandal, Addakal Mandal, and Mutyalampalle Mandal. Administrative linkage of the villages under study areas are presented in ***Figure 5.17*** provided below.

Figure 5.17 ***Administrative set up of the study areas***



Source: District Statistical Handbook of Mahbubnagar district, 2009

Recently, the state of Telangana underwent a significant reorganization of its internal boundaries. As part of the reorganization process, on 11 October, 2016, the Chief Minister of Telangana, K. Chandrashekhar Rao announced the addition of 21 new districts to the state by bifurcating the existing 9 out of the 10 original districts (excluding the district of Hyderabad). With the administrative rearrangement of the state, the number of districts in Telangana has increased from 10 to 31[1]. As part of the internal reorganization process, Mahbubnagar district has been bifurcated into three separate districts i.e. Mahbubnagar, Nagarkurnool and Wanaparthy. The Peddamandadi, Kothakota, Addakal, Devkadra Mandal, where the study area is being set located falls in the Mahbubnagar district. As the district bifurcation happened less than a six month prior to the ERM site visit, no district level socio-economic data and information pertaining to Mahbubnagar could be obtained. Consequently, available data for previous Mahbubnagar district for the purpose of comparative assessment of socio-economic information with that of the state, district, mandals and the study area has been used.

5.5.3 *Demographic Profile*

This section provides a demographic overview of the study area to provide a clear understanding of the socio-economic and cultural context within which

1 . Hindustan Times (11.10.2016). *Telangana map redrawn adding 21 new districts.* URL: http://www.hindustantimes.com/india-news/telangana-map-redrawn-adding-21-new-districts/story-5jxvG2lmDVGym3TU682PiK.html. Accessed on 08.11.2016

the project is located. ***Table 5.18*** provides broad demographic features of the region wherein project study area is located.

Table 5.18 Demographic profile of Telangana, Mahbubnagar District and Mandal

Name of the village	No. of Households	Total population	Sex Ratio	SC %	ST %	Population density	Literacy rate %	Female literacy rate %	Male literacy rate %
Telangana State	8357826	35193978	988	15.44	9.33	307	66.45	57.92	74.95
Mahbubnagar district	869451	4053028	977	17.49	8.99	191	55.04	44.72	65.21
Devkadra	11628	58385	980	14.03	1.8	247	52.93	42.45	63.35
Addakal	10603	52381	979	13.55	5.20	274	52.85	42.34	63.17
Kothakota	16781	79604	972	14.24	6.27	309	55.74	44.78	66.49
Peddamandadi	8147	40303	977	17.04	8.97	224	53.11	41.19	64.86

Source: Census 2011 Data

As per the 2011 Census records, the study area, covering six villages namely Mutyalampalle, Varne, Addakal, Dwarakanagar, Kanmanoor and Balledupalle has a total of 2,083 households and a population of 10,406. The entire population in the study area falls in the rural category. Key demographic data of the villages within the study area represents the fact that mostly villages are densely located as population density of mostly villages of the study areas are higher than population density of the corresponding district level population density data. Demographic profile of study area villages is captured in ***Table 5.19*** provided below.

Table 5.19 Demographic profile of the study area

Name of the village	No. of Households	Total population	Sex Ratio	Population Density	SC %	ST %	Literacy rate %	Female literacy rate %	Male literacy rate %
Mutyalampalle	155	803	949	183	9.84	0.75	54.24	41.87	65.16
Varne	272	1433	1033	227	0.49	0.00	50.12	38.59	62.46
Addakal	944	4491	961	341	14.05	1.16	59.81	49.56	69.69
Dwarakanagar	107	617	922	137	0.00	0.00	36.93	27.20	45.68
Kanmanoor	269	1471	1018	360	17.40	0.54	62.11	50.77	73.53
Balledupalle	336	1591	947	242	31.11	0.38	51.18	37.04	64.62

Source: Census 2011 Data

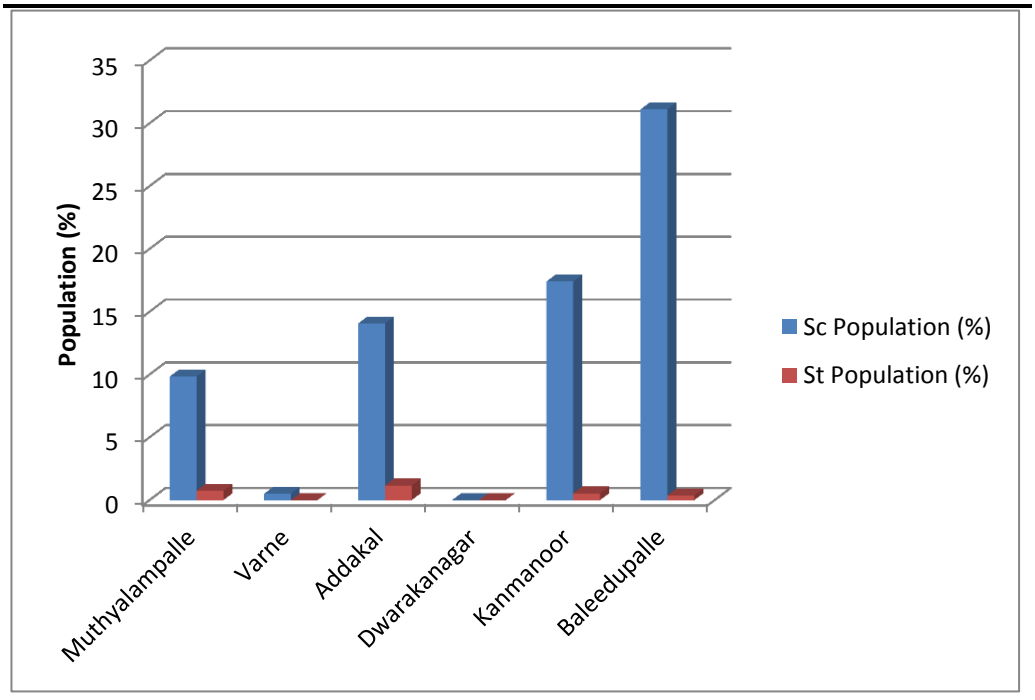
SC/ST Population

Caste and community profile of the study area further reflects that percentage of Scheduled Tribes (ST) population is almost negligible in the study area. Village Addakal is having maximum percentage of ST population (1.16%)

mainly Banjara among the entire study area of the projects. Scheduled Caste (SC) population percentage is quite significant than ST population in every village of the study area and it ranges 0.49% to 31.11% among the villages of study areas with Balledupalle has maximum proportion of SC population percentage. Remaining population are further classified into two major groups; BC (Backward Caste) and OC (Other Caste) that is not accounted for in the Census survey of India. In India, division of people among various caste and communities used to be based upon profession of that particular group and this criterion is still observed locally, however in relatively of lower degree.

The scheduled caste population in the study area is 12.14%, which is lower than the mandal and district figure of 15.35% and 17.49% respectively as per Census 2011 data. Proportion of SC and ST Population in the study area is captured in ***Figure 5.18.***

Figure 5.18 ***Proportion of SC/ST Population in the Study Area vis-à-vis Block/District***



Source: Census 2011 Data

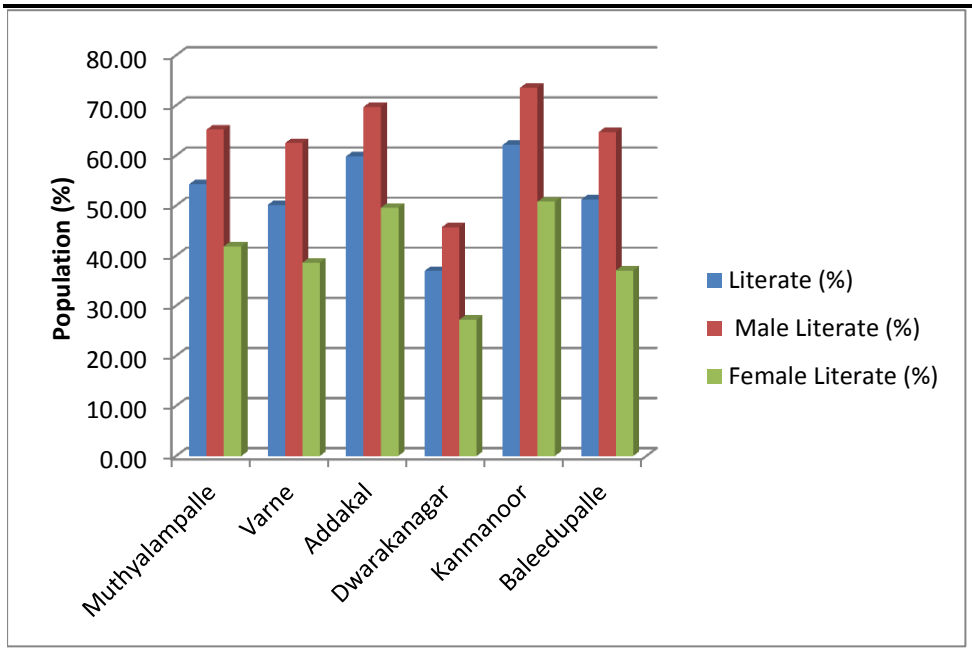
5.5.4 Education profile

Literacy Profile

Literacy status of the study area villages is presented in ***Figure 5.19*** and it suggests that the average literacy rate in study area villages (52.40%), six Mandal (53.66%) and Mahbubnagar district (55.04%) is lower than that observed at the State level (66.45%). Female literacy rate is also lower in all the study area villages. A general trend of education level attainment in study area as observed during consultation is that mostly teenagers drop out after Secondary School and key reasons against this higher drop-out rate were economic conditions of the families as well as lack of quality education. The

dropout rate was to be relatively higher among Scheduled Caste and Backward Caste families.

Figure 5.19 Literacy profile of the study area villages' vis-à-vis Block/District



Source: Census 2011 Data

Educational Infrastructure

The assessment of education facilities and education promotion programs provided by the government in the study area indicates that primary and middle schools are available in each village. However, secondary and senior secondary schools are present in only 2 and 1 village, respectively. Number of schools and colleges existing in study area villages is shown in ***Table 5.20.***

Table 5.20 Schools facilities in study area

Study region	Primary school	Middle school	Nearest Facility	Secondary school	Nearest Facility/Distance	Senior secondary school	Nearest Facility/Distance	Degree college	Nearest Facility/Distance
Muthyalampalle	Y	Y	-	N	Perur/< 5km	N	Devarkadra /10+km	N	Mahbubnagar/10+km
Varne	Y	Y	-	N	Perur/5-10 km	N	Devarkadra /10+km	N	Mahbubnagar/10+km
Addakal	Y	Y	-	Y	-	Y	-	N	Mahbubnagar/10+km
Dwarakanagar	Y	N	Konnur/ <5km	N	Konnur/ <5km	N	Madanpur/ 5-10km	N	Kothakota/10+km
Kanmanoor	Y	Y	-	Y	-	N	Kothakota/ +10km	N	Kothakota/10+km
Baleedupalle	Y	Y	-	N	Addakal /<5km	N	Addakal/<5 km	N	Kothakota/10+km

Source: Village Directory, Census 2011

5.5.5 *Land Profile*

Land Use Classification

The study area has a predominantly agrarian economy for which dependence on land resources is considerably high. The table on land utilization reiterates the heavy dependence of people on agriculture making it one of the primary sources of livelihood in the region.

Land use classification of the study area villages based on census 2011 data have been captured in the ***Table 5.21*** which is provided below. Land use classification at village level is extracted from Village Directory (VD) Data of Census of India.

Table 5.21 Land use classification of villages in the study area (in hectares)

Land use Type	Mutyalam palle	Varne	Addakal	Dwarakanagar	Kanmanoor	Balledupalle
Total Area In Hector	438	632	1318	452	409	658
Forest Area	0	0	0	0	0	0
Area under non-agricultural uses	42.5	69	53.37	8.3	27.04	59.49
Barren and uncultivable land	0	0	348.51	6.5	8.9	12.53
Permanent pastures and other grazing lands	0	0	7.68	0	10.89	0
Land under miscellaneous tree, crops etc.	0	0	0	0	0	0
Culturable waste land	0	0	16.11	9.7	0	0
Fallow lands other than current fallows	0	0	323.76	8	20.23	95.91
Current fallows	0	0	291.76	186	170.37	337.1
Net area sown	395.5	563	276.81	233.5	171.57	152.97
Total Unirrigated Land Area (in Hectares)	255.5	350	585.9	379.3	321.3	507.48
Area Irrigated by Source (in Hectares)	140	213	306.43	48.2	40.87	78.5

Source: Village Directory 2011, Census 2011, Mahbubnagar district

Land use classification based on census 2011 data shows that only 55% land in the study villages is under cultivation because of scarcity of water. Rain water is the main source of water for cultivation and only 25% of the total agricultural land has localised deep tube well irrigation facility. Therefore, agriculture in this area is not a viable source of earning, however people are still involved in agricultural as there is no other livelihood opportunity present with in the study area. Review of the land information suggests that a there is no permanent pastures and grazing land and forest land is present within the study.

Land Holding Pattern

Landholding Census 2005 data for the study region classify land holders in five categories that are Marginal framers (having land holding upto 1 hectare), Small farmers (having land holding between 1 to 2 hectare), Semi-medium farmers (having land holding between 2 to 4 hectare), Medium farmers (having landholding between 4 to 10 hectares) and Large Farmers (having land holding above 10 hectares). Land holding pattern of these Mandals show that majority famers in these areas are under small and marginal categories of farmers. This trend of land holdings was also validated through community consultations in the project area. It was noticed that the marginalised section of the villages like people from SC community, BC community are mostly under marginal category. However consultation with the land sellers reveals that TSEPL procure the land from medium and large landowner of that area. Considerable amount of land is remain with the land owners and after selling of the land and no one became land less.

5.5.6 Occupation and Livelihood

Agriculture is the mainstay of the local economy of the study area. Agriculture labourers constitute significant portion among the different occupation followed by the people in study area. Classification of working population of the study area as well as of the study area as per census 2011 data is presented in the ***Table 5.22.***

Table 5.22 Occupational pattern of villages in the study area[1]

Name of the village	WPR	Main Workers	Marginal Workers	Cultivator	Agricultural Labourers	Household Industry	Other Workers
Mutyalampalle	52.05	99.52	0.48	16.75	36.60	0.96	45.69
Varne	54.57	97.83	2.17	31.33	58.95	1.15	8.57
Addakal	46.89	91.55	8.45	22.84	38.84	1.85	36.47
Dwarakanagar	59.48	100.00	0.00	27.25	60.76	0.00	11.99
Kanmanoor	60.03	95.36	4.64	9.29	70.10	4.19	16.42
Balledupalle	55.00	98.40	1.60	11.09	73.94	2.17	12.80

Source: Census 2011 Data
Note: WPR – Work Participation Ratio

Work Participation ratio (WPR)[2], defined as percentage of total workers including main and marginal workers out of the total population of the study area, is 54.67 % which suggests the study area villages have relatively low unemployment rate as most of people are involved in agriculture.

Other noticeable aspects as evident in the above table is that proportion of Agriculture Labourer (AL) is relatively high in all the study area villages which indicates number of farmers having sufficient land holding for their

1. According to the Census of India, Workers are classified as Main workers, Marginal workers, Non-workers, Workers engaged in cultivation, Agricultural labourers, Household industry workers and Other workers. url: http://censusindia.gov.in/Census_And_You/economic_activity.aspx. Accessed on 08.11.2016.
2. Work Participation ratio (WPR) is defined as percentage of total workers including main and marginal workers out of the total population of the study area

livelihood is on lower side in study area and community consultation also reveals that most of the people of local community has marginal to small landholding which is not sufficient for earning their livelihood.

Cropping Pattern, Intensity and Productivity

Community consultation provides broad overview of cropping pattern in the study area village. Paddy, Castor, Ground nut are the key crops grown in study area; Paddy is key crop during Rabi season in study area; other common crops being sown in Rabi season includes maize. Cotton and castor is the most grown crop during Kharif season. Other crops grown during Kharif season however in lower intensity includes maize etc.

Agriculture productively has been severely affected owing to are being drought prone zone over the previous many years. As reported in local community consultation, that agricultural production observed a sharp decline in agriculture yield is largely attributed to poor rain fall over the previous years as well as lack of access to alternate irrigation facilities in the area.

Agriculture Labour

The occupational pattern of the study area villages as presented in ***Table 5.22*** shows that working population in most of study area villages are actually agriculture labour who works on other's field at certain wage rate mutually negotiated between cultivator and agriculture worker. Another important aspect as observed during community consultation is that agriculture workers mostly belong to the SC and BC community.

Livestock based livelihood

Common livestock in study area includes rearing cattle, buffaloes, while some households are also involved in poultry and Goat farming. Certain families are involved in large scale poultry business.

Non-Farm based livelihood

Non- farm based livelihood as presented in ***Table 5.22*** under the categories of HH workers and other workers suggest that its proportion is relatively very less. Other livelihood opportunities as identified during stakeholder consultations include petty shops in village, working as construction labour, government jobs etc.

There is some industries in the study area but involvement of local people is very limited. The construction phase of solar power project is a good opportunity for local employment. Sizeable population across the HHs were reported to be working outside district.

5.5.7 *Drinking Water & Sanitation Facilities*

The social organization and settlement pattern in the study area is predominantly arranged around the available agricultural land and water resources in the area. Land based livelihood being the key feature of the community, proximity and availability of water is often linked to the economic status of the family/ household. Also typically in a village, water for drinking and other purposes defines the household hygiene/ sanitation and ultimately the standard of living of the community. For drinking purpose, availability of water is mostly in the form of Tap water. Tap water fitted with water filter sourced from ground water serve mostly to the needs of household drinking water consumption. People have to pay Rs. 4 for collecting 20 litter of drinking water from the water filter. But supply of water is very irregular and it was not available during summer month. Villagers depends on water tanker for supplied by panchayat during summer month

Almost 60% of the household have access to individual sanitation facility; only economically weaker section community reportedly resort to open defecation.

5.5.8 *Irrigation*

Community consultation reveals that irrigation facilities in study area seem to be extremely poor as farmers reported to be entirely dependent upon rain water for irrigating their field. Though use of water drawn from bore wells was reported, the same was confirmed to be rare. Similarly, tube wells were also observed to be used only by limited number of farmers for irrigation.

5.6 *HEALTH INFRASTRUCTURE*

Health care infrastructure of the study region is captured in the table provided below.

Table 5.23 Health care facilities in study area

Study villages	Hospitals	PHC	Sub-Centre
Mutyalampalle	10+km	<5km	5-10km
Varne	10+km	<5km	5-10km
Addakal	10+km	Yes	Yes
Dwarakanagar	10+km	10+km	5-10km
Kanmanoor	10+km	10+km	Yes
Balledupalle	10+km	10+km	<5km

Source: Hand book of Statistics, Mahbubnagar District 2011.

It can be revealed from ***Table 5.23*** that there is only 1 primary Health Centre located in Addakal Village but treatment facility in this PHC is very limited. There are no hospitals located within the Study area. Nearest hospital is located at Mahbubnagar, which caters to the health care requirement for most people of the study area. There are no private clinics or doctors in the study villages.

5.7 OTHER PHYSICAL INFRASTRUCTURE

Road & Transportation

All the study area villages are connected with NH 44 through metal road. For the local transportation, use of auto rickshaw is very common in the study area.

Electricity

All study area villages have access to steady electricity supply and most of the households were reported to be connected with the existing electricity supply network. As per community consultation power cut is very limited.

Postal Service, Bank, Telecommunication

As per 2011 census data, none of the villages in the study area have post office and operational branches of banks. Nearest post office and bank facility is available in Addakal village. Mobile phone is the prominent source of telecommunication in the villages under study area.

6 STAKEHOLDER ENGAGEMENT

6.1 INTRODUCTION

This section profiles the key stakeholders for the TSEPL solar project and assesses their potential concerns and levels of influence.

6.2 STAKEHOLDER CONSULTATION AND DISCLOSURE REQUIREMENT FOR THE PROJECT

The disclosure of project information and consultations with stakeholders has been increasingly emphasized by project finance institutions and government regulatory bodies. A brief overview of the requirements of public disclosure and stakeholder consultation applicable to this project is provided below.

Table 6.1 Overview of Disclosure and stakeholder consultation requirement

Institution/ Regulatory Body	Reference Regulation/ Standard	Requirements
IFC	PS-1	• Community engagement is to be undertaken with the affected communities and must be free of external manipulation, interference, or coercion, and intimidation; • Furthermore, in situations where an affected community may be subject to risks or adverse impacts from a project, the proponent must undertake a process of consultation so as to provide the affected communities with an opportunity to express their views on the project risks, impacts, and mitigation measures, as well as allow the proponents to consider and respond to them; • *Informed participation:* For projects with significant adverse impacts on affected communities, the consultation process must ensure that free, prior and informed consultation with affected communities occurs and that processes exist to facilitate participation by those affected; • Apart from such a consultation process, the project proponents are also to establish a Grievance Redressal Mechanism, which will allow the affected communities' concerns and grievances about the project proponent's environmental and social performance to be received and allow for steps to be taken to resolve the same; and • *Broader stakeholder engagement:* The proponent must identify and engage with stakeholders that are not directly affected by the Project but those that have established relationships with local communities and/or interest in the Project – local government, civil society organizations, etc. – and establish a dialogue.

6.3 STAKEHOLDER CATEGORISATION

A stakeholder is "a person, group, or organization that has a direct or indirect stake in a project/organization because it can affect or be affected by the

Project/organization's actions, objectives, and policies"[1]. Stakeholders thus vary in terms of degree of interest, influence and control they have over the project. While those stakeholders who have a direct impact on or are directly impacted by the project are known as **Primary Stakeholders,** those who have an indirect impact or are indirectly impacted are known as **Secondary Stakeholders**. Keeping in mind the nature of the project and its setting, the stakeholders have been identified and listed in the table given below.

Table 6.2 Stakeholder Group categorisation

Stakeholder Groups	Primary Stakeholders	Secondary Stakeholders
Community	• Land Sellers • Sub-contractors • Local labourers	• Local community • Agricultural labourers • Vulnerable Community
Institutional Stakeholders	• Gram Panchayats • Project investors	
Government Bodies	• Regulatory Authorities; • District Administration	

6.4 APPROACH AND METHODOLOGY FOR STAKEHOLDER ANALYSIS

The significance of a stakeholder group is categorized considering the magnitude of impact (type, extent, duration, scale, frequency) or degree of influence (power, proximity) of a stakeholder group and urgency/likelihood of the impact/influence associated with the particular stakeholder group in the project context. The magnitude of stakeholder impact/influence is assessed taking the power/responsibility[2] and proximity[3] of the stakeholder group and is categorized as negligible, small, medium and large. The urgency or likelihood of the impact on/influence by the stakeholder is assessed in a scale of low, medium and high. The overall significance of the stakeholder group is assessed as per the matrix provided below:

Table 6.3 Stakeholder Significance and Engagement Requirement

		Urgency/Likelihood of Influence on/by Stakeholder		
		Low	Medium	High
Magnitude of Influence/ Impact	Negligible	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Urgent
	Large	Moderate	Urgent	Urgent

6.5 STAKEHOLDER ANALYSIS

Stakeholder analysis for the identified stakeholders is being detailed in ***Table 6.5.*** Summary of overall stakeholder influence is presented in the ***Table 6.4.***

1. URL: http://www.stakeholdermap.com/what-is-a-stakeholder.html. Accessed on 10.11.2016.
2. **Power/Responsibility**: Those stakeholders to whom the organisation has, or in the future may have, legal, financial, and operational responsibilities in the form of regulations, contracts, policies or codes of practice.
3. **Proximity:** indicates stakeholders that the organisation interacts with most, including internal stakeholders, those with long-standing relationships and those the organisation depends on its day-to-day operations.

Table 6.4 Summary of overall stakeholder influence

Stakeholder Category	Relevant Stakeholders	Magnitude of Influence/ Impact	Urgency/ Likelihood of Influence	Overall Rating of Stakeholder Influence
Primary stakeholder	Land Sellers	Medium	Low	Minor
	Contractors/Sub-contractors	Medium	Low	Minor
	Local labourers	Small	Medium	Minor
	Gram Panchayats	Medium	Low	Minor
	Regulatory Authorities;	Medium	Low	Minor
	District /Mandal Administration	Medium	Low	Minor
	Local community	Small	Medium	Minor
Secondary Stakeholders	Agricultural labourers	Medium	Low	Minor
	Vulnerable Community	Small	Medium	Minor

Table 6.5 Assessing significance of stakeholder for the Project

Stakeholder Category	Relevant Stakeholders	Profile/Status	Magnitude of Influence/Impact (Negligible, Small, Medium, Large)		Urgency/ Likelihood of Influence (Low, Medium, High)		Overall Rating of Stakeholder Influence
Primary Stakeholder	Land Sellers	• Small, medium and large farmers who owned single or multi crop/barren ancestral and own land; • Although land is an important asset, its economic value is limited due to low productivity and dependence on rainfall; and • Most of the cultivation on land is for subsistence and not for sale in market.	• Selling land is considered an opportunity to liquidate their assets and repay the pending debt as the profit margin become less due high production cost and very low rainfall; • Land procurement process provides an opportunity to land seller to refuse in case they are not willing to sell land; and • Decline in land holding size of the farmers until money received out of land sale is reinvested by farmers for further land purchase. • People also buy additional better quality of land with compensation money	Medium	• Land (550 acres) was procured from 166 land sellers on the basis of willing buyer and willing sellers.	Low	Minor
	Contractors/Sub-contractors	• S &WPL is the EPC Contractor	• Civil construction work during	Medium	• It was reported by the	Low	Minor

Stakeholder Category	Relevant Stakeholders	Profile/Status	Magnitude of Influence/Impact (Negligible, Small, Medium, Large)		Urgency/ Likelihood of Influence (Low, Medium, High)		Overall Rating of Stakeholder Influence
		for the project	construction phase will absorb daily wagers mostly from local areas; and • Migrant workforce would be hired for skilled jobs, mainly in power evacuation process of sub-station.		developer that an estimated maximum 600 labourers in the unskilled, semi-skilled and skilled categories will be employed during the construction phase under different contractors and sub-contractors.		
	Local Labourers	• Local area is having adequate workforce in unskilled category as mostly working population of the local area are agriculture labourer; • Due to very low involvement in the industry nearby, mostly people have to stick to agricultural activity or as evident from community consultations migrate to the middle east (gulf	• Mostly employment opportunities for local people would be limited to construction phase; • The employment opportunities could be in form of requirement for construction labour, vending opportunities like vehicle hiring, tractors hiring, food item supply to labour colony etc.; and • The operational phase would be	Small	• The local wage earners have high expectation of employment from the project; and • The local availability of wage earners is linked to the agricultural season.	Medium	Minor

Stakeholder Category	Relevant Stakeholders	Profile/Status	Magnitude of Influence/Impact (Negligible, Small, Medium, Large)		Urgency/ Likelihood of Influence (Low, Medium, High)		Overall Rating of Stakeholder Influence
		countries) for working as wage labour in the construction industry; and • Employment opportunities generated during construction phase will attract local workers.	have very limited opportunity for employment of local people and this is expected to be for requirement of security personnel;				
	Gram Panchayats	• The Head of the GPs are aware and efficient; • The participation of the people on local governance is satisfactory as regular Gram Sabhas are held; and • GPs play active role in execution of development programs in their village.	• The GPs do not need to issue NoC for establishing Solar Plant; and • The GP has authority to restrict the land-use and resource utilization within the area of their jurisdiction.	Medium	• GPs need to work out a mechanism for cooperation to avoid loss to the property of villagers during construction works; and • GPs needs to play an effective role on in grievance redress mechanism established by TSEPL.	Low	Minor
	Regulatory Authorities;	• The primary regulator for solar energy project in Telangana is Telangana Electricity Regulatory Commission (TSERC) Govt. of Telangana and	• The project requires complying with the guidelines of APERC and IREDA as sector regulators;	Medium	• As per TSEPL personnel application for single window clearance was already submitted	Low	Minor

Stakeholder Category	Relevant Stakeholders	Profile/Status	Magnitude of Influence/Impact (Negligible, Small, Medium, Large)		Urgency/ Likelihood of Influence (Low, Medium, High)		Overall Rating of Stakeholder Influence
		IREDA at National level; • Telangana Pollution Control Board;					
	District /Mandal Administration	• The revenue department (sub registrar) is responsible for registration of land sale, mutation, updating and records and transfer of land; • It also issues NA permission for change in land; • The village secretary, land surveyor plays a significant role as land survey and record keeping; and • The District Collector is overall responsible for protection and maintenance of peace in area.	• The construction phase requires a number of permissions and support from the local administration; • The procedural complication can cause significant project delay; and • The land-matters can give rise to unnecessary litigations;	Medium	• The influence of the stakeholders pertains to the role played in the land allotment process and the smooth functioning of the project	Low	Minor
Secondary Stakeholders	Local community	• Large numbers of people are from SC community;	• The local population has high expectation on getting employment opportunity from the project; and • The rain-fed	Small	• Concerned about safety due to plying of vehicles in their area; • Concerned about loss of	Medium	Minor

Stakeholder Category	Relevant Stakeholders	Profile/Status	Magnitude of Influence/Impact (Negligible, Small, Medium, Large)		Urgency/ Likelihood of Influence (Low, Medium, High)		Overall Rating of Stakeholder Influence
			agriculture provides them limited return.		standing crops due to movement of labours and equipment close by their field; • Want preference in employment opportunities generated by the project.		
	Agricultural Labourers	• There are only a few large farmers in the study area. Most of them are small to marginal farmers who cultivate their land and work as agricultural labourers in neighbouring farms also;	• All project land is located on private land of the locals and that are largely rain fed area;	Medium	• The agriculture labourers will have the opportunity as daily wage labours during construction phase; and • The local sub-contractors can engage local labourers	Low	Minor
	Vulnerable Community	• This stakeholder group is comprised of the economically weaker families (Below the Poverty Line Families), the SC population, and women headed households. These subdivisions have been drawn on the basis of the	• The employment opportunities available to them will be for short term only.	Small	• The study area population is likely to get only short term benefit of employment in construction phase. • The operational phase would have very limited job opportunity like few security	Medium	Minor

Stakeholder Category	Relevant Stakeholders	Profile/Status	Magnitude of Influence/Impact (Negligible, Small, Medium, Large)	Urgency/ Likelihood of Influence (Low, Medium, High)	Overall Rating of Stakeholder Influence
		understanding of the possibility of differentiated impacts on the community on the basis of the economic and social status in the society.		personnel.	

Note: It is significant to note that the stakeholder analysis is based on the current situation. The stakeholder influence on the project is dynamic and may change during the project life. Consequently, the stakeholder analysis needs periodical reassessment and updating

6.6 SUMMARY OF STAKEHOLDER CONSULTATIONS

ERM undertook consultations/ meetings with identified stakeholders during site visit. The intensive deliberations provided a platform for two-way communication between the team of consultants and the stakeholder groups. This in turn helped in developing an understanding of the perceptions of stakeholders with regards to the project and also allowed for a means of recording their feedback. The key points discussed with each of these stakeholders are provided in the table below:

Table 6.6 Stakeholders and Key Points Discussed

S. No.	Stakeholder Category	Key Points Discussed	Outcomes in brief
1.1	Owners of land to be procured for TSEPL Project	• Issues/ grievances with respect to the land purchase process; • Community perception towards the project • Socio-economic condition of the people inhabiting the study area.	• Proposed Project area is primarily single crop agricultural land as irrigation facility is not available. • Only individual level bore well irrigation is present in a few land parcels • Although land is an important asset, its economic value is limited due to low productivity and dependence on rainfall; and • Selling land is considered an opportunity to liquidate their assets and repay the pending debt as the profit margin become less due high production cost and very low rainfall; • Land procurement process provides an opportunity to land seller to refuse in case they are not willing to sell land; and • Decline in land holding size of the farmers until money received out of land sale is reinvested by farmers for further land purchase. • People also buy additional better quality of land with compensation money • Land holders already gets entire amount of compensation for the land
1.2	Local Community	• Land holding pattern in the study area; • Impact of land purchase on livelihood; • Perception of agricultural labourers towards the project; • Current engagement scenario – alternate livelihood options; • Basic amenities in the village – electricity, water supply etc.; • Profile of households by source of water; • Proposed schemes for water supply in the village; • Health scenario in the	• Most of agricultural land is mono cropped. Very few are bi-cropped who have bore well irrigation facility at individual level. • Castor, Maze, Ground nut are the main agricultural produce of the area. • Rice production is very limited due to scarcity of water • People have to invest Rs. 20000/acre for agriculture but the return is only Rs. 30000 to 36000/ acre. • Though the return of investment in agriculture is very limited, people are involved in agriculture as there is no other livelihood opportunity is not present with is the study area. • People are very positive about the industrial development as it will create some livelihood opportunity for local people

S. No.	Stakeholder Category	Key Points Discussed	Outcomes in brief
		village and distances of Hospitals/ Clinics;	• Water supply is not present in the village. Villagers totally are dependent on Tap water fitted with filter installed by the Panchayats for fulfil their water requirement for drinking and other household activity. • Community have pay INR 4 for every 20 litter of water fetching from tap. • Young generation is not interested in agriculture. • Every village has primary school and middle school. For higher education student from study villages goes outside. • Nearest health facility is located in Addakal village which is 6 km away
1.3	Land Aggregator	• No of land owner • Status of land procurement • Land purchase process • Land Compensation • Circle price of land	• Total number of land owner is 166 (28 land owner from Addakal, 81 land owner from Baleedupalli, 57 land owner from Mutyallampalli village) • Land procurement process is over for Addakal and Baleedupalli project site and 90% of land procurement process was completed for Mutyallampalli project site. • Land transfer from land aggregator to SPV, conversion and mutation process is going on. • Land aggregator team negotiated to each land owner in an individual basis. • Land compensation was already paid to every land owner • Land aggregator also assisting the land owner for purchases good quality of land by investing the compensation money on request • Circle price of land is Rs. 1,00,000 to 1,20,000/ acre
1.3	Project Proponent	• Location of the project • Requirement of water, manpower, power etc. during operation phase of the project • Land requirement for the project • Project status and timeline • Power evacuation • Total no. of land owner • Status of land procurement • Land purchase process • Land Compensation • Circle price of land	• 100 MW solar power project is spread into three sites viz. Addakal site, Mutyalampalle site and Balledupalle site. Addakal site is located in Addakal village in Addakal Mandal; Mutyalampalle site is located in Mutyalampalle village in Devarkadra Mandal (Mutyalampalle) and Balledupalle site is located in Balledupalle village in Peddamandadi Mandal, in Mahbubnagar District in Telangana State. • Total land measuring approximately 550 acres is required for installing the project, with site office and inverter room, stock yard etc. • Power purchase agreement signed on 25th February 2016. Anticipated commissioning date is May, 2017 • Power from the project (Addakal site,

S. No.	Stakeholder Category	Key Points Discussed	Outcomes in brief
			Mutyalampalle and Balledupalle) will be evacuated to 400 KV Veltoor substation, located at 1.2 km from Balledupalle. • Approx. 766 KL of water will be required per month for module cleaning. • Total number of land owner is 166 (28 land owner from Addakal, 81 land owner from Baleedupalli, 57 land owner from Mutyallampalli village) • Land procurement process is over for Addakal and Baleedupalli project site and 90% of land procurement process was completed for Mutyallampalli project site. • TSEPL personnel negotiated to each land owner in an individual basis. • Land compensation was already paid to every land owner • TSEPL also assisting the land owner for purchases good quality of land by investing the compensation money on request • Circle price of land is Rs. 1,00,000 to 1,20,000/ acre
1.5	EPC contractor	• Resource requirement (water, manpower, power, raw material etc.) during construction phase of the project. • Subcontractor to be involved for the project	• The major raw materials required for the construction phase are fencing material, construction materials like cement, sand, aggregate that is sourced from local areas. • EPC Contractor- Sterling and Wilson Private Limited; • Civil and Electrical Work- Maruti Construction, MDP, MKS Construction, Star Delta, Prabhu Electrical, Sai Establishment, Chola Electrical, Star Electrical, Mars Control • Six DG sets are procured for power requirement during construction phase of the project. • Approximately 19 KL of water is required per day for civil works during construction stage. • Peak labour requirement for the project is approximately 600 per day during construction phase.

Stakeholder consultation records are presented in ***Annex E***.

Figure 6.1 Stakeholder Consultation

Consultation with Land Owner

Consultation with Land Aggregator

Consultaion with Local Community

Source: ERM Site visit from 13-15 February 2017

7 IMPACT ASSESSMENT AND MITIGATION MEASURES

7.1 INTRODUCTION

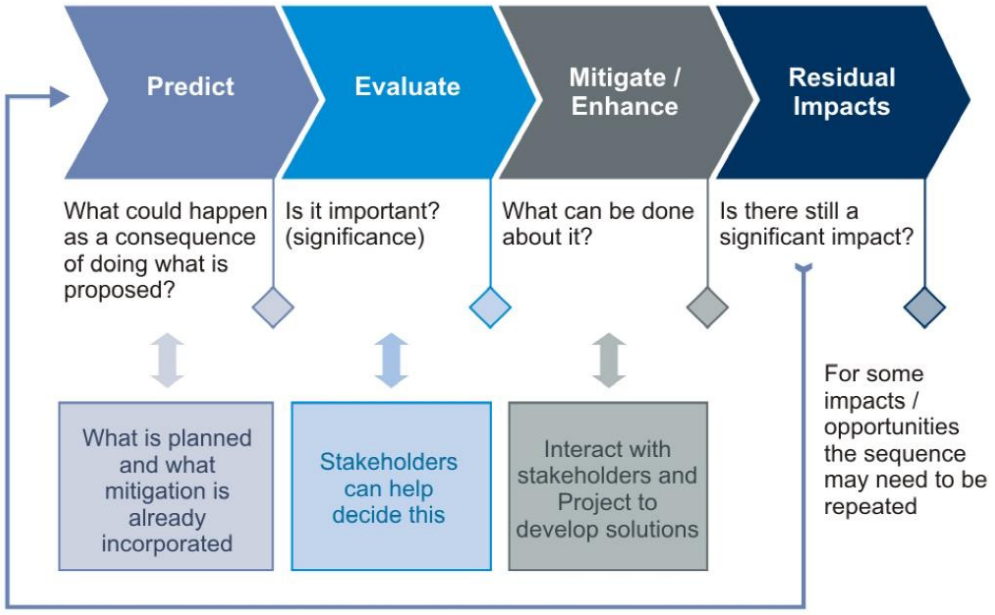
This section assesses the manner in which the project will interact with elements of the physical, ecological or social environment to produce impacts to resources/ receptors. It has been organized as per the various phases of the Project life cycle to understand the risks and impacts associated with each phase.

7.2 ASSESSMENT METHODOLOGY

Impact identification and assessment starts with scoping and continues through the remainder of the IA Process. The principal IA steps are summarized in ***Figure 7.1*** and comprises of

- **Impact prediction**: to determine what could potentially happen to resources/receptors as a consequence of the projects and its associated activities.
- **Impact evaluation**: to evaluate the significance of the predicted impacts by considering their magnitude and likelihood of occurrence, and the sensitivity, value and/or importance of the affected resource/receptor.
- **Mitigation and enhancement**: to identify appropriate and justified measures to mitigate negative impacts and enhance positive impacts.
- **Residual impact evaluation**: to evaluate the significance of impacts assuming effective implementation of mitigation and enhancement measures.

Figure 7.1 *Impact Assessment Process*



Prediction of Impacts

Prediction of impacts was carried out with an objective to determine what is likely to happen to the environment as a consequence of the Project and its associated activities. From the potentially significant interactions identified in scoping, the impacts to the various resources/receptors were elaborated and evaluated.

Evaluation of Impacts

Each impact was described in terms of its various relevant characteristics (e.g., type, scale, duration, frequency, extent). The terminology used to describe impact characteristics is shown in ***Table 7.1.***

Table 7.1 Impact Characteristic Terminology

Characteristic	Definition	Designation
Type	A descriptor indicating the relationship of the impact to the project (in terms of cause and effect)	Direct Indirect Induced
Extent	The "reach" of the impact (e.g., confined to a small area around the Project Footprint, projected for several kilometres, etc.)	Local National Global
Duration	The time period over which a resource/ receptor is affected.	Temporary Short-term Long-term Permanent
Scale	The size of the impact (e.g., the size of the area damaged or impacted, the fraction of a resource that is lost or affected, etc.)	[no fixed designations; intended to be a numerical value or a qualitative description of "intensity"]
Frequency	A measure of the constancy or periodicity of the impact.	[no fixed designations; intended to be a numerical value or a qualitative description]

The definitions for the type designations are given in ***Table 7.2***. Definitions for the other designations are resource/receptor-specific.

Table 7.2 Impact Type Definitions

Type	Definition
Direct	Impacts that result from a direct interaction between the Project and a resource/ receptor
Indirect	Impacts that follow on from the direct interactions between the Project and its environment as a result of subsequent interactions within the environment
Induced	Impacts that result from other activities (which are not part of the Project) that happen as a consequence of the Project.

The above characteristics and definitions apply to planned and unplanned events. An additional characteristic that pertains only to unplanned events is

likelihood. The likelihood of an unplanned event occurring was designated using a qualitative scale, as described in ***Table 7.3.***

Table 7.3 Definitions of Likelihood Designations

Likelihood	Definition
Unlikely	The event is unlikely but may occur at some time during normal operating conditions (probability less than 20%)
Possible	The event is likely to occur at some time during normal operating conditions (probability greater than 20% and less than 50%)
Likely	The event will occur during normal operating conditions (probability greater than 50%

Once an impact's characteristics were defined, each impact was assigned a 'magnitude'. Magnitude is typically a function of a combination (depending on the resource/receptor in question) of the following impact characteristics:

- Extent
- Duration
- Scale
- Frequency

In case of unplanned events only, magnitude incorporates the 'likelihood' factor discussed above.

Magnitude essentially describes the intensity of the change that was predicted to occur in the resource/receptor as a result of the impact. As discussed above, the magnitude designations themselves are universally consistent, but the descriptions for these designations vary on a resource/receptor-by-resource/receptor basis. The universal magnitude designations are:

- Positive
- Negligible
- Small
- Medium
- Large

In the case of a positive impact, no magnitude designation (aside from 'positive') was assigned. It was considered sufficient for the purpose of the IA to indicate that the Project was expected to result in a positive impact, without characterising the exact degree of positive change likely to occur.

In the case of impacts resulting from unplanned events, the same resource/ receptor-specific approach to concluding a magnitude designation was followed, but the 'likelihood' factor was considered, together with the other impact characteristics, when assigning a magnitude designation.

In addition to characterising the magnitude of impact, the other principal impact evaluation step was definition of the sensitivity/ vulnerability/ importance of the impacted resource/receptor. There are a range of factors that was taken into account when defining the sensitivity/ vulnerability/ importance of the resource/receptor, which may be physical, biological, cultural or human. Other factors were also considered when characterising sensitivity/ vulnerability/importance, such as legal protection, government policy, stakeholder views and economic value. The sensitivity/ vulnerability/importance designations used herein for all resources/receptors are:

- Low
- Medium
- High

Once magnitude of impact and sensitivity/ vulnerability/ importance of resource/ receptor have been characterised, the significance was assigned for each impact. Impact significance is designated using the matrix shown in ***Figure 7.2***

Figure 7.2 ***Impact Significance***

		Sensitivity/Vulnerability/Importance of Resource/Receptor		
		Low	Medium	High
Magnitude of Impact	Negligible	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	Large	Moderate	Major	Major

The matrix applies universally to all resources/receptors, and all impacts to these resources/receptors, as the resource/receptor-specific considerations are factored into the assignment of magnitude and sensitivity/ vulnerability/ importance designations that enter into the matrix. ***Box 7.1*** provides a context of what the various impact significance ratings imply.

Box 7.1 Context of Impact Significance

An impact of **negligible** significance is one where a resource/ receptor (including people) will essentially not be affected in any way by a particular activity or the predicted effect is deemed to be 'imperceptible' or is indistinguishable from natural background variations.

An impact of **minor** significance is one where a resource/ receptor will experience a noticeable effect, but the impact magnitude is sufficiently small and/or the resource/receptor is of low sensitivity/ vulnerability/ importance. In either case, the magnitude should be well within applicable standards/ guidelines.

An impact of **moderate** significance has an impact magnitude that is within applicable standards/guidelines, but falls somewhere in the range from a threshold below which the impact is minor, up to a level that might be just short of breaching a legal limit. Clearly, to design an activity so that its effects only just avoid breaking a law and/or cause a major impact is not best practice. The emphasis for moderate impacts is therefore on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable (ALARP). This does not necessarily mean that impacts of moderate significance have to be reduced to minor, but that moderate impacts are being managed effectively and efficiently.

An impact of **major** significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. An aim of IA is to get to a position where the Project does not have any major residual impacts, certainly not ones that would endure into the long-term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). An example might be the visual impact of a facility. It is then the function of regulators and stakeholders to weigh such negative factors against the positive ones, such as employment, in coming to a decision on the Project.

It is important to note that impact prediction and evaluation takes into account any embedded controls (i.e., physical or procedural controls that are already planned as part of the Project design, regardless of the results of the IA Process).

An activity – impact interaction matrix for construction and operation phases of the Project is presented in ***Table 4.1***, which has been further used to assess the impact significance at activity levels on environmental, ecological and social resources.

Identification of Mitigation and Enhancement Measures

Once the significance of an impact has been characterised, the next step was to evaluate what mitigation and enhancement measures are warranted. For the purposes of this IA, ERM adopted the following Mitigation Hierarchy:

- **Avoid at Source, Reduce at Source:** avoiding or reducing at source through the design of the Project.
- **Abate on Site:** add something to the design to abate the impact.
- **Abate at Receptor:** if an impact cannot be abated on-site then control measures can be implemented off-site.
- **Repair or Remedy:** some impacts involve unavoidable damage to a resource (e.g. agricultural land and forestry due to creating access, work camps or materials storage areas) and these impacts can be addressed through repair, restoration or reinstatement measures.

- **Compensate in Kind, Compensate Through Other Means:** where other mitigation approaches are not possible or fully effective, then compensation for loss, damage and disturbance might be appropriate (e.g., planting to replace damaged vegetation, financial compensation for damaged crops or providing community facilities for loss of fisheries, access, recreation and amenity space).

The priority in mitigation was to first apply mitigation measures to the source of the impact (i.e., to avoid or reduce the magnitude of the impact from the associated Project activity), and then to address the resultant effect to the resource/receptor via abatement or compensatory measures or offsets (i.e., to reduce the significance of the effect once all reasonably practicable mitigations have been applied to reduce the impact magnitude).

Management and Monitoring

The final stage in the IA Process was the definition of the basic management and monitoring measures that are needed to identify whether: a) impacts or their associated Project components remain in conformance with applicable standards/ guidelines; and b) mitigation measures are effectively addressing impacts and compensatory measures and offsets are reducing effects to the extent predicted. This is covered in ***Section 8*** under environmental and social management plan (ESMP).

7.3 KEY ENVIRONMENTAL RISKS

Interactions that are likely to lead to significant impacts as identified during the scoping exercise (refer to ***Section 4.3.1***) and baseline conditions (**Section 5.1**) are presented ***Table 7.4***.

Table 7.4 Environmental Interactions identified that are likely to result in significant impacts

Resource/Receptor	Potentially Significant Impacts
Land Use	• Permanent changes in land use due to installation of PV Modules, Central Monitoring Station, Switching Yard, access roads. • Temporary changes in land use due to temporary site office and material storage yard.
Topography and drainage	• Alteration of topography and micro drainage channel due to construction of project site approach road.
Soil Environment	• Decrease of soil quality due to loss of vegetation cover; • Soil erosion during monsoon season and windy periods; • Sedimentation into nearby water bodies due to soil erosion and run-off; • Storage and handling of hazardous materials (e.g., fuel and lubricant) and waste generated from operation of construction equipment and machinery and their maintenance may lead to soil contamination due to leaks/ spillage; and • Impact on soil and land environment due to improper management of domestic solid waste generated.

Resource/Receptor	Potentially Significant Impacts
Ambient Air Quality	• Fugitive dust emissions due to movement of machinery and vehicles; • Fugitive emission due to operation of pile drivers; and • Air emissions due to operations of DG sets and machinery.
Water Environment	• Usage of ground water for construction activities and cleaning of PV modules; • Surface and ground water contamination due to improper disposal of sewage at site; and • Surface and ground water contamination due to spillage of oil, lubricant and hazardous waste.
Ambient Noise Quality	• Noise generation due to movement of vehicles and machineries; • Noise generation due to operation of pile drivers; and • Noise generation due to operation of DG set.
Occupational Health and Safety	• Occupational health hazards due to dust and noise pollution; • Safety risk due to wrong handling of construction machinery, working at heights; and • Exposure of workers to electromagnetic field (EMF) while working in proximity to charged electric power lines during operation and maintenance.

7.3.1 Change in Land Use

For the purpose of assessment of impacts on land use of the area, following project activities leading to an alteration in land use of the area during construction phase were considered:

- Strengthening of access roads and construction of internal access roads;
- Installation of PV modules;
- Construction of Central Monitoring Station, Switching Yard and
- Establishment and operation of temporary structures such as temporary site office (porta cabin) and store yard.

Criteria

For the assessment of land use, the sensitivity and magnitude criteria outline in ***Table 7.5*** and ***Table 7.6*** have been used respectively.

Table 7.5 Sensitivity Assessment Criteria for Land Use

Land Use Sensitivity	Criteria
Low	• Land use not of relevant use by Community • Negligible visual change.
Medium	• Land use of local use by communities e.g. grazing, agriculture, but no major dependence • Visual Change but common feature
High	• Land use of regional importance. Change would impact Land use classification of the area. • Land use of major dependence of local people for agriculture, livestock grazing, settlement etc. • Visual Change aesthetically affecting locals.

Table 7.6 Criteria for Impact Magnitude for Assessment of Impact to Land Use

Magnitude	Criteria
Negligible	An imperceptible, barely or rarely perceptible change in land use characteristics. The change may be short term.
Small	Subtle changes in land use character over a wide area of a more noticeable change either over a restricted area or infrequently perceived. The change may be short term to long term and is reversible.
Medium	A noticeable change in land use character, frequently perceived or continuous and over a wide area; or a clearly evident change over a restricted area that may be infrequently perceived. The change may be medium to long term and may not be reversible.
Large	A clearly evident, frequently perceived and continuous change in land use characteristics affecting an extensive area. The change may be long term and would not be reversible.

Context and Receptor Sensitivity

The study area consists largely of private agricultural land with patches of scrubland, stony waste and water body. The land acquired for the project site was mainly used for cultivation, while a part of this land was scrub land. There is no major dependency for grazing on the land acquired for the project. Scrub land forms 24.39% of the total study area and will act as an alternative for grazing. Thus, receptor sensitivity is assessed as **medium** as per ***Table 7.5.***

Embedded/In-built Controls

Construction activities will also be restricted to within the allotted land and immediate surroundings only. After construction work, any land taken for a temporary basis for storage of material will be restored to their original form. Existing roads will be used for access to the project site with the exception of a small connection from the main village road to the plant site.

Impact Magnitude

During consultation, it was learnt that the cultivable land was not belonging to marginal farmers (as discussed in the baseline section above). The establishment of the solar plant will convert cultivable land to industrial use for long term (25 years). Changes in land use are also envisaged for material store yard and temporary site office (porta cabin). However, those changes in land use will take place only during construction period (6 months). Further, the project will require new access road, which will cause permanent changes in land use. Thus, magnitude of the impact has been assessed to be **medium**.

Significance of Impact

The overall impact significance will therefore be **moderate.**

Additional Mitigation Measures

- Construction activities should be restricted to designated area.
- On completion of construction activities, land used for temporary facilities such as stockyard if any should be restored to the extent possible; and
- The land use in and around permanent project facilities should not be disturbed.

Residual Impact Significance

The residual impact significance will remain **moderate** as changes in land use will be for long term for majority of the project component (installation of PV modules, access roads, central monitoring station, switching yard).

Impact	Changes in Land use during construction and operation				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Limited to project site and associated facilities				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource /Receptor Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **moderate.**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **moderate**				

7.3.2 *Impact on Topography and Drainage*

For the purpose of assessment of impacts on topography and drainage of the area, sensitivity and magnitude criteria have been outlined in ***Table 7.7*** and ***Table 7.8*** respectively.

Table 7.7 Sensitivity Assessment Criteria for Topography

Topography and Drainage Sensitivity	Criteria
Low	Flat topography
Medium	Undulating topography
High	Hilly area

Table 7.8 Criteria for Impact Magnitude for Assessment of Impacts on Topography and Drainage

Magnitude	Criteria

Magnitude	Criteria
Negligible	An imperceptible, barely or rarely perceptible change in topographical characteristics. The change may be short term.
Small	A subtle change in topography character over a wide area of a more noticeable change either over a restricted area or infrequently perceived. The change may be short term to long term and is reversible.
Medium	A noticeable change in topographic character, frequently perceived or continuous and over a wide area; or a clearly evident change over a restricted area that may be infrequently perceived. The change may be medium to long term and may not be reversible.
Large	A clearly evident, frequently perceived and continuous change in topographic characteristics affecting an extensive area. The change may be long term and would not be reversible.

Receptor Sensitivity

The project area exhibits undulating topography. Peddavagu River passes close to (approximately 50 m) Balledupalle site (refer ***Section 5.3.5***). From discussion with local community it was understood that the river was dry for past several years. Also, one micro drainage channel flows close to the Balledupalle site. The receptor sensitivity has been assessed to be **medium**.

Impact Magnitude

Due to undulating topography, study area exhibits several micro drainage channels. Though the solar power project does not require levelling of land, construction of access road for the project purpose could potentially alter topography thereby disturbing micro drainage channel. The impact magnitude has therefore been assessed as **medium.**

Embedded/In-built Control

The EPC contractor will be instructed to avoid any unnecessary changes in the topography. Water bodies and micro drainage channel should be particularly avoided when constructing access roads or planning the transmission line pathway.

Significance of Impacts

Significance of impact is assessed to be **moderate**.

Additional Mitigation Measures

- Disruption/alteration of micro-watershed drainage pattern should be minimized to the extent possible; and
- Appropriate number of cross drainage channels should be provided during access road construction to maintain flow in existing natural channels.

Residual Impact Significance

The residual impact significance will be reduced to **minor** after implementing above mentioned mitigation measures.

Impact	Change in topography and drainage				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Limited to project site and access road				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Moderate.**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor.**				

7.3.3 Impact on Soil Environment

Project Phases and Associated Activities

For impact assessment, the following phases of the project cycles were considered for potential impacts on the soil environment. The phase wise project activities that may impact the environment are described below:

Construction Phase

- Construction/strengthening of access roads;
- Vegetarian clearance and top soil removal;
- Storage of oil and lubricants onsite;
- Storage of construction materials; and
- Disposal of different type of waste generated from the temporary project site

Operational Phase

- Storage of oil and lubricants onsite;
- Disposal of municipal solid waste and waste water from site office; and
- Storage of waste materials onsite.

Decommissioning Phase

- Removal of PV modules; and
- Removal of associated infrastructure.

For the assessment of soil quality, the sensitivity and magnitude criteria is outlined in ***Table 7.9*** and ***Table 7.10*** respectively.

Table 7.9 Sensitivity Assessment Criteria for Soil Quality (compaction, erosion and contamination)

Sensitivity Criteria	Contributing Criteria	
	Environment	*Social*
Soil Quality related criteria as compaction, erosion and contamination and Landuse change	The extent to which the soil and its quality plays an ecosystem role in terms of supporting biodiversity. This includes its role as in supporting a lifecycle stage	The extent to which the soil and its quality provides a use (agricultural use) to the local communities and businesses, or is important in terms of national resource protection objectives, targets and legislation
Low	The soil quality does not support diverse habitat or populations and/or supports habitat or population of low quality	The soil quality has little or no role in provisioning of services as agricultural uses for the local community.
Medium	The soil quality supports diverse habitat or population of flora and fauna and supports habitats commonly available in the study area	The soil has local importance in terms of provisioning services as agricultural services but there is ample capacity and / or adequate opportunity for alternative sources of comparable quality i.e. ready availability across the study area.
High	The soil quality supports economically important or biologically unique species or provides essential habitat for such species.	The soil is wholly relied upon locally, with no suitable technically or economically feasible alternatives, or is important at a regional level for provisioning services.

Table 7.10 Criteria for Impact Magnitude for Assessment of Impact to Soil

Magnitude Criteria	Negligible	Small	medium	Large
Soil compaction and erosion	• Qualitative- No perceptible or readily measurable change from baseline conditions • Scale- Localized area as Particular activity areas • Time-Short duration (few days) or one time as temporary	• Perceptible change from baseline conditions but likely to easily revert back to earlier stage with mitigation • Scale- -Project site, activity areas and immediate vicinity not impacting any sensitive receptor • Short term- Only during particular	• Clearly evident (e.g. perceptible and readily measurable) change from baseline conditions and/or likely take time to revert back to earlier stage with mitigation • Scale- Project site, activity areas and immediate vicinity impacting sensitive	• Major (e.g. order of magnitude) change in comparison to baseline conditions and/or likely difficult or may not to revert back to earlier stage with mitigation • Scale- Regional or international; • Permanent change

Magnitude Criteria	Negligible	Small	medium	Large
		activities or phase of the project lifecycle as civil works or construction phase (few months)	receptor/s • Long term- Spread across several phases of the project lifecycle (few years)	
Soil contamination	Well within Dutch standard[1]	Well within Dutch standard[2]	Exceeds Target Value but well within Interventional Value	Exceeds Interventional Value and needs intervention.

Receptor Sensitivity

The receptor sensitivity has been assessed as **medium** because of the preponderance of agriculture as a source of livelihood in the area.

As discussed in ***Section 5.3.4***, soil quality in this area does not indicate contamination from other source. SAR value of the soil also indicates its suitability for cultivation.

Soil Compaction and Erosion

Soil compaction and erosion has been considered for the construction and decommissioning phases only. In the operation phase, soil compaction and erosion may occur due to vehicle movement, which only happens during the occasional maintenance activities. Soil compaction for the operation phase has therefore been considered to be infrequent and negligible.

Embedded/In-built Controls

Vehicles will utilize existing roads to access the site. Existing roads will be widened to have the width and turning radius to accommodate the necessary vehicles for the project.

Impact Magnitude

The site clearance, excavation for foundation and access road construction will largely affect the top layers of the soil. Loss of top soil quality would have an impact on the agricultural productivity of the land but the effects can be reversed over time. Further, site clearance will be restricted only in the project

[1] Dutch Target and Intervention Values (Soil remediation Circular 2009-2012 Revision), https://zoek.officielebekendmakingen.nl/stcrt-2012-6563.pdf.
The assessment of potential impacts to soil and sediment has been considered as per the Dutch Standard as Bangladesh does not have any local standards for soil or sediment quality.
[2] Dutch Target and Intervention Values (Soil remediation Circular 2009-2012 Revision), https://zoek.officielebekendmakingen.nl/stcrt-2012-6563.pdf.
The assessment of potential impacts to soil and sediment has been considered as per the Dutch Standard as Bangladesh does not have any local standards for soil or sediment quality.

site. Agricultural land/scrub land close to the project site will not be disturbed.

Road quality in the region is moderate and therefore vehicles will be encouraged to utilize the existing roads with minor strengthening. The usage of existing roads by vehicles and minimal access road construction will reduce the impact from soil compaction in the area.

The Impact Magnitude has been assessed to be **small.**

Significance of Impact

The overall impact significance on soil erosion and compaction has been assessed as **minor**.

Additional Mitigation Measures

- Site clearance, piling, excavation and access road construction will not be carried out during the monsoon season to minimize erosion and run-off.

Significance of Residual Impacts

The significance of residual impacts has been reduced to **negligible** taking into account the recommended mitigation measures.

Impact	Soil Erosion and Compaction (Construction and Decommissioning)				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Limited to Project areas				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor.**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Negligible.**				

Waste Generation and Soil Contamination

Waste is generated in all phases of the Project:

Construction:

- Construction waste including concrete, steel cuttings etc.;

- Municipal solid waste produced at the temporary site office including food, plastic, glass, aluminium cans and waste paper; and
- Hazardous material and waste including oil, used oil, oil containing rags, etc.

Operation:

- Solid waste generated by the O&M team including disposal of food, plastic, aluminium cans, glass, etc.;
- Sewage generated from the site office; and
- Hazardous waste (used transformer oil).

Decommissioning:

- Demolition waste generated from removal of site components;
- Hazardous waste including unused oil, fluids, lubricants and grease; and
- Municipal solid waste generated by site office.

Context

General construction waste generated onsite will comprise of concrete, steel cuttings/filings, packaging paper or plastic etc. Municipal solid wastes consisting of food waste, plastic, glass and waste paper will also be generated by the construction workforce at canteen facility. A small proportion of the waste generated during construction phase will be hazardous and will include waste fuel, grease and waste oil containing rags. Use transformer oil which is also categorised as hazardous waste will be generated from the plant. If improperly managed, solid waste could create impacts on soil quality.

Embedded/In-built Control

Hazardous material and waste will be properly labelled, stored onsite at a location provided with impervious surface and in a secondary containment system.

Impact Magnitude

S&WPL (EPC Contractor) has managed several solar farm projects in the past and have effective management systems for waste and hazardous substances being generated or utilized during the project life cycle. The impact magnitude has therefore been assessed as **small**.

Significance of Impact

The impact significance for waste generation and soil contamination has been assessed as **minor.**

Additional Mitigation Measures

- EPC Contractor should ensure that no unauthorized dumping of used oil and other hazardous waste is undertaken at the site;
- Designated areas should be provided for Solid Municipal Waste and daily collection and period disposal should be ensured;
- Construction and Demolition Waste should be stored separately and be periodically collected by an authorized treatment and storage facility;
- All waste should be stored in a shed that is protected from the elements (wind, rain, storms, etc.) and away from natural drainage channels;
- A log book should be maintained for quantity and type of hazardous waste generated; and
- In case of accidental/unintended spillage, the contaminated soil should be immediately collected and stored as hazardous waste.

Significance of Residual Impacts

The significance of impacts due to waste generation in the construction and decommissioning phases after implementation of mitigation measures has been considered as **negligible.**

Impact	Impact on soil environment due to waste generation (hazardous and non- hazardous)				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Limited to project area				
Frequency	Occasionally				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/Receptor Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **minor.**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Major
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **negligible.**				

7.3.4 *Impact on Water Environment*

The impacts of project on the water environment are assessed due to consumption of water during project activities and contamination of water from accidental spillage of fuel, lubricant and hazardous waste.

Criteria

For the assessment of water quality, the sensitivity and magnitude criteria are outlined in ***Table 7.11*** and ***Table 7.12*** respectively have been used.

Table 7.11 Sensitivity Assessment Criteria for Water Resources (Surface water and Ground water)

Sensitivity Criteria	Contributing Criteria	
	Environment	***Social***
Water Resources -Surface water and ground water (quality/quantity related criteria)	The extent to which the water resource plays an ecosystem or amenity role in terms of supporting biodiversity either directly or indirectly, particularly with respect to dependent ecosystems.	The extent to which the water resource provides or could provide a use (drinking water, agricultural uses, washing and other domestic or industrial, use as waterways) to the local communities and businesses, or is important in terms of national resource protection objectives, targets and legislation.
Low	The water resource does not support diverse aquatic habitat or populations, or supports aquatic habitat or population that is of low quality.	The water resource has little or no role in terms of provisioning services as agricultural water source, other domestic uses as washing, bathing, industrial use and waterways for the local community. The groundwater resource is not currently abstracted and used in the vicinity of the Project, but is of sufficient quality and yield to be used for that purpose in the future (and there is a reasonable potential for future use).
Medium	The water resource supports diverse populations of flora and / or fauna but available in the surface water bodies in the region.	The surface water resources have local importance in terms of provisioning services but there is ample capacity and / or adequate opportunity for alternative sources of comparable quality. The groundwater resource is an important water supply, and is currently used, but there is capacity and / or adequate opportunity for alternative sources of comparable quality.
High	The water resource supports economically important or biologically unique aquatic species or provides essential habitat for such species.	The surface water resources are wholly relied upon locally, with no suitable technically or economically feasible alternatives, it is important at a regional or transboundary watershed level for provisioning services.

Sensitivity Criteria	Contributing Criteria	
	Environment	*Social*
		The groundwater resource is wholly relied upon locally, with no suitable technically or economically feasible alternatives. The development stage of groundwater is critical or over exploited.

Table 7.12 Criteria for Impact Magnitude for Assessment of Impact to Surface and Groundwater Resources

Magnitude Criteria	Negligible	Small	Medium	Large
General Criteria	No perceptible or readily measurable change from baseline conditions.	Perceptible change from baseline conditions but likely to be within applicable norms and standards for mode of use.	Clearly evident (e.g. perceptible and readily measurable) change from baseline conditions and / or likely to approach and even occasionally exceed applicable norms and standards for mode of use.	Major changes in comparison to baseline conditions and / or likely to regularly or continually exceed applicable norms and standards for mode of use.
Water	There is likely to be negligible or no consumption of surface water by the Project at any time	The Project will consume surface water, but the amounts abstracted are likely to be relatively small in comparison to the resource available at the time of use (i.e. taking into account seasonal fluctuation)	The Project will consume surface water, and the amounts abstracted are likely to be significant in comparison to the resource available at the time of use (i.e. taking into account seasonal fluctuation)	The Project will consume surface water, and the amounts abstracted are likely to be very significant in comparison to the resource available at the time of use (i.e. taking into account seasonal fluctuation)

Magnitude Criteria	Negligible	Small	Medium	Large
	There is likely to be negligible or no abstraction, use of or discharge to the groundwater by the Project at any time.	The Project will consume groundwater or deliver discharge to groundwater, but the amounts abstracted / discharged are likely to be relatively small in comparison to the resource available at the time of use (i.e. taking into account seasonal fluctuation).	The Project will consume groundwater or discharge to groundwater, and the amounts abstracted / discharged are likely to be significant in comparison to the resource available at the time of use (i.e. taking into account seasonal fluctuation).	The Project will consume groundwater or discharge to groundwater, and the amounts abstracted / discharged are likely to be very significant in comparison to the resource available at the time of use (i.e. taking into account seasonal fluctuation).

Context and Receptor Sensitivity

Addakal Mandal where the Addakal site of the project is located falls in semi-critical category as specified in the CGWB report of Mahbubnagar district. Also, from community consultation, it was understood that ground water is scared in this area. People in this area wholly relied on ground water for agriculture and for their other needs. The receptor sensitivity has been assessed as low for environmental criteria but medium for social criteria as per ***Table 7.11.***

Embedded/In-built control

- The embedded control measure is provision for impervious storage area, especially for fuel & lubricant, hazardous waste, etc.
- Permission will be obtained from Telangana State Water, Land and Trees State Level Authority for abstraction of ground water as the provision of Telangana Water, Land and Trees Rules, 2004.

Impact Magnitude

During construction phase, water is sourced through tank water supply from nearby bore wells. Approximately 19 KLD of water is presently being used during construction work. Water requirement for workers is approximately 6 KLD considering peak labour engagement. During operation phase, water will be required for washing the face of the solar modules once in every month. Approximately 766 KL of water will be required monthly for PV module washing. Water for module cleaning will be source from bore wells at the project site.

The fuels, lubricant and hazardous waste generated during construction and operation phase of the project will be stored at a designated area which is paved with provision of secondary containment. Thus the contamination of groundwater can happen only due to accidental spillage of fuel, lubricants

and chemicals from storage areas or and during the transfer of fuels and chemicals. In this area groundwater level varied between 5 to 10m below the ground level. However, the soil type of the area is clayey. This type of soil is clay which does not allow easy percolation into the subsoil and subsequently the ground water. The spillage of chemical and fuel may not easily contaminate the ground water. Also, the water quality of the study area reveals that there was no contamination in the ground as well as surface water quality in this area. Therefore, the spillage of chemicals and fuel may not cause measurable changes in the ground water quality. The constriction activity is short term, (i.e. 6 months).

The magnitude of impact for ground water quality is assessed to be **minor**. However, impact on ground water resource mainly during operation phase of the project is assessed as **moderate**.

Significance of Impact

The overall impact significance will therefore be **major.**

Additional Mitigation Measures

- Hazardous material should be kept on impervious layer with secondary containment;
- In case of accidental/unintended spillage, the contaminated soil should be immediately collected and stored as hazardous waste;
- Regularly monitor the ground water quality;
- Maintain logbook for water consumption;
- Adopt less water consuming module cleaning methods; and
- Prepare and implement water conservation scheme e.g., rainwater harvesting at the project site.

Significance of Residual Impact

Residual impact significance has to be retained as **minor**.

Impact	Water quality due to spillage of oil, hazardous waste (waste oil) and water resource due requirement of water for construction and ground water resource due to water requirement (PV module cleaning) during operational phase of the project				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Limited to project areas				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/Receptor Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **major.**				

Residual Impact Magnitude	Positive	Negligible	Small	Medium	Major
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **minor.**				

7.3.5 *Impact on Air Quality*

The assessment with respect to air quality of the study area has been done for the following project activities:

- Fugitive emissions from site clearing, excavation work, material handling etc.;
- Fugitive emission from traffic movement;
- Exhaust emission from operation of machineries like pile drivers, vehicles; and
- Point source emission from diesel generator.

Criteria

The sensitivity criteria and impact magnitude criteria has been provided in ***Table 7.13*** and ***Table 7.14*** respectively.

Table 7.13 Sensitivity criteria for air quality

Sensitivity Criteria	Contributing Criteria	
	Human Receptors	***Ecological Receptors***
Low	Locations where human exposure is transient.[11]	No
Medium	Few Receptors (settlements) within 500 m of the project site	Nationally designated sites.
High	Densely populated receptors(settlements) within 500 m of project site	Internationally designated sites.

Table 7.14 Criteria for Impact Magnitude for Assessment of Impact to Air Quality

Magnitude Criteria	Negligible	Small	Medium	Large
Air Quality	Soil type with large grain size (e.g. sand); and/or No emissions/dust generation due to Project across all phases	Soil type with large grain size (e.g. sand); and/or Limited emissions/dust generations for short duration	Moderately dusty soil type (e.g. silt); and/or Dust generation and emissions from Projects for long duration	Potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size); and Significant process emissions from Project for the entire Project

[1] As per the NAAQS and World Bank/IFC guidelines, there are no standards that apply to short –term exposure, e.g., one or two hours, but there is still a risk of health impacts, albeit less certain.

Magnitude Criteria	Negligible	Small	Medium	Large
				cycle.

Receptor Sensitivity

The receptor sensitivity has been assessed as medium for human receptors and low for ecological receptors. The receptor sensitivity is therefore **medium** based on the criteria provided in ***Table 7.13.***

Construction Phase

Air quality impacts in the construction phase will be largely due to the following sources:

- Fugitive dust emissions from site clearance, piling work, handling of construction materials, emission due to movement of vehicles on unpaved roads, plying of vehicles, etc.
- Vehicular emissions due to increased traffic movement on site and on the approach roads;
- Exhaust emissions from construction machinery and other equipment such as pile drivers; and
- Emissions from diesel generators required to be run for construction power purposes.

Impact Magnitude

The biggest source of emissions in the construction phase is the fugitive dust emissions from construction activities. The construction activities are also going to occur for a small period of time (~6 months). The impact magnitude has been categorized as **small** because the soil type is largely clay and the dust emissions will only occur occasionally.

Embedded/In-built Controls

- Diesel generator use should be restricted to emergencies and power back-up only to minimize air emissions; and
- Vehicle engines need to be properly maintained and should have a valid Pollution Under Control (PUC) to ensure minimization in vehicular emissions.

Significance of Impact

The impact significance for air quality in the construction phase is assessed as **minor**. There will be some impacts due to plying of vehicles on the access roads which runs across settlement area. The impacts however, are not anticipated to be significant considering short duration of the construction phase of the project.

Additional Mitigation Measures

- Speed of vehicles on site should be limited to 10-15 km/hr; and
- Prevent idling of vehicles and equipment.

Significance of Residual Impact

The significance of residual impact will be **negligible** after implementing mitigation measures.

Impact	Ambient Air quality – Construction phase				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Project area and vicinity				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **minor.**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Major
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **negligible.**				

Decommissioning Phase

Air quality impacts in the decommissioning phase will be largely due to the following sources:

- Fugitive dust emissions from demolition, handling of demolition materials and transportation of materials;
- Vehicular emissions due to increased traffic movement on site and on the approach roads;
- Exhaust emissions from demolition machinery and other equipment such as bulldozers, excavators etc.; and
- Emissions from diesel generators required to be run for demolition purposes.

Impact Magnitude

The biggest source of emissions in the decommissioning phase is the fugitive dust emissions from demolition activities. The demolition activities are likely to occur for a very small period of time (~3 months) and therefore the impact magnitude has been assessed as **small** as per ***Table 7.14.***

Embedded/In-built Controls

- Diesel generator use should be restricted to emergencies and power back-up only to minimize air emissions; and
- Vehicle engines need to be properly maintained and should have a valid Pollution Under Control (PUC) to ensure minimization in vehicular emissions.

Significance of Impact

The impact significance for air quality in the decommissioning phase is assessed as **minor**. As discussed above, there will be some impacts due to plying of vehicles on the access roads which runs across settlement area. The impacts however, are not anticipated to be significant considering short duration of decommissioning phase of the project.

Mitigation Measures

- Speed of vehicles on site should be limited to 10-15 km/hr; and
- Prevent idling of vehicles and equipment.

Significance of Residual Impacts

The significance of residual impact will be **negligible** after implementing mitigation measures because of the fugitive dust emissions anticipated during demolition activities.

Impact	Ambient Air quality – Decommissioning Phase				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Project area and vicinity				
Frequency	Regular during decommissioning				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **minor.**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Major
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **negligible.**				

7.3.6 *Impact on Noise Levels*

The assessment with respect to ambient noise quality of the study area has been done for the following project activities:

- Construction activities including site preparation, piling work, access road widening, construction of ancillary facilities;
- Transportation of construction materials, machinery and personnel;
- Operation of DG sets; and
- Demolition activities during decommissioning phase.

Criteria

The ambient noise levels have been assessed with respect to Noise Pollution (Regulation and Control) Rules, 2000 and WHO Guidelines as shown in ***Table 7.15*** and ***Table 7.16*** respectively.

Table 7.15 Ambient noise quality standards [(1)]

Area Code	Category of Area	Limits in dB(A) L_{eq}*	
		Day Time	Night Time
(A)	Industrial Area	75	70
(B)	Commercial Area	65	55
(C)	Residential Area	55	45
(D)	Silence Zone	50	40

Note:

1. Day time shall mean from 6.00 a.m. and 10.00 p.m.
2. Night time shall mean from 10.00 p.m. and 6.00 a.m.
3. Silence zone is an area comprising not less than 100 metres around hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority.
4. Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.

* dB(A) Leq denotes the time weighted average of the level of sound in decibels on scale A which is relatable to human hearing. A "decibel" is a unit in which noise is measured. "A", in dB(A) Leq, denotes the frequency weighting in the measurement of noise and corresponds to frequency response characteristics of the human ear. Leq: It is energy mean of the noise level over a specified period.

Table 7.16 Noise emission criteria

Location	Noise Level Limit (dB(A)	
	Daytime (0700 – 2200 hrs)	Night-time (2200 – 0700 hrs)
Industrial; commercial	70	70
Residential; institutional; educational	55	45

Source: Guidelines values are for noise levels measured out of doors. Source: Guidelines for Community Noise, World Health Organisation (WHO), 1999.

The above standards have been utilized to create a sensitivity criteria for ambient noise (***Table 7.17***) and criteria for impact magnitude for assessment of impact to ambient noise (***Table 7.18***).

Table 7.17 Sensitivity criteria for ambient noise

Sensitivity Criteria	Contributing Criteria	
	Human Receptors	***Ecological Receptors***

[(1)]Source: Schedule of The Noise Pollution (Regulation and Control) Rules, 2000 vide S. O. 123(E), dated 14.2.2000 and subsequently amended vide S.O. 1046(E), dated 22.11.2000, S.O. 1088(E), dated 11.10.2002, S.O. 1569 (E), dated 19.09.2006 and S.O. 50 (E) dated 11.01.2010 under the Environment (Protection) Act, 1986

Sensitivity Criteria	Contributing Criteria	
	Human Receptors	*Ecological Receptors*
Low	Industrial Use	Locally designated sites; and/or areas of specific ecological interest, not subject to statutory protection (for example, as defined by the project ecology team).
Medium	Residential and Recreational place	Nationally designated sites.
High	Educational/ Religious/ Medical Facilities	Internationally designated sites.

Table 7.18 Criteria for impact magnitude for assessment of impact to ambient noise

Magnitude Criteria	Negligible	Small	Medium	Large
Noise Quality	Predicted noise levels are at or less than 3 dB (A) above the relevant limits / thresholds. Short term exposure (Few hours in a day and not continuous)	Predicted noise levels are 3 to less than 5 dB (A) above the relevant limits / thresholds.	Predicted noise levels are between 5 and 10 dB (A) above the relevant limits / thresholds. Medium Term Exposure (1 to 6 months)	Predicted noise levels are more than 10 dB (A) above the relevant limits / thresholds. Long term exposure (> 6 months)

The receptor sensitivity has been assessed as **medium** as per the criteria set in ***Table 7.17.***

Construction and Decommissioning Phase

The sources of noise in the construction phase include construction activities, operation of DG sets and movement of vehicles. There will also be increased noise levels because of increased anthropogenic movement in the area.

Similar to construction phase, during decommissioning phase of the project, noise will generate from movement of vehicles carrying dismantled structure and equipment.

Context and Receptor Sensitivity

Settlement of Baleedupalle Village is most likely to be affected by increasing noise levels because of proximity to the project site access road. Also, settlement of Kanmanoor Village is likely to be impacted due to proximity to Mutyalampalle and Balledupalle site. The receptor sensitivity is therefore considered as **medium.**

Embedded/In-built control

Normal working hours of the contractor to be defined (preferable 8 am to 6pm). If work needs to be undertaken outside these hours, it should be limited to activities which do not generate noise.

Impact Magnitude

Impact magnitude is considered to be **small** considering the construction period of the project to last for approximately 6 months**.**

Significance of Impact

The impact significance has therefore been assessed as **minor.**

Mitigation Measures

- Only well-maintained equipment should be operated on-site;
- If it is noticed that any particular equipment is generating too much noise then lubricating moving parts, tightening loose parts and replacing worn out components should be carried out to bring down the noise and placing such machinery far away from the households as possible;
- Machinery and construction equipment that may be in intermittent use should be shut down or throttled down during non-work periods; and
- Minimal use of vehicle horns and heavy engine breaking in the area needs to be encouraged.

Significance of Residual Impacts

Significance of residual impact is assessed to be **negligible** considering above mentioned mitigation measures.

Impact	Ambient Noise Levels – Construction & Decommissioning Phase				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Project area and vicinity				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered to be **minor**.				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Major
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **negligible.**				

7.3.7 Occupational Health and Safety

Working at height will be undertaken during erection of transmission line and stringing of wires. Construction of support structure for PV module would require operation of pile drivers. The installation of solar module will involve

operation of cranes and other mechanical lifting equipment. Laying of interconnecting cable with require digging. The commissioning of the inverter rooms and transmission line will also involve live power lines. The working at height has the risks of falling from the height and working on live wires carrying power has dangers of electric shock and electrocution.

The project site also needs to implement proper measures for fire safety, structural safety and any for emergency situations.

The occupational health and safety concerns mentioned above would be consistent across the project life cycle and therefore the impacts would be similar in nature.

Embedded/In-built Controls

- All construction activities should be carried out during daytime hours and vigilance should be maintained for any potential accidents;
- Personal Protective Equipment (PPEs) including safety shoes, helmet, goggles, ear muffs and face masks;
- Cranes and other lifting equipment are operated by trained and authorised persons;
- Training of the workers on climbing techniques, and rescue of fall-arrested workers;
- Excavated areas should be temporarily fenced to avoid access to outsiders and wildlife;
- An up-to-date first aid box should be provided at all construction sites and a trained person should be appointed to manage it; and
- Electrical and maintenance work should not be carried out during poor weather and during lightning strikes.

Significance of Impact

The impact on occupational health and safety during the construction phase is evaluated to be of **minor** significance, as the installation of solar module and erection of transmission line will be done through experienced and trained workers.

Mitigation Measures

- All workers (regular and contracted) should be provided with training on Health and Safety management system of the EPC contractor during construction stage and SP Infra's EHS policies and procedures during the operation stage;
- Obtain and check safety method statements from contractors;
- Monitor health and safety performance and have an operating audit system; and
- Permitting system should be implemented to ensure that cranes and lifting equipment is operated by trained and authorized persons only;

- Appropriate safety harnesses and lowering/raising tools should be used for working at heights;
- All equipment should be turned off and checked when not in use; and
- A safety or emergency management plan should be in place to account for natural disasters, accidents and any emergency situations.

Significance of Residual Impacts

Significance of residual impact is assessed to be **negligible** considering above mentioned mitigation measures.

Impact	Occupational health and safety during construction, operation & maintenance and decommissioning.				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	The construction work involves construction of solar power station along with construction of transmission lines				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Vulnerability of Receptors	Low	Medium	High		
	The construction of solar power plant and erection of transmission line will be done through experienced and trained workers. However, construction of other components will involve local workers who may not have earlier experience. Hence, there will be greater vulnerability for accidents.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the overall impact magnitude and vulnerability of social receptors, the impact significance is assessed as **minor**.				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Major
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **negligible.**				

7.4 KEY ECOLOGICAL RISKS

7.4.1 Assessment Criteria

ERM Impact Assessment Standards defines sensitivity of ecological receptors by determining the significance of effects on species and habitats separately. The significance tables for species and habitats are given in ***Table 7.19*** and ***Table 7.20*** respectively.

Table 7.19 Habitat-Impact Assessment Criteria

Habitat Sensitivity/ Value		Magnitude of Effect on Baseline Habitats			
		Negligible	Small	Medium	Large
		Effect is within the normal range of variation	Affects only a small area of habitat, such that there is no loss of viability/ function of the habitat	Affects part of the habitat but does not threaten the long-term viability/ function of the habitat	Affects the entire habitat, or a significant portion of it, and the long-term viability/ function of the habitat is threatened.
Negligible	Habitats with negligible interest for biodiversity.	**Negligible**	**Negligible**	**Negligible**	**Negligible**
Low	Habitats with no, or only a local designation / recognition, habitats of significance for species listed as of Least Concern (LC) on IUCN Red List of Threatened Species, habitats which are common and widespread within the region, or with low conservation interest based on expert opinion.	**Negligible**	**Negligible**	**Minor**	**Moderate**
Medium	Habitats within nationally designated or recognised areas, habitats of significant importance to globally Vulnerable (VU) Near Threatened (NT), or Data Deficient (DD) species, habitats of significant importance for nationally restricted range species, habitats supporting nationally significant concentrations of migratory species and / or congregatory species, and low value habitats used by species of medium value.	**Negligible**	**Minor**	**Moderate**	**Major**
High	Habitats within internationally designated or recognised areas; habitats of significant importance to globally Critically Endangered (CR) or Endangered (EN) species, habitats of significant importance to endemic and/or globally restricted-range species, habitats supporting globally significant concentrations of migratory species and / or congregatory species, highly threatened and/or unique ecosystems, areas associated with key evolutionary species, and low or medium value habitats used by high value species.	**Negligible**	**Moderate**	**Major**	**Critical**

Table 7.20 Species-Impact Assessment Criteria

Baseline Species Sensitivity/ Value		Magnitude of Effect on Baseline Habitats			
		Negligible	Small	Medium	Large
		Effect is within the normal range of variation for the population of the species	Effect does not cause a substantial change in the population of the species or other species dependent on it	Effect causes a substantial change in abundance and/or reduction in distribution of a population over one, or more generations, but does not threatened the long term viability/ function of that population dependent on it.	Affects entire population, or a significant part of it causing a substantial decline in abundance and/or change in and recovery of the population (or another dependent on it) is not possible either at all, or within several generations due to natural recruitment (reproduction, immigration from unaffected areas).
Negligible	Species with no specific value or importance attached to them.	**Negligible**	**Negligible**	**Negligible**	**Negligible**
Low	Species and sub-species of LC on the IUCN Red List, or not meeting criteria for medium or high value.	**Negligible**	**Negligible**	**Minor**	**Moderate**
Medium	Species on IUCN Red List as VU, NT, or DD, species protected under national legislation, nationally restricted range species, nationally important numbers of migratory, or congregatory species, species not meeting criteria for high value, and species vital to the survival of a medium value species.	**Negligible**	**Minor**	**Moderate**	**Major**
High	Species on IUCN Red List as CR, or EN. Species having a globally restricted range (i.e. plants endemic to a site, or found globally at fewer than 10 sites, fauna having a distribution range (or globally breeding range for bird species) less than 50,000 km^2), internationally important numbers of migratory, or congregatory species, key evolutionary species, and species vital to the survival of a high value species.	**Negligible**	**Moderate**	**Major**	**Critical**

7.4.2 Impacts during construction Phase

Impacts from the construction phase of the project on the local ecology have been assessed with respect to the following activities:

- Removal of vegetation from fallow agricultural land, open scrubland for site construction and ancillary facilities:
    - Impact on scrubland species and the loss of connectivity between habitats or to resources within a habitat, and
- Impacts from excavation and construction activity on habitats and species:
    - Impact on burrowing species, and
    - Effect of sediment and contaminant input into surrounding water bodies; and
- Laying of access and internal roads for the project.
- Laying of transmission lines and transmission towers

Impact due to Vegetation Clearance

Context

Few trees are located within the project site viz. *Butea monosperma, Tamarindus indica, Prosopis cineraria, Acacia nilotica, Cocos nucifera and Azadirachta indica* etc. Shrubs primarily include *Calotropis procera, Cassia tora, Lantana camara, Zizyphus* sp., *Hyptis suaveolens* etc., while herbs and grasses primarily include *Cynodon dactylon*, *Celosia argentea* etc. Clearance of vegetation will include removal of these trees particularly at the Mutyalampalle site. Removal of shrubs and herbs will take place in all the three sites.

Clearing of vegetation from agricultural land, open scrubland reduces options for nesting habitat, shelter from predators, foraging resources, shade, perching habitat and breeding sites of herpetofauna and ground dwelling birds. The loss of vegetation can also have a negative effect on soil quality and hamper survival of neighbouring floral species, burrowing faunal species and foraging resources for herbivores in the area.

Embedded/ In-built Controls

Clearance of matured trees will be prevented as far as possible. Matured tamarind and coconut trees at Balledupalle site will not be felled.

Significance of Impacts

The significance of impacts from vegetation clearance is being assessed as per ***Table 7.19*** for open scrubland and agricultural land and ***Table 7.20*** for small mammal species, herpetofauna and avifaunal species.

Construction activities will lead to removal of vegetation at the project site. The ecological baseline section reveal that the tree species located at or within the immediate vicinity of the project site are *Butea monosperma, Tamarindus*

indica, Prosopis cineraria, Acacia nilotica, Borassus flabellifer and *Azadirachta indica* etc. Site preparation activities could lead to clearance of these species particularly at the Mutyalampalle site. In addition, vegetation clearance could also remove few shrub and herb species (*Calotropis procera, Cassia tora, Lantana camara, Zizyphus* sp., *Hyptis suaveolens*). Vegetation clearance will lead to habitat disturbance for reptiles such as Indian cobra (*Naja naja*), Oriental Garden Lizard (*Calotes versicolor*), Indian monitor lizard (*Varanus bengalensis*), birds like Indian peafowl (*Pavo cristatus*) and mammals such as Blackbuck (*Antilope cervicapra*), Chinkara (*Gazella bennetti*), Bandicoot rat (*Bandicota indica*) and Indian Hare (*Lepus nigricollis*) etc.

The clearance of vegetation within the site is expected to occur at small enough scale to have an impact on habitat for species (birds, mammals and some reptiles) as vegetation is scattered and there is no continuous vegetation patch within the site. However, as the sites are large (67 acres, 190 acres and 293 acres) construction activities may disrupt connectivity of habitats for species utilizing the area.

Felling of matured trees would be few and limited to Mutyalampalle site only. In the Mutyalampalle site also there is no continuous patch of vegetation present. Vegetation removal at Balledupalle and Addakal sites would be limited to removal of shrubs and herbs only. Habitat impact magnitude is thereby considered **small** as per ***Table 7.19***.

The sensitivity of these habitats is considered **medium** (as per ***Table 7.19)*** though vegetation to be removed are not included under protected status as per IUCN categorization, however, they may have some significance for providing habitat for few Schedule I species like Blackbuck and Chinkara.

The tree, shrub or herb species to be removed from open scrub and agricultural habitats are common to the area and not protected as per IUCN categorization. However the site has few reptilian, avian and mammalian species protected under Schedule I of the IWPA and therefore the site has been deemed to have **medium** sensitivity for species (as per ***Table 7.20***). The impacts described above will not cause a significant change in the population of these floral species as the floral species are common to the area and have widespread distribution. Moreover, similar kind of habitats are widespread in the areas adjoining to the project site, hence loss of habitat for faunal species within the project site will not cause any substantial change in population of the faunal species as they could easily relocate to surrounding areas and therefore impact magnitude has been deemed **small** (as per ***Table 7.20***).

The overall impact significance has been assessed as **minor** for habitats and **minor** for species.

Mitigation Measures

The following mitigation measures will further reduce the impact significance on the habitat and species:

- Vegetation disturbance and clearance should be restricted to the project activity area – location of laydown area, construction activities and storage areas;
- Unnecessary disturbance of neighbouring vegetation due to off-road vehicular movement, fuel wood procurement and destruction of floral resources should be prohibited.

Residual Impacts

Removal of vegetation can have a direct and indirect impact on the local ecology. While the impact is limited to the relatively short construction phase of the project, the recovery time to return to pre-project conditions is long and therefore the significance of the residual impacts will remain **minor** for habitat and **minor** for species.

Table 7.21 Impact significance of vegetation clearance during the construction phase

Impact	Clearance of vegetation				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Limited to construction area				
Frequency	Construction phase				
Likelihood	Likely				
Impact Magnitude (Habitat)	Positive	Negligible	Small	Medium	Large
Impact Magnitude (Species)	Positive	Negligible	Small	Medium	Large
Resource Sensitivity (Open Scrubland & agricultural lands)	Low	Medium	High		
Resource Sensitivity (Species)	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **minor** for habitats and **minor** for species.				
Residual Impact Significance	Significance of impact is considered **minor** for habitats and minor for species**.**				

7.4.3 Construction Activities

Context

Vegetation clearance and habitat disturbance are two of the biggest impacts from construction activities and have already been covered in the previous section. This category will focus on increased anthropogenic movement in the

project study area, noise from construction activities. These activities are assessed with respect to disturbance of habitats and species.

Site preparation, access road construction and ancillary facilities will have a direct impact on burrowing fauna and an indirect impact on flora/fauna through the changing of soil properties. A decrease in soil quality will affect surrounding vegetation and reduce foraging resources for herbivorous species.

Anthropogenic movement will result in an increased stress placed on fauna in the area that will have to remain alert for an extended period of time and may prevent proper breeding, nesting, mating, socializing and foraging. Noise from anthropogenic movement (men and transport) along with the construction activities may further disturb fauna in the nearby areas.

Embedded/ In-built Controls

The embedded controls to be adopted by the project is mentioned below

- Avoidance of vegetation clusters;
- Minimum clearance of vegetation with proper use of the open barren spaces present in the area;
- Whenever feasible, existing village or tractor roads would be upgraded to create an approach road minimizing the disturbances on local flora and fauna.

Significance of Impacts

The significance of impacts from construction activities is being assessed as per ***Table 7.19*** for open scrubland, agricultural land, and ***Table 7.20*** for burrowing species (Indian Grey Mongoose, snakes and lizards).

Site preparation and access road construction can have a detrimental impact on the soil properties in the area that will have an effect on burrowing species, neighbouring flora and herbivores. Burrowing animals including Indian Grey Mongoose, snakes (Spectacled Cobra, Indian Rat snake, etc.), ground-roosting bird species and lizard burrowing holes can be directly affected by site preparation activities or indirectly affected by the weakening of the soil layers. The weakening of soil layers will also promote grass and shorter vegetation instead of denser scrub and can change the floral and faunal composition in the area.

Anthropogenic movement will create an increased stress on faunal species. Mammals, birds and reptiles in the project study area are particularly susceptible to this movement. Mammal species are also susceptible to higher noise levels from anthropogenic movement and construction due to their better auditory perception. Noises can affect mating and breeding behaviour in all species that utilize sound to communicate with one another and find suitable mates.

Habitat impact magnitude is considered **small** as per ***Table 7.19*** as impacts occur over a small area and do not affect habitat function/viability regionally. The sensitivity of these habitats is considered **medium** as per ***Table 7.19*** as they may have some significance for Schedule I species like Chinkara, Blackbuck, Peacock, Monitor lizard etc.

Sensitivity of species is considered **medium** as per ***Table 7.20*** several reptilian, avian and mammalian species protected under Schedule I of the IWPA are recorded/reported from the study area which have the potential of experiencing these impacts. The impacts described above will not cause a significant change in the population of these species and therefore the impact magnitude has been deemed **small** (as per ***Table 7.20***).

Impact significance for habitats is considered **minor**. Furthermore impact significance for species is also considered **minor**.

Mitigation Measures

The following mitigation measures could potentially reduce the impact significance on the habitat and species:

- Construction and transportation activities should be avoided as far as possible during night (6:00 pm to 6:00 am);
- Construction activities to be avoided during rainy season as far as possible;
- It is recommended that construction activity be conducted in a phased manner in other words construction activity should not be widespread affecting all habitats at the same time;
- No water source/flow to be obstructed as a result of construction activities
- Temporary barriers should be installed on excavated areas;
- Hazardous materials should not be stored near natural drainage channels;
- Small vegetation patches in proximity to the boundary of the project sites should be protected; the sites should not be used as resting place for labours
- Good housekeeping should be followed for construction activities, waste packaging material should be properly disposed;
- Speed limit of vehicles plying on these routes should be kept to 10-15 km/hr to avoid road kill of mammals and reptiles;
- Proper sanitation facilities should be provided at site offices;
- Anti-poaching, trapping and hunting policy among employees and contractors should be strictly enforced; and
- General awareness regarding fauna should be enhanced through trainings, posters, etc. among the staff and labourers.

Residual Impact Significance

The implementation of suggested mitigation measures will reduce the impacts of construction activities and the residual impacts on habitats and species will be **negligible**.

Table 7.22 Impact significance of construction activities during the construction phase

Impact	Construction activities				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Largely restricted to construction area and immediate surroundings.				
Frequency	Construction phase				
Likelihood	Likely				
Impact Magnitude (habitat)	Positive	Negligible	Small	Medium	Large
	Positive	Negligible	Small	Medium	Large
Resource Sensitivity (Habitat)	Low	Medium	High		
Resource Sensitivity (Species)	Low	Medium	High		
Impact Significance	Not significant	Minor	Moderate	Major	
	Significance of impact is considered **minor** for habitats and **minor** for species.				
Residual Impact Significance	Significance of impact is considered **negligible** for habitats and species**.**				

7.4.4 Impacts during Operation Phase

Context

Birds utilize transmission towers for nesting by placing the nests across wires or using holes in the tower itself. Birds that roost on or near solar modules can also be affected by the wiring that is connecting the module to the main grid. Birds are attracted to these modules because of the reflection of the solar panel mimicking the reflection of water bodies.

Ecological survey undertaken recorded one Painted, Black Headed Ibis, River Tern specifies which is identified as Near Threatened as per IUCN categorization (ver. 2016-3). However no roosting sites or water bodies serving as habitat for these birds were identified within 2 km of the project site or transmission lines. Hence no potential impact on the avifaunal specifies in the form of electrocution is envisaged.

Embedded/ In-built Control

There are no embedded controls to prevent roosting/nesting of birds in transmission towers.

Significance of Impacts

Our observations of few Schedule I species protected under the IWPA (1972) use transmission poles for perching could cross the transmission lines the species sensitivity is assessed as **medium**. However it is unlikely that mortality from electrocution will cause any changes in the population regionally. The impact magnitude has been assessed as **small.** Furthermore impact significance to species is considered **minor**.

Mitigation Measures

The following mitigation measures will further reduce the impact significance on avifaunal species:

- Upright insulators on transmission poles should be covered with plastic insulating caps or insulating tubing to prevent electrocution risk; and
- Bird detractors such as moving cloth or scarecrow to prevent birds from venturing close to solar modules.
- Regular checking of the vacuums or holes in the towers to avoid nesting by any of the birds;

Residual Impact Significance

After implementation of mitigation measures, the significance of residual impacts will be **negligible**.

Table 7.23 Impact significance during operational phase

Impact	Operational activities				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Limited to electrical components of the solar sites including transmission lines (internal and external) and transmission poles.				
Frequency	Operation phase				
Likelihood	Likely				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource Sensitivity (Species)	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is **minor** for species.				
Residual Impact Significance	Significance of impact is considered **negligible** for species**.**				

7.5 KEY SOCIAL RISKS

7.5.1 Criteria

For the assessment of social impacts, the sensitivity and magnitude criteria outlined in ***Table 7.24***and ***Table 7.25*** respectively have been used. The social impacts associated with the pre-construction, construction, operations and decommissioning stages have been assessed qualitatively and in some cases quantitatively (subject to availability of data), using professional judgment based on past experience from similar projects.

Table 7.24 Impact Magnitude for Local Communities

Category	Extent / Duration / Scale / Frequency
Large	Change dominates over baseline conditions. Affects the majority of the area or population in the area of influence and/or persists over many years. The impact may be experienced over a regional or national area.
Medium	Clearly evident difference from baseline conditions. Tendency is that impact affects a substantial area or number of people and/or is of medium duration. Frequency may be occasional and impact may potentially be regional in scale.
Small	Perceptible difference from baseline conditions. Tendency is that impact is local, rare and affects a small proportion of receptors and is of a short duration.
Negligible	Change remains within the range commonly experienced within the household or community.

Table 7.25 Receptor Sensitivity for Local Communities

Category	Definition
High	Profound or multiple levels of vulnerability that undermine the ability to adapt to changes brought by the project.
Medium	Some but few areas of vulnerability; but still retaining an ability to at least in part adapt to change brought by the project.
Low	Minimal vulnerability; consequently with a high ability to adapt to changes brought by the project and opportunities associated with it.

7.5.2 Impact on Social and Community health

The receptors for impacts on community health and safety include settlements in the close proximity of the project site (within 1km and along the access road) and transmission line (within 100 m from the centreline), which will be exposed to health impacts from the project activities.

As per IFC EHS guidelines, the occupational and community health and safety hazards during the construction, operation, and decommissioning of solar power projects are generally similar to those of most large infrastructure projects. They may include physical hazards such as working at heights, working in confined spaces, electrical safety and structural safety of project infrastructure, life and fire safety, public accessibility, emergency situations and falling objects.

Awareness about these issues among the concerned stakeholders was low and emerging and hence no stakeholder has apportioned any amount of community H&S risk due to solar power projects in the region.

Construction Phase

Source of Impact

Possible sources of impacts to community health and safety during the construction phase are:

- Changes in environmental quality due to construction activities;
- Increased prevalence of disease arising from the influx of construction workers; and
- Heavy traffic movement

Changes in Environmental Conditions

Changes in baseline environmental conditions can be experienced by the local community in terms of increased nuisance levels from emissions to air, contamination of surface water or ground water and high noise levels during the construction phases.

An increase in dust and noise during the construction period has the potential to lead to health impacts associated with eye irritation and general disturbance to daily activities.

The discharge of domestic waste effluent from sanitary facilities for construction workers may have the potential to cause contamination of surface water and groundwater in this area. However, due to adequate safeguard facility, the potential for long term impacts to community health are minor.

Increased Prevalence of Disease

Approximately 100-300 workers will be employed for the construction phase from commencement and peak demand will be up to 300 workers (As per DPR). Influx of workers to the community may cause impacts to public health, especially an increase in prevalence of diseases as well as pressures on existing health infrastructure. There is also the possibility of increase in sexually transmitted diseases such as HIV/AIDS as a result of the expected influx of workers to the area. In addition, vector-borne diseases will be sensitivity for settlements closer to campsites for the construction phase labour, particularly due to lack of hygienic conditions.

Pollution control and mitigation measures will be implemented to reduce the likelihood of contamination of surface and groundwater from sanitary effluent (construction camps) generated during construction.

Embedded/In build control

The embedded measures to address the impacts related to the community health, safety and security will include:

- Provision of training on vehicular safety to the transport workers;
- Undertaking regular health check-ups of the work-force and reporting any major illnesses at the earlier to the local medical officer;
- Regular heath checkup of labour and reporting the notified diseases to the Block health officer for disease control and surveillance.

Impact Significance

The impact to community health and safety during the construction phase is evaluated to be of **minor** significance due to the low density of population and no labour camps proposed near to the village

Additional Mitigation Measures

Measures to reduce the prevalence of diseases will include screening of workers, undertaking health awareness among communities, implementation of vector control programs and avoiding presence of unsanitary conditions.

Residual Impacts

After the implementation of these mitigation measures, the residual impact significance is expected to be **negligible**.

Table 7.26 Impact Significance on the Community, Health and Safety during Construction Phase

Impact	Community Health and Safety during Construction				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Project locations including nearby villages and access road areas.				
Frequency	Limited only in the construction stage.				
Likelihood	Local	Regional	International		
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **minor.**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Negligible.**				

7.5.3 *Access restriction to Agricultural land and Common Property Resource Surrounded by project area*

Source of Impact

The land where the solar power plant is located is mostly agricultural lands, the surrounding area of which would still be used for cultivation in future. The solar power plant may restrict access or make accessibility difficult especially during the construction phase.

Embedded/In build control

- The project proponent in consultation with local community should provide the required resource and support to ensure that accessibility to fields is not a problem.

Impact significance

The impact of access restriction to surrounding agricultural land the construction phase is evaluated to be of **minor** as community consultation reveals that there is no existing community access road present with in the proposed site

Additional Mitigation Measures

- The availability of fuel, fodder and water should not be affect by the project and in case if there is shortage reported due to the project then it must be supplemented by the developer. Develop should take proactive action in case required to avoid any undue confrontation with affected community.

Residual Impacts

After the implementation of these mitigation measures, the residual impact significance is expected to be **negligible**.

Table 7.27 Significance of impact due to access restriction on surrounding agricultural land and common property resources

Impact	Impact on access restriction on common property resources				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
	Project area				
Frequency	Construction and operation phase of the Project				
Impact Magnitude	Positive	Negligible	Small	Medium	Large

Vulnerability of social Receptors	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor.**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	

7.5.4 *Impact due to Labour Influx*

Source of Impact

The assessment of the labour requirement for construction phase is 300 workers per day during peak construction period. Though, a large chunk of this labour requirement will be met locally, yet some of the specialized works where local skills are not available will be met through migrant labours. A primary assessment of the migrant labour shows that there will be 60-100 migrant labours engaged during the construction phase.

The supply of local labours during the peak agricultural season will be a constraint. This would be met through bringing labours from outside.

The needs of migrant labours need to be met during their stay in the project location. The number of migrated labour is quite small in proportion to the host population. However, influx of the labour force will have following consequences:

- Their need for shelter, food supply, water and sanitation provisions may compromise the requirements of the host population;
- The migrant labours can bring contagious diseases to the project area;
- If there is any insufficient provisions for the construction workers will result in non-compliance to local laws and regulations;
- The cultural and ethnic differences may create tussles and affect local peace; and
- The provisioning for their food and other daily requirements will benefit the local retailers.

EPC Contractor of TSEPL will make provisions for labour to accommodate migrant labour with in the village. EPC will provide adequate shelter, drinking water, toilet facilities for the workers.

Impact Significance

The impact of labour influx during the construction phase is evaluated to be of **moderate** significance as TSEPL will not provide labour camp for the migrant labour and they will be accommodated with in the village settlement on rent.

Mitigation/Management Measures

Following measures are recommended to mitigate the negative impacts of the labour influx.

- The health check-up of all migrant labours should be conducted through the District Medical Officer;
- The mixing of local and migrant labours should be prevented as far as possible;
- The migrant labours should be allowed to go back home periodically (in every two months) to avoid long stay away from their family;
- They should be made aware about the local cultural sensitivities; and
- Should be made aware about the Sexually Transmitted Diseases and HIV/AIDS.

Significance of Residual Impact

The residual impact after implementing the recommended mitigation measures would be **minor**.

Table 7.28 Significance of impact of labour influx

Impact	Labour influx				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	The labour influx will involve 60-100 workers for 1 months				
Frequency	Once, during construction phase.				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Sensitivity of Social Receptors	Low	Medium	High		
	The host population sensitivity for migrant population is rated as medium keeping the precedence and their expectation of employment from the project.				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the impact magnitude and sensitivity of host community, the impact significance is assigned as **minor**.				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the impact magnitude and sensitivity of host community, the impact significance is assigned as **minor**				

7.5.5 *Impact on local employment opportunity*

Source of Impact

It is evident from the social baseline conditions of the study area that major working population of the entire study area villages is agriculture labour, working on other's field for a sum negotiated with cultivator/owner of the field. The existing scenario of the agriculture in the study area also indicates that it is not actually sound enough to meet requirements of the people who are dependent upon this sector. In absence of any industrial activity in the study area, people have to resort to either agriculture or will migrate to other place for searching work.

Skilled and unskilled workers are expected to be engaged during construction phase. Secondly, project is also expected to open up limited vending opportunity during construction phase like hiring of tractors, petty contractors, market for grocery items etc.

During operation phase of the project, employment opportunities won't be much for local people and it could be restricted to requirement of few security personnel and few housekeeping staff at site office.

Local people are preferred by the project for the requirement of manpower under un-skilled category to the best possible extent. In case of non-availability of suitable workers, migrant workers will be hired to meet the manpower requirement.

Table.7.29 Significance of employment opportunity

Impact	Impact on local employment opportunities during project cycle				
Impact Nature	Negative		Positive		Neutral
Impact Type	Direct		Indirect		Induced
Impact Duration	Temporary	Short-term		Long-term	Permanent
Impact Extent	Local		Regional		International
	Locals would have short term employment opportunities during construction phase of the project. However people from across the State of Telangana and other State, though in limited number are likely be engaged in the project during project cycle in semi-skilled and skilled category of manpower.				
Frequency	Construction Phase, operation and decommissioning phase of the project				
Impact Magnitude	Positive	Negligible	Small	Medium	Large

This section presents the Environmental and Social Management Plan (ESMP) for the Project. The purpose of this ESMP is to specify the standards and controls required to manage and monitor environmental and social impacts during construction and operation phase. To achieve this, the ESMP identifies potential adverse impacts from the planned activities and outlines mitigation measures required to reduce the likely negative effects on the physical, natural and social environment.

8.1 TSEPL'S ORGANIZATIONAL STRUCTURE

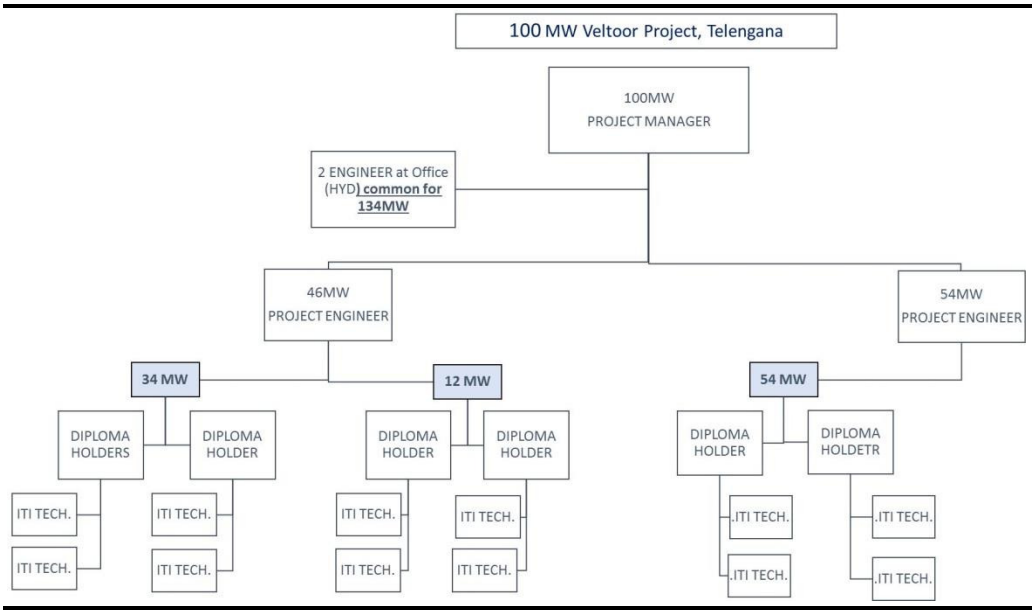
To ensure the efficacy of Environmental and social management plan, certain institutional mechanism with well-defined roles and responsibilities is essential for effective implementation of identified mitigation measures both during construction and operation phases.

8.1.1 TSEPL's Management

TSEPL will have ultimate responsibility for implementing the provisions of the ESMP during construction and operation phase of the project. This role will include the on-going management of environmental and social impacts, monitoring of contractor performance as well as development of mechanisms for dealing with environmental and social problems.

TSEPL will also ensure that the activities of its contractors are conducted in accordance with good practice measures, implementation of which will be required through contractual documentation. Organization structure of TSEPL is presented in ***Figure 8.1***.

Figure 8.1 TSEPL's Organization Structure



Source: SP Infra

8.2 EPC CONTRACTOR – S&WPL

SP Infra has appointed S&WPL as EPC contractor for the project for construction phase.

8.2.1 S&WPL's Management

The EPC contractor, i.e. S&WPL will have a dedicated HSE department for the projects. The HSE department take the overall responsibility for co-ordination of the actions required for environment and social management and mitigation and for monitoring the progress of the proposed ESMP for the project. However, ultimate responsibility for implementing the provisions of the ESMP will lie with TSEPL.

Environment, Health and Safety Department (HSE) of S&WPL

In general, the HSE department shall perform the following activities:

- Preparation of required documents on environmental and social management;
- Ensuring availability of resources and appropriate institutional arrangements for implementation of ESMP;
- Implementation of the health and safety measures;
- Collection of the statistics of health of workers;
- Providing support during routine medical check-ups of workers;
- Awareness and implementing safety programmes;
- Providing job specific induction training;
- Compliance of regulatory requirements;
- Carrying out environmental audits;
- Identify unsafe acts & conditions and suggest remedies;
- Develop safety culture and comply with company's HSE policy & standards requirements;
- Encourage and enforce the use of PPE's;
- Educate all employees for the use of PPE's & safe practices;
- Direct, coordinate and orient the safety activities;
- Promulgate the spread of policy, objectives, rules and/or regulations;
- Perform a thorough investigation of all accidents and review the recommendations to avoid any repetition;
- Monitoring the progress of implementation of ESMP; and
- Reviewing and updating the ESMP as and when required for its effective implementation.

8.3 INSPECTION, MONITORING AND AUDIT

Inspection and monitoring of the environmental impacts of the Project activities will increase the effectiveness of ESMP. Through the process of inspection and auditing, TSEPL will ensure that the conditions stipulated in various permits are complied. The inspection and audits will be done by the

project identified HSE staff in coordination with O & M contractors and any other external agencies identified. The entire process of inspections and audits should being documented. The inspection and audit findings are to be implemented by the site In-charge in their respective areas.

8.4 REPORTING AND DOCUMENTATION

TSEPL will develop and implement a programme of reporting through all stages of the project cycle. Delegated personnel shall require to fully complying with the reporting programme in terms of both timely submissions of reports as per acceptable level of detail. Reporting will be done in form of environmental check list, incident record register, environmental and social performance reports (weekly, monthly, quarterly, half yearly, yearly etc.).

8.4.1 Documentation

Documentation is an important step in implementing ESMP. TSEPL will establish a documentation and record keeping system to ensure recording and updating of documents per the requirements specified in ESMP. The documents should be kept as hardcopies as well as in electronic format. Responsibilities have to be assigned to relevant personnel for ensuring that the ESMP documentation system is maintained and that document control is ensured through access by and distribution to, identified personnel in form of the following:

- Master Environment Management System document;
- 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.

8.4.2 Internal Reporting and Communication

Inspection and audits finding along with their improvement program are to be regularly reported to the senior management for their consideration. The same are also to be communicated within the staff working on the project. To maintain an open communication between the staff and management on HSE and social issues the followings are being used:

- Team Briefings,
- On-site work group meetings;
- Work Specific Instructions; and
- Meeting with stakeholders.

8.4.3 External Reporting and Communication

HSE In-charge is the responsible person for ensuring that communication with regulatory agencies and stakeholders are maintained as per the requirement. All complaints and enquiries are to be appropriately dealt with and records be maintained in a Complaint/Enquiry Register by the delegated staff of HSE. All communications made to regulatory agencies should also be reported to SP Infra's corporate HSE Head.

8.4.4 ESMP Review and Amendments

The ESMP act as an environment and social management tool which needs to be reviewed periodically to address changes in the organisation, process or regulatory requirements.

Following a review, HSE In-charge will be responsible for making the amendments in the ESMP and seeking approval from the senior management. The amended ESMP will be communicated to all the staff.

8.5 TRAINING PROGRAMME AND CAPACITY BUILDING

Training is needed for effective implementation of ESMP. HSE Officer of S&WPL, HSE In-charge of TSEPL as well as SP Infra Corporate HSE Head will ensure that Environmental health and safety induction training and job specific trainings are identified and given to the concerned personnel for construction activities and during operations of the solar farm.

Also general environmental awareness will be increased among the projects' teams to encourage the implementation of environmentally sound practices and compliance requirements of the project activities. This will help in minimising adverse environmental impacts, compliance with the applicable regulations and standards, and achieving performance beyond compliance. The same level of awareness and commitment will be imparted to the contractors and sub-contractors involved in the project.

8.6 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

This section outlines the potential adverse impacts, mitigation measures, monitoring and management responsibilities during construction and operation phases of the Projects.

The purpose of ESMP is to:

- Provide an institutional mechanism with well-defined roles and responsibilities for ensuring that measures identified in ESIA designed to mitigate potentially adverse impacts, are implemented;
- List all suggested mitigation measures and control technologies, safeguards identified through the ESIA process;

- Provide Project monitoring program for effective implementation of the mitigation measures and ascertain efficacy of the environmental management and risk control systems in place; and
- Assist in ensuring compliance with all relevant legislations at local, state and national level for the Projects.

In order to minimize adverse impacts during different phases of project lifecycles, mitigation measures, monitoring plan and responsibilities for its implementation are given in ***Table 8.1***

The responsibility for implementation of ESMP will primarily lies with S&WPL HSE Department and HSE In-charge of TSEPL will majorly plays a role of supervisor to oversee the project performance pertaining to environment, health, safety and social issues.

Table 8.1 Environmental and Social Management and Monitoring Plan

Project Activities	Impact/Issue	Applicable Project Phase	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of Verification that mitigation has been met	Timelines /frequency of Monitoring	Responsibility for implementation of monitoring	Supervision responsibility	Reporting Requirements
Land use									
• Construction and strengthening of access road; • Installation of PV modules • Construction of Central Monitoring Station, Switching Yard; and • Establishment and operation of temporary structures such as temporary site office and store yard.	Permanent and temporary changes in land use	Construction	On completion of construction activities, land used for temporary facilities such as store yard should be restored to the extent possible	S&WPL Team	Site inspection	Upon completion of task	Site HSE Officer of S&WPL	HSE In-charge of TSEPL	Report from HSE officer of S&WPL to site HSE In-charge of TSEPL
			The land use in and around permanent project facilities should not be disturbed.	S&WPL Team	Site inspection	Monthly monitoring	Site HSE Officer of S&WPL	HSE In-charge of TSEPL	Report from HSE officer of S&WPL to site HSE In-charge of TSEPL
			Construction activities should be restricted to designated area.	S&WPL Team	Site inspection	Monthly monitoring	Site HSE Officer of S&WPL	HSE In-charge of TSEPL	Report from HSE officer of S&WPL to site HSE In-charge of TSEPL
Topography and Drainage									
• Construction and strengthening of access roads; and • Site clearance.	Changes in Topography and Drainage	Construction	Disruption/alteration of micro-watershed drainage pattern should be minimized to the extent possible; and	S&WPL Team	Site inspection	Monthly monitoring	Site HSE Officer of S&WPL	HSE In-charge of TSEPL	Report from HSE officer of S&WPL to site HSE In-charge of TSEPL
			Appropriate number of cross drainage channels should be provided during access road construction to maintain flow in existing natural channels	S&WPL Team	Site inspection	Monthly monitoring	Site HSE Officer of S&WPL	HSE In-charge of TSEPL	Report from HSE officer of S&WPL to site HSE In-charge of TSEPL
Soil									
• Construction/ strengthening of access roads; • Vehicular movement; and • Piling and excavation work.	Soil compaction and soil erosion	Construction and Decommissioning	Vehicles will utilize existing roads to access the site.	S&WPL Team	Site inspection	Monthly monitoring	Site HSE Officer of S&WPL	HSE In-charge of TSEPL	Report from HSE officer of S&WPL to site HSE In-charge of TSEPL
			Piling and excavation work will not be carried out during the monsoon season to minimize erosion and run-off.	S&WPL Team	Site inspection	Monthly monitoring	Site HSE Officer of S&WPL	HSE In-charge of TSEPL	Report from HSE officer of S&WPL to site HSE In-charge of TSEPL
• Storage and transport of construction materials; • Storage of oil and lubricants onsite; • Storage of hazardous waste onsite; • Storage of waste (MSW and construction/demolition) onsite from project site; and Sewage generated from the site office.	Soil contamination	Construction, Operation, Decommissioning	No unauthorized dumping of used oil and other hazardous waste should be undertaken at site.	S&WPL Team, O&M Team	Site inspection	Monthly monitoring	Site HSE Officer of S&WPL, site HSE In-charge of O&M Team	HSE In-charge of TSEPL	Report from HSE officer of S&WPL/O&M contractor to site HSE In-charge of TSEPL
			Construction and Demolition Waste should be stored separately and be periodically collected by an authorized treatment and storage facility	S&WPL Team, O&M Team	Site inspection	Monthly monitoring	Site HSE Officer of S&WPL, site HSE In-charge of O&M Team	HSE In-charge of TSEPL	Report from HSE officer of S&WPL/O&M contractor to site HSE In-charge of TSEPL
			Hazardous waste should be properly labelled, stored onsite at a location provided with impervious surface and in a secondary containment system	S&WPL Team, O&M Team	Site inspection	Monthly monitoring	Site HSE Officer of S&WPL, HSE In-charge of O&M Team	HSE In-charge of TSEPL	Report from HSE officer of S&WPL/O&M contractor to site HSE In-charge of TSEPL
			In case of accidental/unintended spillage on small area, the contaminated soil should be immediately collected and stored as hazardous waste.	S&WPL Team, O&M Team	Site inspection	Monthly monitoring	Site HSE Officer of S&WPL, site HSE In-charge of O&M Team	HSE In-charge of TSEPL	Report from HSE officer of S&WPL/O&M contractor to site HSE In-charge of TSEPL

Project Activities	Impact/Issue	Applicable Project Phase	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of Verification that mitigation has been met	Timelines /frequency of Monitoring	Responsibility for implementation of monitoring	Supervision responsibility	Reporting Requirements
			Designated areas should be provided for Solid Municipal Waste and daily collection and period disposal should be ensured	S&WPL Team, O&M Team	Site inspection	Monthly monitoring	Site HSE Officer of S&WPL, site HSE In-charge of O&M Team	HSE In-charge of TSEPL	Report from HSE officer of S&WPL/O&M contractor to site HSE In-charge of TSEPL
			All waste should be stored in a shed that is protected from the elements (wind, rain, storms, etc.) and away from natural drainage channels	S&WPL Team, O&M Team	Site inspection	Monthly monitoring	Site HSE Officer of S&WPL, site HSE In-charge of O&M Team	HSE In-charge of TSEPL	Report from HSE officer of S&WPL/O&M contractor to site HSE In-charge of TSEPL
Air Quality									
• Fugitive emissions from site clearing, excavation work, material handling etc.; • Fugitive emission from traffic movement; • Exhaust emission from operation of machineries like pile drivers, vehicles; • Point source emission from diesel generator.	Fugitive and pint source emission	Construction, Operation, Decommissioning	Speed of vehicles should be limited to 10-15 km/hr	S&WPL Team, O&M Team	Site inspection	Monthly monitoring	Site HSE Officer of S&WPL, site HSE In-charge of O&M Team	HSE In-charge of TSEPL	Report from HSE officer of S&WPL/O&M contractor to site HSE In-charge of TSEPL
			DG sets should be placed within enclosures and have an adequate stack height;	S&WPL Team, O&M Team	Site inspection	Monthly monitoring	Site HSE Officer of S&WPL, site HSE In-charge of O&M Team	HSE In-charge of TSEPL	Report from HSE officer of S&WPL/O&M contractor to site HSE In-charge of TSEPL
			Prevent idling of vehicles and equipment	S&WPL Team, O&M Team	Site inspection	Monthly monitoring	Site HSE Officer of S&WPL, site HSE In-charge of O&M Team	HSE In-charge of TSEPL	Report from HSE officer of S&WPL/O&M contractor to site HSE In-charge of TSEPL
			Vehicle engines need to be properly maintained and should have a valid Pollution Under Control (PUC) to ensure minimization in vehicular emissions	S&WPL Team, O&M Team	Review of PUC documents of vehicles	Monthly monitoring	Site HSE Officer of S&WPL, site HSE In-charge of O&M Team	HSE In-charge of TSEPL	Report from HSE officer of S&WPL/O&M contractor to site HSE In-charge of TSEPL
Water Environment									
Water required for construction phase and operation phase of the project	Depletion of water resource	Construction, Operation	Permission will be obtained from Telangana State Water, Land and Trees State Level Authority for abstraction of ground water as the provision of Telangana Water, Land and Trees Rules, 2004.	S&WPL Team, O&M Team	Permission letter	Monthly monitoring	Site HSE Officer of S&WPL, site HSE In-charge of O&M Team	HSE In-charge of TSEPL	Report from HSE officer of S&WPL/O&M contractor to site HSE In-charge of TSEPL
			Maintain logbook for water consumption; and	S&WPL Team, O&M Team	Water consumption log book	Monthly monitoring	Site HSE Officer of S&WPL, site HSE In-charge of O&M Team	HSE In-charge of TSEPL	Report from HSE officer of S&WPL/O&M contractor to site HSE In-charge of TSEPL
			Prepare and implement water conservation scheme e.g., rainwater harvesting	S&WPL Team, O&M Team	Site inspection	Monthly monitoring	Site HSE Officer of S&WPL, site HSE In-charge of O&M Team	HSE In-charge of TSEPL	Report from HSE officer of S&WPL/O&M contractor to site HSE In-charge of TSEPL
• Storage of hazardous substances onsite; and • Storage of hazardous waste onsite.	Water Contamination	Construction, Operation, Decommissioning	Prevent & mitigate spill of fuel within the construction site	S&WPL Team, O&M Team	Site inspection	Monthly monitoring	Site HSE Officer of S&WPL, site HSE In-charge of O&M Team	HSE In-charge of TSEPL	Report from HSE officer of S&WPL/O&M contractor to site HSE In-charge of TSEPL
			Regularly monitored the surface and ground water quality	S&WPL Team, O&M Team	Monitoring Report	Monthly monitoring	Site HSE Officer of S&WPL, site HSE In-charge of O&M	HSE In-charge of TSEPL	Report from HSE officer of S&WPL/O&M

Project Activities	Impact/Issue	Applicable Project Phase	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of Verification that mitigation has been met	Timelines /frequency of Monitoring	Responsibility for implementation of monitoring	Supervision responsibility	Reporting Requirements
							Team		contractor to site HSE In-charge of TSEPL
Noise quality									
• Construction and demolition activities; • Operation of DG sets; and • Vehicular movement	Increase in noise level	Construction and Decommissioning	Normal working hours of the contractor to be defined (preferable 8 am to 6pm). If work needs to be undertaken outside these hours, it should be limited to activities which do not generate noise;	S&WPL Team, O&M Team	Site inspection	Monthly monitoring	Site HSE Officer of S&WPL, site HSE In-charge of O&M Team	HSE In-charge of TSEPL	Report from HSE officer of S&WPL/O&M contractor to site HSE In-charge of TSEPL
			Only well-maintained equipment should be operated on-site.	S&WPL Team, O&M Team	Site inspection	Monthly monitoring	Site HSE Officer of S&WPL, site HSE In-charge of O&M Team	HSE In-charge of TSEPL	Report from HSE officer of S&WPL/O&M contractor to HSE officer of TSEPL
Operational Health and Safety									
• Working at heights; • Working with live electrical components; and • operation of cranes and other mechanical lifting equipment	Injury, near-misses and fatalities for labour contracted on site.	Construction, Operation, Decommissioning	All workers (regular and contracted) should be provided with training on Health and Safety policies in place with appropriate refresher courses throughout the life cycle of the Project	S&WPL Team, O&M Team	Training report	Monthly monitoring	Site HSE Officer of S&WPL, site HSE In-charge of O&M Team	HSE In-charge of TSEPL	Report from HSE officer of S&WPL/O&M contractor to site HSE In-charge of TSEPL
			Obtain and check safety method statements from contractors	S&WPL Team, O&M Team	Site inspection	Monthly monitoring	Site HSE Officer of S&WPL, site HSE In-charge of O&M Team	HSE In-charge of TSEPL	Report from HSE officer of S&WPL/O&M contractor to site HSE In-charge of TSEPL
			Permitting system should be implemented to ensure that cranes and lifting equipment is operated by trained and authorized persons only	S&WPL Team, O&M Team	Permitting document	Monthly monitoring	Site HSE Officer of S&WPL, site HSE In-charge of O&M Team	HSE In-charge of TSEPL	Report from HSE officer of S&WPL/O&M contractor to site HSE In-charge of TSEPL
			Appropriate safety harnesses and lowering/raising tools should be used for working at heights	S&WPL Team, O&M Team	Site inspection	Monthly monitoring	Site HSE Officer of S&WPL, site HSE In-charge of O&M Team	HSE In-charge of TSEPL	Report from HSE officer of S&WPL/O&M contractor to site HSE In-charge of TSEPL
			A safety or emergency management plan should be in place to account for natural disasters, accidents and any emergency situations	S&WPL Team, O&M Team	Site specific Emergency Management Plan	Monthly monitoring	Site HSE Officer of S&WPL, site HSE In-charge of O&M Team	HSE In-charge of TSEPL	Report from HSE officer of S&WPL/O&M contractor to site HSE In-charge of TSEPL
			A safety or emergency management plan should be in place to account for natural disasters, accidents and any emergency situations. The nearest hospital, ambulance, fire station and police station should be identified in the implemented emergency management plan.	S&WPL Team, O&M Team	Site inspection	Monthly monitoring	Site HSE Officer of S&WPL, site HSE In-charge of O&M Team	HSE In-charge of TSEPL	Report from HSE officer of S&WPL/O&M contractor to site HSE In-charge of TSEPL
Ecology									
• Construction of sites and access roads	Impact on local flora and fauna	Construction	• Vegetation disturbance and clearance should be restricted to the project activity area – location of laydown area, construction activities and storage areas; • Unnecessary disturbance of neighbouring vegetation due to off-road vehicular movement, fuel wood procurement and destruction of floral resources should be	S&WPL Team, O&M Team	• Site Inspection; • Training records; • Visual Assessment by experts	Monthly monitoring	Site HSE Officer of S&WPL, site HSE In-charge of O&M Team	HSE In-charge of TSEPL	Report from HSE officer of S&WPL/O&M contractor to site HSE In-charge of TSEPL

Project Activities	Impact/Issue	Applicable Project Phase	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of Verification that mitigation has been met	Timelines /frequency of Monitoring	Responsibility for implementation of monitoring	Supervision responsibility	Reporting Requirements
			prohibited; • Strict prohibition should be maintained on use of fuel wood and shrubs from nearby areas as kitchen fuel. • Construction and transportation activities should be avoided as far as possible during night (6:00 pm to 6:00 am); • Construction activities to be avoided during rainy season as far as possible; • It is recommended that construction activity be conducted in a phased manner in other words construction activity should not be widespread affecting all habitats at the same time; • No water source/flow to be obstructed as a result of construction activities • Temporary barriers should be installed on excavated areas; • Hazardous materials should not be stored near natural drainage channels; • Small vegetation patches in proximity to the boundary of the project sites should be protected; the sites should not be used as resting place for labours; • Good housekeeping should be followed for construction activities, waste packaging material should be properly disposed; • Speed limit of vehicles plying on these routes should be kept to 10-15 km/hr to avoid road kill of mammals and reptiles; • Proper sanitation facilities should be provided at site offices; • Anti-poaching, trapping and hunting policy among employees and contractors should be strictly enforced; and • General awareness regarding fauna should be enhanced through trainings, posters, etc. among the staff and labourers.					
	Impact on avifauna	Operation Phase	• Upright insulators on transmission poles should be covered with plastic insulating caps or insulating tubing to prevent electrocution risk; • Bird detractors such as moving cloth or scarecrow to prevent birds from venturing close to solar modules. • Regular checking of the vacuums or holes in the towers to avoid nesting by any of the birds;	O&M Team	• Site Inspection; • Visual Assessment by experts	Monthly monitoring	Site HSE In-charge of O&M Team	HSE In-charge of TSEPL	Report from HSE officer of S&WPL/O&M contractor to site HSE In-charge of TSEPL
Community Health and Safety									
	Increased Prevalence of Disease	Construction Phase	• For the access road: Identify community health hazards and safety risks especially during night time along the construction stretch. Formulate mitigation strategies and implement them effectively. Specific issues	TSEPL through EPC contactor, Electrical Contractor and any other contractors to be mobilised at site.	• Site Inspection; • Training records; • Visual	Monthly	EHS- EPC and Electrical Contractors	HSE In-charge of TSEPL	Monthly Progress Report

Project Activities	Impact/Issue	Applicable Project Phase	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of Verification that mitigation has been met	Timelines /frequency of Monitoring	Responsibility for implementation of monitoring	Supervision responsibility	Reporting Requirements
			that will pose safety risks to local community could be restricted carriage way width; allowing heavy machineries/heavy load traffic through normal village roads, material loading/ unloading sites, boulder dumps etc.; night time visibility especially if material/ waste dumps are maintained along traffic allowed carriageway; hazardous road surface conditions that is dusty or wet or pot holed; poor SWD arrangements etc.; • The project will communicate about the technical aspects of the construction and operations along with their community safety and nuisance implications; • TSEPL Power shall ensure that the EPC and Electrical Contractors are committed to health and safety of workers as well as the community and their property and will community the precautions that will be taken; • Exposure visits of community representatives to construction sites to increase awareness on community H&S aspects; • Review the construction phase accident and incident records at least every month; • Training of contractors and their labourers on precautions to be taken to minimize nuisance for the local community; • Movement of vehicles: The access road to the site location passes through some villages. Plying of vehicles carrying equipment to the site particularly during day time could lead to unsafe situation for the local community; • Other safety measure like provision for night time visibility at accident prone areas, repair hazardous road surface conditions etc. should devised based on consultation with community representatives.; • There should be control on movement of migrant workers in local community. Site authority should provide all the basic facilities to migrant workers at site only; • The project should communicate with community about the technical aspects of the construction and operations along with their community safety and nuisance implications; • TSEPL shall ensure that the EPC and Electrical contractors are committed to health and safety of workers as well as the community and their property ; • Provision for cattle safety should be provided as the area was observed with many grazing animals; • Training of contractors and their labourers on		Assessment				

Project Activities	Impact/Issue	Applicable Project Phase	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of Verification that mitigation has been met	Timelines /frequency of Monitoring	Responsibility for implementation of monitoring	Supervision responsibility	Reporting Requirements
			precautions to be taken to minimize nuisance for the local community.						
Migrant Labour	• Influx of Workers – Construction Phase • Stress on local infrastructure and resources	Construction Phase	• TSEPL and their EPC/Electrical contractor to implement a "Code of Conduct" for the construction phase which will take into account (a) predominantly rural community in the vicinity; (b) health & safety aspects; (c) restrictions on activities – Dos and Don'ts; (d) briefing on the local area/immediate vicinity etc. (e) zero tolerance of illegal activities by construction personnel including: unlicensed prostitution; illegal sale or purchase of alcohol; sale, purchase or consumption of drugs; illegal gambling or fighting which will be shared with all contractors for induction of their employees/supervisors/workers; • Social interactions between migrant labour and the host community will be closely monitored by the project. The community will be consulted at regular intervals and any complaints or concerns with respect to labour should be addressed without delay; • The project will conduct routine medical check-ups, health and safety training and sensitization programmes to raise awareness about STDs, and HIV amongst the labourers. These trainings will also have sessions on maintaining behaviour standards while moving in the community, knowing and respecting prevalent socio- cultural systems of host community etc. • The project will, where possible, maximise procurement of goods and supplies catering to the site office from the local markets. This will ensure that the project catalyses the local economy. • Monitor contractors for compliance on labour laws as well as PS2. • Training of all supervisors, workers and labourers on community health & safety aspects, Code of Conduct and any other local regulations; • Linkage of Communication, Disclosure and Grievance Redressal Mechanism to also cover labourers so that any concerns on working conditions and/or contractor mal-practices can be managed; • The project will keep the local administration and police informed about the details of outside labourers as also a list should be provided to the Panchayat /block office; • Contractors of the migrant workers should follow their duties towards migrant workers						

Project Activities	Impact/Issue	Applicable Project Phase	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of Verification that mitigation has been met	Timelines /frequency of Monitoring	Responsibility for implementation of monitoring	Supervision responsibility	Reporting Requirements
			as mentioned in Inter-State Migrant Workers Act like maintain passbook for each migrant workers which should include personal detail, period of terms of employment, payment detail. Contractors should also provide displacement allowance, journey allowance and other necessary facilities. • Principle employer for the migrant workers should have necessary 'certificate of registration' in place for their engagement as per Interstate Migrant Workers act, 1979. • All key contractors should have 'certificate of registration in place' for the engagement of migrant workers through sub-contractors.						

9 CONCLUSION AND RECOMMENDATIONS

The impact assessment has been conducted in compliance with administrative framework, identified herein, including relevant national legislative requirement, international conventions.

9.1 IMPACTS REQUIRING DETAILED ASSESSMENT

Following a scoping exercise, this ESIA was focused on interactions between the Project activities and various resources/receptors that could result in significant impacts. The table below presents the outcomes of the comprehensive assessment of identified impacts as a result of the various phases of the Project.

Table 9.1 Impact Assessment Summary

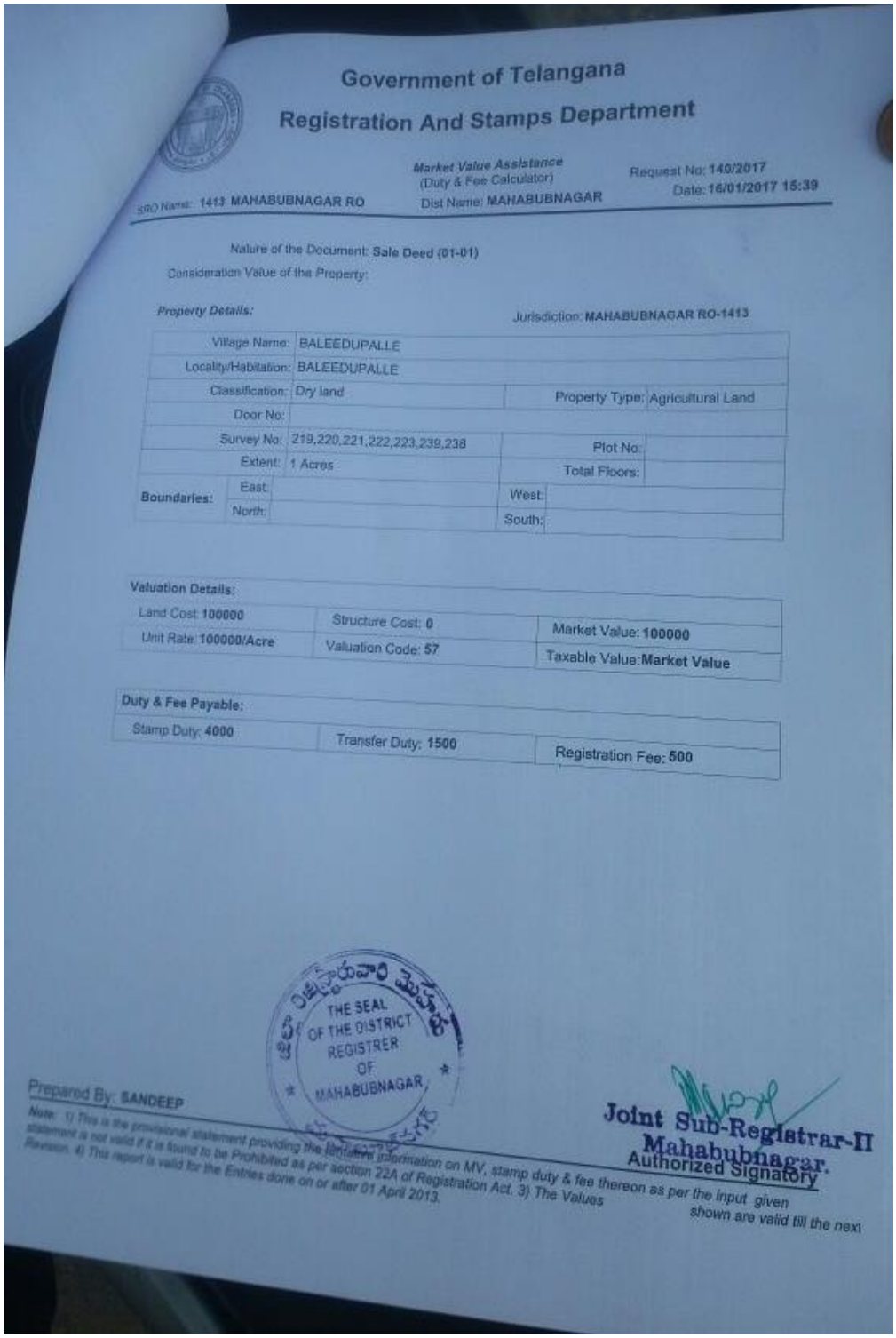
Impact Description	Impact nature	Significance of Impact	
		Before Mitigation	With Mitigation
Construction Phase			
Change in land use	Negative	Moderate	Moderate
Change in Topography and Drainage	Negative	Moderate	Minor
Soil erosion and compaction	Negative	Minor	Negligible
Soil contamination from waste generation and spills/leaks	Negative	Minor	Negligible
Depletion of water resource	Negative	Moderate	Minor
Impact on ambient air quality	Negative	Minor	Negligible
Impact on noise quality	Negative	Minor	Negligible
Occupational Health and Safety	Negative	Minor	Negligible
Community Health and Safety	Negative	Minor	Negligible
Ecological impacts due to Vegetation Clearance	Negative	Minor	Minor
Ecological impacts due to Construction Activities	Negative	Minor	Negligible
Access restriction to Agricultural land and Common Property Resource	Negative	Minor	Negligible
Impact on Local Employment	Positive		
Impact of labour influx/migrant workforce	Negative	Moderate	Minor
Operation Phase			
Soil contamination due to waste generation, spillage and leakage	Negative	Minor	Negligible
Depletion of water resources	Negative	Moderate	Negligible
Impact on noise quality	Negative	Negligible	Negligible
Occupational Health and Safety	Negative	Minor	Negligible
Impact on fauna	Negative	Minor	Negligible
Impact on Local Employment	Positive		
Decommissioning Phase			
Impact on soil environment	Negative	Minor	Negligible
Impact on ambient air quality	Negative	Minor	Negligible
Occupational Health and Safety	Negative	Minor	Negligible

The Environmental and Social Management Plan (ESMP) describes mitigation measures for impacts specific to the Project activities and also discusses implementation mechanisms.

To conclude, implementation of ESMP will help TSEPL to comply with national/state regulatory framework as well as to meet IFC Performance Standard requirements.

Annex A

Land Value Certificate



Government of Telangana

Registration And Stamps Department

Market Value Assistance
(Duty & Fee Calculator)

Request No: 140/2017
Date: 16/01/2017 15:39

SRO Name: 1413 MAHABUBNAGAR RO

Dist Name: MAHABUBNAGAR

Nature of the Document: Sale Deed (01-01)

Consideration Value of the Property:

Property Details:

Jurisdiction: MAHABUBNAGAR RO-1413

Village Name:	BALEEDUPALLE		
Locality/Habitation:	BALEEDUPALLE		
Classification:	Dry land	Property Type:	Agricultural Land
Door No:			
Survey No:	219,220,221,222,223,239,238	Plot No:	
Extent:	1 Acres	Total Floors:	
Boundaries: East:		West:	
North:		South:	

Valuation Details:

Land Cost: 100000	Structure Cost: 0	Market Value: 100000
Unit Rate: 100000/Acre	Valuation Code: 57	Taxable Value: Market Value

Duty & Fee Payable:

Stamp Duty: 4000	Transfer Duty: 1500	Registration Fee: 500

THE SEAL OF THE DISTRICT REGISTRER OF MAHABUBNAGAR

Prepared By: SANDEEP

Joint Sub-Registrar-II
Mahabubnagar.
Authorized Signatory

Note: 1) This is the provisional statement providing the tentative information on MV, stamp duty & fee thereon as per the input given statement is not valid if it is found to be Prohibited as per section 22A of Registration Act. 3) The Values shown are valid till the next Revision. 4) This report is valid for the Entries done on or after 01 April 2013.

Annex B

Land Sale Deed

SCANNED

4062/2016

4/50

తెలంగాణ తెలంగానా TELANGANA

SL. No. 8418 Date 20/9/16 Rs. 20/-
Sold to N. Jeevan Reddy S/o Ramakrishna Reddy
for Whom Self
R/O Ramgelore.

08AA 831351
MOHAMMED AHMED HUSSAIN
LICENSED STAMP VENDOR
L. No. 18-07-02/2013
RL. No. 18-07-09/2015
C/o. RAJA XEROX, H. No. 5-8-26, NH-7 Road,
Opp: New Bus Stand, KAMAREDDY
Dist. Nizamabad, Cell: 9885540180

AGREEMENT OF SALE-CUM-GENERAL POWER OF ATTORNEY
M.V. of Rs. 5,87,500/-

This Deed of Agreement of Sale Cum-General Power of Attorney is made and executed on this 21st day of September 2016 by :-

Sai Krishna

1) **SHESHOLLA SAI KRISHNA S/O SRINIVASULU,** aged about (19) years, Occupation: Student, R/o H.No: 8-3-228/678/717, Karmikanagar, Yousuf Guda Hyderabad., Under the Guardianship of his Mother 2) **Mrs. SHESHOLLA CHANDRAKALA W/O SRINIVASULU,** aged about (42) years Occupation: House Hold, R/o H.No: 8-3-228/678/717, Karmikanagar, Yousuf Guda Hyderabad., hereinafter referred to as the **"The Vendor's/Principal"**

AND

3) **SHESHOLLA SRINIVASULU S/O MALLAPPA,** Aged about (48) years Occupation: Employee, R/o H.No: 8-3-228/678/717, Karmikanagar, Yousuf Guda Hyderabad.,

hereinafter referred to as the **"Consenting Party"**

hereinafter referred to as the **"The Vendor's/Principal"** which terms shall mean and include her/his heirs, successors, executors and legal representatives, in interest whatsoever of the one part.

Contd...2

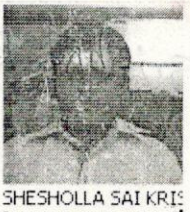
Sai Krishna

S/o Ramakrishna Reddy

Presentation Endorsement:

Presented in the Office of the Joint Sub-Registrar, Atmakur along with the Photographs & Thumb Impressions as required Under Section 32-A of Registration Act, 1908 and fee of Rs. 2000/- paid between the hours of 7 and 8 on the 21st day of SEP, 2016 by Sri N.Jeevan Reddy

Execution admitted by (Details of all Executants/Claimants under Sec 32A):

Sl No	Code	Thumb Impression	Photo	Address	Signature/Ink Thumb Impression
1	CL		 N.JEEVAN REDDY::2 [1403-1-2016-4150]	**N.JEEVAN REDDY** **S/O. RAMAKRISHNA REDDY** 16TH CROSS, 16TH MAIN, HSR LAYOUR, 4TH SECTOR, BENGALORE	
2	EX		 SHESHOLLA SRINIVA [1403-1-2016-4150]	**SHESHOLLA SRINIVASULU** **S/O. MALLAPPA** 8-3-228/678/717, KARMIKANAGAR, YOUSUFGUDA, HYDERABAD	
3	EX		 SHESOLLA CHANDRA [1403-1-2016-4150]	**SHESOLLA CHANDRAKALA** **W/O. SRINIVASULU** 8-3-228/678/717, KARMIKANAGAR, YOUSUFGUDA, HYDERABAD	
4	EX		 SHESHOLLA SAI KRI [1403-1-2016-4150]	**SHESHOLLA SAI KRISHNA** **S/O. SRINIVASULU** 8-3-228/678/717, KARMIKANAGAR, YOUSUFGUDA, HYDERABAD	

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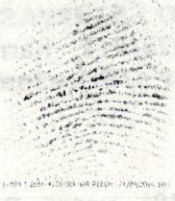
G. Vinod Kumar
Joint SubRegistrar5
Atmakur

Identified by Witness:

Sl No	Thumb Impression	Photo	Name & Address	Signature
1		 JAHENGEER::21/09/ [1403-1-2016-4150]	**JAHENGEER** S/O SARWAR R/O BANDANAGAR	
2		 SEKHAR REDDY::21/ [1403-1-2016-4150]	**SEKHAR REDDY** S/O NARSIMHA REDDY R/O MUTHYLAMPALLY	

21st day of September,2016

G. Vinod Kumar
Signature of Joint SubRegistrar5
Atmakur

K. Vinod Kumar
K. VINOD KUMAR
Joint Registrar (5)
ATMAKUR (A)

OFFICE OF The Seal of Joint SubRegistrar Office Atmakur JOINT SUBREGISTRAR

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తెలంగాణ तेलंगाना TELANGANA

SL. No. 8416 Date 20/9/16 Rs 20/-
Sold to N. Jeevan Reddy s/o. Ramakrishna Reddy
for Whom self
R/O Bangalore.

08AA 831349
MOHAMMED AHMED HUSSAIN
LICENSED STAMP VENDOR
L. No. 18-07-02/2013
RL. No. 18-07-09/2015
C/o. RAJA XEROX, H. No. 5-8-26, NH-7 Road,
Opp: New Bus Stand, KAMAREDDY
Dist. Nizamabad, Cell: 9885540180

IN FAVOUR OF

N. JEEVAN REDDY S/O RAMA KRISHNA REDDY, aged about (35) Years, Occupation: Business, R/o 16th Cross, 16th Main, HSR Layout, 4th Sector, Bangalore-560102., hereinafter called **"The Vendee"** referred to as G.P.A. Holder which terms shall mean and include his/her heirs successors, executors and legal representatives administrators and assignees etc., of the other part.

WHEREAS the Vendor/Principal is absolute owner and possessor of the **Agriculture Land Bearing Sy.No: 66 , Extent of Ac: 5-35 Gts (2-35 Hects) Dry Land in Full, The Grand Total Land Extent of Ac: 5-35 Gts (2-35 Hects) Dry Land in Full.,** Situated at **MUTHYALAMMAPALLY (V), DEVARAKADHRA (M)** of Mehaboobnagar-Dist., Through Pattadhar Pass Book No. 197728 Tittle Deed No. 197728 Patta No. 276 issued by M.R.O.Devarakadhra & Regd. Sale Deed Doct. No: 257/2011 Regs. At S.R.O.Atmakur., more particularly described stands on the name of the Vendor herein, which is clearly shown in below described Schedule of Property in respect thereof.

The Vendor offered to sell the schedule of property for valuable sale consideration a sum of **Rs: 5,87,500/- (Rupees Five Lakhs Eighty Seven Thousand Five Hundred Only).**

Contd...3

Jai Krishna.

5-250 చదరపు

Endorsement: Stamp Duty, Tranfer Duty, Registration Fee and User Charges are collected as below in respect of this Instrument.

Description of Fee/Duty	In the Form of Stamp Papers	Challan u/S 41of IS Act	E-Challan	Cash	Stamp Duty u/S 16 of IS act	DD/BC/ Pay Order	Total
Stamp Duty	60	0	29350	15	0	0	29425
Transfer Duty	NA	0	0	0	0	0	0
Reg. Fee	NA	0	2000	0	0	0	2000
User Charges	NA	0	100	0	0	0	100
Total	60	0	31450	15	0	0	31525

03 JUN 2016

Rs. 29365/- towards Stamp Duty including T.D under Section 41 of I.S. Act, 1899 and Rs. 2000/- towards Registration Fees on the chargeable value of Rs. 587500/- was paid by the party through Cash and E-Challan/BC/Pay Order No ,447MCK200916 dated ,20-SEP-16 of ,SBH/ASHOKNAGARKAMAREDDY

E-Chalian Details Received from Bank :

(1). AMOUNT PAID: Rs. 31450/-, DATE: 20-SEP-16, BANK NAME: SBH, BRANCH NAME: ASHOKNAGARKAMAREDDY, BANK REFERENCE NO: 003318870,REMITTER NAME: JEEVAN REDDY,EXECUTANT NAME: S.CHNDRAKALA,CLAIMANT NAME: JEEVAN REDDY) .

Date:

21st day of September,2016

Signature of Registering Officer

Atmakur

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Joint SubRegistrar Atmakur

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తెలంగాణ తెలంగాణా TELANGANA

SL. No. 8477 Date 20/9/16 Rs. 2015

Sold to N. Jeevan Reddy S/o. Ramakrishna Reddy

for Whom Self

R/O Bangalore

08AA 831350

MOHAMMED AHMED HUSSAIN
LICENSED STAMP VENDOR
L. No. 18-07-02/2013
RL. No. 18-07-09/2015
C/o. RAJA XEROX, H. No. 5-8-26, NH-7 Road,
Opp: New Bus Stand, KAMAREDDY
Dist. Nizamabad, Cell: 9885540180

WHEREAS the Vendee accepted the said offer agreed to purchase the above mentioned schedule described property for said sale consideration of **5,87,500/- (Rupees Five Lakhs Eighty Seven Thousand Five Hundred Only)** on the following mutually agreed terms and conditions.

Contd....3

NOW THIS AGREEMENT OF SALE-CUM-GENRAL POWER OF ATTORNEY

In pursuance of above offer and acceptance the Vendee has already paid the entire sale consideration of **Rs5,87,500/- (Rupees Five Lakhs Eighty Seven Thousand Five Hundred Only) Through Cheque No: _____ Bank_____ Date: _____.**

The Vendor hereby inform and assure the Vendee that the schedule described property is free from all encumbrances, claims charges prior sales, mortgages, Hypothecation and lien etc. It is also free from defect of title and in case the Vendee sustain any loss or damage or deprived of peaceful possession and enjoyment of schedule described property of Vendor or any part thereof on being inducted into possession of the same on account of Vendor defect of title the Vendor hereby indemnify and undertake to keep indemnified the Vendee of all such losses and damages.

The Vendor hereby handed over deliver the actual and physical possession of the schedule described property to the Vendee and the Vendor hereby expressly permit the Vendee to enter into the schedule property.

Contd....4

Raj Krishna.

S. Jeevan Reddy

The Vendor hereby inform and assure the Vendee that the schedule described property is not assigned land and it do not attract the provisions of Act 9 of 1977.

The vendor hereby inform and assure the Vendee that he/she possess absolute, valid and marketable title over the schedule described property and he undertake to convey the schedule described property in favour of the Vendee or its nominee or nominees as and when the Vendee desires it. The Vendor with a view to facilitate the Vendee to deal with the schedule described property effectively and beneficially and to secure conveyance of schedule property either in its name or in the name of its nominees hereby constitute the above named Vendee represented by its G.P./Vendee as its lawful **N. JEEVAN REDDY** Attorney in respect of schedule described property to do and perform all or any of the following acts and deeds in the names of Vendor and on his/her behalf as under.

To represent the Vendor/Principal before all Government, Quasi Government and competent authorities and departments in respect of all matters pertaining to our above mentioned property and to attend its day-to-day management and for said purpose our attorney is empowered to do all such acts and deeds. Which our attorney may deem necessary in its absolute discretion.

To represent the Vendor/Principal before all Government, Quasi Government and competent authorities and departments in respect of all matters pertaining to our above mentioned property and to attend its day-to-day management and for said purpose our attorney is empowered to do all such acts and deeds. Which our attorney may deem necessary in its absolute discretion.

To represent the Vendor/Principal before all Civil, Criminal and Revenue Courts and Tribunals in respect of all matter pertaining to above mentioned schedule described property and to sue on our behalf and to defend us and for said purpose, we hereby authorize our attorney to engage Advocates and to sign, verify and execute Vakalath, Memos of Appearances, Plaints, written statements, affidavits etc., and on appear and depose before all Courts Tribunals and to carry the matter in Appeal and Revision wherever necessary and to negotiate and to enter into compromise and to present the compromise memos/petitions before the Courts. Tribunals, Competent authorities and to secure adjudication of the matter either in terms of compromise on merits and to do all other acts and deeds which our attorney may deem necessary in its absolute discretion.

To represent Vendor/Principal before prospective buyers and to sell our above mentioned land to prospective buyers by negotiating and fixing the sale consideration and our attorney is further empowered to receive sale consideration and our attorney is further empowered to receive sale consideration and to pass receipt thereof and to execute and Register appropriate Sale Deed or Deeds or any other conveyance deed or deeds in respect of our above mentioned property either in its favour of its nominees or in favour of prospective buyers or his/her nominee and for said purpose to appear before the Registering Authorities and to admit sale transaction and to observe all formalities attached thereto and to do all such other acts and deeds, which our attorney may deem necessary for conveyance of valid, marketable title unto the Vendee or its nominees and to deliver actual and physical possession thereof.

Contd.....5

Jai Krishna

S. W. O.

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To represent the Vendor/Principal before Municipal Authority under Urban land ceiling Act or any other competent Authority etc., and to prepare layouts and to submit the same before the concerned authority and to secure sanction and approval of building plans and to deposit money, fees, developmental charges etc., and to all such other acts and deeds which our attorney may deed necessary in its absolute discretion for realizing the above objective. The Vendor hereby declare that the adjustment in stamp duty paid in this Agreement under Act 6, B(I) of Stamp Act No.21 of 1995 shall acrue to the benefit of the Vendee or its nominees at the time of registering Sale Deed or Deeds.

The Vendor/Principal hereby declare that his/her Vendee/Attorney is further empowered to do and perform all such other acts and deeds, which are not specifically stated herein above and which our Attorney may deem just and necessary in the circumstances.

The Vendor/Principal hereby declare and undertake to ratify and confirm All lawful acts and deeds done by the Attorney pursuant to this deed.

The Vendor/Principal hereby that this is an irrevocable Agreement of Sale Cum-General Power of Attorney.

SCHEDULE OF PROPERTY

Agriculture Land Bearing Sy.No: 66 , Extent of Ac: 5-35 Gts (2-35 Hects) Dry Land in Full.,

The Grand Total Land Extent of Ac: 5-35 Gts (2-35 Hects) Dry Land in Full., Bounded by:-

North	**:**	**Agril.Land of S. Srinivas**
South	**:**	**Agril.Land of Badam Rama Swamy**
East	**:**	**Agril.Land of Sanjeev Reddy**
West	**:**	**Railway Track**

Situated at MUTHYALAMMAPALLY (V), DEVERAKADHRA (M), Of Mehaboobnagar-District within the limits of G.P.Muthyalammapally M.P.Devakadhra, Z.P. Mehaboobnagar Registration Sub-Dist. Atmakur and Registration District, Mehaboobnagar.

The Vendor hereby further declares as under:-

1. The land mentioned in the document is not the assigned land as defined in the A.P. assigned lands (pot) Act No.9 of 1977.
2. The market value of the above plot is Rs: **1,00,000/-** per Acer and the total market Value comes to **Rs. 5,87,500/-**
3. The land alienated is not the Govt. land or its agencies or mortgaged to any others.

Contd.....6

Bal krishna

S. Venkat Reddy

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4. There is no structures existing in the schedule of plot, or any constructions at present going on, if any suppression in the matter may be punished U/sec. 27 and 64 of I.S. Act.

A stamp duty of **Rs. 2,93,750/-** Under Article 6B(1) and further stamp duty of Rs.50/- under Article 42(C) is paid on this doct. Chief Controller of Revenue Authority vide his proceedings No.MV/18289/95, dt.1-7-95 though stamp duty paid on G.P.A. under 42(c) is not adjustable the stamp duty on this Doct. Under Article 6B(1) is adjustable to the Vendees or his/her Nominee(s) Account.

In Witness whereof the Vendor/Principal has set his/her respective hands on these present with free will and consent without any force or coercion in the presence of witnesses on the day, month and year first above mentioned.

Raj Krishna S-W0 (05 58

Vendors/Principal

Witnesses:

1.

2.

Consenting Party

Purchaser:-

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JOINT SUBREGISTRAR OFFICE OF The Seal of Joint SubRegistrar Office Atmakur

KARNATAKA STATE

DRIVING LICENCE FORM

INDIA

DL.No.: 3664/2001-02
JEEVAN R
S/O: N RAMAKRISHNA REDDY
VIGNESH, #521, 16th CROSS,
16th MAIN, HSR LAYOUT, 4th SECTOR,
BANGALORE-560 034
Bld Grp : A+VE
D.O.B : 05/05/1981
PH : 57604948

Valid Throughout India

M/CY WG
LMV

OLA : RTO BNG CENTRAL
D.O.I. : 10/07/2001
C.D.O.I. : 22/07/2006
Temporary Address :

	From	To
Non - Trans. :	10/07/2001	09/07/2021
Trans. :		
Tested by :	IMV	
Badge No :		
Badge No1 :		
Badge No2 :		
Restriction :		

DL.No.: 3664/2001-02

AMS COMPUTERS LTD.

No horn should be used at night (bet 10. PM & 6. AM) in residential area, except in exceptional circumstance.

L A BANGALORE CENTRAL

Bk - 1, CS No 4150/2016 & Doct No 4062/2016. Sheet 7 of 8 Joint SubRegistrar5 Atmakur

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JOINT SUBREGISTRAR OFFICE OF Atmakur The Seal of Joint SubRegistrar Office

ఎస్ సాయి కృష్ణ
S Sai Krishna

పుట్టిన సంవత్సరం/Year of Birth : 2004
పురుషుడు / Male

6627 0246 8060

ఆధార్ - సామాన్యుని హక్కు
UNIQUE IDENTIFICATION AUTHORITY OF INDIA

చిరునామా: S/O ఎస్ శ్రీనివాసులు, 8-3-228/678/717, కార్మిక నగర, యూసఫ్ గూడ, హైదరాబాద్, ఆంధ్ర ప్రదేశ్, 500045

Address: S/O S Srinivasulu, 8-3-228/678/717, Karmika Nagar, Yousuf Guda, Hyderabad, Andhra Pradesh, 500045

1947
1800 180 1947
help@uidai.gov.in
www.uidai.gov.in
పి.బి. బాక్స్ నెం. 1947, బెంగళూరు-560001

INDIAN UNION DRIVING LICENCE
ANDHRA PRADESH
DRIVING LICENCE
DLRAP02200090362013
SADIQ MD
MD. MAHABUB ALI
11-51/1
NEAR EDGHA
KOTHAKOTA
MAHABUB NAGAR

28/02/2013

Licencing Authority
RTA-MAHABUBNAGAR

	Class Of Vehicle	Validity
Transport	MCWG	04/08/2020
sport	HGV,HPV,LMV	28/02/2016
rdous Validity		
e No.	2582	
rence No.	5457/MBNR/1990	
nal LA.	RTA MAHABOOBNAGAR	
	05/08/1970	
d Gr.		
of 1st Issue	07/08/1990	

ALWAYS FOLLOW TRAFFIC RULES

భారత ప్రభుత్వం
GOVERNMENT OF INDIA

ఎస్ చంద్రకళ
S Chandrakala

పుట్టిన సంవత్సరం/ Year of Birth: 1972
స్త్రీ / Female

3360 3555 0451

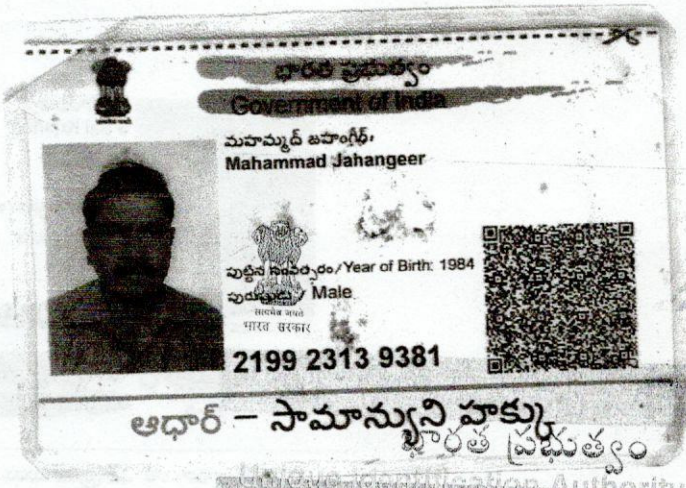
ఆధార్ - సామాన్యుని హక్కు

ఆధార్
భారత విశిష్ట గుర్తింపు ప్రాధికార సంస్థ
UNIQUE IDENTIFICATION AUTHORITY OF INDIA

చిరునామా: W/O ఎస్ శ్రీనివాసులు 8-3-228/678/717, కార్మిక నగర, యూసఫ్ గూడ హైదరాబాద్, హైదరాబాద్, ఆంధ్ర ప్రదేశ్ 500045

Address: W/O S Srinivasulu, 8-3-228/678/717, Karmika Nagar, Yousuf Guda, Hyderabad, Andhra Pradesh, 500045

1947
1800 180 1947
help@uidai.gov.in
www.uidai.gov.in
పి.బి. బాక్స్ నెం. 1947, బెంగళూరు-560001



నమోదు సంఖ్య / Enrollment No. : 2022/50021/19328

To
Chintakunta Shekar Reddy
చింతకుంట శేఖర్ రెడ్డి
H.NO 6/45
DEVARKADRA MANDAL
Muthyalampaile
Varne,Mahabub Nagar
Andhra Pradesh - 509219
9866764117

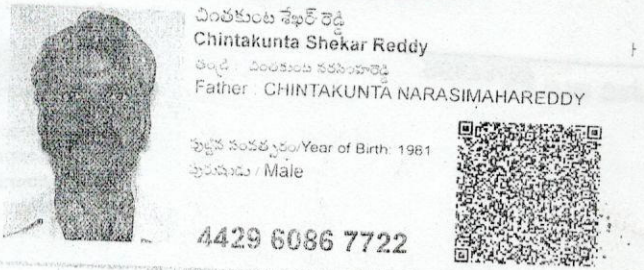
04/01/2013

KL093980550DF
9398055

మీ ఆధార్ సంఖ్య / Your Aadhaar No. :

4429 6086 7722

ఆధార్ – సామాన్యుని హక్కు



Bk-1, CS No 4150/2016 & Doct No 4063/2016. Sheet 8 of 8 Joint SubRegistrar5 Atmakur

OFFICE OF The Seal of Joint SubRegistrar Office Atmakur JOINT SUBREGISTRAR

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Annex C

Permission for Ground Water Abstraction

GOVERNMENT OF TELANGANA
GROUND WATER DEPARTMENT

From:-
K.Dhananjaiah,
MSc., M.Sc(Tech),
DIRECTOR (FAC),
Ground Water Department,
Chintal Basthi, Khairathabad
Hyderabad – 500 004.
Office Phone: 040-23314978
Fax No.040-23314950
Email ID:director.tgsgwd@gmail.com

To
The Commissioner of Industries,
Chirag Ali Lane,
Abids,
Hyderabad.

Letter No.1381/GP/TS iPASS/MBNR/2016-17, **Dated:22.02.2017.**

Sir,

Sub:- Telangana State Ground Water Department –TSiPASS- M/s Transform Sun Energy Private Limited - Permission for withdrawal of Ground Water – Ground Water Investigation Report -Submitted – Reg.

Ref:- 1. CAF of M/S Transform Sun Energy Private Limited, Addakal Village, Addakal Mandal of Mahabubnagar District.
2. Unique ID No.LRG00700383725.
Pre-Scrutiny completed dated:10-02-2017 .
3. LR.No.2387/Tech/2017, dt:18.02.2017 of the District Ground Water Officer, Ground Water Department, Mahabubnagar District.

<><><>

With reference to the subject and reference cited, it is to inform that, the District Ground Water Officer, Ground Water Department, Mahabubnagar District has conducted groundwater investigations in the extent of 270330.00 Sq.mts land of M/S Transform Sun Energy Private Limited, located in Addakal Village, Addakal Mandal of Mahabubnagar District to study the feasibility for extraction of 8 KLD of ground water and submitted report to the undersigned vide reference 2nd cited.

After scrutiny of the report, the permission is herewith accorded for withdrawal 8 KLD of ground water from one recommended Borewell against the requirement of 8 KLD for the firm subject to the following terms and conditions.

- The firm is permitted to draw the 8 KLD of water from one recommended Borewell.
- Rainwater Harvesting Structures must be constructed at proposed locations in the premises to augment rainwater.

- The Government of Telangana reserves the right to stop from using of ground water during emergencies or wherever the plant deviates the terms and conditions.
- The party must conduct pump test once in every half-year and preserve the data.
- The party must establish observation wells and they should monitor the water levels once in a month (last week of a month) and quality twice a year (Pre and Post monsoon periods) and record the data for further technical use.
- The party must send half yearly reports on the above studies regularly to the District Ground Water Officer, Ground Water Department, Mahabubnagar district.
- The effluents must be treated properly and must be free from all toxic materials. Colour and turbidity harmful to human beings, plants and animals.
- The effluents before or after treatment must not be let out into any surface or groundwater bodies. Used water must be recycled for reuse.
- Officers of Ground Water Department must be allowed to inspect the wells, plant area, and data whenever found necessary by the Department.
- TSWALTA Authority / Government reserve the right to take over the wells during emergency.

The investigation report is herewith uploaded in to the TSiPASS web portal for necessary further action. As per the TSiPASS webportal payment of Rs.30000/- is paid by online, but not yet received to this Office.

Yours faithfully,

Encl:-Report

Sd/-K.DHANANJAIAH

DIRECTOR.

Copy to District Ground Water Officer, Ground Water Department, Mahabubnagar district.

REPORT ON GROUND WATER INVESTIGATIONS FOR M/s.TRANSFORM SUN ENERGY PVT. LTD. ADDAKAL (V) ADDAKAL (M) MAHABUBNAGAR DISTRICT

INTRODUCTION :

As per the common Application form TS - iPASS downloaded UID No:-LRG00700383725 on 10-02-2017 and as per the instructions of the Director, Ground Water Department, Hyderabad. Dated:10-02-2017. Ground Water Surveys have been carried out in the premises of M/s. Transform Sun Energy Pvt. Ltd., area covering 66.8 acres in Sy.No. 386, 387, 388, 392 ETC of Addakal Village, Addakal Mandal, Mahabubnagar District on 16-02-2017 for selection of feasible ground water structures.

The authorized signatory has forwarded the common application form for establishment, application form-I for Transform Sun Energy Pvt. Ltd., for Addakal Village, Addakal Mandal, Mahabubnagar, in it is mentioned that 8 KL/Day is the requirement of ground water to meet their demand.

LOCATION :

The M/s. Transform Sun Energy Pvt. Ltd., area is located at a distance of 2.5 Km South-West of Addakal Village, Addakal Mandal, The total extent of the investigated area is 66.8 acres consisting .No. 386, 387, 388, 392 ETC falling in Topo sheet No. 56 H/14&56 H/15.The Geographical Co –ordinates of the plant area as obtained from the GPS are in between 77^0 55'14.5"- 77^0 55'21.0"- 77^0 55'18.5"- 77^0 55'24.1"- 77^0 55'19.7"- 77^0 55'08.7"- 77^0 55'00.1"- 77^0 55'01.1"- 77^0 55'05.4"- to East Longitudes and 16^0 29'27.5"- 16^0 29'26.4"- 16^0 29'22.0"- 16^0 29'17.1"- 16^0 29'11.9"- 16^0 29'10.4'"- 16^0 29'15.5"- 16^0 29'20.2"- 16^0 29'19.1"- to North Latitudes, Also the Geographical Co-ordinates of the investigated area and the Topo sheet extract showing the location is enclosed in plate No. I

PHYSIOGRAPHY AND DRAINAGE :

The investigated area exhibits with gentle slope topography towards West direction. The elevation is about 348-352 meters above mean sea level. The drainage pattern of the area is sub-dendritic to dentritic. It drains into Dindy river and forms a part of the major basin of Krishna River. It is observed that it comes under non command category.

Climate & Rainfall :

The area under investigation falls in Semi- arid region and the climate in the area is generally hot. The maximum rain fall is received from South–west monsoon and the annual normal rain fall of Addakal Mandal is 623mm. The actual rain fall received for a period of decade from the year 2006-07(Addakal Mandal Rain Gauge station) is as shown below in table-I.

TABLE - I

Year	Normal rain fall (mm)	Actual rain fall received (mm)	% Deviation from the normal & category
2006-07	623	430.4	-31.0 Deficit
2007-08		781.1	+25.3 Excess
2008-09		484.6	-22.2 Deficit
2009-10		744.4	+19.4 Normal
2010-11		729.0	+17.0 Normal
2011-12		539.4	-13.4 Normal
2012-13		723.2	+16.0 Normal
2013-14		934.2	+50.0 Excess
2014-15		553.6	-11.4 Normal
2015-16		729.2	+33.0 Excess
Average		**664.90**	**+14.35 Normal**

It is observed from the above rainfall data that the mandal received normal rainfall for 5 years during the years 2009-10, 2010-11, 2011-12, 2012-13, 2014-15 & excess rain fall for 3 years 2007-08, 2013-14, 2015-16. The rainfall was deficit during two years 2006-07 & 2008-09. Over all, rain fall pattern is recorded as normal in the mandal during the period from 2009 to 2013.

SOIL TYPE & CROPPING PATTERN :

The area under investigation is covered by black cotton soils and partly by mixed soils in the lower elevation. The thickness of the soil varies from 1.5 meters to 2.5 meters. In general, percolation and infiltration factors of the area are moderate to high.

It is observed that paddy is grown under Bore wells during Kharif season, and crops like Red gram, Paddy, Fodder, Vegetables and other Irrigated dry crops are grown under ground water irrigation, through bore wells during Rabi season.

HYDROGEOLOGY :

The area under investigation is underlain by gray and pink granites with pegmatite veins comes under Achaean age. The area is generally covered with Red sandy soils followed by weathered and semi weathered then minor fractured granite and massive basement. The texture of the formation is medium to Coarse grained in nature. The ground water occurs under water table as well as semi confined conditions in the weathered and fractured zones.

DEPTH TO WATER LEVELS: (Addakal Piezometer data)

Ground Water Department is monitoring the depth to water levels of Addakal Peizometer on monthly basis and the analysis of month wise water level data from June 2006 to May 2016, for a period of 11 years, is furnished in the table-II.

Table-II

S.NO	Year	Depth to Water Level in meters bgl											
		June	July	August	September	October	November	December	January	February	March	April	May
1	2006-07	8.89	7.99	8.50	8.51	8.50	8.61	849	8.47	9.07	9.36	10.02	9.58
2	2007-08	9.33	7.72	7.70	4.92	4.88	5.42	5.72	6.26	6.40	6.62	6.56	7.24
3	2008-09	7.46	7.21	4.85	4.46	4.90	5.22	5.60	6.24	6.69	7.19	7.64	7.91
4	2009-10	7.76	8.30	8.74	7.66	4.56	5.69	6.39	6.94	7.24	7.81	8.05	8.25
5	2010-11	8.02	6.76	4.52	2.82	3.24	3.74	4.09	4.54	4.95	5.39	5.66	6.06
6	2011-12	6.36	6.20	5.44	5.42	5.39	5.63	6.16	6.47	6.76	6.94	7.50	7.96
7	2012-13	8.33	8.05	4.49	3.55	3.33	3.87	4.43	4.54	5.03	5.41	6.60	6.21
8	2013-14	7.36	5.50	4.77	0.80	0.98	0.74	2.38	3.58	4.02	4.15	4.42	4.74
9	2014-15	2.77	2.23	2.95	1.95	3.44	5.18	4.60	6.00	6.21	6.53	6.88	7.38
10	2015-16	5.34	6.10	4.75	3.65	3.79	5.78	5.96	6.94	6.41	7.59	8.39	10.18

The analysis of water level data indicates that the pre monsoon water levels range from 4.74 (May 2013) to 10.18m (May 2016) where as the post monsoon water levels are ranging from 0.74 m (November 2013) to 8.61 m (November, 2006). Over all, the water levels are shallow to moderate in pre-monsoon and season and Post monsoon seasons. It is also observed that the seasonal fluctuations from post monsoon to pre monsoon period are ranging from 0 -10m every year indicating to safe for ground water for various users and also concomitant recharge during monsoon periods & hence the hydrograph (Enclosed in Plate No.III) does not show any pronounced falling trend in depth to water levels.

DYNAMIC GROUND WATER RESOURCE ESTIMATION :

Ground Water Department has been conducting periodical exercise to estimate the basin wise ground water resource, draft, and balance, the stage of ground water development and categorization of the basin in the district. Addakal Village of Addakal Mandal is falling in the MBNR_ D_44_ADDAKAL sub basin. As per the Ground Water Resource Estimation as the base year 2010-11, this sub basin is categorized as "Safe" basin with 50% of stage of ground water development. Details are given in the table-III.

TABLE-III

Name of the basin	GW Available resource Ha.m	GW Draft for all uses Ha.m	Balance in Ha.m	% of development	Category
MBNR_D_44_ADDAKAL	4964	2506	2171	50%	safe

QUALITY :

It is reported that in general the quality of ground water is potable and also suitable for agriculture and Industrial purposes.

SUGGESTION FOR IMPROVEMENT OF GROUND WATER :

It is advised to construct in site specific Rain Water Harvesting structures at West side and other suitable locations to sustain the ground water yields. The Process of recycling of water also has to be adopted to conserve the ground water over the years and other related measures may also be taken up for proper sustainability and conservation of ground water resource.

RECOMMENDATIONS :

The area investigated is feasible for ground water development one bore well can be recommended for drilling at Hg site bore well No.1 as shown in table IV and expected yields is 3600LPH.

Bore Well :(Table-IV):

S.No	Hg-1 Bore well (Geo – Coordinates)	Type of well Recommended	Depth (m)	Dimensions	Anticipated Yield (LPH)
1	N 16^0 29' 11.4'' E 77^0 55' 08.6"	Bore Well	90	165mm	3600

The total yield of the Bore Well is 28800 LPD or 28.8 KLD with 8 hours of pumping in a day and the firm is permitted to withdraw 8 KLD of ground water from the recommended bore well.

CONCLUSIONS AND RECOMMENDATIONS :

1. The area of M/s. Transform Sun Energy Pvt.Ltd., is located at Addakal (V) Addakal (M) Mahabubnagar District.
2. The water requirement of the Industry is 8 KLD.
3. Total yield of the recommended borewell is 28.8 KLD and the firm is restricted to withdraw only 8 KLD of ground water.
4. The Rain Water Harvesting Structure at the suitable location to be constructed to sustain The Ground Water Yields.
5. The investigated Industry area is underlain by granites of Achaean age.
6. The annual normal rain fall of the mandal is 623mm and it received normal rainfall during 5 years out of 10 years for which data is studied.
7. The depth to water levels is moderately shallow and the fluctuations in the water levels indicate no pronounced falling trend.
8. As per the GEC-2010-11 estimation, estimated ground water resource in the sub-basin is 4964 Ha.m, draft is 2506 Ha.m, ground water balance is 2171 Ha.m and the stage of development is 50% and hence the basin falls under Safe category.

TERMS AND CONDITIONS :

1 The recommendations hold good subject to normal rainfall conditions and prevailing stage of groundwater development in the area.

2 O.B Well (Observation wells) must be established in the premises of the plant for monitoring of water levels every month(1st week of the month) and quality twice in a year(pre & post monsoon period).

3 Half yearly/by monthly report on the above must be send to the District Ground Water Officer, Ground Water Department, Mahabubnagar.

4 Officers of the Ground Water Department must be allowed to inspect the well and records of water levels etc., when ever required.

5 The District/Mandal WALTA Authority and Ground Water Department reserve the right to stop the plant for excess usage of ground water or during emergency.

ENCLOSURES :

I. Toposheet extract (Location map)
II. Site plan
III. Hydrograph

18/2/17

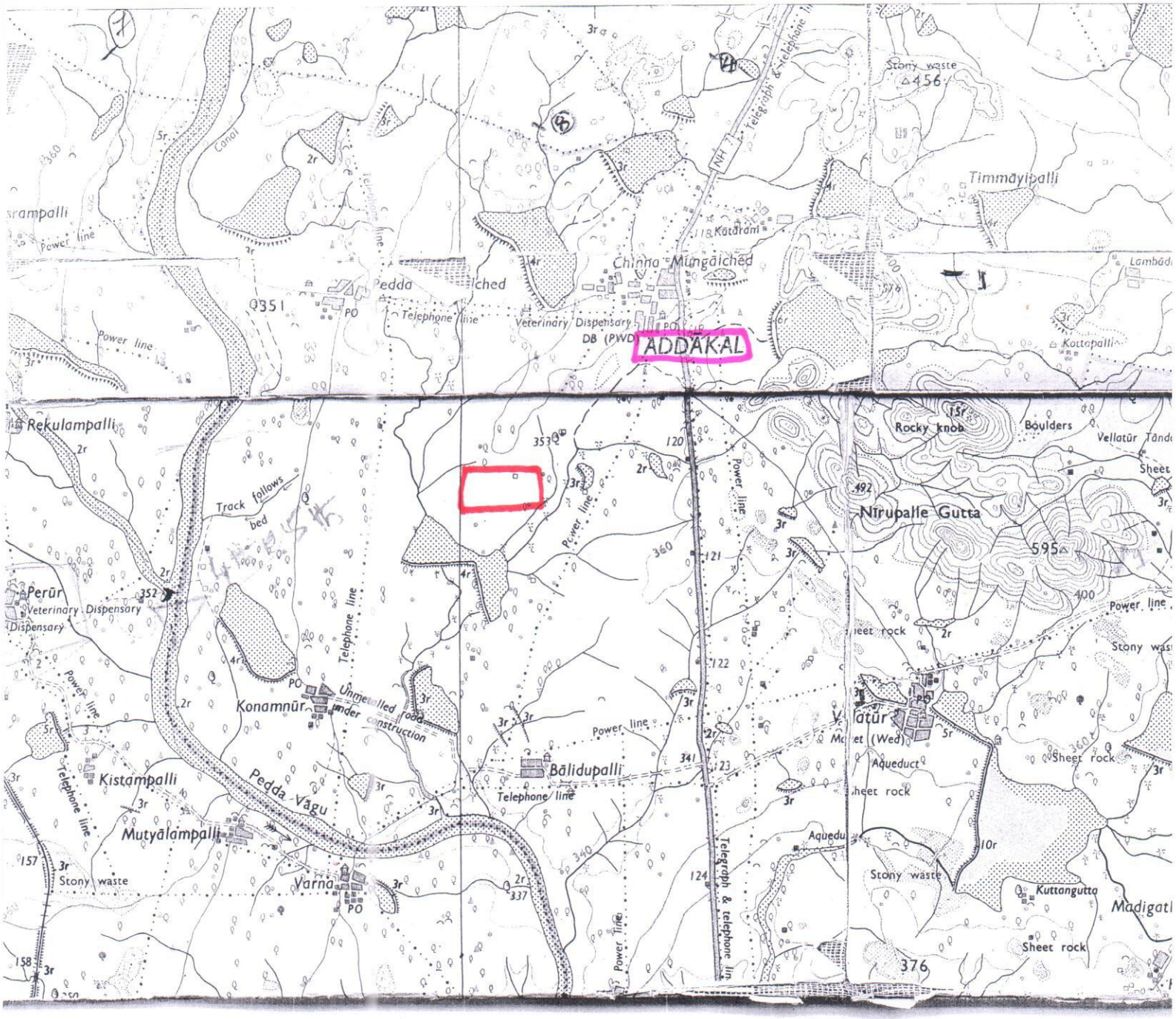
District Ground Water Officer
Ground Water Department
Mahabubnagar

18/2/17
Asst. Hydrogeologist

PLATE NO. I

Topo sheet No:- 56 H/14, 56 H/15.

Location of M/s. Transform Sun Energy Pvt. Ltd, Addakal (V), Addakal (V), Mahabubnagar (D)



Index

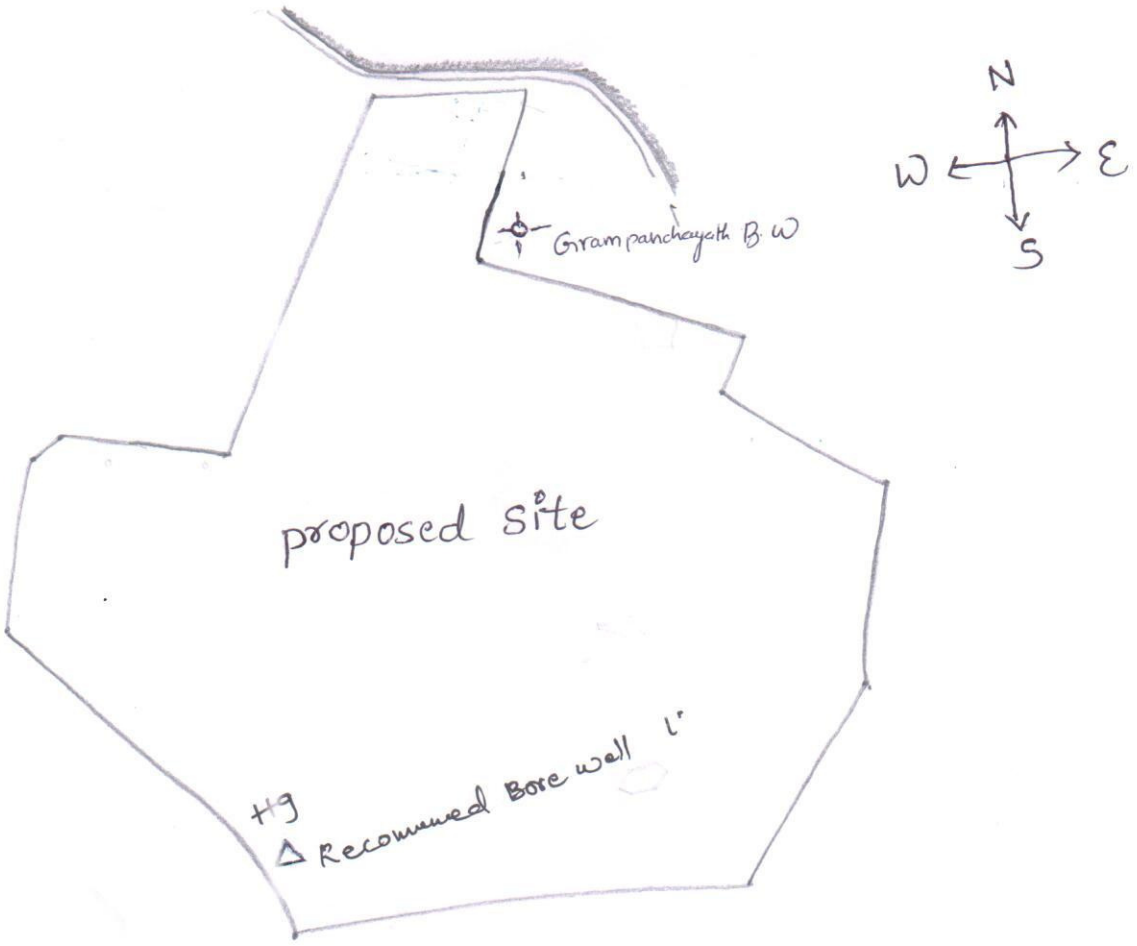
- Mandal
- Village
- Proposed site.

18/2/17

Plate NO - II

SITE PLAN OF TRANSFORM SUN ENERGY

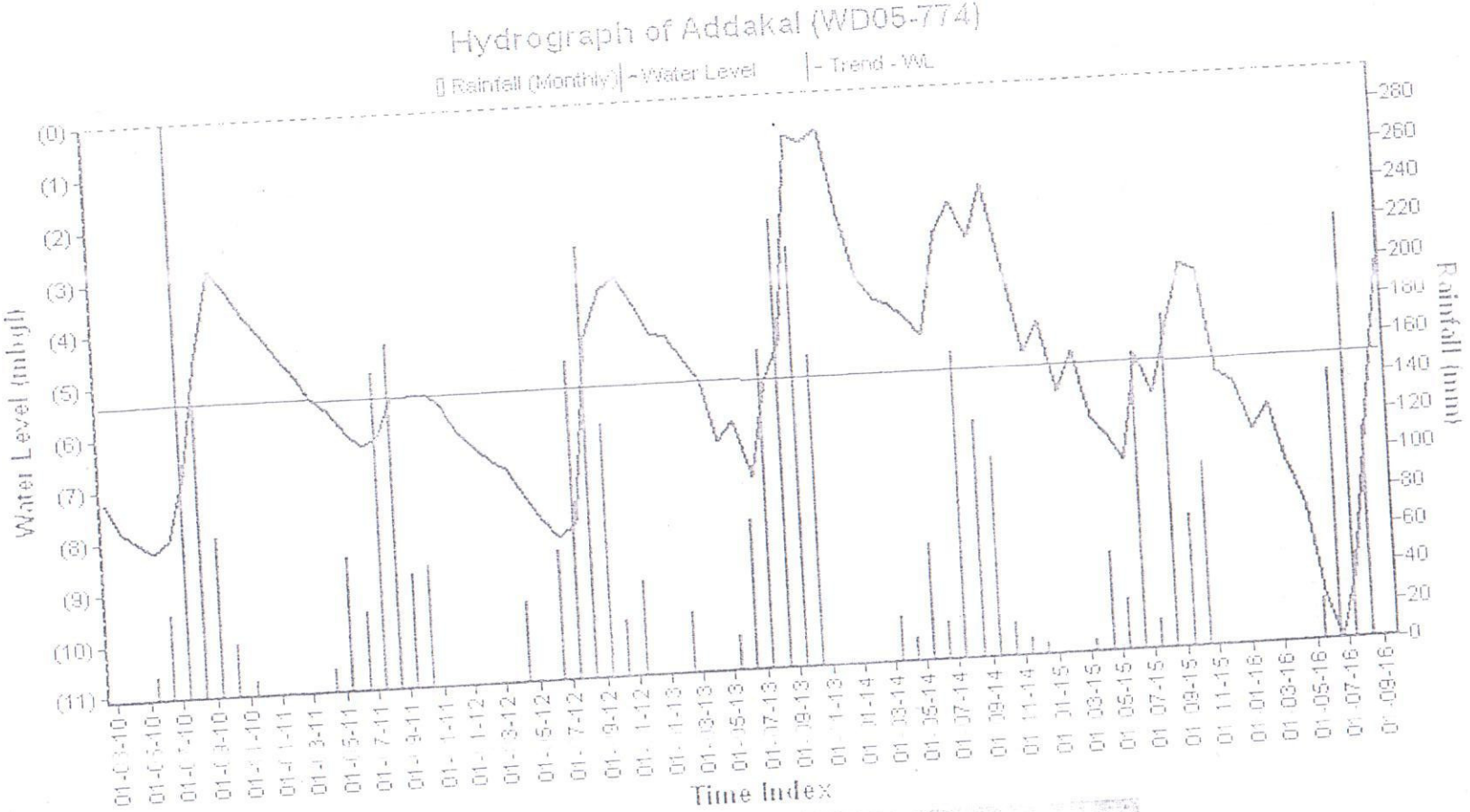
(V) :- Addakal; (M) Addakal ; (Dist) : Mahabubnagar.



Deep
18/2/17

Asst. Hydrogeologist

PLATE - III



DRees 28/2/17
Asst. Hydrogeologist

DGM(D) 18/2/17

GOVERNMENT OF TELANGANA
GROUND WATER DEPARTMENT

From:-
K.Dhananjaiah,
MSc., M.Sc(Tech),
DIRECTOR (FAC),
Ground Water Department,
Chintal Basthi, Khairathabad
Hyderabad – 500 004.
Office Phone: 040-23314978
Fax No.040-23314950
Email ID:director.tgsgwd@gmail.com

To
The Commissioner of Industries,
Chirag Ali Lane,
Abids,
Hyderabad.

Letter No.1382/GP/TS iPASS/MBNR/2016-17, **Dated:22.02.2017.**

Sir,

Sub:- Telangana State Ground Water Department –TSiPASS- M/s Transform Sun Energy Private Limited - Permission for withdrawal of Ground Water – Ground Water Investigation Report -Submitted – Reg.

Ref:-
1. CAF of M/S Transform Sun Energy Private Limited, Baleedupalle Village, Addakal Mandal of Mahabubnagar District.
2. Unique ID No.MEG00700383771.
   Pre-Scrutiny completed dated:10-02-2017 .
3. LR.No.2377/Tech/2017, dt:18.02.2017 of the District Ground Water Officer, Ground Water Department, Mahabubnagar District.

<><><>

With reference to the subject and reference cited above, it is to inform that, the District Ground Water Officer, Ground Water Department, Mahabubnagar District has conducted groundwater investigations in the extent of 770169.00 Sq.mts land of M/S Transform Sun Energy Private Limited, located in Baleedupalle Village, Addakal Mandal of Mahabubnagar District to study the feasibility for extraction of 10 KLD of ground water and submitted report to the undersigned vide reference 2nd cited.

After scrutiny of the report, the permission is herewith accorded for withdrawal 10 KLD of ground water from one existing Borewell against the requirement of 10 KLD for the firm subject to the following terms and conditions.

- The firm is permitted to draw the 10 KLD of water from one existing Borewell.
- Rainwater Harvesting Structures must be constructed at proposed locations in the premises to augment rainwater.

- The Government of Telangana reserves the right to stop from using of ground water during emergencies or wherever the plant deviates the terms and conditions.
- The party must conduct pump test once in every half-year and preserve the data.
- The party must establish observation wells and they should monitor the water levels once in a month (last week of a month) and quality twice a year (Pre and Post monsoon periods) and record the data for further technical use.
- The party must send half yearly reports on the above studies regularly to the District Ground Water Officer, Ground Water Department, Mahabubnagar district.
- The effluents must be treated properly and must be free from all toxic materials. Colour and turbidity harmful to human beings, plants and animals.
- The effluents before or after treatment must not be let out into any surface or groundwater bodies. Used water must be recycled for reuse.
- Officers of Ground Water Department must be allowed to inspect the wells, plant area, and data whenever found necessary by the Department.
- TSWALTA Authority / Government reserve the right to take over the wells during emergency.

The investigation report is herewith uploaded in to the TSiPASS web portal for necessary further action. As per the TSiPASS webportal payment of Rs.42000/- is paid by online, but not yet received to this Office.

Yours faithfully,

Encl:-Report

Sd/-K.DHANANJAIAH

DIRECTOR.

Copy to District Ground Water Officer, Ground Water Department, Mahabubnagar district.

REPORT ON GROUND WATER INVESTIGATIONS FOR M/s.TRANSFORM SUN ENERGY PVT. LTD. BALEEDUPALLE(V) ADDAKAL (M) MAHABUBNAGAR DISTRICT

INTRODUCTION :

As per the common Application form TS - iPASS downloaded UID:- MEG 00700383771 on 09-02-2017 and as per the instructions of the Director, Ground Water Department, Hyderabad. Dated: 09-02-2017. Ground Water Surveys have been carried out in the premises of M/s. Transform Sun Energy Pvt. Ltd., area covering 190 acres in Sy.No. 130-2017 B, ETC of Baleedupalle Village, Addakal Mandal, Mahabubnagar District on 14-02-2017 for selection of feasible ground water structures.

The authorized signatory has forwarded the common application form for establishment, application form-I for Transform Sun Energy Pvt. Ltd., for Baleedupalle Village, Addakal Mandal, Mahabubnagar, in it is mentioned that 10 KL/Day is the requirement of ground water to meet their demand.

LOCATION :

The M/s. Transform Sun Energy Pvt. Ltd., area is located at a distance of 1.0 Km East of Baleedupalle Village, Addakal Mandal, The total extent of the investigated area is 190acres consisting Sy.No. 130-2017 B, ETC falling in Topo sheet No. 56 H/15. The Geographical Co – ordinates of the plant area as obtained from the GPS are in between 77^0 54'55.2"- 77^0 54'59.1"- 77^0 54'45.1"- 77^0 54'43.7"- 77^0 54'50.8"- 77^0 54'47.3"- 77^0 54'37.9"- 77^0 54'22.8"- 77^0 54'19.5"- 77^0 54'17.8"- 77^0 54'21.2"- 77^0 54'22.3"- 77^0 54'43.7"- to East Longitudes and 16^0 28'55.1"- 16^0 28'57.8"- 16^0 29'11.0"- 16^0 29'02.1"- 16^0 28'22.8"- 16^0 28'22.8'"- 16^0 28'09.5"- 16^0 28'16.7"- 16^0 28'12.4"- 16^0 28'05.2"- 16^0 28'01.7"- 16^0 28'01.6"- 16^0 28'00.0"- to North Latitudes, Also the Geographical Co-ordinates of the investigated area and the Topo sheet extract showing the location is enclosed in plate No. I

PHYSIOGRAPHY AND DRAINAGE :

The investigated area exhibits with gentle slope topography towards West direction. The elevation is about 338-348 meters above mean sea level. The drainage pattern of the area is sub-dendritic to dentritic. It drains into Dindy river and forms a part of the major basin of Krishna River. It is observed that it comes under non command category.

Climate & Rainfall :

The area under investigation falls in Semi- arid region and the climate in the area is generally hot. The maximum rain fall is received from South–west monsoon and the annual normal rain fall of Addakal Mandal is 623mm. The actual rain fall received for a period of decade from the year 2006-07(Addakal Mandal Rain Gauge station) is as shown below in table-I.

TABLE - I

Year	Normal rain fall (mm)	Actual rain fall received (mm)	% Deviation from the normal & category
2006-07	623	430.4	-31.0 Deficit
2007-08		781.1	+25.3 Excess
2008-09		484.6	-22.2 Deficit
2009-10		744.4	+19.4 Normal
2010-11		729.0	+17.0 Normal
2011-12		539.4	-13.4 Normal
2012-13		723.2	+16.0 Normal
2013-14		934.2	+50.0 Excess
2014-15		553.6	-11.4 Normal
2015-16		729.2	+33.0 Excess
Average		**664.90**	**+14.35 Normal**

It is observed from the above rainfall data that the mandal received normal rainfall for 5 years during the years 2009-10, 2010-11, 2011-12, 2012-13, 2014-15 & excess rain fall for 3 years 2007-08, 2013-14, 2015-16. The rainfall was deficit during two years 2006-07 & 2008-09. Over all, rain fall pattern is recorded as normal in the mandal during the period from 2009 to 2013.

SOIL TYPE & CROPPING PATTERN :

The area under investigation is covered by black cotton soils and partly by mixed soils in the lower elevation. The thickness of the soil varies from 1.5 meters to 2.0 meters. In general, percolation and infiltration factors of the area are moderate to high.

It is observed that paddy is grown under Bore wells during Kharif season, and crops like Red gram, Paddy, Fodder, Vegetables and other Irrigated dry crops are grown under ground water irrigation, through bore wells during Rabi season.

HYDROGEOLOGY :

The area under investigation is underlain by gray and pink granites with pegmatite veins and quartz vein East- West direction all comes under Achaean age. The area is generally covered with Red sandy soils followed by weathered and semi weathered then minor fractured granite and massive basement. The texture of the formation is medium to Coarse grained in nature. The ground water occurs under water table as well as semi confined conditions in the weathered and fractured zones.

DEPTH TO WATER LEVELS: (Addakal Piezometer data)

Ground Water Department is monitoring the depth to water levels of Addakal Peizometer on monthly basis and the analysis of month wise water level data from June 2006 to May 2016, for a period of 10 years, is furnished in the table-II.

Table-II

S.NO	Year	Depth to Water Level in meters bgl											
		June	July	August	September	October	November	December	January	February	March	April	May
1	2006-07	8.89	7.99	8.50	8.51	8.50	8.61	849	8.47	9.07	9.36	10.02	9.58
2	2007-08	9.33	7.72	7.70	4.92	4.88	5.42	5.72	6.26	6.40	6.62	6.56	7.24
3	2008-09	7.46	7.21	4.85	4.46	4.90	5.22	5.60	6.24	6.69	7.19	7.64	7.91
4	2009-10	7.76	8.30	8.74	7.66	4.56	5.69	6.39	6.94	7.24	7.81	8.05	8.25
5	2010-11	8.02	6.76	4.52	2.82	3.24	3.74	4.09	4.54	4.95	5.39	5.66	6.06
6	2011-12	6.36	6.20	5.44	5.42	5.39	5.63	6.16	6.47	6.76	6.94	7.50	7.96
7	2012-13	8.33	8.05	4.49	3.55	3.33	3.87	4.43	4.54	5.03	5.41	6.60	6.21
8	2013-14	7.36	5.50	4.77	0.80	0.98	0.74	2.38	3.58	4.02	4.15	4.42	4.74
9	2014-15	2.77	2.23	2.95	1.95	3.44	5.18	4.60	6.00	6.21	6.53	6.88	7.38
10	2015-16	5.34	6.10	4.75	3.65	3.79	5.78	5.96	6.94	6.41	7.59	8.39	10.18

The analysis of water level data indicates that the pre monsoon water levels range from 4.74 (May 2013) to 10.18m (May 2016) where as the post monsoon water levels are ranging from 0.74 m (November 2013) to 8.61 m (November, 2006). Over all, the water levels are shallow to moderate in pre-monsoon and season and Post monsoon seasons. It is also observed that the seasonal fluctuations from post monsoon to pre monsoon period are ranging from 0 -10m every year indicating to safe for ground water for various users and also concomitant recharge during monsoon periods & hence the hydrograph (Enclosed in Plate No.III) does not show any pronounced falling trend in depth to water levels.

YIELD MEASUREMENT :

The yield test was conducted in the lands of M/s. Transform Sun Energy Pvt.Ltd. The test was conducted 1hr 30mins by using stop watch and a barrel of 200 liters capacity and the quantity of discharge is measured with respect to time. The yield of the Existing Bore wells is **6000 LPH**. At a rate of 8 hours of pumping in a day the discharge of the existing bore well is arrived at **48000 LPD (or) 48 KLD.**

DYNAMIC GROUND WATER RESOURCE ESTIMATION :

Ground Water Department has been conducting periodical exercise to estimate the basin wise ground water resource, draft, and balance, the stage of ground water development and categorization of the basin in the district. Baleedupalle Village of Addakal Mandal is falling in the MBNR_ D_44_ADDAKAL sub basin. As per the Ground Water Resource Estimation as the

base year 2010-11, this sub basin is categorized as "Safe" basin with 50% of stage of ground water development. Details are given in the table-III.

TABLE-III

Name of the basin	GW Available resource Ha.m	GW Draft for all uses Ha.m	Balance in Ha.m	% of development	Category
MBNR_D_44_ADDAKAL	4964	2506	2171	50%	safe

WELL INVENTORY :(Table-IV):

S.No	Existing Bore wells(Geo – Coordinates)	Dimensions/ Depth	DTWL mbgl	Yield(LPH)	Requirement of Ground Water
1	N 16^0 28' 08.1'' E 77^0 54' 43.5"	165mm dia/90m	6.19	6000	10KLD

QUALITY

It is reported that in general the quality of ground water is potable and also suitable for agriculture and Industrial purposes.

SUGGESTION FOR IMPROVEMENT OF GROUND WATER :

It is advised to construct in site specific Rain Water Harvesting structures at west side and other suitable locations to sustain the ground water yields. The Process of recycling of water also has to be adopted to conserve the ground water over the years and other related measures may also be taken up for proper sustainability and conservation of ground water resource.

CONCLUSIONS AND RECOMMENDATIONS :

1. The Industrial area of M/s. Transform Sun Energy Pvt.Ltd., is located at Baleedupalle (V) Addakal (M) Mahabubnagar District.
2. The water requirement of the Industry is 10KLD.
3. The total yield from the existing Bore well is 6000 LPH or 48 KLD with 8 hours of pumping in a day and the firm is permitted to withdraw 10 KLD Ground Water from the existing Bore Wells as per their requirement.
4. The Rain Water Harvesting Structure at the suitable location to be constructed to sustain The Ground Water Yields.
5. The investigated Industry area is underlain by granites of Achaean age.
6. The annual normal rain fall of the mandal is 623mm and it received normal rainfall during 5 years out of 10 years for which data is studied.
7. The depth to water levels is moderately shallow and the fluctuations in the water levels indicate no pronounced falling trend.
8. As per the GEC-2010-11 estimation, estimated ground water resource in the sub-basin is 4964 Ha.m, draft is 2506 Ha.m, ground water balance is 2171 Ha.m and the stage of development is 50% and hence the basin falls under Safe category.

TERMS AND CONDITIONS :

1. The recommendations hold good subject to normal rainfall conditions and prevailing stage of groundwater development in the area.

2. O.B Well (Observation wells) must be established in the premises of the plant for monitoring of water levels every month(1st week of the month) and quality twice in a year(pre & post monsoon period).

3. Half yearly/by monthly report on the above must be send to the District Ground Water Officer Ground Water Department, Mahabubnagar.

4. Officers of the Ground Water Department must be allowed to inspect the well and records of water levels etc., when ever required.

5. The District/Mandal WALTA Authority and Ground Water Department reserve the right to stop the plant for excess usage of ground water or during emergency.

ENCLOSURES:

I. Toposheet extract (Location map)
II. Site plan
III. Hydrograph

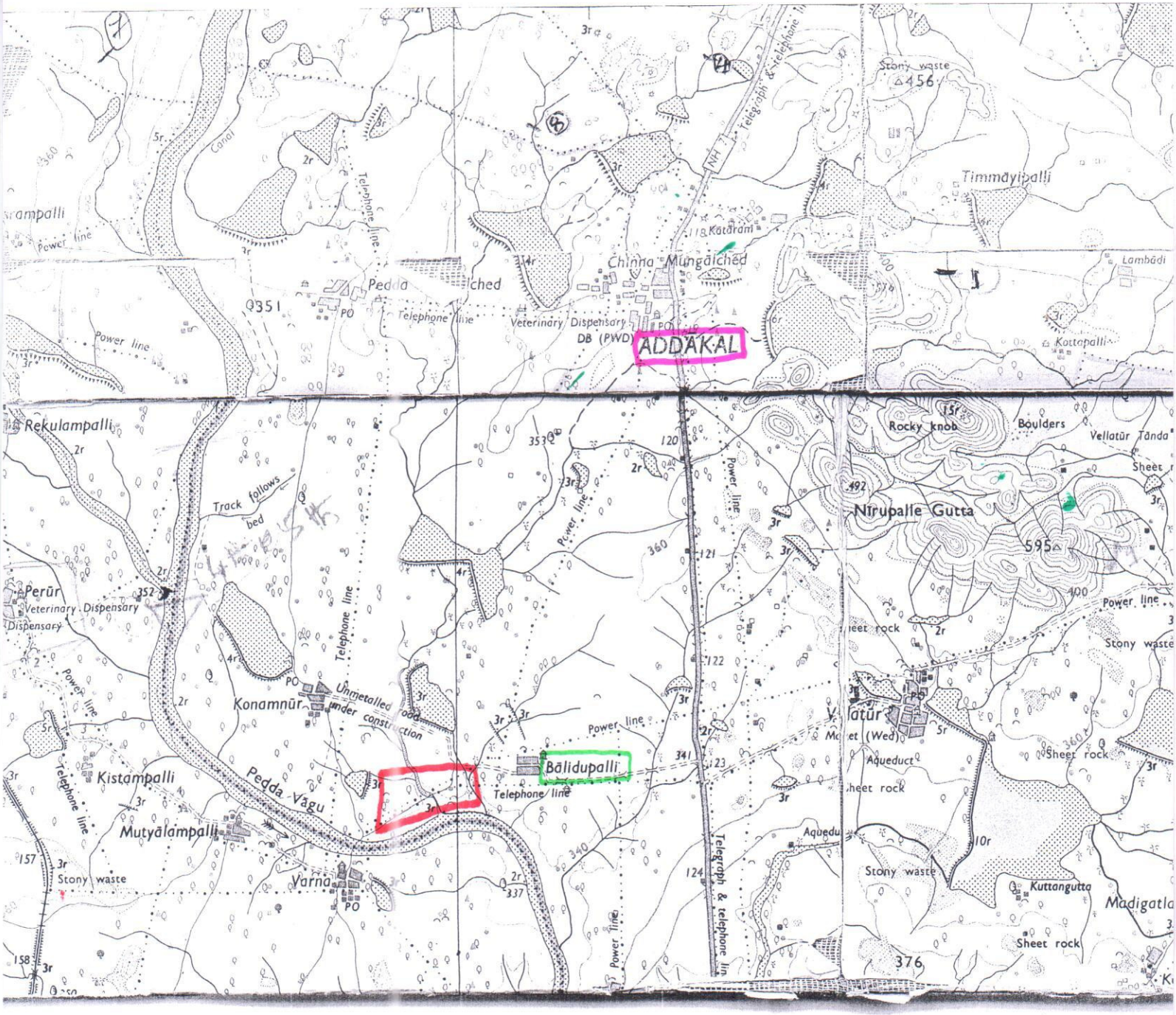
Dr. 18/2/17
Asst. Hydrogeologist

District Ground Water Officer
Ground Water Department
Mahabubnagar

PLATE NO. I

...o sheet NO. 56 $\frac{H}{14}$, 56 $\frac{H}{15}$.

Location of M/s. Transform Sun Energy pvt. Ltd, Baleedupalle(V), Addakal (M), Mahabubnagar(D)



Index

- Mandal
- Village
- proposed site

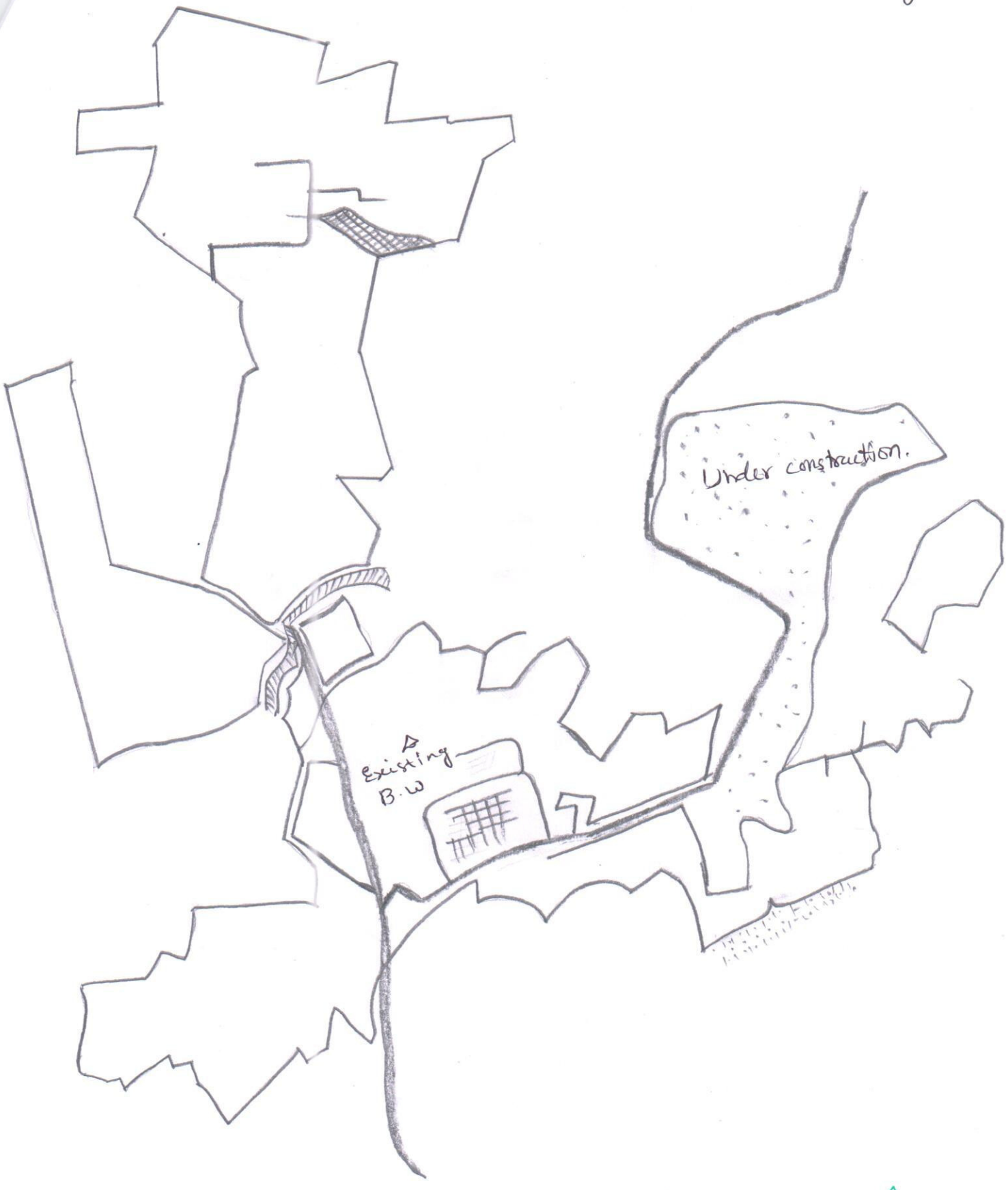
Dzeey
18/2/17
Asst. Hydrogeologist

D4000
18/2/17

PLATE NO - II

SITE PLAN FOR M/s. TRANSFORM SUN ENERGY PVT. LTD

(Vill) : - Baleedupalle ; (M) Addakal ; (Dist) : Mahabubnagar.



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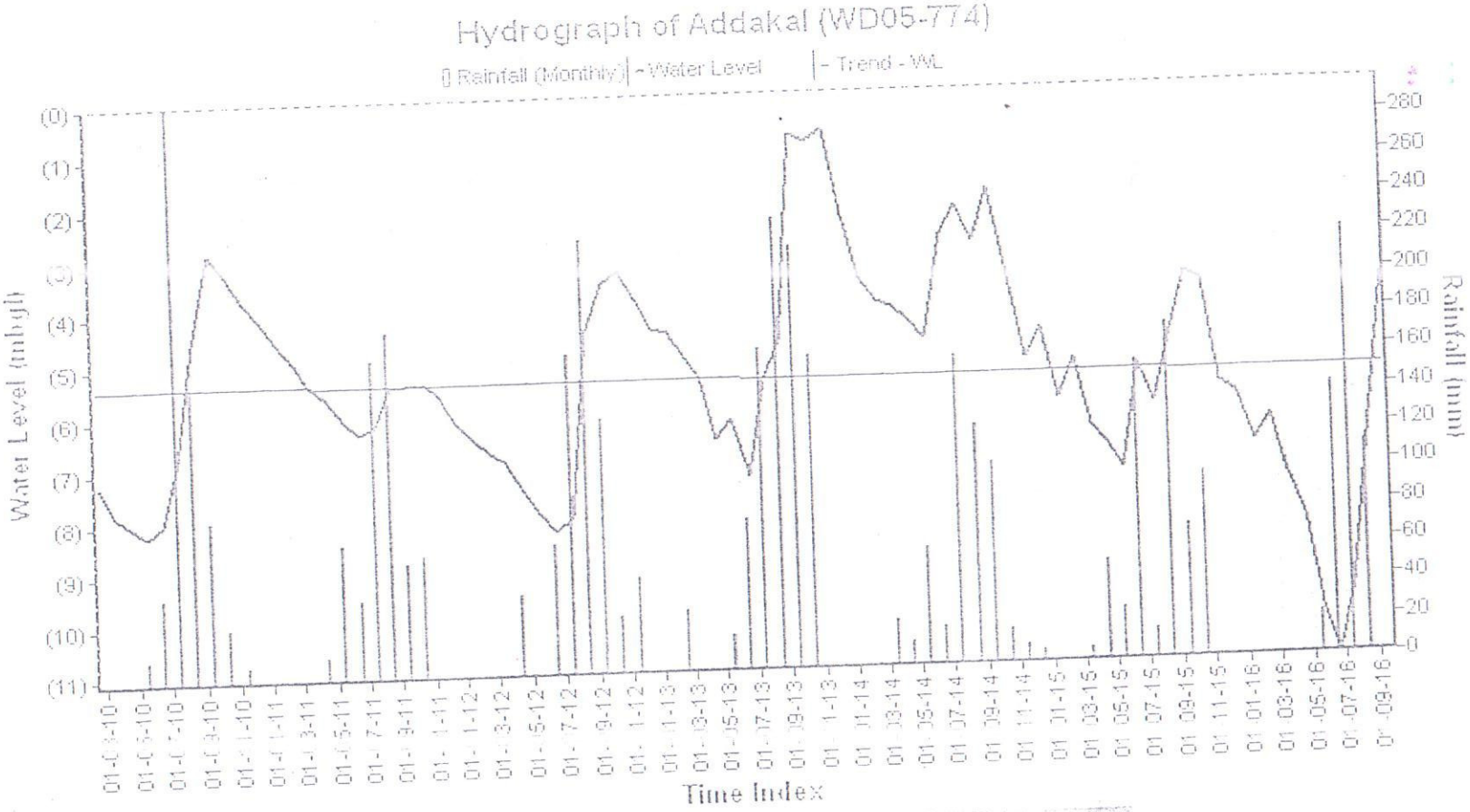
18/2/17

PLATE - III



Dr. [illegible] 15/2/17

15/2/17

Asst. Hydrogeologist

GOVERNMENT OF TELANGANA
GROUND WATER DEPARTMENT

From:-
K.Dhananjaiah,
MSc., M.Sc(Tech),
DIRECTOR (FAC),
Ground Water Department,
Chintal Basthi, Khairathabad
Hyderabad – 500 004.
Office Phone: 040-23314978
Fax No.040-23314950
Email ID:director.tgsgwd@gmail.com

To
The Commissioner of Industries,
Chirag Ali Lane,
Abids,
Hyderabad.

Letter No.1380/GP/TS iPASS/MBNR/2016-17, **Dated:22.02.2017.**

Sir,

Sub:- Telangana State Ground Water Department –TSiPASS- M/s Transform Sun Energy Private Limited - Permission for withdrawal of Ground Water – Ground Water Investigation Report -Submitted – Reg.

Ref:-
1. CAF of M/S Transform Sun Energy Private Limited, Muthyalampalle Village, Addakal (Erstwhile Devarkadra) Mandal of Mahabubnagar District.
2. Unique ID No.MEG00700253656.
   Pre-Scrutiny completed dated:10-02-2017 .
3. LR.No.2388/Tech/2017, dt:18.02.2017 of the District Ground Water Officer, Ground Water Department, Mahabubnagar District.

<><><>

With reference to the subject and reference cited above, it is to inform that, the District Ground Water Officer, Ground Water Department, Mahabubnagar District has conducted groundwater investigations in the extent of 880231.74 Sq.mts land of M/S Transform Sun Energy Private Limited, located in Muthyalampalle Village, Addakal (Erstwhile Devarkadra) Mandal of Mahabubnagar District to study the feasibility for extraction of 12 KLD of ground water and submitted report to the undersigned vide reference 2nd cited.

After scrutiny of the report, the permission is herewith accorded for withdrawal 12 KLD of ground water from one existing Borewell against the requirement of 12 KLD for the firm subject to the following terms and conditions.

- The firm is permitted to draw the 12 KLD of water from one existing Borewell.
- Rainwater Harvesting Structures must be constructed at proposed locations in the premises to augment rainwater.

- The Government of Telangana reserves the right to stop from using of ground water during emergencies or wherever the plant deviates the terms and conditions.
- The party must conduct pump test once in every half-year and preserve the data.
- The party must establish observation wells and they should monitor the water levels once in a month (last week of a month) and quality twice a year (Pre and Post monsoon periods) and record the data for further technical use.
- The party must send half yearly reports on the above studies regularly to the District Ground Water Officer, Ground Water Department, Mahabubnagar district.
- The effluents must be treated properly and must be free from all toxic materials. Colour and turbidity harmful to human beings, plants and animals.
- The effluents before or after treatment must not be let out into any surface or groundwater bodies. Used water must be recycled for reuse.
- Officers of Ground Water Department must be allowed to inspect the wells, plant area, and data whenever found necessary by the Department.
- TSWALTA Authority / Government reserve the right to take over the wells during emergency.

The investigation report is herewith uploaded in to the TSiPASS web portal for necessary further action. As per the TSiPASS webportal payment of Rs.42000/- is paid by online, but not yet received to this Office.

Yours faithfully,

Encl:-Report

Sd/-K.DHANANJAIAH

DIRECTOR.

Copy to District Ground Water Officer, Ground Water Department, Mahabubnagar district.

REPORT ON GROUND WATER INVESTIGATIONS FOR M/s.TRANSFORM SUN ENERGY PVT. LTD. MUTHYALAMPALLE (V) ADDAKAL (M) MAHABUBNAGAR DISTRICT

INTRODUCTION :

As per the common Application form TS - iPASS downloaded UID No:- MEG 00700253656 on 10-02-2017 and as per the instructions of the Director, Ground Water Department, Hyderabad. Dated: 10-02-2017. Ground Water Surveys have been carried out in the premises of M/s. Transform Sun Energy Pvt. Ltd., area covering 217 acres in Sy.No. 28, 30, 31, 32, 33, 66, 69 ETC of Muthyalampalle Village, Addakal Mandal, Mahabubnagar District on 17-02-2017 for selection of feasible ground water structures.

The authorized signatory has forwarded the common application form for establishment, application form-I for Transform Sun Energy Pvt. Ltd., for Muthyalampalle Village, Addakal Mandal, Mahabubnagar, in it is mentioned that 12 KL/Day is the requirement of ground water to meet their demand.

LOCATION :

The M/s. Transform Sun Energy Pvt. Ltd., area is located at a distance of 1.5 Km West of Muthyalampalle Village, Addakal Mandal, The total extent of the investigated area is 217 acres consisting Sy.No. 28, 30, 31, 32, 33, 66, 69 ETC falling in Topo sheet No. 56 H/15. The Geographical Co –ordinates of the plant area as obtained from the GPS are in between 77^0 52'46.3"- 77^0 52'53.4"- 77^0 53'10.0"- 77^0 53'07.4"- 77^0 53'00.6"- 77^0 52'59.32"- 77^0 52'50.1"- 77^0 52'49.15"- 77^0 53'13.1"- 77^0 53'13.64"- to East Longitudes and 16^0 27'17.1"- 16^0 27'16.5"- 16^0 27'08.8"- 16^0 27'03.8"- 16^0 27'07.5"- 16^0 27'02.0''- 16^0 27'38.29"- 16^0 27'49.3"- 16^0 27'34.68"- 16^0 27'36.3"- to North Latitudes, Also the Geographical Co-ordinates of the investigated area and the Topo sheet extract showing the location is enclosed in plate No. I

PHYSIOGRAPHY AND DRAINAGE :

The investigated area exhibits with gentle slope topography towards West direction. The elevation is about 354-362 meters above mean sea level. The drainage pattern of the area is sub-dendritic to dentritic. It drains into Dindy river and forms a part of the major basin of Krishna River. It is observed that it comes under non command category.

Climate & Rainfall :

The area under investigation falls in Semi- arid region and the climate in the area is generally hot. The maximum rain fall is received from South–west monsoon and the annual normal rain fall of Addakal Mandal is 623mm. The actual rain fall received for a period of decade from the year 2006-07(Addakal Mandal Rain Gauge station) is as shown below in table-I.

TABLE - I

Year	Normal rain fall (mm)	Actual rain fall received (mm)	% Deviation from the normal & category
2006-07	623	430.4	-31.0 Deficit
2007-08		781.1	+25.3 Excess
2008-09		484.6	-22.2 Deficit
2009-10		744.4	+19.4 Normal
2010-11		729.0	+17.0 Normal
2011-12		539.4	-13.4 Normal
2012-13		723.2	+16.0 Normal
2013-14		934.2	+50.0 Excess
2014-15		553.6	-11.4 Normal
2015-16		729.2	+33.0 Excess
Average		**664.90**	**+14.35 Normal**

It is observed from the above rainfall data that the mandal received normal rainfall for 5 years during the years 2009-10, 2010-11, 2011-12, 2012-13, 2014-15 & excess rain fall for 3 years 2007-08, 2013-14, 2015-16. The rainfall was deficit during two years 2006-07 & 2008-09. Over all, rain fall pattern is recorded as normal in the mandal during the period from 2009 to 2013.

SOIL TYPE & CROPPING PATTERN ;

The area under investigation is covered by black cotton soils and partly by mixed soils in the lower elevation. The thickness of the soil varies from 1.5 meters to 2.0 meters. In general, percolation and infiltration factors of the area are moderate to high.

It is observed that paddy is grown under Bore wells during Kharif season, and crops like Red gram, Paddy, Fodder, Vegetables and other Irrigated dry crops are grown under ground water irrigation, through bore wells during Rabi season. Horticulture is also being developed under the Bore wells around the investigated area.

HYDROGEOLOGY ;

The area under investigation is underlain by gray and pink granites with pegmatite veins and quartz vein East- West direction all comes under Achaean age. The area is generally covered with Red sandy soils followed by weathered and semi weathered then minor fractured granite and massive basement. The texture of the formation is medium to Coarse grained in nature. The ground water occurs under water table as well as semi confined conditions in the weathered and fractured zones. At some places sets of joints are observed. Structural controls of ground water such as Quartz veins are also observed in the vicinity of the investigated area.

DEPTH TO WATER LEVELS: (Addakal Piezometer data)

Ground Water Department is monitoring the depth to water levels of Addakal Peizometer on monthly basis and the analysis of month wise water level data from June 2006 to May 2016, for a period of 10 years, is furnished in the table-II.

Table-II

S.NO	Year	Depth to Water Level in meters bgl											
		June	July	August	September	October	November	December	January	February	March	April	May
1	2006-07	8.89	7.99	8.50	8.51	8.50	8.61	849	8.47	9.07	9.36	10.02	9.58
2	2007-08	9.33	7.72	7.70	4.92	4.88	5.42	5.72	6.26	6.40	6.62	6.56	7.24
3	2008-09	7.46	7.21	4.85	4.46	4.90	5.22	5.60	6.24	6.69	7.19	7.64	7.91
4	2009-10	7.76	8.30	8.74	7.66	4.56	5.69	6.39	6.94	7.24	7.81	8.05	8.25
5	2010-11	8.02	6.76	4.52	2.82	3.24	3.74	4.09	4.54	4.95	5.39	5.66	6.06
6	2011-12	6.36	6.20	5.44	5.42	5.39	5.63	6.16	6.47	6.76	6.94	7.50	7.96
7	2012-13	8.33	8.05	4.49	3.55	3.33	3.87	4.43	4.54	5.03	5.41	6.60	6.21
8	2013-14	7.36	5.50	4.77	0.80	0.98	0.74	2.38	3.58	4.02	4.15	4.42	4.74
9	2014-15	2.77	2.23	2.95	1.95	3.44	5.18	4.60	6.00	6.21	6.53	6.88	7.38
10	2015-16	5.34	6.10	4.75	3.65	3.79	5.78	5.96	6.94	6.41	7.59	8.39	10.18

The analysis of water level data indicates that the pre monsoon water levels range from 4.74 (May 2013) to 10.18m (May 2016) where as the post monsoon water levels are ranging from 0.74 m (November 2013) to 8.61 m (November, 2006). Over all, the water levels are shallow to moderate in pre-monsoon and season and Post monsoon seasons. It is also observed that the seasonal fluctuations from post monsoon to pre monsoon period are ranging from 0 -10m every year indicating to safe for ground water for various users and also concomitant recharge during monsoon periods & hence the hydrograph (Enclosed in Plate No.III) does not show any pronounced falling trend in depth to water levels.

YIELD MEASUREMENT :

The yield test was conducted in the lands of M/s. Transform Sun Energy Pvt.Ltd. The test was conducted 1 hr 30mins by using stop watch and a barrel of 200 liters capacity and the quantity of discharge is measured with respect to time. The yield of the Existing Bore well is **4500 LPH**. At a rate of 8 hours of pumping in a day the discharge of the existing bore well is arrived at **36000 LPD (or) 36 KLD.**

DYNAMIC GROUND WATER RESOURCE ESTIMATION

Ground Water Department has been conducting periodical exercise to estimate the basin wise ground water resource, draft, and balance, the stage of ground water development and categorization of the basin in the district. Muthyalampalle Village of Addakal Mandal is falling in the MBNR_ D_44_KOUKUNTLA sub basin. As per the Ground Water Resource Estimation

as the base year 2010-11, this sub basin is categorized as "Semi Critical" basin with 64% of stage of ground water development. Details are given in the table-III.

TABLE-III

Name of the basin	GW Available resource Ha.m	GW Draft for all uses Ha.m	Balance in Ha.m	% of development	Category
MBNR_D_44_KOUKUNTLA	3714	2390	1062	64%	Semi-Critical

WELL INVENTORY :(Table-IV):

S.No	Existing Bore wells(Geo – Coordinates)	Dimensions/ Depth	DTWL mbgl	Yield(LPH)	Requirement of Ground Water
1	N 16^0 27' 26.9'' E 77^0 52' 51.5"	165mm dia/90m	9.15	4500	12KLD

QUALITY

It is reported that in general the quality of ground water is potable and also suitable for agriculture and Industrial purposes.

SUGGESTION FOR IMPROVEMENT OF GROUND WATER

It is advised to construct in site specific Rain Water Harvesting structures at west side and other suitable locations to sustain the ground water yields. The Process of recycling of water also has to be adopted to conserve the ground water over the years and other related measures may also be taken up for proper sustainability and conservation of ground water resource.

CONCLUSIONS AND RECOMMENDATIONS :

1. The Industrial area of M/s. Transform Sun Energy Pvt.Ltd., is located at Muthyalampalle(V) Addakal (M) Mahabubnagar District.
2. The water requirement of the Industry is 12KLD.
3. The total yield from the existing Bore well is 4500 LPH or 36 KLD with 8 hours of pumping in a day and the firm is permitted to withdraw 12 KLD Ground Water from the existing Bore Wells as per their requirement.
4. The Rain Water Harvesting Structure at the suitable location to be constructed to sustain The Ground Water Yields.
5. The investigated Industry area is underlain by granites of Achaean age.
6. The annual normal rain fall of the mandal is 623mm and it received normal rainfall during 5 years out of 10 years for which data is studied.
7. The depth to water levels is moderately shallow and the fluctuations in the water levels indicate no pronounced falling trend.

Mahabubnagar

TERMS AND CONDITIONS :

1. The recommendations hold good subject to normal rainfall conditions and prevailing stage of groundwater development in the area.

2. O.B Well (Observation wells) must be established in the premises of the plant for monitoring of water levels every month(1st week of the month) and quality twice in a year(pre & post monsoon period).

3. Half yearly/by monthly report on the above must be send to the District Ground Water Officer, Ground Water Department, Mahabubnagar.

4. Officers of the Ground Water Department must be allowed to inspect the well and records of water levels etc., when ever required.

5. The District/Mandal WALTA Authority and Ground Water Department reserve the right to stop the plant for excess usage of ground water or during emergency.

ENCLOSURES :

I. Toposheet extract (Location map)
II. Site plan
III. Hydrograph

18/12/17

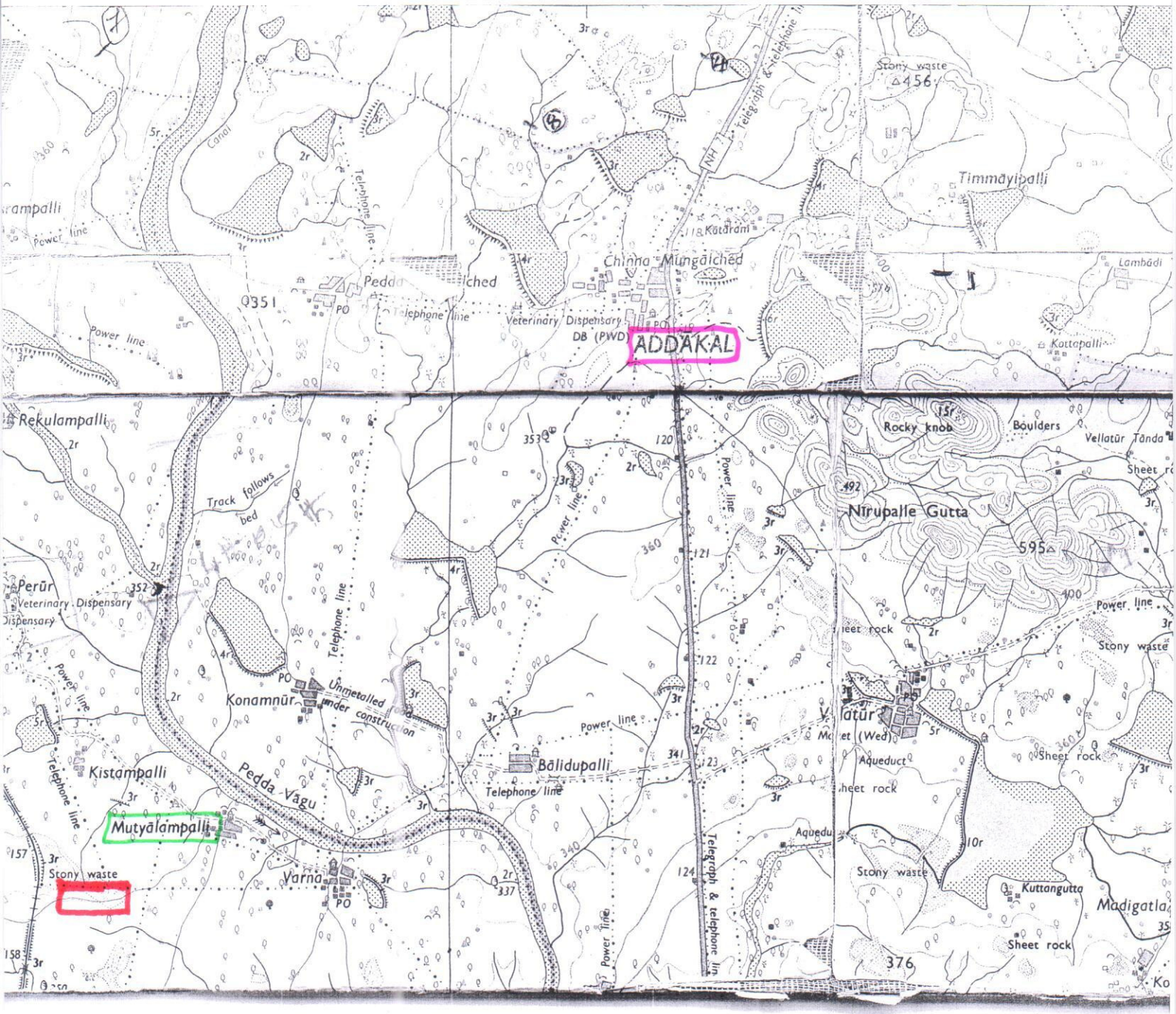
District Ground Water Officer
Ground Water Department
Mahabubnagar

DReey
18/12/17
Asst. Hydrogeologist

PLATE NO. I

Topo sheet NO:- 56 H/14, 56 H/15.

Location of M/s. Traneform Sun Energy pvt. Ltd, Muthyalampalli (V)
Addakal (M), Mahabubnagar (D)



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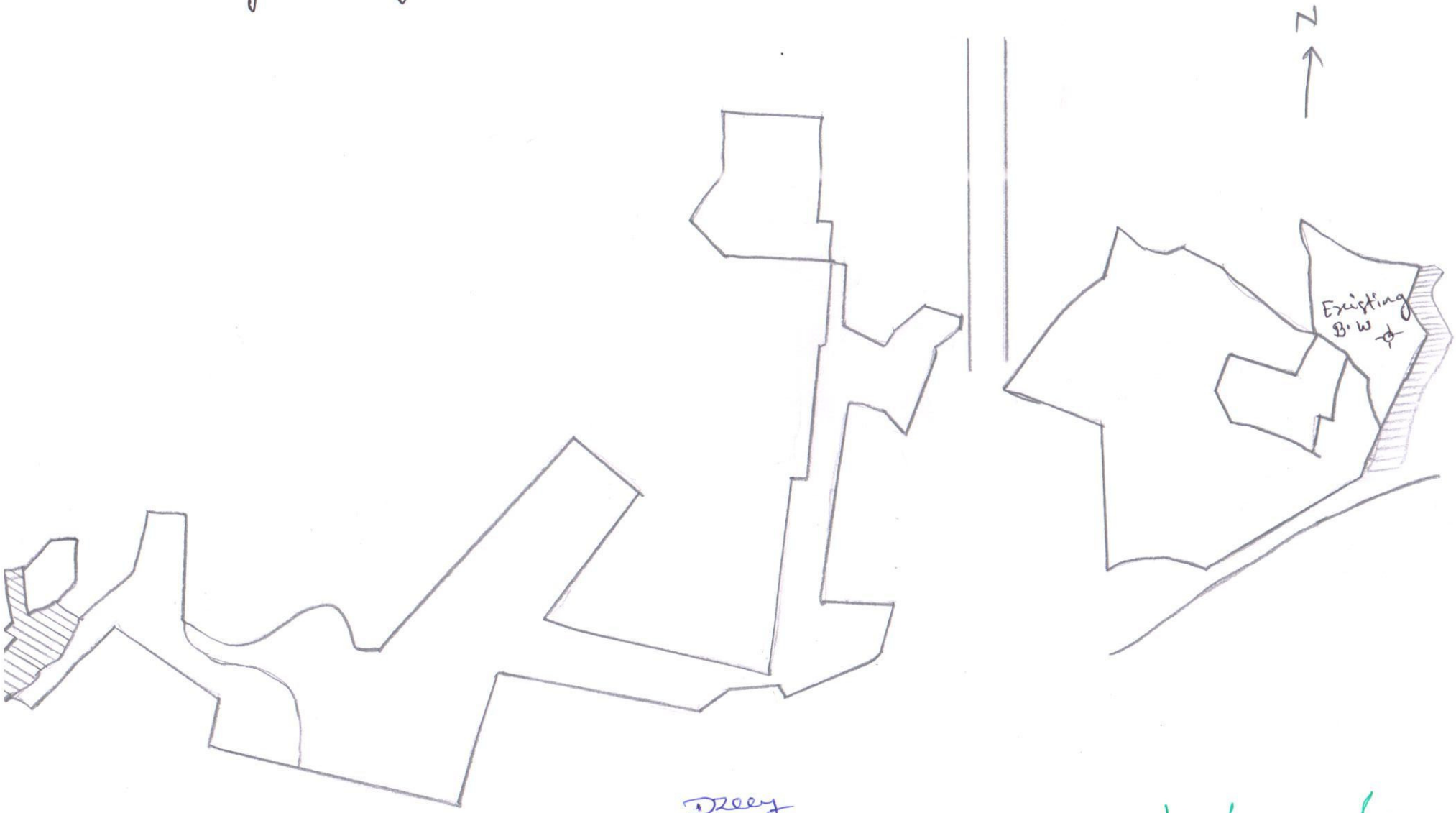
18/2/17

18/2/17

PLATE NO - II

SITE PLAN FOR. M/s. TRASFORM SUN ENERGY PVT.LTD

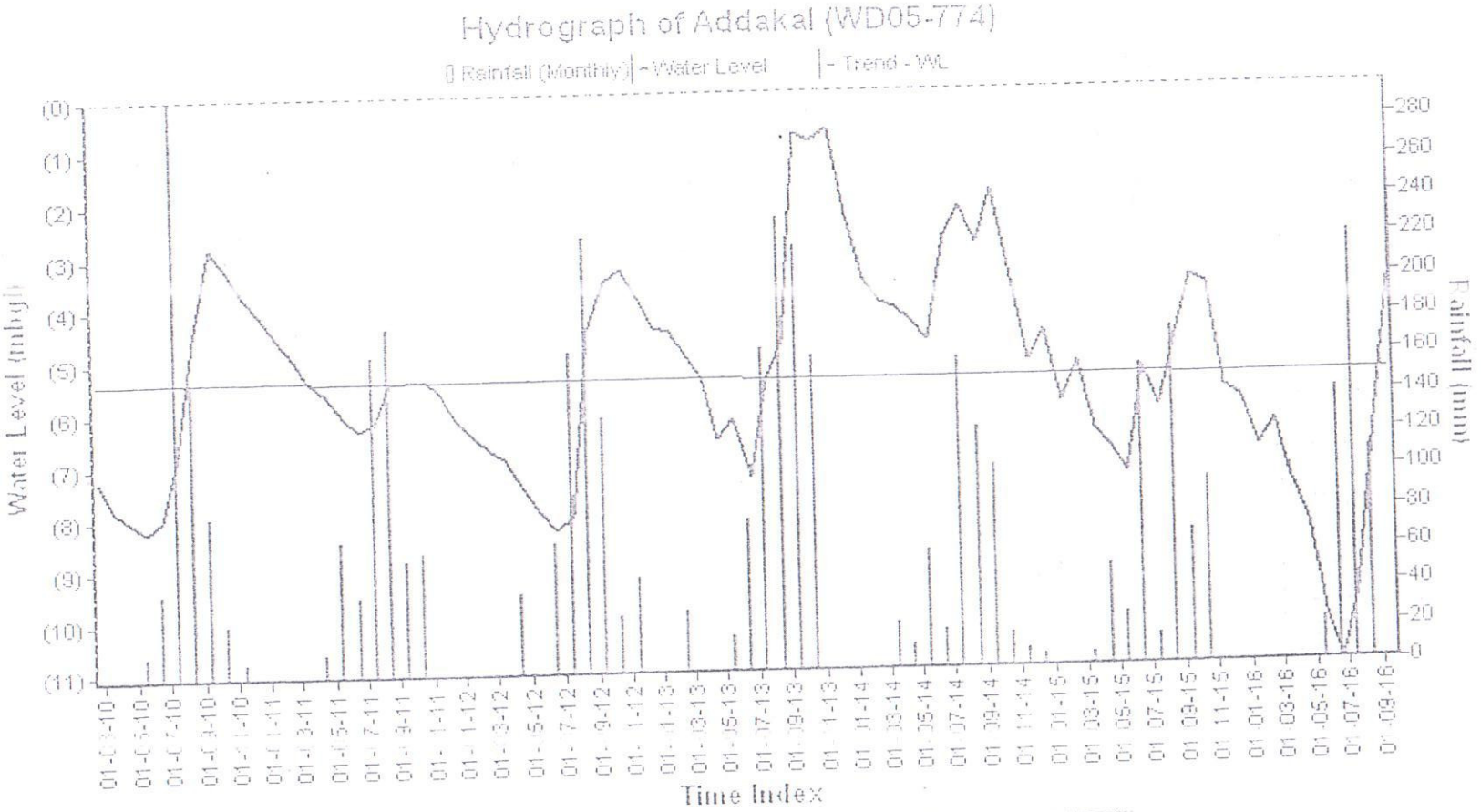
Village:- Muthyalampalle; Mandal:- Addakal; Dist:- Mahabubnagar.



Dreey
18/2/17
Asst. Hydrogeologist

Dgwo
18/2/17

PLATE - III



Dr
18/2/17
Asst. Hydrogeologist

DWARO
18/2/17

Annex D

Approval Letter for 220 KV Bay at Veltoor Substation

TRANSMISSION CORPORATION OF TELANGANA LIMITED

From
Chief Engineer,
Transmission,
TSTRANSCO,
Vidyut Soudha,
Hyderabad-500 082.

To
M/s.Transform Sun Enrgy Pvt Ltd
(M/s.Shapoorji Pallonji Infrastructure Capital Company Pvt Ltd),
SP Centre,41/44, Minoo Desai Marg,
Colaba, Mumbai- 400005

Lr.No. TST(CE-Tran)/SE(Const)/DE2/Transform-Veltoor-Solar / D. No. 19(A) /2017, dt. 03.01.2017.

Sub:- 100MW Solar Power Project is being set up by M/s.Transform Sun Enrgy Pvt Ltd(SPV of M/s.Shapoorji Pallonji Infrastructure Capital Company Pvt Ltd) near Balidupally(V), Peddamandi(M) in Mahaboobnagar District – Erection of 220KV DC/SC line from existing 400/220KV Veltoor SS to proposed Solar power project –Payment of Tentative Project Cost – Regarding.

Ref: Lr.No.CGM(Comml)/SE(IPC)/F.Solar bid-2015/D.No.1934/15,dt.23.02.2016

* * * *

The Chief General Manager (Comml & RAC)/TSSPDCL vide ref cited above has informed that you have entered in power purchase agreement under competitive bidding by TSDISCOMS.

Approval was accorded for erection of 220KV DC/SC line from existing 400/220KV Veltoor SS to proposed Solar power project under the supervision of TSTRANSCO.

As per the estimate, the subject work involves

1. Erection of 220KV DC/SC line from existing 400/220KV Veltoor SS to proposed Solar power project near Balidupally(V), Peddamandi(M) in Mahaboobnagar District for a line length of 2KM
2. Erection of 1 no. 220 KV bay at M/s.Transform Sun Enrgy Pvt Ltd(SPV of M/s.Shapoorji Pallonji Infrastructure Capital Company Pvt Ltd) .
3. Erection of 1 no. 220 KV bay at 400/220KV Veltoor SS.

The tentative scheme cost for erection of 220KV DC/SC line from existing 400/220KV Veltoor SS to proposed Solar power project along with connected bays is Rs.657.86 lakhs. The Engineering charges, service tax etc to be paid by you are as follows:-

Sl. No	Name of the item	Line	Bay	Metering Bay	Total in Rs lakhs
1	Engg. Charges including cost of spares& excluding Supervision Charges	**5.28**	**6.13**	**11.88**	**22.29**
2	Service tax @ 14%	**0.41**	**0.49**	**0.99**	**1.89**
3	Swatch Bharath Cess @0.5%	**0.015**	**0.018**	**0.036**	**0.069**
4	Krishi Kalyan Cess @ 0.5% on Engg Charges on 'D'	**0.015**	**0.018**	**0.036**	**0.069**
5	Land cost for the 220KV bay at 400/220KV Veltoor SS(Approximately)				**15**
6	Shut down charges towards Power interruption caused in existing 220KV Jurala - Veltoor line				**100**
					140.32

P.T.O

You are requested to deposit an amount of Rs **140.32** lakhs towards Engineering Charges, service tax, Swachh Bharath cess, Krishi Kalyan Cess, land cost for 220KVbay at 400KV Veltoor SS and shut down charges by way of Demand Draft in favour of Pay officer/ TSTRANSCO/ Vidyut Soudha/Hyderabad for taking up the above mentioned work.

It is to inform that, you have to ensure that generation should be within 15 months from PPA date or within a maximum period of 2 years from the date of application whichever is earlier, otherwise supervision charges will be levied on you as per the clause no.11 of Telangana Solar Policy-2015.

Further, it is to inform that the amount is provisional and you should pay the balance amount if any as per actuals after completion of work.

The terms and conditions to be followed for taking up the above works under supervision of TSTRANSCO are herewith enclosed. You are requested to confirm the acceptance of the same.

Encl: Terms & conditions.

Yours faithfully,

CHIEF ENGINEER
TRANSMISSION

Copy to:
The Chief Engineer/Planning, Comml & Coordination/TSTRANSCO/VS/Hyderabad
The Chief Engineer/Rural Zone/220KV SS Erragadda/TSTRANSCO/Hyderabad
The CGM(Comml&RAC)/TSSPDCL/Mint Compound/Hyderabad
The Superintending Engineer/OMC/Mahaboobnagar/TSTRANSCO/Mettuguda /Mahaboobnagar
The ED/Finance/TSTRANSCO/VS/Hyd
The Pay Officer/TSTRANSCO/VS/Hyd
The Executive Engineer/Construction/Mahaboobnagar/ Mint Compound/Hyderabad
The Asst. Executive Engineer/TLC/ Mahaboobnagar /Hyderabad

TERMS & CONDITIONS

1. M/s.Transform Sun Enrgy Pvt Ltd(SPV of M/s.Shapoorji Pallonji Infrastructure Capital Company Pvt Ltd) hereafter called as "The Company" may execute the works on their own under TSTRANSCO's supervision.

2. The Company would be executing the works and the TSTRANSCO will only supervise the works. However after completion of the works, the company shall pay the additional supervision, Engineering and spares charges if any due to increase in the scheme cost.

3. The works should be executed by licensed contractor who have executed similar works as per standards of TSTRANSCO under the supervision of TSTRANSCO officials. Approval of TSTRANSCO shall be obtained before engaging the contractor. The quality of work should be strictly adhered to the technical specification of TSTRANSCO.

4. Material/Equipment should be purchased from the approved manufacturers of TSTRANSCO as per the list enclosed. Original guarantee card should be handed over to the TSTRANSCO along with the invoices and other necessary documents.

5. The works will be checked regularly by TSTRANSCO's Quality Control Wing. The company shall adhere to the Quality Assurance Plan of TSTRANSCO during execution of works.

6. All the major materials like conductors, line towers, substation structures, insulators, earth wire and other materials should be got inspected and tested by the TSTRANSCO officials.No material shall be used without approval of TSTRANSCO. The Company/contractor shall give at least 15 days advance intimation to enable TSTRANSCO to depute his representative for witnessing acceptance and routine tests. No material shall be dispatched from its point of manufacture before it has been satisfactorily inspected and tested and cleared for dispatch.

7. All layouts & drawings for the equipment and materials shall be as per the Standard drawings of TSTRANSCO, line route proposals, test certificates are to be got approved by TSTRANSCO. All the standardized/approved GTPs and Drawings are available at TSTRANSCO web site. Approved copies of GTPs and drawings and Technical Specification are to be made available at work site.

8. For Transmission lines, PTCC route approval and energisation approval shall be obtained prior to commissioning of the lines for all the lines exceeding 0.8KM. Expenditure towards works to be executed as per PTCC approval shall be borne by the company only. Processing and obtaining of PTCC approval is the responsibility of the Company.

9. Right of way for tower foundations, erection of towers, shifting and stringing shall be arranged by the company with the assistance of TSTRANSCO. The TSTRANSCO cannot be held responsible in the event of occurrence of any delays due to unforeseen calamities / accidents during the execution of the works or for such incidents or consequential losses or damages.

10. The measurements of actual works executed are to be got recorded in the departmental Measurement Books. Prior approval of TSTRANSCO shall be obtained for technical deviations from TSTRANSCO's standard specification or significant change in scope of work.

11. The TSTRANSCO reserves the right to get the works executed by an alternate agency at company's cost and risk, in case the execution of the work is not satisfactory and not as per specification by the TSTRANSCO.

12. The company shall arrange third party NABL laboratory testing of energy meter and metering CTs and PTs for ratio test and phase angle error tests before TSTRANSCO and TSSPDCL officials.

13. The Company shall warrant for the satisfactory functioning of the materials / equipment supplied and for the satisfactory operation of the workmanship performed by him, for a minimum period of **12** months from the date of commissioning of the project (Line / Sub-Station / Bay works etc.)' whichever is later. If any defects are found within this period the Company shall rectify such defects without any extra cost to TSTRANSCO. The company must furnish 10% of gross estimated value of works indicated in the scheme approval letter by way of DO drawn in favour of Pay Officer/ TSTRANSCO/ Vidyut SoudhalHyderabad or Bank Guarantee issued by any Nationalised / Scheduled Bank for performance guarantee period of 12 months from the date of charging with 2 months claim period thereafter.

14. The works mentioned in the scheme approval letter shall be deemed to be the property of the TSTRANSCO after take over. TSTRANSCO can utilize the above works in any manner as required from time to time. The Company shall cooperate with TSTRANSCO for facilitating Shutdown/Line Clears for maintenance purpose or works involving construction activities such as line crossing etc.,

15. In case of Schemes requiring construction of switching stations/Bay extensions for which land is to be acquired by the consumer/developer, the suitable site with sufficient area shall be acquired and handed over to TSTRANSCO before erection.

(The above terms and conditions shall be accepted by the Company duly furnishing an undertaking on Rs. 100/- stamp paper along with payment of engineering charges)

CHIEF ENGINEER
TRANSMISSION

Annex E

Stakeholder Consultation Records

A	*Project Title:*	Environmental and Social Impact Assessment (ESIA) of Proposed 100 MW Solar PV Power Project: Veltoor, Telangana, INDIA	
B	*Stakeholder Title:*	Land Owner of Addakal, Baleedupalli, Mutyallampalli Village	
Note: This document provides a working summary of the main facts captured during the consultation/ key informant interview held and should not be treated as formal minutes. It is therefore deliberately not exhaustive or chronological. Its purpose is to record significant information/ feedback and not intended for official review or approval.			
C	*Basic details:*		
	Location:	Baleedupalli village	
	Date	14.02.2017	
D	*Attended By*		
	Sr.	Name	Designation
	1.	Mr. Choadar Ali	Baleedupalli Village
	2.	Mr. Vekkteshara Balu	Baleedupalli Village
	3.	Mr. Ram Reddy	Baleedupalli Village
	4.	Mr. K. Praveen Kumar Reddy	Mutyallampalli Village
	5.	Mr. Chintakuntabal Reddy	Mutyallampalli Village
	6.	Mr. Kotha Basi Reddy	Mutyallampalli Village
	7.	Mr. Tumu Anil Kumar Reddy	Addakal Village
	8.	Mr. Boya Babu	Addakal Village
	9.	Mr. M Uthanna	Addakal Village
	10.	Mr. G Mohan	Addakal Village
	11.	Mr. Ashish Idarpu	TSEPL
	12.	Shreya Tiwari	SP Infra
	13.	Mr. Jeevan Reddy	Land Aggregator
	14.	Souvik Basu	ERM
	15.	Abhishek Roy Goswami	ERM
	16.	Suvankar Das	ERM
E	*Purpose of Consultation*		
	– Land purchase process; – Land compensation; – Issues/ grievances with respect to the land purchase process; – Community perception towards the project; – Socio-economic condition of the people inhabiting the study area;		
F	*Key Points Discussed:*		
	• Proposed Project area is primarily single crop agricultural land as irrigation facility is not available. • Only individual level bore well irrigation is present in a few land parcels • Although land is an important asset, its economic value is limited due to low productivity and dependence on rainfall; and • Selling land is considered an opportunity to liquidate their assets and repay the pending debt as the profit margin become less due high production cost and very low rainfall; • Land procurement process provides an opportunity to land seller to refuse in case they are not willing to sell land; and • Decline in land holding size of the farmers until money received out of land sale is reinvested by farmers for further land purchase. • People also buy additional better quality of land with compensation money • Land holders already gets entire amount of compensation for the land		

A	*Project Title:*	Environmental and Social Impact Assessment (ESIA) of Proposed 100 MW Solar PV Power Project: Veltoor, Telangana, INDIA	
B	*Stakeholder Title:*	Local Community of Addakal, Baleedupalli, Mutyallampalli Village	
Note: This document provides a working summary of the main facts captured during the consultation/ key informant interview held and should not be treated as formal minutes. It is therefore deliberately not exhaustive or chronological. Its purpose is to record significant information/ feedback and not intended for official review or approval.			
C	*Basic details:*		
	Location:	Baleedupalli village	
	Date	14.02.2017	
D	*Attended By*		
	Sr.	Name	Designation
	1.	Mr. Sankariya	Mutyallampalli Village
	2.	Mr. Sekhar Reddy	Mutyallampalli Village
	3.	Vengkatesh Reddy	Addakal Village
	4.	Ram Reddy	Mutyallampalli Village
	5.	Gouni Mannepu Reddy	Addakal Village
	6.	Puram Srinivasu Reddy	Addakal Village
	7.	Mansoor Ahmad	Baleedupalli Village
	8.	V Narasimha Rao	Baleedupalli Village
	9.	Mr. Ashish Idarpu	TSEPL
	10.	Shreya Tiwari	SP Infra
	11.	Mr. Jeevan Reddy	Land Aggregator
	12.	Souvik Basu	ERM
	13.	Abhishek Roy Goswami	ERM
	14.	Suvankar Das	ERM
E	*Purpose of Consultation*		
	– Land holding pattern in the study area; – Impact of land purchase on livelihood; – Perception of agricultural labourers towards the project; – Current engagement scenario – alternate livelihood options; – Basic amenities in the village – electricity, water supply etc.; – Profile of households by source of water; – Proposed schemes for water supply in the village; – Health scenario in the village and distances of Hospitals/ Clinics;		
F	*Key Points Discussed:*		
	• Most of agricultural land is mono cropped. Very few are bi-cropped who have bore well irrigation facility at individual level. • Castor, Maze, Ground nut are the main agricultural produce of the area. • Rice production is very limited due to scarcity of water • People have to invest Rs. 20000/acre for agriculture but the return is only Rs. 30000 to 36000/ acre. • Though the return of investment in agriculture is very limited, people are involved in agriculture as there is no other livelihood opportunity is not present with is the study area. • People are very positive about the industrial development as it will create some livelihood opportunity for local people • Water supply is not present in the village. Villagers totally are dependent on Tap water fitted with filter installed by the Panchayets for fulfil their water requirement for drinking and other household activity. • Community have pay Rs. 4 for every 20 litter of water fetching from tap. • Young generation is not interested in agriculture. • Every village has primary school and middle school. For higher education student from study villages goes outside. • Nearest health facility is located in Addakal village which is 6 km away		

A	*Project Title:*	Environmental and Social Impact Assessment (ESIA) of Proposed 100 MW Solar PV Power Project: Veltoor, Telangana, INDIA	
B	*Stakeholder Title:*	Land Aggregator	
Note: This document provides a working summary of the main facts captured during the consultation/ key informant interview held and should not be treated as formal minutes. It is therefore deliberately not exhaustive or chronological. Its purpose is to record significant information/ feedback and not intended for official review or approval.			
C	*Basic details:*		
	Location:	Baleedupalli Project Site	
	Date	13.02.2017	
D	*Attended By*		
	Sr.	Name	Designation
	1.	Mr. Jeevan Reddy	Land Aggregator
	2.	Mr. Ashish Idarpu	TSEPL
	3.	Shreya Tiwari	SP Infra
	4.	Souvik Basu	ERM
	5.	Abhishek Roy Goswami	ERM
	6.	Suvankar Das	ERM
E	*Purpose of Consultation*		
	– No of land owner; – Status of land procurement; – Land purchase process; – Land Compensation; – Circle price of land;		
F	*Key Points Discussed:*		
	• Total number of land owner is 166 (28 land owner from Addakal, 81 land owner from Baleedupalli, 57 land owner from Mutyallampalli village) • Land procurement process is over for Addakal and Baleedupalli project site and 90% of land procurement process was completed for Mutyallampalli project site. • Land transfer from land aggregator to SPV, conversion and mutation process is going on. • Land aggregator and his team negotiated to each land owner in an individual basis. • Land compensation was already paid to every land owner • Land aggregator also assisting the land owner for purchases good quality of land by investing the compensation money on request • Circle price of land is Rs. 1,00,000 to 1,20,000 per acre • Land Compensation is varies from Rs. 5,00,000 to 6,00,000 per acre		

A	*Project Title:*	Environmental and Social Impact Assessment (ESIA) of Proposed 100 MW Solar PV Power Project: Veltoor, Telangana, INDIA	
B	*Stakeholder Title:*	Project Proponent (TSEPL)	
Note: This document provides a working summary of the main facts captured during the consultation/ key informant interview held and should not be treated as formal minutes. It is therefore deliberately not exhaustive or chronological. Its purpose is to record significant information/ feedback and not intended for official review or approval.			
C	*Basic details:*		
	Location:	Baleedupalli Project Site	
	Date	13.02.2017	
D	*Attended By*		

Sr.	Name	Designation
1.	Mr. Narayan Rati	Vice President, TSEPL
2.	Mr. Ashish Idarpu	TSEPL
3.	Shreya Tiwari	SP Infra
4.	Souvik Basu	ERM
5.	Abhishek Roy Goswami	ERM
6.	Suvankar Das	ERM

E *Purpose of Consultation*

- Location of the project;
- Requirement of water, manpower, power etc. during operation phase of the project ;
- Land requirement for the project;
- Project status and timeline;
- Power evacuation;

F *Key Points Discussed:*

- 100 MW solar power project is spread into three sites viz. Addakal site, Mutyalampalle site and Balledupalle site. Addakal site is located in Addakal village in Addakal Mandal; Mutyalampalle site is located in Mutyalampalle village in Devarkadra Mandal (Mutyalampalle) and Balledupalle site is located in Balledupalle village in Peddamandadi Mandal, in Mahbubnagar District in Telangana State.
- Total land measuring approximately 550 acres is required for installing the project, with site office and inverter room, stock yard etc.
- Power purchase agreement signed on 25th February 2016. Anticipated commissioning date is May, 2017
- Power from the project (Addakal site, Mutyalampalle and Balledupalle) will be evacuated to 400 KV Veltoor substations, located at 1.2 km from Balledupalle.
- Approx. 3,713 KL of water will be required per month for module cleaning.

A	*Project Title:*	Environmental and Social Impact Assessment (ESIA) of Proposed 100 MW Solar PV Power Project: Veltoor, Telangana, INDIA	
B	*Stakeholder Title:*	EPC Contractor (Sterling and Wilson Pvt. Ltd.)	
Note: This document provides a working summary of the main facts captured during the consultation/ key informant interview held and should not be treated as formal minutes. It is therefore deliberately not exhaustive or chronological. Its purpose is to record significant information/ feedback and not intended for official review or approval.			
C	*Basic details:*		
	Location:	Baleedupalli Project Site	
	Date	13.02.2017	
D	*Attended By*		
	Sr.	Name	Designation
	1.	Mr. Ramesh Kumar	Site Incharge, S &WPL
	2.	Mr. Sashi Kumar	Site Personnel, S &WPL
	3.	Suvankar Das	ERM
E	*Purpose of Consultation*		
	– Resource requirement (water, manpower, power, raw material etc.) during construction phase of the project; – Subcontractor to be involved for the project;		
F	*Key Points Discussed:*		
	• The major raw materials required for the construction phase are fencing material, construction materials like cement, sand, aggregate that is sourced from local areas. • EPC Contractor- Sterling and Wilson Private Limited; • Civil and Electrical Work- Maruti Construction, MDP, MKS Construction, Star Delta, Prabhu Electrical, Sai Establishment, Chola Electrical, Star Electrical, Mars Control • Land Aggregator- Mr. Jeevan Reddy • Six DG sets are required for power requirement during construction phase of the project. • Approximately 19 KL of water is required per day for civil works during		

Annex F

Photo-Documentation

Photo-documentation

Photo 1: Site office at Balledupalle site

Photo 2: Safety instruction displayed at site office at Balledupalle site

Photo 3: Sanitation facility at Balledupalle site

Photo 4: DG set at Balledupalle site

Photo 5: Diesel storage facility at Balledupalle site

Photo 6: Consultation with local community

Project: ESIA Study for 100 MW Veltoor Solar Plant, Telangana

ERM India Private Limited
Building 10, 4th Floor,
Tower A, DLF Cyber City
Gurgaon – 122 002, India
Board: +91- 0124 4170300
Fax: + 91-0124 - 4170301

Photo-documentation

Photo 7: Excavation work at Balledupalle site

Photo 8: Piling work at Addakal site

Photo 9: Emergency card with S&WPL personnel

Photo 10: Store yard at Balledupalle site

Photo 11: Empty cement packet kept at project site

Photo 12: Soil sampling at Balledupalle village

Project: ESIA Study for 100 MW Veltoor Solar Plant, Telangana

ERM India Private Limited
Building 10, 4th Floor,
Tower A, DLF Cyber City
Gurgaon – 122 002, India
Board: +91- 0124 4170300
Fax: + 91-0124 - 4170301

Photo-documentation

Photo 13: Tree at Mutyalampalle site

Photo 14: Surface water sampling from Sarala Sagar

Photo 15: Bore well at Balledupalle site

Photo 16: Mutyalampalle site

Photo 17: Temple at Balledupalle site

Photo 18: Graveyard at Balledupalle site

Project: ESIA Study for 100 MW Veltoor Solar Plant, Telangana

ERM India Private Limited
Building 10, 4th Floor,
Tower A, DLF Cyber City
Gurgaon – 122 002, India
Board: +91- 0124 4170300
Fax: + 91-0124 - 4170301

Annex G

Baseline Monitoring Reports

Mitra S. K. Private Limited

rachi Centre (5th Floor)
B, Acharya Jagadish Chandra Bose Road
lkata – 700 016, West Bengal, India
N: U51909WB1956PTC023037
: 91 33 22172249 / 40143000 / 22650006 / 22650007
: 91 33 22650008
: info@mitrask.com
: www.mitrask.com

MSK TESTING • INSPECTION

TEST REPORT

me & Address of the Customer :
RM India Pvt.Ltd. "
toor, Telengana

f. No. & Date : 1169/12/2016

Report No. : WB/ED- 01130
Date : 28.02.2017
Sample Description : Trafic Survey
Sample No:0893-0894

ANALYSIS RESULT

TRAFFIC DENSITY - DATA

T-2(Project Site access road) Mathyalampalle

NAME OF PROJECT : ERM, Veltoor, Telengana **Coordinate :** 16°27'51.9" N 77°54'2.2" E

LOCATION : NH 44 to Projet Site,Project Site to NH 44(UP & DOWN) **Date of Monitoring :** 17/18.02.2017

SL. NO.	TIME (Hours)	MOTORIZED VEHICLES			NON-MOTORIZED VEHICLES	TOTAL
		Heavy Motor Vehicles	Light Motor Vehicles	Two/Three Wheelers		
		(Truck,Bus,Dumper, Tanker,Trailer)	(Car,Jeep,Van,Metador, Tractor,Tempo,Mini Bus)	(Scooter, Motor Cycle, Auto, Moped)	(Bicycle, Tricycle)	
1	9.00-10.00	9	30	45	6	**90**
2	10.00-11.00	10	24	60	3	**97**
3	11.00-12.00	6	19	75	2	**102**
4	12.00-13.00	4	28	48	0	**80**
5	13.00-14.00	8	23	35	0	**66**
6	14.00-15.00	11	19	26	3	**59**
7	15.00-16.00	7	16	39	2	**64**
8	16.00-17.00	8	19	42	1	**70**

ntinue Page-2

MITRA S. K. PRIVATE LTD.

Mitra S. K. Private Limited

nrachi Centre (5th Floor)
4B, Acharya Jagadish Chandra Bose Road
olkata – 700 016, West Bengal, India
N: U51909WB1956PTC023037
: 91 33 22172249 / 40143000 / 22650006 / 22650007
: 91 33 22650008
: info@mitrask.com
: www.mitrask.com

MSK
TESTING • INSPECTION

Date:28.02.2017

BED-01130

9	17.00-18.00	3	17	44	0	**64**
10	18.00-19.00	0	19	38	0	**57**
11	19.00-20.00	2	25	30	0	**57**
12	20.00-21.00	0	15	10	0	**25**
13	21.00-22.00	0	5	8	0	**13**
14	22.00-23.00	0	3	2	0	**5**
15	23.00-00.00	0	0	3	0	**3**
16	00.00-01.00	0	0	0	0	**0**
17	01.00-02.00	0	0	0	0	**0**
18	02.00-03.00	0	0	0	0	**0**
19	03.00-04.00	0	0	0	0	**0**
20	04.00-05.00	0	0	0	0	**0**
21	05.00-06.00	2	6	8	0	**16**
22	06.00-07.00	3	10	10	0	**23**
23	07.00-08.00	4	20	18	0	**42**
24	08.00-09.00	5	28	22	0	**55**
Total Numbers		**82**	**326**	**563**	**17**	**988**

oort Prepared by:

For Mitra S.K Pvt Ltd

Authorised Signatory

Mitra S. K. Private Limited

nrachi Centre (5th Floor)
4B, Acharya Jagadish Chandra Bose Road
olkata – 700 016, West Bengal, India
N: U51909WB1956PTC023037
: 91 33 22172249 / 40143000 / 22650006 / 22650007
: 91 33 22650008
: info@mitrask.com
: www.mitrask.com

MSK TESTING • INSPECTION

TEST REPORT

me & Address of the Customer :
RM India Pvt.Ltd. "
ltoor, Telengana

f. No. & Date : 1169/12/2016

Report No. : WB/ED- 01129
Date : 28.02.2017
Sample Description : Trafic Survey
Sample No:0893-0894

ANALYSIS RESULT

TRAFFIC DENSITY - DATA

T-1(Project Site access road) Baledupalle

NAME OF PROJECT : ERM, Veltoor, Telengana **Coordinate :** 16°28'9.4" N 77°55'29.1" E

LOCATION : NH 44 to Projet Site,Project Site to NH 44**(UP & DOWN)** **Date of Monitoring :** 16/17.02.2017

SL. NO.	TIME (Hours)	MOTORIZED VEHICLES			NON-MOTORIZED VEHICLES	TOTAL
		Heavy Motor Vehicles	Light Motor Vehicles	Two/Three Wheelers		
		(Truck,Bus,Dumper, Tanker,Trailer)	(Car,Jeep,Van,Metador, Tractor,Tempo,Mini Bus)	(Scooter, Motor Cycle, Auto, Moped)	(Bicycle, Tricycle)	
1	9.00-10.00	10	36	54	9	**109**
2	10.00-11.00	9	60	153	2	**224**
3	11.00-12.00	18	47	116	3	**184**
4	12.00-13.00	5	31	112	2	**150**
5	13.00-14.00	6	20	98	5	**129**
6	14.00-15.00	13	18	65	0	**96**
7	15.00-16.00	4	17	43	3	**67**
8	16.00-17.00	4	19	44	0	**67**

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Date:28.02.2017

9	17.00-18.00	7	15	46	5	**73**
10	18.00-19.00	12	23	42	4	**81**
11	19.00-20.00	2	24	33	2	**61**
12	20.00-21.00	3	11	10	0	**24**
13	21.00-22.00	2	5	4	0	**11**
14	22.00-23.00	2	3	2	0	**7**
15	23.00-00.00	0	2	4	0	**6**
16	00.00-01.00	0	2	0	0	**2**
17	01.00-02.00	0	0	0	0	**0**
18	02.00-03.00	0	0	0	0	**0**
19	03.00-04.00	0	0	0	0	**0**
20	04.00-05.00	0	0	5	0	**5**
21	05.00-06.00	2	8	8	0	**18**
22	06.00-07.00	4	12	20	0	**36**
23	07.00-08.00	8	18	35	0	**61**
24	08.00-09.00	6	24	48	0	**78**
Total Numbers		**117**	**395**	**942**	**35**	**1489**

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TEST REPORT

me & Address of the Customer :
RM India Pvt.Ltd. "
ltoor, Telengana

f. No. & Date : 1169/12/2016

Report No. : WB/ED- 01128
Date : 28.02.2017
Sample Description : Surface water
Sample No:0898

ANALYSIS RESULT

Sl No	PARAMETER	Location	Sarala Sagar Surgace water	Method
		Latitude	16°24'35.2"N	
		Longitude	77°54'15.4"E	
		Sample Code	SW-1	
		Date Of Sampling	14.02.2017	
		Unit	Result	
1	Colour	Hazen	<1	APHA 22nd Edtn-2012, 2120B
2	Odour	None	Unobjectionable	APHA 22nd Edtn -2012, 2150B
3	pH value	None	9.45	APHA 22nd Edtn-2012,4500-H+B
4	Total Dissolved Solids (as TDS)	mg/l	560	APHA 22nd Edtn 2012, 2540C
5	Boron (as B)	mg/l	<0.5	APHA 22nd EDTN 4500B C
6	Chloride (as Cl)	mg/l	108	APHA 22nd Edtn-2012, 4500CL B
7	Copper (as Cu)	mg/l	<0.02	APHA 22nd Edtn-2012,3111B
8	Iron (as Fe)	mg/l	1.48	APHA 22nd Edtn-2012, 3500 Fe B
9	Manganese (as Mn)	mg/l	0.09	APHA 22nd Edtn-2012,3111B
10	Nitrate (as NO3)	mg/l	5.5	APHA 22nd Edtn-2012, 4500NO3 E

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11	Sulphate (as SO4)	mg/l	104	APHA 22nd Edtn 2012, 4500SO4-E
12	Lead (as Pb)	mg/l	<0.005	APHA 22nd Edtn-2012,3111 B, 3113A
13	Arsenic(as As)	mg/l	<0.01	APHA 22nd Edtn-2012, 3114 C
14	Electrical conductivity	µs/cm	845	APHA 22nd Edtn-2012, 2510B
15	Sodium Adsorption Ration (as SAR)	None	6.4	DIAGONISIS AND IMPROVEMENT OF SALINE AND ALKALINE SOIL
16	Zinc (as Zn)	mg/l	<0.02	APHA 22nd Edtn-2012,3111B
17	Total Suspended Solid (as TSS)	mg/l	67.2	APHA 22nd Edn-2012,2540D
18	Temperature	Deg C	25.4	IS 3025 (Part 9)-1984; Rffm:2006
19	Dissolved Oxygen	mg/l	6.2	APHA 22nd Edtn 2012, 4500-O-C
20	Biochemical Oxygen Demand (as BOD)	mg/l	10	APHA 22nd Edtn-2012, 5210B
21	Chemical Oxygen Demand (COD)	mg/l	52	APHA 22nd Edtn-2012, 5220B
22	Oil and Grease	mg/l	<1.4	APHA 22 nd edition 2012,5520 E
23	Free Ammonia	mg/l	0.21	APHA 22ND EDN 4500NH3-B (WITHOUT BUFFER),F
24	Dissolved Phosphate (as P)	mg/l	0.18	APHA 22nd Edtn-2012, 4500P-D
25	Faecal coliforrm	/100ml	Present	APHA 22nd Ed. 9221E
26	Total coliform	MPN/100ml	33	APHA 22 ED 2012 9221B

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TEST REPORT

me & Address of the Customer :
RM India Pvt.Ltd. "
ltoor, Telengana

f. No. & Date : 1169/12/2016

Report No. : WB/ED- 01127
Date : 28.02.2017
Sample Description : Soil
Sample No:0906-0909

ANALYSIS RESULT

No	PARAMETER	Location	Baledupalli	Adakkal site	Muthyalampalle dwarka nagar	Muthyappali Parur	Method
		Latitude	16°27'59.0"N	16°29'23.3"N	16°26'56.5"N	16°27'22.6"N	
		Longitude	77°54'37.5"E	77°55'30"E	77°53'14.8"E	77°53'8.8"E	
		Sample Code	S-1	S-2	S-3	S-4	
		Date Of Sampling	14.02.2017	15.02.2017	15.02.2017	15.02.2017	
		Unit	Result	Result	Result	Result	
1	pH (1:2.5) at 25 Deg C	None	8.78	7.91	7.92	7.49	IS 2720 (Part 26)-1987; Rffm:2007
2	Boron (as B)	mg/kg	<0.25	1.1	1.06	1.44	TPM/MSK/E/1/O, Methods of Soil Analysis (Soil Science Society for America) Part-II, pg 1062
3	Calcium (as Ca)	mg/kg	952	2762	2381	2476	TPM/MSK/E/1/F, Methods of Soil Analysis (Soil Science Society for America) Part-II, pg 1003
4	Chloride (as Cl)	mg/kg	88.2	58.8	49	176	TPM/MSK/E/1/J/,Methoeds of soil Analysis (Soil Science society for America) Part II, Pg.947
5	Copper (as Cu)	mg/kg	4.6	12.4	14.2	11.4	EPA 7000 B-February,2007
6	Iron (as Fe)	mg/kg	<5	<5	<5	22.0	EPA 7000 B-February,2007
7	Magnesium (as Mg)	mg/kg	743	686	1257	1600	TPM/MSK/E/1/F, Methods of Soil Analysis (Soil Science Society for America) Part-II, pg 1006
8	Sulphate (as SO4)	mg/kg	86.4	<12	<12	113	IS 2720 (Part 27)-1977; Rffm:2006

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9	Alkalinity (as CaCO3)	mg/kg	365	115.2	134.4	285	TPM/MSK/E/1/U Methods of soil analysis soil science socity for America part II ,pg 945
0	Bulk Density	gm/cc	1.25	1.19	1.20	1.16	IS 2720 (Part -29) 1975;Rffm:2005
1	Sodium (as Na)	mg/kg	230	180	800	900	TPM/MSK/E/1/D, Methods of Soil Analysis (Soil Science Society for America) Part-II, pg 1033
2	Specific gravity	None	2.42	2.47	2.48	2.52	IS 2720 (Part-3)-1980; Rffm:2002
3	Texture	None	Sandy Loam	Clay	Clay	Clay	TPM/MSK/E/1/AL, Soil & Plant Analysis,
4	Electrical conductivity at 25 Deg C	µs/cm	1058	303	218	1204	IS 14767 :2000
5	Potassium (as K)	mg/kg	70	80	70	130	TPM/MSK/E/1/E, Methods of Soil Analysis (Soil Science Society for America) Part-II, pg 1026
6	Sodium Adsorption Ration	None	0.66	0.39	1.6	1.68	TPM/MSK/E/1/AF,DIAGONISIS AND IMPROVEMENT OF SALINE AND ALKALINE SOIL
7	Zinc (as Zn)	mg/kg	15.8	5.8	17.4	14.2	EPA 7000 B-February,2007
8	Permeability	Cm/hr	2.32	0.047	0.046	0.043	IS 2720 (Part17)-1986;Rffm:2002
9	Water Holding capacity	%	42.5	52.9	54.1	56.4	TPM/MSK/E/1/Q, Soil & Plant Analysis, C.S.Piper
0	Cation Exchange Capacit	meq/100 gm	11.6	19.3	21.4	26.2	IS 2720 (Part 24) 1976; Rffm:2005
1	Phosphorus (as P)	mg/kg	7.9	<3.0	3.3	16.5	TPM/MSK/E/1/L, Methods of Soil Analysis (Soil Science Society for America) Part-II, pg
2	Porosity	%	48.3	51.8	51.6	54.0	TPM/MSK/E/1/AE,Methods of Soil Analysis (Soil Science society for America) Part I, pg 300
3	Moisture	%	11.2	12.7	16.6	19.1	IS 2720 (Part 2) 1973 Rffm 2006
4	Particle Size Distribution	%	Sand-66.7 ,Silt-14.8, Clay-18.5	Sand-23.6,Silt-21.1,Clay-	Sand-20.3,Silt-21.6,Clay-58.1	Sand-18.7,Silt-13.0,Clay-68.3	TPM/MSK/E/1/AL, Soil & Plant Analysis, C.S.Piper
5	Nitrogen (as N)	mg/kg	194	199	231	242	IS 14684 (1999); Rffm:2008
6	Acidity	mg/kg	Nil	Nil	Nil	Nil	APHA 22nd Edtn-2012, 2540E
7	Carbonate	mg/kg	76.8	Nil	Nil	Nil	TPM/MSK/E/1/X Methods of Analysis Soil Science socity for America Part II ,pg 945
8	Infiltration Capacity	mm/Hr	26.6	4.2	3.8	3.3	TPM/MSK/E/1/AT, Field Method for Measurement of Infiltration,

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TEST REPORT

me & Address of the Customer :
RM India Pvt.Ltd. "
toor, Telengana

f. No. & Date : 1169/12/2016

Report No. : WB/ED- 01126
Date : 28.02.2017
Sample Description : Ground Water
Sample No:0895-0897

ANALYSIS RESULT

Sl No	PARAMETER	Location	ADAKKAL GVT.HOSPITAL	BELEEDUPALLI TEMPLE	MUTHYALAM PALLE SITE	Method
		Latitude	16°30'27.1"N	16°28'17.5"N	16°27'26.6"N	
		Longitude	77°55'52.5"E	77°54'53.4"E	77°52'51.2"E	
		Sample Code	GW-1	GW-2	GW-3	
		Date Of Sampling	15.02.2017	15.02.2017	15.02.2017	
		Unit	Result	Result	Result	
1	Colour	Hazen	<1.0	<1.0	<1.0	APHA 22nd Edtn-2012, 2120B
2	pH value	None	6.85	7.47	7.1	APHA 22nd Edtn-2012,4500-H+B
3	Turbidity	N.T.U.	18	<1.0	<1.0	APHA 22nd Edtn-2012,2130B
4	Total Dissolved Solids (as TDS)	mg/l	3520	1240	695	APHA 22nd Edtn 2012, 2540C
5	Calcium (as Ca)	mg/l	573	19.2	68.8	APHA 22nd Edtn-2012, 3500 Ca B
6	Chloride (as Cl)	mg/l	231	106	41	APHA 22nd Edtn-2012, 4500CL B
7	Fluoride (as F)	mg/l	0.77	2.5	1.3	APHA 22nd Edtn-2012, 4500 F C
8	Iron (as Fe)	mg/l	5.61	0.32	0.19	APHA 22nd Edtn-2012, 3500 Fe B
9	Magnesium (as Mg)	mg/l	94	36	36	APHA 22nd Edtn-2012, 3500 Mg B
10	Manganese (as Mn)	mg/l	0.8	<0.02	<0.02	APHA 22nd Edtn-2012,3111B
11	Nitrate (as NO3)	mg/l	158	11.6	2.72	APHA 22nd Edtn-2012, 4500NO3 E

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Date:28.02.2017

12	Nitrate (as NO3)	mg/l	158	11.6	2.72	APHA 22nd Edtn-2012, 4500NO3 E
13	Sulphate (as SO4)	mg/l	406	42.2	30.1	APHA 22nd Edtn 2012, 4500SO4-E
14	Total Hardness (as CaCO3)	mg/l	1824	200	320	APHA 22nd Edtn-2012, 2340C
15	Cadmium (as Cd)	mg/l	<0.001	<0.001	<0.001	APHA 22nd Edtn-2012, 3111 D, 3113A
16	Lead (as Pb)	mg/l	0.12	<0.005	<0.005	APHA 22nd Edtn-2012,3111 B, 3113A
17	Mercury (as Hg)	mg/l	<0.001	<0.001	<0.001	APHA 22nd Edtn-2012, 3112B
18	Nickel (as Ni)	mg/l	<0.02	<0.02	<0.02	APHA 22nd Edtn-2012,3111B
19	Arsenic(as As)	mg/l	<0.01	<0.01	<0.01	APHA 22nd Edtn-2012, 3114 C
20	Total Chromium (as Cr)	mg/l	<0.01	<0.01	<0.01	APHA 22nd edtn-2012,3111D
21	Nitrite (as NO2)	mg/l	1.7	0.57	0.11	APHA 22nd Edition-2012, 4500 NO2 B
22	Sodium (as Na)	mg/l	650	550	140	APHA 22nd Edtn -2012, 3500 Na B
23	Potassium (as K)	mg/l	100	1	2	APHA 22nd Edtn-2012, 3500 K B
24	Total Nitrogen (as N)	mg/l	275	2.9	1.23	IS 14684 (1999); Rffm:2008
25	Zinc (as Zn)	mg/l	1.87	0.07	<0.02	APHA 22nd Edtn-2012,3111B
26	Total Iron (as Fe)	mg/l	5.61	0.32	0.19	APHA 22nd Edtn-2012, 2540E
27	Total Suspended Solid (as TSS)	mg/l	16.8	3.8	5.9	APHA 22nd Edn-2012,2540D
28	Temperature	Deg C	30.9	30.8	29.9	IS 3025 (Part 9)-1984; Rffm:2006
29	Salinity in respect to KCl eqv. salinity 35	None	3.78	1.13	0.57	APHA 22nd Edtn-2012, 2520B
30	Phenol	mg/l	<0.001	<0.001	<0.001	APHA 21st Ed.5530C
31	Total Alkalinity (as CaCO3)	mg/l	576	864	461	APHA 22nd Edtn-2012, 2320B
32	Phosphate	mg/l	0.24	0.23	0.22	APHA 22nd Edtn-2012, 4500P-D
33	Faecal coliforrm	/100ml	Present	Present	Present	APHA 22nd Ed. 9221E
34	Total coliform	MPN/100ml	23	13	33	APHA 22 ED 2012 9221B

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For Mitra S.K.Pvt Ltd

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