FOREWARD

This report contains rapid EIA and EMP for the proposed Power plant of **capacity 90 MW** of **M/s Bajaj Hindusthan Ltd.** at Vill. Kundarki, Block- Jajheri, Tehsil-Sadar, Distt.-Gonda (U.P.).

For the purpose of the preparation of The Environmental Impact Statement, the check list of Ministry of Environment & forests notification on Environmental Impact Assessment of development projects, New Delhi. The EIA Notification (MoeF) So-1533, of 14.09.2006 has been taken as the basis.

The environmental parameters, such as the levels of pollutants and noise in ambient air, pollutants in ground and surface waters, have been determined by actual tests conducted in our own lab/site. The data of flora and Fauna, rainfall, wind direction and speed, temperature and humidity have been collected is actual on site. The present report is an interim report of EIA study based on field data obtained from (01 NOV, 2009 to 31 JAN, 2010). The Environmental Impact Statement identifies the various negative and positive environmental impacts of the project. It is based on the environmental impact analysis and studies. The Environmental management plan incorporates the measures, which are envisaged to mitigate the adverse environmental impacts as well as to enhance environmental and ecological values.

The reports has been prepared not only to meet the statuary requirement for the award of "No Objection Certificate" by the Pollution Control Board, but also to appraise the project proponent of the steps, which should be taken to minimize damages to environment and to enhance environmental and socio-economic.

There are many individual who have helped us in the preparation of this report are District Statistical Officer -Gonda, Block Office - Jhajhri, Director of Meteorological Department Lucknow, District forest officer, Gonda,deserve my special thanks.

I am also thankful to ***Dr. S. Prasad of Siva Test House, Patna*** *(Approved by MoeF & NABL) for their guidance & co-operation to prepare this report.*

I am also thankful to the Management of **M/S BAJAJ HINDUSTHAN LTD.** for giving to us this opportunity to prepare this report

DR. MANOJ GARG
Consultant - Environment
Environmental & Technical Research Centre
4/57 Vipul Khand
LUCKNOW(U.P)

Date .....

CHAPTER-I

INTRODUCTION

1.1 Purpose of the Report :

Bajaj Hindusthan Ltd. Proposes to install New Independed Power Project of capacity 90 MW Coal based plant at Vill. Kundarki, Block- Jajheri, Tehsil-Sadar, Distt.-Gonda (U.P.).

The proposed establishment falls under category B-1 Project as per Environmental Impact Assessment (EIA) notification SO1533, of 14.09.2006 which necessary obtaining the Environmental clearance from SEAC Uttar Pradesh.

As per the requirement of EIA notification BHL had submitted the necessary obligation to MoeF for approval of Terms of reference (TOR). The Terms of reference approved by SEAC, U.P. vide SEAC letter No. 36/Parya/SEAC/367/09 dated 06th January, 2010.

EIA report incorporating the Terms of reference is presented below.

1.2 Bajaj Hindusthan Ltd. Group & Power Scenario in Uttar Pradesh :

Bajaj Hindusthan Ltd. belongs to the renowned "Bajaj Group" which was founded by the country's foremost industrial pioneers, Jamnalal Bajaj nearly a century ago. The Group comprises of Bajaj Hindusthan Ltd., Bajaj Hindusthan Sugar & Industries Ltd., Bajaj Eco-tec Products Ltd., Bajaj Consumer Care Ltd. and Bajaj Corp Ltd. The registered/corporate office of these Group Companies is situated in Mumbai.

INDUSTRY LEADERSHIP:

Bajaj Group, is leader in sugar, ethanol, and alcohol business. Besides, it has its major presence in Medium Density Fiber (MDF) and Particle Boards. The Group also has considerable experience in power generation and supply to grid.

Bajaj Hindusthan Ltd. (BHL) is the flagship company of Bajaj Group. BHL, with its strategic and aggressive expansion of sugar and ethanol production capacities over the last three years, has emerged as trie India's largest and world's fourth largest sugar producing company. BHL has also become the India's largest and world's 10th largest ethanol producing company.

BHL along with the other units managed by it has twelve sugar plants, located across the State of Uttar Pradesh (UP) with a total cane crushing capacity of 107,000 ton per day. Thus, BHL group currently produces nearly 1.6 million ton of sugar a year. BHL also has a capacity to produce 640000 liters of alcohol per day from its distilleries.

BHL has pioneered the India's bio-fuel (ethanol) program, producing/ supplying currently around 160 million liters of ethanol to various oil companies in a year and thus, catering to nearly 20% of all India demand at 5% ethanol doping.

BHL, under its subsidiary, Bajaj Eco-tec Products Ltd. (BEPL) is now pioneering the manufacture of environment-friendly and completely wood-free Medium Density Fiber (MDF) Boards, Particle Boards, High Density Fiber (HDF) Boards (alt both plain & pre-laminated) and Laminated Flooring, produced from sugarcane bagasse waste from its sugar mills. With three plants spread across UP, the Company commenced production MDF and Particle Boards. With a total manufacturing capacity of 210,000 M3 per annum (160,000 M3 of MDF Boards and 50,000 M3 of Particle Boards), these wood-substitute products will meet the rapidly growing demand of the construction and furniture sectors, conserving valuable forests and preserving the precious environment. It reflects the environmental consciousness of the Bajaj Hindusthan Group that BEPL's production of 1,60,000 M3of MDF Boards will save an estimated 1,00,000 mature trees from being cut down in a year.

Bajaj Consumer Care. Ltd., (BCCL) a renowned FMCG company has to its credit of being the second largest company in hair oil segment of FMCG. Bajaj Corp Ltd. is its subsidiary.

HANDS ON EXPERIENCE IN POWER GENERATION

Bajaj Group's flagship company BHL & two other plants managed by BHL, presently have a combined cogeneration capacity of approx. 355 MW at its sugar plants and after meeting its in house captive requirements, surplus power of approx. 90 MW is being exported to the UP State Grid. It could be seen that, BHL does have to its credit, rich experience in power generation and supply.

PROFESSIONAL TEAM OF MANAGERS

All the projects within the group of BHL shall be executed from its corporate office located in NOIDA and the proposed power plant proposals also will be executed from NOIDA only. Therefore Bajaj Group has got a highly experienced team of professionals, who are capable of executing large projects efficiently, effectively and well in time. The Group's ability to manage each of its business lines and its leadership in each of these segments is clear indication of the capability of its highly experienced and skilled professionals. Group's ability to manage its business in diversified areas such as Sugar, Ethanol, FMCG, MDF and Cogeneration can be leveraged in the power sector as well. In addition to the existing strength, Group has already set up and is in the process of expanding the project organization comprising of highly skilled professionals with vast experience in power project development, execution and operations.

ENVIRONMENT-FRIENDLY GROUP

Environmental friendliness is at the core value of the Bajaj Group. This can be evidenced from its flagship company, BHL's endaevour of promoting eco-friendly substitutes for non-renewable fossil fuels. The company has the installed capacity of approximately 355 MW of Bagasse based cogeneration projects which have replaced the fossil fuel based

energy. Further, BEPL has also endeavored in bring out a wood-substitute MDF Board manufactured from Bagasse, which another example of etc, eco-friendly strategy.

FINANCIAL CAPABILITY OF GROUP:

Bajaj Group has financial strength and capacity to undertake large projects, including power projects. The select data in terms of Net worth, Revenue and Internal Accruals may be briefed as follows:

- **Net worth;** Group's current net worth is over Rs. 3,351 Crores (after the recent QIP by BHL). It may be pertinent to mention that the net worth of Rs. 3,351 Crores qualifies us for around 6700 MW as per the competitive bidding requirements as illustrated below:
- Profitability and Internal Accruals: The companies in the Groups are profitable and have good internal accruals. Therefore, Group would be able to generate more than Rs. 1500 Crores

DIVERSIFICATION INTO POWER GENERATION:

With the above background and with hands on experience in power generation and export of power from its captive plants to State Grid, Bajaj Group is contemplating diversification in to Power generation.

As environmental friendliness is one of the core values of the company, the company would undertake environmental friendly technology for the proposed power project that may be economically viable.

POWER SCENARIO IN UTTAR PRADESH AND NORTHERN REGION.

Northern region and the State of UP are short of power to the extent of 10.5% & 18.5% energy respectively and 16.7 & 22.7 % peaking energy respectively (April-June 09 as published by CEA Planning wing). As all our units (existing and proposed) are located in the Northern Region, the addition of another 90 MW in the 11th plan period will help the region significantly.

UTTAR PRADESH

1. INSTALLED CAPACITY (AT THE END OF 10TH PLAN) (FIGURES IN MW)

Sector	Hydro	Thermal				Nuclear	R.E.S. (MNRE)	Total
		Coal	Gas	Diesel	Total			
STATE	541.1	4380	0.0	0.0	4380	0.0	11.4	4932.5
PRIVATE	0.0	0.0	0.0	0.0	0.0	0.0	78.5	78.5
CENTRAL	1073	2381.1	550	0.0	2941.1	204	0.0	4218.1
TOTAL	**1614.1**	**67711**	**550**	**0.0**	**7321.1**	**204**	**89.9**	**922S.0**

2. INSTALLED CAPACITY AS ON 30.6.2009 (FIGURES IN MW)

Sector	Hydro	Tharmal				Nuclear	R.E.S. (MNRE)	Total
		Coal	Gas	Diesel	Total			
STATE	527.4	4120	0.0	0.0	4120	0.0	25.1	4872.5
PRIVATE	0.0	0.0	0.0	0.0	0.0	0.0	377.9	377.9
CENTRAL	1073	2895.8	550	0.0	3245.8	204	0.0	4522.3
TOTAL	**1600.3**	**6815.8**	**550**	**0.0**	**7365.8**	**204**	**403**	**9573.1**

3. ACTUAL POWER SUPPLY POSITION

Period	Peak Demand (MW)	Peak Met (MW)	Peak deficit/ Surplus (MW)	Peak Deficit/ Surplus (%)	Energy Requi-rment (MU)	Energy Avail-bility (MU)	Energy Deficit/ Surplus (MU)	Energy Deficit/ Surplus *(%)*
9TH PLAN END	7584	6887	497	-9.2	48332	43545	4787	-9.9
2002-03	6700	5750	-950	-14.2	44777	38789	-7988	-17.8
2003-04	7218	8029	-1189	-18.5	48552	40399	-6153	-13.2
2004-05	7877	8268	-1609	-20.4	52017	41585	-10432	-20.1
2005-08	8175	6588	-1587	-19.4	55882	44033	-11649	-20.9
2006-07	9184	7531	-1653	-18.0	57441	48370	-9071	-15.8
2007-08	11104	8588	-2538	-22.8	82828	51335	-11293	-18.0
2008.2009	10587	8248	-2339	-22.1	88003	53798	-14207	-20.9
APR-JUNE 2009	11080	8563	-2517	-22.7	17770	14478	-3294	-18.5
JUNE 2009	11080	7215	-3885	-34.8	5228	4898	-528	-10.1

NOTE :- PEAK DEMAND -11024 MW, ENERGY REQUIREMENT- 68725 MU FOR THE YEAR 2008-2009 (AS PER 17TH EPS REPORT), OCCURENCE OF PEAK AS PER ACTUAL POWER SUPPLY POSITION IN THE MONTH(S)-DECEMBER & JANUARY

4. CAPACITY ADDED DURING XTH PLAN:

CENTRAL SECTOR : 1000MW (RIHAND -II)

210MW (UNCHAHAR -III)

* SHARE OF CENTRAL SECTOR PROJECTS INCLUDED IN ITEM NO. 1

STATE SECTOR : 420 MW (PARICHA EXTN)

PRIVATE SECTOR : NIL

5. LIKELY POWER SUPPLY POSITION AT THE END OF 2011-12* (DEMAND AS PER 17TH EPS)

Period	Peak Demand (MW)	Peak Met (MW)	Peak eficit/ Surplus (MW)	Peak Deficit/ Surplus (%)	Energy Requi-rement (MU)	Energy Avail-bility (MU)	Energy Deficit/ Surplus (MU)	Energy Deficit Surplus (%)
2011-12	**13947**	**11709**	**-2238**	**-16.0**	**79268**	**78600**	**.$65**	**-0.8**

* Peak and Energy availability from all IPPs to be commissioned during 11th Plan are taken in the respective state.

6. PROJECTS PLANNED FOR XITH PLAN (STATE SECTOR/ PRIVATE SECTOR/CENTRAL SECTOR)

S. NO.	PROJECT	AGENCY	STATUS	TYPE	CAPACITY (MW)	LIKELY YEAR/ DATE OF COMMISSIONING
1	DADRIEXTU-5,6	NTPC	Under Construction	COAL	980	2009-11
	SUB TOTAL-Central sector				980	
2	PARICHHAEXTU-5,8	UPRVUNL	*Under* Construction	COAL	500	2010-11
3	HARDUAGANJEXTU-5.6	UPRVUNL	Under Construction	COAL	500	2010-11
4	ANPARA-D	UPRVUNL	Under Construction	COAL	1000	2011-12
	SUB TOTAL-state sector				2000	
6	ANPARA-C	LANCO	Under Construction	COAL	1200	2011-12
7	ROSASM	ROSA POWER	Under Construction	COAL	600	2003-11
9	ROSAST-II	ROSA POWER	Under Construction	COAL	600	2011-12
	SUB TOTAL-private sector				2400	
	TOTAL (UP)				5380	

Linkage required for Anpara D U2, 500 MW.

7. LIKELY CAPACITY ADDITION DURING 11TH PLAN

FOR THE STATE : - UTTAR PARDESH

Project Name	Type	Status	Installed Capacity (IMF)	Capacity Addition During XIIth Plan (IMI)	Benefits Shares of state (MW)	Commissioned' slipped during 2007-2012 (MW)	Last Unit Commissioning Date/ (Likely Date of Commissioning)
CENTRAL-SECTOR							
*PARBATIST-H	H	U	800.00	800.00	169.00		(2011-2012)
*PARSATIST-il!	H	U	520.00	mm	110.00		(2010-2011)
*CHAMERAIIi	H	U	231.00	231.00	49.00		(2010-2011)
*SEWASTH	H	U	120.00	120.00	25.00		(2009-2010)
*URUI	H	U	240.00	240.00	51.00		(2010-2011)
*KOLDAM	H	U	800.00	800.00	189.00		(2010-2011)
*LOHARINAGPALA	H	U	600.00	600.00	127.00		(2011-2012)
*TAPOVANVGARH	H	U	520.00	520.00	110.00		(2011-2012)
NCP PROJECTORS	T	U	980.00	980.00	98.00		(2009-2011)
*RAMPUR	H	U	412.00	412.00	87.00		(2011-2012)
*KOTESHWAR	H	U	400.00	400.00	152.00		(2010-2011)
*RAPPU-546	N	U	440.00	440.00	101.00		(2008-2009)
*KAHALGAONS,7	T	U	1000.00	1000.00	100.00	COMM 500.00	16.03.2008
*SU8ANS1RILOWE	H	U	2000.00	2000.00	179.00		(2011-2012)
*KAMENG	H	U	600.00	600.00	54.00		(2011-2012)
CENTRAL-SECTOR TOTAL:-					**1581.00**		
STATE-SECTOR							
ANPARA 'D[1]	T	U	1000.00	1000.00	1000.00		(2011-2012)
HARDUAGANJ EXT 5,6	T	U	500.00	500.00	500.00		(2010-2011)
PAWCHHA EXTN 5, 6	T	U	500.00	500.00	500.00		(2010-2011)
STATE-SECTOR TOTAL-					**2000.00**		
PRIVATE-SECTOR							
ROSA I	T	U	600.00	600.00	600.00		(2010-2012)
SANPARA 'C'	T	U	1200.00	1200.00	1200.00		(2011-2012)
ROSA II	T	U	600.00	600.00	600.00		(2011-2012)
PRIVATE-SECTOR TOTAL:-					**2400.00**		
UMPP							
ULTRA MEGA SASAN	H	U	3960.00	1320.00	165.00		(2011-2012)
TOTAL-UMPP					165.00		
GRAND TOTAL:-					**6146.00**		

NOTE:- U - UNDER CONSTRUCTION PROJECTS
C - CONSTRUCTION YET TO START (LOA TO BE PLACED)
* SHARES FROM CENTRAL SECTOR PROJECTS FOR WHICH M.O.P. ORDERS ARE YET TO BE ISSUED ARE TENTATIVE.

8. T&D LOSSES

2003-04-35.17%

2004-05-34.39%

2005-06-32.63%

2006-07-33.49%

9 PEAK & ENERGY TABLE

(As per 17th EPS Report vs Actual Achieved)

YEAR	PEAK		ENERGY	
	Requirement as per17th EPS	Actual Achieved	Requirement as Per 17th EPS	Actual Achieved
2004-05	8057	6263	53033	41585
2005-06	8714	6588	56167	44033
2006-07	S425	7531	59486	48370
2607-08	10193	8568	63002	51335
2008-09	11024	6248	66725	53796
2009-10	11923		70668	
2010-11	12896		74845	
2011-12	13947		79268	

NORTHERN REGION

1. INSTALLED CAPACITY (AT THE END OF 10TH PLAN) (FIGURES IN MW)

Sector	Hydro	Thermal				Nuclear	R.E.S. (MNRE)	Total
		Coal	Gas	Diesel	Total			
STATE	6718.4	10977.5	1011.2	15.0	12003.7	0.0	247.9	18967.9
PRIVATE	786.0	0.0	0.0	0.0	0.0	0.0	565.5	1351.5
CENTRAL	5498.0	7216,0	23120.0	0.0	8528.0	1180.0	0.0	18208.0
TOTAL	**13000.3**	**18193.5**	**3323.2**	**15.0**	**21531.7**	**1180.0**	**313.4**	**36525.4**

2. INSTALLED CAPACITY AS ON 30.6.2009 (FIGURES IN MW)

Sector	Hydro	Thermal				Nuclear	R.E.S. (MNRE)	Total
		Coal	Gas	Diesel	Mai			
STATE	71411.0	11757.5	1219.2	13.0	12989.7	0.0	6488.0	20779.7
PRIVATE	786.0	0.0	0.0	0.0	0.0	0.0	1117.5	1903.5
CENTRAL	54880.0	8250.7	2312.0	0.0	10562.7	1180.0	0.0	17240.7
TOTAL	**13425.1**	**20008.2**	**3531.2**	**13.0**	**23552.4**	**1180**	**1766.4**	**39923.9**

3. ACTUAL POWER SUPPLY POSITION

Period	Peak Demand (MW)	Peak Met (MW)	Peak Deficit Surplus (MW)	Peak Deficit Surplus (%)	Energy /Requi-rment (MU)	Energy Avail-ability (MU)	Energy Deficit/ Surplus (MU)	Energy Deficit/ Surplus (%)
9TH PLAN END	23200	21346	-1854	-8	150383	142410	-7973	-5.3
20D2-03	24092	21889	-2203	-9.1	156810	144218	-12392	-7.9
2003-04	23817	22271	-1546	4.5	161595	152743	-8852	-55
2004-05	26834	24125	-2709	-10.1	175498	159358	-16140	*32*
2005-06	28154	25200	-2954	-10.5	188794	168611	-20183	-10.7
2006-07	31516	26644	-4872	-15.5	202125	179988	-22139	-11
2007-08	32462	29495	-2967	-9.1	219797	196147	-23650	-10.8
2008-09	33034	2S504	-3530	-10.7	224218	199928	-24290	-10.8
APR-JUNE ,2009	35491	29574	-5917	-16.7	59583	53318	-8247	-10.5
JUNE 2009	35491	29574	-5917	-16.7	19541	17835	-1906	-9.8

NOTE:- PEAK DEMANO - 38021WN, ENERGY REQUIREMENT - 239807 MU FOR THE YEAR 2008-2009 AS PER 17TH EPS REPORT.OCCUPENCE OF PEAK AS PER ACTUAL POWER SUPPLY POSITION IN THE MONTHS - JUNE, JULY & AUGUST

4. CAPACITY ADDITION DURING 11TH PLAN (AS PER PLANNING COMMISSION TARGET)

Region	Hydro	Thermal				Nuclear	Wind	Total
		Coal	Gas	Diesel	Total			
STATE	964.0	5870.0	1720.0	0.0	7590.0	0.0	0.0	85540.0
PRIVATE	17920.0	2680.0	0.0	0.0	2880.0	0.0	0.0	4472.0
CENTRAL	47320.0	2730.0	0.0	0.0	2730.0	440.0	0.0	7902.0
TOTAL	7488.0	11280.0	1720.0	0.0	13000.0	440.0	0.0	20928.0

5. LIKELY POWER SUPPLY POSITION AT THE END OF 2011-12 (DEMAND AS PER 17TH EPS)

Period	Peak Demand |MW)	Peak Met (MW)	Peak Deficit/ Surplus	Peak Deficit/ Surplus (%)	Energy Requi - rement (MU)	Energy Avail-ability (MU)	Energy Deficit/ Surplus MU)	Energy Deficit/ Surplus (%)
2011-12	48137	48266	129	0.3	29441	314885	20044	6.8

1.3 Details Of Proposed Plant

M/s Bajaj hinduisthan Ltd. is a limited company incorporated Promoted by Mr Shishir Bajaj

Company has incorporated in its object clause to carry on the business of manufacturers, producers etc. in the field of Sugar, MDF, Alcohol and Captive Power.

Proposed project

Bajaj has existing sugar & power plant(Baggasse based) at Vill. Kundarki, Block- Jajheri, Tehsil-Sadar, Distt.-Gonda (U.P.).

Now bajaj decided to install a Independent Power (Coal based) in the same existing premises . The details of the proposed project are are shown in Table 1.0

Table 1.0: Details of the proposed project

Details	Specification	Expected Commercial Operation Date
• Power generation	90 MW	
• Fuel(100 % coal)	Coal- 1600 T/day	
• Turbine	2x45 Mw each	March, 2011
• Water consumption	6984 KLPD	
• Working days	300 days in year	

The plant capacity has been worked out based on a working of 300 days in a year on 3 shift basis per day Power Plant.

Justification

Power generation will help to meet the requirement of shortage of Power in Utter Pradesh.

1.4 Location Details

The Proposed power plant at Vill. Kundarki, Block- Jajheri, Tehsil-Sadar, Distt.-Gonda (U.P.) with an installation of Power Plant & has 51.0 acres of land within existing premises. The total project cost is Rs. 320.00 crores. Layout of the proposed site is shown in figure-01 & Salient Feature of the project is given in table-2.

Land details:

Land for plant & machinery - 16.0 acre

Land for Green area- 25 Acre

Land for Ash pond -10 Acre

1.5 The Approach

1.5.1 Road

The plant is connected by developed road connected to Faizabad & Gonda.

1.5.2 Rail

The nearest railway station is Gonda 20.0 km from the site.

1.5.3 Airport

Nearest airport Lucknow is approx. 200 km away from the site.

Table 2.0 : Salient Features of the study area for Proposed Plant Site (Power Plant)

Features	Details :
Longitude	27° 04' 853" North
Latitude	082° 05' 038'East
Village, Tehsil, District and State	Vill. Kundarki, Block- Jajheri, Tehsil-Sadar, Distt.-Gonda (U.P.)
Maximum Temperature	45.0° C during summer
Minimum Temperature	5.5° C during winter
Average Relative Humidity	65-100%
Annual Rainfall (district)	1200 mm
Land Availability	51.0 acres
Nearest River	Manwar River, approx 12.5 km towards E Direction Tirahi River, approx 12.0 km towards W direction
Nearest Highway	NH-24 (75 km from Site)
Nearest Railway Station	Pilibhit Railway Station 18.0 km.
Nearest Air port	Lucknow-200 km
Nearest Forest	12 km Forest towards East.
Sensitive Places	None within 10 km radius of the site
Historical Places	None within 10 km radius of the site
Industries	NONE

1.6 SCOPE AND METHODOLOGY OF REIA STUDY

1.6.1 SCOPE OF REIA

The scope of the study include detailed characterization of various environmental components like air, noise, water, land and socio-economics within an area of 10 km radius around the proposed power Plant(within existing premises), Vill. Kundarki, Block- Jajheri, Tehsil-Sadar, Distt.-Gonda (U.P.). The main objectives includes:

- Literature review that includes identification of relevant data and articles from various publications, various government agencies and other sources;
- Collection of available secondary data
- Environmental monitoring so as to establish the baseline environmental status of the study area
- Identify various existing pollution loads due to industrial and domestic activities in the ambient zone;
- Prediction of impacts on environmental attributes
- Evaluate the predicted impacts on the various environmental attributes in the study area by using scientifically developed and widely accepted Environmental Impact Assessment (EIA) Methodologies
- Preparation an Environmental Management Plan (EMP) outlining the measures for improving the environmental quality
- Identify critical environmental attributes required to be monitored]

1.6.2 METHODOLOGY OF REIA

Environmental Impact Assessment study has been conducted within an area of 10 km radius around the proposed power plant. The various steps involved in the study for a particular project are divided into three following phases

- Identification of significant environmental parameters and assessing the status within the impact zone
- Prediction of Impacts envisaged due to proposed scheme on various environmental parameters
- Evaluation of impacts after superimposing the predicted scenario over the baseline scenario to prepare Environmental Management Plan

Accordingly, field studies were carried out during Post-Monsoon (1st NOV-2009 - 31st Jan 2010) to establish the existing conditions of environmental attributes are outlined in **Table 3.0**

Table: 3.0 : Environmental Attributes and Frequency of Monitoring

Attribute	Parameters	Frequency of Monitoring
Ambient Air Quality	SPM, RPM, SO_2, NO_X & CO	24 hourly samples twice a week for 13 weeks at 8locations.
Meteorology	Surface: Wind Speed, direction, temperature, relative humidity and rainfall	Surface : Continuous monitoring station for one non-monsoon on hourly basis and also data collection from secondary sources.
Water Quality	Physical, Chemical and Bacteriological Parameters	Once during the study season at 8 locations for surface and ground water samples.
Ecology	Existing Flora and Fauna	Through field visit during the study period and substantiated through secondary sources.
Noise Levels	Noise levels in db (A)	Hourly observations for 24 hours per location at eight locations.
Soil Characteristics	Parameters related to agricultural and afforestation potential	Once during the season at eight locations.
Land Use	Trend of land use change for different categories	Data from various Government agencies
Socio-economic aspects	Socio-economic characteristics, labour force characteristics, population statistics and existing amenities in the study area.	Based on area surveys and data collected from secondary sources (Census Handbooks, 2009).

CHAPTER-2

2.0 PROJECT DESCRIPTION :

Independent Power Plant of capacity - 90 MW coal based, along with 2x45 MW turbines & 2 x190 TPH CFBC boilers.

The Plot plan of the Project is shown in Figure - 2.0.

2.1 PLANT DETAILS :

To avoid the dependency on erratic grid power during peak production period, it is proposed to install a 2x45 MW coal based thermal power plant.

To meet the steam requirement of the 90 MW power plant, Bajaj Group proposes to install a CFBC boiler of 2 x 190 TPH capacity where Indian coal will be used. The quantity of coal requirement is estimated to be about 67 tonnes/hour.

SALIENT FEATURES OF 2x45 MW POWER PLANT

The power plant is designed based on Circulating Fluidised Bed Combustion (CFBC) Boiler design, which is Environment Friendly Technology. This CFBC design allows burning of high ash content coals, multi-fuel operation, low stack gas temperatures and low fly ash generation. The boiler is designed for a. rated steam output of 2x190 TPH TPH at a pressure of 110 ata and 540 deg. C. As in the case of any other thermal power plant the process involves production of super heated steam. The enthalpy of the steam is converted into mechanical energy in a condensing the turbines, which drives turbo-generator system to produce alternative current.

For condensing the steam, Water Cooled condenser is provided.

Salient feature of the power plant are given in **Table -4.0**

2.5.1 POWER GENERATION PROCESS

Power generation process is based on Rankine Steam cycle. The steam generated in the boiler when expanded through a turbine, turns the turbine shaft, which is tandem coupled to an electric power generator. The schematic diagram of the power generation process is shown in Figure-3.0

Proposed Power plant is aimed at generation of 2x45 MW of electric power. The power plant is designed based on Circulating Fluidized Bed Combustion (CFBC) Boiler design, which is an Environment Friendly Technology. This CFBC design allows burning of high ash content coals, multi-fuel operation, low stack gas temperatures and low fly ash generation. The boiler will be designed for a rated steam output of 2x190 TPH at a pressure 110 ata and 540º C.

TABLE -4.0

SALIENT FEATURES OF POWER PLANT

	Details
Location	Kundarki
Total Land (Acres)	51.0 Acres
Capacity (MWe)	2x45
Steam Generators Capacity (CFBC boiler), tph	2x190
Steam Turbine - Capacity, MW	2x45
Fuel	Indian Coal
Fuel Consumption, tpd (design value)	1600 TPD
Calorific Value of Coal	(Calorific Value considered for computation is 3000 kcal/kg).
Ash Content in Coal	(Ash content considered for computation is 40%).
Sulphur Content in coal	0.6% (Worst Case)
Fuel Supply	Indian Coal.
Height of Chimney	110 m only one Chimney with two Boiler.
Source of Water	Tubewell
Water Consumption, m^2/day	6984
Type of cooling	Water cooled condensate system

2.1.2 RAW MATERIAL

Indian coal is the fuel proposed for operation of the power plant. The required coal for the production of steam will be supplied by from Bihar Sorrisa. Coal yard will be located adjacent for the ease of transportation and handling purpose. Coal to the power plant from Source will be conveyed through trucks/rail to the coal stock yard. Coal will be crushed in the crusher to a size of 50 mm and is transported by belt conveyor and stacked in the form of piles by stacker. The stacked coal will be utilized as

per the requirement by reclaimer. Adequate coal handling system will be provided for handling of the coal.

The coal consumption of proposed Thermal power plant will be 67tonnes/hour as per design values considering ash content of 40 % and sulphur content of 0.6%

Parameter	**As per Design**
Coal consumption	66.6 TPH
Total ash generation	26.66 TPH
Sulphur content in the coal	0.6% Max. for design
SO_2 emission rate	222 g/sec.
Temperature of flue gas exit	140-155º C
Ash content	40%

The sources of water are from Tube well. The total water requirement of the power plant will be 6984 m³/day.

2.1.3 TECHNICAL FEATURES OF PROPOSED POWER PLANT

In order to take advantage of efficient steam generators having greater flexibility in using low grade coals and reduce emissions, it is proposed to use Circulating Fluidised Bed Combustion type boiler.

The following paragraphs detail the technical features of proposed units of the power plant.

2.1.3.1 PLANT HEAT RATE

The gross plant heat rate of the proposed power plant will be 2617 kcal/kWh.

2.1.3.2 STEAM GENERATORS AND AUXILIARIES

The steam generator would be of coal fired, circulating fludised bed combustion type and semi outdoor unit. In this process the mixture of coal and primary air is fed in to the boiler furnace by pneumatic underfeed

system. The major advantage of FBC system is getting ash with low unburnt carbon on one hand and collecting less bottom ash rather than fly ash.

The rating of each steam generator would be 2x190 TPH at a pressure of 110 ata and temperature of 540 +/- 5°C at the superheater outlet when supplied with feed water at a temperature of 230°C. The steam generator will be provided with fuel oil system using HSD which would be used during start-up of steam generators.

2.1.3.3 STEAM TURBINE GENERATORS

The steam turbine would be horizontal split casing, extraction cum condensing type. The following are the technical specifications of the steam turbine

SPECIFICATIONS OF TURBINE

Multistage impulse cum reaction condensing with uncontrolled Extraction turbine.

Horse Power	:	2x45 MW
Inlet steam pressure	:	110 ata
Inlet steam temp.	:	535ºC

The turbines would be complete with all the accessories customarily supplied by the manufacturers such as governing and protection system, turbine oil system and its auxiliaries, turbine gland seal system, turning gear, supervisory and operating instruments with all necessary indicating and control devices to permit the unit to be placed on turning gear, rolled, accelerated and synchronized from the central control room.

GENERATOR

The generators stator core, stator coil and rotor would be air-cooled. The following are the technical specification of the generators.

SPECIFICATION OF SYNCHRONOUS GENERATOR

Output	:	56.25 MVA
No. of phases	:	3
No. of poles	:	4
Voltage	:	11000 V
Frequency	:	50 Hz
Speed	:	1500 rpm
P.F.	:	0.80.
Rating	:	Continuous

2.1.4 PLANT CYCLE

2.1.4.1 MAIN AND EXTRACTION STEAM SYSTEMS

Steam delivered from the steam generators would be conveyed to the turbines through alloy steel piping. A branch pipe from the main steam piping would supply steam to the Auxiliary Pressure Reducing And Desuperheating Station (APRDS) where the steam condition will be reduced to about 10 ata and 400ºC The steam requirements of steam jet air ejectors, steam turbine gland sealing and deaerator heating/pegging during start-up would be supplied by the APRDS. Steam would be extracted from three non-regulated extraction points of the turbine for feed water heating.

2.1.4.2 REGENERATIVE FEED WATER HEATING SYSTEM

The regenerative feed water heating system of the unit would have two feed water heaters besides the deaerator (2HPH +1 Deaerator + 1LPH). Condensate from the hotwell would be pumped by 2 x 100% capacity condensate extraction pumps to the deaerator through the low pressure heaters, drain cooler, ejector condenser and gland steam condenser. Feed water would be pumped from the deaerator to the economiser section of the steam generators through the high pressure heater by means of 2 x 100 % boiler feed pumps. The deaerating feed water heater

would be spray type of spray-cum-tray type mounted on a feed water storage tank having 16 minutes storage capacity.

2.1.5 WATER SYSTEMS RAW WATER SYSTEM

The source of water is Ground Water. A raw water storage reservoir of required capacity to 2 days requirement will be provided.

Service Water System

The service water for plant miscellaneous services would be met directly from the service water storage tank.

Water Treatment Plant

- Details of water treatment is given below :
- One no. of 16200 m3 capacity are proposed for storage of raw water.
- Raw water will be passed through the clarification plant and clarified water is stored in clear water tank.
- Water from raw water tank is passed through demineralization plant to remove all suspended and dissolved impurities like anions, cations and dissolved gases. The pure demineralized water stored for further use in boiler.

EFFLUENT DISPOSAL SYSTEM

Wastewater generated from the Auxiliary cooling water system (ACW), Boiler blow down and DM plant contains high turbidity and TSS. Auxiliaries, Cooling Water (ACW) System.

ACW treatment will also include advanced polymer based eco-friendly chemicals for de-scaling and biological growth control.

The wastewater streams will be mixed with each other and the diluted water will be utilized for green belt development, dust suppression within the plant.

Fire Protection System

It is proposed to provide a full fledged fire protection system namely, hydrant system for all the areas of power plant, high velocity water spray system for transformers, turbine lube oil tanks, medium velocity spray system for cable vault/gallery, portable fire extinguishers for all the buildings of the plant as per best industry practices.

2.1.6 WATER COOLED CONDENSER (WCC)

Condenser cooling tower

The Condenser cooling tower with required number of cells to maintain 10°C At is proposed for circulating the cooling water to the Steam Condensers of both TGs. And also the Turbine and Generator auxiliaries like lube oil cooler and Generator air cooler, heat exchangers and gland cooling. Necessary dosing system for controlling the pH of cooling water and also metering system for the dosing system shall be provided. Monitoring system for the cooling water chemistry also shall be provided. Chlorination system with all safety gadgets shall be provided to maintain the residual chlorine in order to have proper control on algy and fungy to maintain a clean condenser. Necessary level control system along with the level transmitter shall be provided to control the level of fore bay, there by controlling the overflowing of the sump-which ensures the saving of water and chemicals added and also indication of level of sump in DCS. Further auto blow down system shall be provided for the auto blow down of cooling tower to maintain the designed COC.

The cooling tower shall be provided with the fans for exhausting the vapors generated during heat rejection from the cooling tower and the fans will be driven by electric motors controlled by variable frequency drives to optimize the consumption of energy during winter season and also to reduce the impact on the shaft during starting.

The cooling water from the fore bay will be circulated using 3X100 % capacity cooling water circulating pumps with necessary motor operated suction and discharge valves, NRV and necessary instrumentation for the

local indication of pressure and flow. One flow transmitter shall be provided in the common discharge line of each condenser to monitor the flow of cooling water to each of the condenser to monitor the efficiency of the condensers.

2.1.7 FUEL OIL SYSTEM

It is proposed to use HSD as fuel for initial start-up of boiler. A HSD storage and handling facilities are proposed.

2.1.8 AIR CONDITIONING AND VENTILATION SYSTEM

It is proposed to air condition the control room, ESP, CHS and Ash handling control rooms and DM plant control room. A dry bulb temperature of 22°C $\pm$ 1°C and relative humidity not exceeding 60% will be maintained uniformly in all air-conditioned rooms.

For the DM plant control room and ESP control room split packaged air conditioners would be provided.

For the ventilation of station building evaporative cooling plant would be provided. The plant would consist of centrifugal supply air fans, ducting, air washer, louvers and filters and circulating water pumps. Exhaust of hot air out of the station building would be achieved by provision of roof extractors and wall mounted exhaust fans. All other buildings would be provided with supply air fans or exhaust air fans or a suitable combination of both.

2.1.9 AIR SYSTEM

The required air for the combustion is heated in the air pre-heater before feeding into the Boiler. Excess air is maintained in the order of (20 to 30%) of the stoichiometric air composition in order to burn the coal completely and to reduce the unburnt carbon in the fly ash. Bajab proposes to use the fly ash and bottom ash in the production of cement & for filling of low laying areas.

The feed air is passed through air pre-heater and hot flue gases at 210 deg. C passed through the vertically fitted pipes in the air preheater. The heat of flue gas is transferred to the input air.

2.1.10 FUEL HANDLING SYSTEM

The unloaded coal from the wagons will be stored in the coal stock yard and the coal will be crushed to below 6mm size and will be stored in coal bunker and fed in to the boiler by means of pressurized air. The combustion of coal (in suspension) takes place in the boiler furnace to generate the required heat. The water circulated through the boiler tubes is converted in to steam by application of heat. The steam is used to drive the turbo generator.

The proposed FBC boiler is envisaged to give maximum operational flexibility in terms of fuel usage and meet the stringent Environmental Emission guidelines.

COAL HANDLING SYSTEM

Coal will be transported by trucks/rail and is unloaded into hoppers and fed to the belt conveyor by plough feeders or vibrating feeders. The coal is conveyed through the tunnel and fed to belt conveyors and reach the crusher house where it is crushed to <10 mm size. From there it is fed to coal bunkers or to stock yard for stacking.

CRUSHING SYSTEM

The coal-unloading conveyor will feed coal to crushers to crush the coal <10 mm size. Crushed coal will be either fed to forward conveyors or to the stacking conveyor.

Necessary inline magnetic separators will be provided in the conveyors feeding the crusher house. Adequately sized surge hoppers/feed chutes/flap gates will be provided to have maximum flexibility in the flow of material. The crushing and screening system will be 2x100%. Crushers are supported by RCC floor and isolated from other foundation work.

Necessary anti-vibration dampers will be provided for the crushers as required.

STACKING AND RECLAIMING SYSTEM / STOCKPILE

Crushed coal will be sent to stockpile when coal is not required in the bunkers. Stacking/reclaiming of coal will be done by bucket wheel type stacker/reclaimer moving on rails. The stacker/ reclaimer can stack coal on either sides of the pile.

When coal is required in the bunkers and crusher is not in operation, coal will be reclaimed by the stacker/reclaimer and fed to boiler bunkers. An emergency reclaim hopper will be provided to reclaim coal by dozers when stacker/reclaimer is not in operation. Required no. of dozers/mobile equipment will be supplied.

The stockpile of coal will have adequate storage for atleast l5days coal consumption considering a plant load factor of 0.8 Coal stockpile height will be 8m and area of coal stockpile will be 1200m².

The stockpile will be provided with necessary fire hydrant system, compacting and dust suppression system.

CONVEYING SYSTEM / BUNKER FEEDING SYSTEM

The capacity of the forward conveying system from secondary crusher onwards will be to meet the 16 Hrs.

Coal samplers and belt weigh scales will be provided in the junction tower prior to bunker feeding conveyor.

In line magnetic separators and metal detectors will be also be provided.

Bunker top will be sealed to have effective ventilation system in the bunker floor and necessary tipper arrangement will also be provided on bunker top.

DUST EXTRACTION / DUST SUPPRESSION / VENTILATION SYSTEM

Dust extraction system/Dust suppression system will be provided in all the transfer towers and crusher house to minimise the air pollution problem.

Dust suppression system will also be provided to the coal stock pile. Necessary spray system and arrangement will be provided in the stock Pile.

Bunker ventilation/dust extraction will be provided to extract the dust due to bunker filling operation.

The system will be designed for air quality in which respirable participate matter (size less than 10 microns) will not exceed (8 hrs) micro gram/m3 on work hours basis.

2.1.11 FLUE GASES

The quantity of the flue gas discharged is entirely dependent on the air required for complete combustion of coal in the fluidized boiler. For complete combustion of coal, a minimum amount of excess air in the boiler is required. In FBC boiler system, the excess air requirement is marginally low which in turn helps in the reduction of the heat loss through stack flue gases and the stack gas temperatures less than 150°C are attainable.

BHL will provide a stack of 110 m to exhaust flue gas from the proposed 2x190 boiler.

Design Of Stack Height

Design of stack heights is based on SO_2 emission rates, SO2 emission is computed for the coal consumption of 40% ash content and 0.6% Sulphur and calorific value of 3000 kcal/kg. BHL propose to provide a combined stack. The height of stack is computed as follows :

Coal consumption of proposed thermal power plant = 66.6 TPH

SO_2 emission in g/sec based on 0.6% coal content = 222.2

Stack height - 14 $(Q)^{0.3}$ = 104.2 m.

A ELECTROSTATIC PRECIPITATORS

An electrostatic precipitator will be installed in the flue gas path to collect the fly ash generated from the boiler. The outlet concentration of PM will be maintained 100 mg/Nm³ with all fields in service and 100 with One field out of service.

2.1.12 ASH HANDLING SYSTEM

Burning of coal in the boiler results in generation of both coarse ash and fly ash. The coarse ash collected from bed ash coolers, economizer and air heater hoppers will be conveyed to ash silo by pneumatic system. The fly ash will be collected in electrostatic precipitator (ESP) hoppers. The fly ash collected in ESP hoppers will be transported through pneumatic conveyors and will be stored in the fly ash silos.

The fly ash thus collected will be sent to cement plant and will be used in the cement manufacturing process. Approximately 640 tonnes (worst estimate based on ash concentration) per day of total ash will be generated from the power plant and the same will be totally consumed in the cement manufacturing/Brick manufacturing/Road making process.

2.1.13 PLANT ELECTRICAL SYSTEM

The major electrical systems comprise generator, 11 kV generation switchgear, 132/11 kV switchyard, generator transformer (GT), station auxiliary transformers (SAT), station service transformers(SST), 11 kV switchgear, 415 Volts auxiliary system, DC system, UPS system and emergency 415 volts system.

2.1.14 INSTRUMENTATION AND CONTROL SYSTEM

The control of the power plant would be accomplished using state-of-the-art microprocessor based Distributed Control System (DCS). The DCS would integrate the control and monitoring functions for the steam generator, turbine generator, their auxiliaries, the balance of the plant auxiliary systems and the electrical systems.

The distributed microprocessor based instrumentation and control system would have complete control capabilities that include closed loop control, open loop control, computation and interfacing for data acquisition, graphic displays, logging, trending, performance calculations, annunciation, sequence of events recording (SER), data storage and retrieval. The system will be provided with redundancy at various levels thereby ensuring reliability of the system. The system would allow for CRT operation from the control desk.

2.7.15 POLLUTION CONTROL SYSTEM OF THE THERMAL POWER PLANT

FLUE GASES

The quantity of the flue gas discharged is entirely dependent on the air required for complete combustion of coal in the fluidized boiler. For complete combustion of coal, a minimum amount of excess air in the boiler is required. In FBC boiler system, the excess air requirement is marginally low which in turn helps in the reduction of the heat loss through stack flue gases and the stack gas temperatures less than 150 °C are attainable. The design flue gas emission will be in the order of 25.0 m^3/sec.

Due to burning of coal in the captive power plant, the major pollutants expected from the power plant, will be suspended particulate matter, Sulphur dioxide.

ELECTROSTATIC PRECIPITATOR

An electrostatic precipitator will be installed in the flue gas path to collect the fly ash generated from the boiler. The outlet concentration of SPM will maintained less than 100 mg/Nm3 throughout the operation of the power plant.

STACK HEIGHT

Design of stack height is based on SO_2 emission rates, SO_2 emission computed for the coal consumption of 40% ash content and 0.6% Sulphur.

SO_2 EMISSIOIN RATE AND STACK HEIGHTS

Parameter	As per Design
Coal consumption (t/hr)	67
Sulphur content in coal (%)	0.6
SO_2 emission rate (gm/sec.)	222
Required stack height based on SO_2	110 meter

NOx CONCENTRATIONS

NOx will be released from the coal based power plants due to fuel bound Nitrogen as well as Thermal Nitrogen. Thermal Nitrogen oxides will be generated due to the reaction of inert Nitrogen with Oxygen at high temperatures in the burning zone. In coal based power plants, thermal NOx will be approximately 85% of the total NOx generated from the boilers. Due to adoption of fluidised bed boilers the NOx emissions were reduced drastically.

WASTE WATER GENERATION

Wastewater is generated from DM plant, cooling tower blow down and plant floor wash will be 1000 m³/day. The major source of wastewater from the power plant is cooling water blow-down & softening plant.

Blowdown effluent will be slightly alkaline with considerable amount of TDS and cooling water from DM plant is slightly acidic and contains no TDS and TSS. The cooling water blowdown is just similar to and which will be utilized for dilution and neutralization of the combined effluent to bring all the parameters well within the limits & finally treated in EA went treatment Plant and treated effluent will utilize for Recycle / Reuse dust suppression and gardening purpose.

FLY ASH UTILISATION

Burning of coal in the boiler results in generation of both coarse ash and fly ash. The coarse ash collected from bed ash coolers, economizer and air heater hoppers will be conveyed to ash silo by pneumatic system. The total ash will be collected in electrostatic precipitator (ESP) hoppers. The fly ash collected in ESP hoppers will be transported through pneumatic conveyors and will be stored in the fly ash silos. Fly ash generation will be approx. 640 T/day which will be utilized as per plan given in EMP Chapter.

CHAPTER-3

EXISTING ENVIRONMENTAL STATUS

The existing Environmental status of the area 10.0 Km. radius around the proposed project 90 MW Power Plant has been studies. Hence forth this area shall be called "STUDY AREA". The parameters covered up for the base line Environmental status are as follows.

3.1 Land use studies (Land Pattern)
3.2 Meteorology (Aerial Environment)
3.3 Ambient Air Quality (Aerial Environment)
3.4 Noise Quality (Aerial Environment)
3.5 Water Quality (Water Environment)
3.6 Soil Quality (Land Environment)
3.7 Ecology (Biological Environment)
3.8 Demography (Socio-Economic Environment)

We have selected TEN (9) locations for sampling/data collection for the period 01 Nov, 2009 to 31 Jan, 2010 around the 10.0 Km. radius of the proposed factory, details are as under. Map showing sampling points are enclosed in Figure-4.0 & 5.0.

Table-5.0 : STUDY AREA

Sr. No.	Study Area	Location from the factory	Distance from the proposed site
1.	Villlage - Bidyanagar	NE	5.4
2.	Villlage - Imlia	SE	6.0
3.	Villlage - Khuyasa	W	4.3
4.	Villlage - Ruhanwan	NW	6.1
5.	Villlage - Indtapur	SW	8.4
6.	Villlage - Khutahna	SE	3.8
7.	Villlage - Shahjot	SW	4.6
8.	Villlage - Siswatia	NE	3.0
9.	Factory Site	-	-

3.0 Baseline Environmental Quality

The scope of the baseline studies includes detailed characterization of various components like Meteorological Observations, Ambient Air Quality, Noise Levels, Water Quality, Soil Quality and Demographic Pattern.

The main object of baseline studies is

- To Assess the existing baseline environmental status
- To Identify the impacts due to emission from various sources
- To evaluate the impacts envisaged due to proposed industrial activities
- Preparation of Environmental Management Plan with control technologies
- To regulate the environmental quality of the study within the prescribed standards of Central Pollution Control Board

TABLE: 6.0 : SALIENT FEATURES OF BASELINE ENVIRONMENTAL PARAMETERS

Parameter	Inference
Micrometeorological Studies	To assess wind pattern to identify air pollution impacts on neighboring environment
Air Quality Data	To assess baseline air quality status of the area
Noise Quality Studies	To identify noise producing areas and anticipated noise levels
Water Quality	To identify baseline water quality
Soil Quality Studies	To identify existing soil quality
Biological Environment	Flora & Fauna of the study area presence of any endangered species in the area and impacts due to proposed activities
Socio-economic & Demographic studies	To know the baseline socio-economic status of the study area.

TABLE: 7.0: STANDARD METHODS APPLIED FOR ENVIRONMENTAL MONITORING

S.NO	ACTIVITY	POLLUTANT	DETAILS OF METHOD
1.	**Air Quality Monitoring**	Suspended Particulate Matter (SPM) Respirable Particulate Matter (RPM) Sulfur Dioxide (SO_2) Oxides of Nitrogen (NOx) Carbon Monoxide (CO) Hydrocarbons (HC)	IS 5182 Part—I to Part-XXII
2.	**Water Quality Monitoring**	Physical, Chemical, Bacteriological and Heavy Metals	IS: 10500 & IS: 3025
3.	**Noise Level Measurement**	Noise Levels	IS 4954
4.	**Soil Quality Testing**	Physical, Chemical and Heavy Metals	Standard Methods

3.1 Land Use Studies

Studies on land use aspects of eco-system play important roles for identifying sensitive issues, if any, and taking appropriate actions for maintaining the ecological balance in the development of the region. The objective of this section is to define the present environmental status and wherever possible evaluate the changes that have occurred during the last decade due on account of industrialization and urbanization in the region.

3.1.1 Objectives

The objectives of land use studies are:

- To determine the present land use pattern;
- To analyze the impacts on land use pattern due to the industrial activities in the study area; and
- To give recommendations for optimizing the future land use pattern in light of increasing industrial and mining activities in the study area and its associated impacts.

3.1.2 Methodology

For the study of land use, literature review of various secondary sources such as District Census Handbooks, regional maps regarding topography, zoning settlement, industry, forest etc., were taken. The data was collected from various sources like District Census Handbook, Revenue records, state and central government offices and Survey of India (SOI) Toposheets and also through primary field surveys.

The landuse pattern of the study area has been studied by analyzing the available secondary data published in the District Primary Census abstract of the year 2009, as the latest (2009) Census land use data has not yet been finalized by the Census Department shown in table-8.0.

TABLE -8.0

LAND USE PATTERN OF DISTT- PILIBHIT AND BLOCK-BARKHERA

IN WHICH PROPOSED SITE IS SITUATED

S.No.	Classification	Area (Hectare)
1.	Total reported land	
2.	Forest	
3.	Banjar Land fit for cultivation	
4.	Current fallow land	
5.	Other fallow land	
6.	Usar not fit for agricultural purposes	
7.	Garden/Bagh/Shrubs	
8.	Pasture land	
9.	Zaid crop	
10.	Kharif crop	
11.	Rabi	
12.	Net irrigated area	
13.	Gross irrigated area	
14.	Land prepared for cane	

The figures inside the brackets pertain to the whole of the Block-Barkhera

.

3.1.3 Land use Based on Secondary Data (Through Satellite Imagery)

Based on the census report, the Proposed Power Plant is located at Tehsil: Sadar, Dist: Gonda Uttar Pradesh State. The 10-km radial distance around the Plant lease boundary has been considered in the study. These areas were studied in detail to get the idea of land use pattern in the study area. The land use pattern of the study area is given in **Table-9.0.** The land use land cover pattern of the 10-km area based on IRS Imagery is shown in **Figure**- **6.0 & 7.0**

Study Area Land Use / Land Cover Classification System

Using the standard land use classification system proposed by NRSC, about five classes of level I, twelve of level II and four of level III land use / land cover classes were identified and mapped using satellite data in the present study. The imagery is interpreted and ground checked for corrections.

The land use / land cover of Kundarki- Village, Gonda- District, Uttar Pradesh State, is given in table 9.0.

Table 9.0 shows Landuse / land cover statistics of the study area

S.NO.	LU\LC Land Classification	AREA KM²	Percentage
1	Built up area	7.51	2.39
2	Waste Land	8.47	2.69
3	Fellow Land	182.42	54.9
4	Canals	15.26	4.85
5	Dry Sand Area	6.37	2.02
6	Water Bodies	2.92	0.92
7	Plantation	14.08	4.48
8	Crop	52.11	16.59
9	Scrub	23.85	7.59
TOTAL		**314**	**100.6**

3.2 METEOROLOGY (AERIAL EINVIRONMENT)

Micrometeorological data within the study area during the air quality survey period is an indispensable part of the air pollution study. The meteorological data recorded during the survey period is very useful for proper interpretation of the baseline information as well as for input, to predictive models for air quality dispersion. Historical data on meteorological parameters will also play an important role in identifying the general meteorological regime of the region.

3.2.1 Methodology

The methodology adopted for monitoring surface observations is done as per the standard norms laid down by Bureau of Indian Standards and Indian Meteorological Department (IMD).

METEOROLOGICAL DATE COLLECTED BY ETRC (ANALYSIS)

Temperature

Table 64-155 shows the daily hourly temperature date collected by ETRC field team during Nov-09, Dec-09 & Jan-2010. The daily 24 hourly average temperature ranged between 9.4 to 28.9 deg. C during study period. The temperature profile matches well with IMD data for these months.

Relative Humidity

Relative humidity observed during the study period, shown in Table 64-155 ranged between 45% and 85% with average daily minimum and maximum with an overall average of 74%.

Wind Velocity

Wind velocity is one of the most important metrological parameters which govern dispersion, diffusion, transportation of pollutants into the atmosphere.

Wind pattern of the study area recorded during the study period is presented in summarized form in Tables 64-155 .Wind speed recorded is

1.3-4.6 km/hr. The data for wind speed and direction are

depicted as wind rose diagrams enclosed which yields a graphic picture of the frequency and velocity of winds from sixteen directions. On the basis of 24 hour data, the following points emerge.

The overall calm period was recorded as 48% during study period. The calm was 48%, 47% and 35% during the months of Nov., Dec.-2009 and Jan-2010 respectively.

3.3 AMBIENT AIR QUALITY (AERIAL ENVIRONMENT)

The Ambient Air Quality with respect to the study zone of 10 km radius around proposed site forms the baseline information. The study area represents mostly in rural environment. The various sources of air pollution in the region include industrial activities, vehicular traffic, and dust arising from unpaved village roads. The prime objective of the baseline air quality study was to assess the existing ambient air quality of the study area.

The scenario of the existing Ambient Air Quality in the study region has been assessed through a network of eight Ambient Air Quality locations. The expected impact is mainly on ambient levels of Oxides of Nitrogen (NO_x), Sulphur dioxide (SO_2), Suspended Particulate Matter (SPM), Respirable Particulate Matter (RPM) and partly on Hydrocarbons (HC) and Carbon Monoxide (CO) levels. These parameters were monitored at 8 selected stations. The following points were taken into consideration in designing the network of sampling stations.

- Topography / Terrain of the study area
- Human Settlements
- Prevailing wind pattern
- Representation of Regional Background levels
- Health status
- Accessibility of Monitoring site
- Resource Availability

Pre-calibrated Samplers (for PM-10, PM-2.5 & TS PM) have been used for monitoring the existing AAQ status. Methodologies adopted for sampling and analysis were as per the approved methods of Central Pollution Control Board (CPCB).

Maximum, Minimum, Average and Percentile values have been computed from the raw data collected at all individual sampling stations to represent the Ambient Air Quality Status.

The Ambient Air Quality studies were carried out during Post-Monsoon (1st NOV – 31ST JAN 2010). The significant parameters *viz*., Suspended Particulate Matter (SPM), Respirable Particulate Matter, PM-10, PM-2.5 Sulphur dioxide (SO_2), Oxides of Nitrogen (NO_x), CO and HC were monitored in the core and buffer zones. The data thus obtained is considered for determining the baseline ambient air quality status.

A total number of 9 (Nine) stations were monitored. The duration, period and frequency of sampling is as per the guidelines of National Ambient Air Quality (NAAQ) Standards prescribed by Central Pollution Control Board (CPCB), New Delhi and are as given below:

Duration	: Post Monsoon (01 NOV– 31 JAN 2010).
Period	: a. 24 hrs for SPM, PSPM, PM-10, PM-2.5, SO_2 & NO_x
	b. 8 hr for CO & HC
Frequency	: Twice a week for the entire study period.

Details of location of AAQ monitoring stations are shown in **Table 10.0** and the Location map showing the AAQ monitoring Stations is presented as **Figure 4.0**

TABLE: 10.0 AMBIENT AIR QUALITY LOCATIONS

S.NO	CODE	NAME OF SAMPLING STATION	DIRECTION	DISTANCE
1	A-1	Villlage - Bidyanagar	NE	5.4
2	A-2	Villlage - Imlia	SE	6.0
3	A-3	Villlage - Khuyasa	W	4.3
4	A-4	Villlage - Ruhanwan	NW	6.1
5	A-5	Villlage - Indtapur	SW	8.4
6	A-6	Villlage - Khutahna	SE	3.8
7	A-7	Villlage - Shahjot	SW	4.6
8	A-8	Villlage - Siswatia	NE	3.0
9.	A-9	Factory Site	-	-

3.3.1 Details of the Sampling Locations

All the sampling locations are described below. The stations were selected to assess present pollution levels.

TABLE 11.0 : AMBIENT AIR QUALITY MONITORING LOCATIONS

Sampling Station	Description of the Sampling Station
A-1: **Vill.- Bidyanagar**	The Ambient Air Quality monitoring station was installed at the Vill. Bidyanagar that is 5.4 km towards NE direction and is free from any obstructions.
A-2: **Vill.- Imlia**	The sampling station was located in the village Imlia is 6.0 km in the SE direction from the site.
A-3: **Vill.- Khuyasa**	The sampling station was located in the village Khuyasa that is 4.3 km in the W direction from the proposed site.
A-4: **Vill.- Ruhanwan**	The sampling station was located in the village Ruhawan that is 6.1 km from the proposed site towards SW direction.
A-5: **Vill.- Indtapur**	The sampling station was located in the village Indtapur that is 8.4 km in the crosswind direction from the proposed site towards SW direction.
A-6: **Vill.- Khutahna**	The sampling station was located in the village Khutahna that is 3.0 km in the crosswind direction from the proposed site towards SE.
A-7: **Vill.-Shahjot**	The sampling station was located in the village Shahjot that is 4.6 km in the upwind direction from the proposed site towards SW down wind direction.
A-8: **Vill.- Siswatia**	The sampling station was located in the village Siswatia that is 3.0 km at NE downwind direction.
A-9: **Factory premises**	Within Existing Premises.

3.3.2 Sampling And Testing Methodology

Table 12.0 below gives the standard procedure for sampling and testing. The procedures are all in compliance with CPCB & MoeF.

TABLE 12.0 : Sampling And Testing Methodology

Parameter	Duration of Sampling	Recommended Analytical Procedure
SPM & RPM	24 hours - continuous	Gravimetric Method as per IS: 5182
SO_2	8 hours - continuous	Pararosaniline – Colorimetric method (Modified West & Gaeke Procedure)
NO_x	8 hours - continuous	Modified Jacob & Hochheiser Method
HC	Grab Sample	As per IS 5182
CO	Grab Sample	As per IS 5182

3.3.3 Analysis of Baseline Concentrations

The Ambient Air Quality levels in the study area are summarized below in **Table 13.0**. Detailed AAQ results including percentile values of all the locations are given in **Table 14 - 20**

TABLE 13.0 : 98th Percentile Values

Pollutant Location		TSPM µg / m³	PM_{10} µg / m³	$PM_{2.5}$ µg / m³	SO_2 µg / m³	NO_X µg / m³
A-1	Villlage - Bidyanagar	129.92	36.90	26.74	9.90	10.80
A-2	Villlage - Imlia	127.46	38.36	25.73	9.80	11.75
A-3	Villlage - Khuyasa	128.40	38.90	24.77	9.77	11.65
A-4	Villlage - Ruhanwan	127.50	38.55	24.80	9.70	11.80
A-5	Villlage - Indtapur	127.50	37.75	24.50	9.75	11.60
A-6	Villlage - Khutahna	128.00	39.00	24.50	9.75	11.85
A-7	Villlage - Shahjot	128.50	37.95	24.14	9.40	11.45
A-8	Villlage - Siswatia	127.50	36.50	24.35	9.80	11.80
A-9	Factory Site	159.50	63.90	39.00	13.90	17.85

TABLE 14.0

AMBIENT AIR QUALITYOF VILLAGE-BIDYANAGAR

LOCATION: Village A1								
Sr. No	Date of Sampling	PM (Less than 10 micron)	PM (Less than 2.5 micron)	TSPM	SO_2	NO_X	HC	CO
Unit		µg/ M^3	µg/ M^3	µg/ M^3	µg/ M^3	µg/ M^3	PPM	PPM
1	01.11.2009	28.9	20.2	119	8.8	9.5	<1	<1
2	02.11.2009	26.4	28.9	123	9.2	7.3	<1	<1
3	08.11.2009	34.2	22.5	120	8.5	7.8	<1	<1
4	09.11.2009	34.8	21.6	118	9.8	8.3	<1	<1
5	15.11.2009	26.4	19.2	124	7.5	8.4	<1	<1
6	16.11.2009	28.6	19.8	123	7.9	9.9	<1	<1
7	22.11.2009	30.1	16.8	120	8.6	9.5	<1	<1
8	23.11.2009	28.3	20.1	125	9.9	7.3	<1	<1
9	29.11.2009	30.9	22.3	121	8.6	8.7	<1	<1
10	30.11.2009	32.1	22.5	119	9.5	8.4	<1	<1
11	06.12.2009	27.6	21.9	126	7.2	9.8	<1	<1
12	07.12.2009	26.3	19.9	120	9.7	10.8	<1	<1
13	13.12.2009	32.9	18.5	118	7.3	9.4	<1	<1
14	14.12.2009	30.2	22.3	122	7.6	8.7	<1	<1
15	20.12.2009	31.9	24.9	124	8.3	7.3	<1	<1
16	21.12.2009	35.6	23.4	129	8.5	8.8	<1	<1
17	27.12.2009	32.8	21.8	121	8.7	9.9	<1	<1
18	28.12.2009	32.3	22.4	119	9.5	7.8	<1	<1
19	03.01.2020	30.1	19.2	123	8.1	10.6	<1	<1
20	04.01.2010	28.8	18.4	125	7.8	10.8	<1	<1
21	11.01.2010	31.8	24.1	120	8.5	9.4	<1	<1
22	12.01.2010	32.8	23.4	122	9.5	8.6	<1	<1
23	18.01.2010	32.4	24.6	125	9.2	8.9	<1	<1
24	19.01.2010	34.5	22.1	121	7.6	8.4	<1	<1
25	25.01.2010	38.5	18.6	126	8.4	9.4	<1	<1
26	26.01.2010	33.7	21.6	127	7.4	8.7	<1	<1
27	30.01.2010	33.2	24.7	119	9.9	9.4	<1	<1
28	31.01.2010	31.5	22.1	121	9.3	9.3	<1	<1
OBSERVATION								
Parameters		PM -10	PM -2.5	TSPM	SO_2	NO_X	HC	CO
Minimum Value		26.3	16.8	18	7.2	7.3	<1	<1
Maximum Value		38.5	28.9	129	9.9	10.8	<1	<1
Arithmetic Mean		31.34	21.71	122.14	8.60	8.97	<1	<1
Standard Deviation		2.98	2.53	2.93	0.85	0.98	-	-
98 percentile		36.93	26.74	127.92	9.90	10.80	-	-

TABLE 15.0

AMBIENT AIR QUALITYOF VILLAGE-IMLIA

LOCATION: Village A 2								
Sr. No	Date of Sampling	PM (Less than 10 micron)	PM (Less than 2.5 micron)	TSPM	SO_2	NO_X	HC	CO
Unit		µg/ M^3	µg/ M^3	µg/ M^3	µg/ M^3	µg/ M^3	PPM	PPM
1	01.11.2009	33.5	22.3	121	8.4	9.4	<1	<1
2	02.11.2009	34.2	24.6	125	7.5	7.8	<1	<1
3	08.11.2009	28.1	26.7	119	7.7	8.3	<1	<1
4	09.11.2009	29.9	19.6	120	9.8	9.7	<1	<1
5	15.11.2009	33.4	18.6	124	8.4	8.2	<1	<1
6	16.11.2009	32.1	20.5	118	7.6	9.5	<1	<1
7	22.11.2009	26.8	21.6	123	8.7	7.8	<1	<1
8	23.11.2009	30.6	23.4	117	8.4	8.2	<1	<1
9	29.11.2009	34.2	20.1	128	7.3	7.5	<1	<1
10	30.11.2009	36.8	19.9	121	8.7	8.7	<1	<1
11	06.12.2009	34.2	17.8	124	8.9	8.4	<1	<1
12	07.12.2009	30.1	24.9	120	9.4	9.8	<1	<1
13	13.12.2009	26.5	23.4	125	8.7	8.1	<1	<1
14	14.12.2009	34.2	22.9	119	7.3	9.7	<1	<1
15	20.12.2009	38.9	21.8	121	7.8	8.4	<1	<1
16	21.12.2009	24.5	20.6	118	8.7	7.4	<1	<1
17	27.12.2009	33.5	24.8	126	8.3	11.4	<1	<1
18	28.12.2009	32.4	23.5	120	9.8	10.7	<1	<1
19	03.01.2020	29.8	24.8	124	7.6	10.3	<1	<1
20	04.01.2010	27.8	23.5	121	9.7	11.7	<1	<1
21	11.01.2010	31.3	21.3	127	7.5	7.4	<1	<1
22	12.01.2010	32.5	21.5	120	7.6	7.6	<1	<1
23	18.01.2010	34.2	23.5	126	8.7	10.7	<1	<1
24	19.01.2010	35.7	22.1	123	7.3	11.8	<1	<1
25	25.01.2010	37.9	21.4	120	8.6	9.7	<1	<1
26	26.01.2010	34.5	18.4	119	9.7	8.5	<1	<1
27	30.01.2010	37.8	20.5	123	8.4	10.3	<1	<1
28	31.01.2010	33.7	19.3	124	8.8	11.7	<1	<1
OBSERVATION								
Parameters		PM -10	PM -2.5	TSPM	SO_2	NO_X	HC	CO
Minimum Value		24.5	17.8	117	7.3	7.4	<1	<1
Maximum Value		38.9	26.7	128	9.8	11.8	<1	<1
Arthmetic Mean		32.47	21.90	122.00	8.40	9.24	<1	<1
Standard Deviation		3.59	2.24	2.97	0.80	1.42	-	-
98 percentile		38.36	25.73	127.46	9.80	11.75	-	-

TABLE 16.0

AMBIENT AIR QUALITYOF VILLAGE-KHUYASA

LOCATION: Village A 3								
Sr. No	Date of Sampling	PM (Less than 10 micron)	PM (Less than 2.5 micron)	TSPM	SO_2	NO_X	HC	CO
Unit		µg/ M^3	µg/ M^3	µg/ M^3	µg/ M^3	µg/ M^3	PPM	PPM
1	01.11.2009	28.5	22.7	120	9.1	8.9	<1	<1
2	02.11.2009	28.1	23.5	124	8.4	10.1	<1	<1
3	08.11.2009	32.7	20.1	123	9.7	11.4	<1	<1
4	09.11.2009	38.5	17.2	118	9.9	10.4	<1	<1
5	15.11.2009	38.9	17.7	126	8.7	11.6	<1	<1
6	16.11.2009	34.6	22.8	119	9.3	9.5	<1	<1
7	22.11.2009	37.6	25.9	121	9.6	8.6	<1	<1
8	23.11.2009	38.9	20.1	118	7.5	8.3	<1	<1
9	29.11.2009	37.2	17.4	123	8.6	10.6	<1	<1
10	30.11.2009	34.9	22.4	120	8.3	11.4	<1	<1
11	06.12.2009	36.8	23.8	124	8.6	11.3	<1	<1
12	07.12.2009	33.6	21.1	126	7.6	10.6	<1	<1
13	13.12.2009	31.7	18.5	129	9.7	9.5	<1	<1
14	14.12.2009	30.1	21.6	123	9.4	10.4	<1	<1
15	20.12.2009	28.3	20.7	125	8.6	11.7	<1	<1
16	21.12.2009	25.7	21.4	118	7.2	10.4	<1	<1
17	27.12.2009	33.5	17.7	121	7.8	11.5	<1	<1
18	28.12.2009	34.8	18.8	124	9.4	9.7	<1	<1
19	03.01.2020	25.8	22.9	119	7.9	8.7	<1	<1
20	04.01.2010	28.6	21.4	123	7.2	10.5	<1	<1
21	11.01.2010	29.9	18.8	121	8.4	11.5	<1	<1
22	12.01.2010	27.8	19.3	118	9.3	10.6	<1	<1
23	18.01.2010	26.1	17.6	120	9.7	9.3	<1	<1
24	19.01.2010	31.9	21.4	126	8.3	9.8	<1	<1
25	25.01.2010	36.4	22.5	128	8.7	8.4	<1	<1
26	26.01.2010	36.7	23.4	122	8.4	10.5	<1	<1
27	30.01.2010	38.7	21.2	125	8.7	11.4	<1	<1
28	31.01.2010	33.7	20.4	121	9.4	9.5	<1	<1

OBSERVATION							
Parameters	PM -10	PM -2.5	TSPM	SO_2	NO_X	HC	CO
Minimum Value	25.7	17.2	118	7.2	8.3	<1	<1
Maximum Value	38.9	25.9	129	9.9	11.7	<1	<1
Arithmetic Mean	32.86	20.80	122.32	8.69	10.21786	<1	<1
Standard Deviation	4.33	2.27	3.12	0.79	1.05	-	-
98 percentile	38.90	24.77	128.46	9.79	11.65	-	-

TABLE 17.0

AMBIENT AIR QUALITYOF VILLAGE-BIDYANAGAR

LOCATION: Village A 4								
Sr. No	Date of Sampling	PM (Less than 10 micron)	PM (Less than 2.5 micron)	TSPM	SO_2	NO_X	HC	CO
Unit		µg/ M^3	µg/ M^3	µg/ M^3	µg/ M^3	µg/ M^3	PPM	PPM
1	03.11.2009	30.4	23.5	122	9.1	11.6	<1	<1
2	04.11.2009	33.2	21.7	120	9.5	8.2	<1	<1
3	10.11.2009	37.5	24.9	119	7.4	9.2	<1	<1
4	11.11.2009	32.8	18.9	124	8.3	8.4	<1	<1
5	17.11.2009	29.5	19.5	119	7.6	8.9	<1	<1
6	18.11.2009	25.7	21.4	126	9.4	8.7	<1	<1
7	24.11.2009	27.5	24.6	121	9.1	9.3	<1	<1
8	25.11.2009	30.6	23.8	117	7.5	9.7	<1	<1
9	01.12.2009	28.2	20.9	121	7.7	7.5	<1	<1
10	02.12.2009	32.8	23.1	124	9.3	9.2	<1	<1
11	08.12.2009	36.4	22.8	123	8.5	7.3	<1	<1
12	09.12.2009	25.7	24.7	125	7.8	8.3	<1	<1
13	15.12.2009	38.4	23.5	120	8.2	8.1	<1	<1
14	16.12.2009	24.7	21.9	122	7.8	8.5	<1	<1
15	22.12.2009	33.5	20.2	124	9.6	8.2	<1	<1
16	23.12.2009	31.4	22.6	121	7.2	9.2	<1	<1
17	29.12.2009	29.8	23.2	119	8.1	8.3	<1	<1
18	30.12.2009	28.2	22.2	117	9.8	9.1	<1	<1
19	05.01.2020	31.5	21.1	128	7.8	9.1	<1	<1
20	06.01.2010	32.6	18.7	125	9.4	9.3	<1	<1
21	13.01.2010	34.5	19.4	120	7.6	11.7	<1	<1
22	14.01.2010	37.8	16.7	127	7.5	8.5	<1	<1
23	20.01.2010	38.7	20.6	123	8.6	9.3	<1	<1
24	21.01.2010	36.7	21.8	126	8.1	11.8	<1	<1
25	27.01.2010	34.5	22.2	119	8.5	9.3	<1	<1
26	28.01.2010	34.7	22.5	122	9.3	11.8	<1	<1

OBSERVATION								
Parameters		PM -10	PM -2.5	TSPM	SO_2	NO_X	HC	CO
Minimum Value		24.7	16.7	117	7.2	7.3	<1	<1
Maximum Value		38.7	24.9	128	9.8	11.8	<1	<1
Arthmetic Mean		32.20	21.78	122.07	8.41	9.17	<1	<1
Standard Deviation		4.07	2.02	3.01	0.81	1.25	-	-
98 percentile		38.55	24.80	127.50	9.70	11.80	-	-

TABLE 18.0

AMBIENT AIR QUALITYOF VILLAGE-RUHANWAN

LOCATION: Village A 5								
Sr. No	Date of Sampling	PM (Less than 10 micron)	PM (Less than 2.5 micron)	TSPM	SO_2	NO_X	HC	CO
Unit		µg/ M^3	µg/ M^3	µg/ M^3	µg/ M^3	µg/ M^3	PPM	PPM
1	03.11.2009	26.7	20.2	121	8.9	9.3	<1	<1
2	04.11.2009	25.1	16.2	118	7.1	8.7	<1	<1
3	10.11.2009	32.7	17.3	123	7.6	9.4	<1	<1
4	11.11.2009	29.2	23.7	120	8.4	9.2	<1	<1
5	17.11.2009	31.7	24.3	125	8.8	8.9	<1	<1
6	18.11.2009	35.2	19.8	122	9.4	11.5	<1	<1
7	24.11.2009	32.7	16.5	126	9.5	11.2	<1	<1
8	25.11.2009	31.9	21.9	127	7.8	10.9	<1	<1
9	01.12.2009	36.2	24.7	119	8.1	9.2	<1	<1
10	02.12.2009	33.4	23.6	123	8.5	9.2	<1	<1
11	08.12.2009	30.1	20.9	121	9.8	10.4	<1	<1
12	09.12.2009	29.8	18.3	122	9.4	11.7	<1	<1
13	15.12.2009	28.1	16.2	120	8.2	10.4	<1	<1
14	16.12.2009	24.9	15.9	124	8.7	9.3	<1	<1
15	22.12.2009	32.4	19.2	127	9.5	9.7	<1	<1
16	23.12.2009	34.6	22.1	119	7.6	8.1	<1	<1
17	29.12.2009	36.7	24.3	122	9.5	10.4	<1	<1
18	30.12.2009	31.5	20.5	123	8.4	11.2	<1	<1
19	05.01.2020	34.1	18.3	120	7.3	8.2	<1	<1
20	06.01.2010	36.2	21.3	124	7.8	10.1	<1	<1
21	13.01.2010	38.8	22.6	128	8.3	10.5	<1	<1
22	14.01.2010	32.5	21.7	123	9.5	11.2	<1	<1
23	20.01.2010	30.3	19.3	122	8.4	9.9	<1	<1
24	21.01.2010	32.6	17.2	124	9.5	8.2	<1	<1
25	27.01.2010	34.7	20.7	120	8.1	8.7	<1	<1
26	28.01.2010	35.9	18.9	125	9.7	10.3	<1	<1

OBSERVATION								
Parameters		PM -10	PM -2.5	TSPM	SO_2	NO_X	HC	CO
Minimum Value		24.9	15.9	118	7.3	8.1	<1	<1
Maximum Value		38.8	24.7	128	9.8	11.7	<1	<1
Arithmetic Mean		32.23	20.22	122.62	8.61	9.84	<1	<1
Standard Deviation		3.53	2.73	2.67	0.81	1.07	-	-
98 percentile		37.75	24.50	127.50	9.75	11.60	-	-

TABLE 19.0

AMBIENT AIR QUALITYOF VILLAGE-INDTAPUR

LOCATION: Village A 6								
Sr. No	Date of Sampling	PM (Less than 10 micron)	PM (Less than 2.5 micron)	TSPM	SO_2	NO_X	HC	CO
Unit		µg/ M^3	µg/ M^3	µg/ M^3	µg/ M^3	µg/ M^3	PPM	PPM
1	03.11.2009	31.8	23.8	123	9.8	11.8	<1	<1
2	04.11.2009	33.5	24.9	120	7.3	9.7	<1	<1
3	10.11.2009	34.1	20.5	119	7.2	11.2	<1	<1
4	11.11.2009	38.3	18.4	122	8.5	10.3	<1	<1
5	17.11.2009	39.1	16.4	120	8.9	10.6	<1	<1
6	18.11.2009	29.4	19.2	118	8.3	9.5	<1	<1
7	24.11.2009	30.2	20.3	124	9.7	9.3	<1	<1
8	25.11.2009	32.9	21.2	123	8.3	11.8	<1	<1
9	01.12.2009	35.7	18.7	126	7.5	9.5	<1	<1
10	02.12.2009	36.8	21.1	129	7.8	11.9	<1	<1
11	08.12.2009	38.7	17.3	121	8.5	9.8	<1	<1
12	09.12.2009	34.5	16.5	124	9.4	8.6	<1	<1
13	15.12.2009	37.8	20.9	119	8.1	11.5	<1	<1
14	16.12.2009	38.9	22.4	123	7.3	11.3	<1	<1
15	22.12.2009	36.7	24.1	126	7.9	9.5	<1	<1
16	23.12.2009	34.5	23.1	124	8.5	9.3	<1	<1
17	29.12.2009	32.1	20.9	127	8.1	11.3	<1	<1
18	30.12.2009	32.5	16.8	121	9.4	10.4	<1	<1
19	05.01.2020	31.6	22.8	126	7.8	9.4	<1	<1
20	06.01.2010	27.5	23.5	120	9.3	8.8	<1	<1
21	13.01.2010	26.4	21.1	122	9.1	7.8	<1	<1
22	14.01.2010	30.5	20.7	124	8.2	8.5	<1	<1
23	20.01.2010	31.4	20.1	126	7.6	9.5	<1	<1
24	21.01.2010	32.6	15.9	123	7.5	9.1	<1	<1
25	27.01.2010	31.9	17.8	121	8.2	10.5	<1	<1
26	28.01.2010	35.1	23.5	124	7.6	11.1	<1	<1

OBSERVATION								
Parameters		PM -10	PM -2.5	TSPM	SO_2	NO_X	HC	CO
Minimum Value		26.4	15.9	118	7.2	7.8	<1	<1
Maximum Value		39.1	24.9	129	9.8	11.9	<1	<1
Arithmetic Mean		33.63	20.46	122.88	8.30	10.07692	<1	<1
Standard Deviation		3.47	2.63	2.76	0.77	1.15	-	-
98 percentile		39.00	24.50	128.00	9.75	11.85	-	-

TABLE 20.0

AMBIENT AIR QUALITYOF VILLAGE-KHUTAHNA

LOCATION: Village A 7								
Sr. No	Date of Sampling	PM (Less than 10 micron)	PM (Less than 2.5 micron)	TSPM	SO_2	NO_X	HC	CO
Unit		µg/ M^3	µg/ M^3	µg/ M^3	µg/ M^3	µg/ M^3	PPM	PPM
1	05.11.2009	28.7	24.2	121	8.5	9.7	<1	<1
2	06.11.2009	26.8	20.1	124	7.8	8.5	<1	<1
3	12.11.2009	31.9	19.5	126	9.1	11.2	<1	<1
4	13.11.2009	33.5	15.3	120	8.4	11.1	<1	<1
5	19.11.2009	34.5	23.8	123	9.5	10.5	<1	<1
6	20.11.2009	36.8	19.5	119	9.4	9.9	<1	<1
7	26.11.2009	32.1	21.2	122	8.5	10.8	<1	<1
8	27.11.2009	30.8	23.1	124	8.9	11.1	<1	<1
9	03.12.2009	29.5	20.2	113	8.4	10.9	<1	<1
10	04.12.2009	27.5	18.9	124	7.8	9.5	<1	<1
11	10.12.2009	27.4	19.8	122	9.2	8.9	<1	<1
12	11.12.2009	26.3	22.5	128	9.4	9.7	<1	<1
13	17.12.2009	31.3	24.1	123	7.6	10.6	<1	<1
14	18.12.2009	34.5	23.2	124	7.5	11.4	<1	<1
15	24.12.2009	36.7	21.5	120	8.6	10.9	<1	<1
16	25.12.2009	38.4	20.5	126	8.1	9.9	<1	<1
17	31.12.2009	32.1	18.7	121	8.5	9.8	<1	<1
18	01.01.2010	30.6	16.4	129	9.3	8.5	<1	<1
19	07.01.2020	32.2	21.5	120	8.3	10.9	<1	<1
20	08.01.2010	34.6	23.4	119	8.1	11.5	<1	<1
21	15.01.2010	25.9	18.7	122	7.6	9.5	<1	<1
22	16.01.2010	31.1	19.4	127	8.7	11.2	<1	<1
23	22.01.2010	32.5	16.7	126	9.1	9.5	<1	<1
24	23.01.2010	33.5	20.6	123	8.4	8.8	<1	<1
25	29.01.2010	37.5	21.8	120	7.5	10.5	<1	<1
26	30.01.2010	36.2	22.2	119	7.1	11.2	<1	<1

OBSERVATION								
Parameters		PM -10	PM -2.5	TSPM	SO_2	NO_X	HC	CO
Minimum Value		25.9	15.3	119	7.1	8.5	<1	<1
Maximum Value		38.4	24.2	129	9.5	11.5	<1	<1
Arthmetic Mean		32.03	20.65	122.50	8.43	10.230769	<1	<1
Standard Deviation		3.57	2.38	3.44	0.68	0.93	-	-
98 percentile		37.95	24.15	128.50	9.45	11.45	-	-

TABLE 21.0

AMBIENT AIR QUALITYOF VILLAGE-SISWATIA

LOCATION: Village A 8								
Sr. No	Date of Sampling	PM (Less than 10 micron)	PM (Less than 2.5 micron)	TSPM	SO_2	NO_X	HC	CO
Unit		µg/ M^3	µg/ M^3	µg/ M^3	µg/ M^3	µg/ M^3	PPM	PPM
1	05.11.2009	31.6	16.5	121	8.7	10.2	<1	<1
2	06.11.2009	32.6	19.2	119	9.8	11.6	<1	<1
3	12.11.2009	25.6	23.4	124	9.3	9.8	<1	<1
4	13.11.2009	26.1	20.4	120	7.7	9.7	<1	<1
5	19.11.2009	30.1	22.4	118	7.2	10.2	<1	<1
6	20.11.2009	30.5	25.3	123	8.1	10.7	<1	<1
7	26.11.2009	32.1	23.1	122	8.5	11.7	<1	<1
8	27.11.2009	28.7	21.6	126	8.4	10.5	<1	<1
9	03.12.2009	27.9	19.7	120	9.1	11.5	<1	<1
10	04.12.2009	31.5	16.2	125	8.7	10.5	<1	<1
11	10.12.2009	34.5	19.7	121	7.8	10.9	<1	<1
12	11.12.2009	36.9	20.2	127	7.2	9.8	<1	<1
13	17.12.2009	32.5	18.9	123	7.9	9.1	<1	<1
14	18.12.2009	30.5	16.7	120	9.4	8.9	<1	<1
15	24.12.2009	31.5	19.7	118	9.4	8.1	<1	<1
16	25.12.2009	34.3	20.5	124	8.1	9.4	<1	<1
17	31.12.2009	36.1	21.5	119	8.7	10.5	<1	<1
18	01.01.2010	32.5	18.9	126	9.2	11.2	<1	<1
19	07.01.2020	30.4	21.5	122	7.6	9.9	<1	<1
20	08.01.2010	34.6	15.8	124	7.1	11.8	<1	<1
21	15.01.2010	32.5	18.5	120	8.4	9.5	<1	<1
22	16.01.2010	31.4	17.9	126	8.2	9.8	<1	<1
23	22.01.2010	30.4	20.3	128	9.8	8.7	<1	<1
24	23.01.2010	29.3	23.4	120	8.2	11.5	<1	<1
25	29.01.2010	33.4	23.4	124	9.8	10.7	<1	<1
26	30.01.2010	28.1	21.5	118	7.7	11.8	<1	<1

OBSERVATION								
Parameters		PM -10	PM -2.5	TSPM	SO_2	NO_X	HC	CO
Minimum Value		25.6	15.3	118	7.1	8.1	<1	<1
Maximum Value		36.9	25.8	128	9.8	11.8	<1	<1
Arithmetic Mean		31.37	20.24	122.23	8.46	10.31	<1	<1
Standard Deviation		2.77	2.46	2.98	0.83	1.02	-	-
98 percentile		36.50	24.35	127.50	9.80	11.80	-	-

TABLE 22.0

AMBIENT AIR QUALITYOF VILLAGE-FACTORY PREMISES

LOCATION: Factory Premises								
Sr. No	Date of Sampling	PM (Less than 10 micron)	PM (Less than 2.5 micron)	TSPM	SO_2	NO_X	HC	CO
Unit		µg/ M^3	µg/ M^3	µg/ M^3	µg/ M^3	µg/ M^3	PPM	PPM
1	05.11.2009	51.2	33.7	142.0	12.8	14.5	<1	<1
2	06.11.2009	54.3	34.5	145.0	13.5	14.3	<1	<1
3	12.11.2009	56.7	36.1	146.0	13.8	16.7	<1	<1
4	13.11.2009	57.3	38.5	149.0	12.4	14.6	<1	<1
5	19.11.2009	61.2	35.2	151.0	13.9	15.3	<1	<1
6	20.11.2009	55.8	32.7	150.0	12.5	14.6	<1	<1
7	26.11.2009	57.8	31.7	153.0	13.8	16.3	<1	<1
8	27.11.2009	55.3	34.7	154.0	12.5	17.3	<1	<1
9	03.12.2009	56.8	36.1	149.0	13.7	17.8	<1	<1
10	04.12.2009	55.7	38.5	143.0	12.5	16.5	<1	<1
11	10.12.2009	60.1	31.7	148.0	13.9	16.8	<1	<1
12	11.12.2009	62.6	33.1	156.0	12.1	16.3	<1	<1
13	17.12.2009	58.5	39.4	157.0	13.6	15.8	<1	<1
14	18.12.2009	61.7	33.8	152.0	13.2	15.9	<1	<1
15	24.12.2009	58.9	31.4	159.0	13.8	14.5	<1	<1
16	25.12.2009	55.3	35.1	149.0	12.4	15.4	<1	<1
17	31.12.2009	59.8	34.8	153.0	12.5	17.9	<1	<1
18	01.01.2010	55.3	35.7	160.0	13.5	16.3	<1	<1
19	07.01.2020	63.6	33.4	145.0	13.4	14.8	<1	<1
20	08.01.2010	64.2	34.1	149.0	13.7	17.2	<1	<1
21	15.01.2010	57.8	35.8	152.0	12.2	17.8	<1	<1
22	16.01.2010	57.2	36.7	157.0	12.9	16.3	<1	<1
23	22.01.2010	58.7	37.2	153.0	12.3	16.3	<1	<1
24	23.01.2010	60.1	37.9	150.0	13.8	14.7	<1	<1
25	29.01.2010	61.7	38.6	157.0	13.2	14.1	<1	<1
26	30.01.2010	62.5	35.7	158.0	12.5	16.9	<1	<1
				3937.00	151.42			
OBSERVATION								
Parameters		PM -10	PM -2.5	TSPM	SO_2	NO_X	HC	CO
Minimum Value		51.2	31.4	142	12.1	14.1	<1	<1
Maximum Value		64.2	39.4	160	13.9	17.9	<1	<1
Arithmetic Mean		58.47	35.23	151.42	13.09	15.96	<1	<1
Standard Deviation		3.18	2.25	4.96	0.63	1.18	-	-
98 percentile		63.90	39.00	159.50	13.90	17.85	-	-

AAQ In Study Area

- TSPM monitored in the study area are in the range of 127.50-159.50 μg/m³
- PM-10 monitored in the study area are in the range of 36.5-63.90 μg/m³
- SO_2 monitored in the study area are in the range of 9.40-13.90 μg/m³
- NOX monitored in the study area are in the range of 10.80-17.85 μg/m³
- HC and CO concentration at all locations was found to be less the 1ppm

The values of SPM, SO_2, NO_X, HC and CO monitored at all locations were found to be well within the NAAQ Standards.

3.4 NOISE ENVIRONMENT (AERIAL ENVIRONMENT)

3.4.1 Reconnaissance

A reconnaissance survey was conducted in order to establish the baseline status of the environment with respect to noise levels in the study area. The objective of the present study is to assess the impacts of noise generated proposed units inside the plant premises and its impact on the hum settlements within 10.0 km radius, Location of sampling points are shown Table-23.0

Table: 23.0 : Details of Noise Quality Monitoring Locations

S.NO	CODE	NAME OF SAMPLING STATION	DIRECTION	DISTANCE
1	N-1	Villlage - Bidyanagar	NE	5.4
2	N-2	Villlage - Imlia	SE	6.0
3	N-3	Villlage - Khuyasa	W	4.3
4	N-4	Villlage - Ruhanwan	NW	6.1
5	N-5	Villlage - Indtapur	SW	8.4
6	N-6	Villlage - Khutahna	SE	3.8
7	N-7	Villlage - Shahjot	SW	4.6
8	N-8	Villlage - Siswatia	NE	3.0
9.	N-9	Factory Site	-	-

Table 24.0

Noise level Monitoring Data

NOISE LEVEL MONITORING DATA									
TIME IN HRS	**N1**	**N2**	**N3**	**N4**	**N5**	**N6**	**N7**	**N8**	**N9**
NAME OF STATION									**Factory Premises**
7.00									
8.00									
9.00									
10.00									
11.00									
12.00									
13.00									
14.00									
15.00									
16.00									
17.00									
18.00									
19.00									
20.00									
21.00									
22.00									
23.00									
24.00									
1.00									
2.00									
3.00									
4.00									
5.00									
6.00									

OBSERVATION									
L Min									
L Max									
L_d									
L_N									

N-1	Villlage - Bidyanagar	N-6	Villlage - Khutahna
N-2	Villlage - Imlia	N-7	Villlage - Shahjot
N-3	Villlage - Khuyasa	N-8	Villlage - Siswatia
N-4	Villlage - Ruhanwan	N-9	Factory Site
N-5	Villlage - Indtapur		

3.4.2 EXISTING NOISE ENVIRONMENT

Noise levels were measured once at various locations during Post-Monsoon (1 NOV - 31 JAN 2010), in order to evaluate the ambient Noise level in the study area. Noise monitoring was carried out at 9 locations on hourly basis. The hourly values are given in table- 24.0

The equivalent noise levels in locations are summarized as below in **Table 25.0**

Table 25.0 : Equivalent Noise Levels in the Study Area

Sl. No.	Pollutant Location	Equivalent Noise Levels dB (A)			
		L min	L max	Ld	Ln
N-1	Villlage - Bidyanagar				
N-2	Villlage - Imlia				
N-3	Villlage - Khuyasa				
N-4	Villlage - Ruhanwan				
N-5	Villlage - Indtapur				
N-6	Villlage - Khutahna				
N-7	Villlage - Shahjot				
N-8	Villlage - Siswatia				
N-9	Factory Site				

Note : L_{min} - Minimum Noise Level Recorded

L_{max} - Maximum Noise Level Recorded

L_d - Day Equivalent

L_n - Night Equivalent

The Noise Levels were within the prescribed limits when compared with Ambient Noise Level standards in respect of noise vide rule-3 of Environmental (protection) Rule 1986.

3.5 WATER QUALITY (WATER ENVIRONMENT)

3.5.1 Introduction

- Assessment of baseline data on water quality includes
- Identification of surface water sources
- Identification of ground water sources
- Collection of water samples
- Analyzing water samples collected for physico-chemical and biological parameters

The details of the above are presented below

3.5.2 Surface Water Quality

Surface Water Resources (Shown in table-26.0)

Surface water resources in the study region includes :

1. Deoha river in W direction from the proposed plant site(SWR-1) 3.0 km
2. Mata river in E direction from the proposed plant site (SWF-2) 10.0 km
3. Ambuha river in W from the proposed site (SWR-3) 8.0 km
4. Pangati river in W from the proposed site (SWR-4) 15.0 km.

Methodology

Reconnaissance survey was undertaken and monitoring locations were finalized based on :

- Location of the water bodies
- Usage of the water
- Areas that can represent baseline conditions

Surface water samples were collected from rivers.

3-5-3 Ground Water Quality (Shown in table-27.0)

Most of the villages in the study area depend on ground water source for their domestic and agricultural needs. In order to assess the physico-chemical characteristics of the ground water sources MNE samples were collected, analysed and reported as per Indian Standards IS 10500 (Drinking Water Standards)

Samples

A total of Thirteen water samples (4 surface water and 9 ground water samples) have been collected from the study area. Details of location of water quality monitoring stations is given in **Table 26.0** and represented in **Table 27 .0**

Table: 26.0 Surface Water Quality Monitoring Stations

S.No	Code	Name of Sampling Station	Source of Water
1	SWR-1	River Manwar	Surface Water
2	SWR-2	River Tirhi	Surface Water
3	SWR-3	River Bisuhi	Surface Water
4	SWR-4	River Chandahi	Surface Water

Table: 27.0 Ground Water Quality Monitoring Stations

S.No	Code	Name of Sampling Station	Source of Water
1	GW-1	Villlage - Bidyanagar	Borewell
2	GW-2	Villlage - Imlia	Borewell
3	GW-3	Villlage - Khuyasa	Borewell
4	GW-4	Villlage - Ruhanwan	Borewell
5	GW-5	Villlage - Indtapur	Borewell
6	GW-6	Villlage - Khutahna	Borewell
7	GW-7	Villlage - Shahjot	Borewell
8	GW-8	Villlage - Siswatia	Borewell
9	GW-9	Factory Site	

Observation

Surface Water :

The detailed water quality analysis data are given in Table 28.0 From the analysis of the data the following general observations were made Surface Water Samples.

- It is observed that the pH of the surface water samples is in the range of .....
- Total dissolved solids (TDS) in the samples were in the range ..... mg/l.
- Total hardness of the surface samples was found to vary between ..... mg/l
- Fluoride concentration was found to vary between ..... mg/l
- Heavy metal concentrations in all the samples were found to be well within the limits.

Ground Water (Table- 29.0 - 31.0)

- It is observed that the pH of the ground water samples is in the range of .....
- Total dissolved solids (TDS) in the samples were in the range 252.0 to .....
- Total hardness of the ground water samples was found to vary between ..... mg/l
- Fluoride concentration was found to vary between .....mg/l
- Heavy metal concentrations in all the samples were found to be well within the limits.

Ground water samples collected from all the locations within the study area showed compliance of all parameters with the drinking water standard of IS 10500.

Table -28.0

SURFACE WATER QUALITY OF THE STUDY AREA						
SL. NO	**PARAMETRS**	**RESULTS**				
		UNITS	**SWR 1**	**SWR 2**	**SWR 3**	**SWR 4**
ESSENTIAL CHARACTERISTICS						
	Name of River					
1	Colour	Hazen	<5	<5	<5	<5
2	Odour	-	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable
3	Total Suspended Solids	mg/l	19	21	24	22
4	Turbidity	NTU	9	10	13	11
5	pH	-	7.29	7.31	7.39	7.32
6	Total Hardness as $CaCO_3$	mg/l	62	64	72	70
7	Iron as Fe	mg/l	0.12	0.14	0.18	0.16
8	Chloride as Cl	mg/l	33.7	33.1	39.9	37.2
9	Conductivity	mg/l	144	141.2	154.7	157.9
DESIRABLE CHARACTERISTICS						
10	Dissolved Solids	mg/l	93	98	122	119
11	Calsium as Ca	mg/l	29	30.5	36.2	40.3
12	Magnesium as Mg	mg/l	10.2	9.2	12.3	12.9
13	Copper as Cu	mg/l	BDL	BDL	BDL	BDL
14	Manganese as Mn	mg/l	BDL	BDL	BDL	BDL
15	Sulphate as SO_4	mg/l	27	24.1	33.6	31.2
16	Nitrate as NO_3	mg/l	8.9	9.3	14.3	12.8
17	Floride as F	mg/l	0.9	0.8	0.23	0.21
18	Phenolic Compounds as C_6H_5OH	mg/l	BDL	BDL	BDL	BDL
19	Mercury as Hg	mg/l	BDL	BDL	BDL	BDL
20	Cadmium as Cd	mg/l	BDL	BDL	BDL	BDL
21	Selenium as Se	mg/l	BDL	BDL	BDL	BDL
22	Arsenic as As	mg/l	BDL	BDL	BDL	BDL
23	Cyanide as Cn	mg/l	BDL	BDL	BDL	BDL
24	Lead as Pb	mg/l	BDL	BDL	BDL	BDL
25	Zinc as Zn	mg/l	BDL	BDL	BDL	BDL
26	Sulphide as S^-	mg/l	BDL	BDL	BDL	BDL
27	Cromium as Cr^{+6}	mg/l	BDL	BDL	BDL	BDL
28	Oil & Grease	mg/l	<1	<1	<1	<1
29	Alkalinity	mg/l	56.2	65.7	81.9	82.5
30	Barium	mg/l	BDL	BDL	BDL	BDL
31	Boron as B	mg/l	0.13	0.42	0.43	0.45
32	Sodium as Na	mg/l	14.2	15.3	20.9	23.4
33	Percent Sodium	mg/l	23.1	24.9	27.4	28.2
34	Nitrite as NO_2	mg/l	BDL	BDL	BDL	BDL
35	Nickel as Ni	mg/l	BDL	BDL	BDL	BDL
36	Silver as Ag	mg/l	BDL	BDL	BDL	BDL
37	Dissolved Oxygen	mg/l	6.7	6.5	5.4	5.6
38	Ammonium Nitrate	mg/l	BDL	BDL	BDL	BDL
39	Kjeldhal Nitrogen	mg/l	BDL	BDL	BDL	BDL
40	Free Ammonia	mg/l	BDL	BDL	BDL	BDL
41	Residual Na_2CO_3	mg/l	Nil	Nil	Nil	Nil
42	Dissolved Phosphate	mg/l	BDL	BDL	BDL	BDL
43	Chemical Oxygen Demand	mg/l	10	11	18	16

BDL: BELOW DETACTABLE LIMIT

Table -29.0

DRINKING WATER QUALITY DATA							
SL. NO	**PARAMETRS**	**RESULTS**				**IS 10500 DRIKING WATER STANDARD**	
		UNITS	**DWQ 1**	**DWQ 2**	**DWQ 3**	**DESIRABLE LIMITS**	**PERMISSIBLE LIMITS**
	Name of sampling station						
1	Odour		Odourless	Odourless	Odourless	-	-
2	Taste		Agreeable	Agreeable	Agreeable	-	-
3	Colour	Hazen	Colourless	Colourless	Colourless	5	25
4	pH		7.56	7.62	7.58	6.5 to 8.5	6.5 to 8.5
5	Turbidity	NTU	0.3	0.6	0.1	5	10
6	Total Hardness as $CaCO_3$	mg/l	201.3	222.9	254.3	300	600
7	Iron as Fe	mg/l	0.085	0.098	0.09	0.3	1
8	Chloride as Cl	mg/l	91.2	92.3	89.3	250	1000
9	Dissolved Solids	mg/l	289.3	295.7	297.3	500	2000
10	Calcium as Ca	mg/l	129.6	132.1	133.5	75	200
11	Copper as Cu	mg/l	BDL	BDL	BDL	0.05	1.5
12	Manganese as Mn	mg/l	BDL	BDL	BDL	1.1	0.3
13	Sulphate as SO_4	mg/l	11.2	10.9	13.8	200	400
14	Nitrate as NO_3	mg/l	1.44	1.49	1.51	45	200
15	Floride as F	mg/l	0.2	0.18	0.17	0.6 to 1.2	1.5
16	Mercury as Hg	mg/l	BDL	BDL	BDL	0.001	0.001
17	Cadmium as Cd	mg/l	BDL	BDL	BDL	0.01	0.01
18	Selenium as Se	mg/l	BDL	BDL	BDL	0.01	0.01
19	Arsenic as As	mg/l	BDL	BDL	BDL	0.05	0.05
20	Cyanide as CN	mg/l	BDL	BDL	BDL	0.05	0.05
21	Lead as Pb	mg/l	BDL	BDL	BDL	0.05	0.05
22	Zinc as Zn	mg/l	BDL	BDL	BDL	5	15
23	Cromium as Cr^{+6}	mg/l	Absent	Absent	Absent	0.05	0.05
24	Pesticides	mg/l	Absent	Absent	Absent	Absent	Absent
25	Alkalinity	mg/l	92.3	93.7	91.8	200	600
26	Boron as B	mg/l	Nil	Nil	Nil	1	5
27	Magnesium as Mg	mg/l	9.3	10.3	11.8	30	100
28	MPN of Coliform coumt/100 ml	mg/l	Nil	Nil	Nil	10 (E. Coli = Absent)	10 (E. Coli = Absent)

BDL: Below Detectable limit

Table -30.0

DRINKING WATER QUALITY DATA							
SL. NO	**PARAMETRS**	**RESULTS**				**IS 10500 DRIKING WATER STANDARD**	
		UNITS	**DWQ 4**	**DWQ 5**	**DWQ 6**	**DESIRABLE LIMITS**	**PERMISSIBLE LIMITS**
	Name of sampling station						
1	Odour		Odourless	Odourless	Odourless	-	-
2	Taste		Agreeable	Agreeable	Agreeable	-	-
3	Colour	Hazen	Colourless	Colourless	Colourless	5	25
4	pH		7.78	7.81	7.75	6.5 to 8.5	6.5 to 8.5
5	Turbidity	NTU	0.2	0.7	0.8	5	10
6	Total Hardness as $CaCO_3$	mg/l	278.3	275.1	260.4	300	600
7	Iron as Fe	mg/l	0.091	0.08	0.09	0.3	1
8	Chloride as Cl	mg/l	91.9	93.4	93.7	250	1000
9	Dissolved Solids	mg/l	300.2	298.3	289.7	500	2000
10	Calcium as Ca	mg/l	135.6	137.3	132.8	75	200
11	Copper as Cu	mg/l	BDL	BDL	BDL	0.05	1.5
12	Manganese as Mn	mg/l	BDL	BDL	BDL	1.1	0.3
13	Sulphate as SO_4	mg/l	12.5	18.9	19.1	200	400
14	Nitrate as NO_3	mg/l	1.52	1.53	1.49	45	200
15	Floride as F	mg/l	0.15	0.14	0.09	0.6 to 1.2	1.5
16	Mercury as Hg	mg/l	BDL	BDL	BDL	0.001	0.001
17	Cadmium as Cd	mg/l	BDL	BDL	BDL	0.01	0.01
18	Selenium as Se	mg/l	BDL	BDL	BDL	0.01	0.01
19	Arsenic as As	mg/l	BDL	BDL	BDL	0.05	0.05
20	Cyanide as CN	mg/l	BDL	BDL	BDL	0.05	0.05
21	Lead as Pb	mg/l	BDL	BDL	BDL	0.05	0.05
22	Zinc as Zn	mg/l	BDL	BDL	BDL	5	15
23	Cromium as Cr^{+6}	mg/l	Absent	Absent	Absent	0.05	0.05
24	Pesticides	mg/l	Absent	Absent	Absent	Absent	Absent
25	Alkalinity	mg/l	96.3	97.9	95.7	200	600
26	Boron as B	mg/l	Nil	Nil	Nil	1	5
27	Magnesium as Mg	mg/l	11.9	10.8	10.7	30	100
28	MPN of Coliform coumt/100 ml	mg/l	Nil	Nil	Nil	10 (E. Coli = Absent)	10 (E. Coli = Absent)

BDL: Below Detectable limit

Table -31.0

DRINKING WATER QUALITY DATA							
SL. NO	**PARAMETRS**	**RESULTS**				**IS 10500 DRIKING WATER STANDARD**	
		UNITS	**DWQ 7**	**DWQ 8**	**DWQ 9**	**DESIRABLE LIMITS**	**PERMISSIBLE LIMITS**
	Name of sampling station				**Factory Premises**		
1	Odour		Odourless	Odourless	Odourless	-	-
2	Taste		Agreeable	Agreeable	Agreeable	-	-
3	Colour	Hazen	Colourless	Colourless	Colourless	5	25
4	pH		7.78	7.62	7.83	6.5 to 8.5	6.5 to 8.5
5	Turbidity	NTU	0.5	0.4	0.9	5	10
6	Total Hardness as $CaCO_3$	mg/l	271.9	256.1	278	300	600
7	Iron as Fe	mg/l	0.075	0.09	0.1	0.3	1
8	Chloride as Cl	mg/l	92.8	94.2	95.8	250	1000
9	Dissolved Solids	mg/l	299.8	297.1	286	500	2000
10	Calcium as Ca	mg/l	131.2	133.8	138	75	200
11	Copper as Cu	mg/l	BDL	BDL	BDL	0.05	1.5
12	Manganese as Mn	mg/l	BDL	BDL	BDL	1.1	0.3
13	Sulphate as SO_4	mg/l	17.4	16.3	20	200	400
14	Nitrate as NO_3	mg/l	1.5	1.48	1.54	45	200
15	Floride as F	mg/l	0.19	0.12	0.2	0.6 to 1.2	1.5
16	Mercury as Hg	mg/l	BDL	BDL	BDL	0.001	0.001
17	Cadmium as Cd	mg/l	BDL	BDL	BDL	0.01	0.01
18	Selenium as Se	mg/l	BDL	BDL	BDL	0.01	0.01
19	Arsenic as As	mg/l	BDL	BDL	BDL	0.05	0.05
20	Cyanide as CN	mg/l	BDL	BDL	BDL	0.05	0.05
21	Lead as Pb	mg/l	BDL	BDL	BDL	0.05	0.05
22	Zinc as Zn	mg/l	BDL	BDL	BDL	5	15
23	Cromium as Cr^{+6}	mg/l	Absent	Absent	Absent	0.05	0.05
24	Pesticides	mg/l	Absent	Absent	Absent	Absent	Absent
25	Alkalinity	mg/l	91.7	94.9	92	200	600
26	Boron as B	mg/l	Nil	Nil	Nil	1	5
27	Magnesium as Mg	mg/l	9.1	8.9	12.1	30	100
28	MPN of Coliform coumt/100 ml	mg/l	Nil	Nil	Nil	10 (E. Coli = Absent)	10 (E. Coli = Absent)

BDL: Below Detectable limit

3.6 LAND ENVIRONMENT

3.6.1 GEOLOGY OF DISTRICT GONDA (U.P.)

District Gonda occupying an area of 7,352 km2 Is a part of Middle Ganga Plain-West. The territory of Nepal runs in the north-east of the district. On the east the Arrah river separates it from Nepal for some 35 kms while the remaining portion of the boundary is formed by Basti district. The southern borders are washed by the river Ghaghara, across which lies the districts of Faizabad and Bara-Banki. In the west lies the district Bahraich demarcated by various rivers, streams etc. Northern part of the district depicts tarai characteristics. Floods are frequent in the area. This part of the district is unhealthy and famous for malarial fever. Uparhar runs from north-west to south-east a few miles north of the Terhi river and passing through a short distance to the south of Gonda town. The whole tract is raised plateau which is broken by various rivers. These divides it inIb several fertile plains. The Uparhar embraces the part of Utraula, large part of Gonda and a portion of Mahadewa and Nawabganj parganas and is moist area. The level of this area is low about fifteen feet below that of upland and covered with alluvial loam. Because just below the surface of this tract sub-soil water is found, so there is no danger of draught but the floods are very common in the season of abnormal rainfall. This tract comprises whole of Tarabganj tahsil and Paharpur pargana.

The geology of the district does not expose anything except generally Gangetic alluvium with the exception of the boulders detritus brought down from the hills in the north. The slope of the district is slight and runs from north-west to south-east. It is 390 feet above the level of the sea in the north and it drops to 360 feet at Tulsipur and 350 feet at Balrampur. The surface in the central part is higher than this. The Tarhar is lowest part of the district with height ranging from 355 feet at Colonelganj to about 310 feet opposite to Ayodhya. The soils of the district belong to the Aqualfs-Aquefts-Udalfs, Aquents-Fluvents, Ochrepts-Aquepts-Ustalfs, Ochrepts-Orthents-Udaffs and Aquolls-Ustolls sub-order associations. The

soil of the district is not bhur or usar as in other district but in tarai generally a stiff heavy clay is found while at some places it has rich alluvial loam. In uparhar loam predominates and in tarhar it is porous loam with sandy soil. The climate of the district is similar to other adjoining districts, Bahraich and Basti During summer the climate becomes hotest and during winter the coldest. A large proportion of area are under forest in Tulsipur along the Kuwana and Bisuhi rivers and south of the Mankapur and north of Nawabganj. The main trees are sal, assina, haldu, khair etc. Agriculture is the important source of income of the people of the district. About 70 per cent area is under cultivation of which 33 per cent is irrigated. Canals and tubewells are the main sources of irrigation. The district is well connected by roads and rails with other parts of the state arid also has advantages of direct connection with the remote places of all sides.

On the basis of geology, climate, topography soils and natural vegetation the district is sub-divided in the following four sub-micro regions:¬

1. Gonda Tarai
2. Rapti Flood Plain
3. Gonda Plain
4. Ghaghara Khadar

A brief description of these regions is given below:¬-

1. Gonda Tarai: It is situated in the northern part of the district covering major portion of Balrampur tahsil. The northern limit of the region coincides with indo-Nepal international boundary whereas southern limit extends to the high bank of the Rapti river. There are numerous rivulets which drain from north to south direction. These rivulets are wide and change their courses. It is difficult to define the channel of the streams. The surface along these streams are eroded.

   The extent of such erosion decreases as the streams drain southward. During the rains all these streams are flooded and water drain as a sheet rather than gully. The main streams are Gandhela, Kachni, Khanjhar,

Kather, Siria, Nakti, Kataha. Bhambhar etc. Besides above streams Girgithi. Ganeshpur. Baghelkhand and Kohargaddi Tals are very significant. A 100 meter contour passes through the eastern part of the region. The geology of the region is marked with Alluvium and Dun gravels of Recent formation and the soil sub-order association belongs to Aquents-Fluvents. There is a continuous zone of reserved forest spread over along international boundary from one end to other. The important belts of reserved forests are Tulsipur, Rampur, Bankatwa and Bhambhar. These forests are dense mixed jungles mainly of Sal tree. There is lack of irrigational facilities. A few canals are constructed by the diversion of the stream channel. Similarly there are physical limitation in the development of roads. Most of the roads are jeepable and run parallel to the streams. A loop line of the N.E. Railway passes through the region and terminates at Jarwa. Agricul¬ture is mainly rainfed and rice is the main crop. Besides stone quarry is main economic activity in the region. The streams draining in this tract bring a large amount of stone boulders from Nepal Himalayas which are collected here and supplied to other regions of state. Settlements are scattered. The average inter-¬village distance is approximately 3.88 km2. There are 464 villages and two urban centres which are spread over 1803.9 km2 area. It is mainly a rural tract where 449.886 rural population reside. It has the lowest density (261 persons/km2) among all the regions of the district. Tulsipur (12,497) is headquarters of the newly created tahsil whereas pachperwa (9.335) is a block headquarters and a new town.

2. Rapti Flood Plain: The region is situated on both sides of the river Rapti in east-west direction. The north-south extent of this plain coincides with the raised surface which is the limit of the flood water. Rapti flood is a common feature every year. The river enters the district from the west and drains out in the east. Suwawan is the old channel of Rapti which drains in the southern part of the region parallel to it. Pera and Kharjhar are the right bank tributaries. Some natural depressions or tals are also situated here. There are embankments to protect and divert the flood water. A 100 meter contour crosses the region in the eastern part but western side is

still higher than this. The region has Alluvium and Dun gravels (Recent) geological formations. Its soil belongs to Aquolls-¬Ustolfs sub-order association. Due to flood the area is lagging far behind in terms of transport and agri¬culture. The linkages in south of Rapti are more de¬veloped than in the north. Irrigational facilities are absent. Settlements are sparsely located. The average inter settlement distances are comparatively lesser than that in Tarai tract. There are variations in the settlement patterns in north and south of Rapti river also. The total area of the region is 927.8 km2 where 356 rural and 2 urban centres are situated. The break¬up of rural and urban populations is 326.699 and 63.655 respectively. The total density of population of this region is 421. Balrampur (46.058) is an old princely estate and tahsil headquarters. Utraula (17,597) is another tahsil town. The above towns have special significance in the district.

3. Gonda Plain: The region is situated in the centre of the district covering major parts of Utraula and Gonda tahsils. It is a flat plain locally known as Uparhar. The north and south limits of the region is marked by the old high bank of the Rapti and the Ghaghara rivers. The master slope is from north-west to south-east direction. There are numer¬ous streams flowing in the above slope direction and join Ghaghara beyond the region. These streams are Kuwana. Bisuhi and TerhL In the western part Terhi river forms meanders and surface along the stream is also eroded. There are large number of water bodies of different sizes spread over the area. Suhela and Pathri Tals are among them. Being raised surface land. it is devoid from flood havoc. A 100 metre contour passes from the eastern part of the region. Geologi¬cally this region is endowed with Alluvium and Dun gravels (Recent) and its soils pertain to Aquolfs¬Ustolfs-Ochrepts-Orthents-Udolfs sub-order associa¬tion. There are patches of reserved forest spread over along the river sides. Utraula reserved forest along Bisuhi, Kuwana reserve forest along Kuwana. Tikri along Manewar are worth mentioning. Being a plain tract, this region is well served by transport links. There number of main roads which connect the region wilt other parts of the state. Similarly North-Eastern Railway also serve the

area. Although canals are not very prominent yet agricultural persuits are well developed Gonda (70.847) is the district headquarters which is connected with roads and railways with all parts. The total area of the region is 3296.5 km2 where 1.673 villages and 6 towns are situated. It ranks first in rural (1.346.148), urban (110.923) populations as well as in density (442 persons/km2) among all the regions. This fact indicates the development of this region. In comparison to other regions. Mankapur (4,4181) is the centre of Indian Telephone Industry. Other places of significance are Katra (3.630). Khar¬gupur (5,712). Itai Rampur (11,283) and Colonelganj (14.984).

4. Ghaghara Khadar: It is a flood plain locally known as Tarhar. The region is delimited by the extent of flood water of Ghaghara. The area nearby the river Is also called Manjha. In this zone numerous rivulets are situated which are flooded with the back flow of water from the Ghaghara river during rains and cause flood in the entire area Tarhar is slightly higher surface area but liable to flood during heavy rains. To check the extent of flood water embankment has been constructed along the Ghaghara river. This embank¬ment protects the people from flood havoc. Besides, there are number of ox-bow lakes which represent the old course of the rivers. Barpati and Aranga lakes are very prominent. Geology of this region is marked by Alluvium and Dun gravels (Recent) and the soil is of Aquents - FIuvents-Ochrepts-Udalfs-Orthents sub-order association. A part of Tikaria reserved forest falls in this region. Since it is a khadar tract, land productivity is very high. Rabi crops are mainly cultivated. Deve¬lopment of roads are restricted and canals are absent because of physical factors. There are 436 villages and one urban centre spread over an area of 1367.9 km2. The average space between settlements are approxi¬mately 3.36 kilometres. The productivhy of land attracts a large number of people (504.305) to reside in these rural areas. Its rural density is 370 persons/km2. Nawabganj is the only urban centre in this region. It is a famous sugar industry centre.

3.6.2 Soil Sampling and Analysis

Reconnaissance survey was undertaken and monitoring locations were finalized based on Table- 33.0

- Agricultural activity
- Variation in slope, colour, texture, crop growth
- Land usage

Based on the above features Nine locations were selected for analyzing the soil quality status around the proposed project site during Pre-Monsoon (1st Nov-2009 - 31 Jan, 2010). The soil samples were collected from the Core & Buffer Area. All the samples have been analyzed for physico-chemical parameters results are shown in table:33.0

The Sampling Location are shown in the **Table 33.0**

Table: 33.0 : List of Soil Sampling Location

S.No	Code	Name Of Sampling Station	Direction	Distance
1	S-1	Villlage - Bidyanagar	NE	5.4
2	S-2	Villlage - Imlia	SE	6.0
3	S-3	Villlage - Khuyasa	W	4.3
4	S-4	Villlage - Ruhanwan	NW	6.1
5	S-5	Villlage - Indtapur	SW	8.4
6	S-6	Villlage - Khutahna	SE	3.8
7	S-7	Villlage - Shahjot	SW	4.6
8	S-8	Villlage - Siswatia	NE	3.0
9.	S-9	Factory Site	-	-

Note: ***SL - Sandy Loam, C - Clay, SCL - Sandy Clay Loam***

As per the textural class, the soil quality falls under Clay category. Most of the samples are Alkaline in nature except for one sample which is slightly acidic in nature. The pH values obtained are in the range of 6.85 to 7.21.

The nutrients like N, P, K are in moderate concentration in the samples from all nine localities

Texture	Sandy loam.
Nature	Slightly Alkaline
pH Range	6.85 to 7.21
N, P, K Levels	Moderate

The complete analysis of soil quality is given in the **Table-34.0**

Table -34.0

SOIL QUALITY DATA OF THE STUDY AREA

PARAMETERS	UNIT	RESULTS								
		S 1	S 2	S 3	S 4	S 5	S 6	S 7	S 8	S 9
										Factory Premises
pH (1:2 soil water extract)		7.91	7.99	8.06	8.17	8.21	8.14	7.97	8.19	8.24
Electrical Conductivity	µS/ cm	182	192	183	194	198	187	195	181	201
Total Soluble Salts	mg/Kg	203	211	206	213	218	215	207	213	220
Nitrate as N	mg/l	21.6	23.1	22.7	18.9	24.6	23.8	22.6	20.7	25.4
Phosphorous as P_2O_5	mg/Kg	19.6	20.5	18.7	21.6	22.4	20.9	18.1	19.9	23.4
Potash as K_2O	mg/Kg	169	172	180	174	163	183	180	173	186
Sodium as Na_2O	mg/Kg	214.5	217.8	210.6	224.5	227	226.9	212.5	221.5	229
Calcium as Ca	mg/Kg	1945	1951	1948	1951	1955	1947	1953	1949	1957
Magnesium as Mg	mg/Kg	318.9	320.4	311.4	324.5	327.4	316.9	322.6	324.6	329.2
Chloride as Cl	mg/Kg	47.8	49.4	50.2	53.6	57.8	51.4	48.9	46.2	58.6
Organic carbon	%	1.89	1.76	1.99	2.01	1.74	2	1.96	1.88	2.04
Texture		SL	SL	SL	SL	SL	SL	SL	SL	SL
Sand	%	14.8	16.1	11.7	19.8	20.8	17.4	18.8	13.5	21.3
Silt	%	21.5	22.6	24.1	25.8	27.6	26.7	24.9	21.8	28.1
Clay	%	46.3	48.2	41.5	52.8	53.1	49.9	48.7	46.2	53.8
Iron as Fe	mg/Kg	15.6	18.3	19.4	21.6	22.9	16.8	20.4	19.9	23.9
Boron as B	mg/Kg	0.13	0.17	0.22	0.23	0.21	0.19	0.16	0.2	0.25

LOCATIONS :

S-1	Villlage - Bidyanagar	S -6	Villlage - Khutahna
S -2	Villlage - Imlia	S -7	Villlage - Shahjot
S -3	Villlage - Khuyasa	S -8	Villlage - Siswatia
S -4	Villlage - Ruhanwan	S -9	Factory Site
S -5	Villlage - Indtapur		

3.6.2.1 MICROBIAL QUALITY OF SOIL

Microbial organisms like total heterotrophs, fungi and actinomycetes have also been carried out by plate count method. The purpose of the examination of soil samples is to assess the microbial population in the soil samples, which are good indicator organisms for soil fertility.

Total Heterotrophs count ranged from 128 to 218 x 10^5 while fungi is ranged from 68 to 126 x10^5 and 48 to 96 x10^5 respectively. The total count of heterotrophs is soils are comparatively higher than fungi and actinomycetes. The microbial population values are not abnormal and are not indicating any soil contaminations (Table 35.0)

TABLE 35.0

MICROBIAL QUALITY OF SOIL SAMPLES IN STUDY AREA

Sr. No.	Location	Total Heterotrophs CPU x 10^5	Fungi CPU x 10^5	Actinomyceties CPU x 10^5
1.	Villlage - Bidyanagar			
2.	Villlage - Imlia			
3.	Villlage - Khuyasa			
4.	Villlage - Ruhanwan			
5.	Villlage - Indtapur			
6.	Villlage - Khutahna			
7.	Villlage - Shahjot			
8.	Villlage - Siswatia			
9.	Factory Site			

3.6.3 LAND USE AND AGRICULTURE : (DATA CHANGE KARNA HAI)

Table 36.0 gives land use pattern of Distt. Pilibhit and Block-Barkhera in which proposed site is situated. The data pertaining to the ratio of the net to total cultivated area, area cultivating food crops. Total irrigated area have been included in this table.

Table 37.0 contain the relevant data, under different crops of cereals, dals, oil seeds and miscellaneous crops including sugar cane.

Table 38.0 contain the number and the corresponding areas in hectares of Various sizes of land holding i.e. less than 0-5 ha, 0-5-1-0ha, 1.0 – 2.0ha 2.0 – 4.0ha, 4.0 – 10 ha, and over 10 hectare has been shown is this table.

Table 39.0 contains area irrigated by different source of medium of Distt. Pilibhit and Block - Barkhera like canal, own tubewell, well, ponds and other sources.

TABLE -36.0

LAND USE PATTERN OF DISTT-PILIBHIT AND BLOCK-BARKHERA

IN WHICH PROPOSED SITE IS SITUATED

S.No.	Classification	Area (Hectare)
1.	Total reported land	
2.	Forest	
3.	Banjar Land fit for cultivation	
4.	Current fallow land	
5.	Other fallow land	
6.	Usar not fit for agricultural purposes	
7.	Garden/Bagh/Shrubs	
8.	Pasture land	
9.	Zaid crop	
10.	Kharif crop	
11.	Rabi	
12.	Net irrigated area	
13.	Gross irrigated area	
14.	Land prepared for cane	

The figures inside the brackets pertain to the whole of the Block-Barkhera.

TABLE -37

AREA UNDER DIFFERENT CROPS (Hectare)

OF DISTT. -PILIBHIT AND BLOCK-BARKHERA

1. Rice
   - (i) Total –170599(15305)
   - (ii) Irrigated-169719(15305)

2. Wheat
   - (i) Total – 173247(15594)
   - (ii) Irrigated – 173149(15594)

3. Jawar
   - (i) Total – 4 (0)
   - (ii) Irrigated - 1 (0)

4. Bajra
   - (i) Total – 10 (2)
   - (ii) Irrigated – 0 (0)

5. Maize kharif
   - (i) Total – 372 (0)
   - (iii) Irrigated - 6 (0)

6. Maize Zaid
   - (i) Total – 60 (0)
   - (ii) Irrigated – 59 (0)

7. Sawa Kharif
   - (i) Total – 0 (0)
   - (ii) Irrigated – 0 (0)

8. Sawa Zaid
   - (i) Total – 9 (5)
   - (ii) Irrigated – 5 (5)

9. Kodo
   - (i) Total – 0 (0)
   - (ii) Irrigated - 0 (0)

10. Barley
    - (i) Total – 14 (0)
    - (ii) Irrigated – 6 (0)

11. Urad Total
    - (iii) Total – 257 (6)
    - (iv) Irrigated - 60 (1)

12. Massor
    - (i) Total – 4515 (379)
    - (ii) Irrigated - 12 (0)

13. Moong Total
    - (i) Total – 23 (0)
    - (ii) Irrigated - 4 (0)

14. Gram
    - (i) Total – 6 (1)
    - (ii) Irrigated - 0 (0)

15. Arhar
    - (i) Total –82 (9)
    - (ii) Irrigated - 0 (0)

16. Tobacco
    - (i) Total – 2 (2)
    - (ii) Irrigated – 2 (2)

17. Total Dal
    (i) Total – 5108 (404)
    (ii) Irrigated-166 (1)

18. Sanai
    (i) Total – 116 (0)
    (ii) Irrigated – 0 (0)

19. Mustard
    (i) Total – 7480 (1184)
    (ii) Irrigated - 7267 (1184)

20. Haldi
    (i) Total – 4 (0)
    (ii) Irrigated – 4 (0)

21. Pea
    (i) Total – 225 (9)
    (ii) Irrigated - 90 (0)

22. Fodder (Rabi)
    (i) Total – 2710 (156)
    (ii) Irrigated – 2696 (156)

23. Til
    (i) Total – 6820 (245)
    (ii) Irrigated - 24 (0)

24. Fodder (Kharif)
    (i) Total – 4172 (326)
    (ii) Irrigated – 178 (2)

25. Ground Nut
    (i) Total – 687 (0)
    (ii) Irrigated – 12 (0)

26. Fodder (Zaid)
    (i) Total – 2205 (111)
    (ii) Irrigated – 2181 (111)

27. Cane
    (i) Total – 44817 (5849)
    (ii) Irrigated– 44157 (5840)

29. Potato
    (i) Total – 579 (51)
    (ii) Irrigated – 579 (51)

TABLE – 4.8

LAND HOLDING SIZES OF DISTRICT - PILIBHIT

Classification	No	Area (Sq.- Hectare)
Less than – 0.5	79657 (8381)	19774 (2140)
Between - 0.5 - 1.0 ha	44567 (4688)	31555 (2417)
Between – 1.0 – 2.0 ha	41416 (4800)	58042 (6727)
Between – 2.0 – 4.0 ha	23229 (2906)	62126 (7598)
Between – 4.0 – 10 ha	7632 (843)	41014 (3880)
10 ha and above	581 (64)	9346 (812)

TABLE – 4.9

AREA IRRIGATED BY DIFFERENT SOURCE OF MEDIUM OF DISTT. PILIBHIT (IN HECTARE)

(i) Total Irrigated area	219521 (22890)
(ii) Area irrigated by canal	43276 (8326)
(iii) Own Tubwell	105048 (14177)
(iv) Govt. tubewell	537 (386)
(v) Well	68043 (0)
(vi) Ponds	59 (0)
(vii) Other Sources	2558 (0)

The figures inside the brackets pertain to the whole of the Block-Barkhera

3.7 BIOLOGICAL ENVIRONMENT (TERRESTRIAL ECOLOGY)

The inventory on terrestrial ecology has been compiled through data collection from marshes, irrigation canals, agricultural land and groves. The information has been supplemented through field survey of selected villages, as there is no dense habitation.

The area under the Gangetic region of phytogeography is virtually devoid of any natural forests as the area is under intensive cultivation since long. List of Plants, Grasses & Shrubs and Exotic Flora encountered in the study area are presented in Tables - 4.43-4.45, respectively.

As per the records Dr. Butter (1839) stated that tigers and wild buffaloes were found in addition to Hyena, occasional Nilgai, Black buck, Deer, Leopard, Wild dog etc. However, these wild animals have disappeared from the region due to rapid increase in human population and interference of intensive agriculture clubbed with industrial development.

The domestic animal present in the area are listed in Table 4.53. A list of wild life compiled based on investigation, reports of Forest Office, Local inhabitants, University & Zoological Survey of India Officials is given in Table 4.47.

As mentioned above, the innumerable marshes spread over north-eastern half of the study area hosts most of the tropical species of birds saving pelicans, flamingo and a few other migrated birds.

A good number and variety of birds typified by - Adjutant Crane and White-necked stork, Black-necked Stork, were sighted in-spite of openness of the terrain and human disturbances. The Wildlife protection Act of 1972 and strict vigilance of the Department of Forest have given them some protection. List of Birds observed in the study area is presented in Table 4.48 and a list of reptiles and amphibians recorded in the study area are presented in Table. 4.49.

Table 4.43 : List of Plants Found in the Study Area

Scientific Name	Common Name	Family
Acacia Catechu	Khair	Mimosaceae
Aegle marmelos	Bel	Rutaceae
Anogeissus latifolia	Dhawa	Lythraceae
Bridelia retusa	Khaja	Euphorbiaceae
Bychanania lanzan	Piar	Anacardiaceae
Butea monosperma	Palas	Papilionaceae
Cassia fistula	Amaltas	Caesalpiniaceae
Diospyros melanoxylon	Tendu	Ebenaceae
Emblica officinalis	Amla	Euphorbiaceae
Gardenia latifolia	Papria	Rubiaceae
Holarrhena antidysenteria	Koraya, Khurchi	Apocynaceae
Lagerstroemia parviflora	Adish	Lythraceae
Madhuca indica	Mahua	Sapotaceae
Dry Tropical Riverain Tress		
Albizzia lebbek	Kalasiris	Mimosaceae
Anthacephalus chinensis	Kadam	Rubiaceae
Holoptelia integnifolia	Chibul	Moraceae
Saccopetatum tomentosum	Kavri	Anonaceae
Syzygium cumini	Jamun	Myrtaceae
Terminalia arjuna	Kahu	Combretaceae
Scattered trees		
Acacia nilotica	Babul	Mimosaceae
Ailanthus excelsa	Arru	Simerubaceae
Alstonia scholaris	Chetwar	Apocynaceae
Angle mamelos	Bel	Rutaceae
Artocarpus lakoocha	Barhal	Moraceae

Butea monosperma	Tesu	Papilionaceae
Casearia elliptica	Chilla	Samydaceae
Cassia fistula	Amaltas	Caesalpiniaceae
Cassia siamea	Cassia	Caesalpiniaceae
Emblica offinals	Aonla	Euphorbiaceae
Erthetia leavis	Chamror	Boraginaceae
Eucalyptus citriodora	Eucalptus	Myrtaceae
Ficus bengalensis	Bargad	Moraceae
Ficus glomerata	Gular	Moraceae
Gmelina arborea	Garha	Verbenaceae
Hardwickia pinnata	Anjan	Mimosaceae
Mangifera indica	Aam	Anacardiaceae
Melia azedarach	Bakain	Meliaceae
Saraca asoca	Ashok	Caesalpiniaceae
Prema latifolia	Bakar	Verbenaceae
Prosopis cinararia	Cheonkar	Mimosaceae
Psidium guajava	Amrud	Myrtaceae
Tamarix aphylla	Foras	Tamricaceae
Terminalia arjuna	Arjuna	Combretaceae

Table - 4.44 : List of Grasses and Shrubs Found in the Study Area

Grasses		
Scientific Name	**Common Name**	**Family**
Apluda mutica	Bahnjura	Poaceae
Aristida depresa	Safed lappa	Poaceae
Arundo donax	Narkul	Poaceae
Bothriochloa pertusa	Cholijargi	Poaceae
Cenchrus ciliaris	Anjan	Poaceae
Chloria dolichostachys	Saindur	Poaceae
Chrysopogon montanus	Chickwa	Poaceae

Cyndon dactylon	Dub	Poaceae
Desmostachya bipinnata	Dad	Poaceae
Dichanthium annulatum	Janga	Poaceae
Eremopogon faveolatus	Murghaina	Poaceae
Eulaliopsis binata	Sabai	Poaceae
Shrub		
Scientific Name	**Common Name**	**Family**
Adhatoda vasica	Asusa	Acanthaceae
Alangium salcifolium	Akola	Alangiaceae
Balanites aegyptica	Hingola	Simarubaceae
Cajanas cajans	Arhar	Fabaceae
Calotropis gigantean	Madar	Asclepiadaceae
Cannabis sativa	Bhang	Urticaceae
Capparis zeylanica	Hins	Capparidaceae
Cassia occidentalis	Chakwa	Caesalpiniaceae
Cassia spinarum	Karanda	Apocynaceae
Clerodendrum viscosum	Bhant	Verbenaceae
Crotalaria medicaginea	Bansi	Fabaceae

Table 4.45 : List of Exotic Flora Found in the Study Area

Scientific Name	Family
Medicago Polymorpha	Fabaceae
Medicago sativa	Fabaceae
A. ochrolenea	Papaveraceae
A. squamosa	Anonaceae
A. reticulata	Anonaceae
Abutilon cripsum	Malvaceae
Ageratumconyzoides	Asteraceae
Ageratumconysoides honstonianum	Asteraceae
Alternanthera paronychiodes	Amaranthaceae

Alternanthera punges	Amaranthaceae
Althaea ludwigii	Malvaceae
Anagallis arvensis	Primulaceae
Anona muricata	Anonacaae
Argemone maxicana	Papaveraceae
B. rapa	Brasssicaceae
Bixa orellana	Bixaceae
Brassica oleracea	Brassicaceae
Catharanthus roseus	Primulaceae
Cissampelos pariera	Menispermaceae
Citrus grandis	Rutaceae
Caludena lansium	Rutaceae
Cleome spinosa	Capparidaceae
Clitoria ternatea	Fabaceae
Coldenia procumbens	Boraginaceae
Convolvulus arventis	Convulvulaceae
Corchorus crestuans	Tiliaceae
Coronopus didymus	Brasssicaceae
Cynoglossum amabile	Boraginaceae
Dombeya calantha	Sterculiaceae
Indigofera linnaci	Fabaceae
Kleinhovia hospita	Sterculiaceae
Lantana camara var aculeate	Vebenaceae
Lathyrus aphaca	Fabaceae
Lepidium sativum	Brasssicaceae
Magnolia grandiflora	Magnoliaceae
Malva parviflora	Malvaceae
Malvastrum coromendelianum	Malvaceae
Martynia annua	Martyneceae
Medicago lopalina	Fabaceae

Melilotus alba	Fabaceae
Melilotus indica	Fabaceae
Merremia gangetica	Convulvulaceae
Oxalis corniculata	Oxalidaceae
Oxalis corymbosa	Oxalidaceae
Oxalis dehradynesis	Oxalidaceae
Oxalis latifolia	Oxalidaceae
Oxalis pescaprae	Oxalidaceae

Table 4.46 : List of Important Domestic Aminals Found in the Study Area

Sl.No	Scientific Name	Common Name
1.	Bos indicus	Cow
2.	Bubalus indicus	Buffalo
3.	Camelus dromedaries	Camel
4.	Canis familiaris	Dog
5.	Capra hircus	Goat
6.	Equus cabilus	Horse
7.	Equus hemionus	Ass
8.	Felis domesticus	Cat
9.	Ovius polic	Sheep
10.	Sus cristatus	Pig

Table 4.47 : List of Wildlife Found in the Study Area

Scientific Name	Common Name
Rousetius leschnaulti	Fulvous fruitbat
Cynopterus sphinx	Short nosed fruitbat
Moschiola Memina	The Indian mouse
Ratufa indica	The giant squirrel
Funambulus pennanti	5 striped Palm Squirrel
Funambulus palmarum	3 striped Palm Squirrel

Table 4.48 : List of Birds Found in the Study Area

Sl.No.	Scientific Name	Common Name
1.	Acridotheres thristis	The common mynath
2.	Alcedo atthis	Commong king fisher
3.	Anas acuta	Pintail
4.	Anas clypeata	Shoveller
5.	Anas crecca	Common teal
6.	Anastomus oscitans	Openbill strok
7.	Anhinga melanogaster	The India darter
8.	Ardea alba	Large egret
9.	Ardea cinersa	Grey heron
10.	Ardea purpurea	Purple heron
11.	Ardeola grayli	Pond heron
12.	Bubo coromandus	Dusky horned owl
13.	Bubulcus ibis	Cattle egret
14.	Butorides striatua	Little green heron
15.	Ceryle luqubris	Himalyan pied king fisher
16.	Ceryl rudis	Lesser pied king fisher
17.	Charadrius dubius	Little Ringed plover
18.	Charadrius mongolus	Lesser sand plover
19.	Ciconia episcopus	White necked strok
20.	Columba livia	Rock pigeon
21.	Copsychus sanlaris	The magpie robin
22.	Corasius bengalensis	Bluejay
23.	Coturnix coromandelica	Common quail
24.	Crocopus haenicopterus	Green pigeon
25.	Corvus splendens	House crow
26.	Cyanops asiatica	The blue throated barbet
27.	Dendrocygna bicolor	Large whistling teal
28.	Dendrocygna Javanica	Lesser whistling teal

29.	Dicrurus adsimilis	Black drongo
30.	Dicrurus macrocereus	The king crow
31.	Egretta garzetta	Little egret
32.	Egretta intermedia	Smaller egret
33.	Eudynamix scolopaceus	The koel
34.	F. francolinus	Black partridge
35.	Falco tinnunculus	Kestrel
36.	Francolinus pondicerianus	Grey partridge
37.	Fulica atra	Coot
38.	Gyps fulvus	Briffin vulture

Table 4.49 : List of Reptiles & Amphibians Found in the Study Area

Reptiles (Snakes)		
1.	Bangarus fasciatus	Banded krait
2.	Bungarus caerulus	Krait
3.	Dryophis nyeterizans	Green whip snake
4.	Enhydris enhydris	Indian river snake
5.	Enhydris sieboldi	White brown spotted river snake
6.	Naja naja	Cobra
7.	Natrix piscator	Water snake
8.	Oligodon amensis	Black barred snake
9.	Ptyas mucosus	Rat snake
10.	Python molurus	Ajagar
Lizards		
11.	Calotes versicolor	Garden Lizard
12.	Hemidactylus brooki	House geckaa
13.	Uromastix hardwickii	Sanda
14.	Varanus monitor	Monitor Lizards
Testudines		
15.	Chitra indica	Narrow headed soft shelled turtle
16.	Geoclemys hamitonic	North Indina fresh water turtle
17.	Hardella thrugi	Brahmny river turtle
18.	Kachua dhongoka	Dhongoksa turtle
19.	Kachua kachua	Bengal roofed turtle

Amphibia		
20.	Bufo melanostictus	Toad
21.	Rana cynophylyctis	Frog
22.	Rana hexadactyla	Frog
23.	Rana limnocharis	Frog
24.	Rana tigrina	Frog
25.	Rhacophorus	Tree Frog
26.	Hyla	Tree Frog
27.	B. Bangalensis	Bandicoot rat
28.	Bandicota indica	Bandiccot rat
29.	Mus muscatus	Mouse
30.	Rathus rathus	House rat

4.6.2 AQUATIC ECOLOGY

The biological species (Fishes, Phytoplankton, Zooplankton etc.) specific for a particular environmental condition are the best indicators of environmental quality, information on the impact of environmental stress on the community structure serves as inexpensive and efficient early warning and control system to check the effectiveness of the measures to prevent damage to a particular ecosystem.

Planktons

Phytoplankton and Zooplankton are indicators of environmental stress. The quantity and quality of such biological species in a particular environment largely depends on various physico-chemical characteristics of water such as pH, conductivity, nutrients, BOD, alkalinity etc. Diversity is an index to measure the level of pollution. With increasing levels of pollution, diversity of plankton decreases. Higher the value of diversity, higher the stability to resist the adverse environmental factors.

The field sampling was undertaken at the following two locations during 1st Nov 2009 - 31st Jan 2010. A1, A2. A summary of data on phytoplankton and zooplankton is depicted in Tables. 4.50 and respectively. It can be seen from the data that the river does not exhibit

any major chage in the biotic features while flowing in the study area. The overall biotic composition indicates that the river is polluted.

Macrophytes

Species of Cyperus, Scirpus, Echinochola, Oryza and Brachiaria are common weed grases found in the study area. Pistia Eichornia, Naja indica, Hydrilla verticillata, Lemna, Spirodela are also common.

Fishes

The fish fauna of the river Ghaghra as reported by local people are listed in Table 4.51.

3.7.4. PLANKTONS

Phytoplankton and Zooplankton are indicators of environmental stress. The quantity and quality of such biological species in a particular environmental largely depends on various physico-chemical characteristics of water such as pH, conductively, nutrients, BOD, alkalinity etc.

Diversity is an index to measure the level of pollution. With increasing levels of pollution, diversity of plankton decreases. Higher the value of diversity, higher the stability to resist the adverse environmental factors. Generally, the Shannon Weaver formula to measure the diversity index in both the cases is used. According to this formula for clean water, the diversity index in case of phytoplankton should be 6 it may differ slightly in different locations. Decreases in the value of index indicates pollution. For zooplankton index value 3 and above indicates healthy conditions, values between 1 and 2 show mild pollution.

The summary of plankton/Zooplanktons of River Sharda / Khanda depicted in Table 42.0 & 43.0. Results shows that Rivers are free from pollution.

TABLE : 42.0 : Summary of Phytoplankton of River Sharda& Khandwa

Sampling Station	Period	Dominant	TNIS/ml	Organisms in Groups		Shanon Weaver's index
Sharda River	Dec 2009	*Chlymydononas* *Gonium* *Nitzschia* *Mircrocystis* *Phacus*	80	*Chlorophyceae* *Cyanophyceae* *Euglenophyceae* *Baccillariophyceae*		7.23
Sharda River	Jan 2010	*Pediastrum* *Phacus* *Udorina* *Oscillatoria* *Chlamydomonas* *Lyngbya* *Anabaena* *Microcystis*	42	*Chlorophyceae* *Cyanophyceae* *Euglenophyceae* *Baccillariophyceae*		7.28
Khandwa River	Dec 2009	Fragilaria Oscillatoria Udorina Gonium Pediastrum Navicula Phacus Nitzschia	60	Chlorophyceae Cyanophyceae Euglenophyceae Baccillariophyceae		6.27
Khandwa River	Jan 2010	Chlamydomonas Euglena Gonium Pediastrum Nitzschia Navicula Synedra	54	Chlorophyceae Cyanophyceae Euglenophyceae Baccillariophyceae		6.68

ABLE : 43.0 : Summary of Zooplankton of River Sharda& Khandwa

Sampling Station	Period	Dominant	TNIS/ml	Organisms in Groups		Shanon Weaver's index
River Sharda	Dec 2009	Polyartha Keratella Moina Vorticella Polyphemus Daphnia	25	Rotifers Crustaceans		3.84
River Sharda	Jan 2010	Polyartha Filnia Moina	23	Rotifers Crustaceans		3.28
River Khandwa	Dec 2009	Moina Cyclops Mesocyclops Diffugia	42	Rotifers Protozoans Curstaceans Copepodes		3.26
River Khandwa	Jan 2010	Polyartha Daphnia Filnia Moina	54	Protozoans Rotifers Curstaceans		3.42

3.8 SOCIO-ECONOMIC ENVIRONMENT :

3.8.1 DEMOGRAPHY OF THE AREA :

Demographic features of Distt-Gonda, Block-Jhanjri, Vill-Kundarki, in which the Sugar factory is to be establish have also been included in this section. Table 4.36 to 4.37 contains data pertaining to the number of habitated and inhabitated villages sex-wise rural population, area in Km, number of houses and households, sex-wise population of scheduled casts and scheduled tribes, the number of persons engaged in agriculture, animal husbandary, in mining, household and non house-hold industries and in activities like construction, trade and commerce, transport and communication and other miscellaneous work. It also includes statistics on literacy & population based classification of villages.

AVAILABILITY OF INFRASTRUCTURAL FACILITIES :

Table 4.38 & 4.39 which contains the data on the available infrastructure has been divided into 3 parts A, B, C Part A contains information about the availability of biogas plants, electrified villages as a percentage of total, length of pucca roads/thousand sqKm. Area and per lakh of population. It also contains the number of higher secondary schools, commercial banks police stations, fair price grain shops and the distance of the nearest railway station from the head quarter of Jhanjri Block Development office.

The part B contains information regarding the distances of the villages from the nearest fair price shops. The part C provides information on the distance from the villages of the nearest available infrastructure facilities, such as repair facilities for agriculture implements, bazzars/Haats, veterinary hospitals etc. The part gives the whole sale markets, cold storages, seed godowns, veterinary hospitals etc. The part D gives the status of electrification of villages. It contains information on electrification, including electrified villages and those in which L.T. main lines have been provided. It also contains information on the no of tubewells/pumps sets energized, in Table - 4.40.

MEDICAL AND HEALTH SERVICES :

The table 4.41 provides information on the availability of medical and health services for all the three currently popular systems of medicine in block.

A perusal of this table will indicate fixed there are One allopathic hospitals, dispensaries and 06 primary health centres in this block. The entire doctor staff, which is available in the block, is 5 medical personnel.

EDUCATIONAL FACILITIES :

Educational facilities available in the block-Jhanjri are presented in table 4.42. There are 117 Junior basic schools, 21 Senior basic schools, 07 Higher Secondary School, are available in which 460 Teachers are working and approx. 5231 students are studying.

HUMAN RESOURCES DEVELOPMENT :

The information in respect of education facilities has been presented in table 4.42

TABLE 4.36 : DEMOGHAPHY OF DISTT. - GONDA

DETAILS	Population	Male	Female
Population - Total	2765586	1451101	1314485
Population - Rural	2571267	1346004	1225263
Population - Urban	194319	105097	89222
Population (0-6)	536566	274891	261675
SC Population	433491	227851	205640
ST Population	182	104	78
Number of literates	949342	663292	286050
Number of illiterates	1816244	787809	1028435
Total Workers	939094	731854	207240
Main workers	697223	622302	74921
Marginal workers	241871	109552	132319
Non workers	1826492	719247	1107245
Cultivators	560442	462047	98395
Agricultural labourers	224190	137231	86959
Workers in household industries	25450	18812	6638
Other workers	129012	113764	15248
No. of Households			429606
Household size			6.0
Proportion of Urban population (%)			7.0
Sex Ratio (females per 1000 males)			906
Sex Ratio (0-6 Years)			952
Sex Ratio (SC)			903
Sex Ratio (ST)			750

TABLE - 4.37 : DEMOGRAPHY OF VILL - KUNDARKI

DETAILS	Population	Male	Female
Population - Total	357	185	172
Population - Rural	357	185	172
Pupulation - Urban	0	0	0
Population (0-6)	80	37	43
SC Population	72	37	35
ST Population	0	0	0
Number of literates	130	96	34
Number of illiterates	227	89	138
Total Workers	99	97	2
Main workers	95	93	2
Marginal workers	4	4	0
Non workers	258	88	170
Cultivators	85	83	2
Agricultural labourers	1	1	0
Workers in household industries	3	3	0
Other workers	10	10	0
No. of Households			61
Household size			6.0
Proportion of Urban population (%)			0.0
Sex Ratio (females per 1000 males)			930
Sex Ratio (0-6 Years)			1162
Sex Ratio (SC)			946
Sex Ratio (ST)			0

TABLE 4.38

INFRASTRUCTURE

A- INFRASTRUCTURE AVAILABILITY IN BLOCK - JHANJRI

1.	The number of biogas plants per hundred habitated village	380.2
2.	Length of pucca roads (Km) per lacs of population	65.1
3.	Length of pucca roads (Km) per 1000Sq.Km. area	38.5
4.	Length of pucca roads (Km) per 1000 Km. area. Constructed by PWD	65.0
5.	The number of police station	01
6.	The number of Sr. Basic School per laks of population	13.9
7.	No of Junior basic School per lacs of population	77.7
8.	No of Higher Secondary School per lacs of population	4.6
9.	Primary health center per lacs of population	4.0
10.	No of fair price Shops	74
11.	Nearest Railway Station of block	2.0 Km.
12.	Distance from district Head quarter	30 Lm.
13.	Electrified villages as percentage of total Habitated village	63.0
14.	Alopathic hospital & primary health center per 1.0 lacs population	4.0

TABLE 4.39

INFRASTRUCTURE

B- Distance of various Infrastructure facilities of Block Jhanjri

S.No.	Particular	Within Village	Less than 1.0Km	1.0-3.0 Km	3.0-5.0 Km	5.0 Km and above	Total
1.	Vikas Khand	1	3	9	28	121	162
2.	Gram panchyat vikas Kendra	77	2	69	12	2	162
3.	Fair price shop	82	4	60	12	4	162
4.	Drinking water source	162	-	-	-	-	162
5.	Hat Bazar	17	2	40	46	57	162
6.	Whole sale market	-	-	1	4	157	162
7.	Cold Storage	-	-	6	21	135	162
8.	Godown, fertilizer/ Seed/ Inseetiede	2	-	12	24	114	162
9.	Veterinary Hospital	1	5	37	15	104	162
10.	Artificial Insemination centre	1	5	37	15	104	162
11.	Agriculture loan Sahkari Samiti	4	8	64	14	72	162
12.	Sale/Purchase Sahkari Samiti	-	-	-	-	162	162
13.	Govt. Purchase centre	1	3	24	4	130	162
14.	Senior basic School (Boys)	14	10	71	20	47	162
15	Senior basic School (Girls)	-	8	35	59	60	162
16.	Higher Secondary School (Boys)	7	2	8	32	113	162
17.	Higher Secondary School (Girls)	-	-	2	1	159	162
18.	Ayurvedi Hospital/Alopathic	4	8	41	25	84	162
19.	Homeopathic Hospital	-	-	-	-	162	162
20.	Pitch Road (Pucca)	87	4	41	20	10	162
21.	Family Planning center	12	6	63	21	20	162
22.	Post Office	18	14	83	11	36	162
23.	Telegraph Office	-	-	-	2	160	162
24.	Phone (PCO)	46	-	41	28	47	162
25.	Railway station/Halt	-	7	49	16	90	162
26.	Bus Stand/Stop	4	9	56	19	74	162
27.	Post Office Saving bank	15	9	81	10	47	162
28.	Bank Co-operative/industrial	4	-	38	42	78	162

TABLE 4.40

C- STATUS OF ELECTRIFICATIONS OF BLOCK - JHANJRI

No. of Electrified Villages (as per defination)	No. of Villages in which L.T. Lines provided	No. of Electrified Harijan Basti	No. of energized private tubwells/ Pumping sets
102	48	54	280

TABLE 4.41

MEDICAL AND HEALTH SERVICES IN BLOCK - JHANJRI

No. of allopathic Hospital (Govt.)	No. of Primary Health Centre	No. of beds available	No. of Doctors available	Paramedical	Other
01	06	50	5	41	5

TABLE 4.42

EDUCATIONAL FACILITIES IN BLOCK - JHANJRI

S.No.		No. of School/ College	No. of Teachers	No. of Students
A.	Junior basic school	117	260	2302
B.	Senior basic school	21	86	2216
C.	Higher Secondary School	7	122	713
D.	Degree College	-	-	-
E.	Post-graduate College	-	-	-
F.	Technical training centre ITI	-	-	-

CHAPTER 4

PREDICTION AND ASSESSMENT OF IMPACT

4.1 IMPACT IDENTIFICATION

The environmental consequences, which may get affected by activities undertaken by the industry, are identified in this section. Those aspects of the environment, which are likely to be damaged or disturbed due to implementation and continuation and/or up-gradation of the project, are. represented as parameters. As the first step towards, prediction and assessment, the various activities during the construction and operational phase, which are likely to cause an impact on these parameters, have been listed. The next step would be to evaluate quantitatively and qualitatively the impact imposed on the various aspects of the environment. For evaluation of impacts due to proposed manufacturing activities of the unit, the baseline data of environment parameters related to ongoing/proposed industrial activity have been superimposed on the present environmental setting data. The changes in the environmental parameters and their impact, whether short term or long term, are predicted and are discussed in detail; -

4.1.1 Aspects of The Environment

The aspects of the environment have been segregated as mentioned below:

- Air pollution levels
- Water pollution levels
- Soil, topology, subsurface condition.
- Vegetation and natural areas
- Surrounding land use and physical character
- Infrastructure and public services
- Socio-economic development

4.1.2 Activities which can create impact

4.1.2.1 Construction Phase:

	Type of Activities		Potential Impacts
1.	Level And Road Laying		Dust emission, Soil Compaction change in traffic pattern
2.	Earthwork comprising of excavation, grading, trenching		Increase in erosion, soil compaction, increase in transport facilities; increase in employment.
3.	Foundation Work		Dust emission, Noise, Decrease in water table
4.	Mechanical erection		Noise, fumes due to welding, generation of used welding rods

4.1.2.2 During Operational Phase :

	Type of Activities		Potential Environmental Impacts
1.	Trial runs and manufacturing activities		Gaseous emission. Noise, increase in vehicular traffic, increase in employment.
2.	Material Handling		Noise, Visual. Impact, Dust Emission.
3.	Utilities		Increase in traffic, increase in services.
4.	Tree plantation		Visual, Decrease in run off, Increase in ground water table.

4.2 PREDICTION AND ASSESSMENT OF IMPACTS DURING CONSTRUCTION ACTIVITES

This project would be installed in the phased manner. As the installation of the power plants is to be undertaken progressively; the time period of the constriction activities will be elongated. Due to this, the following short term impacts will be incurred on the environment for a period of time. However, due care will be taken to take best suitable measures and complying all the applicable rules and regulations to minimise the negative impacts if any to the environment.

4.2.1 Air Environment

The major construction activities from which air emission may occur are; excavation, loading and unloading of material, operation of batching plant etc.

To minimise the air pollution during the construction stage; following mitigation measures are proposed:

- Water will be sprayed for dust suppression.
- The sand and other such dispersible material will be stored at site for minimum working period.
- Tarpaulin or jute covering will be used wherever required to catch the dust spreading into atmosphere.
- The equipment design shall be chosen for least suspension of dust/sand into atmosphere.

These impacts on air environment will be negligible and short-term.

4.2.2 Water Environment

Ground water through tube wells will be utilised for the construction phase. There will not be any impact on availability of natural resources during this stage.

The wastewater generation will be from the domestic activities; which will be disposed off through septic tank/soak pit system.

4.2.3 Noise Environment

The noise generated from construction machinery shall be kept low by keeping the moving parts serviced and properly lubricated.

The noise imp6cts will be local; limited to the premises and short-term;

4.2.4 Socio-economic Environment:

During the constriction activities, there shall be major positive impacts on the socio- economic environment of the region. During construction activities, there shall be employment generation as direct impact the indirect impacts shall be brought about with the welfare activities

proposed by the industry. The unit shall be equipped with the. medical and other facilities; which shall also kept open for local population.

4.3 PREDICTION AND ASSESSMENT OF IMPACT ON AIR ENVIRONMENT

4.3.1 General:

Quality of the air environment plays very critical role for all living organism, as Air is a prime requirement for life. In nature, there exists a balance between the constituents of air which helps the environment to be in equilibrium. The industrial activities have started disturbing the natural equilibrium of the environment. Air pollution can be defined as the unbalanced state of the environment.

The term air pollution for considering environmental impact will broadly cover the following things:

1. Focusing on the out-door atmosphere without covering the industrial working - environment.
2. Pollution caused by single contaminant gas or particulate or by combination thereof
3. Concentration of air pollutants
4. Duration of exposure or the persistence of a given concentration level of pollutant
5. Effects of air pollutants on living things, inanimate objects and the aesthetic feature of the area.
6. Air Pollution due to construction activities/due to traffic.

4.3.2 Identification of Air Pollutants

The process emissions from the Power generation activity include dust particles & SO_2. The emissions from Crusher house, screen house involve particulate matter only. Fool-proof air pollution control measures are installed at various sources for abatement of pollution. The industry has installed bag-houses. Electrostatic precipitators for reducing the dust

emission from different sources. The detailed description along' with the total dust load to atmosphere is calculated base on the equipment efficiency enumerated below:

4.3.2.1 Waste Load Study

Details of all the flue gas stack and process gas stacks are as follows:

1. Power plant stack

		Proposed Stack 1
Boiler Capacity	TPH	190x2 (Coal based)
Stack Height	Meter	110.0
Stack Diameter	Meter	2.8
Flue Gas Exit Velocity	m/sec.	15.0
Flue Gas Exit Temperature	K	428.0
Volumetric Flow Rate	Nm^3/hr	334493.44
Coal Consumption	Tons/hr	67.0
Emission Rate		
SPM*	g/sec	9.85
SO_2*	g/sec	222.2

2. Crusher House Stack

Stack attached to : Crusher House and Screen House

Air Pollution Control Mechanism : Bag house

Stack height from GL : 30 m

Stack Dia. at sampling point : 0.6 m

Pollutants load : 0.21 gm/sec

4.3.3 Summary of air pollution control measures

The industry has provided efficient air pollution control system attached to all the equipment prone of emitting any dust load. Maintenance is carried out regularly to check proper functioning of the equipment. Regular checks are carried out to confirm the efficiency of dust collectors, bag-filters, ESP etc.

4.3.4 Assessment of Air Impact based on Application of ISCT$_3$ model:

The industry has installed stacks for gaseous emission in the form of flue gas emission. Although, the full-proof air pollution control system will be installed for abatement of air pollution, there is possibility as we have seen above; for minute quantity of gases emitted in the atmosphere. To assess the impact of gaseous emissions through stack, the mathematical model for the Ground Level Concentration (GLC) has been developed by using Gaussian plume equation.

MODELING :

Based on the data, the ground level concentration of various pollutants at different distances within 10-Km radius from the source, the calculation was carried out regarding dispersion.

Stack Height Calculation

The required stack height with the proposed boiler was calculated by using the following formula (EPA Notification, GSR 176(E), 2nd April 1996).

$H=14Q^{0.3}$

Where H = Total stack height in meters from ground level

Q = Sulphur dioxide (SO_2) emission rate in kg/hr

he estimated SO_2 emission rate was 800 kg/hr based on the following designed parameters Coal Consumption: 1600mt/day

Sulpher content: 0.6%

H = 104.01

Therefore the proposed stack height of 110m for the proposed boiler is as per the requirement.

4.3.5 MODELING

Meteorological Data

The hourly micro-meteorological data were recorded near the site continuously for three months November 2009 to January 2010. This site specific hourly met data like wind direction, wind speed, ambient temperature have been used for dispersion modeling.

Determination of Atmospheric Stability

In the present study the Pasquill - Gifford Stability Classes were determined using Turner's method and solar isolation. The hourly solar isolation at Barkhara was determined using equation suggested in "Assessment of impact to air environment: guidelines for conducting air quality modeling", CPCB (1998) - Programme Objective Series: PROBES/70/1997-98.

Application of ISCT3 Model

The impacts of stack emission on the ground level concentration (GLC) of SPM, and SO_2 in the ambient air have been predicted through Industrial Source Complex - Short Term Model (Version 02035). The assumptions made for short-term computations are as follows: -

1. The ISC short-term model for stacks uses the steady state Gaussian plume equation for a continuous elevated source
2. The wind power law is used to adjust the observed wind speed, from a reference measurement height of 10m, to the stack or release height.
3. Calm processing is ignored.
4. The plume rise is estimated by, Briggs formulae.
5. Buoyancy Induced Dispersion is used to describe the increase in plume dispersion during the preliminary phase
6. Stack tip down wash is not considered
7. It is assumed that the pollutants do not undergo any physicochemical transformation and that there is not pollutant removal by dry deposition.

8. Washout by rain is not considered
9. Polar coordinate system has been used for computations, and
10. The model computations have been done for 7 km and isopleths are drawn for the same.

Presentation of Results

Table: 51.0 Highest 24 Hourly Short Term Incremental Concentration

Pollutants	Cumulative Impact (all 3 stacks)			Proposed Stack		
	Incremental GLC μg/m³	Distance (Meters)	Direction	Incremental GLC μg/m³	Distance (Meters)	Direction
SPM	5.0	1000	S	1.35	1000	S
SO_2				30.51	1000	S

The isopleths and wind roses for 24 hourly concentrations of SPM and SO_2 are presented in following figures.

The results show the maximum concentration of pollutant occurs 2000 to 3000 meter distance from the emission source, i.e. the maximum impact of air pollution would be observed within industrial premises. In some case, however the maximum concentration of pollutant was observed at 3 to 10 km distance but these concentrations are very minute and negligible. We consider the worst condition, the Centerline Ground Level concentrations are remaining very well within the norms stipulated by the statutory bodies. The GLCs are calculated based on extreme concentration of the pollutants like SO_2 in the Stack outlet. The actual concentrations will be kept below the allowable norms resulting eventually in reduction in ambient Air concentration. Result shown in Table- 51.0

In general, there is no significant adverse impact on the environment due to gaseous emission from manufacturing activities.

Table - 52.0 Data considered for calculation of GLC

		Existing Stack 1	Proposed Stack 1
Boiler Capacity	TPH	90 X2(Bagasse based)	190x2 (Coal based)
Stack Height	Meter	70.0	110.0
Stack Diameter	Meter	2.6	2.8
Flue Gas Exit Velocity	m/sec.	10.0	16.0
Flue Gas Exit Temperature	K	373.0	428.0
Volumetric Flow Rate	Nm^3/hr	191037.6	334493.4
Fuel	Tons/hr	1500 T/day Bagasse	1600 T/day Coal
Emission Rate			
SPM*	g/sec	5.31	9.85
SO_2*	g/sec	-	222.2

Baggas fired, calculated based on 100 mg/Nm^3 limit, estimated, for coal- 100 mg/Nm^3

The Ground Level Concentration for the proposed power plant considering all the two separate stacks for one power plants & and one sugar plant (existing).

Table No. - 53.0

Pre-Project Scenario (μg/m^3) of Ambient Air Quality observed in the study. (98th Percentile values)

Pollutant Location		TSPM μg / m^3	SO_2 μg / m^3
A-1 :	Villlage - Bidyanagar	129.92	9.90
A-2 :	Villlage - Imlia	127.46	9.80
A-3 :	Villlage - Khuyasa	128.40	9.77
A-4 :	Villlage - Ruhanwan	127.50	9.70
A-5 :	Villlage - Indtapur	127.50	9.75
A-6 :	Villlage - Khutahna	128.00	9.75
A-7 :	Villlage - Shahjot	128.50	9.40
A-8 :	Villlage - Siswatia	127.50	9.80
A-9 :	Factory Site	159.50	13.90

Predicted maximum ground level concentrations computed for 24-hour mean meteorological data of post monsoon season are superimposed on the maximum baseline concentrations obtained during the study period to estimate the post project scenario. The Post Project Scenario with predicted ground level concentrations over the baseline is shown below.

Table No. - 54.0

Post Project Scenario (μg/m³)

24-Hourly Concentrations	Suspended Particulate Matter (SPM)	Sulphur Dioxide (SO_2)
Baseline Scenario (98th percentile) max		
Predicted incremental Ground level Concentration (Max)		
Overall Scenario (worst case)		

Note : The values in parentheses is the CPCB limit for rural and residential areas.

It can be seen that for different stability class the concentration predicted are incremental values and by taking into account the ambient air quality monitoring data, the total values shall be kept with in the norms by induction of appropriate air pollution control measures by the proposed Industry. Also incremental concentration are not significant so as to have a negative impact of environment. Hence it can be concluded that establishment of proposed industry is not likely to adversely affect the air environment of the region.

Results

1.	Resultant concentration of SPM after running of power plant	**μg/m³**
2.	Resultant concentration of SO_2 after running of power plant	**μg/m³**

Note : Oxides of Nitrogen was not modeled because this pollutant has not been considered in the emission standards notification relating to the bagasse/coal fired boilers published till date.

Isopleths for GLC of SPM & SO2 & wind-rose diagrams are shown in Fig. 8 & 9

4.4 PREDICTION AND ASSESSMENT Of IMPACT ON WATER ENVIRONMENT :

4.4.1 General

Water is essential for human, agriculture, industry and commercial use. The industrial activity shall have direct impact on the end users. The water environment broadly covers the following points for consideration of impact.

- Industrial operations, their effect on water quality and ground water potential of study area.
- Identifying potential sources of pollutants focusing specifically on discharge of the wastewater.

ASSESSMENT OF IMPACT

4.4.2 Impact of raw water usage

The main source of water supply for the industrial operations is Tube well and site is not under critical area, permission from CGWA has been granted for extraction of water from ground.

4.4.3 Impact due to Disposal of effluent/sewage:

The main source of wastewater from proposed power plant will be from Cooling' Tower, Boiler Blow Down, Back wash from Softening and DM plant. The major constituents in wastewater generated as Boiler blow down and from Cooling tower, is Total Dissolved Solids (TDS) and that to be utilized after treatment for dust suppression in raw material storage yard and sprinkling on the road or gardening purpose. Flow Diagram of Existing ETP & waste generation is shown in Figure - 10.0 & 11.00

The quantum of water consumed for domestic purposes is 30 m3/day. The sewage emanated from the same is 20 m³/day. The industry has proposed soak pit for disposal of sewage. Hence, no significant impact is proposed due to this parameter.

4.5 PREDICTION AND ASSESSMENT OF IMPACT DUE TO SOLID / HAZARDOUS WASTE

The types of Hazardous/Solid waste are Ash and used/spent oil. Management system for all such types of wastes is discussed in this section. The Ash generated will be handled as follows:

4.5.1 ASH HANDLING SYSTEM

Dry type dense phase pneumatic conveying system is envisaged for ash collection. Ash vassals below each ash discharge point shall be sized based on expected ash generation. ASH evacuation from the ash vessels shall be automatic. The conveying cycle will be staggered by level switch in the ash vessel. One silo is provided for. bed ash and two silos are provided fly ash. Silo is sized for storage based on the following consideration.

Expected ash generation per hour	:	27.0 TPH
Ash generation per day	:	600 MT
Total bed ash generation per day	:	40 MT
Total fly ash generation per day	:	640 MT

Unloading system with ash conditioner shall be provided below ash silo for loading on to covered dumper. Ash silo will be of Plastic Lined construction. One working and one standby compressor shall be provided for supplying the conveying air. Air receiver of suitable capacity shall be provided.

The estimated quality of the proposed ash generation.

Table 55.0 Quality of Fly Ash

Sr. No.	Parameter	Value
1	SILICA	13.4-15.5%
2	FERRIC OXIDE	12.4-14.7%
3	CALCIUM OXIDE	21.8-22.7%
4	MAGNESIUM OXIDE	4.02-4.34%
5	ALUMINA	17.3-20.2%
6	ALKALIES (NA20)	4.9 - 5.04%
7	ALKALIES (K2O)	0.29-0.39%
8	SO_3	18.3-20.1%

4.5.2 ACTION PLAN FOR FLY ASH UTILIZATION

Fly ash will be transpoted through coverd dumper and utilization plan will be as follow:

A. Installation of brick/paver block manufacturing plant.

B. Utilize for soil conditioning.

C. Supply to cement manufacture

D. Road Construction

4.5.3 Spent oil/waste oil:

The waste oil/spent oil discarded after usage shall be collected in the drum and stored at predefined place earmarked for the same. The quantity of the oil will be 300lit/month. The oil shall be sold to registered recyclers.

4.6 PREDICTION AND ASSESSMENT OF IMPACT ON NOISE ENVIRONMENT

The industry is located in rural area away from major human settlement. The adequate steps are proposed to control the noise. The upcoming Power Plant will not result in any significant impact on noise environment. The minor increase in vehicular transportation due to increase material handling will not generate any significant excessive noise. Hence, there shall not be any significant negative impact on noise environment of the study area.

4.7 PREDICTION AND ASSESSMENT OF IMPACT ON SOCIO-ECONOMIC ENVIRONMENT

There will be positive impact on the economic environment. Aesthetic environment, character of community, employment centers and Commercial facilities community facilities and services. With commissioning of this project, there shall be increase in employment generation. Along with the direct emolument in the industry; there shall also be indirect employment opportunities; as the upcoming industrial activity may require many ancillary products/services which are to be captured from the nearby available sources.

In addition, to this, there shall be major impact on power generation factor. The system will work in synchronization with the GEB Power supply. The synchronization will result in optimized utilization of the energy both from GEB and the proposed Power Plant.

The Unit proposes to undertake the Rurc' development activities; which will be concentrating upon the Adult Education Program; provision of Medical facilities; and supporting other development programs as proposed by the villages. The industry proposes to have a group of persons looking after this activity.

4.8 ENVIRONMENTAL IMPACT ANALYSIS :

In this section, area of our focus will be environmental impact analysis. While the quantitative assessment has been already discussed in above subsections, the qualitative analysis is presented below'" The environmental consequences along with their present status, direction of change and the probable final condition is presented in matrix format.

Abbreviations:

A- Major Positive Impact

B- Minor Positive Impact.

C- Major negative impact

D- Minor negative impact

E- Impact exists, its magnitude or direction cannot be determined at present.

4.8.1 Project Elements : Casual Factors

Site preparation; Construction and Erection Phase

Altered element		Operation stage	Initial condition	Direction of change	Possible final condition	Mitigative measures/Remark
A)	**Air Environment**					
	Dust	D	Low	Increase	High	Temporary impact. During the construction activity, civil work may enhance the dusting in addition to transportation activities. It will be curbed by water sprinkling and is limited within project site.
B)	**Water environment**					
1	Ground water table	C	Low	No Change	Low	Industry will use the ground water. No impacts to be observed on existing ground water scenario
2	Quality	E	Good	No change	Good	As there is no discharge of wastewater; there shall not be any impact on ground water quality. The soak-pit shall be provided for labour colony during construction activity
C)	**Ecological Environment**					
1	Open space	D	Good	Decrease	Good	The industry will use 16 acre Land for construction activities
2	Grazing Land	E	Fair	No change	Fair	The land being used is un-irrigated land
3	Vegetation	E	Fair	No change	Fair	The land being used is un-irrigated land

4.8.2 Project Elements : Casual Factors
Operation activities

Altered element		Operation stage	Initial condition	Direction of change	Possible final condition	Potential corrective measures/Remark
A)	**Air Environment**					
a.	Suspended Particulate Matter	C	Fair	Increase	Fair	The flue gases will be discharged through the stacks of adequate height. Full-proof air pollution control system installed at appropriate points of discharge. Due care will be taken for the concentrations remaining in the prescribed norms
b.	Gaseous Emission	C	Fair	Increase	Fair	The system shall work -to keep the concentration of Sulphur Dioxide and Nitrogen Oxides well below the norms
c	Dusting	C	Low	No Change	Low	Tarred roads are provided within the industrial premises. Water is Sprinkled at regular intervals
B)	**Water Environment**					
a.	Water Requirement	E				
1.	Ground water table	E	Low	No change	Low	The Industry proposes to use the Water from Ground.
2.	Quality of intake water	E	Good	No change	Good	Ground water will be used which is well within the standards as per results obtained.
b.	**Disposal of sewage**					
	Quantity	C	Low	Increase	Low	The sewage is disposed off through soak pit/septic tank

Altered element		Operation stage	Initial condition	Direction of change	Possible final condition	Potential corrective measures/Remark
C)	**Land**					
a.	Disposal of Ash	C	None	Increase	Fair	The Bad Ash only will be used for land filling in own land only. The fly ash to be sold to cement manufacturers and brick manufacturers.
b.	Percolation/ Seepage	E	None	No change	None	The wastewater from effluent pit shall be used for gardening, sprinkling on own land only.
D)	**Ecological Environment**					
a.	Vegetation	E	Fair	No change	Fair	The activity of the industry shall not create any impact on vegetation and floral/faunal elements of the study area. In-house green belt shall be developed comprise of various shrubs, plants
b	Flora/founa	E	Fair	No change	Fair	
E)	**Socio Economic Environment**					
a.	Per Capita Income	E	Low	Increase	Fair	The industry will create direct/indirect employment centres due to upcoming project
b.	Population per Sq. Km.	E	Low	Increase	Low	The industry shall employ 50 personnel for the plant
c.	Transportation facilities	E	Good	Increase	Good	Transportation and communication facilities are very well developed in the study area. No alteration due to upcoming activity
d.	Communication facilities	E	Good	No change	Good	
e.	Medical facilities	E	Fair	No change	Fair	No impact on medical facility availability of the study area

F)	**Noise Environment**	D	Low	Increase	Low	• Equipment design shall be kept to keep the noise below prescribed norms • Enclosures shall be provided to moving parts • Periodical lubrication is carried out • Ear-plugs are provided to workers in high-noise area

CHAPTER - 5

ENVIRONMENTAL MANAGEMENT PLAN (EMP)

From construction and operation activities of the process, environmental impact has been identified, predicated and evaluated to mitigate the standards specified by the statutory authority and minimize the impact on eco system Environmental Management Plan (EMP). Environmental Management Plan provided control measures of potential environmental impacts. Environmental Management System for different environmental attributes is discussed in subsequent topics.

	Type of Impact	Mitigation Measures
5.1	**AIR ENVIRONMENT :**	
A)	**Construction Phase :** **a. Excavation**	**a) Excavation :** During excavation, care shall be taken that the excavator shall not release the sand from higher elevation. The piling of sand shall be done uniformly and proper storage shall be maintained to avoid dusting because of wind. If required temporary windshield barrier shall be provided with help of galvanized sheets and bamboos. Water Sprinkling shall be done continuously on the site and periodically on the roads where vehicle movement is more.
	b. Mechanical erection	**b) Mechanical erection:** Fume generation shall be there due to welding and allied activities; this impact will be negligible and restricted to project. Site. The workers would be trained to use welding shields and use safer practices.

	c. Vehicle Movement	**c) Vehicular Movement:** The proper maintenance of construction machines shall be ensured and the engine oils and filter shall be replaced regularly. When the machinery is not in use the engine shall be switched off. All vehicles shall be properly maintained and should have valid PUC registration. This has to be checked periodically.
B)	**Operation Phase :** **Flue gas Emissions :**	
	i) Power Generation	**i) Flue Gas Emissions from Power Plant** The proposed power plant will be operated on coal where SPM, SO_2 and NOx are the major pollutants emitted. The bottom ash generated in the form of clinker is collected in the hoppers. The clinker is ground into ash and used for cement manufacturing. In order to regulate fly ash emission to atmosphere, BHL proposes to install an ESP. ESP of 99.9% efficiency with required number off fields to arrest the particulate emission will be connected to each boiler along with stack of height - 110 mtr. Electro static precipitators will be designed to give a final outlet particulate concentration of less than 50 mg/NM³. Therefore the impact due to particulate emission due to burning of coal leading to raise of suspended particulate concentration in the ambient air is found to be negligible. The fly ash collected in the hopper of ESP will be removed through dry collection system.

	ii) Crusher House	**ii) Crusher House** Crusher house shall be equipped with bag house to control particulate matter.
	iii) Fumes in Ash storage	**iii) Fumes in Ash Storage** Dry pneumatic system is proposed for handling of Ash. Plastic Lined Silo is constructed to store the ash. Water will be regularly sprinkled in the as dykes and the approach roads. Wall of adequate height shall be constructed to control the ash. Section diagram of lined ash pond is shown in Figure- 12.0
	iv. Vehicle Movement	**iv) Vehicular Movement :** The proper maintenance of construction machines shall be ensured and the engine oils and filter shall be replaced regularly. When the machinery is not in use the engine shall be switched off. All vehicles shall be properly maintained and should have valid PUC registration. This has to be checked periodically.
	v) Sewage	**v) Sewage wastewater :** Sewage wastewater generated shall be disposed off through soak pit and septic tank arrangement.
	vi) Process effluent	**vi)** Effluent from factory which is approx 980 m^3 /day will be treated in effluent treatment plant and 100% treated effluent will be recycles/reuse in the process.

5.2	**NOISE ENVIRONMENT**	
	A) Construction Phase :	**i)** During the construction phase the noise levels are expected to rise due to movement of vehicles, equipments and heavy machinery. The mitigation measures will include maintenance of the vehicles and heavy machinery and provision of personal protective equipment to the workers working in high noise level. This impact is supposed to be temporary and restricted within premises.
	B) Operation Phase :	**i)** The major noise generating source in the power plant will be steam turbines. The proposed equipment would be designed for noise levels not exceeding 90 dB(A). Proper encasement of noise generating sources will be done to control the noise levels below 75 dB(A) at plant boundary, wherever feasible. The steam turbine would be housed in a closed building which will considerably reduce the noise. In case of maintenance, the persons working near the steam turbine generator building would be provided with ear muffs. **ii)** In general the following methods will be adopted to control the noise pollution. • The use of concrete and masonry walls and barriers - keeping in view the benefits of stiffness weight and cavity construction and the need to provide well sealed sound attenuating doors and windows.

		• The use of complete or partial enclosures. • Attenuation by use of sound absorbents on walls and fixed or suspended ceilings. • Introduction of control and monitoring rooms having good sound insulation properties. • The reduction or elimination of noise leakage paths • The use of vibration insulation techniques • The use of ducts and plenum chambers • The use of mufflers, sound attenuation and acoustic louvers in air flow paths, taking particular care to direct inlet and discharge an opening away from critical areas wherever possible, so as to take advantage of direct effects. • Proper plantation of trees depending on the wind velocity can reduce noise pollution on the surrounding area. • Providing ear muffs and earplugs to the plant personnel.
5.3	**SOLID WASTE**	
	A) Construction Phase :	**i)** During construction phase major solid waste generated is construction and domestic solid waste. The construction waste will be utilized for leveling and road construction in plant premises. Generated domestic waste will be sent to nearest municipal solid waste landfill sites,

		ii)	The used welding rods will be disposed off through registered metal recyclers.
		iii)	Used oil generated from construction machinery will be collected, stored separately and sold to authorized recyclers.
B)	**Operation Phase :**	**i)**	During operation phase major solid waste generated is-fly ash and bed Ash, which will be approx..-640T/day. Action Plan is prepared as per the guidelines of Statutory authorities; which will be strictly followed. Fly Ash will be utilized by selling to Cement/Brick manufactures.
			Used oil: Very small quantity of used oil shall be generated from the plant. This shall be sent to approved recycler or rousers.

5.4 Socio Economic Impacts

Programs for environmental education and public participation may be developed with the help of audio visual aids to create awareness about the activities. Camps to apprise people of likely environmental hazards due to existing and proposed faculties could be organized. Certain welfare measures will be implemented for the benefit of local population. The operation of the plant will generate direct/indirect employment for local population. No rehabilitation & resettlement is required for the above project area.

5.5 OCCUPATIONAL HEALTH AND SAFETY

Large industries, multifarious activities are involved during construction, erection, testing, commissioning, operation & maintenance, the men, materials and machines are the basic inputs. Along with the boons, the industrializations generally bring several problems one of them is occupational health and safety.

The industrial planner, therefore, has to properly plan and take the steps to minimize the impacts of industrialization and to ensure appropriate occupational health, safety including fire plans. All these activities again may be classified under construction & erection, and operation & maintenance. The proposed safety plan is given below:

5.5.1 OCCUPATIONAL HEALTH

Occupational health needs attention both during construction & erection and operation & maintenance phases. However, the problem varies both in magnitude and variety in the above phases.

CONSTRUCTION & ERECTION

The Occupational health problems envisaged at this stage can mainly be due to constructional accident and noise.

To overcome these hazards, in addition to arrangements to reduce it within TLV's personnel protective equipments shall also need to be supplied to workers.

OPERATION AND MAINTENANCE

The problem of occupational health, in the operation and maintenance phase is hearing loss due to noise. Suitable personnel protective equipments should be given to employees.

The working personnel be given the following appropriate personnel protective equipments.

- Industrial Safety Helmet.
- Crash Helmets.
- Face shield with replacement acrylic vision.
- Zero power plain goggles with cut type filters on both ends.
- Zero power goggles with cut type filters on both sides and blue colour glasses.
- Welder's equipment for eye & face protection.
- Cylindrical type earplug.
- Earmuffs.

- Self Contained breathing apparatus.
- Leather apron.
- Aluminised fiberglass fix proximity suit with hood and gloves.
- Boilersuit.
- Safety belt/line man's safety belt.
- Leather hand gloves.
- Canvas cum leather hand gloves with leather palm.
- Electrical safety shoes without steel tie.

5.5.2 SAFETY AND EMERGENCY PLAN

Safety of both men and materials during construction and operation phases is of concern. The preparedness of an industry for the occurrence of possible disasters is known as emergency plan, which described as Disaster Management Plan (DMP) in Chapter-5. Safety requirement during construction, operation and maintenance phases the safety policy with the following regulations may be observed.

- To allocate sufficient resources to maintain safe and healthy conditions of work.
- To take steps to ensure that all known safety factors are taken into account in the design, construction, operation and maintenance of plants, machinery and equipment.
- To ensure that adequate safety instructions are given to all employees.
- To provide wherever necessary protective equipment, safety appliances and clothing, and to ensure their proper use.
- To inform employees about materials, equipments or processes used in their work, which are known to be potentially hazardous to health or safety.
- To keep all operations and methods of work under regular review for making necessary changes from the point of view of safety in the light of experience and aptitude knowledge.

- To provide appropriate facilities for first aid and prompt treatment of injuries and illness at work.
- To provide appropriate instruction, training, retraining and supervision to employees in health & safety, first aid and to ensure that adequate publicity is given to these matters.
- To ensure proper implementation of fire prevention methods and an appropriate fire fighting service together with training facilities for personnel involved in this service.
- To ensure that professional advice is made available wherever potentially hazardous situations exist or might arise.
- To organize collection, analysis and presentation of data on accident, sickness and incident involving personal injury or injury to health with a view to taking corrective, remedial and preventive action.
- To organize collection, analysis and preventive action.
- To promote through the established machinery, joint consultation in health and safety matters to ensure effective participation by all employees.
- To publish/notify regulations, instructions and notices in the common language of employees.

To prepare separate safety rules for each type of occupation/processes involved in a project.

- To ensure regular safety inspection by a competent person at suitable intervals of all buildings, equipments, work places and operations.
- In operation, the safety guidelines have to be framed in consultation with manufacturer's and be implemented.

Hazard due to Transmission Lines : Transmission Towers would be quite away from the road, hence not posing any hazards.

5.5.3 SAFETY ORGANISATION

CONSTRUCTION & ERECTION PHASE

A Qualified and Experienced safety officer has to be posted. The responsibilities of the safety Officers include identification of the hazardous condition and unsafe acts of workers and advise on corrective ac action, organize training programes and provide professional expert advice on various issues related to occupational safety and health. He is also responsible to ensure compliance of Safety Rules/Statutory provisions.

OPERATION & MAINTENANCE PHASE

When the construction is complete the posting of safety officers shall be in accordance with the requirement of Factories Act and their duties and responsibilities shall be as defined thereof.

SAFETY CIRCLE

In order to fully develop the capabilities in identification of hazardous processes and improving safety and health, safety Circle would be constituted in each area of work. The circle would consist of 5-6 employees from that area. The circle normally shall meet for about an hour every week.

HEALTH AND SAFETY MONITORING PLAN

All the potential occupational hazardous workplace such as chlorine storage area, acid and alkali storage areas will be monitored regularly. The health of employees working in these areas will be monitored once in a year for early detection of any ailment due to exposure to hazardous chemicals.

5.6 WATER ENVIRONMENT & IMPACTS

Water Requirement :

Water requirement of the Power Plant will be total 6984 m^3/day in operational phase. This requirement will be met from borewells.

Table - 56.0

WATER REQUIREMENT (M³/day)

Process		Quality
1.	Cooling, dust suppression, Green best, workshop etc.	6954
2.	Domestic	30
	Total	6984

Factory is located in the tarrai belt of the Uttar Pradesh, plenty of Ground water is available in the region of plant, so no negative impact will be arises. We have also obtained the ground water extraction permission of the quantity @ 6984 m³/day from Central ground water board, New Delhi.

5.7 WATER CONSERVATION AND RECHARGING OF GROUND WATER :

No treated effluent will be discharge from the unit, 100% treated water will be recycled & reuse in the process operations.

The separate net work of storm water drains will be designed to collect the rain water from the roof tops. The water collected from the root tops will be routed to the rain harvesting pits proposed at various locations within the premises.

5.6.3 Waste Water Generation :

Waste water generation will be approx. 986 m³/day from DM Plant, cooling tower & floor washings.

Table : 57.0

Sr. No.	Process	Quantity M³/day
1	DM Plant	72
2.	Cooling Water	842
3.	Floor Washings	72
Total		**986 M³/day**

5.9 WASTE WATER TREATMENTS :

(A) DM Plant (Primary Treatment) :

Collection Pit

Flash Mixer

Neutralization Pit

(B) Cooling Water (Primary Treatment) :

Collection Pit

R O Plant to reduce the Quantity of effluent.

(C) Floor Washing (Primary Treatment) :

Gravity Settler

Final Treatment System for All Streams : (A+B+C)

Existing effluent treatment plant of sugar unit will be used for treatment, which has surplus treatment space, along with sugar in season. Flow diagram enclosed as Figure-8.0

5.10 Green Belt Development

- Adequate green belt will be provided all around the plant and inside the plant premises (approx. 40% of total land).
- Approximately about 2000 plants will be planted annually.
- The green belt will be developed especially around dust generating areas like crushers, screens, conveyors of raw material handling, cooler discharge, magnetic separators and solid waste disposal area are densely covered.
- Two number of nurseries are planned to meet the requirement of plants for green belt development
- Suggested plant species are shown in Table-58.0 to 60.0

Table 58.0: Plant Species Recommended For Reduction Of Noise Level

S.No	Scientific name	Common Name
1	Azadirachta indica	Neem
2	Aegle mamelos	Bel
3	Calbezia trocera	Dhala sirisa
4	Carissa carandas	Karaunda
5	Peltophorum inerme	Perungondrai
6	Saraca indica	Asoka
7	Syzygium cumini	Zaman
8	Tamarindus indica	Imli
9	Pongamia pinnata	Beng
10	Cassia siamia	Chakundi

Table 59.0 : Plant Species Recommended For Protection Against Gases And Particulates

S.No	Scientific name	Common Name
1	Butea monosperma	Dhak
2	Cassia fistura	Amaltas
3	Cassia siamia	Kassod
4	Citrila toona	Mahanim
5	Dalbergia sissoo	Shisham
6	Dillenia indica	Chalta
7	Ficus religosa	Pipal
8	Hardwick binata	Anjan
9	Mathuca indica	Mahua
10	Millingtonia hortensis	Akash nim

Table 60 : Suggested Plant Species For Green Belt Development

Large Plants

S.No	Scientific name	Common Name
1	Cedrreia toona	Mahanim
2	Dalbergia sissoo	Shisham
3	Azadirachta indica	Neem
4	Delonix regia	Gul mohr
5	Millingtonia hortensis	Aksh nim
6	Miomosops elengi	Maulsari
7	Peltophorum inerme	Perungondrai
8	Samania saman	Debdari
9	Thespisia populnea	Paras pipal

Medium Plants

S.No	Scientific name	Common Name
1	Cassia siamia	Kassod
2	Dillenia indica	Chalta
3	Mathuca indica	Mahua
4	Casuriana equisetifolia	Jungali Sum
5	Pongamia pinnata	Beng
6	Tabulia spasiosa	-
7	Ticoma stans	
8	Terminalia catappa	Jangli badam
9	Thevetia peruviana	Pile kamer
10	Lucaena leucocephala	Subabul

Small Plants

S.No.	Scientific name	Common Name
1	Averehoa carabbola	Carabola
2	Nallotus philippensis	Sundur
3	Artaboteys odoratissimus	Madanmast
4	Caesalpinia pulcherima	Gulotora
5	Callistemon lanceolatus	Bottle brush
6	Caryota urens	Mari
7	Cestrum dirunum	Din-Ka Raja
8	Nelia azedarch	

5.11 Proposal for Roof Top Rain Water Harvesting

1	Total roof area (A)	M²	20,000
2	Rain fall per hour (I)	MM	80
3	Run off co-efficient (C)		0.90
4	Discharge M³/hr = 10 CIA	M³	1440 m³/hr.

A. Total Storm water flow : 1440 x 0.75 m³/Hour = 1080 m³/Hour

*Considering coefficient for evaporation / spillage and first flush etc. = 0.25

B. Volume of storm water : 1080 m³ x 0.0833 = 89m³

*Considering 5 min (0.833 hr) retention time :

C. Design of Rain water harvesting pit of size 4.50m dia and depth 3.5 m effective depth.

Volume of 1 no. of RWH pit = 1x3.14 x R² x Depth

= 1x3.14 x (2.25)² x 3.5

= 56.6 M³

D. Design of Rain water harvesting pit = Total Volume /1 No. of RWH pit

= 89.00 / 55.60

= 1.60 or Say 2 Nos.

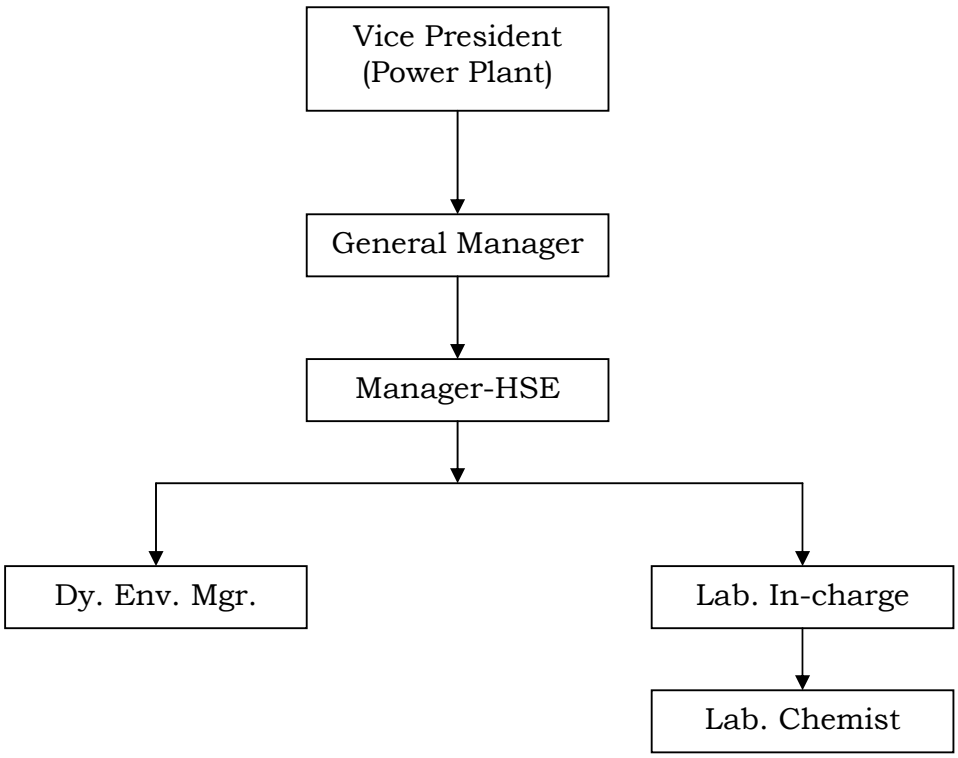
E. Size of Rain water harvesting pit for roof top area 20,000 M²

1	No. of pit	No	2.00
2	Dia of pit	MTR	2.25
3	Depth of pit	MTR	3.50

Design of harvesting pit is enclosed in Figure - 13.0

5.12 Environment management cell

A separate Environment Management Cell will be earmarked for monitoring of pollutants and development of greenbelt as per Environmental Management Plan. Environmental Management Cell (EMC) will meet at least once a month to assess the progress and analyze the data collected for the month. Any deviation/variation noticed shall be immediately taken into consideration for improvement of the same. Yearly action plan of EMP will be updated with respect to results achieved and proposed activities for next year.



5.13 Environmental Monitoring During Operation Phase

Regular monitoring of important parameters is of immense importance to assess the status of environment during plant operation. With the knowledge of baseline conditions, a properly planned monitoring program can serve as an indicator for assessment of any deterioration in environmental conditions. This will facilitate undertaking suitable

measures to mitigate adverse impacts during the operation of the plant and further help to protect the environment in the area.

The main attributes for which monitoring shall be carried out are:

1. Ambient air Quality
2. Stack Emission
3. Wastewater Quality
4. Noise Level
5. Hazardous Waste

5 13.1. Ambient Air Monitoring

Air quality monitoring for sulfur dioxide, nitrogen dioxide and particulate matter will be carried within plant & outside the plant boundary.

5.13.2. Stack Monitoring

Stack emissions shall be monitored, as per the given guidelines for Suspended Particulate Matter, Sulphur Oxide and Nitrogen Oxides.

5.13.3. Water Quality Monitoring

The quality of the treated effluents shall be monitoried as per the mentioned parameters like pH, Temperature, Color, Oil & Grease, Suspended Solids, Ammoniacal Nitrogen, Total Residual Chloride, Nickel, Hexavalent Chromium, Total Chromium, and total metal content.

5.13.4. Noise Monitoring

Noise Monitoring will be carried our inside the plant, within the factory premises and outside the premises as per the frequency and duration suggested by the CPCB.

1. Environmental monitoring plan are shown in Table - 61.0
2. Details of Environmental budget (recurring and capital) are shown in Table - 62.0

Table 61.0 ENVIRONMENT MONITORING PLAN

Sr. No	Activity	Schedule
Meteorological Data		
	Wind velocity. Wind Direction, Temperature, Relative Humidity	Daily or as required by statutory authority
Air Pollution Monitoring		
2.	Stack Monitoring of flue gas stack	Once a month or as specified by Gujarat Pollution Control Board
3.	Ambient Air Quality within premises	Once every fortnight or as specified by Gujarat Pollution Control Board
4.	Ambient Air Monitoring at locations outside premises at three location 120° to each other	Once every Season or as specified by Gujarat Pollution Control Board
Water quality		
5.	Raw water Quality	Once every Quarter
6.	Cooling tower and Boiler Blow down	Daily or as required by statutory Authority
Noise Monitoring		
7.	Work Zone Noise Levels	Once every Quarter or as required by statutory Authority
8.	Ambient Noise Levels	Once every Quarter or as required by statutory Authority
Occupational Health		
9.	Employee Health Checkups	Half-yearly or as required by Statutory Authority

Table 62.0 Details of Estimated expenses for Environmental Matters.

Sr. No.	Area of Expenditure	Recurring Cost per Annum (Rs. In Lacs)	Capital Cost (Rs. in Lacs)
1.	Air Pollution Control	200.0	1000.00
2.	Water pollution control	24.0	80.00
3.	Noise pollution control	1.2	6.00
4.	Environment Monitoring and Management	20.0	6.00
5.	Occupational Health	12.0	6.00
6.	Green Belt	12.0	20.00
7.	Others (pl. Specify)	5.0	5.00
	Total	**274.0**	**1123.00**

CHAPTER-6

6.1 RISK ASSESSMENT AND AN APPROACH TO EMERGENCY PREPAREDNESS PLAN

Increasing use of hazardous chemicals as raw materials, intermediates and finished products has attracted attention of the Government and the public, at large, in view of the chemical disasters which occurred during the last decade. The serious nature of the accidents, which cause damage to the plant, personnel and public, has compelled industries to pay maximum attention to the safety issues and also effectively manage the hazardous material and operations. After the ill-fated Bhopal tragedy, the Government of India has made it mandatory for the industries handling hazardous chemicals/ flammable materials to maintain specified safety standards and generate an 'on-site' emergency plan.

Risk assessment study includes study of nature of hazards due to the proposed activities of the power plant including operations involved in use of hazardous chemicals/fuels storage and handling. The study includes:

- Identification of chemicals and hazards.
- Preliminary identification of hazardous area of the plant and threat of storage with respect to Fire and Explosion index.
- Identification of accident sequences and consequences
- Visualization and Analysis of Maximum Credible accidental scenarios.
- Estimation of damage criteria for heat radiation and toxic concentration levels with recourse to health criteria and dose response.
- Study of onsite and offsite population characteristics.
- Study of characteristics of risk levels through study of nature of exposure, pathways and consequences of maximum credible accidental scenarios and presentation of results in terms of risk contours.

- For developing an "On-site" and "Off-site" Emergency Management Plan incorporating measures of safety prevention, mitigation and control of Hazardous events.

  Hazard identification provides information on onsite hazardous substances, their nature, quantities and details of storage.

  Preliminary hazard Identification is used to identify typical and often relatively apparent risk sources and damage events in a system. As each hazard is identified, the potential causes, effects, and severity of accidents and possible corrective and/or preventive measures are also listed.

  Hazards of significant nature whose consequences potential is of worth consideration and wherein a specified area or where more number of personnel likely to be present etc., are considered in identifying the hazards. The following hazards have been are evaluated:

  1. Fire Hazards
  2. Explosion Hazards.
  3. Toxic Hazards.

6.1.1 PRELIMINARY HAZARD ANALYSIS.

Coal is the fuel used in large quantities. The other hazardous materials stored are LDO.

A Type of Accidents.

BHL will handle considerable quantity of toxic/ flammable/ explosive materials like- Coal, LDO & HP steam. The characteristics of the above materials can lead to thermal radiation and toxic effects. In general accidents can occur in three stages.

- Construction, commissioning, start-up or shut down stages.
- Normal process operation and
- Storage and transfer operation.

B Construction/commissioning / start up / shut down stages / vessel / tankage entry.

- During construction stage, most of the accidents occur due to;
- Human errors (by-passing safety rules and regulations).
- Improper laying of cables.
- Improper Housekeeping (keeping combustible material near welding/gas cutting operations)
- Material handling.
- Handling of tools.
- Working at heights/ elevated levels.
- Material handling with equipments like crane, hydraulic payloaders, JCB, Pociain.
- Earth moving and filling.
- Pressure testing of lines.
- Uncovered trenches, Pressuring of the line etc.
- Unsafe electrical practices.

C Process Operations

Accidents in thermal power plants generally occur due to Fire, Explosion and Toxic gas release, High pressure steam leakages and electrical short circuits.

- Malfunctioning of equipment.
- Power failures.
- Failure to take corrective steps in time,
- Failure of utilities.
- System failure.
- Ageing of equipments.
- Improper communication.

D Storage and Transfer Operations.

- Accidents due to material spillage/over filling, mechanical failure and external impacts.
- Accident can also occur during opening & maintenance of pipelines, drums, columns, pumps, flanges, drains etc.
- Static electricity.
- Thunder and lightning. :
- On the job accident due to human error.

E. System Elements/ Event that can lead to Major Accidents.

The system like storage vessels/tanks, columns, pipe lines involving highly flammable and hazardous chemicals can lead to major accidents under abnormal conditions. The various systems and its possible events are listed below.

Table : 63.0

Sl.No	Systems	Type Of Events
01.	Pipelines	Leak/ Rapture
02.	Columns/strippers/ Vessel	Dislocation of internals
03.	Boiler	Tube leak/ Over pressure
04.	Burners	Flange leak
05.	Pumps	Mechanical failure/Utility failure
06.	Compressors	Over pressure
07.	Valves	Leak
08.	Boilers	Over pressure / Utility failure
09.	Storage	Over filling/ over pressure/ static Electricity
10.	Hoses	Leak / rupture
11.	Coal Storage	Spontaneous Ignition of Coal

6.1.2 POTENTIAL HAZARDS

Hazard is an event / incident that can lead to damage of equipment or personal injury. The following are the potential areas in a power plant that can lead to major accidents.

a) Coal storage and handling
b) LDO storage and handling
c) Electrical Hazards

Nature of possible hazards

There can be three kinds of major hazards

- Spontaneous ignition of coal - Explosion and Fire hazard
- Leakage of LDO tanks leading to pool fire - Explosion and Fire hazard
- Electrical Hazards like flashover and short circuits

6.1.3 MAXIMUM CREDIBLE ACCIDENT ANALYSIS

Maximum Credible Accident Analysis (MCA Analysis) is one of the methodologies evolved to identify worst credible accident with maximum damage distance, which is still believed to be probable. The analysis does not include quantification of probability. The following is an attempt in that direction.

Hazardous substance may be released as a result of failures of catastrophes, causing damage to the surrounding area. The physical effects resulting from the release of hazardous substances are calculated by means of models. The results thus obtained through modeling are used to translate the physical effects in terms of injuries and damage to exposed population and environment.

Details of the models which are based on the formulae published in the Yellow book by the TNO Netherlands are given below:

POOL FIRE MODEL

The heat load on objects outside the burning pool of liquid can be calculated with the heat radiation model. This model uses an average radiation intensity which is dependent on the liquid. Account is also taken of the diameter to height ratio of the fire, which depends on the burning liquid. In addition, the heat load is also influenced by the following factors :

- Distance from the fire
- The relative humidity of the air (water vapour has a relatively high heat absorbing capacity)

DISPERSION MODEL

The gas or vapour released either instantaneously or continuously will spread in the surrounding area under the influence of the atmospheric turbulence. The concentrations of the gas released in the surrounding area can be calculated by means of the dispersion model.

SCENARIOS FOR MCA ANALYSIS

The above models are selected after studying the failure modes. The following are the worst case scenarios which are considered for MCA analysis

- Fire at coal handling plant/coal mills due to coal dust explosion.
- Pool fire due to rupture of storage and outflow of LDO

FIRE DUE TO SPONTANEOUS COMBUSTION OF COAL DUST

Coal-dust when dispersed in air: and ignited would explode. Crusher Houses and conveyor systems are most susceptible to this hazard. To be explosive, the dust mixture should have:

- particles dispersed In the air with minimum size
- dust concentrations must be reasonably uniform
- minimum explosive concentration for coal dust (33% volatile.) is 50 grams/m^3.

Failure of dust extraction and suppression systems may lead to abnormal conditions and increasing the concentration of coal dust to the explosive limits. Sources of ignition present are incandescent bulbs with the glasses of bulkhead fittings missing, electric equipment and cables, friction, spontaneous combustion in accumulated dust.

Dust explosions may occur without any warnings with maximum explosion pressure up to 6.4 bar. Another dangerous characteristic of dust explosions is that it sets off secondary explosions after the occurrence of the initial dust explosion. Many a time, the secondary explosions are more damaging than primary ones.

The dust explosions are powerful enough to destroy structures, kill or injure people and set dangerous fires likely to damage a large portion of the Coal Handling Plant including collapse of its steel structure which may cripple the life line of the power plant

Stock pile areas shall be provided with automatic garden type sprinklers for dust suppression.

POOL FIRE OF LDO STORAGE

Two tanks of 400 KL capacity will be provided to store LDO. In the event of spilling its contents through a small leakage or due to rupture of the pipeline connecting the tank and on ignition, fire will eventuate. As a worst case it is assumed that the entire contents are leaked out. As the tanks are provided within the dyke the fire will be confined within the dyke wall.

A FAILURE SCENARIOS OF LDO STORAGE TANK

The spill out of LDO on ignition will result in a pool fire. The injuries in this case are mainly cased by heat radiation.

The heat radiation intensities due to the pool fire are computed using the pool fire model. The results obtained are presented in the following Table

SCENARIOS : POOL FIRE OF LDO STORAGE

Details	LDO tank
Quantity of Storage m³	2X400
Intensity of Heat Radiation at the centre of the pool (kW/m²) Damage Criteria	80.16
100 % Lethality (37.5 kW/m²)	5
50 % lethality (25.0 kW/m²)	15
1 %Lethality (12.5 kW/m²)	35
First Degree burns (4.5 kW/m²)	55
Normal Intensity with no discomfort (1.6 kW/m2)	140

B DAMAGE CRITERIA FOR HEAT RADIATION

The following table indicates likely damage level for different level of heat radiations:

DAMAGE CRITERAIA FOR HEAT RADIATION

Incident Radiation Intensity (kW/m2)	Type Of Damage
62.0	Spontaneous ignition of wood
37.5	Sufficient to cause damage to process equipment
25	Minimum energy required to ignite wood at infinitely long exposure (non piloted)
12.5	Minimum energy required for piloted ignition of wood, melting plastic tubing etc.
4.5	Sufficient to cause pain to personnel if unable to reach cover within 20 seconds; however blistering of skin (1st degree burns) is likely.
1.6	Will cause no discomfort to long exposure.
0.7	Equivalent to solar radiation

C CRITICAL RADIATION ON HUMAN BODY

1.	Unprotected skin continuous	-	0.15 W/Sq.cm.
2.	Blisters in skin at 30 sec	-	0.5 W/Sq.cm.
3.	Protected skin	-	0.5 W/Sq.cm.
4.	Special Protection	-	0.8 W/Sq.cm.

For continuous presence of persons, the following thermal radiation intensity levels are usually assumed.

4.5 kW/m2 - for Plant Operators
1.6 kW/m2 - for outside population

These criteria are followed where peak load conditions may occur for a short time but mostly without warning. If the operators are properly trained and clothed, they are expected to run to shelter very quickly.

For the secondary fires, a thermal incident radiation ofl2.5 kW/m2 is adopted as minimum criteria.

D PHYSICAL EFFECT OF THRESHOLD THERMAL DOSES

The effects of heat radiation depend upon the intensity and duration of exposure. Intensity and duration put together is the thermal dose. The consequence on human body for different thermal doses are tabulated here:

Dose Threshold kJ/m2	Effects
375	3rd degree burns
250	2nd degree burns
125	1st degree burns
65	Threshold of pain, no reddening or blistering of skin caused.

6.1.4 SUMMARY OF MCA ANALYSIS

A LDO STORAGE TANK FAILURE

The vulnerable zone of heat radiation intensities due to failure LDO tanks extends up to a distance of about 55 m (4.5 KW/M2) from the edge of pool. . 100% lethality (37.5 KW/M2) zone will extend up to a distance of about 5 m. 1% lethality (12.5 KW/M2) zones extend up to a distance of about 35 m from the edge of the pool.

Failure of LDO tank showed vulnerable area up to 55 m from the edge of the pool.

6.1.5 CONSEQUENCE ANALYSIS

Consequence analysis of certain failure cases are carried out with the objective to study how many persons are involved in an accident and are likely to get killed or injured, or how large is the area which is likely to be destroyed or rendered unusable so that a true assessment of the safety of the plant can be made.

The total no. of employees at power plant would be about 211. The power plant would run in three shifts-24 Hrs. Thus, at any point of time, the maximum strength of all cadres including greenbelt development workers of power plant in general shift would be about 150.

Meteorological information plays a major role to identify the zone which is likely to be affected. Heat radiation intensities are dependent on the humidity conditions of that particular area.

LDO tank failure

LDO storage tank failure will result in 100 % and 50 % lethality within 5 m from the edge of the pool. No manual attendance at this location is envisaged.

6.1.6 FIRE PROTECTION AND SAFETY MEASURES FOR FIRE AND EXPLOSION HAZARDS

For protection of the plant against fire, all buildings/equipment, storage yards and plant would be protected by any one or a combination of the following system.

- Hydrant System
- Medium velocity water spray system
- High velocity water spray system
- Low expansion foam system
- Mobile & portable fire extinguishing equipment
- Fire alarm & detection system

The system will be designed in accordance with the recommendations of TAC/ National Fire Protection Association (NFPA), USA will be followed, as applicable. While designing the fire protection system for this power station its extreme ambient condition will be taken into account.

The water for hydrant and water spray system will be met from a dedicated firewater storage tank. The hydrant system will be fed by electric motor driven fire pumps with diesel driven standby pump (100%) of similar capacity. The pressure in the system will be maintained by means of jockey pumps. Fire hydrants are located throughout the plant covering the following buildings:

- Boiler area
- Turbine buildings
- Coal bunkers
- ESP
- Transformer & Switchyard
- Fuel oil storage area & pump house
- Administration building and canteen
- Workshop & stores
- Water treatment plant area
- Coal handling area & storage area

All fire hydrants axe. provided with necessary accessories and hose houses.

An automatic medium velocity water spray system with heat detection system will be provided for fuel oil storage tanks, cable spreader/ trench area. A manual type medium velocity water spray system will be provided for air heaters. Water for the spray system is drawn from the hydrant main ring.

High velocity water spray system will be provided for steam turbine lube oil tanks, generator transformer & unit auxiliary transformer. Dry pilot quartzoid bulbs type heat detection system will be used for detection of fire in the above area.

Fire water for HVWS system will be from an independent pipe network fed by electric motor driven pump. The hydrant network standby pump will also serve as standby to HVWS networks.

Fuel oil storage tanks will be provided with low expansion foam "system to extinguish the fire in tanks. Water for foam system will be drawn from hydrant mains."

Dry powder type fire extinguisher and CO2 type portable and mobile fire extinguishers will be kept at strategic locations in the plant area. In addition to these, manual call points will also be provided at different locations and there will be one mobile fire tender consisting of fire water storage, pump, hose reels, foam proportioner, foam containers, standby diesel pump etc. stationed within the plant premises.

Automatic fire detection & alarm system comprising of smoke/ heat/ fire sensors will be provided as per NFPA 72 recommendation.

6.1.7 EMERGENCY PREPAREDNESS PLAN

As per the rules 10 to 13 under Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989 of Environment (Protection) Act, 1986, the occupier of the industry using hazardous chemicals in its manufacturing activity should develop an Emergency Management Plan.

This includes description of the emergencies likely to arise out of the activity together with proposed measures to overcome the situation.

The purpose of the Emergency Preparedness Plan is to minimize the danger to life and property in the event of a Plant emergency. To achieve this goal, well-defined, clear-cut steps are to be taken. For the purpose of this Plan, emergency procedures will be implemented for fires and explosions, material spills or natural disasters which require immediate emergency action and/or evacuation of the Plant.

An onsite emergency in the industries involving hazardous processes or in hazardous installations is one situation which has potential to cause serious injury or loss of life. It may cause extensive damage to property and serious disruption in the work area and usually, the effects are confined to factory or in several departments of factory, premises.

A quick and effective response during an emergency can have tremendous significance on whether the situation is controlled with little loss or it turns into a major emergency. Therefore, the purpose of this preliminary Onsite Emergency Plan (OSEP) is to provide basic guidance to the personnel for effectively combating such situations to minimize loss of life, damage to property and loss of property.

The plant authorities will prepare a detailed **On-site Emergency Preparedness Plan** before commissioning the Power plant after incorporating the relevant details like responsibilities of individual officers or staff, telephone numbers, communication system designated emergency exits etc. Similarly, a detailed **Off-site Emergency Preparedness Plan** shall be prepared before commissioning the plant after incorporating relevant details like telephone numbers of statutory authorities (fire, police etc), nearby hospitals , nearby medical stores, press etc.

6.1.8 STRUCTURE OF EMERGENCY MANAGEMENT

The following is the general approach for handling any emergency. The steps include

1. Noticing the accident
2. Informing the Declarer
3. Declaration of Emergency
4. Interaction with the outside agencies

Noticing the Accidents

The workers in the working zone most probably notice emergencies though an emergency is to be controlled by a senior person. Therefore, the first person that comes to know that the emergency situation has risen would be the shift in charge working in the shift. This shift in charge on assessing the situation will get in touch with the Declarer of emergency. Depending on the nature of the accident, the shift in charge may initiate the action for shutting down the Plant. In case of minor accident, the shift in charge can continue with operations.

The emergency has to be controlled from one particular spot. This spot should be away from the likely points of accident and is easily accessible. The control room of a power plant is one such area where the management of emergency can be handled. The following facilities will be provided in the Control Room:

I) Plant layout
II) Emergency telephone numbers
III) General telephone numbers
IV) Emergency lighting
V) Daily number of people working in hazardous area
VI) Population around the Plant site
VII) Hot lines to District Magistrate, Police control room, Fire brigade, Hospitals, antidotes and telephone number of pharmacy, etc.

VIII) Safety equipment

IX) Personal protection equipment

X) Tools and tackles.

Informing Declarer of Emergency

Shift incharge will be responsible to inform the declarer of emergency through phone/messenger/ siren for immediate attention at work spot for taking the management of emergency during the period. Every one including the shift-in-charge will know the declarer of Emergency as well as his alternate. In case the main declarer of emergency is not available, the alternate has to be got in touch with.

Declaration of Emergency

The declarer of emergency at accident spot will assess the situation. If he finds that the accident could result in an On-site or Off-site emergency situation, he will immediately declare the emergency by a coded, siren to inform the workers of the Plant that an emergency situation has arisen and they would have to shutdown the operations of the Plant and move towards safer areas which have been pre-decided.

Incase the emergency is of onsite nature, the management of the emergency will be entirely in the hands of 'Declarer'. On the other hand, if the situation is so serious that it effects are likely to be felt outside the Plant premises, it would be 'offsite* emergency situation and the declarer has to get in touch with the pre-decided authority who will come and take over the management of emergency situation. The management of the emergency will be conducted from a control room or its alternate, both of which will have to be pre-decided.

Functions of Declarer

The declarer will have to perform number of functions simultaneously. Firstly, the declarer has to find out the nature of accident and has to get in touch with the Incident controller. Incident controller will have two teams under him for each shift. Incident controller will come to the accident spot

along with the trained two teams. These two teams under the supervision of Incident controller will start functioning. One team will look for injured workers and help those who are not injured to be located and shifted to a safer spot. This team will also have to bring out injured workers to a safer spot from where arrangements have to be made for them to be taken to the hospital. The second team will try to control the cause of emergency. These two teams will have all the protective equipment available in the control room for such an emergency situation.

Interaction with Outside Agencies:

The Controller of Emergency (Incident controller) will also get in touch with other industries and nearby population. The question of nearby population arises only if emergency is an 'Offsite' one and the actual contact with the public will be done through the Police department. The declarer of Emergency will have detailed information about the hospital, ambulances and antidotes which will be made available in the control room. The arrangement to carry the injured to the hospital also will have to be decided before hand.

The declarer of emergency will inform the police personnel about the possible hazards before hand so that they would be ready to undertake the work. Further, the declarer of emergency will inform the Fire Brigade if necessary and give all information to the local authorities like Chief Inspector of Factories and Police control room. He will also request Police Department to make statement to the Press and give information to the public. Only one person who will be entrusted this work will perform this job and nobody else would be authorized to make any statement regarding the state of emergency.

Finally when the Incident Controller has brought the emergency under control, the declarer of emergency will give an "All Clear Signal", the code of which will be decided before hand. Thus the workers and the public would come to know that the emergency situation has now come under control.

6.1.9 EVACUATION OF WORKERS AND SHUT DOWN OF OPERATIONS

Evacuation of workers

When the Emergency is declared, all workers will have to leave their places of work and reach the safe place. However, in the confusion and excitement, the workers may not exactly know which path to follow. If it is night time, the paths themselves may not be visible. Further, when the emergency is in the same section in which a particular worker is working, there will be so much smoke or fumes that it may be difficult for him to find the path of exit and he will require some special guidance. Thus, it is very necessary that there are guide paths for the workers to follow in case of emergency so that they can reach the safe place/gate.

There may be some workers who have been hurt and are unable to come out. To help them, team members will be made available to the incident controller who will send this team with hailers to the Plant area along with necessary safety equipment which will be kept ready for use in main control room. This team will pick up those workers who are injured and make arrangements to bring them to safe place/Gate.

At the gate, there will be arrangement for counting of the workmen reporting there. All the workers who have arrived at the main gate will be counted against the number which had entered. The total number that has been put together consists not only the workers but also visitors and contract labourers.

When the injured workers are brought to the safe place/gate, they have to be shifted to the hospitals with or without the help of Police. For this, arrangements will be made for a number of vehicles, ambulances, etc.

If outside public in nearby villages is affected, Police will do their evacuation. However, such situation is a remote possibility in case of BHL Plant.

6.1.10 CONTROL OF EMERGENCY

Apart from bringing the injured workers out and looking after then-welfare, it will be necessary that the emergency be controlled. This will be done under the direction of the Incident Controller.

6.1.11 EMERGENCY EQUIPMENT

Emergency handling teams will consider maintaining on-site equipment to help mitigate damage. The common practice is to have disaster 'bins' at strategic points around the building containing paper towels, plastic sheeting, torches and similar supplies. Ready made disaster bins and optional extras will be obtained. Contents of a disaster recovery bin will include:

recovery bin	CO2 fire Extinguishers
blotting paper	bucket butchers paper
cotton gloves	dust mask
extension cord	fire blanket
freezer bags	glove liners
hand towel	knife
Note pad/folder	Paperclips
paper towel	pegs
pencil	plastic canister
plastic bin liners	plastic sheeting
post it notes	power board
rubber gloves	scissors
sponge	tags/ties torch and batteries
waterproof marking pens	
apron	

6.1.12 TRAINING FACILITIES

All employees, including maintenance and contractor employees will be made aware of the safety and health hazards which can occur in the power plant.

The purpose of training is to establish and verify the organization's ability to prevent fires and to effectively respond to fire emergencies. BHL will provide training through its training department. Training considerations include:

1. **Actions to be taken in the event of a fire:**

   When to evacuate, how to extinguish a fire, whom to notify, what equipment to shut down.

2. **Portable fire extinguishers**

   The. correct extinguisher and its proper operation on a particular type of fire (e.g., metals, electrical, chemical, wood or paper). The training should be "hands-on" to give employees experience in extinguishments techniques.

3. **Familiarity with Plant:**

   A tour of the entire facility, with emphasis on the location of exits, fire extinguishers, hazardous operations, and restricted areas.

4. **Care and maintenance of equipment or machinery they will be operating:**

   To reduce fire loss potential by helping to keep equipment from malfunctioning or breaking down.

5. **Alarms**

   The meaning of various alarms and the actions to take when they are sounded.

6. Hot-Work Permits

How to protect against fire hazards caused from welding/cutting/ brazing and other hot work.

7. Flammable Liquids:

How to safely handle, use, and store Flammable liquids.

However, additional training in subjects such as operating procedures and safety work practices, emergency evacuation and response, safety procedures, routine and non routine work authorization activities, and other areas pertinent to process safety and health will also be covered.

Operating personnel, who will work in a control room or at control panels, will be trained on power plant simulator. Upset conditions of various types could be displayed on the simulator, such that the employee could go through the proper operating procedures to bring the simulator back to the normal operating parameters.

BHL will periodically- evaluate their training programs to see if the necessary skills, knowledge, and routines are being properly understood and implemented by their trained employees. The means or methods for evaluating the training will be developed along with the training program goals and objectives. Training program evaluation will help BHL to determine the amount of training their employees understood, and whether the desired results were obtained. If, after the evaluation, it appears that the trained employees are not at the level of knowledge and skill that was expected, BHL will revise the training program, provide retraining, or provide more frequent refresher training sessions until the deficiency is resolved.

6.1.13 INTERACTION WITH OUTSIDE AGENCIES

Treatment of affected persons:

Based on the maximum accidental analysis, it is observed that the accidents are mainly confined to Plant boundary and will not call for off

site emergency. However, as a safety measure, it is assumed that the accident will call for offsite emergency. Incase of offsite emergency, the effects will be felt not only within the Plant premises but outside by general public around the factory premises. BHL will provide all first aid facilities and medicines to handle the affected.

Injured person will be shifted to hospital on urgent basis. BHL will utilize the ambulance services of the nearby hospitals and own vehicles for transport of injured persons. BHL will register with the nearby hospitals to handle the injured cases.

Interaction with Police

BHL will inform the nearby police station about the nature of possible hazards that can occur.

Interaction with Fire Brigade

BHL along with its own fire fighting facility and the service of the nearest fire station will be utilized to bring the situation under control.

6.1.14 INTERACTION WITH PUBLIC & PRESS

Based on the maximum accidental analysis, it is observed that the accidents are mainly confined to Plant boundary and will not call for off site emergency. However, as a safety measure, it is assumed that the accident will call for offsite emergency. In the case of Off site emergency the Plant personnel will not interact directly with the public. In such instances, information will be given by Police Department only. Police Department will be informed about possible hazards.

Incase of a major accident, public and press will be informed about the status at different interval. Apart from this, it will also be necessary" to inform the concerned people about the status of the injured. Incase of deaths, the bodies of the dead will be handed over to the relatives. The police will perform these functions with assistance of the controller of emergency.

Authorized person of BHL will have contact with general public, relatives of workers and representative of the press. BHL will inform the statutory authorities like chief inspector of factories and boilers, Andhra Pradesh Electricity Board to draw their attention to the Declaration of Emergency. This will be done with the help of telephone/telex/messenger.

The controller of Emergency will ensure that the neighboring settlements are informed of the emergency on an appropriate basis through phone or messenger.

6.1.15 ALL CLEAR SIGNAL

The moment when the situation of emergency is brought under control, it will be necessary to bring this attention of public, press etc. This will be done by siren.

6.1.16 CLEAN DEVELOPMENT MECHANISM (CDM)

Proposed Power Plant is coal based and coal as a fuel will be used. Coal is fossil fuel and also it is not the renewable.

So we are not capable for CDM qualifications.

CHAPTER -7

PROJECT BENEFITS

7.1 PROJECT BENEFITS

Any industrial activity will help in improving the socio-economic benefits in areas like employment, communication, educational etc.

7.2 EMPLOYMENT POTENTIAL

A total of about 150-200 persons under direct employment will be benefited due to implementation of the project. About 200-250 (peak) people will benefit during construction activity under each phase. Apart from this, about 250-300 people will get benefited under indirect employment during operation of the power plant in areas like house keeping, security, ash management, horticulture and maintenance of infrastructure.

7.3 REACHING OUT TO THE COMMUNITY

All socio-economic development activities will be done under the aegis of BHL. Social responsibility begins with good governance, efficient utilization of resources and protection of stakeholder and consumer interests. It is for a successful corporate to take initiatives for socially relevant activities and causes. BHL will strive to achieve the following objectives:

Objective

- To provide basic amenities for the rural poor
- To save arts/crafts of historical relevance which are on the verge of extinction.
- To develop integrated programmes for the disabled
- To encourage fresh talents in the area of sports
- To take up other humanitarian activities

7.4 CORPORATE SOCIAL RESPONSIBILITY

BHL is committed to develop the surrounding areas in a well-coordinated and balanced manner while safeguarding the environmental and social aspects. BHL will provide employment to the locals wherever possible, buy goods and services, encourage local entrepreneurs for providing support services, generate awareness about health and encourage local traditions and local crafts.

BHL had earmarked a budget of Rs 60 lakhs spread over three years for implementation of the need based community development plan.

The following activities will be taken up by BHL:

- Provide free health checkup facility,
- Medicine to poor villagers
- Donating building materials and furniture for school buildings, stationery for schools
- Sponsoring training programmes in association with ITI's and local polytechnic colleges.

During construction and operation of the project, BHL will develop an effective public relations strategy by encouraging local youth in the surrounding villages and availing the services of people like plumbers, masons vehicle repair shops, electricians, shopkeepers and traders, hotels etc.

CHAPTER-8

RECOMMENDATIONS

Following recommendations are delineated for evolving and creating effective environment management plan. These would entail planning to control land, air, noise pollution due to industrial activity during establishment as well as operational phase of proposed industry.

- During expansion phase preparation of site such as clearing of site if operation like excavation, leveling, transportation that generate dui could be controlled by utilizing water spray wherever possible.

- Proper drinking water supply & sanitation facilities should be provided to the workers so as to have minimum environment impact and they shall not hinder the domestic waste disposal profile of surroundings.

- Constructional and installation activities must be carried out in such a way that any liquid waste emanating from these shall be properly treated & disposed. The transportation vehicles should be properly maintained to minimize smoke emissions. Spillage of oil shall be adequately taken care of. Any other type of solid waste obtained should be properly disposed off in suitable dumping areas provided for the purpose. Noise level arising due to fabrication, erection site preparation could be controlled by keeping it below 75dB(A) near residential by way of placing acoustic barriers, creating temporary earth bunds of soil at site.

- Judicious use of water in various plant practices & its recycle will reduce the volume of waste to a great extent. Floor washings, cooling waste could be recycled leakages should be a minimized by way of collection provisions and then recycled back to process stream.

- Green belt provision should be done within premises all along as per given details.

- In order to have a close monitoring on water use & conservation in plant, the industry could go for installing flow measuring devices at various points of intake as well as interconnecting drains of discharge. The flow and water consumption could be easily monitored on regular basis. Any overuse could then be controlled and points of recycle be identified.

- Attempts should be made to evolve an exhaustive procedure of environmental operational matrix by the industry during operational phase of its proposed establishment. This should than be compared with baselines matrix consisting of biological, physical, chemical, cultural, bio-cultural linkages in terms of evaluation with respect to scale of importance, scale of operational phase and scale of management by rating system..

CONCLUSION

There is no denying the fact that the proposed establishment of ***Power plant*** *activities may have some impact on the existing environment. The measures required to mitigate these impacts have been dealt with in detail. From the detailed analysis of the environmental impacts and the remedial measures suggested/ recommended. It can be conclude that no significant deterioration in the ecosystem likely to occur due to the proposed establishment of plant. On the other hand, several benefit like employment generation; aforestation and economic growth in the area will increase and also contribute to the overall development of the nearby area.*

From the detailed study of the environmental impact on account of proposed plant and the remedial measures suggested thereof in the Environmental management plan it could be concluded that no significant deterioration in the ecosystem is likely to be caused in the long run.

The proponents *M/S BAJAJ HINDUSTAN LTD.* ***are industrialist of repute and having highly experienced administrative and technical staff, capable of managing the industry with full confidence.***

So, it is recommended without any reservations that 'Environmental Clearance for the establishment of this project be granted.

Dr Manoj Garg *Date :*
Director
(Consultant - Environment)
Environmental & Technical Research Centres