ENVIRONMENT IMPACT ASSESSMENT REPORT

FOR DEVELOPMENT OF GROUP HOUSING PROJECT "INTEGRATED TOWNSHIP, MORADABAD" AT VILLAGE MANGUPURA AND MEHALAKPUR MAFI, NEAR NH-24, BYPASS MORE, MORADABAD, UTTAR PRADESH.

PROJECT PROPONENT

M/S CHADHA INFRATECH LIMITED

ENVIRONMENT CONSULTANT

GREENCINDIA CONSULTING PVT. LTD.

GHAZIABAD

QCI/NABET/EIA/ACO/19/1186

QCI-NABET Accredited Consultant - **Townships & Area Development Projects,** Mine & Minerals, River Valley, Thermal Power Plants, Coal Washery, Metallurgical Industries, Cement Plants, Oil & Gas pipeline, Airports, Industrial Estate, Highways, CMSWMF, Building & Large Construction Projects,
Email: information@greencindia.com
Phone: 0120-4111527

February 2020

NABET DISCLOSURE

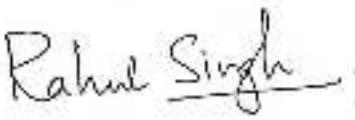
Declaration by Experts contributing to Final EIA Report for DEVELOPMENT OF GROUP HOUSING PROJECT "INTEGRATED TOWNSHIP, MORADABAD" AT VILLAGE MANGUPURA AND MEHALAKPUR MAFI, NEAR NH-24, BYPASS MORE, MORADABAD, UTTAR PRADESH.

I, hereby, certify that we were part of the team in the following capacity that developed the above EIA.

EIA CO-ORDINATOR : 8(b) Township & Area Development projects

Name of EC : Rahul Singh

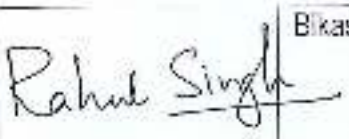
Signature & Date :



Period of Involvement : FEBRUARY 2019 TO TILL DATE

Contact Information : 608-611, Level-5, Shopprix Mall, Vaishali, Ghaziabad

Functional Area Experts:

Sl. No.	Functional Areas	Name of the Experts	Task	Signature	Team Member
A	CORE FUNCTIONAL AREAS				
A-1	Water Pollution Monitoring, Prevention & Control-WP	Dr. Subinoy Mondal	• Monitoring location selection for ground water and surface water • Assessment of impact associated with the project operation activities • Development of Water Management Plan.		-
A-2	Municipal Solid Waste-MSW	Dr. Seema Awasthi	• Quantitative assessment of wastes to be generated during construction & operation phase. • Development of solid waste Management Plan		-
B	SIGNIFICANT FUNCTIONAL AREA				
B-1	Land Use-LU	Rahul Singh	• Development of Land-use Map • Impact of project on surrounding Land use		Bikash Ruj

Sl. No.	Functional Areas	Name of the Experts	Task	Signature	Team Member
			• Assistance during development of project management plan. • Mitigation Measures due to change in Land uses by the project		
B-2	Socio-economy SE		• Assessment of social impact associated with project • Assistance during development of project management plan		Bikash Ruj
B-3	Ecology & Biodiversity-EB	Dipannita Das	• Survey of existing flora & fauna in the study area • Assessment of impact associated with project • Selection of species for greenery development • Assistance during development of project management plan	Dipannita Das	
B-4	Air Pollution Monitoring Prevention Control-AP	KD Chouchury	• Assessment of Impact associated with the project operation Activities • Assessment of Impact Associated with vehicle movement Operation • Development of Management Plan to control the air pollution & its mitigation	KDchoudhury	Rahul Singh
B-5	Noise-N		• Assessment of impact associated with project • Assistance during development of project management plan		-
B-4	Soil Conservation-SC	Dr. PC Kuniyal	• Assessment of soil quality • Assistance during development of project management plan	P.C. Kuniyal	-
B-6	Hydrology.	Dr. Manoj	• Water table of the area		-

Sl. No.	Functional Areas	Name of the Experts	Task	Signature	Team Member
	Ground Water & Water Conservaton-HG	Kumar	in pre-monsoon and post monsoon season • Development of management plan		

Declaration by the Head of the Accredited Consultant Organization

I, Nandini Choudhury, hereby, confirm that the above mentioned experts were involved in preparation of Final EIA Report for Development of Group Housing Project "Integrated Township, Moradabad" at Village Mangupura and Mehalakpur Mafi, Near NH-24, Bypass More, Moradabad, Uttar Pradesh. I also confirm that I shall be fully accountable for any misleading information mentioned in this statement.

Signature:

Name : Nandini Choudhury
Designation : Managing Director
Name of the EIA Consultant Organization : Greencindia Consulting Private Limited
NABET Certificate No. & Issue Date : QCI/NABET/EIA/ACO/19/1186, Dec, 2019

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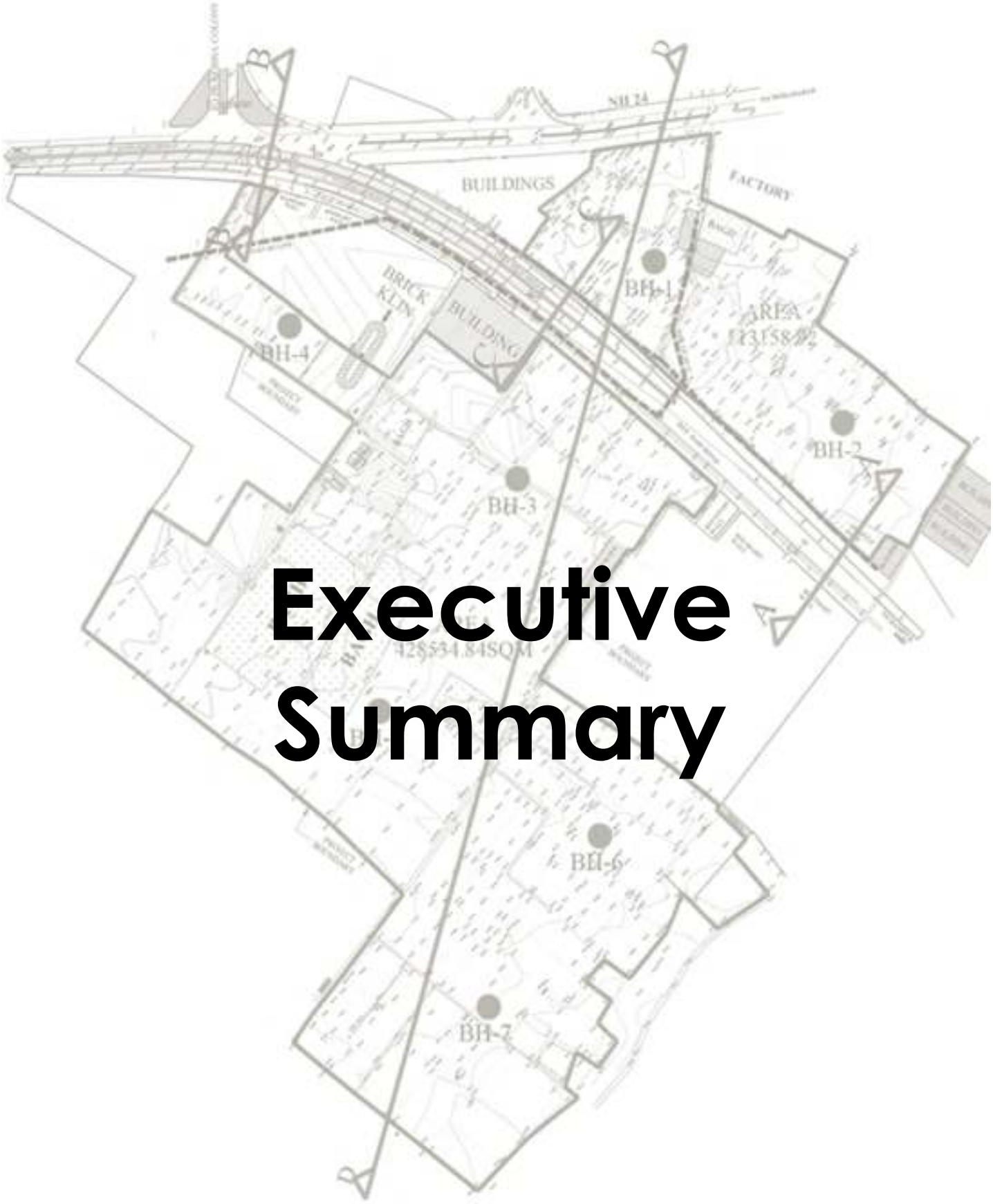


Executive Summary

EXECUTIVE SUMMARY

1. PROJECT DESCRIPTION

The total land area of the project is 6,25,909.02 m^2 for which Environment Clearance is sought. ***The Environmental Clearance individually would be taken for each township component in future under Category B2 if required*. This project is independent and does not link with any other project/s which attracts directly or indirectly any provisions of schedule of EIA notification 2006 amended to date.** The site is falling under the revenue boundary of 2 villages namely Mangupura, and Mahalakpur Mafi. The proposed site is identified near the site for New Moradabad Township proposed by Master Plan on North-West side.

The plotted development is spread over 82.662% of the total area, group housing over 12.99% area, EWS/LIG housing over 4.39% area and residential development over 61.58% area. The rest proposed for mixed development, public & semi-public uses, commercial development and for roads and green area.

Parking has been proposed for 8321 ECS as per State Standards. The total water requirement for the project during operation phase has been estimated to be 5296 KLD of which fresh water requirement is 2836 KLD which shall be sourced from bore wells. The wastewater generated shall be treated in 5000 KLD capacity STP based on MBBR technology. The maximum demand of power requirement for the project is 40 MVA to be sourced from UPPCL. Around 200 labours will be engaged during the construction phase.

2. DESCRIPTION OF THE ENVIRONMENT

The baseline data for the project was collected during Mar to May, 2019 covering an area of 10 km radius from the project site. There are no notified forest patches within the study area.

Land Environment: The project site falls under Seismic Zone IV signifying high damage risk zone. The site also falls under flood prone area and lies in very high damage cyclone risk zone. The project site has a flat topography with elevation ranges from 198 m to 205 m above Mean Sea Level (amsl). The slope of site is towards the North-East.

The project site is not underlain by any valuable mineral resources. The study area as well as project site is mainly occupied by agricultural land. There is a brick kiln in the project site which shall be dismantled prior to site preparation activities. The water body in the project site shall be retained. The soil samples collected give an impression of an average profile of soil quality for vegetation growth. The NPK and organic carbon content in the soil samples is fair.

Water Environment: There are no streams passing through the project site. The study area is drained by River Ramganga & Gangan and forms a part of Central Ganga Plain. Surface water samples collected from 5 locations indicate that the water is not suitable for drinking purpose. Dissolved oxygen was recorded moderate in the study area. The water samples collected are either suitable propagation of wildlife and fisheries or for irrigation, industrial cooling, and controlled waste disposal.

As per CGWB, depth to water level in the project site during pre-monsoon and post-monsoon period varies from 7-10 m bgl. The samples of groundwater collected from 5 locations give an impression of slightly alkaline water quality, hard to very hard in nature. Average TDS values were found to be more than 600 mg/l, which gives a clear evidence of anthropogenic influences. The concentration of EC, TH, Ca, Mg, Na, HCO_3 and Cl at most of the sampling stations not exceeds the safety limits for drinking water. Computational analysis of the data set of hydrochemical constituents in the groundwater suggests that the aquifer (TDS) is mainly controlled by Cl, total hardness Na, and EC. As per CGWB's Ground Water Resource Assessment, 2017, the Moradabad city falls under over-exploited zone.

Air Environment: The average maximum and minimum temperature recorded at site during March to May, 2019 were 41^0C and 16^0C respectively. The average relative humidity (maximum and minimum) was observed in the range of 78.7% to 13.0% during the study period. The average wind speed recorded at the site was 8.6 kmph. The predominant wind direction during the study period was mainly from North.

Air quality was monitored in 11 locations and all the parameters were found to be within the stipulated limits of CPCB. Maximum concentration of PM_{10} (85.6 µg/m^3) and $PM_{2.5}$ (40.1 µg/m^3) was recorded in AAQ10, Ekta Colony (Moradabad) which may be attributed to its proximity to industrial belt and its placement in the dominant downwind direction. Likewise, maximum concentration of gaseous pollutants SO_2 and NO_2 was also recorded in Ekta Colony (Moradabad). The maximum value of CO (0.63 mg/m^3) was observed in AAQ6, Fajalpur which is well below the NAAQ standard of 2 mg/m^3 for 8 hourly sampling.

Leq during day time varies from 54.7 dB(A) to 50.5 dB(A) at the monitoring stations while Leq during night time varies from 47 dB(A) to 41 dB(A). Leq is higher in few locations due to their proximity to major roads where vehicles keep plying continuously.

Traffic volume count was done in 3 locations and was done as per IRC Code. Total number of vehicles per hour was determined. The results indicated that the surveyed roads have a stable flow zones indicating no congestion during peak hours.

Ecology: Ecological survey implied that there is no dense vegetation in the study area. The study area does not support healthy vegetation due to too much biotic pressure. No ecologically sensitive floral species have been reported from the area. Common species found near villages are mostly useful plants like *Mangifera indica*, *Syzigium cumini*, *Azadirachta indica*, *Albizia lebbeck*, *Delonix regia*, *Tamarindus indica* etc. Growth of weeds like *Argemone mexicana*, Cannabis sativa, *Cenchrus ciliaris*, *Heteropogon contortus*, *Lantana camara*, *Parthenium hysterosphorus* etc. in agricultural land and along road sides is very common. No significant wild animals have been reported from the study area. No established habitats of any mammals or birds have been noticed along the river bank. There are some small water bodies which attract avian species. Common myna, kingfisher, cormorants are some common bird species observed in the study area.

Socio-economy: There are 164 villages in the study area having a total population of 13,09,275 out of which 6,84,802 are males and 6,24,473 are females as per Census of India 2011. The gender ratio of the project site has increased 885 to 912 from 2001 to 2011. 7.7% of the population in the study area is in SC category while only 0.034 % is in ST category as per the 2011 Census. The literacy rate was found to have increased from

44.65% in 2001 to 54.72% in 2011 in the study area. Female literacy rate has shown improvement from 37.81% in 2001 to 49.59% in 2011. The Work Participation Rate in the study area was found to have increased from 28.07% in 2001 to 29.91% in 2011. As far as educational facilities are concerned, the numbers of schools have increased over a span of 10 years; however, there are no facilities for higher education in the villages. The medical facilities present in the study area seem to be appropriate to cater the population.

3. ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

Land: The project shall be developed as per Moradabad Master Plan-2021 which demarcates the site as residential zone. The brick kiln at the site is operated by the Project Proponent and shall be dismantled. The water body at site shall not be disturbed.

Development shall be done after taking all necessary approvals from competent authority. The water body shall be retained and preserved by proving a 30 m green buffer.

Soil quality: Site preparation activities make the soil more prone to erosion. Waste littering can pollute soil. The quantity of waste to be generated during operation is estimated to be 20.3 TPD.

Vegetation cover shall be removed only from areas where construction is to take place. A well-planned solid waste collection system covering all areas of the project site apart from door to door for the residential units shall be developed. The waste shall be segregated at source and treated/disposed accordingly.

Surface water quality & hydrology: Run-off from rains may take excavated soil/construction material to the nearby water bodies thereby polluting them. Sewage generated at site may also pollute water bodies. Fuel leakage and spillage from vehicles may take place which can be carried away by rainfall run-off to nearby water bodies and pollute them. Wastewater generated from residential units, if not properly treated, may find its way to surface water bodies.

Wastewater generated from the domestic activities will be treated in septic tank followed by soak pit. The construction material/excavated soil shall be stored properly in closed areas so as not to get affected by rain. An STP of 5000 KLD capacity shall be installed to treat waste water generated during operation phase. Proper oil & grease interceptors will be installed at outlet point of storm water drainage.

Ground water quality & resource: Extraction of ground water for operational activities shall put additional pressure on ground water resource. Used oil from DG sets may percolate to ground water, if not properly stored and treated.

Rainwater harvesting has been planned for ground water recharge. The used oil from DG sets shall be collected in a concrete bund where proper oil & grease interceptors will be installed. To further lower the water consumption, options of low flow flushing systems, sensor based fixtures, and tap aerators etc. will be explored.

Air Quality: Fugitive dust emission shall occur as a result of construction activities, handling of construction materials. Operation DG sets shall emit gaseous pollutants, although in insignificant amount. The vehicular emissions, however, will be significant, once the project starts operation with maximum contribution coming from CO.

Dust suppression system shall be provided wherever necessary. Avenue plantation on the internal roads and peripheral plantation around the site will be developed which will help in arresting the dust particles to fly away from the construction areas by creating a physical barrier. Proper traffic management within the project premises to avoid congestion at any particular place.

Sound pressure level: The main source of noise pollution would be construction equipment, transportation activities. Noise from earthmoving equipment has the potential to cause nuisance. The main sources of noise from the project operation are running of D.G. Sets and vehicular traffic.

The highest noise level emitted from construction equipments merges with the highest standard noise level (55 dB during day time) at around 100 m from the source and the sound level keeps on decreasing with increasing distances. The sources are intermittent and shall generate sound for short duration. The vehicles playing within the site will be mainly of the residents and are hence not expected to cause unnecessary noise. DG sets will be provided with acoustic enclosures.

Ecology: The project site does not involve any forest land. There are, however, trees present in the site which shall be removes prior to site development. Likely settling of dust from movement of vehicles for construction activities on leaves may results in stunted growth of vegetation and may also affect the rate of photosynthetic capacity. High noise levels generated from equipments may prove to be harmful for local fauna as it affects their behavioral pattern. Unsegregated and open waste dumping areas may attract birds who will feed on the wastes causing intoxications, injuries, illness and finally death.

Removal of vegetation shall be restricted to areas where construction activities shall be involved. Plantation and landscaping shall be done from construction phase to strengthen flora in the area. High incremental concentration of SO_2 and NOx is not likely to occur as a result of the project operation as found from modelling studies so as to cause any injury to vegetation. The wastes shall be segregated at source and collected in closed containers. The segregated wastes shall be disposed or treated based on their characteristics. Open dumping of wastes shall be strictly prohibited.

Socio-economy: During the development and construction of Project, about 200 skilled and semiskilled and unskilled workers per day will get direct employment opportunity, which will have beneficial impact on the local people and improve socio-economic conditions of the area. Construction materials will be procured from local markets. The people will get benefit by providing logistics. During operational phase, more than 100 persons will get employment opportunities as staff for management, maintenance and security.

Suitable measures will be taken at the construction camps to mitigate anticipated impacts due to temporary accommodation of laborers such as provision of clean drinking water, adequate toilet facilities, water and solid waste disposal system

4. ENVIRONMENT MONITORING PROGRAMME

The purpose of the monitoring programme is to ensure that the intended environmental measures are achieved. To ensure proper implementation of the Environment Management Plan (EMP), it is essential that an effective monitoring programme is designed and carried out during construction and operation. The broad objectives of the environment monitoring programme are:

- To monitor impacts on the surrounding environment and the effectiveness of mitigation measures during construction and operation.
- To ensure that the environmental control systems are operating satisfactorily.
- To suggest on-going improvements in management plan, if required, for subsequent effective monitoring.

The Environment Monitoring Cost for Construction Phase is INR 5.04 lakhs and for Operation Phase is INR 9.92 lakhs. A capital cost of Rs. 1.5 lakhs has been earmarked for installation of weather monitoring station along with data logger.

5. ADDITIONAL STUDIES

Township & area development projects are exempted from public hearing.

The major risk associated with area development projects include lifting and transportation of building materials at different levels, digging pits, operation of concrete mixer, working near electrical circuit, which is required during construction. Such work puts workers at risk of burial, engulfment or falling from a height, risk of electrocution where the risk is particularly aggravated by the nature of the work or processes used or by the environment at the place of work or site. However, it is not always possible to totally eliminate such eventualities and random failures of equipment due to human errors or natural calamities like earthquake.

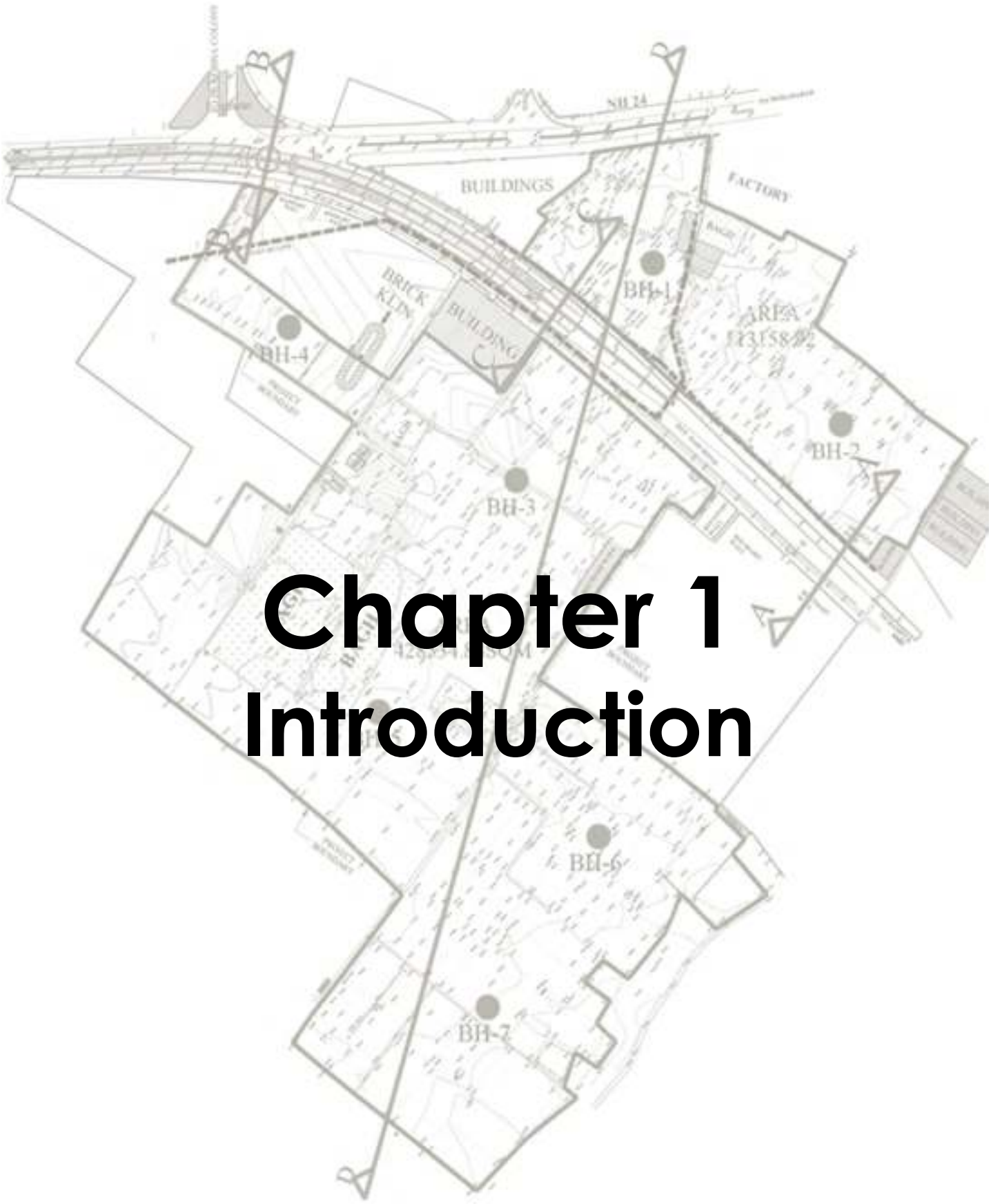
A proper disaster management plan including safety measures during construction phase, proper fire-fighting system and procedures for safety during natural calamity shall be put into place prior to start of site preparation activities.

6. PROJECT BENEFITS

The project shall lead to value addition to the existing infrastructure facility such as public transport, water supply, telecommunications, etc. It will also provide all kinds of facilities within the township so as to make it self- sustained. The propose project will enhance the quality of life, equity, and social well-being through community support and awareness. The local people shall be given employment in the project, thus bringing about economic benefits to the economically backward local population. As per MoEF&CC's OM dated 1st May, 2018, 1.5% (Rs. 5.54 Crores) of the project cost is to be spent on CER (Corporate Environment Responsibility) activities.

7. ENVIRONMENT MANAGEMENT PLAN

The Environmental Management Plan (EMP) consists of description of the administrative aspects of ensuring that mitigative measures are implemented and their effectiveness monitored, after approval of the EIA. The capital cost for EMP during the construction phase have been estimated to be Rs 8.95 lakhs while the annual recurring cost will be Rs. 2.15 lakhs. The EMP cost during the operation phase has been calculated to be Rs. 64.25 Lakhs as capital cost and Rs. 14.25 lakhs as annual recurring cost.



Chapter 1
Introduction

1. INTRODUCTION

1.1 PURPOSE OF THE REPORT

As per the EIA notification of 14th September 2006 and its latest amendment, building/ construction projects/ area development projects and township are divided into two categories as mentioned in **Table 1.1**.

Table 1-1: Screening of Category 8 Projects

Project or Activity		Category with threshold limit		Conditions if any
		A	B	
8 (a)	Building and Construction projects	-	≥ 20,000 m^2 and < 1,50,000 m^2 of built-up area#	#(built up area for covered construction; in the case of facilities open to the sky, it will be the activity area)
8 (b)	Township and Area Development projects	-	Covering an area ≥ 50 ha and or built up area ≥1,50,000 m^2++	++All projects under Item 8(b) shall be appraised as Category B1

The concerned project falls under Category 8(b) of Building and Construction Project (As per EIA notification dated 14th September 2006 and amended till date) and requires environmental clearance as built-up area of the Project is > 20,000 m^2.

The total land area of the project is 6,25,909.02 m^2 for which we are seeking the Environment Clearance. ***The Environmental Clearance individually would be taken for each township component in future under Category B2 if required.*** **This project is independent and does not link with any other project/s which attracts directly or indirectly any provisions of schedule of EIA notification 2006 amended to date.**

1.2 IDENTIFICATION OF PROJECT & PROJECT PROPONENT

1.2.1 Identification of Project

The proposed site identified for development of an Integrated Township is divided into two parts by the Rampur By-pass road. Site is located beside of the NH-24 (**Fig. 1.1**). The site is falling under the revenue boundary of 2 villages namely Mangupura, and Mahalakpur Mafi. The proposed site is identified near the site for New Moradabad Township proposed by Master Plan on North-West side. Total project area of Township is 154.66 acres.

1.2.2 Identification of Project Proponent

M/s Chadha Infratech Limited has been incorporated under the Companies act, 1956 on 6th day of November 2007 having its registered office at D-851, IInd floor, New Friends Colony, New Delhi- 110065. Chadha Infratech Limited real estate sector's developing group has come forward as a developer for the development of Integrated Township at Moradabad. Moradabad Development Authority (MDA) has issued license no. 1713/ MDA dated 25.01.2016 for development of Integrated Township under the purview of aforesaid Integrated Township Policy (**Annex 1.1**).

The present project of the company aims to provide world class infrastructure to the surrounding. The Unique philosophy of integrating space with the outdoor and creating natural environment that is in perfect harmony with its surroundings defines the township project, beautifully designed and surrounded by greenery.

1.3 BRIEF DESCRIPTION OF NATURE, SIZE, LOCATION OF THE PROJECT AND ITS IMPORTANCE TO THE COUNTRY, REGION

1.3.1 Nature and Size of the Project

The proposed "Integrated Township, Moradabad" is on a land measuring 6,25,909.02 m^2 (62.59 ha). The co-ordinates of the project site along with salient features of the project are shown in **Table 1.2**. The co-ordinates of the Project site are shown in **Figure 1.1.**

Table 1-2: Project Salient Features

Parameters	Description		
Location	Mangupura and Mahalakpur Mafi, Rampur By-pass road beside NH-24, Moradabad, Uttar Pradesh		
Co-ordinate	**Points**	**Latitude**	**Longitude**
	Block A (NE of NH- 24/9)		
	1	28°49'24.01"N	78°41'49.77"E
	2	28°49'20.28"N	78°41'52.92"E
	3	28°49'16.72"N	78°41'54.36"E
	4	28°49'12.31"N	78°42'00.84"E
	5	28°49'07.86"N	78°41'56.12"E
	6	28°49'19.53"N	78°41'41.08"E
	7	28°49'23.35"N	78°41'44.34"E
	Block B (SW of NH- 24/9)		
	A	28°49'22.48"N	78°41'18.93"E
	B	28°49'21.33"N	78°41'31.63"E
	C	28°49'19.08"N	78°41'28.74"E
	D	28°49'14.99"N	78°41'35.15"E
	E	28°49'16.54"N	78°41'41.61"E
	F	28°49'10.46"N	78°41'49.89"E
	G	28°49'03.47"N	78°41'42.54"E
	H	28°48'55.55"N	78°41'51.67"E
	I	28°48'55.17"N	78°41'47.79"E
	J	28°48'54.24"N	78°41'49.44"E
	K	28°48'52.27"N	78°41'43.61"E
	L	28°48'47.95"N	78°41'43.15"E
	M	28°48'44.38"N	78°41'38.07"E
	N	28°48'50.14"N	78°41'30.38"E
	O	28°48'55.74"N	78°41'35.12"E
	P	28°49'05.20"N	78°41'21.52"E
	Q	28°49'12.21"N	78°41'26.47"E
	R	28°49'15.08"N	78°41'21.60"E
	S	28°49'18.23"N	78°41'23.80"E
	T	28°49'21.17"N	78°41'18.28"E

Parameters	Description
Total Plot area	625909.02 m^2
Nearest Town	Moradabad (approximately 8.65 km)
Nearest Railway Station	Moradabad Railway Station (approximately 8 km)
Nearest Airport	Hindon Airport Ghaziabad (approximately 133.25 km)

Source: M/S Chadha Infratech Limited

1.3.2 Location of the Project

The project is located at Village Mangupura & Mehalakpur Mafi Near NH-24, Bypass More, Moradabad, Uttar Pradesh. The nearest railway station and airport to the project site are Moradabad Railway station and Hindon Airport Ghaziabad respectively. The locality of the project has a mixed land-use with institutional, residential and commercial areas in the vicinity. The project site is surrounded by Parsvnath Pratibha Apartments to the N, Palmgreen Supertech Building Society to the NNW, Krishna Bal Vidya Mandir Inter College adjacent to the project site and NH-24 towards the North of the project site. The site photographs of the site are shown as **Annexure C.**

1.3.3 Importance of the Project

The site is strategic for establishing an Integrated Township to have overall development in its vicinity which will provide excellent and economical housing stock to fulfill the growing demand and help in decongesting the core areas of Moradabad. It is utmost try to build it as self-contained in terms of living and recreation. The Township development of strategic priority covers rapid and time bound urban infrastructure construction, improvement and maintenance of ecological environment.

The Integrated Township is a step towards fulfillment of the basic housing needs of core Moradabad city. The Township will have been an attempt to develop as integration of Moradabad City to a wider area ensuring a high quality of life for all its residents by imparting an appropriate environmental setting and developing it in synchronization with the existing topography. It has been designed to create harmony between human habitat and existing and proposed peripheral developments. This township will provide a pollution free high standard of living through appropriate planning intervention.

1.4 SCOPE OF THE STUDY

The Environmental Impact Assessment Notification dated 14th September 2006 as amended to date, states that all project under **Item 8(b)** shall be appraised as **Category B1** and requires environment clearance from **State Expert Appraisal Committee**. In line with the aforementioned EIA notification, the project was considered for Terms of Reference (hereinafter referred to as "ToR") during 412th Meeting of Uttar Pradesh State Level Expert Appraisal Committee held on 24th July, 2019 (**Annex 1.2).** The scope of the study is as per the ToR issued by SEAC are stated below.

Table 1-3: ToR Compliance

Sl. No.	TOR Conditions/ Points	Compliance
1.	All pages of technical documents/EIA/EMP etc. should be signed by the consultant and	Will be complied

Sl. No.	TOR Conditions/ Points	Compliance
	project proponent both.	
2.	Copy of all the analysis reports signed by analyst approved by NABL or MoEF&CC shall be annexed with the EIA report and original analysis reports should be presented at the time of presentation	The analysis reports are attached as Annex 3.1
3.	MOU signed between the project proponent and the consultant should be submitted	Attached as Annex 12.1 in Chapter 12
4.	Master plan of the area showing proposed project. Permissible uses of the proposed site as per zoning regulation	The Master Plan-2021 of Moradabad has demarcated the site for residential use. The same is shown in Figure 2.2
5.	Allotment letter from concerned development authority	Moradabad Development Authority (MDA) has issued license no. 1713/MDA dated 25.01.2016 for development of Integrated Township under the purview of aforesaid Integrated Township Policy. The same is attached as Annex 1.1.
6.	All approved drawings/maps along with approved services plans	The approved layout plan of the project is shown as Figure 2.9.
7.	Structural design certificate signed by the architect and vetting authority should be submitted. All structural design drawings should be signed by architect and counter signed by vetting authority	Not applicable as the total land area of the project is 6,25,909.02 m^2 for which Environment Clearance is sought. The Environmental Clearance individually would be taken for each township component in future under Category B2 if required. This project is independent and does not link with any other project/s which attracts directly or indirectly any provisions of schedule of EIA notification 2006 amended to date.
8.	Area details showing proposed uses as residential, commercial, parks, parking, roads, other services, facilities of the project also in percentage	The detailed area statement showing proposed uses is given in Table 2.2.
9.	Physical features within 30 m of the project sites with their ownership	The surrounding features around 30 m of the project site along with their ownership is listed in Table 2.8.
10.	Complete Details of facilities to be developed by the project proponent i.e. for which environment clearance is sought	The total land area of the project is 6,25,909.02 m^2 for which Environment Clearance is sought. The Project is designed to be a self-sufficient residential establishment, wherein infrastructure facilities such as road network, water supply, electric supply, emergency power supply and communication facilities are proposed. Further, the project proponent will make provisions for waste collection and disposal, rain water harvesting and sewage treatment to ensure that the project is environment friendly. The project proponent also proposes to arrange for safety, maintenance and security of the residents. The Environmental Clearance individually would be taken for each township component in future under Category B2 if required.
11.	Details of rain water harvesting are to be given	The roof top rainwater harvesting through recharge pit process will be used for the recharge of the water at the project site. The quantity of annual harvested rainfall at the project site at present is 2978.2 m^3. 31 recharge pits of diameter 3.5 m and depth 5 m are proposed. The details of calculation are given in Chapter 4, section 4.2.2.
12.	Provision of 100% solar lighting along the	Solar lighting will be applied as an alternate source of energy to

Sl. No.	TOR Conditions/ Points	Compliance
	road site, stair cases, common places	reduce load on the power supply which will be used in in parks, road sides, substation and other common places like traffic signaling etc.
13.	Plan for EWS/LIG housing provision as per Development Authority bye-laws	EWS/LIG housing is planned over an area of 10938.55 m^2 which is 4.39% of the total area. Plan for the same is attached as Annex 2.2.
14.	Examine in detail the proposed site with reference to impact on infrastructure covering water supply, storm water drainage, sewerage, power, etc., and the disposal of treated/raw wastes from the complex on land/water body and into sewerage system. Consider soil characteristics and permeability for rainwater harvesting proposals, should be made to prevent ground water contamination. Maximize use of treated water by recycling and utilization of rainwater.	Impact on Water Supply: The project is going to utilize ground water during its operational phase which is going to put additional pressure on the already over-exploited ground water resource zone.
		Impact on Water Drainage: The project is not going to alter any natural drainage system.
		Impact on Sewerage: The domestic sewage generated from the site shall be treated in the onsite Sewage Treatment Plant. The treated water shall be reused for flushing and landscaping. Excess Treated Water will be stored in 2 storage tanks of capacity 1977 m^3 each, out of which one tank will be used for fire-fighting and water from other tank will be provided to nearby societies and fields
		Impact on Power: The power required for the project shall be supplied by Uttar Pradesh Power Corporation Limited (UPPCL). The connected load for the Integrated Township Project will be approx. 2x10 MVA which shall be supplied by various transformers of 1000 kVA ,630 kVA, 400 kVA, 11/0.433 kV capacities which will be installed as per the load requirement and after taking prior permission.
		Disposal of treated or raw waste: The waste generation in the operation phase is limited to municipal solid waste, STP Sludge and Electronic Waste. Only biodegradable portion of the wastes shall be treated at site. The other raw wastes shall be segregated at source and sent to respective authorized recyclers. Details are provided in Chapter 4, section 4.2 and 4.2.1.
		Soil characteristics and permeability for rainwater harvesting proposals: The soil samples analysed indicate that the soil is moderately to highly porous. The depth of ground water at the project site as per CGWB varies from 7-10 m bgl. Hence rain water harvesting for ground water recharge has been proposed with pits having depth of 5 m.
		Use of Treated Water: The entire waste water shall be treated at site and re-used for different purposes. Details are provided in Chapter 2, section 2.5.3.
15.	Water requirement and its management plan along with necessary permissions for discharge	It is estimated that the total water demand during the operation phase will be 5295.75 KLD, of which fresh water requirement is 2836 KLD. The entire fresh water shall be sourced from bore wells. Necessary permission for the same shall be taken prior to start of operation. The management plan for both construction & operation phase is detailed out in Chapter 9, Table 9.1 & 9.2.
16.	An underground Pucca tank with kaccha base for collection/reuse of rain water may	The rainwater shall be collected for ground water recharge. Since the area is already an over-exploited zone of ground water

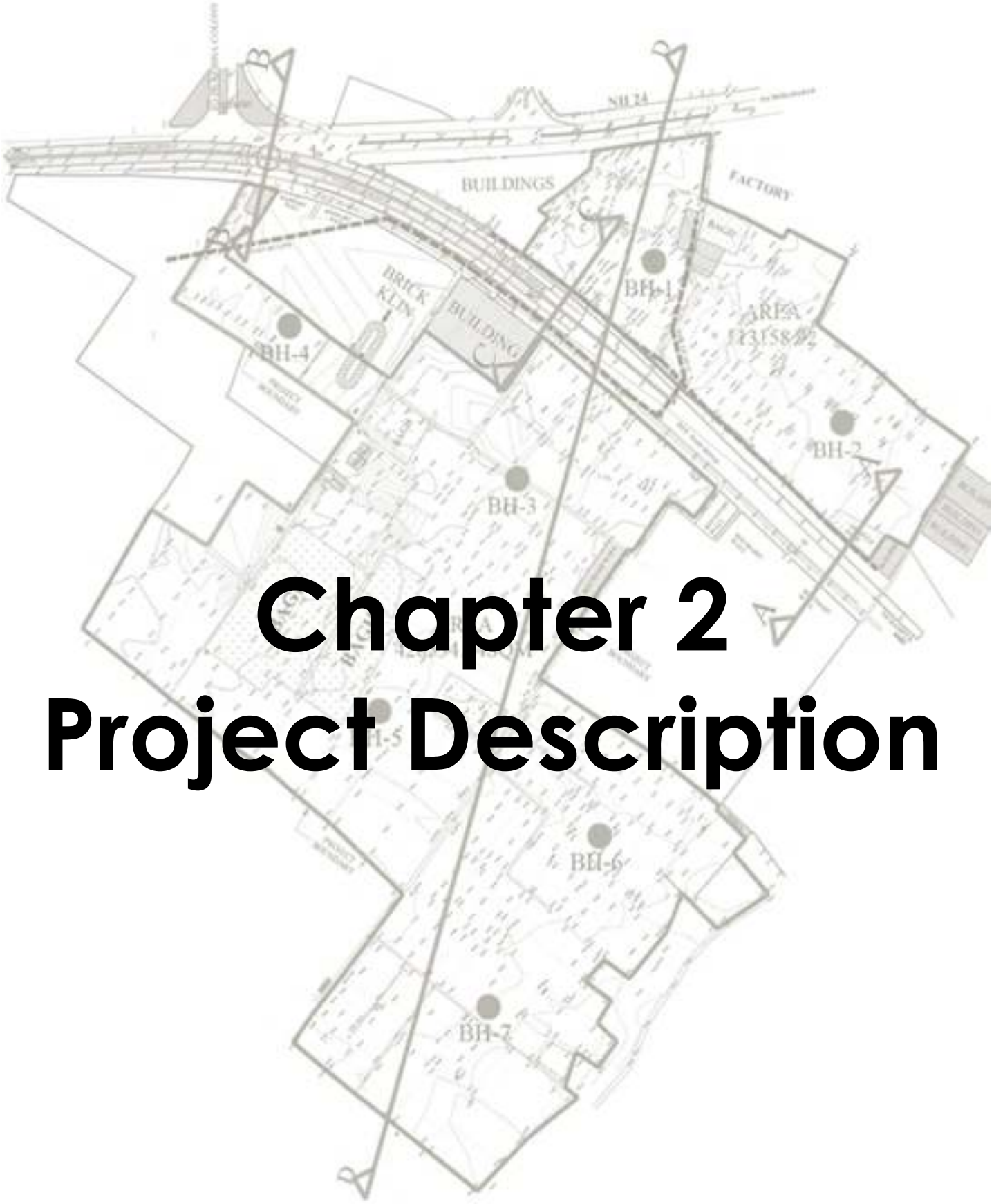
Sl. No.	TOR Conditions/ Points	Compliance
	be constructed	resource as per CGWB, utilizing rainwater for ground water recharge is going to contribute to water conservation. The excess treated water from STP shall be stored in tanks for re-use for different purpose.
17.	Hydro-geological investigations to be carried out and obtain permission from Central Ground Water Authority for withdrawal of ground water	Hydrogeological Investigation: As already informed, the project is for plotted development and the Proponent is only seeking Environment Clearance for the entire land. The Environmental Clearance individually would be taken for each township component in future under Category B2 if required. Therefore, hydrogeological investigation shall be carried out by individual project owners in future if required. Permission from CGWB for ground water withdrawal shall be taken prior to start of operation.
18.	Make provision for safety against failure in the operation of wastewater treatment facilities. Identify acceptable outfall for treated effluent	In case of any accidental discharge, the release will be contained within the internal drainage system of the site and used either for gardening or floor/vehicle washing.
19.	Details of green belt as a measure for mitigation of dust and noise and buffer between habitation and proposed project	Extensive greenbelt development along the periphery as well as in the open spaces shall work as a barrier to air pollution. Plan for greenbelt development is given in Annex 4.2.
20.	Landscape plan, green belts and open spaces may be described separately	14% of the total area has been earmarked for greenbelt development and open spaces. Plan for greenbelt development is given in Annex 4.2.
21.	Study the existing flora and fauna of the area and the impact of the project on them. There should be no basement below 15 m setback. Accordingly, the Plan should be revised and submitted	The project site does not involve any forest land. There are, however, certain plant species within the project site which includes neem, poplar, amaltas and shisham. The exact number shall be ascertained after detailed study. No sensitive floral or faunal species have been reported from the project site or from the study area. Details are provided in Chapter 3, section 3.6.
22.	Section of all internal roads should be provided. Right of way and carriage way width should be clearly marked on the map. Avoid entry/exit at point of junction of roads. Traffic movement plan in and out should be shown.	The road network for the site has been designed based on the proposals outlined in Moradabad Master Plan-2021. The proposed 61 m and 46 m roads have been identified as arterial roads. The traffic movement plan showing internal roads is shown in Annex 4.1.
23.	Examine existing crèche, education, health facilities, police, post office, banks and other services and make adequate provisions in the proposal	Existing infrastructure facilities in the study area are described in Chapter 3, section 3.7.8. The proposal includes provision of institutional and commercial arrangements within the site. Area demarcation for the same is given in Chapter 2, section 2.5.1.
24.	Assess soil erosion in view of the soil characteristics, topography and rainfall pattern	The topography of the site is more or less flat. The area experiences significant rainfall throughout the year with an average of 4 rainy days. The soil texture of the study area is mostly silty with low moisture content. Hence in view of these, it can be said that soil of the area is prone to erosion.
25.	Application of renewable energy/alternate energy, such as solar and wind energy may be described including solar water heating in the guidelines for entrepreneurs	Solar lighting will be applied as an alternate source of energy to reduce load on the power supply which will be used in street light, traffic signaling and in the houses for water heating.
26.	Consider solid wastes, including e-waste in addition to other solid wastes and their	The waste generation in the operation phase is limited to municipal solid waste, STP Sludge and Electronic Waste. As per

Sl. No.	TOR Conditions/ Points	Compliance
	disposal.	the manual on municipal solid waste prescribe by Central Public Health and Environmental Engineering Organization (CPHEEO), the quantity of solid waste generated is 20.30 TPD. The break-up is provided in Chapter 4, section 4.2.1.
27.	Identification of recyclable wastes and waste utilization arrangements may be made	As per break-up provided in Table 4.10, the estimated recyclable wastes to be generated during operation phase are 3.73 tonne/day. The biodegradable portion of the waste shall be utilized in organic waste converter installed within the site.
28.	Explore possibility of generating biogas from biodegradable wastes	The project is for land development only. The owners of respective projects to be developed in these plots may decide on the installation of individual or a common biogas plant depending on the amount of waste to be generated.
29.	Arrangements for hazardous waste management may be described as also the common facilities for waste collection, treatment, recycling and disposal of all effluent, emission and refuse including MSW, biomedical and hazardous wastes. Special attention should be made with respect to bird menace.	Arrangement for waste management is detailed out in Chapter 4, Table 4.8, Sl. No. 2. The wastes shall be segregated at source and collected in closed containers. The segregated wastes shall be disposed or treated based on their characteristics. Open dumping of wastes shall be strictly prohibited.
30.	Provisions made for safety in storage of materials, products and wastes may be described	Construction materials shall be stored in a planned and orderly manner that does not endanger employee safety. Provision for storing wastes in closed pallets to discourage rodent infection.
31.	Disaster management plan should be prepared.	A detailed disaster management plan has been prepared and presented in chapter 7, section 7.2.2.
32.	Traffic management plan including parking and loading/unloading areas may be described. Traffic survey should be carried out both on weekdays and weekend.	Traffic survey was done in three locations and the results are presented in Chapter 3, section 3.5.4. The traffic movement plan is attached as Annex 4.1.
33.	Parking provision is to be made for higher ECS worked out either as per state bye-laws or construction manual of the MoEF. Additional parking (more than required nos. as per norms) will not be permitted.	Parking provision for 8682 ECS has been planned as per MoEF & CC standard.
34.	Exclusive Parking area in the basement (excluding other facilities) and surface is to be clearly mentioned.	Plan for basement parking shall be submitted by individual project owners at a later stage.
35.	Provide service road for entry and exit to project site	The details are shown in Traffic movement plan attached as Annex 4.1.
36.	Use of local building materials should be described.	The major materials required for construction of the proposed project will be steel, cement, bricks, metal, stones, electrical fittings etc. which shall be locally procured.
37.	Consider provision of DG Flue Gas emissions to be treated in a scrubber. Stack details with provisions of sampling port for monitoring to be described. Power backup should be restricted to 50-60% of power requirement. Plan should be revised and submitted.	From modelling studies, it has been estimated that the emission from DG set is very insignificant. Hence there will be no need for scrubbing of the gases. Stack emission details are provided in Chapter 4, Table 4.2. The procured DG set shall have inbuilt sampling port and sampling platform. The proponent shall provide power back-up for the common

Sl. No.	TOR Conditions/ Points	Compliance
		areas only. The power back-up for residential areas shall be arranged by individual developers.
38.	Work out MGLC for the combined capacity of DG sets.	The MGLC for combined DG set capacity is presented in Chapter 4, Table 4.4.
39.	Provide for conservation of resources, energy efficiency and use of renewable sources of energy in the light of ECBC code.	Solar lighting will be applied as an alternate source of energy to reduce load on the power supply which will be used in street light, traffic signaling and in the houses for water heating.
40.	Application of resettlement and rehabilitation policy may be described. Project affected persons should be identified and rehabilitation and resettlement plan should be prepared.	Not applicable for the proposed project. The land available is private land under the possession of owner.
41.	Examine separately the details for construction and operation phases both for Environmental Monitoring Plan and Environmental Management Plan	Environment Management Plan for both construction and operation phases are provided in Table 9.1 and 9.2 of Chapter 9 while the monitoring plan for both phases with cost and parameters is provided in Chapter 6.
42.	Corporate Environmental Responsibility (CER) shall be prepared by the project proponent and the details of the various heads of expenditure to be submitted as per the guidelines provided in the recent CER notification No. 22-65/2017-IA.III dated 01/05/2018.A copy of resolution as above shall be submitted to the authority along with list of beneficiaries with their mobile nos./address	As per MoEF&CC's OM dated 1st May, 2018, 1.5% of the project cost is to be spent on CER (Corporate Environment Responsibility) activities for green-field projects having project cost >100 crores and ≤ 500 crores. As such for the proposed project, an amount of Rs. 5.54 Crores has to be earmarked for spending under CER activities. The break-up is provided in Chapter 8, Table 8.1.
43.	Required no. of trees should be proposed @ 01 tree/80 m^2, submit plan	Greenbelt will be developed in 87,184.92 m^2 area. As such 1090 trees shall be planted. The plan is described in Annex 4.2.
44.	Project falling within 10 Km. area of Wild Life Sanctuary is to obtain a clearance from National Board Wild Life (NBWL) even if the eco-sensitive zone is not earmarked	There are no National Parks, Wildlife Sanctuary, Biosphere Reserve or Tiger Reserve within 10 km radius of the project site
45.	Declare/submit the running cost of STP and other environmental management services (e-g. Municipal Solid Waste Disposal, Green belt Maintenance, Water Management etc.) in the proposals which are to be including in the allotment letters. Vendors should be identified for Municipal Solid Waste Management and submitted.	The environment management cost against each parameter is given in Chapter 9, Table 9.3. An NGO shall be hired who will be managing the municipal solid waste inside the project premises during operation phase. The agency will arrange for door to door collection of domestic waste. The agency will also be responsible for segregation of waste at site.
46.	The proponent will submit the schedule of monitoring/data collection programme to the Office of Directorate, Member Secretary, UP Pollution Control Board and District Magistrate of related District	The baseline monitoring for the project was done from March to May, 2019. The EIA including the baseline data shall be submitted to competent authority for necessary approval.
General Guidelines		
a.	A legal affidavit by the Project proponent on Rs. 100/- non-judicial Stamp Paper, duly	Attached as Annex A

Sl. No.	TOR Conditions/ Points	Compliance
	attested by Public Notary, stating that: I. "There is no litigation pending against the project and/or land in which the project is proposed to be set up (please give name & ownership etc. of the project) and that for any such litigation what so ever, the sole responsibility will be borne by the Project proponent." II. "No activity relating to this project (i.e. name of the project) including civil construction has been undertaken at site except fencing of the site to protect it from getting encroached and construction of temporary shed(s) for the guard(s) (if fencing has not been done, then the same may be deleted). III. "I/We hereby give undertaking that the data and information given in the application, enclosures and other documents are true to the best of my knowledge and belief and I/We am/are aware that if any part of the data and information submitted is found to be false or misleading at any stage, the project will be rejected and clearance given, if any to the Project will be revoked at our risk and cost." IV. Project does not fall under any buffer zone of no-development as declared /identified under any law.	
b.	Another legal affidavit by the consultant stating "(a) that the prescribed TORs have been complied with (to be deleted if not applicable) & (b) that details and the data presented are factually correct", -as per MoEF circular dated 04.08.2009 is also to be submitted along with EIA.	Attached as Annex B
c.	Current site photographs viewing towards the project area from four directions indicating date of photograph taken, direction from which taken, name of the project, and signature of Project proponent along with consultant with seal should be submitted, so as to ensure that no construction has been started before the grant of EC	Attached as Annex C
d.	EIA should strictly follow the guidelines prescribed in annexure-III to the EIA notification of 2006 and the Methods of Monitoring and analysis (Annexure-IV):	Complied

Sl. No.	TOR Conditions/ Points	Compliance
	Guidance for assessment of representativeness and reliability of baseline environmental attributes detailed under EIA manual January, 2001 and other guidelines in the matter.	
e.	The status of accreditation of the EIA consultant with NABET/QCI shall be specifically mentioned. The consultant shall certify that his accreditation is for the sector for which this EIA is prepared	Complied and the status is annexed in Chapter 12 as Annex 12.2.
f.	On the front page of EIA/EMP reports, the name of the consultant/consultancy firm along with their complete details including their accreditation, if any shall be indicated.	Complied
g.	While submitting the EIA/EMP reports, the name of the experts associated with/involved in the preparation of these reports and the Name of laboratory through which the samples have been got analysed should be stated in the report. It shall clearly be indicated whether said laboratory is accredited by NABL or approved under the Environment (Protection) Act, 1986 (Please refer MoEF office memorandum dated 4th August, 2009). The name project leader of the EIA study shall also be mentioned.	Complied
h.	The EIA document shall be printed on both sides, as far as possible	Complied



Chapter 2
Project Description

2. PROJECT DESCRIPTION

2.1 DESCRIPTION OF THE PROJECT

The total plot area of the project is 6,25,909.02 m^2 (62.59 ha). The location of the project site identifying the surroundings is shown in **Figure 2.1** (10-km radius around the project site). In 2008, Moradabad Development Authority by the help of satellite data and existing land-use prepared the Moradabad Master Plan 2021 (draft). The said Master Plan-2021 has aimed at providing ample land for various land uses required for the future urban development as well as to follow a well-organized, well-planned and balanced approach for development of Moradabad city. As per the Master Plan, the proposed project site falls under residential use.

The conceived project by M/s Chadha Infratech Limited, one of the leading Real sectors developing group, has envisioned that the basic needs which are outlined in Master Plan-2021 of providing well versed development of residential stocks to accommodate the growing population with all amenities and integrating it to the basic culture and environment of Moradabad city are fulfilled. Integrated Township is proposed on the land demarcated as residential land use in the Master Plan-2021 as shown in **Figure 2.2**.

2.2 TYPE OF THE PROJECT

The proposed project falls under **Category B1 (8b) of EIA Notification, 2006**. **M/s Chadha Infratech Ltd.** has appointed **Greencindia Consulting Private Limited (hereinafter referred to as "GCPL"), Ghaziabad** to conduct the Environment Impact Assessment Study for the proposed project.

Table 2-1: Precise Area Statement

Total Plot Area	6,25,909.02 m^2 (62.59 ha)
Proposed built-up area	9,31,931.3 m^2
FAR Area	6,65,665.2 m^2
Non FAR Area	2,66,266.1 m^2
Green Area	87,184.92 m^2

Source: Satellite Imagery of Project Area, Google earth Inc, USA

2.3 NEED FOR THE PROJECT

The site is strategic for establishing an Integrated Township to have overall development in its vicinity which will provide excellent and economical housing stock to fulfill the growing demand and help in decongesting the core areas of Moradabad. The effort will be to build it as self-contained in terms of living and recreation. The Township development of strategic priority covers rapid and time bound urban infrastructure construction, improvement and maintenance of ecological environment. The Integrated Township is a step towards fulfillment of the basic housing needs of core Moradabad city.

The Township will be an attempt to develop as integration of Moradabad City to a wider area ensuring a high quality of life for all its residents by imparting an appropriate environmental setting and developing it in synchronization with the existing topography and environment. It has been designed to create harmony

between human habitat and existing and proposed peripheral developments. This township will provide a pollution free high standard of living through appropriate planning intervention.

2.4 PROJECT LOCATION

The project is located at Village Mangupura & Mehalakpur Mafi Near NH-24, Bypass More, Moradabad, Uttar Pradesh. The details of location are given in section 1.3.2 of Chapter 1.

2.5 SIZE OR MAGNITUDE OF OPERATION

The total plot area of the project is 6,25,909.02 m^2 (154.66 Acres). The Project involves water requirement, power requirement and parking requirement which are discussed below.

2.5.1 Land Requirement

As discussed above the project is spread over an area of 62.59 hectare. The whole land is under the possession of project proponent. The detailed area statement including ground coverage, FAR, services and Non-FAR is elaborated in **Table 2.2.**

Table 2-2: Area Statement

Sl. No.	Description	Area in		%	FAR	FAR Area	Non FAR	Total Built-up Area
		m^2	Acres					
a	Plotted	205897.25	50.88	82.62	1.75	360320.19	144128.08	504448.26
b	Group Housing	32375.93	8.00	12.99	2.50	80939.83	32375.93	113315.76
c	EWS/LIG area	10938.55	2.70	4.39	2.00	21877.10	8750.84	30627.94
1	**Residential Area**	**249211.7**	**61.58**	**42.89**		**463137.1**	**185254.8**	**648392.0**
2	Mixed Land-use	17678.16	4.37	3.04	3.00	53034.48	21213.79	74248.27
3	Public & Semi Public	58152.69	14.37	10.01	1.50	87229.04	34891.61	122120.65
4	Commercial /Office	31132.28	7.69	5.36	2.00	62264.56	24905.82	87170.38
5	Green/ Open Space	87184.92	21.54	15.01				
6	Road	137683.8	34.02	23.7				
Net Area for Development		**581043.6**	**143.57**	**100.0**		**665665.2**	**266266.1**	**931931.3**
Area under 30 m Green Belt and Mazar		**44865.41**	**11.09**					
Gross Area for Township		**625909**	**232.29**					

Source: Project Report for "Integrated Township, Moradabad",

2.5.2 Circulation and Parking Plan

Adequate provision will be made for car/vehicle parking at the project site. There shall also be adequate parking provisions for visitors so as not to disturb the traffic and allow smooth movement at the site. There will be the sufficient parking space for the vehicles.

Table 2-3: Parking Area Statement

Sl. No.	Description	FAR Area (m^2)	MoEF&CC Standard (ECS/100 m^2)	Parking Requirement	State Standard (ECS/80 m^2)	Parking Requirement
1	Residential Area	463137	1	4631	1	5789
2	Mixed Land-use	53034.5	2	1061	1	663
3	Public & Semi Public	87229	2	1745	1	1090
4	Commercial /Office	62264.6	2	1245	1	778
Comparative Parking Requirement				**8682**	-	**8321**

Source: (i) Manual on norms and standards for environment clearance of large construction projects, Ministry of Environment and Forests, Government of India (iii) National Building Code of India, 2005, Bureau of Indian Standards, New Delhi (iv) Project Report for "Integrated Township, Moradabad"

As shown in table above, ECS has been calculated as per MoEF&CC as well as State Standard. Accordingly, parking provision has been decided to be provided for higher ECS.

The road network for the site has been designed based on the proposals outlined in Moradabad Master Plan-2021. The proposed 61 m and 46 m roads have been identified as arterial roads. The concept adopted for the circulation plan is aimed such that the various sectors can be segregated through sub arterial roads. Neighborhoods are interconnected through collector and local roads designed in a loop fashion. Pedestrian movement has been encouraged along the local and collector roads by means of suitable footpaths. The pedestrian paths are also located along the green spaces allowing for an alternate network of movement within the site. Public transport would be encouraged on the loop roads through design parameters. Proximity of public transport terminals is also considered in the road network design.

2.5.3 Water System

Water Requirement: It is estimated that the total water demand during the operation phase will be **5295.75 KLD,** treated water will be used for the landscaping, Flushing through Dual Plumbing Pipelines. Water Supply will be provided by the ground water. The water requirement for the project is given below in **Table 2.4.**

Table 2-4: Water Requirement during Operation Phase

Sl. No.	Usage Type	Measure / Unit	Population / Area	Water Requirement in KLD			Wastewater in KLD		
				Total	Fresh	Treated	Total	Fresh (80%)	Treated (95%)
1	Residential	per person	28482	3845.10	2563.40	1281.70	3268.34	2050.72	1217.62
2	Floating Population	per person	4272	64.09	21.36	42.72	57.68	17.09	40.59
3	Commercial	$10m^2$/person	4175	187.88	91.85	96.03	164.70	73.48	91.22
4	Public Semi-Public: International Higher School; Primary Schools	$8m^2$/person	7263	326.84	159.79	167.05	286.53	127.83	158.70
5	Parks (Gardens, Green Area)	Per m^2	87184.92	871.85	0.00	871.85	0.00	0	0.00
Total Demand in KLD				**4423.90**	**2836.40**	**1587.50**	**3777.24**	**2269.12**	**1508.12**

Source: (i) Manual on norms and standards for environment clearance of large construction projects, Ministry of Environment and Forests, Government of India (iii) National Building Code of India, 2005, Bureau of Indian Standards, New Delhi (iv) Project Report for "Integrated Township, Moradabad"

The water balance diagram showing utilization pattern, treatment, reuse and discharge is given as **Figure 2.3.** Roof top and surface run-off will be collected and used for replenishing the groundwater aquifers by the system.

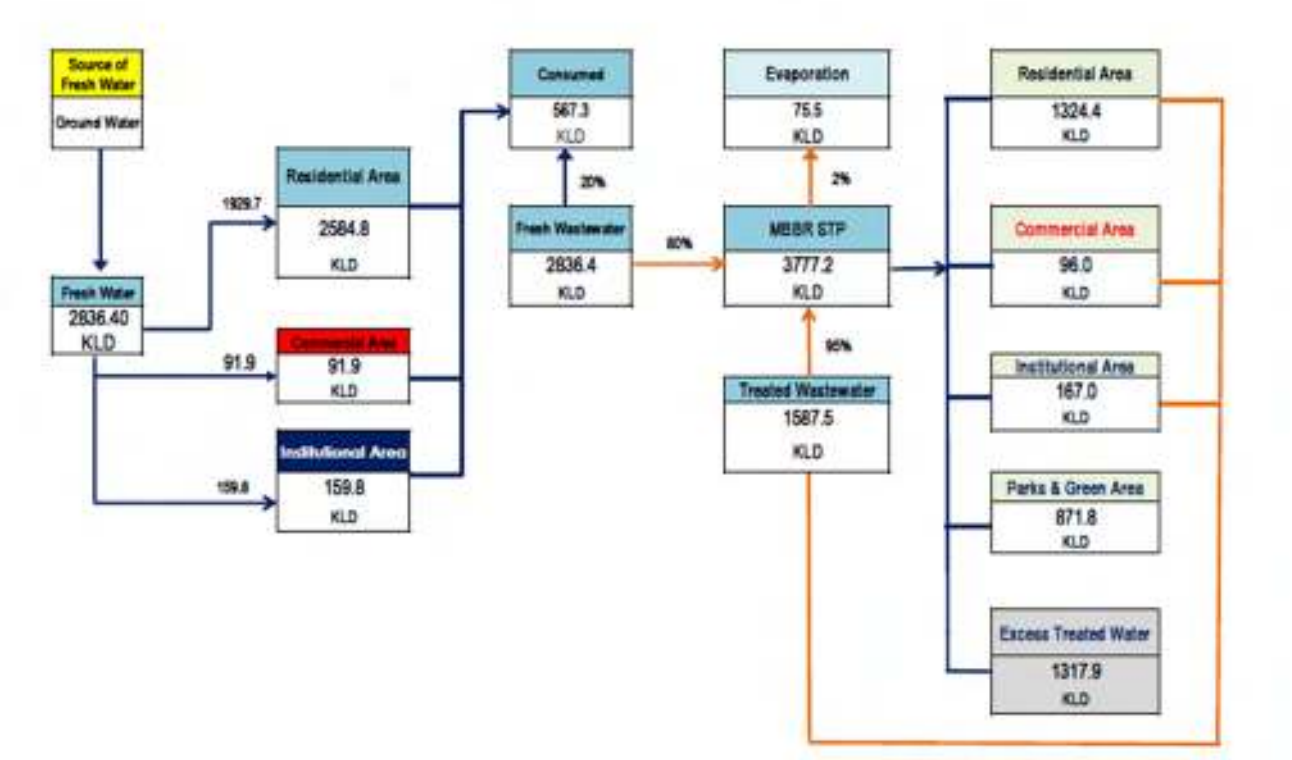


Figure 2.3: Water Balance Diagram

Excess Treated Water will be stored in 2 storage tanks of capacity 1977 m^3 each, out of which one tank will be used for fire fighting and water from other tank will be provided to nearby societies and fields.

Sewage Treatment System: Based on water calculation, an STP of capacity 5000 KL shall be installed. There will be only one STP for the entire unit and system of sewers shall connect to transport the sewage form different plot to the main STP. The schematic line diagram of the STP is shown as **Figure 2.4.**

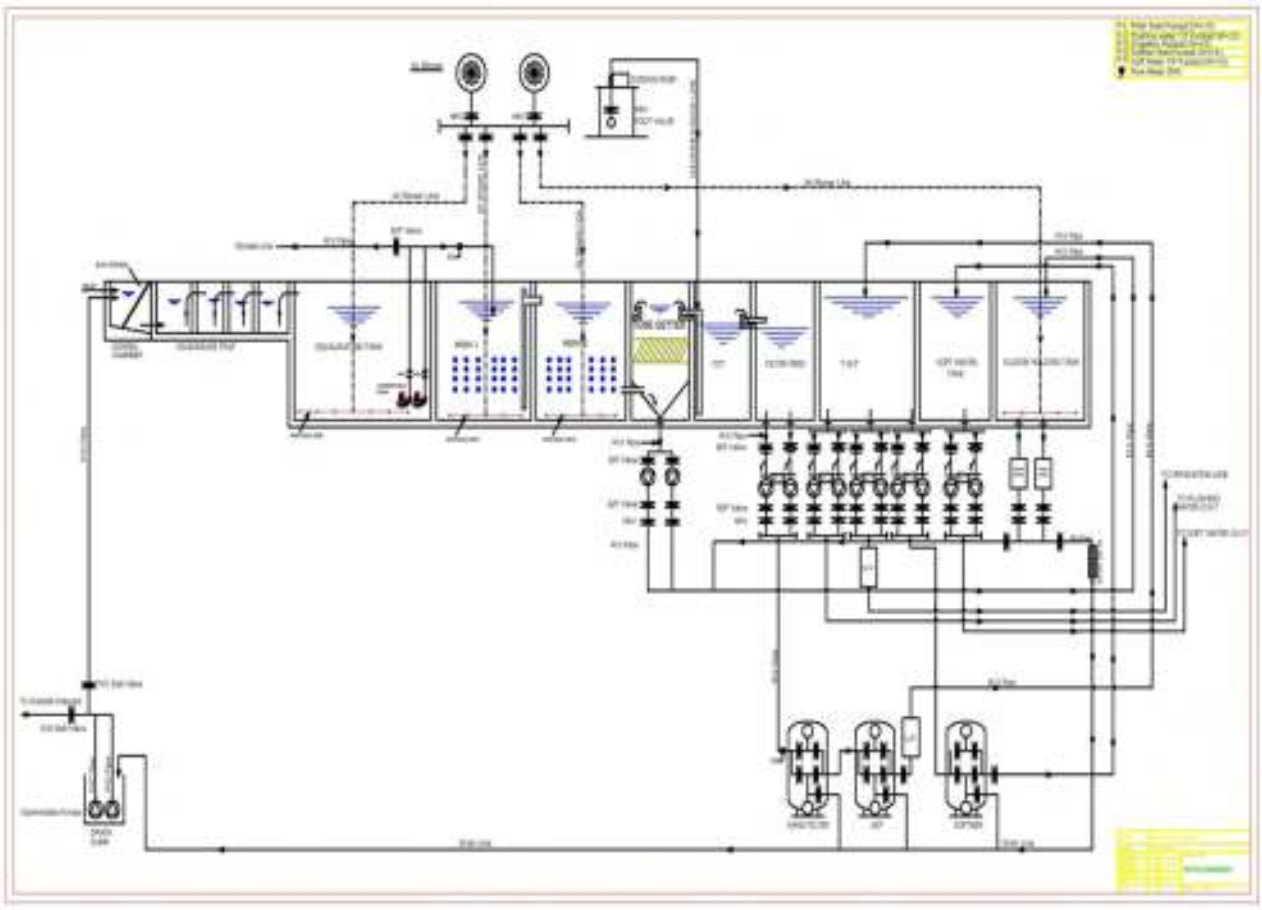


Figure 2.4: Schematic Line Diagram of STP

2.5.4 Power Supply

The power supply shall be supplied by Uttar Pradesh Power Corporation Limited (UPPCL). The connected load for the Integrated Township Project will be approximately 2x10 MVA which shall be supplied by various transformers of 1000 kVA ,630 kVA, 400 kVA, 11/0.433 kV capacities which will be installed as per the load requirement.

There is provision of 3 DG sets of 400 kVA (2x125 kVA+ 1x150 kVA) capacities for power back up. The DG sets will be equipped with acoustic enclosure to minimize noise generation and adequate stack height for proper dispersion. The power supply shall be supplied by Uttar Pradesh Power Corporation Limited, Moradabad (UPPCL). The maximum demand of power requirement for the project is 40 MVA.

Table 2-5: Power Requirement for Operation Phase

Sl. No.	Description	Load Demand in MW
1	Residential	15
2	Commercial	17
3	Public/Semi Public	3
4	Open/ Roads	1
Total		**36**
Load in MVA		**40**

Source: Project Report for "Integrated Township, Moradabad"

2.5.5 Manpower Requirement

Approximately 200 labours will be employed during the construction period. Proper sanitary facilities will be provided to construction laborers through community level toilets and treatment will be done using septic tank. Wash areas will be constructed and good hygienic conditions will be maintained.

2.6 PROPOSED SCHEDULE OF APPROVAL AND IMPLEMENTATION

The proposed Township is scheduled to be completed within the time frame under the integrated township policy 2014. For each activity where operators are detailed, a detailed scheme and schedule of unit operations will be worked out and made available to all operators for implementation and maintaining records of implementation for record, reference and checking. The schedule thus formed can be altered from time to time to suit changes in water quality, hours of availability of power, break-downs if any and upset conditions etc.

The implementation schedule is shown in **Figure 2.5.**

2.7 TECHNOLOGY & PROCESS DESCRIPTION

2.7.1 STP Technology

The proposed STP is based on MBBR Technology. An MBBR (Moving Bed Biofilm Reactor) or adherent reactor biomass moving bed is a biological treatment plant for the purification of waste water, i.e. exhaust, polluted. The reactors, moving bed biomass adherent part of the family of adherent biomass systems, which are displacing jobs to activated sludge treatment of wastewater polluted.

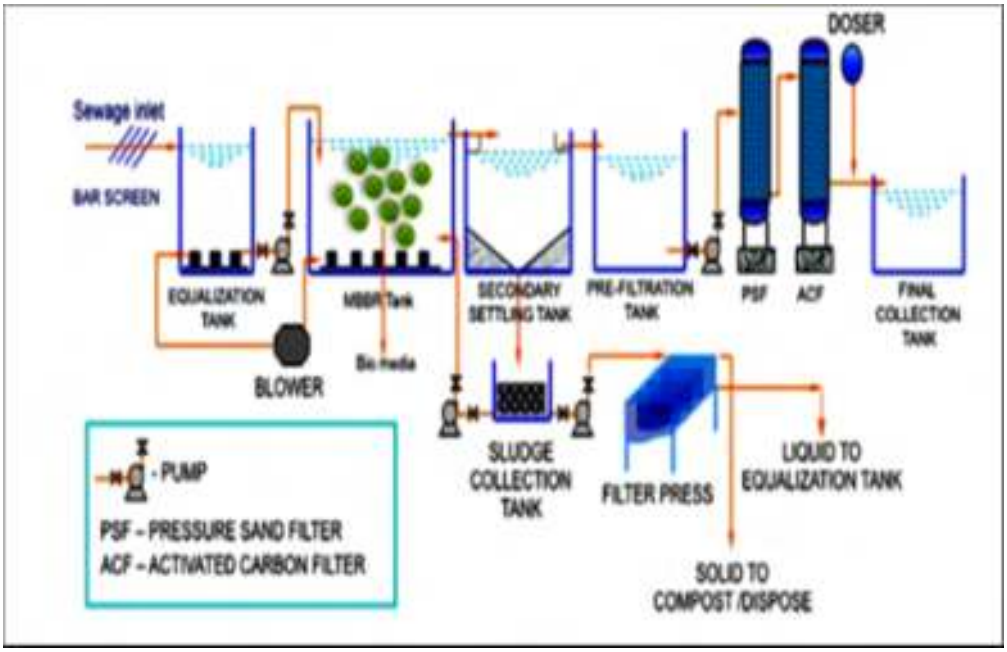


Figure 2.6: Typical Layout of Moving Bed Bio-film Reactor (MBBR)

The MBBR technology has following advantages

- It provides primary, secondary and tertiary treatment all in one unit; in a single evergreen facility open to atmosphere;
- No pre-treatment and no chemical usage;
- Odour-free;
- Low energy requirement.

The sewage shall be collected by gravity into the collection tank/equalization tank of Sewage Treatment Plant (STP) via perforated screens to prevent the large particles into system. In equalization tank, pH and temperature of incoming sewage will be equalized. The sewage from equalization tank will be pumped to Moving Bed Biofilm Reactor (MBBR) reactor for biological treatment, where required quantity of air will be supplied to meet the oxygen requirements by means of blower and fine bubbles air diffusers. In MBBR reactor, thousands of polyethylene biofilm carriers operate in mixed motion within an aerated wastewater treatment basin. Each individual bio carrier increases productivity through providing protected surface area to support the growth of heterotrophic and autotrophic bacteria within its cells. It is this high-density population of bacteria that achieves high-rate biodegradation within the system, while also offering process reliability and ease of operation. After MBBR reactor, sewage will flow by gravity to settler (tube type or equivalent) where sludge will be settled at the bottom due to gravity. There is provision for sludge recirculation, if needed. This settled sludge may be recycled through sludge pump to MBBR reactor to meet the mixed liquor suspended solids (MLSS) requirement. Excess sludge will be discharged through a filter press where solid and liquid will be separated. The sludge collected will have low moisture and after drying can be used as manure. The collected liquid will be re-circulated through the system. Final discharge of treated waste water from settler will be collected in chlorine contact tank, where some chlorine will be dosed for disinfections of treated waste water. Then, treated sewage will be pumped for tertiary treatment through duel media filter or it will be passed through Ultraviolet (UV) disinfection system. Treated sewage will meet the norms prescribed by Environmental (Protection) Rules,1986, Schedule VI for Discharge to Inland Surface Water but will be utilized for flushing, HVAC and for irrigation of greenery & landscaping purpose. Only in monsoon, some treated sewage, which was for irrigation, may be discharged to surface water.

The MBBR Process flow diagram is shown in **Figure 2.7**.

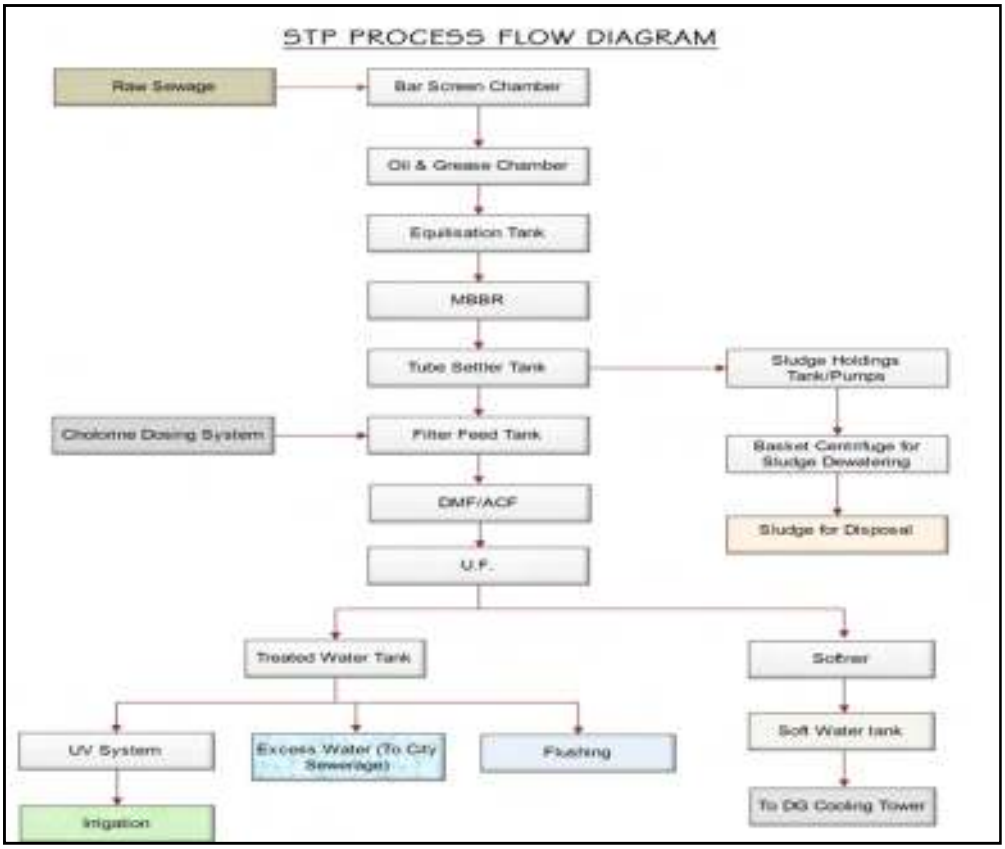


Figure 2.7: STP Process Flow Diagram

Following are the specifications of the STP capacity and waste water characteristics:

Table 2-6: Wastewater Characteristics

Parameters	Amount
Daily load	4236.60 KLD
Daily Average Load	176.53 KLD
Daily Average Peak Load (2/3rd of total / 4hours)	706.1 KLD
Duration of flow	24 hours
Temperature Maximum	46°C
pH	7.0 to 9.5
Color	Mild
TSS	100-400mg/l
BOD	200-300mg/l
COD	500-700mg/l

Source: (i) Project Report for "Integrated Township, Moradabad"

The plant will be designed to meet the standards stipulated by the Pollution Control Board. As mentioned earlier the treated waste is envisaged to be used for landscaping and for Air-conditioning makeup. To achieve this, the plant will meet the standards especially for pH, BOD and suspended solids (SS) parameters as depicted in **Table 2.7.**

Table 2-7: Desired MBBR Output Water Quality

Sl. No.	Parameters	Inlet	Outlet	General Standards for Discharge of Environmental Pollutants Part-A : Effluents: Inland Surface Water
1	BOD	300 mg/l	Less than 20 mg/l	30 mg/l
2.	COD	400 mg/l	Less than 150 mg/l	250 mg/l
3	Oil & Grease	50 mg/l	Less than 10 mg/l	10 mg/l
4	TSS	200 mg/l	Less than 50 mg/l	100 mg/l
5	pH	6.5-8.5	6.5-8.5	5.5 to 9

Source: CPCB

2.8 PROJECT DESCRIPTION

The total built-up area of the project is 9,31,931.3 m^2 for which we are seeking the Environment Clearance. ***The Environmental Clearance individually would be taken for each township component in future under Category B2 if required.*** **This project is independent and does not link with any other project/s which attracts directly or indirectly any provisions of schedule of EIA notification 2006 amended to date.**

The locality of the project has a mixed land-use with institutional, residential and commercial areas in the vicinity. The project site is surrounded by Parsvnath Pratibha Apartments to the N and Krishna Bal Vidya Mandir Inter College adjacent to the project site and NH-24 towards the South-East of the project site. The site area is a flat terrain with mild slope tending towards North to South. The land level or contour maps are attached as **Figure 2.8**.

The surrounding features around 30 m of the project site is listed in **Table 2.8.**

Table 2-8: Surrounding Features of the Project Site (within 30 m)

Sl. No.	Surrounding Features	Distance from Project Site	Direction from Project Site	Land ownership
1	National Highway (NH-24 or NH-9)	Adjacent	N	Government Land
2	Krishna Bal Vidhya Mandir Inter College	Adjacent	SE	Private Land
3	Brick kiln	Adjacent	SW	Private
4	Ganga Handicrafts Factory & Showroom	Adjacent	N	Private

Source: (i) Site Visit by Team; (ii) Satellite Imagery of Project Area, Google earth Inc., USA

The approved layout plan of the project (with EWS/LIG areas marked) is shown as **Figure 2.9.**

2.9 DESCRIPTION OF MITIGATION MEASURES

2.9.1 Solid Waste Management

- The used oils will be sold to MoEF&CC Authorized recyclers.
- The domestic waste shall be handled according to Solid Waste (Management and Handling) Rules 2016. Bio-medical wastes to be generated from the First Aid center, shall be handled as per the Biomedical wastes (Management and Handling) Rules, 2016. These wastes will not be stored or disposed with other municipal wastes and stored at the facility for no more than 24 hours.
- Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008 will be strictly followed.

- Horticultural waste which will be collected at the secured location such that it will not hinder daily activity schedule or washed away by the surface run off causing choking of drains, etc. and will be separately disposed-off along with biodegradable waste.

2.9.2 Soil Quality

- Earthquake generated from cutting, filling, etc. will be collected separately and preserved in stacks with side slopes not exceeding 1:5.
- The topsoil (soil on the top 15 cm patch) will be preserved separately in a stack covered by tarpaulin. Efforts will be made to reinstate the soil for backfilling purposes. Topsoil will be re-used for horticultural areas.

2.9.3 Water Quality

- Excavation shall be avoided during monsoon season and care shall be taken to avoid soil erosion.
- Temporary septic tanks shall be constructed on the site during construction phase to prevent wastewater from entering the water bodies.
- Any wash off from the oil/grease handling area or workshop shall be drained through impervious drains.
- Appropriate drainage arrangements with catch drains and catch pits will be planned to prevent the spillage of chemicals and fuels reaching the water bodies.
- RWH has been proposed for ground water recharge.

2.9.4 Air Quality

- Water sprinkler systems shall be deployed to reduce air borne dust during construction.
- As soon as construction is over, the surplus earth will be utilized properly and in no case, loose earth will be allowed to pile up along the alignment.
- Use of screens to prevent dust dispersion from buildings and infrastructure sites, which are being constructed;
- High vehicle speeds increase the amount of fugitive dust created from unpaved areas. Speed bumps will be provided to ensure speed reduction on unpaved areas. Speed limit of 20 kmph shall be imposed on vehicles inside the site.
- Greenbelt development to attenuate air pollutants.

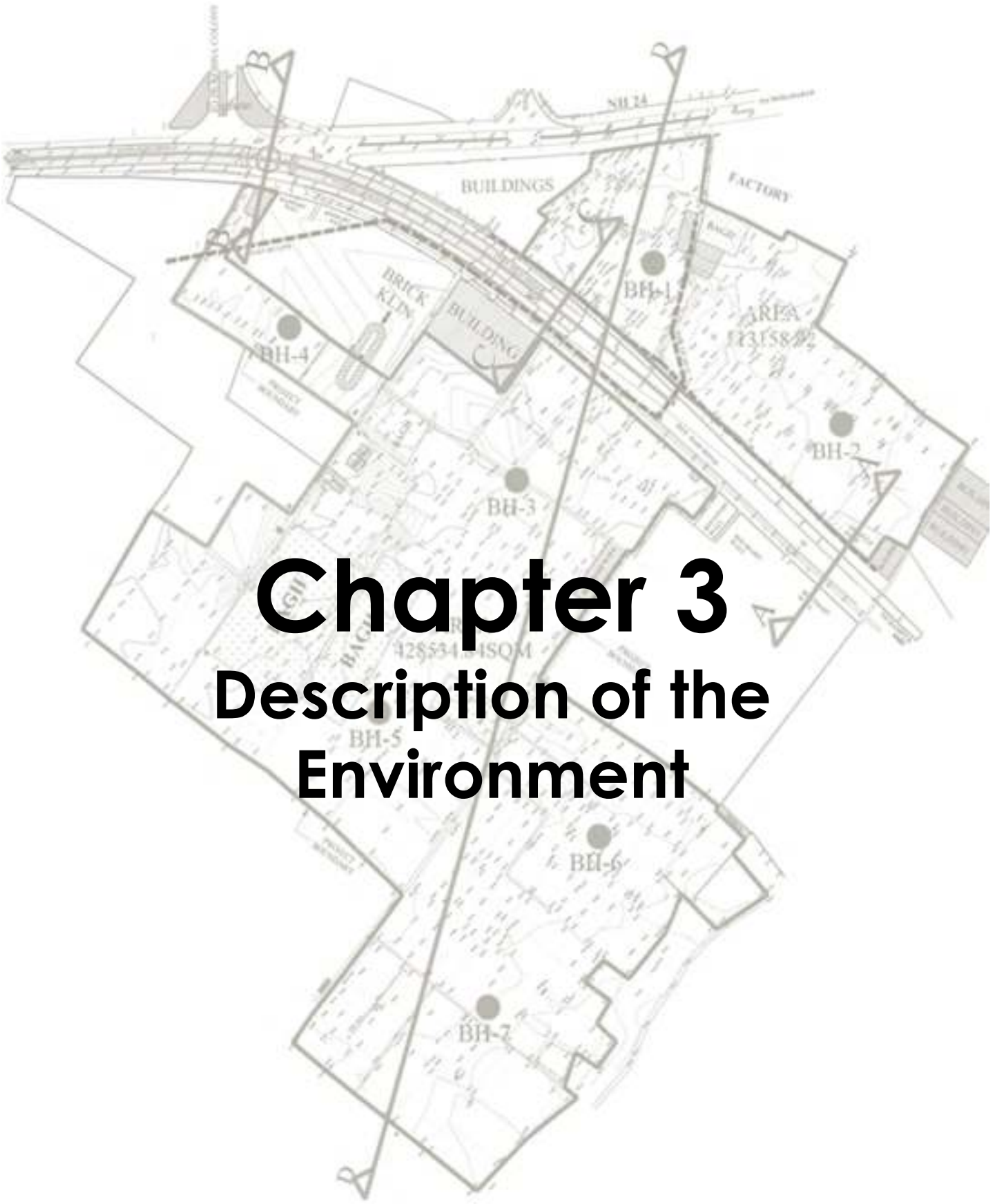
2.9.5 Noise Level

- For protection of construction workers, earplugs shall be provided to those workers who work very close to noise generation sources.
- Smooth flow of traffic shall be ensured on the internal road to avoid idling and honking of vehicles.
- The project proponent will use silent DG sets, with built in acoustic enclosure.

- Plantation will be taken up along the periphery of the project. The plantation will not only minimize propagation of noise but will also arrest dust.

2.10 ASSESSMENT OF NEW & UNTESTED TECHNOLOGY FOR THE RISK OF TECHNOLOGICAL FAILURE

Already best proven technology is proposed to be used in this project. Hence no technological failures are anticipated.



Chapter 3
Description of the Environment

3. DESCRIPTION OF THE ENVIRONMENT

The present chapter highlights various aspects of baseline data on significant environmental parameters and its analysis in the light of the proposed development.

Collection and coalition of environmental baseline data is essential to assess the impact on present environment due to the project activities. The environment includes the components of water, land, air, ecology, noise, socio-economic issues etc. The information presented in the chapter has been collected from primary field studies, desk research and secondary sources.

3.1 STUDY AREA & PERIOD

For baseline data collection, an area covering 10 km radius from the project site boundary has been considered as the study area. The map of the study area is given as **Figure 3.1**. Baseline data for environmental attributes like ambient air, meteorology, water, water use, hydrology, land use, soil, geology, noise, socio-economic, ecology and biodiversity etc. were collected. The study was conducted during the summer season (**March to May, 2019**).

3.1.1 Eco-Sensitive Features

There are no notified forest patches within the study area. The major streams are listed in **Table 3.1**. The sensitive features are shown in **Figure 3.2**.

Table 3-1: Eco-Sensitive Features Present in 15 km Radius of the Project Site

Features	Distance from Project Site (km)	Direction
Gangan Nadi	1.3	N
Ban Nadi	7.4	NW
Ramganga River	8.4	NE
Dhela Nadi	10.2	NE
Damdama Nala	11.2	NNE

Source: (i) Google Earth Imagery, 2018 (ii) SoI Toposheet No. 53L/9, 53L/10, 53L/13 & 53L/14

3.2 COMPONENTS & METHODOLOGY

3.2.1 Components

The components are divided into (A) Sources of Pollution-Existing & Proposed, (B) Propagation Medium-Air, Water & Land and (C) Receptors-Socio-Economy & Ecology. The following schematic diagram explains the network of environment components.

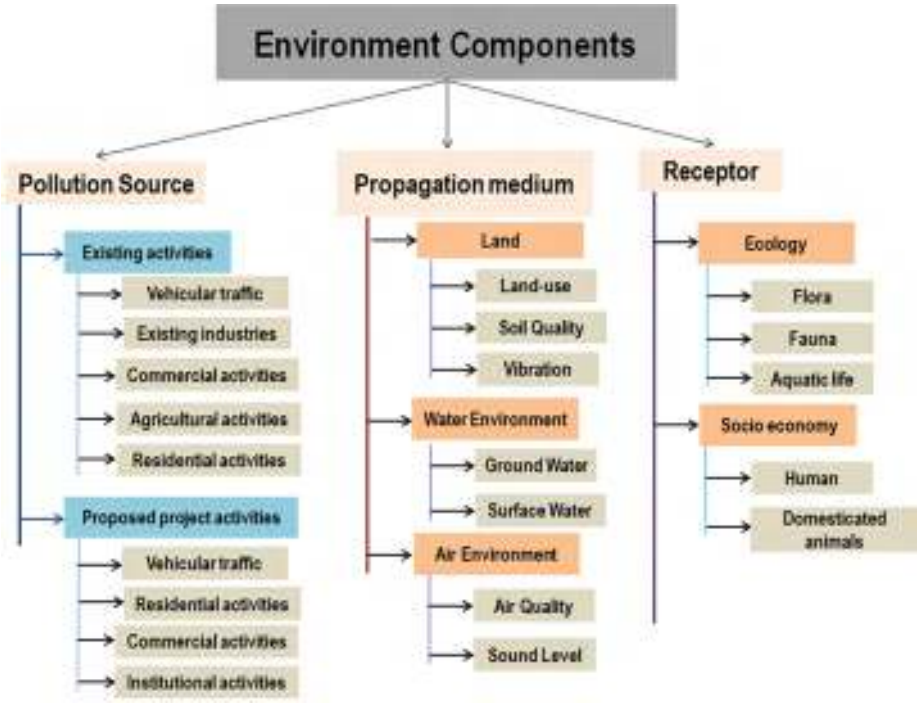


Figure 3.3: Schematic Diagram of Network of Environmental Components

3.2.2 Methodology

Baseline data of environmental attributes like ambient air, water, soil, meteorology, noise, ecology, socio-economic condition are collected as per the standard and specific Terms of Reference stipulated by MoEF&CC. The primary data are collected from site monitoring. In case primary data is not possible to be collected due to long term data needs , the secondary data collected from published sources and State agencies are used after validation and updated using appropriate statistical technique prior to use. The methodology adopted for study is given in following sections.

Primary Data Collection: The primary data collection is a pre-requisite for an Environment Impact Assessment Study in order to provide a description of the status and trends of environmental factors against which the predicted changes can be compared and evaluated in terms of importance. Wherever possible, the primary data are interpreted with site conditions and secondary data. The primary data were collected as mentioned in **Table 3.2.**

Table 3-2: Primary Data Collection and Method

Sl. No.	Area	Description	Method
1	Meteorology	Ambient temperature, rainfall, relative humidity, wind pattern	An automatic meteorological station was set up at project site. Cloud cover was manually observed and noted.
2	Ambient Air Quality	Particulate matter (PM_{10} & $PM_{2.5}$), sulphur dioxide (SO_2), Nitrogen dioxide (NO_2) and Carbon monoxide (CO)	Ambient Air Quality (AAQ), samples of ambient air were collected by installation of Envirotech make Respirable Dust Sampler BL460 (with Gaseous attachment facility) and Envirotech make Fine Particle Sampler APM 550 at 11 different locations and analysed for primary air pollutants.
3	Noise Level	L_{day}: This represents Leq of day-	Noise level measurements were done at 11 locations

Sl. No.	Area	Description	Method
		time. Lday is calculated as logarithmic average using the hourly Leq for day time from 6.00 A.M to 10.00 P.M L_{night}: This represents Leq of night-time. Lnight is calculated as logarithmic average using the hourly Leq for night-time from 10.00 PM to 6.00 A.M.	in the study area at different intervals of time for 24 hours with the help of sound level meter to establish the baseline Lday and Lnight noise pressure levels in the study area.
4	Water Quality	Surface water	Surface water samples were collected from 5 different locations for analysis.
		Ground water	Ground water samples were collected from 5 different adjoining areas and analysed as per standard APHA - and IS: 3025 criteria and IS: 10500, 2012.
5	Soil Quality	Physical and chemical characteristics	Random soil samples were collected from 5 locations by Auger up to depth of 30 cm and homogenized samples were analysed as per the methods described in "Soil Chemical Analysis" (M. L. Jackson, 1967)
6	Ecology & Biodiversity	Inventory of flora and fauna in 10 km radius	Floral and faunal inventory were prepared by identifying various plants and animal species in the study area during field visit.
7	Socio-economic Status	Population, household, caste distribution, infrastructure available	Socio-economic data was collected from primary sources through village-level surveys and Group Discussions.
8	Traffic Survey	Traffic Volume Count	In 3 locations

*The analysis report is attached as **Annex 3.1***

Secondary Data Collection: Secondary data are those collected over the years that can be used to understand the existing environmental scenario of the study area. The environmental impact assessment (EIA) studies are conducted over a short period of time and therefore the understanding of the environmental trends, based on a few months of primary data, has limitations. Ideally, the primary data must be considered along with the secondary data for complete understanding of the existing environmental status of the area. The secondary sources used for reference for this project are given in **Table 3.3**.

Table 3-3: Secondary Data Collection

Sl. No.	Area	Description	Source	Use of data
1.	Meteorology	Temperature, rainfall, humidity, seasonal wind pattern, wind speed, cloud cover, stability, mixing height, inversion	IMD Station, Bareilly (U.P) (1981-2010).	The data was used for verification of data generated during the on-site monitoring through data logger.
2.	Ambient Air Quality	Hourly concentration of PM_{10}, $PM_{2.5}$, SO_2, NO_2, and CO	Ambient air quality data reported in various EIA Reports of nearby industries available in MoEF&CC's website	The data was used for verification
3.	Water Quality	Ground Water	Water quality data reported in various EIA Reports of nearby industries available in MoEF&CC website and Central Ground Water Board- Moradabad	The data was used for verification

Sl. No.	Area	Description	Source	Use of data
			District	
4.	Soil Quality	Physical & chemical characteristics	Soil quality data reported in various EIA reports of nearby industries available in MoEF&CC website.	Soil data was verified by collecting soil samples from the study area which was then analysed for relevant physical & chemical characteristics.
5.	Nature of terrain	Land-use	Survey of India Toposheet, National Remote Sensing Centre (Satellite image)	Data from various sources were used for verification of our data after ground-truthing for features and land-use.
6.	Hydrogeology	Geological formation and analysis, hydro-geological analysis	Ground water brochure of Moradabad District before monsoon and after monsoon	The data was used for verification
7.	Seismic Data	Seismic zone, presence of faults, thrust	Vulnerability Atlas of India (2019)	Discussions were carried out with local people and officials to establish the facts.
8.	Biological Environment	Inventory of flora & fauna, endemic species, migratory routes	District Forest Department	Ecological data was used during field survey and discussion with locals to establish the species richness.
9.	Socio-economic status	Demographic profile, household, occupation status	Census data (2001 & 2011) Data collected from district office.	The census data was used with the primary data and the data collected from district office.

A. POLLUTION SOURCES: EXISTING & PROPOSED

3.3 EXISTING SOURCES

The existing sources of pollution in the study area include:

- Vehicular traffic: There are major roads running across the entire study area. NH-9 leading to Delhi and Moradabad city, SH-78 leading to Amroha and Rampur and SH-49 leading to Bijnor. Vehicles ply continuously in these roads and form a major source of pollution.
- Existing industries: Moradabad is famous for brassware industry. Popularly known as "Pital Nagari", the brassware and carved brassware goods manufactured in Moradabad are exported from this city to other parts of the country and abroad. The brass art objects, utility articles and utensils are exported to U.S.A., West Germany, Canada, Iran, Iraq, Egypt, U.K. and other European and South East countries. The manufacture of brass articles occupies the prominent position in the manufacturing activities of the district accounting for 60 per cent of the total industrial production.
- Commercial & residential activities: Moradabad is a well-established city and hence residential and commercial activities are widespread. These set-ups consume natural resources and in turn emit pollution in the form of greenhouse gases, solid waste, waste water etc.

- Agricultural activities: Around 72% of the entire study area is agricultural land. Agricultural management practices affect emission levels. Chemicals from fertilizers and pesticides make their way into water bodies and finally end up in drinking water.

3.4 PROPOSED SOURCES

The proposed project shall more or less add up to the existing pollution sources as it shall involve residential, commercial and institutional activities. The project shall also lead to increase in vehicular traffic which in turn shall increase the emission levels. The total solid waste estimated to be generated from the project during its operation phase is estimated to be 20.30 TPD. Construction waste generation has been calculated to be 6884 tonnes. The fresh water requirement shall be met from bore well which shall put additional pressure on ground water resource.

B. PROPOGATION MEDIUM

3.5 LAND

3.5.1 Vulnerability of the Study Area

Seismicity: The whole of Uttar Pradesh region is divided into three seismic zones: Zone II to Zone IV signifying low damage to high damage risk zones as per Vulnerability Atlas of India, 2019 (**Figure 3.4**). The project site located in Moradabad region falls under Zone IV signifying high damage risk zone. The two faults namely Moradabad fault and Mahendragarh-Dehradun fault passing through the region accentuate the earthquake risk.

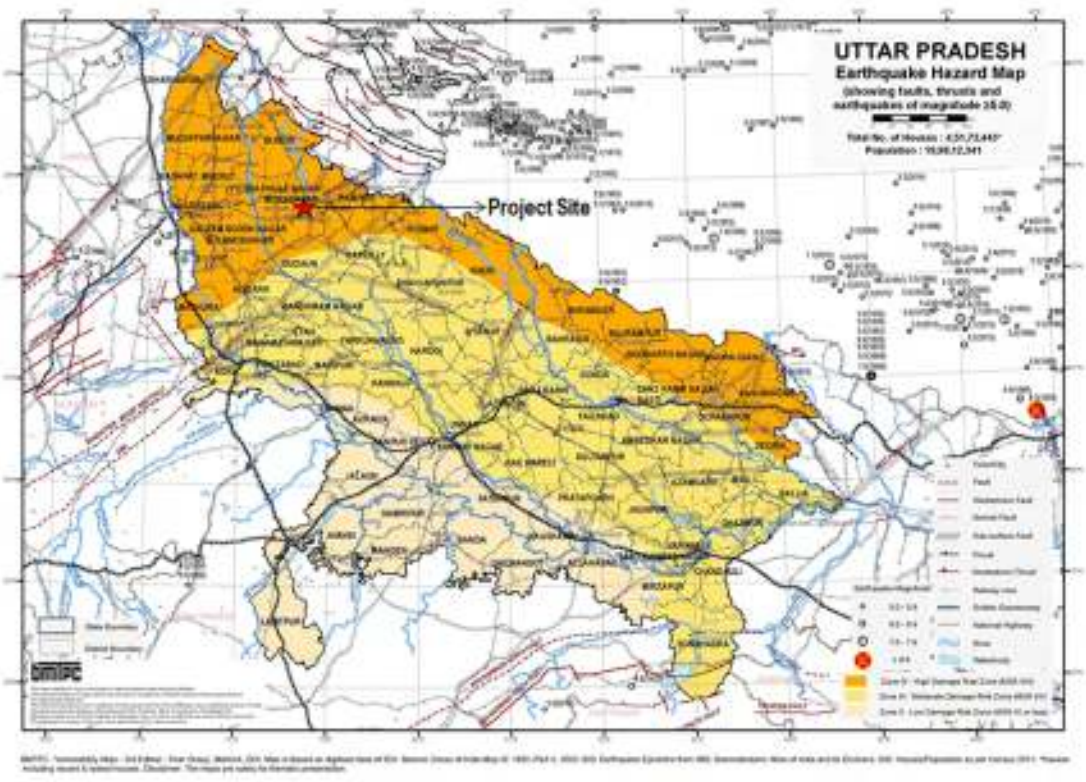


Figure 3.4: Earthquake Hazard Map of Uttar Pradesh

Source: Vulnerability Atlas of India by BMTPC, 2019

Flood & Cyclones: Flash floods bring about disasters. There was a critical situation in some parts of the district during 2010 floods. With most of the roads in and around the town going under water, boats had taken place of vehicles as the mode of transport. The situation turned grim in the town after water of overflowing Ramganga and Kosi Rivers entered the town. Flood water totally covered the streets and many houses were submerged several feet into water. Some people were shifted to safe shelters too. This is one major hazard which Moradabad is regularly prone to and in which there is huge loss of property. **Figure 3.5** shows the flood hazard map of Uttar Pradesh with the project site being marked on the map.

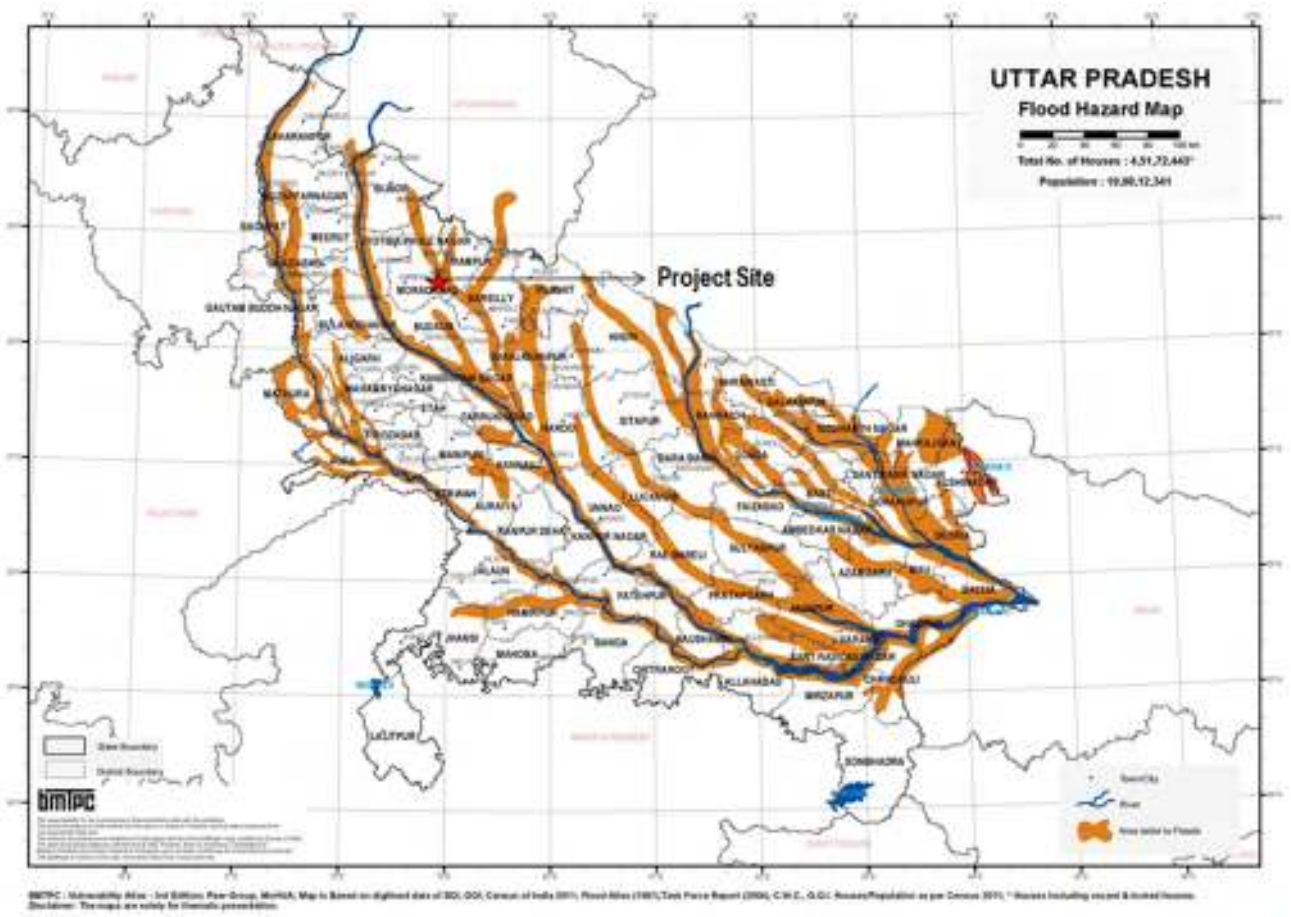


Figure 3.5: Flood Hazard Map-Uttar Pradesh

High Winds: Figure 3.6 shows the wind hazard map of Uttar Pradesh with the project site being marked on the map which shows that the project site lies in a very high damage cyclone risk zone with V_b = 50 m/s (180 km/h) as per Vulnerability Atlas of India, 2019, which attains this value occasionally. Construction works in this region will be designed keeping in mind the above wind speed.

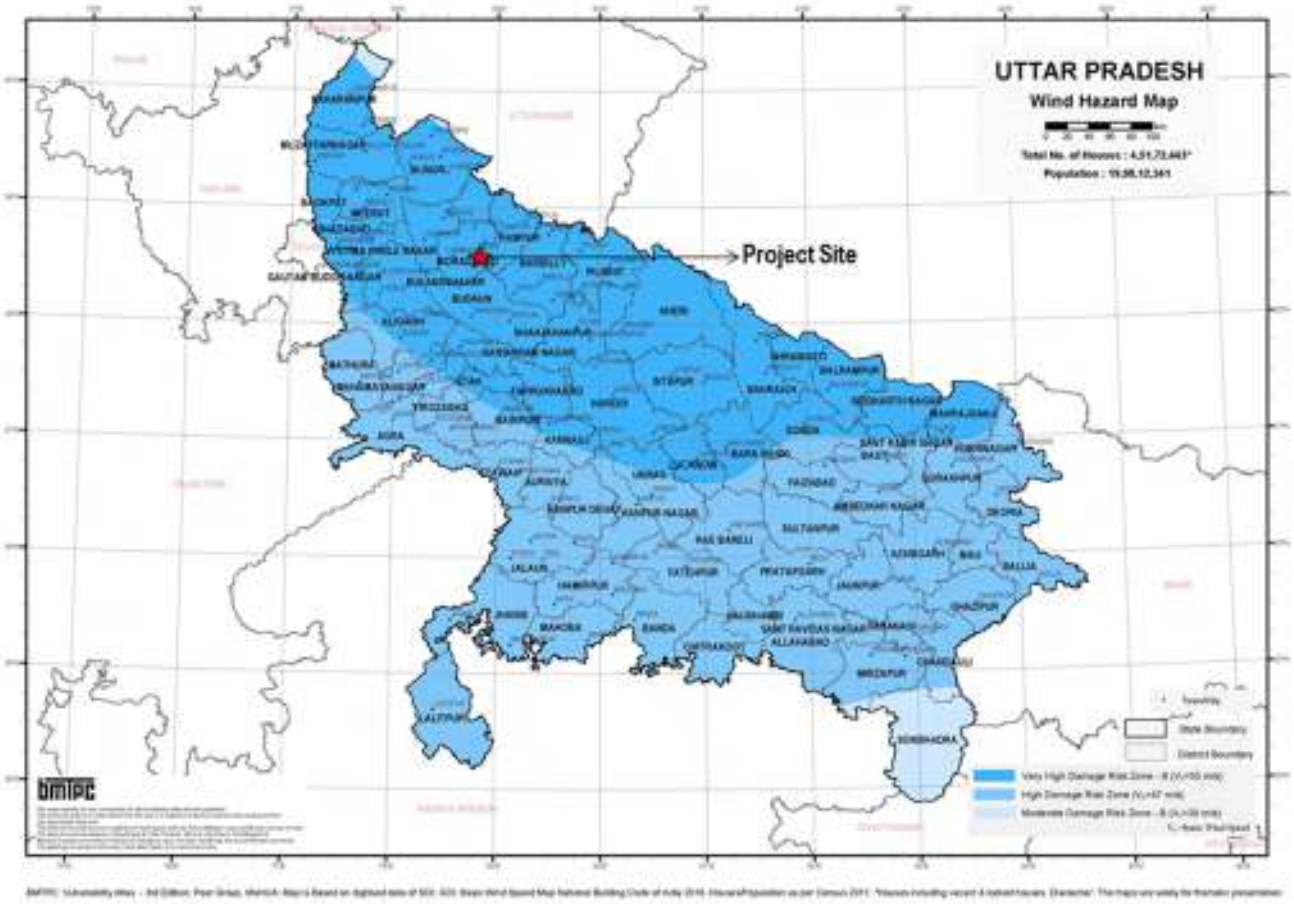


Figure 3.6: Wind Hazard Map-Uttar Pradesh

3.5.2 Topography

The project site has a flat topography with elevation ranges from 198 m to 205 m above Mean Sea Level (amsl). The slope of site is towards the North-East. No hills or high grounds are visible in and around the site. The contour map of the project site is given in **Figure 2.8**.

3.5.3 Geology

Moradabad is situated on the bank of River Ramganga, it is inhabited on the alluvial deposits of quartz energy period. The source of the alluvial deposits in this river has been traced to be from Himalaya ranges that is carried down by the fierce flow in Ganga River system and specially the River Ramganga. The texture of these deposits is from silty to sandy. These alluvial deposits are of two types:

- Bangar is referred to older alluvium and is found at remote areas from the river valley and at the surfaces that is loamy. The sand layer of Banger serves as aquifer at various depths from the ground.
- Khaddar is newer deposits and found near and along the valley and is inundated every year by floods.

The Moradabad Development area can be divided into 4 categories considering the land types.

- Madhya Pathari Area

- Ramganga Khadar Area
- North-East Tarai Area
- Katehar Region

Among these four categories, the site for the township lies under the Katehar region which lies to the south of Ganga River.

In Moradabad, the paleogene sedimentary rocks are situated at greater depths and much below the reach of general boreholes for tube well purposes. The rock constitutes a small massif under quaternary deposits and is faulted toward east. The underground water stored in sand layers and aquifers are found above these rocks and are used for all purposes in the city and nearby areas.

If minerals found in the whole of Uttar Pradesh is compared to the minerals found in the entire country, then this state has only 2% of the total value of the resources found the country. Minerals in this state are found mainly in the southern plateau parts of the state. There is not much minerals in this region because of Alluvial deposits in its geologic structure, which often lacks minerals.

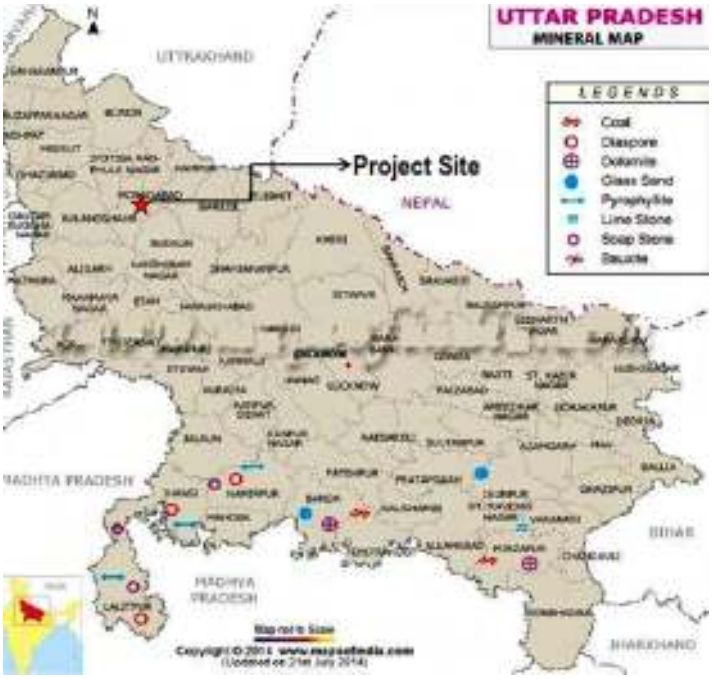


Figure 3.7: Mineralogical Map of Uttar Pradesh showing Project Location

3.5.4 Land-use

The land use of the study area was ascertained by utilizing three principal resources, namely, (i) Survey of India Topo-sheet (ii) FCC Satellite imagery and (iii) Ground validation for the interpretation of the FCC imagery.

The land-use distribution of the study area & project site is given in **Table 3.4**. The land-use table can be meaningfully interpreted from the pie diagram in **Figure 3.8** and **3.9** respectively**.** The land-use map of the study area is presented in **Figure 3.10.**

Table 3-4: Land-use Distribution of the Study Area & Project Site

Land-use	Study Area (10km radius)*		Project Site		Source/ Receptor	Major Direction
	Area in Ha	Area in %	Area in Ha	Area in %		
Built-up	5065	14.38	0.44	0.70	Receptor	N, NW
Industry	452	1.28	-	-	Source	E
Brick Kiln	438	1.24	0.32	0.51	Source	SW to W
Plantation	261	0.74	3.70	5.92	Receptor	Within site, NW
Open Scrub/Park	2436	6.92	5.83	9.31	Receptor	-
Waste Land	300	0.85	-	-	-	-
Open Area	774	2.20	-	-	-	-
Sandy Area	68	0.19	-	-	-	-
Water bodies	197	0.56	0.31	0.49	Receptor	NE
Agriculture Land	25224	71.63	52.00	83.07	Receptor	Project Site
Total	**35215**	**100.00**	**62.59**	**100.00**	-	-

*Note: *The Land-use classification of Study area includes the Land-use area of Project Site*
Source: (i) Google Satellite Imagery, 2018 (ii) Survey of India Toposheet No. 53L/9, 53L/10, 53L/13 & 53L/14

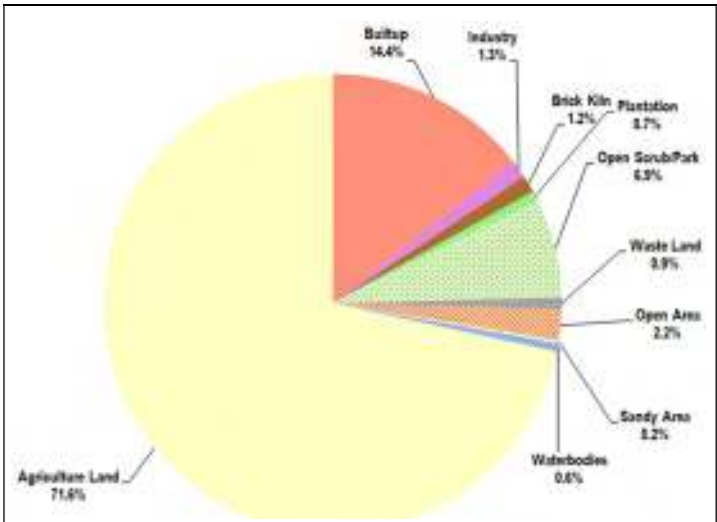


Figure 3.8: Pie Diagram depicting Land-use Pattern of the Study Area

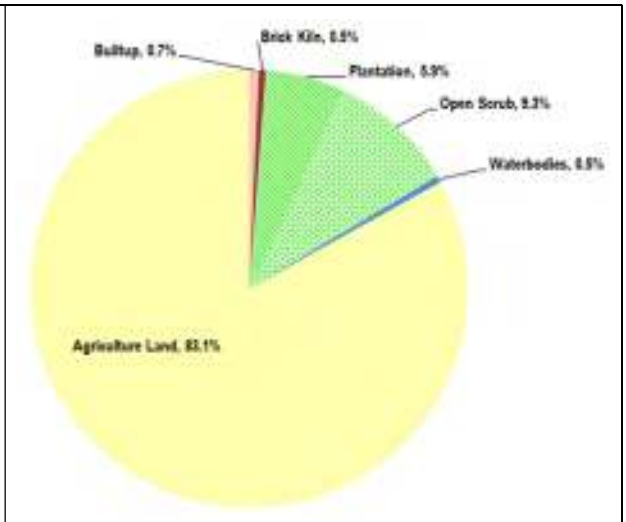


Figure 3.9: Pie Diagram depicting Land-use Pattern of the Project Site

It can be seen from the land-use map that the present development is majorly concentrated along SH-49. New developments including the proposed development are coming up along NH-9 as no more space is available along SH-49 for further linear development. Sporadic development is seen along SH-78 and NH-509. The existing development along NH-9 includes hotels, eateries, vehicle repair shops, housing facilities, various industries, institutions etc.

3.5.5 Soil Type & Characteristics

Assessment of soil quality is an important aspect with reference to tree plantations, percolation of water, ground water impact etc. For studying soil quality, sampling locations were selected to assess the existing soil conditions in and around the project area. The samples are collected by ramming core-cutter into the soil up to 30cm, 60cm and 90cm depth. Five locations have been selected for soil sampling. The sampling locations are shown in **Figure 3.11**. The sealed samples were sent to laboratory for analysis. The soil quality as analysed from the collected samples is given in **Table 3.5**.

These were analysed as per IS: 2720 and Methods of Soil Analysis, Part-1, 2nd edition, 1986 of (American Society for Agronomy and Soil Science Society of America). The homogenized samples were analyzed for physical and chemical characteristics. The samples have been analyzed as per the established scientific methods for physico-chemical parameters. The heavy metals have been analyzed by using Atomic Absorption Spectrophotometer (AAS) and Inductive Coupled Plasma (ICP) analyser.

Table 3-5: Characteristics of Soil Samples

Sl. No.	Parameters	Unit	Project Site (S1)	Manoharpur (S2)	Mahalkpur (S3)	Pakwara (S4)	Shahalampur (S5)
	Distance (in km) from Project Site		-	1.26	0.80	0.90	3.48
	Direction from Project Site		-	SE	WSW	NW	NNE
1	Soil color	----	Yellowish	Yellowish	Brownish	Yellowish	Brownish
2	pH	----	7.4	7.6	7.2	7.4	7.4
3	Electrical Conductivity	µmhos /cm	356	304	318	351	387
4	Moisture	%	4.6	3.8	5.1	4.3	3.2
5	Soil texture	----	Silty	Silty	Silt Loam	Silty	Sandy Loam
6	Clay	%	7	8	14	9	18
7	Silt	%	81	86	58	83	19
8	Sand	%	12	6	28	8	63
9	Infiltration Rate	cm/hr	1.2	1.1	1.1	1.1	1.1
10	Bulk density	gm/cm^3	1.3	1.4	1.5	1.4	1.7
11	Porosity	%	27.4	26.6	22.5	25.8	23.9
12	Nitrogen as N	kg/ha as N	215	291	260	290	189
13	Phosphorus	kg/ha as P	33	31	35	31	25
14	Potassium as K	kg/ha as K	198	193	193	198	125
15	Organic Carbon	%	0.30	0.28	0.31	0.30	0.15
16	Organic matter	%	0.51	0.49	0.54	0.51	0.25

Source: Testing by Envirotech East Pvt. Limited, Kolkata (March to May, 2019)

The samples were analysed as per the standard methods prescribed in "Soil Chemical Analysis (M.L. Jackson, 1967) and Department of Agriculture & Co-operation Ministry of Agriculture, Government of India" (Refer **Table 3.6**). The important properties analysed for soil are bulk density, porosity, infiltration rate, pH and organic matter, Nitrogen, Phosphorous and Potassium.

Table 3-6: Standard Classification of Soil

Sl. No.	Soil Test	Classification
1.	pH	<4.5 Extremely acidic 4.51- 5.50 Very strongly acidic 5.51-6.0 moderately acidic 6.01-6.50 slightly acidic 6.51-7.30 Neutral 7.31-7.80 slightly alkaline 7.81-8.50 moderately alkaline 8.51-9.0 strongly alkaline 9.01 very strongly alkaline
2	Salinity Electrical Conductivity (µmhos/cm) (1 ppm = 640 µmho/cm)	Up to 1.00 Average 1.01-2.00 harmful to germination 2.01-3.00 harmful to crops (sensitive to salts)
3	Organic Carbon	Up to 0.2: very less

Sl. No.	Soil Test	Classification
		0.21-0.4: less 0.41-0.5 medium, 0.51-0.8: on an average sufficient 0.81-1.00: sufficient >1.0 more than sufficient
4	Nitrogen (Kg/ha)	Up to 50 very less 51-100 less 101-150 good 151-300 Better >300 sufficient
5	Phosphorus (Kg/ha)	Up to 15 very less 16-30 less 31-50 medium, 51-65 on an average sufficient 66-80 sufficient >80 more than sufficient
6	Potassium (Kg/ha)	0 -120 very less 120-180 less 181-240 medium 241-300 average 301-360 better >360 more than sufficient

Source: Handbook of Agriculture, Indian Council of Agriculture Research, New Delhi 1961.

3.5.6 Observation and Interpretation

The quality of soil is rather dynamic and can affect the sustainability and productivity of land use. It is the end product of soil degradative or conserving processes and is controlled by chemical, physical, and biological components of a soil and their interactions (Papendick and Parr, 1992). Indicators, however, will vary according to the location and the level of sophistication at which measurements are likely to be made (Riley, 2001). Therefore, it is not possible to develop a single short list which is suitable for all purposes. Syers et al. (1995) also emphasized the range of likely indicators rather than the use of a single indicator.

Indicator	Soil function
Soil organic matter (SOM)	Soil structure, stability, nutrient retention; soil erosion Carter, 2002)
Physical: soil aggregate stability, infiltration and bulk density	Retention and mobility of water and nutrients; habitat for macro and micro fauna (Bengtsson, 1998; Swift et al., 2004)
Chemical: pH, extractable soil nutrients, N-P-K and base cations Ca, Mg & K	Soil biological and chemical activity thresholds; plant available nutrients and potential for N and P as well as loss of Ca, Mg & K (Doran and Jones, 1996a; Drinkwater et al., 1996)
Biological: microbial biomass C and N; potentially mineralizable N	Microbial catalytic potential and repository for C and N; soil productivity and N supplying potential (Cadisch and Giller, 1997; Doran and Jones, 1996b)

Physical Parameters:

- **Moisture Content:** Soil moisture is important for hydrological, biological and bio-geochemical processes. Moisture content of soil samples in the study area ranges from 3.2% (S5: Shahalampur) to 5.1% (S3: Mahalkpur). Generally, optimum crop growth and health occurs when the soil moisture content is held between 50 –80% of the "plant available water" (*Source: Introduction to the Soil-Water-Plant Environment, William Northcott Department of Biosystems and Agricultural Engineering, Michigan State University, NRCS Irrigation Training Feb 2-3 and 9-10, 2010*). **Hence it can be observed that the soil moisture content in the sampling locations is too less for optimum growth of crops.**
- **Texture:** Soil texture describes the size (diameter) of the soil particles. Where larger mineral particles predominate, the soil is gravelly (d>2mm), or sandy (0.05<d<2); where smaller, colloidal mineral particles are dominant, the soil is clayey (d < 0.002). Texture influences plant growth by its direct effect on soil aeration, water infiltration, cation exchange capacity, and erodibility. **The study area was found to have mostly silty texture.**
- **Infiltration rate:** Infiltration rate is dependent on soil texture (percentage of sand, silt and clay) and clay mineralogy. Water moves more quickly through the large pore spaces in a sandy soil than it does through the small pores of a clayey soil, especially if the clay is compacted and has little or no structure or aggregation. Infiltration rate in the study area ranges from 1.1 cm/hr (S4: Pakwara) to 1.2 cm/hr (S1: project site). **Soil organic matter affects infiltration through its positive effect on the development of stable soil aggregates, or crumbs. Highly aggregated soil has increased pore space and infiltration.**
- **Bulk Density:** Bulk density is required for gaseous exchange; so that high bulk density would pose restriction to the growth of deep rooted plants. Bulk Density of soil was found to be in the range from 1.1 gm/cm^3 (S3: Mahalkpur) to 1.7 gm/cm^3 (S5: Shahalampur). **The critical value of bulk density for restricting root growth varies with soil type (Hunt and Gilkes, 1992) but in general bulk densities greater than 1.6 g/cm^3 tend to restrict root growth (McKenzie et al., 2004).**
- **Porosity:** Soil porosity attributes to the fragmentation and aggregation of the soil particles due to vegetation development. The total pore volume of the study area varied from 22.5% (S3: Mahalkpur) to 27.4% (S1: Project site). As per classification given by Marcello Pagliai and Nadia Vignozzi, 1988, the soil in the sampling locations is moderately to highly porous. **Highly porous soils have a low holding capacity for water and become saturated quickly. The large pore spaces allow water to drain through the soil quickly, and porous soil often holds fewer nutrients than other soils.**

Chemical Parameters:

- **pH:** The pH of the soil samples vary from 7.2 (S3: Mahalkpur) to 7.6 (S2: Manoharpur) indicating neutral to slightly alkaline nature of soil.
- **Electrical Conductivity:** The electrical conductivity of soil is actually a measure of salinity. Excessively high salinity can affect plants in many ways: specific toxicity of a particular ion (such as sodium), higher osmotic pressure around the roots prevents an efficient water absorption by the plant. Some plants are more susceptible to the electrical conductivity than others and each species has an electrical conductivity

threshold, beyond which yield decreases. The electrical conductivity of the soil samples range from 304 µmhos/cm (S2: Manoharpur) to 387 µmhos/cm (S5: Shahalampur), which as per ICAR is average for germination.

- **Organic Carbon:** The organic carbon in the soil samples vary between 0.4% (S5: Shahalampur) to 0.8% (S3: Mahalkpur) indicating less to on an average content for growth of plants as per ICAR. The organic matter of the soil has its origin in the decay of dead plants and animals. Researches on soil and plants have received considerable impetus in connection with the role of organic matter in regulating the growth of plants. But, it must be remembered that all organic matters are not beneficial to higher plants.
- **Nitrogen:** The available nitrogen in the soil samples range between 189.4 kg/ha (S5: Shahalampur) to 291.2 kg/ha (S2: Manoharpur) which as per ICAR is better for growth of vegetation. Nitrogen is important because it is a major component of chlorophyll, the compound by which plants use sunlight energy to produce sugars from water and carbon dioxide during photosynthesis. It is also a major component of amino acids. Soil nitrogen exists in three general forms: organic nitrogen compounds, ammonium (NH^{4+}) ions and nitrate (NO^{3-}) ions. The majority of plant-available nitrogen is in the inorganic forms NH^{4+} and NO^{3-} (sometimes called mineral nitrogen).
- **Phosphorus:** Phosphorus is the key content which plays an important role in the photosynthesis, respiration, energy storage and transfer, cell division, cell enlargement and several other properties in the living plant. Available Phosphorus in the study area range between 24.7 kg/ha (S5: Shahalampur) to 34.9 kg/ha (S3: Mahalkpur), which as per ICAR categorization falls in the range of 'less to medium'.
- **Potassium**: Potassium is an essential plant nutrient and is required in large amounts for proper growth and reproduction of plants. Potassium is considered second only to nitrogen, when it comes to nutrients needed by plants, and is commonly considered as the "quality nutrient." It affects the plant shape, size, color, taste and other measurements attributed to healthy produce. Potassium content in the study area varies from 124.6 kg/ha (S5: Shahalampur) to 198.2 kg/ha (S4: Pakwara) which is less to medium for the growth of plant as per ICAR's classification.

Overall, the soil properties of the samples collected indicate an average profile for vegetation growth. The soil ranges from pure sand to stiff clays including all combinations of the two extreme litho units. The pure sand is called Bhur and clay is called Matiar. When both clay and sand are mixed, the soil is called Loam (or Dumat). Alluvial soils occurring in the flood plain of river are called Kamp and yield good crops (Ahmad and Srivastava, 1997). The soils of the area are mainly of three types: Loam, sand and silty loam. Along the river system the tract is mainly composed of loose sandy soils underlain by clays. The soils of the study area are also classified as Entisols and Inceptisols. Entisols are recent alluvium or young soils whereas inceptisols are those in which one or more horizons are developed and have appreciable amount of organic matter.

3.6 WATER ENVIRONMENT

3.6.1 Area Drainage

Moradabad district occupies the interfluve region between River Ramganga and Ganga. The area is almost a monotonous plain with no distinct features except some sandy ridges, river valleys and shallow depressions.

The area is drained by River Ramganga, a tributary of Ganga and River Gangan, a tributary of Ramganga, both on the northeastern margin. Other prominent water bodies in the area are Ban Nadi, Dhela Nadi, Damdama Nala, etc. Mainly dendritic drainage pattern is observed in the study area.

Table 3-7: Major Water Bodies in the Study Area

Particulars	Distance from Project Site (km)	Direction
Gangan Nadi	1.3	N
Ban Nadi	7.4	NW
Ramganga River	8.4	NE
Dhela Nadi	10.2	NE
Damdama Nala	11.2	NNE

Source: Google Satellite Imagery 2018

There are no nala or streams passing through the project site. However, there is a pond near the existing brick kiln. The drainage pattern of the project site is shown in **Figure 3.12**.

3.6.2 Hydrology & Hydrogeology

The area is drained by River Ramganga, the first major tributary joining the Ganga. Ramganga is a foothills-fed river rising in the Himalayan foothills. It shows very limited braiding and is highly sinuous in some reaches. The Ramganga has a relatively narrower active floodplain along its both banks. The catchment area of the sub-basin is about 32,493km^2. The important tributaries that join the Ramganga River are the Ban, the Khoh, the Gangan, the Gagas, the Aril, the Kosi, the Haldgadi Rao and the Deoha.

The study area forms a part of Central Ganga Plain and is underlain by alluvial deposits of Quaternary age. This alluvium is a pile of unconsolidated sediments made up of sequence of clay, silt, calcareous nodules, locally known as Kankar and different grades of sand and occurrence of gravel at depth is also occasionally reported. Calcareous nodules, indicative of sedimentation gaps, occur as thin beds and lenses.

As per CGWB, depth to water level in the project site during pre-monsoon and post-monsoon period varies from 7-10m bgl. The water level is comparatively shallower in the flood plain of River Ramganga and its tributaries. The water level occurs comparatively at deeper in the southern west blocks of River Ramganga fallen in tehsil Bilari, Sambhal and Moradabad.

Figure 3.13(a) and **3.13(b)** shows the depth to water level of the district (with project site marked) during pre-monsoon and post-monsoon periods.

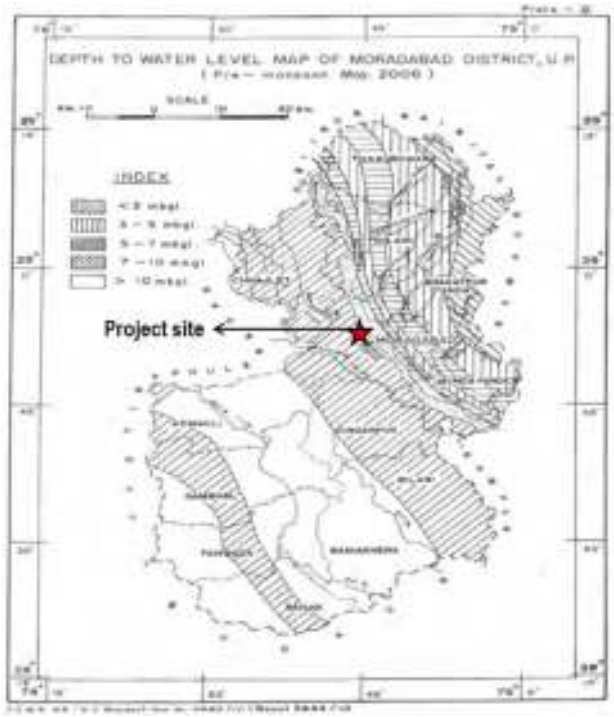


Figure 3.13(a): Depth to Water Level of Moradabad District during Pre-monsoon as per CGWB, 2006

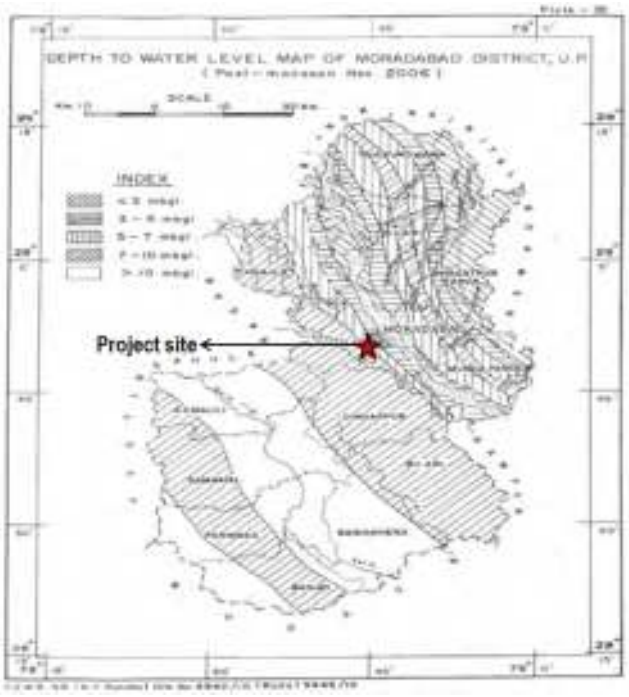


Figure 3.13(b): Depth to Water Level of Moradabad District during Post-monsoon as per CGWB, 2006

Source: http://cgwb.gov.in/District_Profile/UP/moradabad.pdf

As per CGWB's Ground Water Resource Assessment, 2017, the Moradabad city falls under over-exploited zone.

3.6.3 Water Quality

To understand the existing surface and groundwater quality, tests were performed in a laboratory. For this samples were collected, after reconnaissance, from various locations in the area and tested for water quality parameters.

Frequency and Parameters: Water samples were collected thrice during the study period for each sample and analyzed for following selected physico-chemical and biological parameters.

- **Physical Parameters** - pH, colour, temperature, and conductivity, TDS and turbidity, Na, & K etc.
- **Chemical parameters** - Alkalinity, hardness, NO_3, Cl, SO_4, Ca, Mg, Phenolic compounds, DO, BOD and COD
- **Heavy metals** - Cyanide, Aluminium, Arsenic, Cadmium, Chromium, Iron, Copper, Lead, Manganese, Zinc and Mercury

The samples for surface water quality were taken from major surface water bodies and underground water samples were taken from hand-pumps near settlements for assessing the ground water quality.

Surface and ground water sampling was carried out in 5 locations each to get an idea about the water quality of the study area. The water quality sampling locations are shown in **Figure 3.14**.

Methodology of Sampling & Analysis: Analyses of the samples were carried out as per established standard methods and procedures prescribed by CPCB, IS 3025 Codes and APHA 22nd edition, 2012.

Samples for chemical analysis were collected in polyethylene carboys. Samples collected for metal content were acidified with 1ml HNO_3. Physicochemical parameters like pH and conductivity were measured on site using potable meter while for chemical (dissolved oxygen) and biochemical (BOD) parameters water samples were fixed in 300ml BOD bottles using $MnSO_4$ and alkaline iodide in field and sent to the laboratory. A separate BOD bottle with 300ml of respective sample were sent to the laboratory without any fixation for BOD analysis. The basic precautions were taken care to avoid any contamination during the sampling. The methodology for sample collection and preservation techniques was followed as per the Standard Operating Procedure (SOP) mentioned in **Table 3.8**. The analysis methodology is given in **Table 3.9** and CPCB standard for drinking water criteria is given in **Table 3.10**.

Table 3-8: Standard Operating Procedure for Water Sampling & Analysis

Sl. No.	Parameter	Sample Collection	Sample Size	Storage/Preservation
1	pH	Grab sampling plastic/glass container	50 ml	On site analysis
2	Electrical Conductivity	Grab sampling plastic/glass container	50 ml	On site analysis
3	Total Dissolved Solids	Grab sampling plastic/glass container	100 ml	Refrigeration, can be stored for 7 days
4	Residual Chlorine	Grab sampling plastic/glass container	50 ml	On site analysis
5	Hardness	Grab sampling plastic/glass container	100 ml	Add HNO_3 to pH<2, refrigeration; 6 months
6	Chlorides	Grab sampling plastic/glass container	50 ml	Not required; 28 days
7	Sulphates	Grab sampling plastic/glass container	100 ml	Refrigeration; 28 days
8	Sodium, Potassium	Plastic container	100 ml	Not required; 6 months
9	Nitrates	Plastic container	100 ml	Refrigeration; 48 hrs
10	Fluorides	Plastic container only	100 ml	Not required; 28 days
11	Alkalinity	Plastic/glass containers	100 ml	Refrigeration; 14 days
12	Ammonia	Plastic/glass containers	100 ml	Add H_2SO_4 to pH<2, refrigeration, 28 days
13	Hexavalent Chromium, Cr^{+6}	Plastic/Glass rinse with 1+1 HNO_3	100 ml	Grab Sample; refrigeration; 24 hrs
14	Heavy metals (Hg, Cd, Cr, Cu, Fe, Zn, Pb etc.)	Plastic/Glass rinse with 1+1 HNO_3	500 ml	Filter, add HNO_3 to pH< 2; Grab sample; 6 months

Table 3-9: Analytical Procedure

Sl. No.	Parameters	Analytical Method	Reference
1	pH	pH meter	IS : 3025 (Part-11)
2	Turbidity	Nephelo Meter	IS : 3025 (Part-10)
3	Conductivity (at 25^0 C)	Conductivity meter	APHA 22st edition, 2510 B:2012
4	Total Dissolve Solids	Gravimetric	IS : 3025 (Part-16)
5	Alkalinity as $CaCO_3$	Titrimetrically	IS : 3025 (Part-23)
7	Total Hardness as $CaCO_3$	Titrimetrically	IS : 3025 (Part-21)
8	Calcium as Ca	Titrimetrically	IS : 3025 (Part-40)
9	Magnesium as Mg	Calculation	APHA 22st edition,3500 Mg B:2012
10	Sodium	Flame Photometric	APHA 22ndedition, 3500 Na B:2012
11	Potassium	Photometric	APHA 22nd edition,3500 K- B:2012
12	Chloride as Cl	Argentometric	IS : 3025 (Part-32)
13	Sulphate as SO_4	Turbidimetric	IS : 3025 (Part-24)

Sl. No.	Parameters	Analytical Method	Reference
14	Nitrate as NO_3	Spectro photometric	IS : 3025 (Part-34)
15	Phosphate	Spectro-photometric	IS : 3025 (Part-31)
16	Fluoride as F	Ion-meter	APHA 22nd edition,4500 F- D:2012
17	Phenolic compound as C_6H_5OH	Spectro-photometric	IS : 3025 (Part-43)
18	Cyanide	Spectro-photometric	IS : 3025 (Part-27)
19	Dissolve Oxygen	Winkler Method	IS:3025 (Part-38), Reaffirmed 2009
20	Oil & Grease	Gravimetric	IS:3025 (Part 39), 1991 (Reaffirmed 2003)
21	Arsenic	AAS	IS : 3025 (Part-37)
22	Cadmium	AAS	IS : 3025 (Part-41)
23	Total Chromium	AAS	IS : 3025 (Part-52)
24	Iron	AAS	IS:3025 (Part-53), Reaffirmed 2009
25	Copper	AAS	IS : 3025 (Part-42)
26	Lead	AAS	IS : 3025 (Part-47)
27	Manganese	AAS	IS : 3025 (Part-59)
28	Mercury	AAS	IS : 3025 (Part-48)
29	Zinc	AAS	IS : 3025 (Part-49)
30	Dissolved Oxygen	Titrimetrically	IS : 3025 (Part-38) 1989 (RA-2009)
31	Chemical Oxygen Demand	Titrimetrically	IS : 3025 (Part-58) 1989 (RA-2012)
32	Biological Oxygen Demand	Titrimetrically	IS : 3025 (Part-44) 1989 (RA-2009)
33	Total Coliform	MPN Method	IS : 1622 : 1981

The error in ion-balance computation, considering the relationship between the total cations (Ca^{2+}, Mg^{2+}, Na^{+}, K^{+}) and the total anions (NO^{3-}, SO_4^{2-}, HCO^{3-} and Cl^{-}) for each set of complete analyses of water sample, is observed to be within the range of acceptability (±2%) used in most laboratories (APHA 22nded).

Table 3-10: Water Quality Criteria as per CPCB

Designated-Best Use	Class of water	Criteria
Drinking Water Source without conventional treatment but after disinfection	A	▪ Total Coliform Organism MPN/100ml shall be 50 or less ▪ pH between 6.5 and 8.5 ▪ Dissolved Oxygen 6mg/l or more ▪ Biochemical Oxygen Demand 5 days 20^0 C 2ml/l or less
Outdoor bathing (Organized)	B	▪ Total Coliform Organism MPN/100ml shall be 500 or less ▪ pH between 6.5 and 8.5 ▪ Dissolved Oxygen 5mg/l or more ▪ Biochemical Oxygen Demand 5 days 20^0 C 3ml/l or less
Drinking water source after conventional treatment and disinfection	C	▪ Total Coliform Organism MPN/100ml shall be 5000 or less ▪ pH between 6 and 9 ▪ Dissolved Oxygen 4mg/l or more ▪ Biochemical Oxygen Demand 5 days 20^0 C 3ml/l or less
Propagation of Wildlife and Fisheries	D	▪ pH between 6.5 and 8.5 ▪ Dissolved Oxygen 4mg/l or more ▪ Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	▪ pH between 6.0 and 8.5 ▪ Electrical Conductivity at 25^0 C micro mhos/cm Max. 2250 ▪ Sodium absorption Ratio Max. 26 ▪ Boron Max. 2mg/l
	Below-E	**Not meeting A, B, C, D & E Criteria**

Analysis of Surface Water Quality: Major water bodies within 4km radius have been considered for surface water sampling. The surface water quality as analysed is given in **Table 3.11.**

Table 3-11: Surface Water Quality in Study Area

Sl. No.	Parameters	Unit	SW1 (Gangan Nala D/S)	SW2 (Gangan Nala U/S)	SW3 (Pond at Mahalkpur)	SW4 (Pond at Fajalpur)	SW5 (Ratanpur Kalan)
Distance (in km) from Project Site			1.92	2.96	0.78	3.01	2.05
Direction from Project Site			SE	NNW	WSW	ESE	SSW
1	Turbidity	NTU	25	32	22	28	20
2	pH	--	7.40	7.50	7.30	7.60	7.40
3	Conductivity	µS/cm	700.00	760.00	680.00	730.00	650.00
4	Total Dissolve Solids	mg/l	430.00	480.00	425.00	445.00	405.00
5	Alkalinity as $CaCO_3$	mg/l	224.00	245.00	206.00	214.00	198.00
6	Total Hardness as $CaCO_3$	mg/l	236.69	266.21	237.19	256.65	229.57
7	Calcium as Ca	mg/l	53.30	58.70	56.80	61.30	58.20
8	Magnesium as Mg	mg/l	25.20	29.10	23.20	25.20	20.50
9	Sodium	mg/l	26.00	30.00	27.00	29.00	25.00
10	Potassium	mg/l	8.00	7.00	6.00	7.00	6.00
11	Bicarbonate	mg/l	224.00	245.00	206.00	214.00	198.00
12	Chloride as Cl	mg/l	61.30	69.70	71.40	79.20	64.50
13	Sulphate as SO_4	mg/l	27.00	37.00	32.30	36.80	31.70
14	Nitrate as NO_3	mg/l	0.71	0.92	0.73	0.63	0.54
15	Flouride as F	mg/l	0.47	0.49	0.32	0.38	0.27
16	Phenolic compound as C_6H_5OH	mg/l	BDL (DL - 0.001)	BDL (DL - 0.001)	BDL (DL - 0.001)	BDL (DL - 0.001)	BDL (DL - 0.001)
17	Cyanide	mg/l	BDL (DL - 0.008)	BDL (DL - 0.008)	BDL (DL - 0.008)	BDL (DL - 0.008)	BDL (DL - 0.008)
18	Arsenic	mg/l	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)
19	Cadmium	mg/l	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)
20	Chromium as Cr^{+6}	mg/l	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)
21	Iron	mg/l	0.31	0.29	0.32	0.27	0.31
22	Copper	mg/l	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)
23	Lead	mg/l	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)
24	Manganese	mg/l	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)
25	Mercury	mg/l	BDL (DL - 0.01)	BDL (DL - 0.01)	BDL (DL - 0.01)	BDL (DL - 0.01)	BDL (DL - 0.01)
26	Zinc	mg/l	0.19	0.15	0.21	0.23	0.18
27	Oil & Grease	mg/l	<5	<5	<5	<5	<5
28	DO	mg/l	4.7	3.3	5.3	6.8	6.3
29	BOD	mg/l	5.6	7.4	4.2	3.9	4.4
30	COD	mg/l	26.8	29.4	14.7	14.7	14.7

Sl. No.	Parameters	Unit	SW1 (Gangan Nala D/S)	SW2 (Gangan Nala U/S)	SW3 (Pond at Mahalkpur)	SW4 (Pond at Fajalpur)	SW5 (Ratanpur Kalan)
31	Total Coliform	MPN/ 100ml	1400	1400	920	920.00	920.00

Source: Sampling & Analysis by Envirotech East Pvt. Limited, Kolkata (March to May, 2019)
BDL-Below Detection Limit, DL – Detection Limits

Interpretation: Water pollution is the contamination of water bodies such as rivers, lakes and pollution occur when pollutants are directly or indirectly discharged into water bodies without adequate treatment to remove harmful compounds. There are many factors which lead to water pollution. It is essential that firstly understand the sources which contribute to the problem. There are point sources of water pollution that the contaminants which enter a waterway from a single source and non-point sources of water pollution that are diffused contaminants which do not originate from a single discrete source, both that raise the problem of water pollution.

pH is an important chemical parameter that determines the suitability of water for various purposes (*Bhutiani, 2016*). pH of water is very important for the biotic communities because an average pH is adopted by most of the aquatic organism. pH was found the min. range 7.3 of site SW3 and max. 7.6 site SW4. Total solids determined in this study min. range 405 mg/l at SW5 and max. 480 mg/l of site SW2. Analysis of total solids has great implications in the control of physico-chemical and biological wastewater treatment processes. The amount of dissolved and undissolved matter and also its naturally occurring in liquid materials vary greatly. Analysis of Total Dissolved Solids has great implications in the control of biological and physical wastewater treatment processes.

Dissolve oxygen is one of the key factors of natural or wastewater; it is influenced by the physico-chemical parameter and biological activity in the water body such as rivers, lake (Singh, 2017). Dissolved oxygen was recorded moderate in the study area. Directly or indirectly, D.O. quantity of water is dependent on water temperature, a partial pressure of air etc. Result shows that the correlation between dissolved oxygen and biological oxygen demand is negative (y = -0.972x + 10.23).

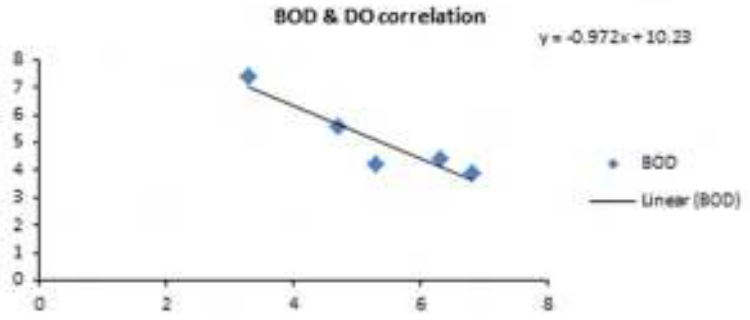


Figure 3.15: Graphical Representation of different Surface Water Quality

Comparing the values of pH, DO, BOD and total coliform with 'Use based classification of surface waters' published by Central Pollution Control Board given in **Table 3.12,** it can be concluded that the surface waters analyzed can be used as drinking water source after conventional treatment and disinfection.

Table 3-12: Location wise Surface Water Class

Locations	SW1 (Gangan Nadi D/S)	SW2 (Gangan Nadi U/S)	SW3 (Pond at Mahalkpur)	SW4 (Pond at Fajalpur)	SW5 (Ratanpur Kalan)
Classes as per CPCB	D	E	D	D	D
Use	Propagation of Wildlife and Fisheries	Irrigation, Industrial Cooling, Controlled Waste disposal	Propagation of Wildlife and Fisheries		

Sample from Ramganga River was not collected as it is too far to be affected by the proposed activities. However, secondary sources reveal that the water from Ramganga River is not suitable for drinking purpose without any form of treatment recommended by CPCB. The main source of Ramganga river water contamination is from domestic, human & industrial. The quality of water is depleting rapidly with the change in human life style i.e., massive industrialization, construction activities, utilization of agricultural land and forest land for other developmental purposes.

Analysis of Ground Water Quality: The results of the parameters analysed for the ground water samples are presented in **Table 3.13**.

Table 3-13: Ground Water Quality in Study Area

Sl. No.	Parameters	Unit	Project site (GW1)	Manoharpur (GW2)	Mahalkpur (GW3)	Pakwara (GW4)	Shahalampur (GW5)	IS 10500: 2012	
								Acceptable limits	Permissible limits
Distance (in km) from Project Site			-	1.23	1.15	0.93	3.96		
Direction from Project Site			-	SSE	SW	NW	N		
1	Turbidity	NTU	<5	<5	<5	<5	<5	1	5
2	pH	--	7.46	7.20	7.40	7.37	7.41	6.5-8.5	NR
3	Conductivity	µS/cm	945.00	930.00	890.00	865.00	940.00	$	$
4	Total Dissolve Solids	mg/l	620.00	650.00	610.00	605.00	645.00	500	2000
5	Alkalinity as $CaCO_3$	mg/l	245.00	252.00	217.00	249.00	267.00	200	600
6	Total Hardness as $CaCO_3$	mg/l	322.00	342.55	353.55	321.62	344.29	300	600
7	Calcium as Ca	mg/l	74.30	76.10	68.80	65.90	70.20	75	200
8	Magnesium as Mg	mg/l	33.20	37.10	44.20	38.20	41.10	30	100
9	Sodium	mg/l	49.00	51.00	38.00	45.00	51.00	$	$
10	Potassium	mg/l	12.00	11.00	10.00	10.00	11.00	$	$
11	Bicarbonate	mg/l	245.00	252.00	217.00	249.00	267.00	$	$
12	Chloride as Cl	mg/l	83.30	85.70	81.40	68.20	80.50	250	1000
13	Sulphate as	mg/l	114.00	127.00	147.30	118.80	124.70	200	400

Sl. No.	Parameters	Unit	Project site (GW1)	Manoharpur (GW2)	Mahalkpur (GW3)	Pakwara (GW4)	Shahalampur (GW5)	IS 10500: 2012	
								Acceptable limits	Permissible limits
Distance (in km) from Project Site			-	1.23	1.15	0.93	3.96		
Direction from Project Site			-	SSE	SW	NW	N		
	SO_4								
14	Nitrate as NO_3	mg/l	4.91	7.52	5.73	9.63	6.53	45	NR
45	Flouride as F	mg/l	0.67	0.59	0.62	0.71	0.57	1.00	1.5
16	Phenolic compound as C_6H_5OH	mg/l	BDL (DL - 0.001)	BDL (DL - 0.001)	BDL (DL - 0.001)	BDL (DL - 0.001)	BDL (DL - 0.001)	0.001	0.002
17	Cyanide	mg/l	BDL (DL - 0.008)	BDL (DL - 0.008)	BDL (DL - 0.008)	BDL (DL - 0.008)	BDL (DL - 0.008)	0.05	NR
18	Aluminium	mg/l	BDL (DL - 0.01)	BDL (DL - 0.01)	BDL (DL - 0.01)	BDL (DL - 0.01)	BDL (DL - 0.01)	0.03	0.2
19	Arsenic	mg/l	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	0.01	0.05
20	Cadmium	mg/l	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	0.003	NR
21	Chromium as Cr^{+6}	mg/l	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	0.05	NR
22	Iron	mg/l	0.31	0.29	0.32	0.27	0.31	0.3	NR
23	Copper	mg/l	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	0.05	1.5
24	Lead	mg/l	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	0.01	NR
25	Manganese	mg/l	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	BDL (DL - 0.005)	0.1	0.3
26	Mercury	mg/l	BDL (DL - 0.01)	BDL (DL - 0.01)	BDL (DL - 0.01)	BDL (DL - 0.01)	BDL (DL - 0.01)	0.001	NR
27	Zinc	mg/l	0.19	0.15	0.21	0.23	0.18	5	15

Source: Sampling & Analysis by Envirotech East Pvt. Limited, Kolkata (March to May, 2019)

BDL-Below Detection Limit, DL – Detection Limits, $ - Not Specified

NR: No Relaxation

Interpretation: Physico-chemical analysis pertaining to the ground water pollution was monitored to assess the water quality. In the present study the chosen parameters were pH, total dissolved solid (TDS), turbidity, total alkalinity (TA), total hardness (TH), Nitrate (NO_3^-), phosphate ($PO_4^=$), chlorides (Cl^-), sulphate ($SO_4^=$), magnesium (Mg), calcium (Ca) and heavy metals. The water samples were alkaline. pH value range between 7.2 to 7.4 in the study area. The reason for such conditions may be due to different types of buffers that may be

present in the groundwater and presence of weak basic salt in the soil. This ability mainly depends on presence of anion and cations in water and also depends on mobility, valence of ions and temperature. High electrical conductivity affects the germination of crops and it may result in much reduced yield. Higher the ionizable solids, greater will be the EC. Conductivity of the study area varies between 945 to 865 µS/cm with the 98 Percentile value 944 µS/cm. Study also reveals that correlation between EC and TDS is highly positive. Alkaline nature of the samples is generally attributed to the presence of carbonates and bi-carbonates. Though alkalinity if not harmful to human health, its presence in the water imparts unpleasant taste. Alkalinity of water is due to the presence of bicarbonate, carbonate and strong bases. The average alkalinity of the study area is 246 ± 18.22 mg/l. Ground water samples shows a strong negative correlation with pH (r = -0.732). The results of the analysis suggested that groundwater is slightly alkaline, hard to very hard in nature, average TDS values were found to be more than 600 mg/l, which gives a clear evidence of anthropogenic influences. In general the groundwater of the study area is alkaline in nature and hard, but at some places the water is relatively soft and falls within the safety limits as prescribed by WHO and Indian Standards. The concentration of EC, TH, Ca, Mg, Na, HCO_3 and Cl at most of the sampling stations not exceeds the safety limits for drinking water. Computational analysis of the data set of hydrochemical constituents in the groundwater suggests that the aquifer (TDS) is mainly controlled by Cl, total hardness Na, and EC. There is a strong positive relationship between TDS-EC; TDS-Ca; TDS-$SO4^{=}$ and weakly positive with TDS-Na.

Basic Statistical Analysis of Groundwater Parameters

Parameters	Units	Min	Max	Average	Sd	98 Percentile
pH	--	7.20	7.46	7.368	0.09	7.5
Conductivity	µS/cm	865.00	945.00	914	34.89	944.6
Total Dissolve Solids	mg/l	605.00	650.00	626	20.43	649.6
Alkalinity as $CaCO_3$	mg/l	217.00	267.00	246	18.22	265.8
Total Hardness	mg/l	321.62	353.55	336.8	14.30	352.8
Calcium as Ca	mg/l	65.90	76.10	71.1	4.13	75.9
Magnesium as Mg	mg/l	33.20	44.20	38.8	4.15	43.9
Sodium	mg/l	38.00	51.00	46.8	5.49	51
Potassium	mg/l	10.00	12.00	10.8	0.83	11.9
Bicarbonate	mg/l	217.00	267.00	246	18.22	265.8
Chloride as Cl	mg/l	68.20	85.70	79.8	6.79	85.5
Sulphate as SO_4	mg/l	114.00	147.30	126.4	12.7	145.7
Nitrate as NO_3	mg/l	4.91	9.63	6.9	1.82	9.6
Flouride as F	mg/l	0.57	0.71	0.6	0.06	0.70
Zinc	mg/l	0.15	0.23	0.19	0.03	0.23

3.7 AIR ENVIRONMENT

3.7.1 Meteorological Condition

Meteorology is the key to understand the air quality. The essential relationship between meteorological condition and atmospheric dispersion involves the wind in the broadest sense. Other factors such as variation in temperature, humidity etc. also plays a direct role in dispersion and dilution of pollutants. Wind fluctuations over a very wide range of time, accomplish dispersion and strongly influence other processes associated with them. This section makes a comparative analysis of the meteorological data of the study area collected by project

team in 2019. The additional data used for the purpose are the 30 years' average IMD data from 1981 to 2010 taken from Meteorological Station, Bareilly (Uttar Pradesh).

3.7.1.1 Secondary Data as per IMD Bareilly (Uttar Pradesh)

Bareilly lies on a borderline between a humid subtropical climate and a tropical savanna climate. Because of its high elevation and inland location even during the hottest months the nights are relatively cool. Three distinct seasons are observed: summer, monsoon and winter. The summary of the 30 years' meteorological data of Bareilly IMD Station from 1981-2010 is shown in **Table 3.14**.

The climate of the district is very hot in summer and severe cold in winter. The hot season starts from the beginning of the February and lasts till the middle of June. After that rainy season starts and continues till October. From October to middle of November, a brief period of post-monsoon prevails in the district. From mid-November to middle of February is the period of winter season. Thus all the four seasons are well marked off.

Table 3-14: Climatology & Meteorology of Bareilly IMD Observatory

Sl. No.	Parameter	Description				
i	Rainfall in mm	Season	Months	Monthly Total (mm)	Heaviest fall in 24 hours (mm)	No. of Rainy Days
		Total Annual average Rainfall is 1136.9 mm				
		Winter (Dec to Feb)	Dec	12.2	0.9	47.3
			Jan	18.7	1.4	159
			Feb	29	2.1	95.3
			Total	**59.9**	**4.4**	**301.6**
		Summer (March to May)	March	13.5	1.8	25.7
			April	12	1	61.6
			May	32.3	2.3	69.4
			Total	**57.8**	**5.1**	**156.7**
		Monsoon (June to Sept)	June	119.4	5.6	218.4
			July	335.9	11.9	256.6
			Aug	310	11.9	224.8
			Sept	214.4	7.4	412.9
			Total	**979.7**	**36.8**	**1112.7**
		Post-Monsoon (Oct to Dec)	Oct	35	1.3	242
			Nov	4.6	0.4	32
			Dec	12.2	0.9	47.3
			Total	**51.8**	**2.6**	**321.3**
ii	**Temperature (Mean Daily Temp. in ^{0}C)**	Winter (Dec to Feb)	**Months**	**Daily Max.**	**Daily Min.**	**Average**
			Dec	23.0	9.9	16.5
			Jan	20.6	8.6	14.6
			Feb	24.7	11.4	18.1
			Average	**22.8**	**10.0**	16.4
		Summer (Mar to May)	March	30.5	15.7	23.1
			April	37.2	21.3	29.3
			May	39.1	25.1	32.1
			Average	**35.6**	**20.7**	28.2
		Monsoon (June to Sept)	June	38.2	26.7	32.5
			July	34.2	26.4	30.3
			Aug	33.3	26.0	29.7
			Sep	33.0	24.5	28.8

Sl. No.	Parameter	Description				
			Average	**34.7**	**25.9**	30.3
		Post-Monsoon (Oct to Dec)	Oct	32.2	19.9	26.1
			Nov	28.1	14.3	21.2
			Dec	23.0	9.9	16.5
			Average	**27.8**	**14.7**	**21.2**
iii	Cloud Cover	Winter (Dec to Feb)	**All cloud**		**Low cloud**	
			08:30	**17:30**	**08:30**	**17:30**
			2.3	1.9	1.3	0.7
			3.3	2.6	2.3	1.2
			2.1	2.4	1.0	1.0
		Summer (Mar to May)	1.8	2.1	0.7	0.8
			1.4	1.7	0.5	0.7
			1.7	1.4	0.8	0.7
		Monsoon (June to Sept)	3.5	3.1	1.9	1.8
			5.6	5.5	3.6	3.7
			5.3	5.6	3.3	3.8
			3.6	3.8	2.4	2.7
		Post-Monsoon (Oct to Dec)	0.9	1.1	0.5	0.6
			0.9	1.0	0.4	0.3
			2.3	1.9	1.3	0.7
iv	Relative Humidity in (RH) %	Winter (Dec to Feb)	**Month**	**08.30 hrs**	**17:30 hrs**	
			Dec	86.0	66.0	
			Jan	88.0	65.0	
			Feb	81.0	52.0	
			Average	**85.0**	**61.0**	
		Summer (Mar to May)	Mar	70.0	40.0	
			Apr	52.0	27.0	
			May	55.0	33.0	
			Average	**59.0**	**33.3**	
		Monsoon (June to Sept)	Jun	67.0	47.0	
			July	84.0	70.0	
			Aug	86.0	75.0	
			Sep	85.0	71.0	
			Average	**80.5**	**65.8**	
		Post-Monsoon (Oct to Dec)	Oct	81.0	60.0	
			Nov	82.0	62.0	
			December	86.0	66.0	
			Average	**83.0**	**62.7**	
v	Wind pattern	Winter (Dec to Feb)	**Months**	**Wind speed in kmph**	**Wind speed in m/s**	
			Dec	1.6	0.4	
			Jan	2.3	0.6	
			Feb	3	0.8	
			Average	**2.3**	**0.6**	
		Summer (Mar to May)	March	3.7	1.0	
			April	3.8	1.1	
			May	3.9	1.1	
			Average	**3.8**	**1.1**	
		Monsoon	June	3.9	1.1	

Sl. No.	Parameter	Description			
		(June to Sept)	July	3.3	0.9
			Aug	2.9	0.8
			Sep	2.6	0.7
			Average	**3.18**	**0.9**
		Post-Monsoon (Oct to Dec)	Oct	1.7	0.5
			Nov	1.4	0.4
			Dec	1.6	0.4
			Average	1.6	0.4

Source: Climatological Table 1981–2010, Indian Meteorological Department, GoI, New Delhi (Bareilly Station)

Rainfall: There is significant rainfall throughout the year. Even the driest month still has a lot of rainfall. The average annual rainfall is 1136.9 mm with an average of 4 rainy days (as per IMD 30 year's average data). The months of July and August experience the most rainfall during the year.

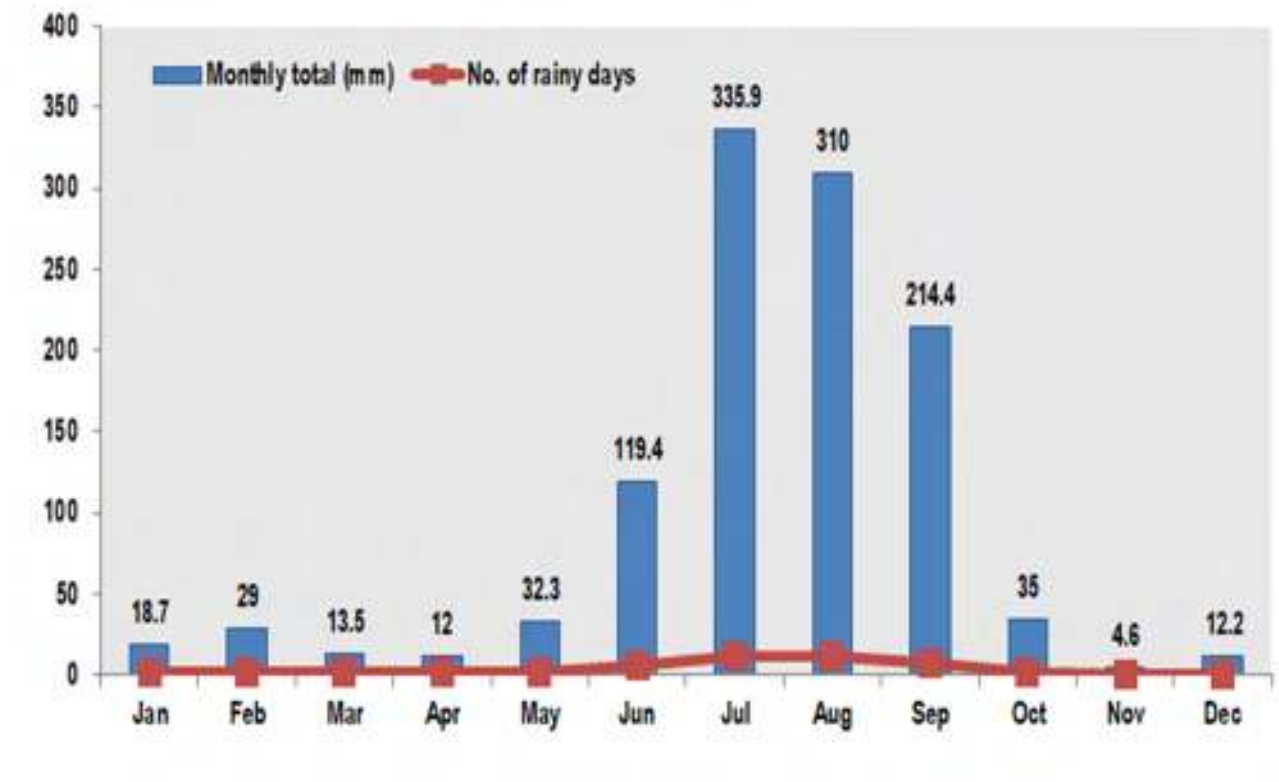


Figure 3.16: Monthly Average Rainfall in mm as per IMD Bareilly

Temperature: The month of May is usually the hottest, seeing day-time temperatures of over 39.1°C. The mean annual maximum and minimum temperature is 31.2^{0}C and 19.2^{0}C respectively. The range of extremes recorded at the station is 43.5°C and 4.9°C. The period from March to May is one of continuous rise in temperatures. After mid-October both day and night temperature drop rapidly till January, which is the coldest month.

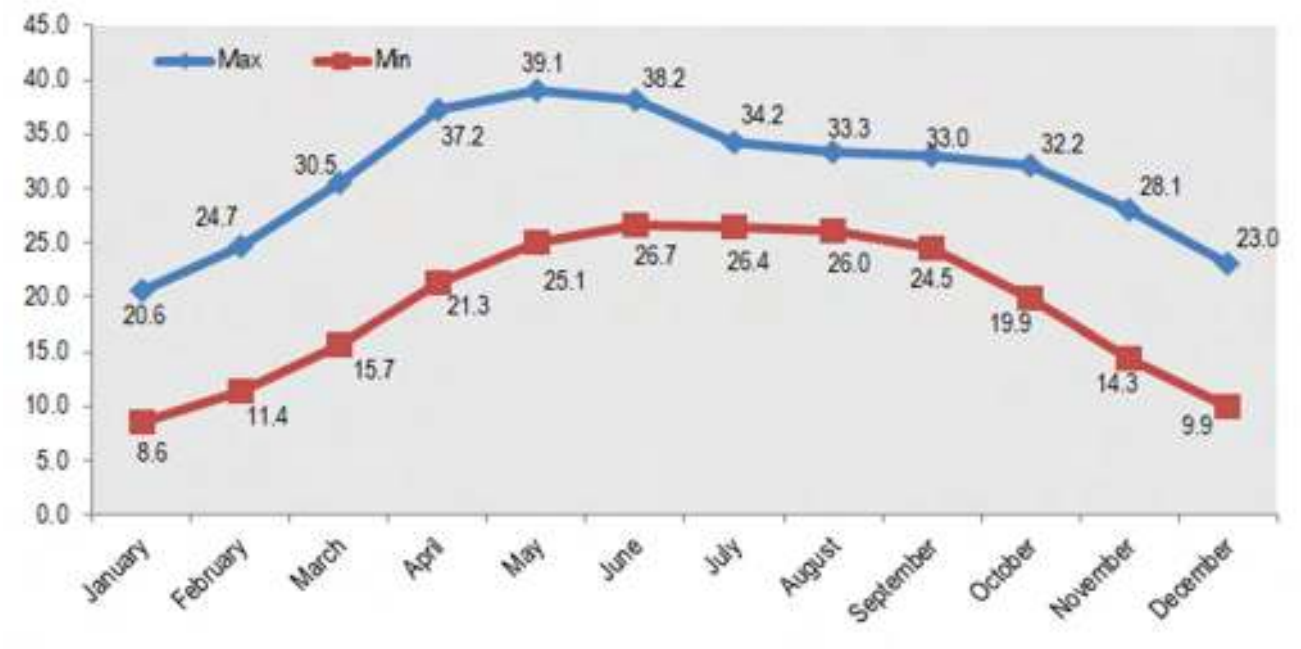
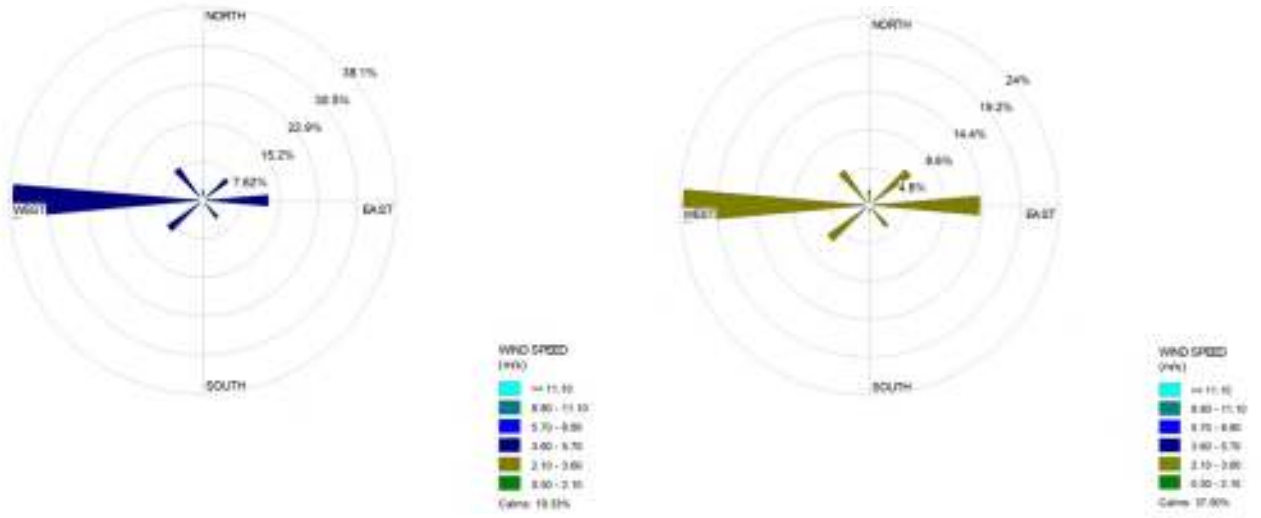


Figure 3.17: Average Maximum and Minimum Temperature (⁰C) as per IMD Bareilly

Relative Humidity: The region has reasonably humid climate especially during monsoon season when moisture levels are very high in the surrounding air. July & August, being the rainiest months, experience humidity level of 86% & 85% respectively in the daytime.

Figure 3.18: Relative Humidity during Day and Evening (%) as per IMD Bareilly

Wind Pattern: Winds are generally light and a little strong in the summer and monsoon seasons. The mean wind velocity is 0.8 m/s.



Summer (March to May) **Annual**

Figure 3.19: Summer and Annual wind-rose as per IMD Bareilly (Uttar Pradesh)

Onsite Meteorological Condition: The data on meteorological parameters in the study area were monitored for the period March to May, 2019. The data was monitored from an automated weather-monitoring station sited at the project site. The instrument was located to allow free exposure to atmosphere all through the study period. The summary of onsite data is presented in **Table 3.15**.

Table 3-15: Summary of Site Specific Meteorological Data

Month	Temperature °C			Humidity %			Wind Speed (km/hr.)	Precipitation (mm)
	Max	Min	Average	Max	Min	Average		
March	37.00	9.00	23.00	94.00	21.00	57.50	7.6	0.00
April	42.00	17.00	29.50	82.00	9.00	45.50	8.1	0.00
May	44.00	22.00	33.00	60.00	9.00	34.50	10.1	0.00
Average	**41.00**	**16.00**	**28.50**	**78.7**	**13.00**	**45.84**	**8.6**	**0.00**

Source: Sampling & Analysis by Envirotech East Private Limited (March to May, 2019)

IMD's Bareilly station is located about 85.2km away from the project site. As such, some mismatches from site data are expected. Moreover, IMD records the data at two times a day, at 0830 hours and at 1730 hours while the site specific data has been recorded at an hourly interval. On comparison, the following observations are brought out:

- The temperature recorded on site when compared with the IMD data, variation was found. The average maximum and minimum temperature recorded at site during March to May were 41^{0}C and 16^{0}C respectively, whereas the average maximum temperature recorded at IMD Bareilly for the same season was 35.6^{0}C. The highest temperature (43.5^{0}C) in this season was observed on 3rd May, 1987 as per IMD Bareilly.
- The average relative humidity (maximum and minimum) was observed in the range of 78.7% to 13.0% during the study period whereas according to IMD Moradabad, the average relative humidity (0830 hrs and 1730 hrs) in the same season is in the range of 59% to 33.3%. This variation could be because of

the fact that the values considered for the site are actual values while the range of IMD data represents the average values of 30 years.

- The average wind speed recorded at the site was 8.6 kmph whereas as per IMD, the average wind speed of the same season is 3.8 kmph.
- Wind rose diagram **(Figure 3.20)** from the monitored data shows that the predominant wind direction during the study period was mainly from North.

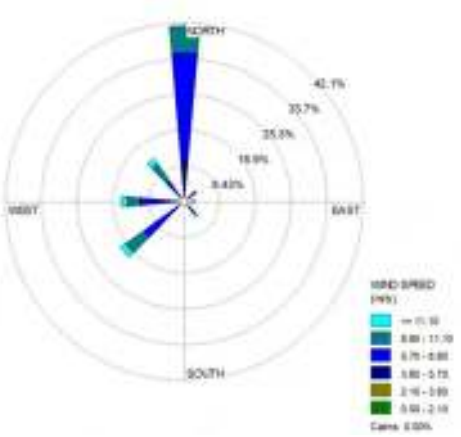


Figure 3.20: Onsite Wind Rose-March to May, 2019

3.7.2 Air Quality

Ambient air quality monitoring has been carried out twice a week in each location during the study period (March to May, 2019). The baseline data of ambient air has been generated for the following parameters as mentioned below.

- Particulate Matter (PM_{10} & $PM_{2.5}$)
- Sulphur Dioxide (SO_2)
- Nitrogen Dioxide (NO_2)
- Carbon monoxide (CO)

The duration of sampling of fine particulate matter ($PM_{2.5}$), Respirable particulate matter (PM_{10}), SO_2 and NO_2 was each twenty four hourly continuous sampling per day and CO was sampled for 8 hours continuous thrice in 24 hour duration. The monitoring was conducted for two days in a week for one month. This is to allow a comparison with the present revised standards mentioned in the latest Gazette Notification of the Central Pollution Control Board (CPCB, November 2009). It was ensured that the equipment was placed at a height of at least 3 to 4 m above the ground level at each monitoring station, for negating the effects of wind-blown ground dust. The distance of the sampler from any air flow obstacle i.e. buildings, walls, was more than two times the height of the obstacle. The equipment was placed at open space free from trees and vegetation which otherwise act as a sink of pollutants resulting in lower levels in monitoring results. Monitoring has been carried out as per the latest CPCB and MoEF&CC guidelines and notifications.

The monitoring locations have been selected keeping in mind the seasonal as well as the annual wind pattern of the study area, accessibility, topography, safety and presence of inhabited localities. The details of the monitoring locations are depicted in the **Table 3.16** and **Figure 3.21.**

Table 3-16: Air Quality Monitoring Stations

Code	Location	Distance (km)	Direction	Selection Criteria
AAQ1	Project Site	-	-	Project area
AAQ2	Manoharpur	1.2	SE	Nearby settlement along SH 78
AAQ3	Bagarpur	3.8	W	Settlement along NH-9 & in dominant upwind direction
AAQ4	Paikbara	0.9	NW	Nearby settlement within 2 km radius along NH-9
AAQ5	Rustampur	3.5	SW	Settlement in pre-dominant downwind direction
AAQ6	Fajalpur	2.9	ESE	Settlement in close proximity to industrial belt
AAQ7	Malipur	2.5	SSE	Settlement in crosswind direction
AAQ8	Umari	2.7	SE	Settlement in crosswind direction
AAQ9	Rasulpur	7.2	S	Controlled point
AAQ10	Ekta Colony (Moradabad)	4.8	E	Settlement in dominant downwind direction
AAQ11	Shahalampur	4.0	NNE	Settlement in crosswind direction

Source: Selection of sampling locations by GCPL

3.7.2.1 Instruments used for Sampling and Analytical Techniques

With a view to collecting the samples, Envirotech Make Calibrated Respirable Dust Samplers (RDS-APM 460 BL) along with Gaseous attachment and Fine Particulate Matter (FPS-APM 550) have been used. The RDS is capable of drawing air at a flow rate of 0.95 to 1.3 m^3/min with very little pressure drop for RDS and FPS is designed to operate at an air flow rate of 1m^3/hr. Filter papers (EPM 2000, Whatman & Whatman 46.2 mm dia) were used for the collection of samples to analyze them for particulate matters and heavy metals. Samples for analyzing SO_2 & NO_2 were collected by drawing air at a flow-rate of 0.5 liters per minute (lpm) through an absorbing solution for the duration of 24 hrs. Sampling and analysis methodology adopted is given in **Table 3.17**.

Table 3-17: Sampling and Analytical Methodology

Sl. No.	Parameter	Methodology
1	Particulate Matter 10 (PM_{10}) (µg/m^3)	APM 550 Fine Particulate Sampler (Gravimetric method)
2	Particulate Matter 10 ($PM_{2.5}$) (µg/m^3)	APM 550 Fine Particulate Sampler (Gravimetric method)
3	Sulphur Dioxide SO_2 (µg/m^3)	West and Gaeke Method
4	Nitrogen dioxide NO_2 (µg/m^3)	IS 5182, Part 6, Jacob & Hochheiser modified
5	Carbon monoxide (mg/m^3)	IS 5182, Part 10, Non-dispersive Infrared Absorption method

3.7.2.2 Analysis of Baseline Concentration

The analysis was carried out as per the method described in the applicable IS codes. Various statistical parameters like 98th percentile, average, standard deviation, maximum and minimum values have been computed from the observed raw data for all the AAQ monitoring locations. The results are shown in **Table 3.18** to **Table 3.21**.

Table 3-18: Particulate Matter (PM_{10}) in µg/m^3

Locations	Minimum	Maximum	Standard	98Percentile	Mean	NAAQS

			Deviation			
AAQ1: Project Site	67.8	71.4	1.0	71.3	69.9	100
AAQ2: Manoharpur	64.8	70.7	1.5	70.4	68.5	100
AAQ3: Bagarpur	61.1	69.8	2.4	69.7	66.0	100
AAQ4: Pakwara	70.2	75.7	1.4	75.2	72.8	100
AAQ5: Rustampur	63.2	67.6	1.3	67.6	65.7	100
AAQ6: Fajalpur	68.4	81.3	2.4	80.6	78.0	100
AAQ7: Malipur	55.4	68.3	2.4	67.6	65.0	100
AAQ8: Umari	69.1	82.0	2.4	81.3	78.7	100
AAQ9: Rasulpur	54.7	67.6	2.4	66.9	64.3	100
AAQ10: Ekta Colony (Moradabad)	73.4	86.3	2.4	85.6	83.0	100
AAQ11: Shahalampur	53.3	66.2	2.4	65.5	62.9	100

Source: Sampling & Analysis by Envirotech East Private Limited (March to May, 2019)

Table 3-19: Particulate Matter ($PM_{2.5}$) in µg/m³

Locations	Minimum	Maximum	Standard Deviation	98Percentile	Mean	NAAQS
AAQ1: Project Site	28.1	31.3	0.9	31.2	29.7	60
AAQ2: Manoharpur	27.7	32.7	1.2	32.3	30.0	60
AAQ3: Bagarpur	21.3	30.0	2.4	29.9	26.2	60
AAQ4: Pakwara	31.1	35.5	1.3	35.3	33.1	60
AAQ5: Rustampur	21.4	25.4	1.1	25.4	23.3	60
AAQ6: Fajalpur	33.8	37.0	0.9	36.9	35.5	60
AAQ7: Malipur	23.0	26.2	0.9	26.1	24.7	60
AAQ8: Umari	36.8	40.0	0.9	39.9	38.5	60
AAQ9: Rasulpur	24.0	27.2	0.9	27.1	25.7	60
AAQ10: Ekta Colony (Moradabad)	37.0	40.2	0.9	40.1	38.7	60
AAQ11: Shahalampur	22.4	25.6	0.9	25.5	24.1	60

Source: Sampling & Analysis by Envirotech East Private Limited (March to May, 2019)

Table 3-20: Sulphur dioxide (SO_2) in µg/m³

Locations	Minimum	Maximum	Standard Deviation	98Percentile	Mean	NAAQS
AAQ1: Project Site	14.4	17.7	1.1	17.6	15.9	80
AAQ2: Manoharpur	13.1	16.5	0.9	16.5	15.4	80
AAQ3: Bagarpur	12.8	16.4	1.0	16.3	14.7	80
AAQ4: Pakwara	14.0	17.8	1.1	17.7	15.9	80
AAQ5: Rustampur	14.4	17.7	0.9	15.1	14.0	80
AAQ6: Fajalpur	16.3	19.7	0.9	19.7	18.6	80
AAQ7: Malipur	12.3	15.7	0.9	15.7	14.6	80
AAQ8: Umari	17.3	20.7	0.9	20.7	19.6	80
AAQ9: Rasulpur	12.1	15.5	0.9	15.5	14.4	80
AAQ10: Ekta Colony (Moradabad)	17.8	21.2	0.9	21.2	20.1	80
AAQ11: Shahalampur	11.4	14.8	0.9	14.8	13.7	80

Source: Sampling & Analysis by Envirotech East Private Limited (March to May, 2019)

Table 3-21: Nitrogen Dioxide (NO_2) in µg/m³

Locations	Minimum	Maximum	Standard Deviation	98Percentile	Mean	NAAQS
AAQ1: Project Site	19.1	22.8	1.0	22.6	20.9	80
AAQ2: Manoharpur	19.5	22.4	0.9	22.4	21.0	80
AAQ3: Bagarpur	17.7	20.5	0.8	20.4	18.9	80
AAQ4: Pakwara	21.4	23.2	0.6	23.2	22.3	80

Locations	Minimum	Maximum	Standard Deviation	98Percentile	Mean	NAAQS
AAQ5: Rustampur	17.5	21.4	1.1	21.3	19.7	80
AAQ6: Fajalpur	21.7	24.6	0.9	24.6	23.2	80
AAQ7: Malipur	17.7	20.6	0.9	20.6	19.2	80
AAQ8: Umari	22.8	25.7	0.9	25.7	24.3	80
AAQ9: Rasulpur	17.8	20.7	0.9	20.7	19.3	80
AAQ10: Ekta Colony (Moradabad)	22.9	25.8	0.9	25.8	24.4	80
AAQ11: Shahalampur	15.2	18.1	0.9	18.1	16.7	80

Source: Sampling & Analysis by Envirotech East Private Limited (March to May, 2019)

Table 3-22: Carbon Monoxide (CO) in mg/m³

Locations	Minimum	Maximum	Standard Deviation	98Percentile	Mean	NAAQS
AAQ1: Project Site	0.42	0.52	0.03	0.52	0.49	2
AAQ2: Manoharpur	0.48	0.53	0.01	0.53	0.51	2
AAQ3: Bagarpur	0.38	0.46	0.02	0.46	0.43	2
AAQ4: Pakwara	0.47	0.59	0.04	0.59	0.54	2
AAQ5: Rustampur	0.37	0.45	0.02	0.45	0.42	2
AAQ6: Fajalpur	0.58	0.63	0.01	0.63	0.61	2
AAQ7: Malipur	0.37	0.42	0.01	0.42	0.40	2
AAQ8: Umari	0.55	0.60	0.01	0.60	0.58	2
AAQ9: Rasulpur	0.41	0.46	0.01	0.46	0.44	2
AAQ10: Ekta Colony (Moradabad)	0.57	0.62	0.01	0.62	0.60	2
AAQ11: Shahalampur	0.32	0.37	0.01	0.37	0.35	2

Source: Sampling & Analysis by Envirotech East Private Limited (March to May, 2019)

Table 3-23: Consolidated 24 hours averaging Values of AAQ (98th Percentile)

Location	Distance	Direction	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	CO (mg/m^3)
AAQ1: Project Site	-	-	71.3	31.2	17.6	22.6	0.52
AAQ2: Manoharpur	1.2	SSE	70.4	32.3	16.5	22.4	0.53
AAQ3: Bagarpur	3.8	WNW	69.7	29.9	16.3	20.4	0.46
AAQ4: Pakwara	0.9	NW	75.2	35.3	17.7	23.2	0.59
AAQ5: Rustampur	3.5	SW	67.6	25.4	15.1	21.3	0.45
AAQ6: Fajalpur	2.9	ESE	80.6	36.9	19.7	24.6	0.63
AAQ7: Malipur	2.5	SSE	67.6	26.1	15.7	20.6	0.42
AAQ8: Umari	2.7	SSE	81.3	39.9	20.7	25.7	0.60
AAQ9: Rasulpur	7.2	S	66.9	27.1	15.5	20.7	0.46
AAQ10: Ekta Colony (Moradabad)	4.8	E	85.6	40.1	21.2	25.8	0.62
AAQ11: Shahalampur	4.0	NNE	65.5	25.5	14.8	18.1	0.37
National Ambient Air Quality Standard							
Industrial, Residential, Rural & Other Areas			100	60	80	80	02
Ecologically Sensitive Area (notified by Central Government)			100	60	80	80	02

Source: Gazette of India Notification, dated 18th Nov, 2009

** Annual Arithmetic Means of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals,*

*** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable shall be complied with 98% of the time in a year. 2% of the time they may exceed the limits but not on two consecutive days of monitoring,*

**** For CO, 8 hourly standard is being considered*

Observation & Interpretation:

Particulate Matter (PM_{10}): The particulate matter of size up to 10 µm in diameter is collectively referred to as PM_{10}. Hence respiratory health effects on people can be observed when they are exposed at elevated concentrations (Pope et al. 2002). Maximum concentration of PM_{10} was recorded in AAQ10, Ekta Colony (Moradabad) (85.6 µg/m^3) while the minimum concentration was recorded in AAQ11-Shahalampur (65.5 µg/m^3). The higher concentration of PM_{10} in AAQ10 may be attributed to its proximity to industrial belt and its placement in the dominant downwind direction.

Particulate Matter ($PM_{2.5}$) constitutes mostly fine particles smaller than 2.5 µm in diameter. Fine and ultrafine particles are formed by chemical reaction; nucleation, condensation, coagulation, evaporation of fog and cloud droplets, in which gases also dissolve and react (Seinfeld et al, 2004). As per the monitoring data, $PM_{2.5}$ ranges between 25.4 µg/m^3 in AAQ5 (Rustampur) to 40.1 µg/m^3 in AAQ10, Ekta Colony (Moradabad). The values recorded are well within the stipulated standards. Populations subjected to long-term exposure to particulate matter have a significantly higher cardiovascular incident and mortality rate. Short-term acute exposures subtly increase the rate of cardiovascular events within days of a pollution spike.

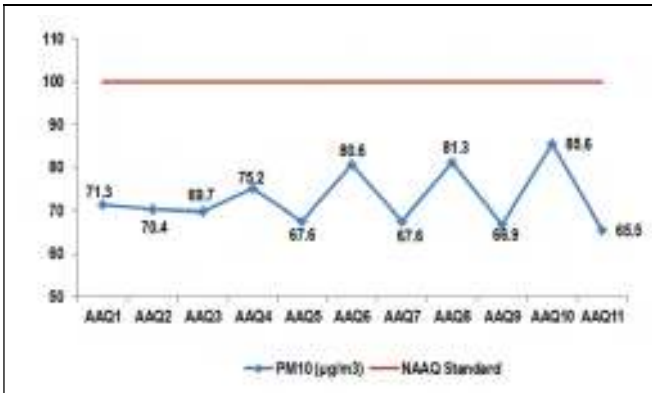


Figure 3.22: 98 Percentile of Particulate Matter (PM_{10}) in µg/m^3

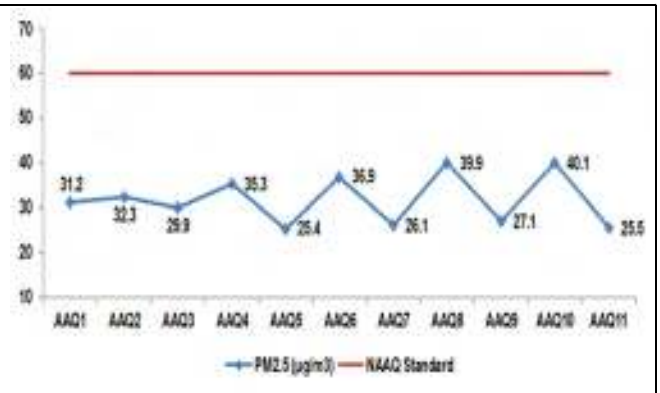


Figure 3.23: 98 Percentile of Particulate Matter ($PM_{2.5}$) in µg/m^3

Sulphur Dioxide (SO_2): The source of SO_2 in the study area is mainly from burning fuels containing sulphur. Other anthropogenic sources are emissions from domestic burning and vehicles (Seinfed, J.L. and Pandis, 1998). Exposure to sulphur dioxide in the ambient air has been associated with reduced lung function, increased incidence of respiratory symptoms and diseases, irritation of the eyes, nose, and throat. Sulphur dioxide reacts with other substances in the atmosphere to form sulphate aerosols (USEPA, 1982)[1]. Since most sulphate aerosols are part of $PM_{2.5}$, they may have an important role in the health impacts associated with fine particulates (WHO, 1979)[2]. However, the values of sulphur pollutants in the selected monitoring locations were found well below the NAAQ standard.

The concentration of SO_2 was found in the range from 14.8 µg/m^3 in AAQ11 (Shahalampur) to 21.2 µg/m^3 at AAQ10, Ekta Colony (Moradabad). The values of SO_2 are well within the NAAQ standard prescribed by CPCB. The higher level at AAQ10 as compared to the other locations is due to commercial activities and nearby industries.

[1] USEPA (United States Environmental Protection Agency). 1982. *Air Quality Criteria for Particulate Matter and Sulfur Oxides.* EPA-600/8-82-029, December, Research Triangle Park, N.C.
[2] WHO (World Health Organization) 1979, "Sulfur Oxides and Suspended Particulate Matter," *Environmental Health Criteria* 8Geneva

Nitrogen Dioxide (NO_2): Nitrogen dioxides (NO_2) in the ambient air consist primarily of nitric oxide (NO) and nitrogen dioxide (NO_2). These two forms of gaseous nitrogen oxides are significant pollutants of the lower atmosphere. NO_2 is one of the main ingredients involved in the formation of ground level ozone, which can trigger serious respiratory problems. It reacts to form nitrate particles, acid aerosols, as well as NO_2, which also cause respiratory problems (NAPAP 1991)[3].

In the study area, NO_2 varied from 18.1 µg/m^3 at Shahalampur to 25.8 µg/m^3 at AAQ10, Ekta Colony (Moradabad). The values are, however, well within the National Ambient Air Quality Standards. The primary sources of NO_2 in the study area are motor vehicles, electric utilities and other industrial and residential sources that burn fuels.

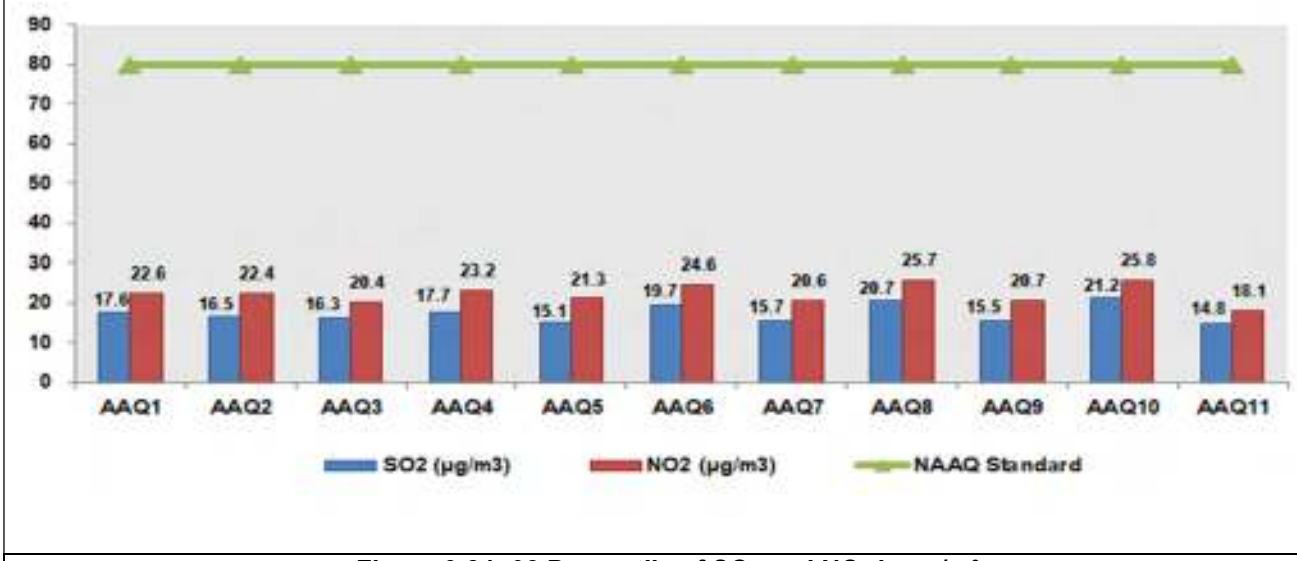


Figure 3.24: 98 Percentile of SO_2 and NO_2 in µg/m^3

Carbon Monoxide (CO): Carbon monoxide (CO), a colourless, odourless, tasteless and toxic air pollutant, is produced in the incomplete combustion of carbon-containing fuels, such as gasoline, natural gas, oil, coal, and wood. Anthropogenic emissions of carbon monoxide originate mainly from incomplete combustion of carbonaceous materials like coal, oil, etc. Also the largest proportions of these emissions are produced as exhausts of internal combustion engines, especially by motor vehicles. The maximum value 0.63 mg/m^3 of CO was observed in AAQ6, Fajalpur while the minimum value, 0.37 mg/m^3 was observed at Shahalampur. The values observed were well below the NAAQ standard of 2 mg/m^3 for 8 hourly sampling.

[3] NAPAP (National Acid Precipitation Assessment Program).Various years, 1987–91, Washington, D.C.: Government Printing Office.

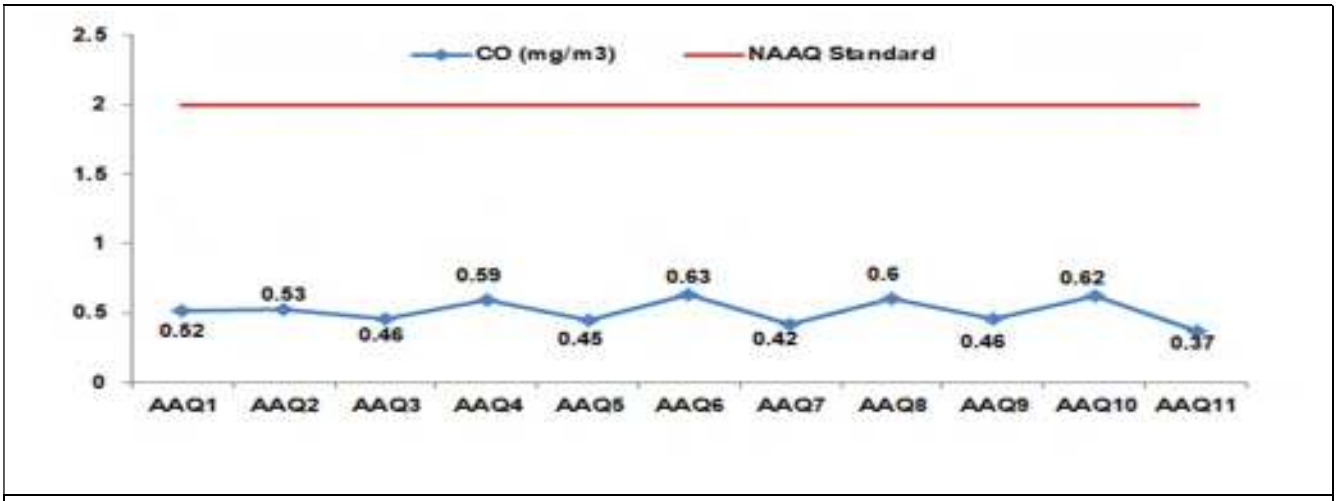


Figure 3.25: 98 Percentile of CO in mg/m³

3.7.3 Sound Pressure Level

Sound Pressure Level (herein referred to as Noise levels) was recorded at an interval of 60 minutes during the day and night time to compute the day equivalent, night equivalent and day-night equivalent level. The noise level was monitored once during the study period at each monitoring location. The noise level is recorded in dB(A). The important parameters measured are Leq, Lday, and Lnight.

Leq: Noise monitoring equipments provide the facility for measurement of Leq directly. However, Leq can also be calculated using the following equation:

$$L_{eq}\ (hourly) = L_{50} + (L_{10} - L_{90})^2/60$$

Where,

- L_{10} ***(Ten Percentile Exceeding Level)*** *is level of sound, which exceeds 10% of the total time of measurement*
- L_{90} ***(Ninety Percentile Exceeding Level)*** *is level of sound, which exceeds 90% of the total time of measurement.*
- L_{eq}***:*** *This represents Leq of whole day including night. Leq is calculated as logarithmic average using the hourly Leq for whole 24 hrs in a day.*
- L_{day}***:*** *This represents Leq of day-time. Lday is calculated as logarithmic average using the hourly Leq's for day time hours from 6.00 AM to 10.00 PM*
- L_{night}***:*** *This represents Leq of night-time. Lnight is calculated as logarithmic average using the hourly Leq's for night-time hours from 10.00 PM to 6.00 AM*

Envirotech make automatic sound level meter (SLM100) was used for measuring the noise levels. This instrument measures Sound Pressure Level (SPL), maximum sound pressure level (max) and equivalent continuous noise level (L_{eq}).

The noise level was recorded continuous for 24 hours at an interval of 1 hour. The hourly average computed from the noise reading taken at every 5 minutes' interval. The monitoring was carried out once during the study period. The important parameters to be measured are L_{eq}, L_{day}, and L_{night}.

Assessment of ambient noise levels is an important parameter in preparation of impact assessment report. Noise levels are more annoying in the night time particularly in the residential area. The environmental impact of noise can have several effects varying from annoyance to hearing loss depending on loudness of noise levels. The monitoring for noise levels was done in 11 locations keeping considering the population and traffic of the area. The locations are given in **Table 3.24** and **Figure 3.26**.

Table 3-24: Noise Level Monitoring Locations

Sl. No.	Station Name	Code	Distance (km)	Direction
1	Project Site	N1	-	-
2	Manoharpur	N2	1.2	SSE
3	Bagarpur	N3	3.8	WNW
4	Pakwara	N4	0.9	NW
5	Rustampur	N5	3.5	SW
6	Fajalpur	N6	2.9	ESE
7	Malipur	N7	2.5	SSE
8	Umari	N8	2.7	SSE
9	Rasulpur	N9	7.2	S
10	Ekta Colony (Moradabad)	N10	4.8	ESE
11	Shahalampur	N11	4.0	NNE

Source: Selection of sampling locations by GCPL

Analysis of Baseline Sound level: The major source of the noise level fluctuation in daytime and night time was observed majorly due to the vehicular movement and industrial activities.

L_{eq} Day Time: The maximum Leq in daytime observed was 54.7 dB(A) at Manoharpur while minimum Leq observed was 50.5 dB(A) at Rasulpur.

Leq Night Time: The maximum Leq in night time observed was 47 dB(A) at N2-Manoharpur while minimum Leq during night was 41 dB(A) at Shahalampur.

Analysis results for of Ambient Noise level in day time and night time are represented in **Table 3.25.**

Table 3-25: Ambient Noise Level in Day time & Night time

Noise Location	Day			Night		
	L Max	L Min	Leq	L Max	L Min	Leq
Project Site (N1)	57.3	46.3	53.3	46.3	42.2	44.1
Manoharpur (N2)	58.1	48.4	54.7	48.6	45.4	47
Bagarpur (N3)	55.4	47.5	52.5	45.8	39.3	42.4
Pakwara (N4)	57	42.5	53.5	44.8	40.4	43.4
Rustampur (N5)	56.2	44.1	53.1	46.2	36.8	42.4
Fajalpur (N6)	54.1	48	52.2	47.9	38.9	43.9
Malipur (N7)	55.1	42.9	51	44.3	36	41
Umari (N8)	56.9	46.5	53.2	48.6	42.4	46.1
Rasulpur (N9)	54.5	43.2	50.5	44.6	37.8	41.7
Ekta Colony (Muradabad) (N10)	53.9	46.1	51.5	47.4	36.9	43.4
Shahalampur (N11)	53.9	46.1	51.5	46.4	35.9	42.4

Ambient Noise Standards (CPCB)

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

Source: Sampling & Analysis by Envirotech East Private Limited (March to May, 2019)
**Silent zone is defined as an area up to 100 meters around such premises as hospitals, educational institutions and courts. The silence zones are to be declared by the competent authority.*
Note: (i) Day time means 06:00 hrs to 22:00 hrs, (ii) Night time means 22:00 hrs to 06:00 hrs

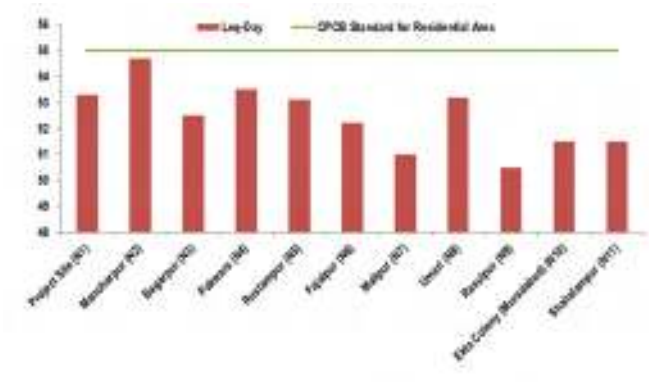


Figure 3.27: Ambient Noise Level during Day Time

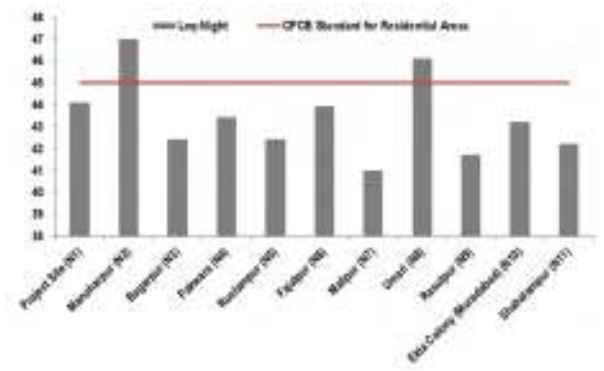


Figure 3.28: Ambient Noise Level during Night Time

3.7.4 Traffic Scenario

Traffic Volume count was done at 3 locations marked on the map in **Figure 3.29** and given in **Table 3.26**. The monitoring was conducted in May, 2019. 24 hours classified Volume Count was done for different categories of vehicles. The traffic volume count was done as per IRC code and 2 staffs were deployed for single direction vehicular movement. The total numbers of vehicles per hour under the categories are determined.

Table 3-26: Existing Traffic Scenario

Location	Distance (km)	Direction	2 Wheelers		3 Wheelers		Cars		LCV		Bus/Truck		Heavy Vehicles		Total PCU/HR
			Equivalency Factor												
			0.5		1		1		1.4		2.2		4		
			No./HR	PCU/HR	No./HR	PCU/HR	No./HR	PCU/HR	No./HR	PCU/HR	No./HR	PCU/HR	No./HR	PCU/HR	
T1: SH-78	3	WNW	192	96	78	78	67	67	35	49	59	129.8	17	68	**487.8**
T2: NH-9 (Moradabad Byepass road)	0.8	SE	137	68.5	65	65	59	59	23	32.2	45	99	15	60	**383.7**
T3: Old NH-24 (Old Moradabad Byepass road)	2.2	ENE	88	44	41	41	43	43	15	21	21	46.2	8	32	**227.2**

Source: Traffic Survey by GCPL

Based on the results of the survey, the existing PCU of each location was compared with the capacity of each type of road as suggested by Indian Road Congress thus determining the existing Level of Service (LoS) for each location.

Table 3-27: Existing Level of Service

Location	V = Volume in PCU per hour	C = Suggested design capacity in PCU/hour	V/C ratio	LoS as per IRC
T1: SH-78	487.8	1500	0.33	B
T2: NH-9 (Moradabad Byepass road)	383.7	3600	0.11	A
T3: Old NH-24 (Old Moradabad Byepass road)	227.2	3600	0.06	A

Relation between V/C ratio & LoS

V/C Ratio	LoS	Performance
0.0-0.2	A	Represents a condition of free flow
0.2-0.4	B	Represents a zone of stable flow
0.4-0.6	C	The general level of comfort and convenience declines noticeably at this level
0.6-0.8	D	Represents the limit of stable flow
0.8-1.0	E	Represents operating condition when traffic volumes are at or close to the capacity level

From the survey, it is clear that the surveyed roads represent a condition of stable flow zones.

C. RECEPTOR

3.8 ECOLOGICAL ENVIRONMENT

A baseline terrestrial ecology has been established to understand the ecological condition of the study area. The purpose of establishing the baseline is to collect comprehensive and up-to-date ecological information relating to the study area to allow an assessment of potential impacts associated with the construction and operation of the project on terrestrial ecology. It is also used to propose suitable mitigation measures, and for the development of monitoring programme where necessary. The ecological baseline information is collected primary survey, literature reviews and District Census Handbook.

3.8.1 Forest Resource

The forests of Moradabad district can be classified under the tropical dry deciduous forests, which are commonly known as Central Indian type. There is no dense vegetation in the study area. There are no National Parks, Wildlife Sanctuary, Biosphere Reserve or Tiger Reserve within 10 km radius of the project site.

3.8.2 Cropping Pattern

The economy of the district is predominantly based on agriculture, as maximum per cent of the population resides in rural areas and their main occupation is agriculture. Kharif and Rabi are the two principal harvests grown. Wheat occupies the predominant place in terms of area and production. Sugarcane is the most important commercial crop in the district. Potato, tobacco, rice and barley are other main crops.

3.8.3 Floral Composition

The study area does not support healthy vegetation due to too much biotic pressure. Chunks of vegetation are either found along Ramganga River or along roads. No ecologically sensitive floral species have been reported from the area. Common species found near villages are mostly useful plants like *Mangifera indica*, *Syzigium cumini*, *Azadirachta indica*, *Albizia lebbeck*, *Delonix regia*, *Tamarindus indica* etc.

Growth of weeds like *Argemone mexicana*, *Cannabis sativa*, *Cenchrus ciliaris*, *Heteropogon contortus*, *Lantana camara*, *Parthenium hysterosphorus* etc. in agricultural land and along road sides is very common.

The floral species documented in the study area are given in **Table 3.28**.

Table 3-28: Floral Species reported in the Study Area

Sl. No.	Botanical Name	Local Name
Trees		
1	*Acacia arabica*	Babool
2	*Adina cordifolia*	Haldu
3	*Aegle marmelos*	Bail
4	*Ailanthus excelsa*	Aru
5	*Albizzia lebbeck*	Siras shafed
6	*Azadirachta indica*	Neem
7	*Bauhinia variegata*	Kachnar
8	*Careya arborea*	Kumbhi
9	*Cordia dichotoma*	Lasora
10	*Croton roxburghii*	Arjuna
11	*Delonix regia*	Gulmohar
12	*Emblica officinalis*	Aamla
13	*Ficus glomerata*	Goolar
14	*Ficus religiosa*	Pipal
15	*Hardwickia binata*	Anjan
16	*Lagerstroemia flosreginae*	Jarul
17	*Mangifera indica*	Aam
18	*Morus alba*	Shahtoot
19	*Nerium indicum*	Kaner
20	*Psidium guajava*	Amrud
21	*Polyalthia longifolia*	Ashok
22	*Prosopis juliflora*	Bil
23	*Syzygium cumini*	Jamun
24	*Tamarindus indica*	Imli
25	*Terminalia arjuna*	Arjun
26	*Trewia nudiflora*	Gutel
27	*Zizyphus mauritiana*	Ber
28	*Zizyphus xylopyra*	Kathber
Herbs & Shrubs		
1	*Cannabis sativa*	Bhang
2	*Carissa carandus*	Karaunda
3	*Lantana camara*	Kuri
4	*Ocimum sanctum*	Tulsi
5	*Opuntia dillenii*	Nagfani
6	*Combretum decandrum*	Kali bel
7	*Cuscuta reflexa*	Amar bel

Sl. No.	Botanical Name	Local Name
8	*Vallaris solanacea*	Dudhi bel

Source: (i) Primary Survey (ii) Discussion with local people

3.8.4 Faunal Diversity & Species Inventory

The study area is mostly covered by agricultural land and human settlements. Roads are cris crossing the entire study area which acts as a barrier for wildlife movement. Hence no significant wild animals have been reported from the study area. No established habitats of any mammals or birds have been noticed along the river bank. There are some small water bodies which attract avian species. Common myna, kingfisher, cormorants are some common bird species observed in the study area. A list of wild fauna has been prepared based on local inquiry from the villagers and from published literatures and is presented in **Table 3.29**.

Table 3-29: Faunal Species Reported in the Study Area

Sl. No.	Zoological Name	Common Name	Schedule as WPA 1972	Status as per IUCN
Mammals				
1	*Macaca mulatta*	Monkey	Schedule II	Least concern
2	*Presbytis entellus*	Langur	Schedule II	Least concern
3	*Canis aureus*	Jackal	Schedule II	Least concern
4	*Herpestes edwardsii*	Mongoose	Schedule II	Least concern
5	*Boselaphus tragocamelus*	Nilgai	Schedule III	Least concern
6	*Funambulus palmarum*	Squirrel	Schedule IV	Least concern
7	*Rattus rattus*	Mouse	Schedule V	Least concern
8	*Lepus nigricollis*	Hare	Schedule IV	Least concern
9	*Suncus murinus*	Shrew	-	Least concern
10	*Scotophilus heathi*	Bat	-	Least concern
Aves				
1	*Francolinus pondicerraneous*	Grey francolin	Schedule IV	Least concern
2	*Coturnix coturnix*	Common quail	Schedule IV	Least concern
3	*Columba livia*	Pigeon	-	Least concern
4	*Spilopelia chinensis*	Spotted dove	Schedule IV	Least concern
5	*Anser indicus*	Bar headed goose	Schedule IV	Least concern
6	*Egretta garzetta*	Little egret	Schedule IV	Least concern
7	*Ardea cinerea*	Grey heron	Schedule IV	Least concern
8	*Bubulcus ibis*	Cattle egret	Schedule IV	Least concern
9	*Milvus migrans*	Black kite	Schedule IV	Least concern
10	*Eudynamys scolopacia*	Koel	Schedule IV	Least concern
11	*Glaucidium radiatum*	Jungle owlet	Schedule IV	Least concern
12	*Coracias benghalensis*	Indian roller	Schedule IV	Least concern
13	*Dinopium benghalense*	Black rumped flameback	Schedule IV	Least concern
14	*Acridotheres fuscus*	Jungle myna	Schedule IV	Least concern
15	*Corvus splendens*	Common Crow	Schedule V	Least concern
16	*Pycnonotus cafer*	Red vented bulbul	Schedule IV	Least concern
17	*Estrilda amandava*	Red avadavat	Schedule IV	-
18	*Psittacula krameri*	Rose ringed parakeet	Schedule IV	Least concern
19	*Vanellus indicus*	Red wattled lapwing	Schedule IV	Least concern
20	*Phalacrocorax fuscicollis*	Indian cormorant	Schedule IV	Least concern
21	*Passer domesticus*	House sparrow	Schedule IV	Least concern
22	*Acridotheres tristis*	Common myna	Schedule IV	Least concern

Sl. No.	Zoological Name	Common Name	Schedule as WPA 1972	Status as per IUCN
23	*Upupa epops*	Hoopoe	-	Least concern

Source: (i) Primary Survey (ii) Discussion with local people

3.9 SOCIAL ENVIRONMENT

3.9.1 Demographic Profile

The study area, as shown in **Table 3.29**, has 164 villages. This information for the analysis is sourced from the Census of India, 2001 and Census of India, 2011 data. Populations of villages located even partially in the study area have been considered in enumerating the study area population.

As per the census of India, 2011, the total population is 13,09,275 out of which 6,84,802 are males and 6,24,473 are females. The decadal growth of the study area was found to be 35.54%. The higher increase is due to urbanization of the area as part of Moradabad City development. The comparative analysis of the demographic features of the Study Area for Census 2001 and 2011 are given in **Table 3.30**. The gender ratio of the project site has increased 885 to 912 from 2001 to 2011. This increasing trend in gender ratio has been observed in the whole study region.

Table 3-30: Sex Ratio of the Study Area

Area	Number of villages/towns	Total Population		Male		Female		Gender Ratio	
		2001	2011	2001	2011	2001	2011	2001	2011
Project site	2	9875	12626	5213	6612	4662	6014	894	910
Within 2 km	10	54457	74326	28804	38676	25653	35650	891	922
2km to 5 km	36	703831	967790	373329	506447	330502	461343	885	911
5km to 7km	38	69236	92823	37006	48536	32230	44287	871	912
7km to 10km	78	128562	161710	68157	84531	60405	77179	886	913
Total	**164**	**965961**	**1309275**	**512509**	**684802**	**453452**	**624473**	**885**	**912**

Source: Census of India 2001 & 2011

3.9.2 House Hold Size

The household size in study area is 5.7 according to census 2011 and 6.4 according to Census 2001. The decrease in the household size is due to influx of labors that has been marked as families in the Census data **(Table 3.31).**

Table 3-31: Household Size of Study Area

Area	No. of Villages/ towns	Total Population		No. of Households		Household size	
		2001	2011	2001	2011	2001	2011
Project site	2	9875	12626	1344	2037	7.3	6.2
Within 2 km	10	54457	74326	8042	11966	6.8	6.2
2km to 5 km	36	703831	967790	111937	174349	6.3	5.6
5km to 7km	38	69236	92823	10116	14547	6.8	6.4

Area	No. of Villages/ towns	Total Population		No. of Households		Household size	
		2001	2011	2001	2011	2001	2011
7km to 10km	78	128562	161710	19006	26612	6.8	6.1
Total	**164**	**965961**	**1309275**	**150445**	**229511**	**6.4**	**5.7**

Source: Census of India 2001 & 2011

3.9.3 Child Population and Sex Ratio

As per the 2001 and 2011 census, the total population between the ages of 0-6 years was 1,72,708 and 1,92,231 respectively. Child sex ratio as per census 2011 was 910 compared to 911 of census 2001 indicating decrease in number of female child **(Table 3.32).**

Table 3-32: Child Population Sex Ratio of Study Area

Area	No. of Villages/ towns	Total Population		Male (0-6 years)		Female (0-6 years)		Gender Ratio (0-6 years)	
		2001	2011	2001	2011	2001	2011	2001	2011
Project site	2	2264	2306	1180	1183	1084	1123	919	949
within 2 km	10	11984	12737	6201	6724	5783	6013	933	894
2km to 5 km	36	113858	130548	59790	68356	54068	62192	904	910
5km to 7km	38	16000	17723	8295	9228	7705	8495	929	921
7km to 10km	78	28602	28917	14910	15153	13692	13764	918	908
Total	**164**	**172708**	**192231**	**90376**	**100644**	**82332**	**91587**	**911**	**910**

Source: Census of India 2001 & 2011

3.9.4 Vulnerable Group

While assessing social impact of any area, it is very important to identify the population who fall under the marginalized and vulnerable groups such as Scheduled Tribes and Scheduled Castes. Although these groups are usually small farmers or landless, their livelihood is the worst affected and they get the worst compensation deals due to small land-holding and less properties. So, special attention has to be given towards these groups. The statistics regarding the social profile of the human population (distribution of SC & ST Community) in the study area are given in **Table 3.33.** 7.7% of the population in the study area is in SC category while only 0.034 % is in ST category as per the 2011 Census.

Table 3-33: Distribution of SC & ST Population in the Study Area

Area	No. of Villages/ towns	Total Population		Schedule caste				Schedule tribe			
		2001	2011	2001	2011	2001 (%)	2011 (%)	2001	2011	2001 (%)	2011 (%)
Project site	2	9875	12626	1560	2078	6.3	6.1	0	0	0.000	0.000
Within 2 km	10	54457	74326	10459	13433	5.2	5.5	0	0	0.000	0.000
2km to 5 km	36	703831	967790	77015	110807	9.1	8.7	183	432	0.026	0.045
5km to 7km	38	69236	92823	10049	13628	6.9	6.8	0	9	0.000	0.010
7km to 10km	78	128562	161710	24160	30207	5.3	5.4	0	2	0.000	0.001
Total	**164**	**965961**	**1309275**	**123243**	**170153**	**7.8**	**7.7**	**183**	**443**	**0.019**	**0.034**

Source: Census of India 2001 & 2011

3.9.5 Literacy Rate

Literacy rate is one of the most significant indicators of human and social development. This not only reflects on the educational attainment of the population but also reflects on the status of women, caste equation and economic condition of a particular area. It also shows the skill level of the people and their capability to get trained and work in various sectors. The literacy rate is given in **Table 3.34** to describe the total and gender-wise literacy rate of the people in the study area.

Table 3-34: Literacy Rate in the Study Area

Area	No. of Villages/ towns	Total Literacy Rate (%)		Male Literacy Rate (%)		Female Literacy Rate (%)	
		2001	2011	2001	2011	2001	2011
Project site	2	28.75	46.09	38.00	54.40	18.40	36.95
Within 2 km	10	36.83	47.41	46.77	55.33	25.66	38.82
2km to 5 km	36	49.75	58.47	54.34	61.96	44.56	54.65
5km to 7km	38	25.75	40.46	35.55	48.69	14.50	31.43
7km to 10km	78	31.44	44.49	41.64	52.45	19.94	35.78
Total	**164**	**44.65**	**54.72**	**50.70**	**59.40**	**37.81**	**49.59**

Source: Census of India 2001 & 2011

The literacy rate was found to have increased from 44.65% in 2001 to 54.72% in 2011 in the study area. The female literacy rate of the study area has shown improvement from 37.81% in 2001 to 49.59% in 2011. In comparison the literacy growth rate of males have shown a low increase from 50.70% in 2001 to 59.40% in 2011.

3.9.6 Economic Activities

The economy of an area is defined by the occupational pattern and income level of the people in the area. The Work Participation Rate and proportion of Main Workers are some of the main indicators of economic condition of the area. **Table 3.35** shows the distribution of workers in the study area.

Table 3-35: Section wise Distribution of workers in the Study Area

Area	No. of Villages/ towns	Total Worker		Main worker		Marginal Worker		Non Worker	
		2001	2011	2001	2011	2001	2011	2001	2011
Project site	2	3075	3173	1841	2137	1234	1036	6800	9453
within 2 km	10	15216	19871	12730	16234	2486	3637	39241	54455
2km to 5 km	36	190877	295286	170206	241440	20671	53846	512954	672504
5km to 7km	38	20373	26922	16245	20002	4128	6920	48863	65901
7km to 10km	78	41612	46290	33047	35387	8565	10903	86950	115420
Total	**164**	**271153**	**391542**	**234069**	**315200**	**37084**	**76342**	**694808**	**917733**

Source: Census of India 2001 & 2011

The Work Participation Rate in the study area was found to have increased from 28.07% in 2001 to 29.91% in 2011. There has been an increase in percentage of main workers as well. The work participation rate, although low, is showing an increasing trend indicating the availability of jobs in the study area.

3.9.7 Occupational Pattern

The occupational pattern in the study area was found to be varied. Majority of the population are involved in other industries. The occupational pattern in the study area and change during the last decade is described in the **Table 3.36.**

Table 3-36: Occupational Pattern in the Study Area

Area	No. of Villages/ towns	Agriculture Laborers		Cultivators		Household Industries		Others	
		2001	2011	2001	2011	2001	2011	2001	2011
Project site	2	346	76	47	43	9	36	832	881
Within 2 km	10	629	327	235	150	487	380	1135	2780
2km to 5 km	36	2580	6153	1178	1355	2109	3926	14804	42412
5km to 7km	38	1456	2384	881	1039	386	590	1405	2907
7km to 10km	78	2275	4792	1596	1178	1427	1013	3267	3920
Total	**164**	**7286**	**13732**	**3937**	**3765**	**4418**	**5945**	**21443**	**52900**

Source: Census of India 2001 & 2011

3.9.8 Infrastructure Facilities

The socio-economic analysis of the study area shows that in terms of educational and other developments the area is moderately developed.

3.9.8.1 Educational Facilities

Education is not only about enhancing skills or becoming employable. It is for getting equipped for a better quality of life. For example, it has been observed from NFHS (National Family Health Survey) that the educated females prefer going to doctors than availing traditional health services. The women who mostly go for ante-natal check-ups (ANC's) are the ones who are educated at least up to Class 8. Proper education can help improve child mortality rate, maternal health, nutritional intake, etc. of the people. The details of village-wise education facilities in the study area are described below in **Table 3.37.**

Table 3-37: Educational Facilities

Area	Number of Villages	Primary School		Middle School		Secondary School		Senior Secondary School	
		2001	2011	2001	2011	2001	2011	2001	2011
Project site	2	2	2	0	4	0	2	0	2
Within 2 km	9	10	15	1	15	0	3	0	1
2km to 5 km	35	34	42	6	35	0	12	0	3
5km to 7km	38	38	48	5	29	0	8	0	2
7km to 10km	78	66	75	19	60	7	20	5	14
Study Area	**162**	**150**	**182**	**31**	**143**	**7**	**45**	**5**	**22**

Note: Census data lists infrastructure information of villages only
Source: Census of India 2001 & 2011

There are a total of 182 Primary Schools, 143 Middle Schools, 45 Secondary School and 22 Senior Secondary Schools in the study area as per Census 2011. It can be seen that there has been an increase in the number of schools over the 10 years in the study area. However, there are no facilities for higher education in the villages.

3.9.8.2 Drinking Water Facilities

One of the most important factors responsible for the emergence of a settlement is availability of water. Many water sources such as wells, hand pumps, tanks, etc. are available in rural areas. In the villages under study, the main source of water is hand pump followed by hand pumps and tube well. The water from the sources is used for drinking, bathing and household purposes. The list of water sources is given in **Table 3.38**. It can be seen from the table that there has been no major change in the number of hand pumps from 2001 to 2011 while there has been a decline in the number of wells.

Table 3-38: Drinking Water Facilities

Area	No. of villages	Tap		Well		Tank		Hand pump		Tube well	
		2001	2011	2001	2011	2001	2011	2001	2011	2001	2011
Project site	2	1	0	0	**1**	0	**0**	2	**2**	0	**2**
Within 2 km	9	4	0	1	2	1	3	9	9	2	7
2km to 5 km	35	18	6	4	7	2	11	31	32	7	15
5km to 7km	38	22	7	3	0	4	8	34	38	12	16
7km to 10km	78	42	10	8	3	8	12	59	64	20	22
Study Area	**162**	**87**	**23**	**16**	**13**	**15**	**34**	**135**	**145**	**41**	**62**

Note: Census data lists infrastructure information of villages only
Source: Census of India 2001 & 2011

3.9.8.3 Health Facilities

Health is a pre-requisite for human development and is an essential component for the well-being of mankind. The health problems of any community are influenced by interplay of various factors including social, economic and political. The common beliefs, customs, practices related to health and disease in turn influence the health seeking behaviour of the community.

For basic ailments, people visit the sub-centres located in the villages. For serious or chronic diseases, people visit one of the two hospitals present in the study area-Teerthaker Mahaveer University Hospital & DMR Hospital. Overall the medical facilities present in the study area seem to be appropriate to cater the population. The details of the health related facilities available in the study area are shown in **Table 3.39**.

Table 3-39: Health Facilities

Area	No. of Villages	Mother-Child Welfare Centre		Public Health Centre		Public Health Sub-centre		TB Clinic (Numbers)	
		2001	2011	2001	2011	2001	2011	2001	2011
Project site	2	1	0	0	0	0	1	0	0
Within 2 km	9	1	1	0	1	1	2	0	0
2km to 5 km	35	0	1	0	1	3	2	0	0
5km to 7km	38	2	1	1	1	1	2	1	0
7km to 10km	78	6	4	3	2	1	5	0	2
Study Area	**162**	**10**	**7**	**4**	**5**	**6**	**12**	**1**	**2**

Note: Census data lists infrastructure information of villages only
Source: Census of India 2001 & 2011

3.9.8.4 Post Office & Bank Facilities

The number of post offices in the area has decreased from 21 in 2001 to 18 in 2011. Agricultural societies also have decreased from 15 to 11 from 2001 to 2011. Various types of banking facilities available in the study area are illustrated in **Table 3.40**.

Table 3-40: Post Office and Bank Facilities

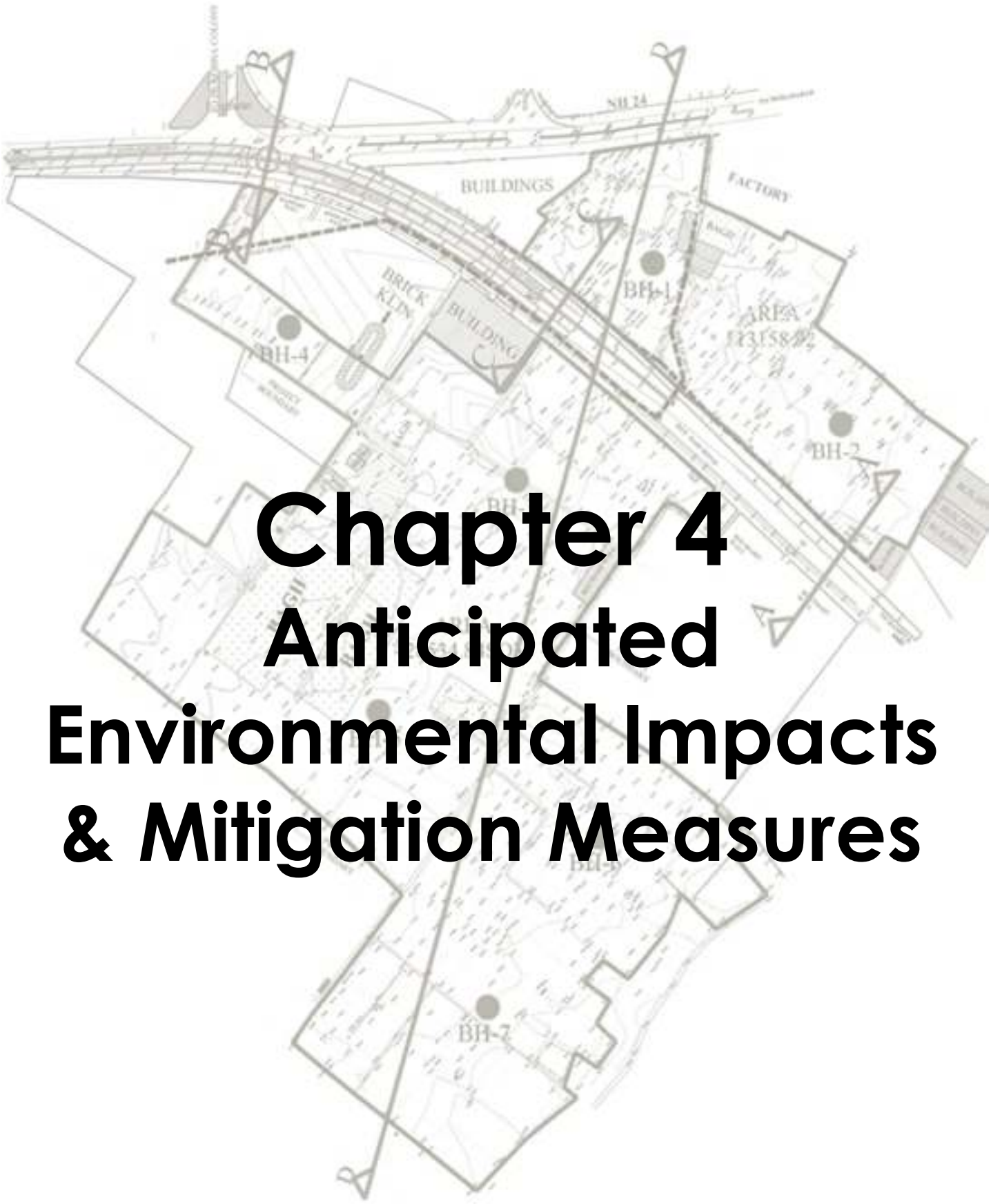
Area	Number of Villages	Post Office		Commercial Bank		Co-operative Bank		Agricultural Credit Societies	
		2001	2011	2001	2011	2001	2011	2001	2011
Project Site	2	0	0	0	0	0	0	0	0
Within 2 km	9	1	1	0	1	0	0	0	0
2km to 5 km	35	4	2	1	2	2	0	1	1
5km to 7km	38	7	8	4	0	2	0	4	4
7km to 10km	78	9	7	2	1	3	3	10	6
Study Area	**162**	**21**	**18**	**7**	**4**	**7**	**3**	**15**	**11**

Note: Census data lists infrastructure information of villages only
Source: Census of India 2001 & 2011

3.10 SUMMARY OF BASELINE DATA

Parameter	Status
Eco-sensitivity	• No National Park/Wildlife Sanctuary/Biosphere Reserve within study area. • No forest patches within study area or project site
Seismicity	Project site falls under Zone IV signifying high damage risk zone
Flood & Cyclone	The project site lies in flood prone area and in a very high damage cyclone risk zone
Topography	The project site has a flat topography. Slope is towards NE.
Geology	The project site is not underlain by any valuable mineral resources.
Land-use	• The project site as well as the study area is majorly covered by agricultural land. • There is a brick kiln in the project site which shall be dismantled prior to site preparation activities. • The water body in the project site shall be retained.
Soil Quality	• The soil samples collected give an impression of an average profile of soil quality for vegetation growth. • The NPK and organic carbon content in the soil samples is fair.
Drainage Pattern	• There are no streams passing through the project site. • The study area is drained by River Ramganga & Gangan and forms a part of Central Ganga Plain
Hydrogeology	• As per CGWB, depth to water level in the project site during pre-monsoon and post-monsoon period varies from 7-10 m bgl. • The water level is comparatively shallower in the flood plain of River Ramganga and its tributaries. • As per CGWB's Ground Water Resource Assessment, 2017, the Moradabad city falls under over-exploited zone.
Surface Water Quality	• Surface water samples collected from 5 locations indicate that the water is not suitable for drinking purpose. • Dissolved oxygen was recorded moderate in the study area. • The water samples collected are either suitable propagation of wildlife and fisheries or for irrigation, industrial cooling, controlled waste disposal
Ground Water Quality	• The samples of groundwater collected from 5 locations give an impression of slightly alkaline water quality, hard to very hard in nature, • Average TDS values were found to be more than 600 mg/l, which gives a clear evidence of anthropogenic influences. • The concentration of EC, TH, Ca, Mg, Na, HCO_3 and Cl at most of the sampling stations not exceeds the safety limits for drinking water. • Computational analysis of the data set of hydrochemical constituents in the groundwater suggests that the aquifer (TDS) is mainly controlled by Cl, total hardness Na, and EC.

Parameter	Status
Meteorology	• The average maximum and minimum temperature recorded at site during March to May, 2019 were 41^0C and 16^0C respectively. • The average relative humidity (maximum and minimum) was observed in the range of 78.7% to 13.0% during the study period. • The average wind speed recorded at the site was 8.6 kmph. • The predominant wind direction during the study period was mainly from North.
Air Quality	• Air quality was monitored in 11 locations and all the parameters were found to be within the stipulated limits of CPCB. • Maximum concentration of PM_{10} (85.6 µg/m^3) and $PM_{2.5}$ (40.1 µg/m^3) was recorded in AAQ10, Ekta Colony (Moradabad) which may be attributed to its proximity to industrial belt and its placement in the dominant downwind direction. • Likewise, maximum concentration of gaseous pollutants SO_2 and NO_2 was also recorded in Ekta Colony (Moradabad). • The maximum value of CO (0.63 mg/m^3) was observed in AAQ6, Fajalpur which is well below the NAAQ standard of 2 mg/m^3 for 8 hourly sampling.
Sound Pressure Level	• Leq during day time varies from 54.7 dB(A) to 50.5 dB(A) at the monitoring stations while Leq during night time varies from 47 dB(A) to 41 dB(A). • Leq is higher in few locations due to their proximity to major roads where vehicles keep plying continuously.
Traffic Density	• Traffic volume count was done in 3 locations and was done as per IRC Code. • Total number of vehicles per hour was determined. • The results indicated that the surveyed roads have a stable flow zones indicating no congestion during peak hours.
Ecology	• Ecological survey implied that there is no dense vegetation in the study area. • The study area does not support healthy vegetation due to too much biotic pressure. • No ecologically sensitive floral species have been reported from the area. Common species found near villages are mostly useful plants like *Mangifera indica*, *Syzigium cumini*, *Azadirachta indica*, *Albizia lebbeck*, *Delonix regia*, *Tamarindus indica* etc. • Growth of weeds like *Argemone mexicana*, *Cannabis sativa*, *Cenchrus ciliaris*, *Heteropogon contortus*, *Lantana camara*, *Parthenium hysterosphorus* etc. in agricultural land and along road sides is very common. • No significant wild animals have been reported from the study area. No established habitats of any mammals or birds have been noticed along the river bank. • There are some small water bodies which attract avian species. Common myna, kingfisher, cormorants are some common bird species observed in the study area.
Socio-economy	• There are 164 villages in the study area having a total population of 13,09,275 out of which 6,84,802 are males and 6,24,473 are females as per Census of India 2011. • The gender ratio of the project site has increased 885 to 912 from 2001 to 2011. • 7.7% of the population in the study area is in SC category while only 0.034 % is in ST category as per the 2011 Census. • The literacy rate was found to have increased from 44.65% in 2001 to 54.72% in 2011 in the study area. Female literacy rate has shown improvement from 37.81% in 2001 to 49.59% in 2011. • The Work Participation Rate in the study area was found to have increased from 28.07% in 2001 to 29.91% in 2011. • As far as educational facilities are concerned, the number of schools have increased over a span of 10 years, however, there are no facilities for higher education in the villages. • The medical facilities present in the study area seem to be appropriate to cater the population.



Chapter 4
Anticipated Environmental Impacts & Mitigation Measures

4. ANTICIPATED ENVIRONMENTAL IMPACT & MITIGATION MEASURES

The assessment of potential environmental impacts consists of comparing the expected changes in the environment with or without the project. This chapter assesses the nature, type and magnitude of the potential impacts likely on the various relevant physical, biological, social and cultural components due to proposed project. The environmental, biological, ecological and social impacts can be direct as well as indirect. The direct area of influence includes the site for the project and surrounding area. The impacts on various environmental components can occur at any of the following stages of the project planning and implementation; (i) Construction Stage; and (ii) Operation Stage.

4.1 DETAILS OF INVESTIGATED ENVIRONMENTAL IMPACTS

Generally, the environmental impacts can be categorized as either primary or secondary. The development, construction and functional phase of the project comprise various activities, each of which may have some impact on environmental parameter. For each category of environmental receptor (such as, ambient air quality, water quality, soils, land, etc.) the potential impacts of activities during development, construction and functional phases have been identified. The impact assessment matrix given in **Table 4.1** reveals the impact associated with each activity of the project on various environmental parameters during construction and functional phases respectively before any mitigation measures are implanted. To assess the severity of the impacts, they are categorized as follows:

Table 4-1: Impact Identification Matrix

Environmental Parameters	Nature of Potential Impacts during Construction and Operation Phases									
	Local	Regional	Short Term	Long Term	Reversible	Irreversible	Adverse	Beneficial	Significant	Insignificant
Soil	√		√		√					√
Water Resources	√			√		√	√		√	
Water Quality	√									
Land Use	√			√		√		√		√
Air Quality	√		√		√		√			√
Noise Level	√		√		√					√
Flora	√			√		√			√	
Fauna	√		√							√
Employment	√			√		√		√	√	

4.1.1 Modelling Studies

Impact of air emissions from emergency DG sets and vehicles has been predicted by using a mathematical model as described in section 4.1.1.1. The noise modelling impacts have been described in Section 4.1.1.2.

4.1.1.1 Air Dispersion Modelling for DG set

There will be provision of 2 DG sets of 125 kVA capacity each and 1 DG set of 150 KVA capacity to serve during power failure for operation phase. Pollution load has been calculated assuming that DG sets will be operated for 4 hours per day and low Sulphur content diesel will be used as fuel. Stack height of the DG set has been considered as 30 m as minimum permissible height allowed as per CPCB Standards. This is provided as input to a Gaussian point source Model used with hourly meteorological conditions for dispersion modelling described hereafter. The estimated exhaust emissions characteristics from DG sets are presented in **Table 4.2**.

Table 4-2: Emission from DG Sets

Parameters	Units	Capacity of DG Set (kVA)	
		125	150
Number of DG Sets	No.	2	1
Stack Height	m	30	30
Stack Diameter	m	0.09	0.11
Stack exit velocity	m/s	12.7	15.2
Flue Gas Temperature	^{0}K	773	773
Emission Load			
PM@ 0.3 g/kw-hr	g/s	0.010	0.012
SO_2@0.005% Sulphur in Diesel	g/s	0.0005	0.0006
NO_2@9.2 g/kw-hr	g/s	0.26	0.31
CO@3.5 g/kw-hr	g/s	0.10	0.11

Application of AERMOD:

For obtaining short-term incremental ground level concentration (GLC) within study area, US EPA approved AERMOD Cloud5 has been used for the project. This is an air dispersion-modeling package, which seamlessly incorporates the popular USEPA Models, ISCST3 and AERMOD into one interface without any modifications to the models. These models are used extensively to assess pollution concentration and deposition from a wide variety of sources (Point source for DG set in this case).

Meteorological Data:

In order to conduct a refined air dispersion modeling project using the AERMOD short-term air quality dispersion model, it is necessary to process the meteorological data representative of the study area being modeled. The collected meteorological data is not always in the format supported by the model, therefore the meteorological data needs to be pre-processed using AERMET program.

The AERMET program is a meteorological pre-processor, which prepares hourly surface data and upper air data for use in the AERMOD air quality dispersion model. AERMET is designed to allow future enhancements to process other types of data and to compute boundary layer parameters with different algorithms. AERMET processes meteorological data in three stages and from this process two files are generated for use with the AERMOD model. A surface file of hourly boundary layer parameters estimates a profile file of multiple-level

observations of wind speed, wind direction, temperature and standard deviation of the fluctuating wind components.

Presentation of Results:

The incremental concentrations are estimated for the study period representing summer season (March to May, 2019). The results of present baseline values and predicted additional values of ground level concentrations for PM_{10}, NO_2 and CO are presented in **Table 4.3**. The concentration of SO_2 was too low for the model to plot isopleths.

The isopleths of predicted value of additional concentration of the said parameters in microgram/m^3 are shown as **Figure 4.1** to **4.3**.

Table 4-3: Highest Resultant Ground Level Concentration (GLC) during Project Operation in µg/m^3

Station Name	Direction	Distance (in km)	Monitored GLCs			Predicted Incremental GLCs			Resultant GLCs		
			PM_{10}	NO_2	CO	PM_{10}	NO_2	CO	PM_{10}	NO_2	CO
AAQ1: Project Site	-	-	71.3	22.6	520	0	0	0	71.3	22.6	520
AAQ2: Manoharpur	1.2	SSE	70.4	22.4	530	0	0.05	0.02	70.4	22.45	530.02
AAQ3: Bagarpur	3.8	WNW	69.7	20.4	460	0	0.02	0.01	69.7	20.42	460.01
AAQ4: Pakwara	0.9	NW	75.2	23.2	590	0.01	0.2	0.08	75.21	23.4	590.08
AAQ5: Rustampur	3.5	SW	67.6	21.3	450	0.01	0.26	0.09	67.61	21.56	450.09
AAQ6: Fajalpur	2.9	ESE	80.6	24.6	630	0	0	0	80.6	24.6	630
AAQ7: Malipur	2.5	SSE	67.6	20.6	420	0	0.06	0.02	67.6	20.66	420.02
AAQ8: Umari	3.8	SSE	81.3	25.7	600	0.01	0.19	0.07	81.31	25.89	600.07
AAQ9: Rasulpur	7.2	S	66.9	20.7	460	0.01	0.3	0.1	66.91	21	460.1
AAQ10: Ekta Colony (Moradabad)	4.8	E	85.6	25.8	620	0	0.13	0.05	85.6	25.93	620.05
AAQ11: Shahalampur	4.0	NNE	65.5	18.1	370	0.01	0.36	0.13	65.51	18.46	370.13
NAAQS									**100**	**80**	**2000**

Source: Impact Modelling Done by GCPL

The predicted additional values in the above table presents the worst case scenario i.e., on the day of maximum predicted GLC as done by the model from every day hourly input meteorological data. The maximum concentration of individual pollutants is shown in **Table 4.4**.

Table 4-4: Maximum GLC of Pollutants

Pollutant	Maximum GLC in µg/m^3	Distance (m)	Direction
PM_{10}	0.07	1000	ESE
NOx	1.74	1000	ESE
CO	0.64	1000	ESE

Source: Impact Modelling Done by GCPL

NO_x is the highest contributor among all pollutants analyzed. However, the maximum GLC is too low to cause any additional impact on the environment.

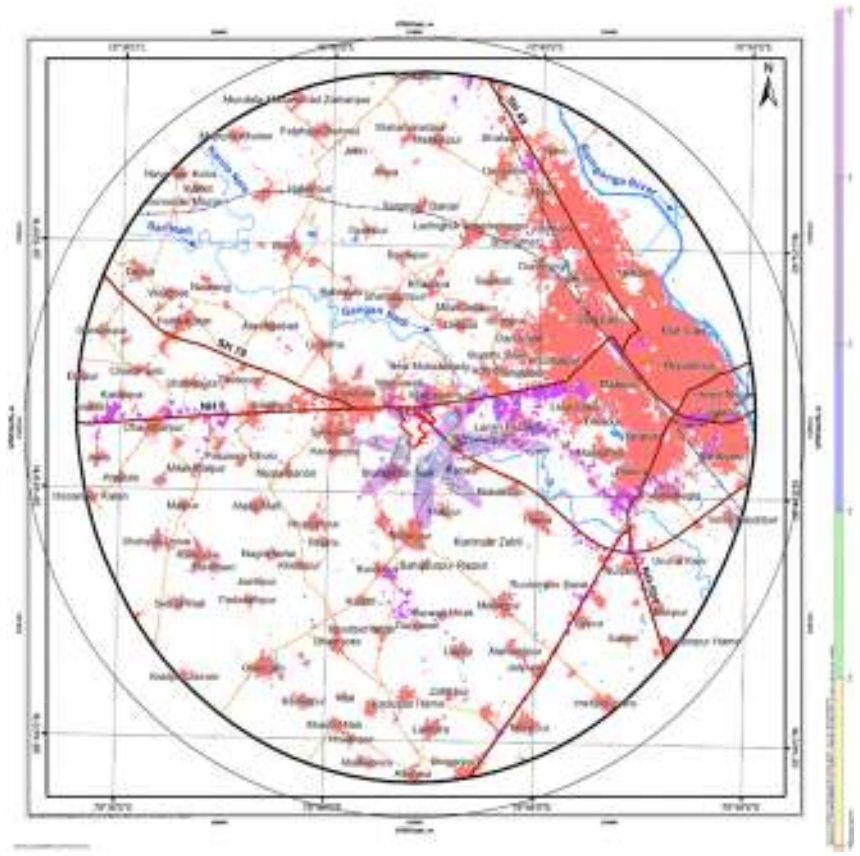


Figure 4.1: Predicted GLCs superimposed on Land-use Map - 10 km for PM_{10} (µg/m³)

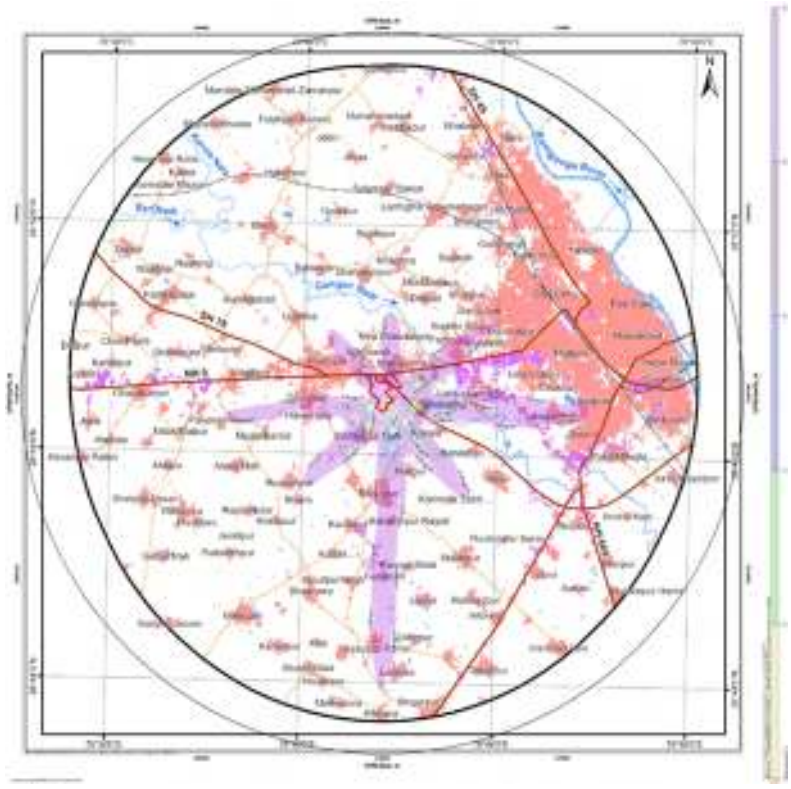


Figure 4.2: Predicted GLCs superimposed on Land-use Map - 10 km for NOx (µg/m³)

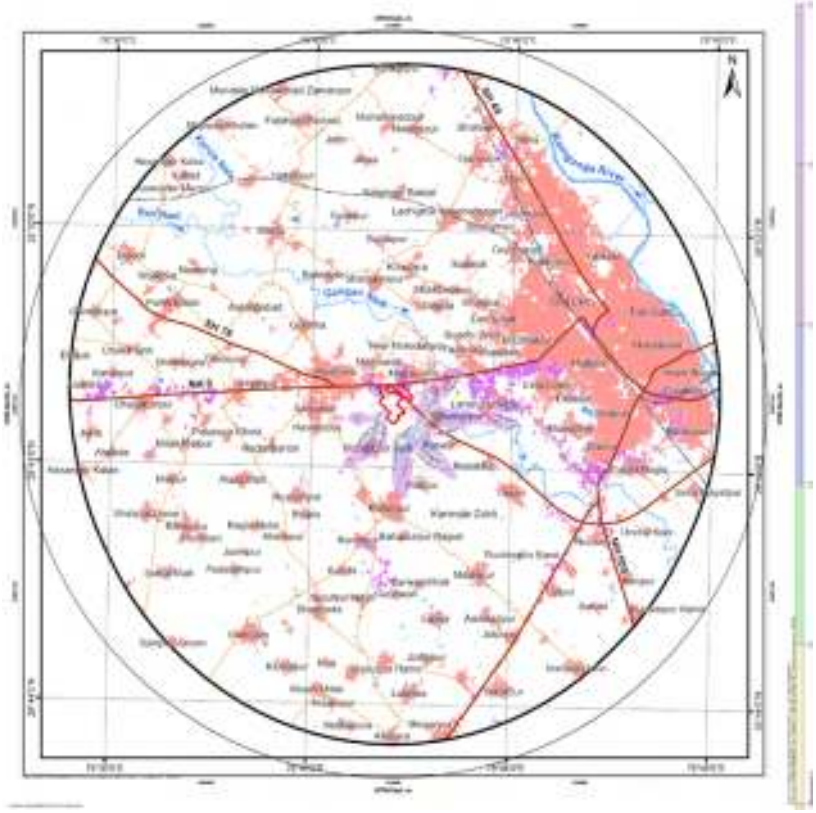


Figure 4.3: Predicted GLCs superimposed on Land-use Map - 10 km for CO (µg/m³)

4.1.1.2 Air Dispersion Modelling for Vehicles

After the project will start operation, it is expected that the traffic increase from the project will get diverted towards the locations where traffic volume count was surveyed (T1, T2 & T3 as showing **Figure 3.29**). The existing traffic load on the T1, T2 & T3 as found during survey done in May, 2019 is 488 PCU/hr, 384 PCU/hr and 227 PCU/hr respectively.

The project is expected to add another 8682 PCU/day. Considering 30% flow along T1, 20% flow along T2 and 50% flow along T3 during peak hour, an increase of 1042 PCU/hour will occur in T1, 695 PCU/hour along T2 and 1736 PCU/hr along T3 (considering that 40% of the additional PCU i. e 3328 PCU/hr shall be available on roads during the peak hour).

A line source modelling has been carried out to study the impact on air quality around the 1 km area of both the roads (T1, T2 & T3). The extent of these impacts, at any given time, depends upon (i) the rate of vehicular emission within a given stretch of the road and (ii) the prevailing meteorological conditions. The impacts have strong temporal dependence as both of these factors vary with time. The temporal dependence would have diurnal, seasonal as well as long term components. The existing and the predicted traffic volumes have been considered to project future air quality scenarios to provide an indication of variations in air quality.

The emission factors reported in this study are based on BS-IV certified diesel cars for which the predicted Ground level concentrations of Sulfur di-oxide, CO, and HC+NOx has been estimated on 24 hours basis. The model has been run on the basis of total no. of PCUs/hr that will be plying on the surveyed roads after project

expansion considering wind speed of 4 km/hr and stability class C. The predicted ground level concentration of gases is given in **Table 4.5**.

Table 4-5: Comparison between Pollution Load before and after Project Scenario

Pollutant	Distance (m)	GLC 24hr (µg/m³) BS IV					
		T1: SH-78		T2: NH-9 (Moradabad Byepass road)		T3: Old NH-24 (Old Moradabad Byepass road)	
		Before project	After project	Before project	After project	Before project	After project
NOx+HC	100	3	9	2	6	1	12
	200	1	5	1	3	1	6
	300	1	3	1	2	0	4
	400	1	3	1	2	0	3
	500	1	2	1	2	0	3
	600	1	2	1	1	0	3
	700	1	2	0	1	0	2
	800	0	2	0	1	0	2
	900	0	1	0	1	0	2
SO_2	100	0.1	0.3	0.1	0.2	0.0	0.4
	200	0.0	0.1	0.0	0.1	0.0	0.2
	300	0.0	0.1	0.0	0.1	0.0	0.1
	400	0.0	0.1	0.0	0.1	0.0	0.1
	500	0.0	0.1	0.0	0.0	0.0	0.1
	600	0.0	0.1	0.0	0.0	0.0	0.1
	700	0.0	0.0	0.0	0.0	0.0	0.1
	800	0.0	0.0	0.0	0.0	0.0	0.1
	900	0.0	0.0	0.0	0.0	0.0	0.1
CO	100	16	51	13	36	8	65
	200	8	25	6	18	4	33
	300	5	17	4	12	3	22
	400	5	15	4	10	2	19
	500	4	13	3	9	2	16
	600	4	11	3	8	2	15
	700	3	9	2	7	1	12
	800	3	8	2	6	1	11
	900	2	8	2	6	1	10

It is evident from the above table that the impact due to vehicle movement is quite significant with the most contribution coming from CO.

4.1.1.3 Noise Modelling

Construction Phase

The major noise generating source during the construction phase is vehicular traffic, operation of various equipment/ HEMMs (Heavy Earth Moving Machineries), operational DG sets etc. During construction, these equipments will generate noise ranging between 80-90 dB (A).The areas close to the site are likely to be affected. The tentative noise specifications for various equipments at 15 m from source are given in **Table 4.6**.

Table 4-6: Construction Equipment Noise Emission Levels

Equipment	Typical Noise Level (dBA) 15 m from Source
Loaders	85
Scrapers	89
Pavers	89
Trucks	88
Concrete mixer	85
Concrete pumps	82
Generator	81
Grader	85

Source: Based on EPA Report, measured data from railroad construction equipment taken during Northeast Corridor improvement project and other measured data

Based on the **Table 4.6**, an approximate estimation of noise dispersion at different distances [considering the total sound generated by construction instrument (in this case 92 dBA)] has been calculated.

Table 4-7: Noise levels at Different Distances

Sl. No.	Distance of Points in m	Noise Level in dB(A)
1	100	52
2	200	46
3	300	43
4	400	40
5	500	38

Source: Greencindia Consulting Private Limited

From **Table 4.7**, it is evident that the highest noise level (the one emitted from scrapers and pavers) merges with the highest standard noise level (55 dB during day time) at around 100 m from the source and the sound level keeps on decreasing with increasing distances. No cost effective mitigation has been considered as the sources are mobile in nature and will operate for short periods only.

4.2 MEASURES FOR MINIMIZING AND/OR OFFSETTING ADVERSE IMPACTS

Table 4.8 summarises the identified impacts and respective mitigation measures.

Table 4-8: Identified Impacts and Respective Mitigation Measures

Sl. No.	Aspects	Construction Phase		Operation Phase	
		Impact	Mitigation Measures	Impact	Mitigation Measures
1	**Land-use:** • The project site as well as the study area is majorly covered by agricultural land. • There is a brick kiln in the project site which shall be dismantled prior to site preparation activities. • The water body in the project site shall be retained.	• The project shall be developed as per Moradabad Master Plan-2021 which demarcates the site as residential zone. • The brick kiln is operated by the Project Proponent and shall be dismantled. • The water body at site shall not be disturbed.	• Development shall be done after taking all necessary approvals from competent authority. • The water body shall be retained and preserved by proving a 30 m green buffer.	-	-
2	**Soil Quality:** • The soil samples collected give an impression of an average profile of soil quality for vegetation growth. • The NPK and organic carbon content in the soil samples is fair.	• Site preparation activities involve removal of vegetation cover which makes the soil prone to erosion. • Soil would be excavated at project site for leveling of land and demarcating plots for various developments. • During this, the top soil cover shall be lost and the inner soil layer shall be exposed.	• Since the site is almost a levelled land, the earth generated from excavation shall be minimal in amount which shall be stored in area earmarked and then shall be used to fill up low lying area in and around the project site and for landscaping. • Proper drainage system shall be provided to deal with the storm water in case of rain. • Vegetative cover shall be removed only from specific site on which construction is to take	• During the operation phase of the project, the soil may get polluted/ contaminated from littering of various kinds of wastes generated within the site such as food items, paper, wood pieces, paints, pesticides, oil & grease etc. • The waste generation in the operation phase is limited to municipal solid waste, STP Sludge and Electronic Waste. As per the manual on municipal solid waste prescribe by Central Public Health and Environmental	• To ensure against any chances of soil pollution, it is imperative to establish a well-planned solid waste collection system covering all areas of the project site apart from door to door for the residential units. An identified area shall be designated for storage and segregation of the wastes which will be treated/ disposed as per their characteristics. • The waste shall be collected in three separate bins namely bio-degradable, non-bio-degradable and domestic hazardous wastes.

Sl. No.	Aspects	Construction Phase		Operation Phase	
		Impact	Mitigation Measures	Impact	Mitigation Measures
			place.	Engineering Organization (CPHEEO), the quantity of solid waste generated is 20.30 TPD.	The respective wastes shall be handed over to authorised waste collectors who will dispose them as per the direction or notification by the local by the local authorities from time to time. • Biodegradable portion of MSW will be treated at site by Organic Waste Converters and manure generated will be sold or used for plantation. Recyclable waste will be disposed off by selling. • Spent oil from DG sets shall be stored in separate cans and sold to authorized recyclers. • The e-wastes and used oil will be stored properly and handed over to authorized recyclers.
3	**Surface Water Quality & hydrology** • There are no streams passing through the project site. • Surface water samples collected from 5 locations	• Runoff during rains takes way to natural drain and in storm water drains laid in the area. • This may carry the excavated soils and other wastes generated at site	• Wastewater generated from the domestic activities will be treated in septic tank followed by soak pit. • A sediment trap will be provided to prevent the	• Fuel leakage and spillage from vehicles may take place which can be carried away by rainfall run-off to nearby water bodies and pollute them. • Wastewater generated	• Proper oil & grease interceptors will be installed at outlet point of storm water drainage • Based on waste water calculation, an STP of 5000 KLD capacity shall be

Sl. No.	Aspects	Construction Phase		Operation Phase	
		Impact	Mitigation Measures	Impact	Mitigation Measures
	indicate that the water is not suitable for drinking purpose. • Dissolved oxygen was recorded moderate in the study area. • The water samples collected are either suitable propagation of wildlife and fisheries or for irrigation, industrial cooling, controlled waste disposal	to the nearby water bodies thereby polluting them.	discharge of excessive suspended solids. • To prevent contamination from spillage of oil, storage areas will be made by cemented floor, bunded and will be cleaned at regular intervals. • Suitable drainage network would be made to ensure proper draining of wastewater from the construction sites. • Used oil will be given to authorized used oil recyclers.	from residential units, if not properly treated, may find its way to surface water bodies. • Odour from STP can become a nuisance if not controlled.	installed at the site. The capacity of the STP is far more than the estimated wastewater generation. • The entire treated waste water shall be reused for various activities within the site. • In case of any accidental discharge, the release will be contained within the internal drainage system of the site and used either for gardening or floor/vehicle washing. The internal drainage plan is shown in **Figure 4.4**. • Most odor problems in STP occur in the collection system, in primary treatment facilities and in solids handling facilities. The integration of Ozone into Air Handling System is the latest and most popular technology to reduce H_2S and NH_3 from enclosed STP Exhaust.
4	**Ground water quality & resource** • The samples of groundwater	• Water required for site development activities shall be sourced from tankers	• Since there is no significant impact on ground water during	• The project shall extract 2836 KLD of ground water during operation phase	• Rainwater harvesting through recharge pit process will be adopted

Sl. No.	Aspects	Construction Phase		Operation Phase	
		Impact	Mitigation Measures	Impact	Mitigation Measures
	collected from 5 locations give an impression of slightly alkaline water quality, hard to very hard in nature, • Average TDS values were found to be more than 600 mg/l, which gives a clear evidence of anthropogenic influences. • The concentration of EC, TH, Ca, Mg, Na, HCO_3 and Cl at most of the sampling stations not exceeds the safety limits for drinking water. • Computational analysis of the data set of hydrochemical constituents in the groundwater suggests that the aquifer (TDS) is mainly controlled by Cl, total hardness Na, and EC. • As per CGWB's Ground Water Resource Assessment, 2017, the Moradabad city falls under over-exploited zone.	and the amount shall vary depending upon construction activities.	construction phase, no cost effective mitigation measures have been suggested.	after taking prior permission. • Since Moradabad city is already marked as an over-exploited zone as per CGWB in terms of ground water assessment, extraction of this amount per day shall out additional pressure on ground water resources. • Used oil from DG sets may percolate to ground water, if not properly stored and treated.	for ground water recharge at the project site after adequate treatment of the storm water through oil, grease traps and filtration. The quantity of annual harvested rainfall at the project site shall be 2978.2 **cum**. **31 recharge pits of diameter 3.5 m and depth 5 m** are proposed. • The used oil from DG sets shall be collected in a concrete bund where proper oil & grease interceptors will be installed. • To further lower the water consumption, options of low flow flushing systems, sensor based fixtures, and tap aerators etc. will be explored.
5	**Air Quality** • Air quality was monitored in 11 locations and all the parameters were found to be within the stipulated limits of CPCB. • Maximum concentration of PM_{10} (85.6 µg/m^3) and $PM_{2.5}$	• During the excavation, unloading of construction material, cement bags and mixing of cement with other building materials such as brick, wood dust, fugitive dust emissions shall be emitted at	• During construction, curtaining floors from all sides will be done to prevent cement dust from becoming airborne. • It may be noted that all the emissions will be	▪ From the modelling outputs, it has been established that NOx is the highest contributor among all pollutants analyzed. However, the maximum GLC is too low to cause any additional	▪ Proper traffic management within the project premises to avoid congestion at any particular place. Traffic movement plan is attached as **Annex 4.1**. ▪ Extensive greenbelt development along the

Sl. No.	Aspects	Construction Phase		Operation Phase	
		Impact	Mitigation Measures	Impact	Mitigation Measures
	(40.1 µg/m^3) was recorded in AAQ10, Ekta Colony (Moradabad) which may be attributed to its proximity to industrial belt and its placement in the dominant downwind direction. • Likewise, maximum concentration of gaseous pollutants SO_2 and NO_2 was also recorded in Ekta Colony (Moradabad). • The maximum value of CO (0.63 mg/m^3) was observed in AAQ6, Fajalpur which is well below the NAAQ standard of 2 mg/m^3 for 8 hourly sampling.	construction site.	in the form of coarse particulate matter and settle down ultimately in closed vicinity of construction site. • Dust suppression system is to be provided wherever necessary. • Avenue plantation on the internal roads and peripheral plantation around the site will be developed which will help in arresting the dust particles to fly away from the construction areas by creating a physical barrier.	impact on the environment. ▪ The vehicular emissions, however, will be significant, once the project starts operation with maximum contribution coming from CO. ▪ Traffic projection has shown that after the project starts operating, there shall be congestion on roads and as the constant acceleration and braking of stop-and-go traffic burns more gas; it therefore pumps more pollutants into the air with the maximum contribution coming from CO. ▪ CO bonds to the haemoglobin in the blood, and reduces the oxygen carrying capacity of the red blood cells. The resulting lack of oxygen in the body causes cells to die.	periphery as well as in the open spaces shall work as a barrier to air pollution.
6	**Sound Pressure Level** • Leq during day time varies from	• The main source of noise pollution would be	• The highest noise level emitted from	• The main sources of noise from the project operation	▪ The sources are intermittent and shall

Sl. No.	Aspects	Construction Phase		Operation Phase	
		Impact	Mitigation Measures	Impact	Mitigation Measures
	54.7 dB(A) to 50.5 dB(A) at the monitoring stations while Leq during night time varies from 47 dB(A) to 41 dB(A). • Leq is higher in few locations due to their proximity to major roads where vehicles keep plying continuously.	construction equipment, transportation activities. Noise from earthmoving equipment has the potential to cause nuisance, especially if large numbers of machinery used are in poor condition. • During construction phase noise will also be generated from vibrating machinery, movement of trucks, operation of frontend loaders and vehicle reversing alarms. • Other sources include generation of noise during concreting, hammering etc. and from mechanical operations like drilling, fitting etc.	construction equipments merges with the highest standard noise level (55 dB during day time) at around 100 m from the source and the sound level keeps on decreasing with increasing distances. • The heavy construction and transport activities shall be restricted to daytime operations. • All around the construction activity area on the site periphery, about 2.5 meter high barrier GI Sheet shall restrict the noise impact by about 10dB(A). • Proper operation and maintenance of heavy equipment as well as transport vehicles shall also ensure lower noise emissions. • Ear plugs, ear muffs etc. will be provided to workers handling high noise level equipment or stone cutting operations.	are running of D.G. Sets and vehicular traffic.	generate sound for short duration. ▪ The vehicles playing within the site will be mainly of the residents and are hence not expected to cause unnecessary noise. ▪ The DG set shall be provided with proper exhaust muffler with insertion loss of minimum 25 dB(A). ▪ Adequate personnel protective equipment (PPE) will be provided to the personnel engaged in D.G. Set Room ▪ Proposed rows of plantation will further restrict the noise on other side of the plantation i.e. outside the boundary.

Sl. No.	Aspects	Construction Phase		Operation Phase	
		Impact	Mitigation Measures	Impact	Mitigation Measures
			• Warning signs should be set up in active work areas, prohibiting entry to persons without ear protection.		
7	**Ecology** • Ecological survey implied that there is no dense vegetation in the study area. • The study area does not support healthy vegetation due to too much biotic pressure. • There are certain plant species within the project site which includes neem, poplar, amaltas and shisham. • No ecologically sensitive floral species have been reported from the area. Common species found near villages are mostly useful plants like *Mangifera indica*, *Syzigium cumini*, *Azadirachta indica*, *Albizia lebbeck*, *Delonix regia*, *Tamarindus indica* etc. • Growth of weeds like *Argemone mexicana*, *Cannabis sativa*, *Cenchrus ciliaris*, *Heteropogon contortus*, *Lantana camara*, *Parthenium hysterosphorus* etc. in agricultural land and along	▪ The project site does not involve any forest land. ▪ There are, however, trees present in the site which shall be removed prior to site development. ▪ Likely settling of dust from movement of vehicles for construction activities on leaves may results in stunted growth of vegetation and may also affect the rate of photosynthetic capacity. ▪ High noise levels generated from equipments may prove to be harmful for local fauna as it affects their behavioral pattern.	▪ Removal of vegetation shall be restricted to areas where construction activities shall be involved. Effort shall be made for minimum vegetation removal. ▪ Plantation and landscaping shall be done from construction phase to strengthen flora in the area. ▪ Air and noise emission during construction phase will be temporary and localised and restricted during day time. ▪ Extensive green areas shall be developed in the project site to improve the aesthetics of the area which will	▪ The emission from DG sets may be harmful for the local species in case they cross the stipulated limits. ▪ Unsegregated and open waste dumping areas may attract birds who will feed on the wastes causing intoxications, injuries, illness and finally death.	▪ CPCB adopted the injury symptoms and pollution dose thresholds of tolerance by sensitive species of plants developed by W.H. Smith (1981) which stipulates that SO_2 at 0.70 ppm (1820 µg/m^3) after 1 hour exposure or 0.18 ppm (468 µg/m^3) after 8 hours' exposure gives rise to visible injury symptoms in vegetation. ▪ Similarly NOx at 20 ppm (38x103 µg/m^3) after 1 hour exposure or 1.6-2.6 ppm (3000-5000 µg/m^3) after 48 hours' exposure or 1 ppm (1900 µg/m^3) after 100 hours' exposure is likely to bring about injury symptoms in vegetation. However, such high incremental concentration of SO_2 and NOx is not likely to occur in the area. As per

Sl. No.	Aspects	Construction Phase		Operation Phase	
		Impact	Mitigation Measures	Impact	Mitigation Measures
	road sides is very common. • No significant wild animals have been reported from the study area. No established habitats of any mammals or birds have been noticed along the river bank. • There are some small water bodies which attract avian species. Common myna, kingfisher, cormorants are some common bird species observed in the study area.		also help in reduction of air pollution, noise pollution and provide suitable habitat for local birds and animal species. Plan for greenbelt development is given in **Annex 4.2.**		modelling studies done, the maximum resultant concentration of NOx in the ambient air even after the project comes into operation will be 1.74 $\mu g/m^3$. The incremental concentration of SO_2 was too low to be detected. ▪ The wastes shall be segregated at source and collected in closed containers. The segregated wastes shall be disposed or treated based on their characteristics. Open dumping of wastes shall be strictly prohibited.
8	**Socio-economy** • There are 164 villages in the study area having a total population of 13,09,275 out of which 6,84,802 are males and 6,24,473 are females as per Census of India 2011. • The gender ratio of the project site has increased 885 to 912 from 2001 to 2011. • 7.7% of the population in the study area is in SC category while only 0.034 % is in ST	• During the development and construction of Project, about 200 skilled and semiskilled and unskilled workers per day will get direct employment opportunity, which will have beneficial impact on the local people and improve socio-economic conditions of the area. Construction materials will be procured from local	• Suitable measures will be taken at the construction camps to mitigate anticipated impacts due to temporary accommodation of laborers such as provision of clean drinking water, adequate toilet facilities, water and solid waste disposal	• During operational phase, more than 100 persons will get employment opportunities as staff for management, maintenance and security. • This will help in improving the quality of life of economically weaker sections of the local area as most of the	• Adequate provision of safety and security shall be made for the working staff. • The proponent will spend an estimated amount of INR 5.54 Crores on CER.

Sl. No.	Aspects	Construction Phase		Operation Phase	
		Impact	Mitigation Measures	Impact	Mitigation Measures
	category as per the 2011 Census. • The literacy rate was found to have increased from 44.65% in 2001 to 54.72% in 2011 in the study area. Female literacy rate has shown improvement from 37.81% in 2001 to 49.59% in 2011. • The Work Participation Rate in the study area was found to have increased from 28.07% in 2001 to 29.91% in 2011. • As far as educational facilities are concerned, the numbers of schools have increased over a span of 10 years; however, there are no facilities for higher education in the villages. • The medical facilities present in the study area seem to be appropriate to cater the population.	markets. The people will get benefit by providing logistics.	system. • Other safety precautions to be maintained at work site include provision of PPEs, guarding of dangerous machine parts, maintenance of equipments as hoists and lifts etc., and adequate provision of different types of fire extinguishers.	staff will be locally hired.	
9	**Energy Conservation**	-	-	-	• To promote energy conservation, it is proposed to provide the buildings with low energy consuming fixtures and maximize availability of natural light. • Solar lighting will be

Sl. No.	Aspects	Construction Phase		Operation Phase	
		Impact	Mitigation Measures	Impact	Mitigation Measures
					applied as an alternate source of energy to reduce load on the power supply which will be used in street light, traffic signaling and other common areas. • Houses will be designed to reduce use of lead up to 50% to reduce the load on air conditioning as lead works as insulator. • Proper design will allow natural light to reduce the load on power.

4.2.1 Solid Waste Generation

Table 4-9: Generation of Construction Waste

Proposed road area	=	137683.8	m^2
Total Construction Waste Generated @50kg/m^2	=	6884190	kg
	=	6884.19	tonne

Table 4-10: Source wise generation of Construction Waste

Construction & Demolition Waste (50kg/m^2)	:	Soil, Sand, Gravel	Bricks & Masonary	Concrete	Bitumen	Others
		36%	31%	23%	2%	8%

The waste generation in the operation phase is limited to municipal solid waste, STP Sludge and Electronic Waste. As per the manual on municipal solid waste prescribe by Central Public Health and Environmental Engineering Organization (CPHEEO), the quantity of solid waste generated is 20.30 TPD. The solid waste will comprise biodegradable waste e.g. domestic waste, food waste, horticultural waste etc. and recyclable waste, like plastic, paper etc. (**Table 4.11** & **4.12**).

Table 4-11: Activity wise Solid Waste Generation during Operation Phase

Sl. No.	User	Rate of solid waste production (kg/capita/day)	Population	Anticipated Solid Waste Ton/day
1.	Residential	0.55	32755	18.02
2.	Commercial	0.2	4175	0.84
3.	Public-semipublic	0.2	7263	1.45
Total			**44193**	**20.30**

Source: For Waste Collection, Chapter 3, Table 3.6, Page no. 49, Central Public Health & Environment Engineering Organization, Ministry of Urban Development, (Government of India, May 2000) (ii) Project Report for "Integrated Township, Moradabad"

Table 4-12: Segregation of Solid Waste Generated during Operation Phase in tonnes/day

Sl. No.	Description	Residential	Commercial	Public- Semipublic
1.	Biodegradable Waste	10.47	0.44	0.76
2.	Recyclable Waste	2.83	0.34	0.56
3.	Others	4.72	0.06	0.13
Total		**18.02**	**0.84**	**1.45**

An NGO shall be hired who will be managing the municipal solid waste inside the project premises during operation phase. The agency will arrange for door to door collection of domestic waste. The agency will also be responsible for segregation of waste at site. The biodegradable waste shall be treated in the organic waste converters installed at site. The MSW shall be carried by vans to the nearest intermediate MSW dump for disposal.

Calculation for a typical Organic Waste Converter to treat 200 kg of food waste per day	
Area Required	100 sq. feet area is required to keep the machine and store manure
Machine Capacity:	1 batch of organic waste converter machine can take 50kg of food waste. Therefore the machine needs to run 4 times (Assuming 200kg food waste) Each batch takes up to 15 minutes, machine will run for maximum 60 minutes/day
Electricity :	Machine consumes 4 units if it is running less than 1 hour, Therefore it will consume 4 units of electricity, which will cost Rs. 40 per day. (assuming Rs. 10 per unit)

Calculation for a typical Organic Waste Converter to treat 200 kg of food waste per day	
Bulking Agent	Saw duster rice husk or sugarcane molasses are good bulking agents; these agents are easily available anywhere from Rs. 4-6 per kg. dry shredded garden waste can be the best bulking again (if available)
Culture powder	It is bacteria generating powder; it is easily available across India. It costs Rs. 100-150 per kg Only 1 gram should be put per kg.
Total cost for processing 300 kg of waste	Electricity + culture powder + manpower =40 + 100+ 40 = Rs. 180
This manure is sold at average	Rs. 5 per kg.
every month sellable manure Generated	3600 kg
Income = 3600kg x Rs 5	18000/-
Expenses for month	Rs. 5200/-
Total income	Rs. 12800/-

The domestic hazardous wastes like CFL bulbs, tube lights, expired medicines, batteries etc. generated at household level shall be collected in separate bins and deposited in nearest waste deposition centre meant for such wastes. The plastic wastes shall be handed over to the local rag pickers.

4.2.2 Rainwater Harvesting

Water Harvesting: The roof top rainwater harvesting through recharge pit process will be used for the recharge of the water at the project site. The quantity of annual harvested rainfall at the project site at present is **2978.2 m^3**. **31 recharge pits of diameter 3.5 m and depth 5 m** are proposed. Mesh will be provided at the roof so that leaves or any other solid waste/debris will be prevented from entering the pit. Rainwater from roofs will be taken to collection/desilting chambers located on ground. These collection chambers are interconnected to the filter pit through pipes. The filter pit will be circular in shape and will be back-filled with graded material, boulder at the bottom, gravel in the middle and sand at the top. The final disposal of storm / rain water shall be in multiple recharge / rain harvesting pits as per MOEF guidelines to recharge the ground water. The water collected will be used for replenishing the ground water aquifers and creating surface storages for utilization in non-rainy season (**Table 4.13**). Only rooftop water will be taken in the Rainwater Harvesting Pit.

Table 4-13: Annual Recharge Potential (After Construction)

Sl. No.	Description	Area Considered in m^2	Runoff Coefficient	Rainfall intensity (mm/hr)	Total vol. of water available for RWH (m^3/hr)	Total vol. of water available for RWH (m^3/30 min)
1	Roof Top Water	153550.00	0.9	25	3454.9	1727.5
2	Road Area	137683.84	0.6	25	2065.3	1032.7
3	Green Areas	87184.92	0.2	25	435.9	218.0
Total		**378418.76**			**5956.1**	**2978.2**

Source: (i) Manual on norms and standards for environment clearance of large construction projects, Ministry of Environment and Forests, Government of India (iii) National Building Code of India, 2005, Bureau of Indian Standards, New Delhi. (iv) Project Report for "Integrated Township, Moradabad"

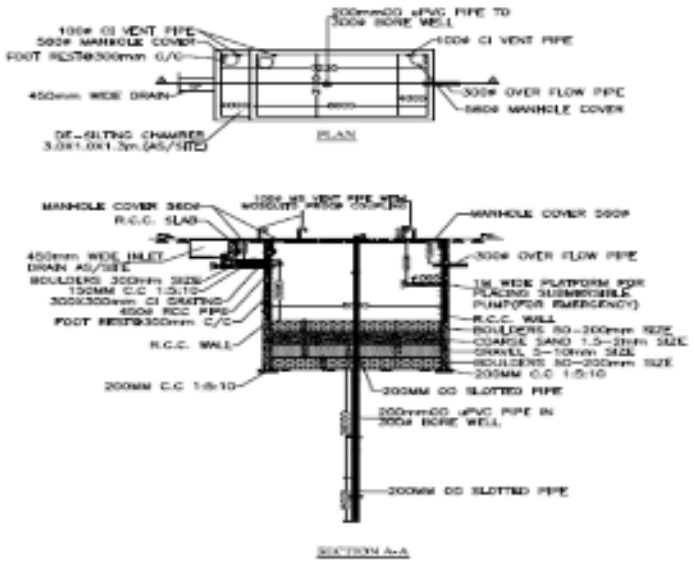


Figure 4.5: Typical Rainwater Harvesting Pit Design

4.2.3 Projected Level of Service for the Surveyed Roads

With the construction of the proposed project, the traffic in the area is likely to increase, particularly during the operation phase. The increase in traffic may create congestion, potential delays and inconvenience for pedestrians and residents accessing the localities.

As per Indian Road Congress (IRC) Standards and based on the existing traffic scenario as mentioned in Chapter 3, the level of service has been determined and shown in **Table 4.14**.

Table 4-14: Existing Level of Service

Location	Distance (km)	Direction	V = Volume in PCU per hour	C = Suggested design capacity in PCU/hour	V/C ratio	LoS as per IRC
T1: SH-78	1.28	WNW	487.8	1500	0.33	B
T2: NH-9 (Moradabad Byepass road)	0.85	SE	383.7	3600	0.11	A
T3: Old NH-24 (Old Moradabad Byepass road)	2.16	ENE	227.2	3600	0.06	A

Relation between V/C ratio & LoS		
V/C Ratio	LoS	Performance
0.0-0.2	A	Represents a condition of free flow
0.2-0.4	B	Represents a zone of stable flow
0.4-0.6	C	The general level of comfort and convenience declines noticeably at this level
0.6-0.8	D	Represents the limit of stable flow
0.8-1.0	E	Represents operating condition when traffic volumes are at or close to the capacity level

From the survey, it is clear that three of the roads surveyed represent a condition of free flow.

Post-project Level of Service

The project is expected to add another 8682 PCU/day. Considering 30% flow along T1, 20% flow along T2 and 50% flow along T3 during peak hour, an increase of 998 PCU/hour will occur in T1, 666 PCU/hour along T2 and 1664 PCU/hr along T3 (considering that 40% of the additional PCU i. e 3328 PCU/hr shall be available on roads during the peak hour).

The total additional PCU in both the surveyed roads is given in **Table 4.15**.

Table 4-15: Level of Service after Expansion

	T1: SH-78	T2: NH-9 (Moradabad Byepass road)	T3: Old NH-24 (Old Moradabad Byepass road)
Existing PCU per hour	488	384	227
Additional PCU per hour	1042	695	1736
Total PCU per hour when proposed project would be operational	1530	1079	1963
V/C ratio	>1.0	0.29	0.54
LoS	<E	B	C

From **Table 4.15**, it is clear that after the project starts operating; the LOS of T1 shall reach its saturation point and shall require augmentation. The LOS of T2 and T3 shall degrade to Level B & C respectively.

4.3 IRREVERSIBLE & IRRETRIEVABLE COMMITMENTS OF ENVIRONMENTAL COMPONENTS

The irreversible and irretrievable commitment of environmental components refers to impacts on or losses to resources that cannot be recovered or reversed. For the proposed project, the following irreversible or irretrievable actions have been identified:

- **Consumption of fossil fuel:** In case of power failure, the power requirement shall be met from DG sets that run on diesel oil. The project shall have provision of 3 numbers of DG sets- 2 of 125 kVA capacity and 1 of 150 kVA capacity.
- **Withdrawal of ground water:** The project in operation shall extract 2836 KL of ground water every day which will increase the pressure on ground water resource.
- **Additional load on air quality:** The operation of DG sets shall add to the ambient air, insignificant load of PM_{10}, NO_2 and CO. However, the incremental load from DG set is quite less. Significant contribution of air pollution is expected from vehicular traffic with maximum contribution from CO.

4.4 ASSESSMENT OF SIGNIFICANT IMPACTS

An impact level is rated as "low", "medium" or "high". The impact rating is based on two parameters, i.e. "severity of environmental impacts" and "likelihood of occurrence of the environmental impacts". This is identified as per criteria given in **Table 4.16**.

Table 4-16: Impact Assessment Rating Matrix

Impact		Criteria
Nature of Impact	Beneficial	Positive
	Adverse	Negative
Duration of Impact	Short term	Impacts shall be confined to a stipulated time
	Long term	Impacts shall continue till the end of project life
Impacted Area	Localised	Impacts shall be confined within 10 km radius
	Regional	Impacts shall continue beyond 10 km radius

The significance of each environmental impact is determined by assessing the impact's severity against the likelihood of the environmental impact occurring, as summarized in the environmental impact significance assessment matrix provided in **Table 4.17**.

Table 4-17: Impact Identification Rating Matrix

Impact Severity	Impact Likelihood			
	Unlikely (e.g. not expected to occur during project lifetime)	Low Likelihood (e.g. may occur once or twice during project lifetime)	Medium Likelihood (e.g. may occur every few years)	High Likelihood (e.g. routine, happens several times a year)
Slight	Negligible Impact	Negligible Impact	Negligible Impact	Negligible Impact
Low	Negligible Impact	Negligible Impact	Negligible to Minor Impact	Minor Impact
Medium	Negligible Impact	Minor Impact	Minor–Moderate Impact	Moderate Impact
High	Minor Impact	Moderate Impact	Major Impact	Major Impact

Notes: Negligible Impact: Defined as magnitude of change comparable to natural variation
Minor Impact: Defined as detectable but not significant
Moderate Impact: Defined as insignificant; amenable to mitigation; should be mitigated where practicable
Major Impact: Defined as significant; amenable to mitigation; must be mitigated

Considering this, the impacts have been rated and given as follows:

4.4.1 Land-use

Environmental Impact Rating	Criteria	Reason
Nature of Impact	Adverse	• Project site consists of agricultural land, water bodies and consists of trees as well • Land is already under possession of Proponent.
Duration of Impact	Long term	
Impacted Area	Localized	
Likelihood of Occurrence	High	
Severity of Impact	Low	
Significance of Impact	Minor	

4.4.2 Soil Quality

Environmental Impact Rating	Criteria	Reason
Nature of Impact	Adverse	• Cutting and filling of soil is involved • Top soil shall be excavated which will be re-used within the site. • Solid waste generated shall be segregated and disposed as per prescribed guidelines.
Duration of Impact	Short term	
Impacted Area	Localized	
Likelihood of Occurrence	High	
Severity of Impact	Low	
Significance of Impact	Minor	

4.4.3 Water Quality

Environmental Impact Rating	Criteria	Reason
Nature of Impact	Adverse	• The project involves extraction of ground water. • Zero discharge of wastewater is ensured. • Rainwater harvesting for ground water recharge shall be carried out.
Duration of Impact	Long term	
Impacted Area	Localized	
Likelihood of Occurrence	High	
Severity of Impact	Medium	
Significance of Impact	**Moderate**	

4.4.4 Air Quality

Environmental Impact Rating	Criteria	Reason
Nature of Impact	Adverse	• Bulk of civil work shall continue till few months after which the fugitive dust generation shall minimize. • The maximum GLC of pollutants released due to DG set operation is very insignificant to cause any major impact. • The vehicular emissions, however, are significant, once the project starts operation with maximum contribution coming from CO.
Duration of Impact	Long term	
Impacted Area	Localized	
Likelihood of Occurrence	High	
Severity of Impact	Medium	
Significance of Impact	**Moderate**	

4.4.5 Noise Level

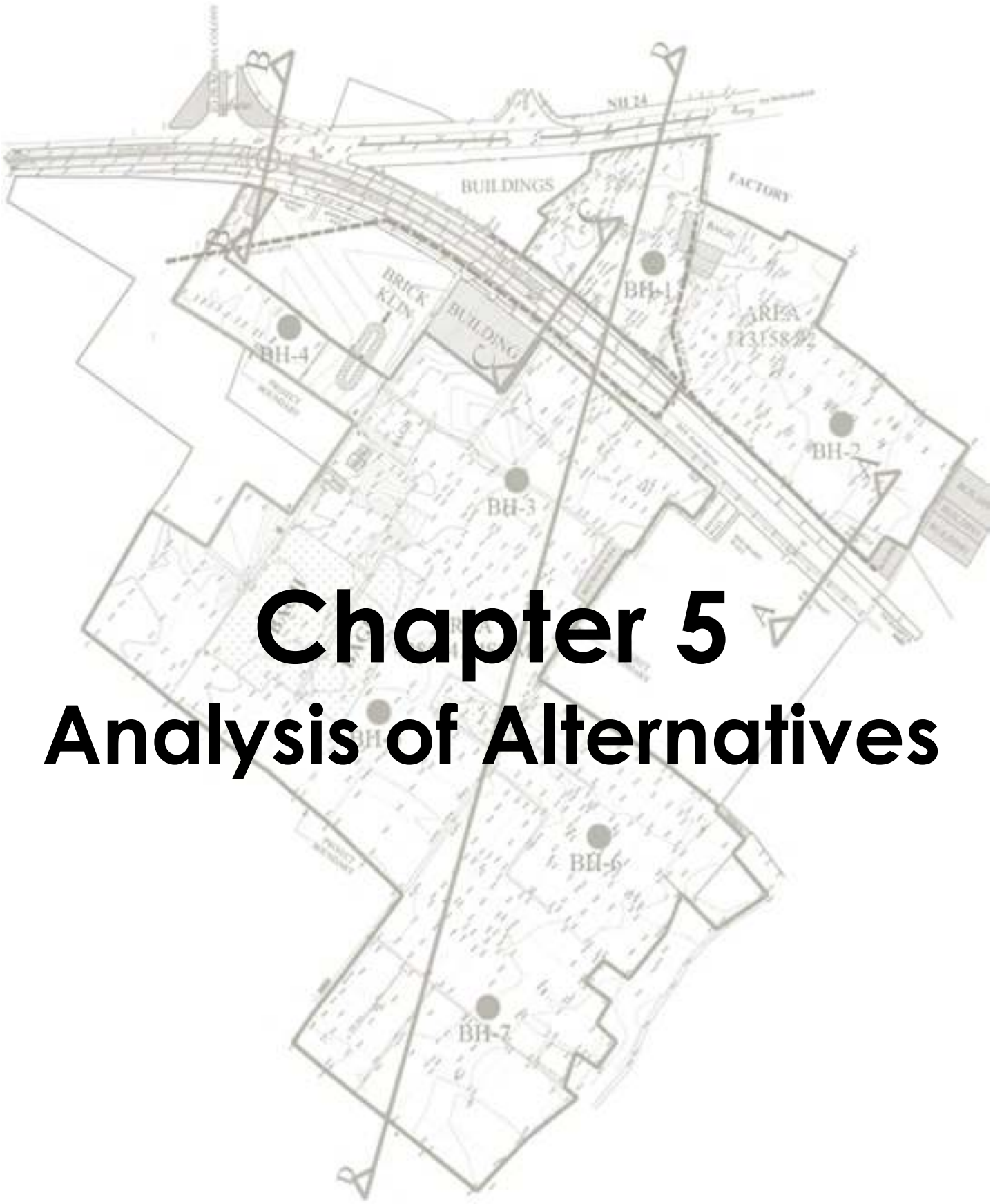
Environmental Impact Rating	Criteria	Reason
Nature of Impact	Adverse	• The noise generating sources are intermittent and shall generate sound for short duration. • The major noise generating source is vehicles, most of which shall be owned by the residents and hence not expected to cause unnecessary noise. • Plantation to be developed for further attenuation of noise.
Duration of Impact	Short term	
Impacted Area	Localized	
Likelihood of Occurrence	Low	
Severity of Impact	Slight	
Significance of Impact	**Negligible**	

4.4.6 Ecology

Environmental Impact Rating	Criteria	Reason
Nature of Impact	Adverse	• Trees are present in site which shall be removed. • Dust emission from site may impact the surrounding trees by affecting their photosynthetic ability due to dust deposition. • Site does not have any forest land. • Extensive greenbelt development shall be done.
Duration of Impact	Long term	
Impacted Area	Local	
Likelihood of Occurrence	High	
Severity of Impact	Medium	
Significance of Impact	**Moderate**	

4.4.7 Socio-economy

Environmental Impact Rating	Criteria	Reason
Nature of Impact	Beneficial	• Employment shall be generated both directly and indirectly as a result of the project. • The proponent will spend an estimated amount of INR 5.54 Crores on CER
Duration of Impact	Long term	
Impacted Area	Localised	
Likelihood of Occurrence	High	
Severity of Impact	High	
Significance of Impact	**Major**	



Chapter 5
Analysis of Alternatives

5. ANALYSIS OF ALTERNATIVES

The consideration of alternatives of the proposed township is one of the more proactive sides of environmental assessment – enhancing the project design through examining options instead of only focusing on the more defensive task of reducing adverse impacts of a single design. This calls for the systematic comparison of feasible alternatives for the proposed site, technology and operational alternatives.

5.1 DESCRIPTION OF ALTERNATIVE PROJECT SITE

The project is an Integrated Township Project located at at Village Mangupura & Mehalakpur Mafi Near NH-24, Bypass More, Moradabad, U.P. The project site is earmarked for residential development and is under the Master Plan of Moradabad Development Authority, 2021.Therefore the proposed project is confirming with the land use master plan. The project site seems to be suitable from the following point of view:

- The site does not have any places of religious, archaeological or historical importance.
- The development of the project in this site shall involve no relocation and rehabilitation issues.
- There are no national parks/wildlife sanctuaries within 10 km radius of the project site. The site is at a good distance from sanctuaries and bio-diversity parks
- No ecologically sensitive receptors in the site.
- No hills or high grounds are present near the site
- The site is not a forest land or is not occupied by any water body.
- Easy access due to presence of major roads nearby.

5.1.1 Alternative Building Materials

The alternative building materials suggested to individual plot owners for construction in the proposed project can help to identify sources which can lead to energy conservation to a great extent as well as use of recyclable materials thereby taking a step forward towards sustainability. The building materials which are proposed to be used during the construction on individual plots are:

- Brick and block products with waste and recycled contents such as fly ash (waste from coal burning plants).
- Fly ash based lightweight aerated concrete blocks for walls.
- Perforated bricks for wall structures.
- Aluminum from verified recycled content.
- Saw dust-based doors and window frames.
- Natural fiber- reinforced polymer composite door panels.

- Alternatives for finishes include fly ash, ceramic tiles, and terrazzo floors.

5.1.2 Transportation

If locally available materials will not use and materials from longer distances will be transported this will increase the transportation cost as well as the energy consumption. Use of locally available materials is most suitable to local climate and incurs less transportation cost.

For the present project only IS approved building materials will be used for the construction. Construction material will be selected based on their thermal characteristic U and R values. The effort will be made to procure the construction materials locally.

5.1.3 Use of Recycled Materials

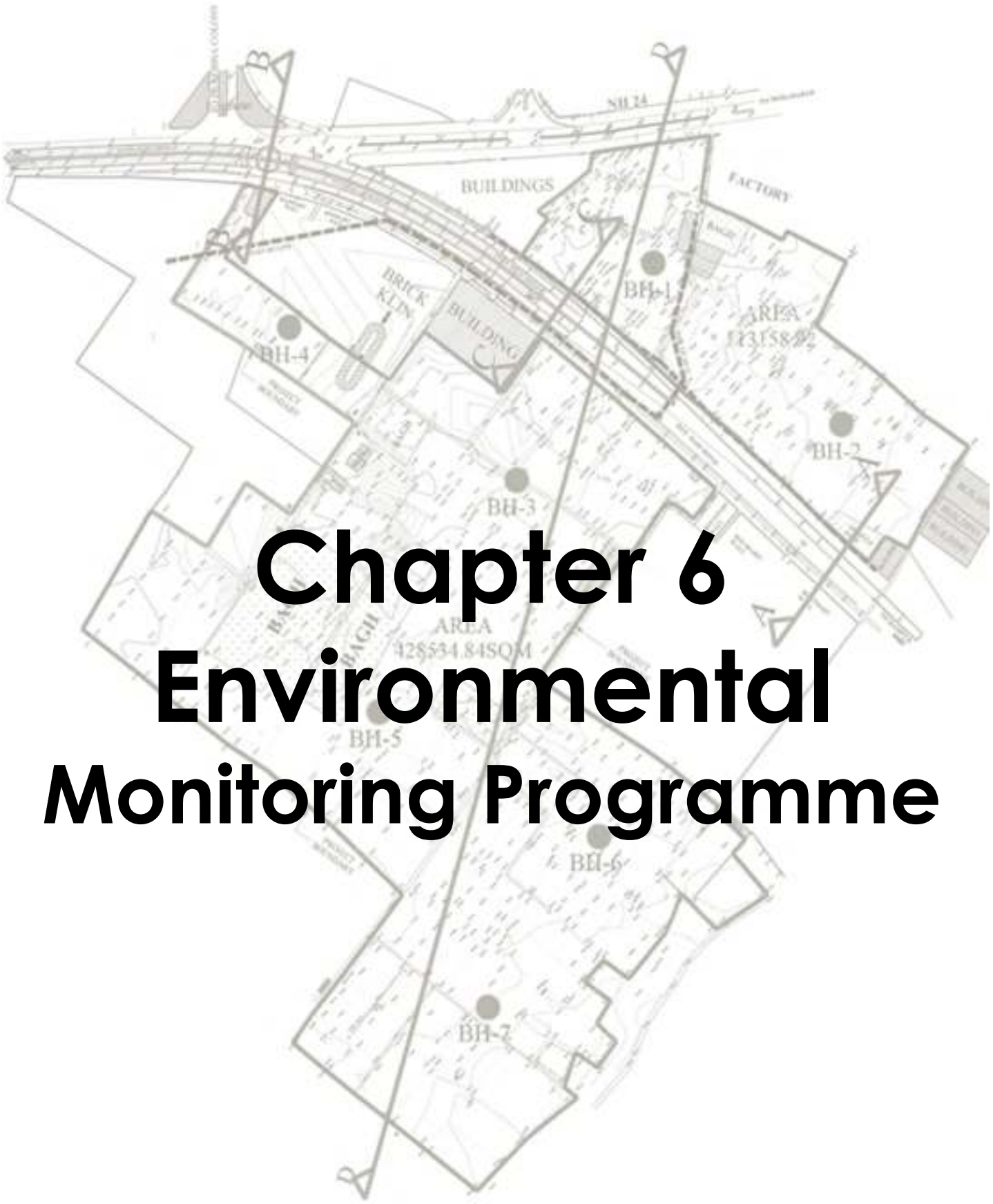
Recycled materials will be used in roads as well as for pavers if locally available. Also materials with low embodied energy will be used in construction which will significantly result in energy savings. The total savings in terms of roads and paving may be upto 10% to 20%. The efforts will also be made for the larger use of Fly ash bricks in road and use of fly-ash based cement in the project.

5.1.4 Roads & Open Spaces

Use of grass pavers on the road, parking and pedestrian areas is a solution to reduce the heat island effect. Recycled materials will be used in roads as well as for pavers if locally available.

5.1.5 Selection of Sewage Treatment Plant

Many technological alternatives for wastewater treatment are available, ranging from advanced technologies to conventional treatment options. It is difficult to select the most appropriate technology from among a set of available alternatives to treat wastewater at a particular location. Many factors, such as capital costs, operation and maintenance costs and land requirement, are involved in the decision-making process. A comparative analysis of various available technologies has been made which is presented in **Annex 5.1**.



Chapter 6 Environmental Monitoring Programme

6. ENVIRONMENT MONITORING PROGRAMME

6.1 MONITORING METHODOLOGY

The purpose of the monitoring programme is to ensure that the intended environmental measures are achieved. To ensure proper implementation of the Environment Management Plan (EMP), it is essential that an effective monitoring programme is designed and carried out. The broad objectives of the environment monitoring program are:

- To monitor impacts on the surrounding environment and the effectiveness of mitigation measures during the construction and operation
- To ensure that the environmental control systems are operating satisfactorily
- To suggest ongoing improvements in management plan, if required, for subsequent effective monitoring.

6.2 MONITORING SCHEDULE

During the course of construction of the project, regular monitoring of all environment parameters is required. The details of monitoring plan proposed during construction stage of the project are given in **Table 6.1** and **6.2**.

Table 6-1: Environment Monitoring Plan during Construction Phase

Aspect	Parameter	Location	Monitoring & Frequency	Responsible Person / Organisation
Ambient Air Quality	PM_{10}, $PM_{2.5}$, SO_2, NO_2, CO	One location at major construction site and one in nearest settlement	Once in two weeks	External MoEF&CC / NABL Accredited laboratory services
Surface Water Quality	Physical, chemical and biological parameters including heavy metals	Two locations in study area likely to receive surface run-off from the site (particularly first run-off after rains)	Once in three months	External MoEF&CC / NABL Accredited laboratory services
Ground Water Quality	Physical, chemical and biological parameters including heavy metals	Two locations	Once in three months	External MoEF&CC / NABL Accredited laboratory services
Noise Level	Sound level	One location at major construction site and one in nearest habitation	Once in two weeks	External MoEF&CC / NABL Accredited laboratory services
Soil	Physical and chemical parameters with organic content	One location near waste storage area	Once in three months	External MoEF&CC / NABL Accredited laboratory services
Ecology	Visual damage assessment on flora and fauna	10 km radius from the project site	Once in a year	Horticulture Specialist/Remote sensing organisation

The following post-project environmental monitoring program is proposed for the project. Six monthly compliance reports will be prepared & submitted to the concerned authorities as per the conditions stipulated in EC letter.

Table 6-2: Environment Monitoring Plan for Operation Phase

Aspect	Parameter	Location	Monitoring & Frequency	Responsible Person / Organisation
Meteorology	Wind speed & direction, temperature, rainfall and Humidity	At project site	Continuous hourly monitoring	Existing set-up will be operated by laboratory services
Ambient Air Quality	PM_{10}, $PM_{2.5}$, SO_2, NO_2, CO	Four stations in and around project site	Once in two weeks	External MoEF&CC / NABL Accredited laboratory services
	Particulate Matter and gaseous pollutants	Stack monitoring for all DG sets through sampling port*	Once in six months	
Surface Water Quality	Physical, chemical and biological parameters including heavy metals	3 locations near to project site	Once in three months	External MoEF&CC / NABL Accredited laboratory services
Ground Water Quality	Physical, chemical and biological parameters including heavy metals	2 locations	Once in three months	External MoEF&CC / NABL Accredited laboratory services
Liquid Effluents	Physical, chemical and biological parameters	Inlet and outlet locations	Once in a month	External MoEF&CC / NABL Accredited laboratory services
Noise Level	Noise as per CPCB guidelines	Five stations at likely affected point and at site	Once in a month	External MoEF&CC / NABL Accredited laboratory services
Soil	Physical and chemical parameters with organic content	One location near waste storage area	Once in three months	External MoEF&CC / NABL Accredited laboratory services
Ecology	Visual Impact on flora and fauna	10 km radius from the project site	Once in a year	Horticulture Specialist/Remote sensing organisation

** A sample port means a small opening perpendicular to the stack to provide access to the gas stream to be sampled. The procured DG set shall have inbuilt sampling port and sampling platform. To ensure laminar flow the sampling ports shall be located at least 8 times chimney diameter downstream and 2 times upstream from any flow disturbance. Minimum two (mutually orthogonal) sampling ports are required in a circular chimney so that full stack cross-sectional area can be covered for measurements, so long as the diameter of the stack is less than 2 meters.*

6.3 REPORTING SYSTEM

Record keeping and reporting of performance is an important management tool for ensuring sustainable operation of the project. The monitoring shall be carried out through MoEF&CC/ NABL approved laboratory. All records shall be maintained for regulatory, monitoring and operational issues. Typical record keeping requirements for the proposed project is summarized in **Table 6.3**.

Table 6-3: Record Keeping Requirements

Parameter	Particulars	Responsibility
Solid Waste Handling & Disposal	• Daily quantity of waste collected. • Daily quantity biodegradable waste collected and treated. • Daily quantity sent for disposal through agency.	The Proponent will take care & arrange to maintain all the records as per the time schedule.
Sewage Treatment	• Daily quantity of raw and treated sewage. • Quantity of usage of treated waste water. • Treated waste water quality at inlet and outlet points	
Regulatory Licenses (Environmental)	• Consents from State Pollution Control Board.	
Monitoring & Survey	• Records of all monitoring carried out as per the finalized monitoring protocol.	
Other	• Log book of maintenance and compliance. • Equipment inspection and calibration records, wherever applicable.	

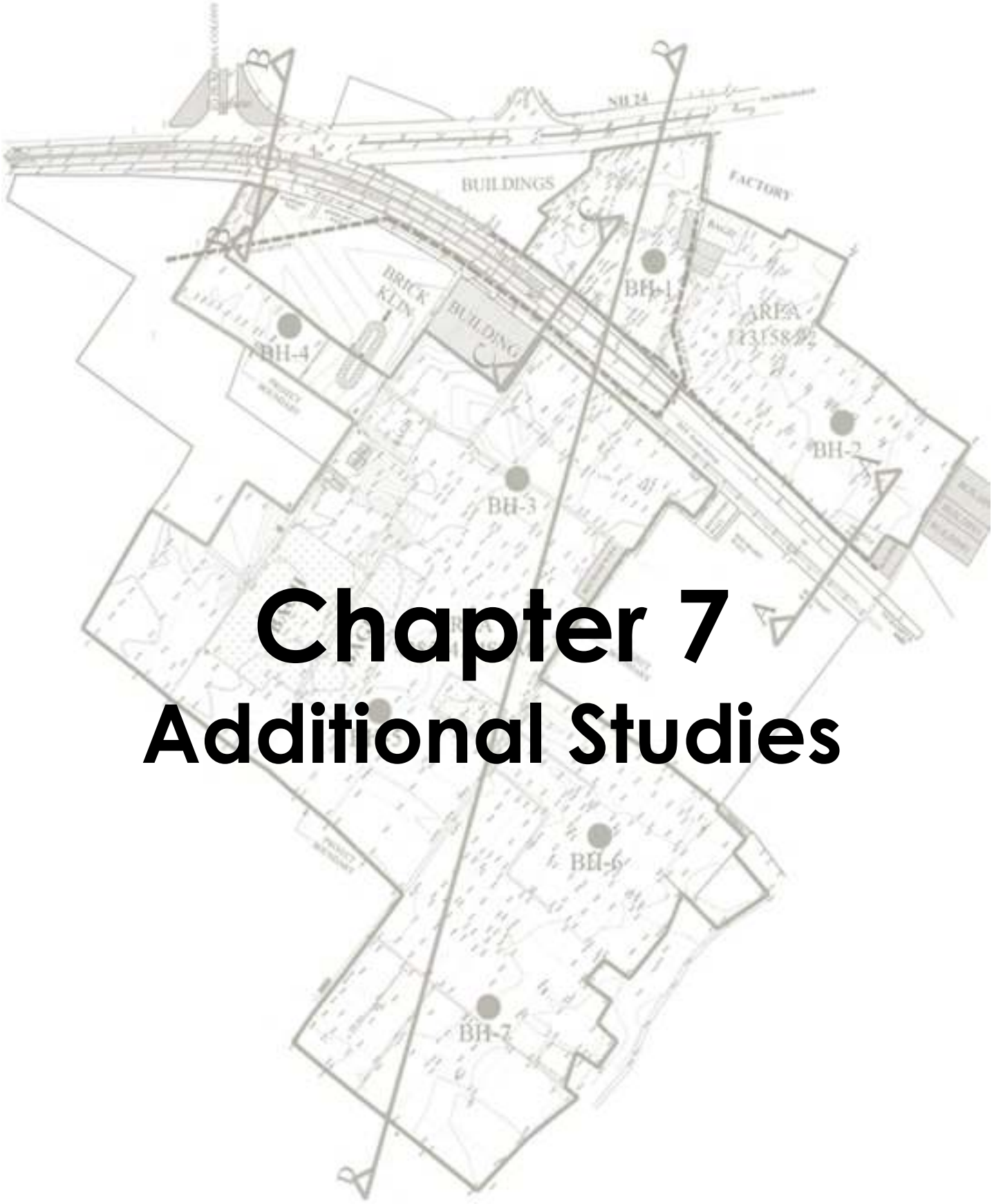
6.4 ENVIRONMENT MONITORING COST

The budget for environmental monitoring for construction and operation phases of the proposed project has been estimated and presented in **Table 6.4**.

Table 6-4: Cost for Environmental Monitoring

Component	Stage	Locations	Frequency	Total no. of samples annually	Cost per Sample (Rs)	Recurring cost (Rs)	Capital Cost (Rs)
Air	Construction	2	Once in two weeks	48	5000	2,40,000	-
	Operation	Onsite weather station with data logger	Continuous	1	150000	0	1,50,000
		2 DG set stacks	Once in 6 months	4	2000	8,000	-
		4	Once in two weeks	96	5000	4,80,000	-
Water	Construction	2 surface water samples	Twice in 6 months	8	6000	48,000	-
		2 ground water samples	Twice in 6 months	8	5500	44,000	-
	Operation	2 surface water samples	Twice in 6 months	8	6000	48,000	-
		2 ground water	Twice in 6 months	8	5500	44,000	-
		Inlet and outlet of STP	Twice a month	24	4000	96,000	-
Noise	Construction	2	Once a month	24	2000	48,000	-

Component	Stage	Locations	Frequency	Total no. of samples annually	Cost per Sample (Rs)	Recurring cost (Rs)	Capital Cost (Rs)
	Operation	4	Once in two weeks	96	2000	1,92,000	-
Soil	Construction	1	Twice in 6 months	4	6000	24,000	-
	Operation	1	Twice in 6 months	4	6000	24,000	-
Ecological survey	Construction	Study Area	Once a year	-	-	1,00,000	-
	Operation	Study Area	Once a year	-		1,00,000	-



Chapter 7
Additional Studies

7. ADDITIONAL STUDIES

7.1 PUBLIC CONSULTATION

Township & area development projects are exempted from public hearing.

7.2 RISK ASSESSMENT

The construction project involves lot of activities like installation of various types of structures and machineries. These activities include lifting and transportation of building materials at different levels, digging pits, operation of concrete mixer, working near electrical circuit, which is required during construction of such housing project. Hence such work puts workers at risk of burial, engulfment or falling from a height, risk of electrocution where the risk is particularly aggravated by the nature of the work or processes used or by the environment at the place of work or site.

On completion of project, the infrastructure created includes provision of lifts, DG set as power backup, laying of internal as well as external electrical cables, provision of pipeline for LPG uses (specially in kitchens), construction of internal roads etc., which may also pose risk of accident to the occupants .

However, it is not always possible to totally eliminate such eventualities and random failures of equipment due to human errors or natural calamities like earthquake.

It is thus necessary to carry out hazard identification and risk assessment for risk monitoring and to formulate its Control Measures like Risk response planning i.e. Disaster Management Plan/Onsite Emergency Plan for the project.

An essential part of major hazard control is therefore, to be concerned with mitigating the effects of such emergency situation and restoration of normalcy at the earliest by following Disaster Management Plan (DMP) for different type of Emergencies like Earthquake, LPG leakage, Fire in the building.

7.2.1 Safety Code for building & Firefighting System

The Firefighting network followed by Emergency Response mock drills are essential part of Risk Control Measures.

The project site falls under residential occupancies according to National Building Code 2016. Following provisions are required to be made according to National Building Code 2016. The firefighting system has been designed considering the following codes, manual and guidelines;

- National Building Code of India (NBC);
- Latest relevant NFPA codes, USA, in particular NFPA – 13, 14, 20 & 22;
- IRI guidelines;
- As per requirement of fire officer/local fire approving authorities; and
- As per Indian Standard Code for Fire Protection (IS Codes)

Following items are envisaged for firefighting:

- Fire-Water Connections;
- Firewater inlet and outlet connections shall be provided to the water storage tanks;

- External main fire ring, having 150 mm diameter and hydrants @ 45 m^3/s spacing shall be provided. This external fire ring shall be separated from the Sprinkler Main Systems;
- All flow switches, test valves, drain pipes etc. shall be provided as per NFPA guidelines on the sprinkler system;
- All pump installation and arrangements shall be in accordance with IRI guidelines and NFPA-20;
- All pumps and accessories and electrical controllers shall be as per UL/FM lists, tested, approved and certified; and
- By-pass arrangements shall be provided (150 mm diameter nominal bore) with NRV and gate valve and bulk flow meter on the discharge header of each pump to check the duties of pumps.
- Storage tanks are provided in the basement for the supply of water for the firefighting facility.
- The fire extinguishers provided should be in conformance with Ozone Depleting Substances (Regulation and Control) Rules 2000.

7.2.2 Disaster Management Plan

The overall objective of DMP is to make use of the combined resources at the site and outside services to achieve the following:

- To localize the emergency and if possible eliminate it;
- To minimize the effects of the accident on people and property;
- Effect the rescue and medical treatment of casualties;
- Safeguard other people;
- Evacuate people to safe areas;
- Informing and collaborating with statutory authorities;
- Initially contain and ultimately bring the incident under control;
- Preserve relevant records and equipment for the subsequent enquiry into the cause and circumstances of the emergency;
- Investigating and taking steps to prevent reoccurrence

The DMP is, therefore, related to identification of sources from which hazards can arise (based on Hazard Identification) and to minimize credible loss scenario that can take place in the concerned area. The DMP takes into account the maximum credible loss scenario and actions that can successfully mitigate the effects of losses.

Hence emergency plan need to be well framed, so that with less effort and resources, emergencies may be controlled and terminated, in minimum time, to reduce damages to life and properties. The Disaster Management Plan is designed to

- Anticipate the types of disasters that are most likely to occur.

- Identify the possible effects of any disaster that may occur.
- Identify the preventative and mitigating strategies to deal with any possible disaster.
- Involve all role players in a coordinated manner to respond to the challenges posed in disaster situations.
- Procure essential goods and services for disaster management.
- Identify the weaknesses in respect of capacity and skills to deal effectively with disastrous situations.
- Provide essential training and skills to handle such disaster and to promote awareness and preparedness in respect of the occurrence of disasters.
- Plan in advance the relief and rescue operations that may be required or to be exercised in disaster situations.

The hazard identified for the project include hazards pertaining to fires in buildings and fire in diesel storage areas, earthquake and LPG leakage and DMP pertaining to these as described in the following section.

7.2.3 Response in case of Earthquake

Response Procedures for Occupants

7.2.3.1 If indoors

- Take cover under a piece of heavy furniture or against an inside wall and hold on.
- **Stay inside:** The most dangerous thing to do during the shaking of an earthquake is to try to leave the building because objects can fall on you.

7.2.3.2 If outdoors

- Move into the open, away from buildings, streetlights, and utility wires. Once in the open, stay there until the shaking stops.

7.2.3.3 If in a moving vehicle

- Stop quickly and stay in the vehicle. Move to a clear area away from buildings, trees, overpasses, or utility wires. Once the shaking has stopped, proceed with caution. Avoid bridges or ramps that might have been damaged by the quake.

7.2.3.4 After the quake

- After the quake be prepared for aftershocks
- Although smaller than the main shock, aftershocks cause additional damage and may bring weakened structures down. Aftershocks can occur in the first hours, days, weeks, or even months after the quake.

7.2.3.5 Help injured or trapped persons

- Give first aid where appropriate. Do not move seriously injured persons unless they are in immediate danger of further injury. Call for help.
- Remember to help those who may require special assistance--infants, the elderly, and people with disabilities.

- Stay out of damaged buildings.
- Use the telephone only for emergency calls.

Response Procedure for Emergency Team

- Formulate an Emergency Response Team for earthquake response
- Using the public address system, inform residents of response procedures discussed above.
- Inform the necessary authorities for aid.
- Ensure that no person is stuck beneath any debris, in case of a structural failure.
- Ensure that all occupants standing outside near the buildings are taken to open areas.
- Ensure that the first aid ambulance and fire tender vehicles are summoned if necessary.
- Inform the nearby hospitals if there are any injuries.
- Check the utilities and storage tanks for any damage.

7.2.4 Response for LPG Leakage

- The affected area should be evacuated and cordoned off immediately
- Initiate an Emergency Response Team for LPG leakage
- Shut down the main valves in the gas bank
- Ensure that only concerned personnel are present in the affected area and all other personnel and visitors are moved to the nearest assembly points
- Rescue trapped personnel, also check if any personnel are unconscious in the area and immediately move them outside and provide first aid.
- Ambulance should be summoned to take injured personnel to the nearest hospital
- Personnel in the nearby buildings to close all doors and windows to prevent entry of the leaked gas
- Source of leakage to be traced and isolated from all the other areas. If required use pedestal fans to bring down the gas concentration
- In case of fire follow the instructions

7.2.5 Response in case of Fire

- Required response during in the event of a fire shall be described in signs located in the lobby.
- On sighting a fire, it shall be immediately informed to the environment manager giving the exact location and type of fire in detail.
- Initiate the Emergency Response Team for fires
- If the fire is small, engage in extinguishing the fire using the nearest fire extinguisher.
- Guide the Emergency Response Team staff to the emergency assembly point.

- The Emergency Response Team shall immediately inform the nearest dispensary and security force. If required a fire tender shall be summoned.
- The response team shall immediately move to the point of fire and take all necessary steps to stop the fire. If the fire is not controllable and spreads then the manager in charge shall inform the district authorities and call for external help.
- The Emergency Response Team will provide immediate relief to the injured residents at the scene of incident. Any injured persons shall be evacuated on priority to the dispensary or one of the nearest hospitals based on their condition.

7.2.6 Instructions for occupants

- Get out of buildings as quickly and as safely as possible.
- Use the stairs to escape. When evacuating, stay low to the ground.
- If possible, cover mouth with a cloth to avoid inhaling smoke and gases.
- Close doors in each room after escaping to delay the spread of the fire.
- If in a room with a closed door.
- If smoke is pouring in around the bottom of the door or if it feels hot, keep the door closed.
- Open a window to escape or for fresh air while awaiting rescue.
- If there is no smoke at the bottom or top and the door is not hot, then open the door slowly.
- If there is too much smoke or fire in the hall, slam the door shut.
- Stay out of damaged buildings.
- Check that all wiring and utilities are safe.

7.2.7 Fire Fighting System

A state of the art firefighting system is proposed for the project to prevent and control fire outbreaks. The firefighting system will consist of portable fire extinguishers, hose reel, wet riser, yard hydrant, automatic sprinkler system, and manual fire alarm system. The proposed buildings will also be provided with automatic fire detection and alarm system.

- Pumps shall be protected with Sprinkler as per NFPA 20 (refer to NFPA 13 for design)
- DG sets need to be protected with mist as per the applicable regulation (refer to NFPA 750 for design)

A state of the art firefighting system is proposed for the project to prevent and control fire outbreaks. The firefighting system will consist of portable fire extinguishers, hose reel, wet riser, yard hydrant, automatic sprinkler system, and manual fire alarm system. The proposed buildings will also be provided with automatic fire detection and alarm system.

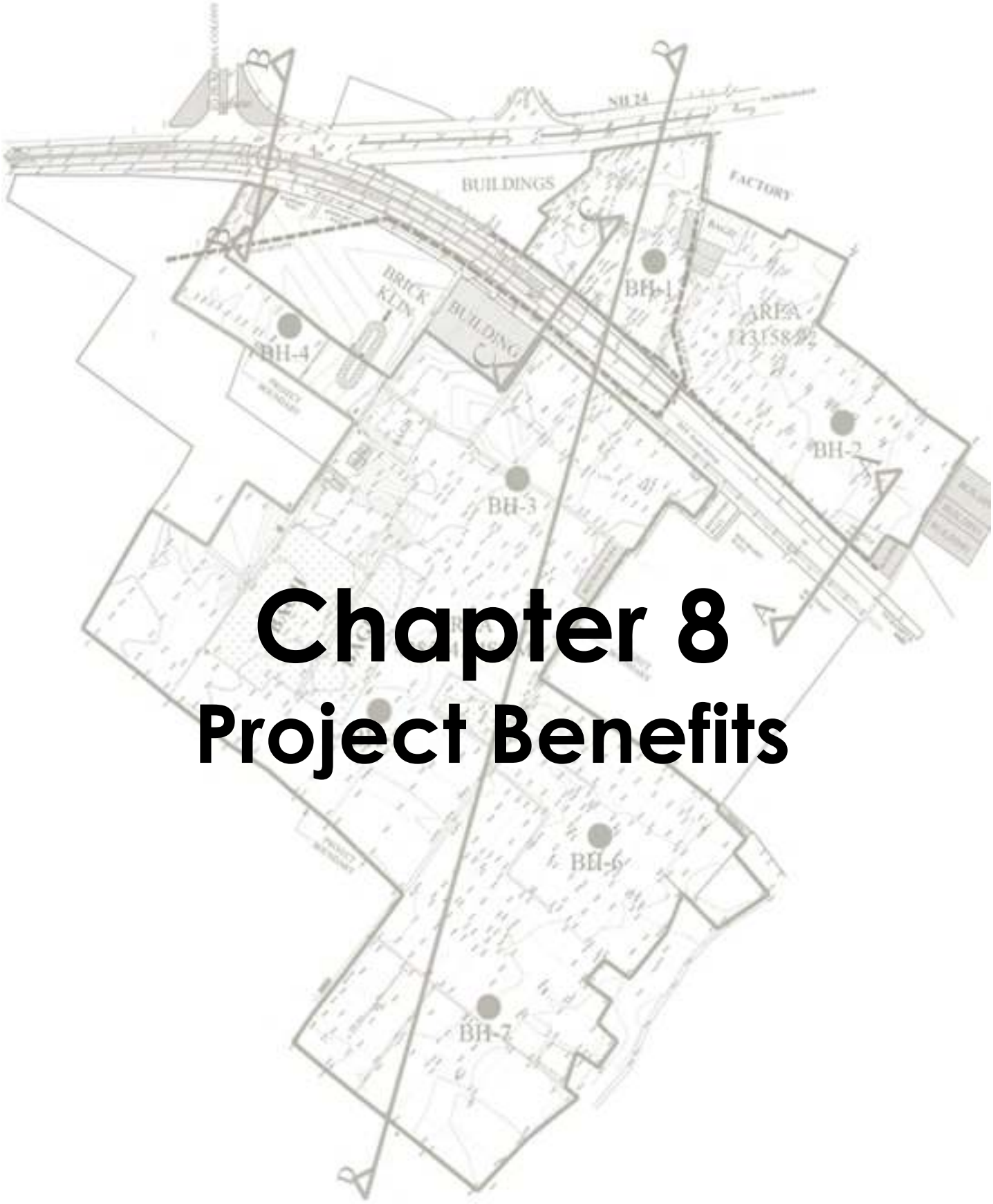
The fire and safety consideration will be as per the applicable National Building Code 2016. Important component are mentioned below.

- Provision of water sprinklers
- Provision of hose reels, external hydrants and wet risers
- Provision of firefighting underground water storage tank,
- Provision of overhead water storage tank on each buildings
- There is a provision of firefighting pumps.
- Adequate Fire Extinguishers shall be available for emergency situations
- HT and LT panels will be protected with manually operated CO2 protection system.
- Automatic sprinklers will be installed in the entire building
- Portable fire extinguishers shall be provided at strategic locations
- Automatic fire detection system i.e. smoke/ heat detection system shall be provided in the buildings at appropriate places. The system will be connected to the fire alarm system

HSD and other petroleum products at site shall be stored at earmarked area having impervious floor and adequate firefighting arrangements. Hazardous wastes as waste oil shall be collected and stored and periodically sold off to MoEF&CC/ SPCB authorized recyclers. Buy back arrangement shall be made with the authorized dealer of Lead acid storage batteries used in the DG Sets.

7.3 SOCIAL IMPACT ASSESSMENT AND R&R ACTION PLANS

This has not been suggested during the scoping stage as the proposed project does not involve acquirement of land and displacement of people.



Chapter 8
Project Benefits

8. PROJECT BENEFITS

The project will improve the standard of living of the native population by providing employment opportunities and improved infrastructure-better roads, education facilities, medical and communication facilities.

The project will also attract the high-income groups to invest in the region and thus bring about economic growth of the region.

8.1 PHYSICAL INFRASTRUCTURE

The project plans to provide all kinds of facilities within the township so as to make it self- sustained. Apart from the residential buildings, it will involve construction of commercial, recreational, industrial, educational and transport infrastructures.

The operation of the project will provide value addition to the existing infrastructure facility such as public transport, water supply, telecommunications, etc. The project will improve the aesthetic look of the area. Also a big investment like this helps in overall development of any area.

8.2 SOCIAL INFRASTRUCTURE

Social and community infrastructure and services will be provided in response to the need of the local communities. The propose project will enhance the quality of life, equity, and social well-being through community support and awareness. The basic infrastructures like school, colleges, medical centre, etc. located in the project vicinity will further be strengthened under the project CSR scheme.

8.3 EMPLOYMENT POTENTIAL

The proposed project shall require about 200 staff during construction stage. The local people shall be given employment in the project, thus bringing about economic benefits to the economically backward local population. With the growth of a project, as is the fact, endeavors are made by the local residents in the form of small shops and other services that provide means of livelihood to them.

8.4 OTHER TANGIBLE BENEFIT

The establishment shall contribute to the business development of the region and the green areas and club shall provide recreational facilities. All these are as per the master plan of the city. Development of the project will lead to development of improved educational, medical, power, communication, water supply and sanitation facilities from which the local residents also benefit. Thus, the project is expected to have a positive impact on the socio-economic growth of the region.

8.5 CORPORATE ENVIRONMENT RESPONSIBILITY

As per MoEF&CC's OM dated 1st May, 2018, 1.5% of the project cost is to be spent on CER (Corporate Environment Responsibility) activities for green-field projects having project cost >100 crores and ≤ 500 crores.

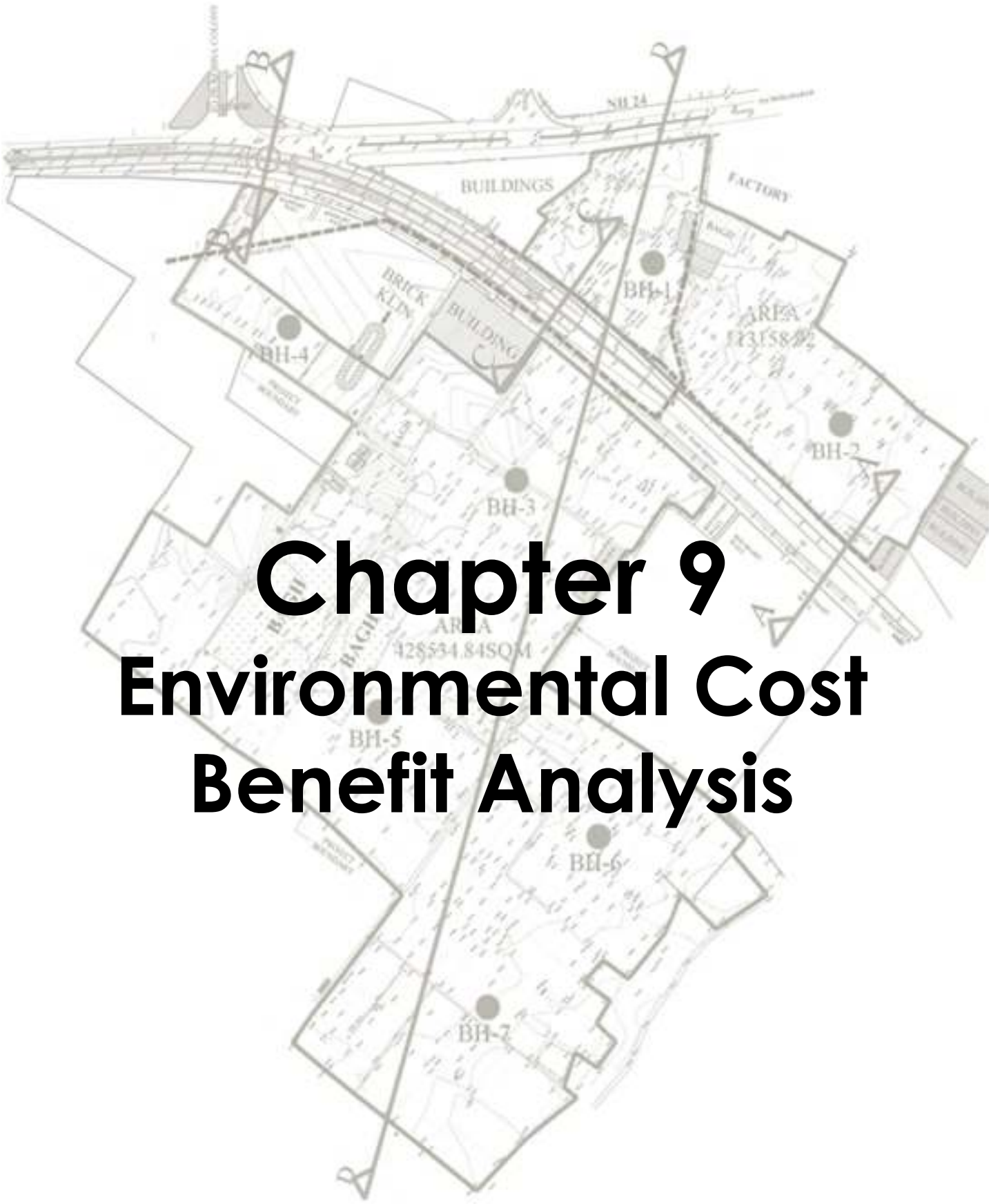
As such for the proposed project, an amount of Rs. 5.54 Crores has to be earmarked for spending under CER activities.

The primary beneficiaries of CER shall be people living within the radius of 10 km of the proposed project. The company has allocated a budget for carrying out socio-economic welfare activities as mentioned above. The amount earmarked in the budget will be separately kept and will not be used for any other purposes. The budget may be increased as per the actual requirement during the implementation stage. The proposed budget for CER activities is given in **Table 8.1**.

Table 8-1: Budget Allocation for CER Activities

Project Cost in INR Crore							**Rs. 369 Crores**
Corporate Environment Responsibility in INR Crore @ 1.5% of the project cost							**Rs. 5.54 Crores**
Sl. No.	**Activity**	**Year wise implementation and Budgetary provision during operation phase**					**Total budgetary provision (Rs.)**
		1st year	**2nd year**	**3rd year**	**4th year**	**5th year**	
Agriculture Related facilities							
1	Creation of irrigation facilities for the farmers.	2,00,000	2,00,000	2,00,000	2,00,000	2,00,000	10,00,000
2	Assistance in development of technical skills and training to the children of farmers	3,00,000	3,00,000	3,00,000	3,00,000	3,00,000	3,00,000
Miscellaneous Facilities in Villages							
3	Provision of solar lanterns in villages	10,00,000	10,00,000	10,00,000	10,00,000	10,00,000	50,00,000
4	Distribution of saplings among villagers to be planted in the open and degraded areas	5,00,000	5,00,000	5,00,000	5,00,000	5,00,000	25,00,000
5	Supply of drinking water to neighboring villages	5,00,000	5,00,000	5,00,000	5,00,000	5,00,000	25,00,000
Health Related facilities							
6	Free of cost distribution of medicine / body check-up tests in the area	2,00,000	2,00,000	2,00,000	2,00,000	2,00,000	10,00,000
7	Training to the farmers related to healthcare	2,00,000	2,00,000	2,00,000	2,00,000	2,00,000	10,00,000
8	Construction of sanitation facilities (toilet) in schools and villages (5 toilets each year)	5,00,000	5,00,000	5,00,000	5,00,000	5,00,000	25,00,000
9	Periodic medical check-up camp by appointing specialist doctor for eyes, skin, heart and dental twice in a year	7,00,000	7,00,000	7,00,000	7,00,000	7,00,000	35,00,000
10	Revamping of existing health infrastructure and providing support	15,00,000	15,00,000	15,00,000	15,00,000	15,00,000	75,00,000
Education Related Facilities							
11	Assistance in providing study materials, uniform, books to the poor students located nearby area	7,00,000	7,00,000	7,00,000	7,00,000	7,00,000	35,00,000
12	Scholarship to the deserving students for higher education	10,00,000	10,00,000	10,00,000	10,00,000	10,00,000	50,00,000

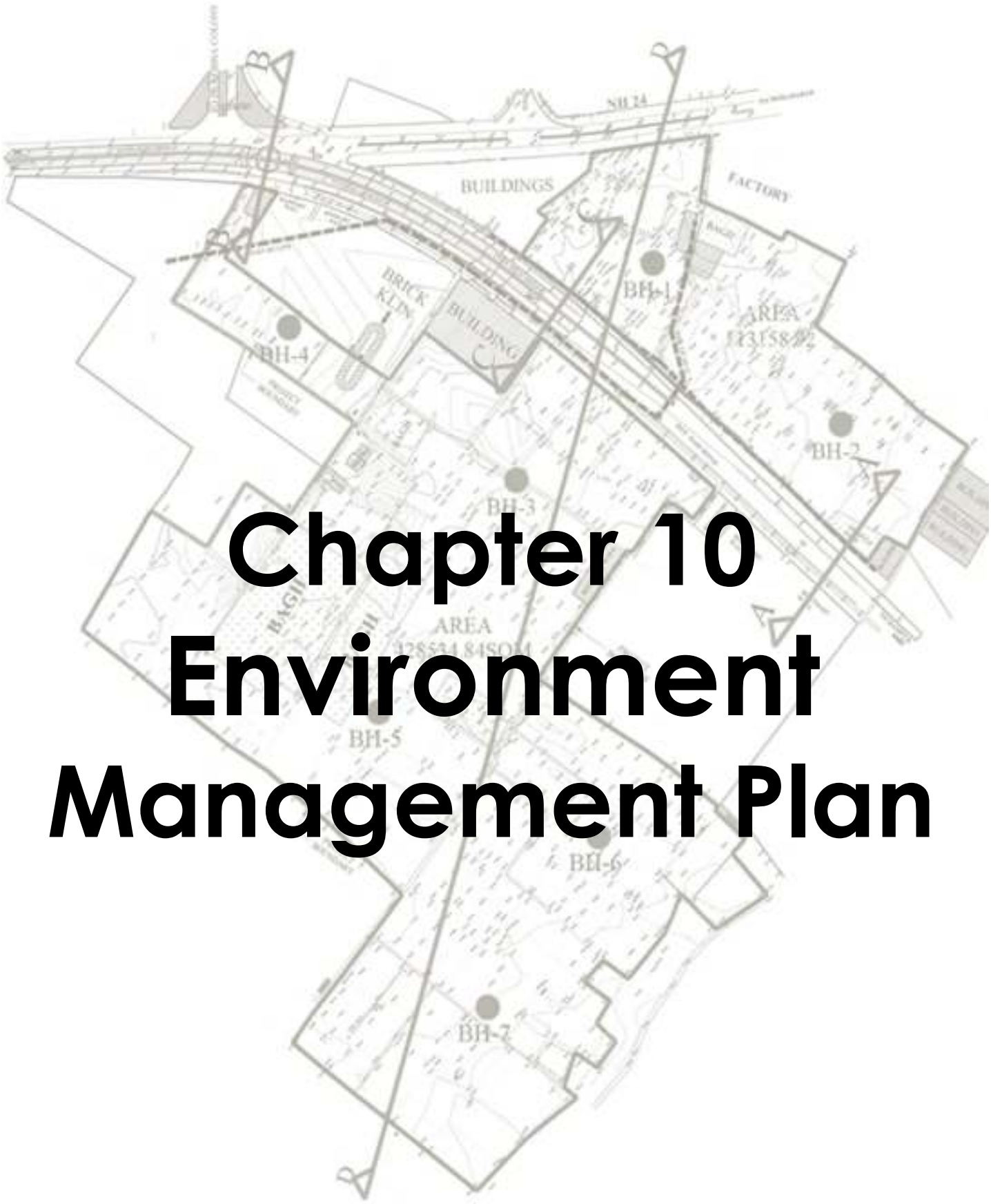
Project Cost in INR Crore							Rs. 369 Crores
Corporate Environment Responsibility in INR Crore @ 1.5% of the project cost							Rs. 5.54 Crores
Sl. No.	Activity	Year wise implementation and Budgetary provision during operation phase					Total budgetary provision (Rs.)
		1st year	2nd year	3rd year	4th year	5th year	
13	Installation of sanitary vending machines in schools	10,00,000	10,00,000	10,00,000	10,00,000	10,00,000	50,00,000
14	Construction of school building & community centre in nearby villages	25,00,000	25,00,000	25,00,000	25,00,000	25,00,000	1,25,00,000
15	Mid-day meals will be provided in Anganwadi	5,20,000	5,20,000	5,20,000	5,20,000	5,20,000	26,00,000
Total							**5,54,00,000**



Chapter 9
Environmental Cost Benefit Analysis

9. ENVIRONMENTAL COST BENEFIT ANALYSIS

This stage was not recommended during the scoping process and hence the environmental cost benefit has not been analysed for this project.



Chapter 10
Environment Management Plan

10. ENVIRONMENT MANAGEMENT PLAN

10.1 ADMINISTRATIVE ASPECTS

The Environmental Management Plan (EMP) contains a description of proposed remedial measures and monitoring plan for the construction and operational period of the project. The EMP often covers construction / management guidelines that specifically address how the contractors are to incorporate environmental considerations into their work. EMP considers compensatory measures if mitigative measures are not feasible or cost-effective.

The most reliable way to ensure that these plans are integrated into the overall project planning and implementation is to include them as an integral component of the project. This ensures that it will receive funding and supervision along with other investment components. For optimal integration of EMP into the project, there should be links for: (a) Funding, (b) Management and (c) Monitoring.

The purpose of the first link is to ensure that proposed actions are adequately financed. The second link helps in embedding training, technical assistance, staffing and other institutional strengthening items in the mitigation measures to implement the overall management plan. The third link provides a critical path for implementation and enables sponsors and the funding agency to evaluate the success of mitigation measures, as part of project supervision, and as a means to improve future projects. For every impact; the mitigation measures, implementing agency and budget have been presented as far as possible. All required funds would be channeled through the project authority. The Environmental Management Plans have been prepared and discussed in subsequent sections.

10.1.1 Environment Management Cell

A separate environment management cell comprising of a team of experienced and qualified personnel reporting to a very senior level executive preferably an environmental engineer is proposed. She/he will be assisted by well trained staff comprising environmental and safety specialists.

Staff will be trained for environment control measures like air, water quality monitoring, solid waste management, noise abatement etc. The head of the Environmental Management Cell will directly report to Project Manager for effective implementation of all decision pertaining to environment. The Environment Management Cell will be responsible managing following activities related to environment function of proposed project:

- Co-ordinate and manage the EMP implementation during pre-construction, construction and operation phase;
- Appoint dedicated environment staff to manage environmental monitoring responsibilities.

- Manage and co-ordinate environmental monitoring and control.
- Co-ordination with other sections and government agencies in relation to environmental management activities.
- Safety specialist to ensure safe working practices in all the areas of the project.

The environment management cell will be responsible to obtain Consent for Operation under Water Act, 1974 and Air Act 1981 from UP Pollution Control Board.

Basically, this cell supervises the monitoring of environmental pollution levels viz. ambient air quality, water and effluent quality; noise level etc., either departmentally or by appointing external agencies wherever necessary. Monitoring will be done in line with regulatory compliance so as to ensure that the pollution is limited to allowable values and to take corrective action by either providing new equipment or by improving the performance of the pollution control equipment.

Environment Management will be headed by a manager and will constitute environmental engineer, safety officer and ecologist/horticulturist. The manager (Environment) will be responsible for environment management activities in the proposed project.

In case the monitored results of environmental pollution are found to exceed the allowable values, the Environment Management Cell suggests remedial action and gets these suggestions implemented through the concerned authorities. The Environment Management Cell also co-ordinates all the related activities such as afforestation and green belt development. Environmental Management cell will implement and review the compliance of the stipulated conditions specified in Environmental Clearance and Consent for Establishment.

10.2 ENVIRONMENT MANAGEMENT PLAN

The impacts of construction activities would be temporary and will reduce gradually with the completion of the construction activities. Various mitigation measures are proposed to be implemented during construction phase. The impacts of operation phase will be long term in nature. The environment management plans for both construction and operation phase are summarized respectively in **Table 10.1** and **10.2**. The EMP will be executed by the civil contractor and supervised by EMC. During operation phase, Project Proponent and EMC are responsible for successful execution of EMP.

Table 10-1: Environment Management Plan for Construction Phase

Sl. No.	Environmental Aspects/Issues	Management Measures
1.	**Site Preparation**	
a.	Earth filling	▪ At the project site cutting and filling will be required. Earth generated from cutting shall be used for filling of low lying areas. ▪ Necessary mitigation measures will be taken during cutting and filling. Simultaneous to filling, compaction and water sprinkling will be carried to suppress dust emissions. During dry season, frequency of water sprinkling will be increased.
b.	Accessibility	▪ The contractor will ensure that the existing accesses to nearby areas will not be disturbed. ▪ The contractor will take care that vehicles brining man and

Sl. No.	Environmental Aspects/Issues	Management Measures
		materials approaching to the site is not disturbing local road and public access. ▪ Contractor will maintain all roads, which are used for transporting construction materials, equipment and machineries. ▪ All vehicles delivering fine materials to the site will be covered to avoid spillage.
2		
a.	Drainage & Flood Control	▪ Contractor will ensure that no construction materials like earth or stones are disposed such as to block the flow of any water course and cross drainage channels. ▪ Contractor will take all necessary measures to prevent the blockage of water flow. Temporary or permanent flooding of the site or any adjacent area will be prevented. ▪ Construction of drainage system to flow rainwater smoothly into natural drain.
b.	Construction waste	▪ Contractor will ensure that any spoils of material unsuitable for fill will not be disposed-off near any water course, agricultural land, and natural habitat. ▪ All waste materials will be completely disposed as per standard practices and certified by Environmental Expert
c.	Water pollution	▪ The Contractor will take all precautionary measures to prevent the wastewater generated during construction from entering into streams or water bodies ▪ Contractor will arrange for collection, storing and disposal of oily wastes to the pre-identified disposal sites. All spills and collected petroleum products will be disposed-off in accordance with MoEF&CC and CPCB guidelines. ▪ The sewage system for the camp are designed, built and operated in such a fashion that no health hazards occurs and no pollution to the air, ground water or adjacent water courses take place. ▪ The water body at site shall be conserved by providing a 30 m buffer all around it.
d.	Air pollution	▪ The contractor will take every precaution to reduce the level of dust from construction sites involving earthwork by sprinkling of water, encapsulation of dust source and by erection of screen/barriers. ▪ Contractor will ensure that all vehicles, equipment and machinery used for construction are regularly maintained and confirm that pollution emissions levels comply with the relevant requirements. ▪ The Contractor will submit PUC certificates for all vehicles/ equipment/machinery used for the project. ▪ Ensure vertical stacks in DG sets with height sufficient for dispersion as per CPCB guidelines.
e.	Noise pollution	▪ All vehicles and equipment used in construction will be fitted with exhaust silencers. ▪ Servicing of all construction vehicles and machinery will be done regularly and during routine servicing operations, the effectiveness of exhaust silencers will be checked and if found defective will be replaced. ▪ Proper maintenance of vehicles, equipment and machinery. ▪ Provision of acoustic covers/ enclosures on equipment and

Sl. No.	Environmental Aspects/Issues	Management Measures
		machinery, wherever possible ▪ Provision of earmuffs/ earplugs to the workers in high noise areas and enforcement of its use. ▪ Use of high noise generating equipments shall be avoided at night
f.	Waste Disposal	▪ The contractor will provide garbage bins in the camps and ensure that these are regularly emptied and disposed-off in a hygienic manner as per the Solid Waste Management practices. Adequate independent collection bins for waste are provided as per Municipal Solid Waste (Management and Handling) Rules, 2016. ▪ Topsoil of the site will be excavated, stored, preserved and will be used for landscaping purpose, while construction waste will be used for levelling of site. Recyclable waste will be sold to recyclers and inert waste will be sent to MSW Disposal sites for landfill. ▪ Hazardous waste generated will be used oil, paints, Lead batteries etc. ▪ Sludge generated from STP will be used as manure in landscaping. ▪ Construction wastes involve topsoil of the site excavated. The waste will be stored and preserved and will be used for landscaping purpose. The recyclable waste will be sold to recyclers and inert waste will be sent to MSW disposal sites for landfill.
h.	Occupational health & safety	▪ Construction materials shall be stored in a planned and orderly manner that does not endanger employee safety. ▪ Storing wastes in pallets to discourage rodent infection. ▪ Provision of environmentally safe camping area for the laborers ▪ Arrangements for water supply and sanitation

Table 10-2: Environmental Management Plan for Operation Phase

Sl. No.	Environmental Aspects/Issues	Management Measures
a.	Air pollution	▪ Stack heights of DG sets will be as per the CPCB guidelines. ▪ Proper traffic management will be prepared to ensure that there is no congestion. It will help in reduction of vehicular emissions at the site. ▪ Development of greenery and landscaping at the site will be helpful in improving ambient air quality. ▪ Monitoring of ambient air quality/ source emission will be carried out as per monitoring plan.
b	Water pollution	▪ During operation phase, continuous efforts will be made to reduce water consumption using less water required cisterns. ▪ Pour flush toilets will be installed which require (much) less water. ▪ Efforts will be made to stop wastage and leakage of water. ▪ Provision will be made for rain water harvesting. ▪ Collection of waste water and treatment of waste water in Sewage Treatment Plant (STP) will be done for reusing of waste water. ▪ Regular testing and analysis of treated waste from STP to ensure effectiveness of operation of STP. ▪ Dry cleaning process in workshop and maintenance area to clean the oil spillages ▪ The storm water from the paved and unpaved areas shall be routed to the rainwater harvesting structures.
c	Solid Waste	▪ The wastes shall be collected, segregated and disposed as per

Sl. No.	Environmental Aspects/Issues	Management Measures
		Municipal Waste Management Rules, 2016. ▪ Used lubricating waste oil will be collected separately in containers and shall be sold to authorized recyclers as per UP SPCB guidelines. ▪ Ensuring hazardous waste storage areas are provided with secondary containment.
d	Noise Pollution	▪ All standards prescribed by competent authority shall be followed and monitoring will be complied. Proper traffic management plan will be prepared to ensure that there is no traffic congestion. ▪ DG sets will be provided with acoustic enclosure as per CPCB guidelines. ▪ Green belt and landscaping will act as barrier for noise pollution. Monitoring of ambient noise will be carried out as per monitoring plan.
e	Terrestrial Ecology	▪ Indigenous species shall be planted in consultation with horticulturist and as per CPCB guidelines. ▪ The species proposed to be planted will also be selected based on the criteria prescribed by the CPCB as "Guidelines for Developing Greenbelts" or proposed greenbelt development/ plantation, horticulturalist will be deputed.
f	Traffic Management	▪ All vehicles will be parked in designated parking area only. Road crossings to be used will be well marked and signaled and informatory and warning signages will be retro reflective type provided, clearly visible in the night. ▪ Personnel will be deployed to guide the vehicles in order to avoid traffic jam.

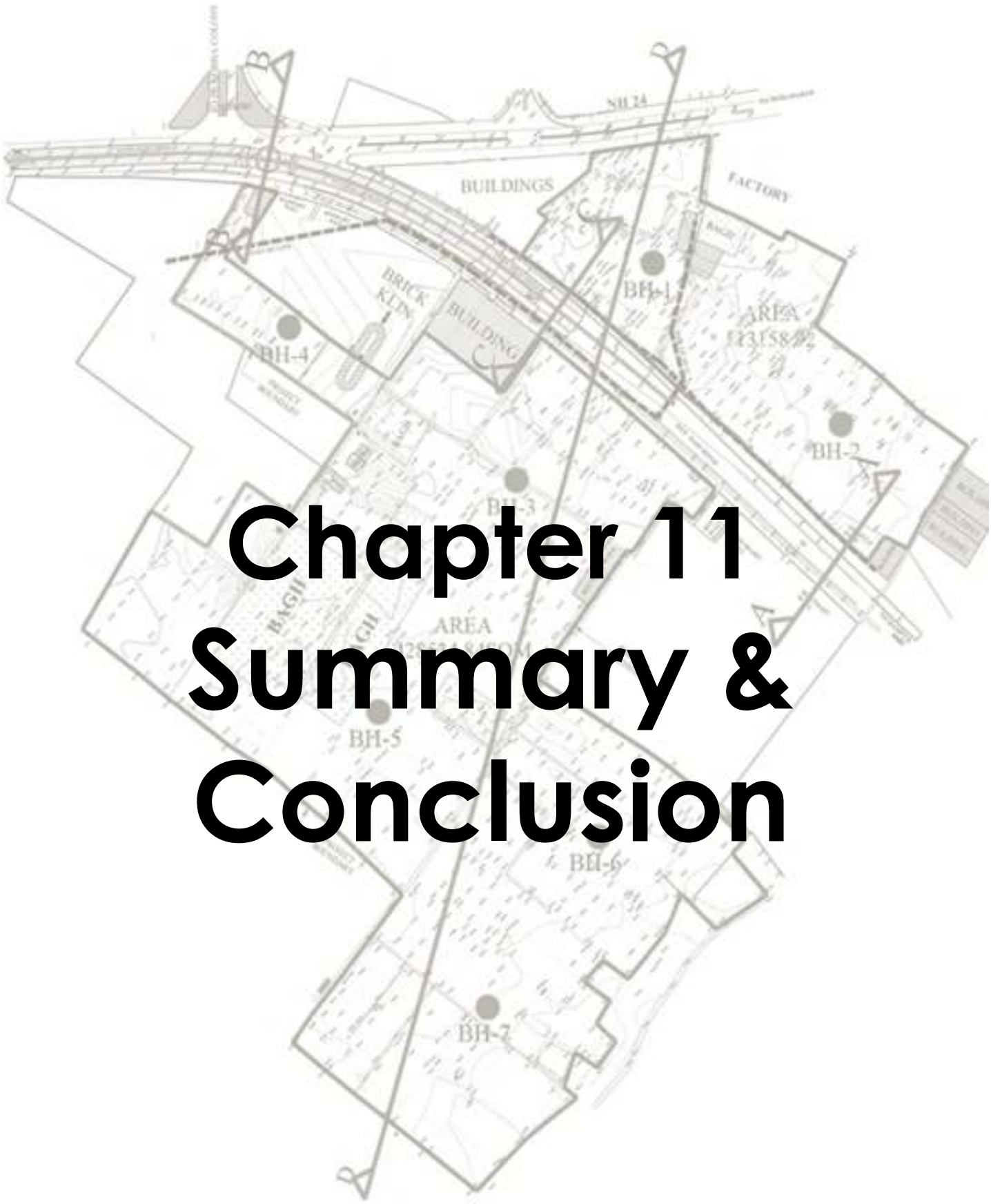
10.3 BUDGET FOR EMP

Total project cost for the proposed project is Rs. 369 Crores. The break-up of environment management cost is given in **Table 10.3**.

Table 10-3: Budget for EMP

Sl. No.	Component	Items	Capital	Recurring cost/ annum
Construction Phase				
1	Air	Dust Management with Sprinkling of Water	1,50,000	50,000
		Covers for vehicles transporting, construction materials	50,000	25,000
2	Water	Sanitary Facilities for Construction Workers	75,000	0
		Construction of green buffer around the water body at site	50,000	10,000
3	Noise	Ear plugs and muff	20,000	10,000
4	Soil	Preservation of Top Soils	15,000	0
5	Construction safety	Facilities to Workers	25,000	0
6	Waste management	Bins for collection of waste from sites	10,000	2,000
7	Greenbelt development	Plantation	2,00,000	50,000

Sl. No.	Component	Items	Capital	Recurring cost/ annum
Total			**5,95,000**	**1,47,000**
Operation Phase				
1	Air	Proper traffic management inside the project site	75,000	50,000
2	Water	Oil & Grease Trap	50,000	25,000
		Rainwater Harvesting	2,00,000	2,00,000
		Storm Water Management	1,50,000	2,00,000
		Installation of STP	40,00,000	5,00,000
3	Noise	Acoustic enclosure of DG set	3,00,000	0
4	Energy Conservation	LED, BMS, Solar Lights	2,50,000	50,000
5	Waste Management	Waste collection and segregation	2,00,000	1,00,000
		Organic waste converter	10,00,000	2,50,000
5	Landscaping	Landscaping and Greenery	2,00,000	50,000
Total			**64,25,000**	**14,25,000**



Chapter 11 Summary & Conclusion

11. SUMMARY & CONCLUSION

11.1 PROJECT DESCRIPTION

The total land area of the project is 6,25,909.02 m^2 for which Environment Clearance is sought. ***The Environmental Clearance individually would be taken for each township component in future under Category B2 if required.*** **This project is independent and does not link with any other project/s which attracts directly or indirectly any provisions of schedule of EIA notification 2006 amended to date.** The site is falling under the revenue boundary of 2 villages namely Mangupura, and Mahalakpur Mafi. The proposed site is identified near the site for New Moradabad Township proposed by Master Plan on North-West side.

The plotted development is spread over 82.662% of the total area, group housing over 12.99% area, EWS/LIG housing over 4.39% area and residential development over 61.58% area. The rest proposed for mixed development, public & semi-public uses, commercial development and for roads and green area.

Parking has been proposed for 8321 ECS as per State Standards. The total water requirement for the project during operation phase has been estimated to be 5296 KLD of which fresh water requirement is 2836 KLD which shall be sourced from bore wells. The wastewater generated shall be treated in 5000 KLD capacity STP based on MBBR technology. The maximum demand of power requirement for the project is 40 MVA to be sourced from UPPCL. Around 200 labours will be engaged during the construction phase.

11.2 DESCRIPTION OF THE ENVIRONMENT

The baseline data for the project was collected during Mar to May, 2019 covering an area of 10 km radius from the project site. There are no notified forest patches within the study area.

Land Environment: The project site falls under Seismic Zone IV signifying high damage risk zone. The site also falls under flood prone area and lies in very high damage cyclone risk zone. The project site has a flat topography with elevation ranges from 198 m to 205 m above Mean Sea Level (amsl). The slope of site is towards the North-East.

The project site is not underlain by any valuable mineral resources. The study area as well as project site is mainly occupied by agricultural land. There is a brick kiln in the project site which shall be dismantled prior to site preparation activities. The water body in the project site shall be retained. The soil samples collected give an impression of an average profile of soil quality for vegetation growth. The NPK and organic carbon content in the soil samples is fair.

Water Environment: There are no streams passing through the project site. The study area is drained by River Ramganga & Gangan and forms a part of Central Ganga Plain. Surface water samples collected from 5 locations indicate that the water is not suitable for drinking purpose. Dissolved oxygen was recorded moderate in the study area. The water samples collected are either suitable propagation of wildlife and fisheries or for irrigation, industrial cooling, and controlled waste disposal.

As per CGWB, depth to water level in the project site during pre-monsoon and post-monsoon period varies from 7-10 m bgl. The samples of groundwater collected from 5 locations give an impression of slightly alkaline water quality, hard to very hard in nature. Average TDS values were found to be more than 600 mg/l, which gives a clear evidence of anthropogenic influences. The concentration of EC, TH, Ca, Mg, Na, HCO_3 and Cl at most of the sampling stations not exceeds the safety limits for drinking water. Computational analysis of the data set of hydrochemical constituents in the groundwater suggests that the aquifer (TDS) is mainly controlled by Cl, total hardness Na, and EC. As per CGWB's Ground Water Resource Assessment, 2017, the Moradabad city falls under over-exploited zone.

Air Environment: The average maximum and minimum temperature recorded at site during March to May, 2019 were 41^0C and 16^0C respectively. The average relative humidity (maximum and minimum) was observed in the range of 78.7% to 13.0% during the study period. The average wind speed recorded at the site was 8.6 kmph. The predominant wind direction during the study period was mainly from North.

Air quality was monitored in 11 locations and all the parameters were found to be within the stipulated limits of CPCB. Maximum concentration of PM_{10} (85.6 µg/m^3) and $PM_{2.5}$ (40.1 µg/m^3) was recorded in AAQ10, Ekta Colony (Moradabad) which may be attributed to its proximity to industrial belt and its placement in the dominant downwind direction. Likewise, maximum concentration of gaseous pollutants SO_2 and NO_2 was also recorded in Ekta Colony (Moradabad). The maximum value of CO (0.63 mg/m^3) was observed in AAQ6, Fajalpur which is well below the NAAQ standard of 2 mg/m^3 for 8 hourly sampling.

Leq during day time varies from 54.7 dB(A) to 50.5 dB(A) at the monitoring stations while Leq during night time varies from 47 dB(A) to 41 dB(A). Leq is higher in few locations due to their proximity to major roads where vehicles keep plying continuously.

Traffic volume count was done in 3 locations and was done as per IRC Code. Total number of vehicles per hour was determined. The results indicated that the surveyed roads have a stable flow zones indicating no congestion during peak hours.

Ecology: Ecological survey implied that there is no dense vegetation in the study area. The study area does not support healthy vegetation due to too much biotic pressure. No ecologically sensitive floral species have been reported from the area. Common species found near villages are mostly useful plants like *Mangifera indica*, *Syzigium cumini*, *Azadirachta indica*, *Albizia lebbeck*, *Delonix regia*, *Tamarindus indica* etc. Growth of weeds like *Argemone mexicana*, Cannabis sativa, *Cenchrus ciliaris*, *Heteropogon contortus*, *Lantana camara*, *Parthenium hysterosphorus* etc. in agricultural land and along road sides is very common. No significant wild animals have been reported from the study area. No established habitats of any mammals or birds have been noticed along the river bank. There are some small water bodies which attract avian species. Common myna, kingfisher, cormorants are some common bird species observed in the study area.

Socio-economy: There are 164 villages in the study area having a total population of 13,09,275 out of which 6,84,802 are males and 6,24,473 are females as per Census of India 2011. The gender ratio of the project site has increased 885 to 912 from 2001 to 2011. 7.7% of the population in the study area is in SC category while only 0.034 % is in ST category as per the 2011 Census. The literacy rate was found to have increased from 44.65% in 2001 to 54.72% in 2011 in the study area. Female literacy rate has shown improvement from 37.81%

in 2001 to 49.59% in 2011. The Work Participation Rate in the study area was found to have increased from 28.07% in 2001 to 29.91% in 2011. As far as educational facilities are concerned, the numbers of schools have increased over a span of 10 years; however, there are no facilities for higher education in the villages. The medical facilities present in the study area seem to be appropriate to cater the population.

11.3 ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

Land: The project shall be developed as per Moradabad Master Plan-2021 which demarcates the site as residential zone. The brick kiln at the site is operated by the Project Proponent and shall be dismantled. The water body at site shall not be disturbed.

Development shall be done after taking all necessary approvals from competent authority. The water body shall be retained and preserved by proving a 30 m green buffer.

Soil quality: Site preparation activities make the soil more prone to erosion. Waste littering can pollute soil. The quantity of waste to be generated during operation is estimated to be 20.3 TPD.

Vegetation cover shall be removed only from areas where construction is to take place. A well-planned solid waste collection system covering all areas of the project site apart from door to door for the residential units shall be developed. The waste shall be segregated at source and treated/disposed accordingly.

Surface water quality & hydrology: Run-off from rains may take excavated soil/construction material to the nearby water bodies thereby polluting them. Sewage generated at site may also pollute water bodies. Fuel leakage and spillage from vehicles may take place which can be carried away by rainfall run-off to nearby water bodies and pollute them. Wastewater generated from residential units, if not properly treated, may find its way to surface water bodies.

Wastewater generated from the domestic activities will be treated in septic tank followed by soak pit. The construction material/excavated soil shall be stored properly in closed areas so as not to get affected by rain. An STP of 5000 KLD capacity shall be installed to treat waste water generated during operation phase. Proper oil & grease interceptors will be installed at outlet point of storm water drainage.

Ground water quality & resource: Extraction of ground water for operational activities shall put additional pressure on ground water resource. Used oil from DG sets may percolate to ground water, if not properly stored and treated.

Rainwater harvesting has been planned for ground water recharge. The used oil from DG sets shall be collected in a concrete bund where proper oil & grease interceptors will be installed. To further lower the water consumption, options of low flow flushing systems, sensor based fixtures, and tap aerators etc. will be explored.

Air Quality: Fugitive dust emission shall occur as a result of construction activities, handling of construction materials. Operation DG sets shall emit gaseous pollutants, although in insignificant amount. The vehicular emissions, however, will be significant, once the project starts operation with maximum contribution coming from CO.

Dust suppression system shall be provided wherever necessary. Avenue plantation on the internal roads and peripheral plantation around the site will be developed which will help in arresting the dust particles to fly away

from the construction areas by creating a physical barrier. Proper traffic management within the project premises to avoid congestion at any particular place.

Sound pressure level: The main source of noise pollution would be construction equipment, transportation activities. Noise from earthmoving equipment has the potential to cause nuisance. The main sources of noise from the project operation are running of D.G. Sets and vehicular traffic.

The highest noise level emitted from construction equipments merges with the highest standard noise level (55 dB during day time) at around 100 m from the source and the sound level keeps on decreasing with increasing distances. The sources are intermittent and shall generate sound for short duration. The vehicles playing within the site will be mainly of the residents and are hence not expected to cause unnecessary noise. DG sets will be provided with acoustic enclosures.

Ecology: The project site does not involve any forest land. There are, however, trees present in the site which shall be removes prior to site development. Likely settling of dust from movement of vehicles for construction activities on leaves may results in stunted growth of vegetation and may also affect the rate of photosynthetic capacity. High noise levels generated from equipments may prove to be harmful for local fauna as it affects their behavioral pattern. Unsegregated and open waste dumping areas may attract birds who will feed on the wastes causing intoxications, injuries, illness and finally death.

Removal of vegetation shall be restricted to areas where construction activities shall be involved. Plantation and landscaping shall be done from construction phase to strengthen flora in the area. High incremental concentration of SO_2 and NOx is not likely to occur as a result of the project operation as found from modelling studies so as to cause any injury to vegetation. The wastes shall be segregated at source and collected in closed containers. The segregated wastes shall be disposed or treated based on their characteristics. Open dumping of wastes shall be strictly prohibited.

Socio-economy: During the development and construction of Project, about 200 skilled and semiskilled and unskilled workers per day will get direct employment opportunity, which will have beneficial impact on the local people and improve socio-economic conditions of the area. Construction materials will be procured from local markets. The people will get benefit by providing logistics. During operational phase, more than 100 persons will get employment opportunities as staff for management, maintenance and security.

Suitable measures will be taken at the construction camps to mitigate anticipated impacts due to temporary accommodation of laborers such as provision of clean drinking water, adequate toilet facilities, water and solid waste disposal system

11.4 ENVIRONMENT MONITORING PROGRAMME

The purpose of the monitoring programme is to ensure that the intended environmental measures are achieved. To ensure proper implementation of the Environment Management Plan (EMP), it is essential that an effective monitoring programme is designed and carried out during construction and operation. The broad objectives of the environment monitoring programme are:

- To monitor impacts on the surrounding environment and the effectiveness of mitigation measures during construction and operation.
- To ensure that the environmental control systems are operating satisfactorily.
- To suggest on-going improvements in management plan, if required, for subsequent effective monitoring.

The Environment Monitoring Cost for Construction Phase is INR 5.04 lakhs and for Operation Phase is INR 9.92 lakhs. A capital cost of Rs. 1.5 lakhs has been earmarked for installation of weather monitoring station along with data logger.

11.5 ADDITIONAL STUDIES

Township & area development projects are exempted from public hearing.

The major risk associated with area development projects include lifting and transportation of building materials at different levels, digging pits, operation of concrete mixer, working near electrical circuit, which is required during construction. Such work puts workers at risk of burial, engulfment or falling from a height, risk of electrocution where the risk is particularly aggravated by the nature of the work or processes used or by the environment at the place of work or site. However, it is not always possible to totally eliminate such eventualities and random failures of equipment due to human errors or natural calamities like earthquake.

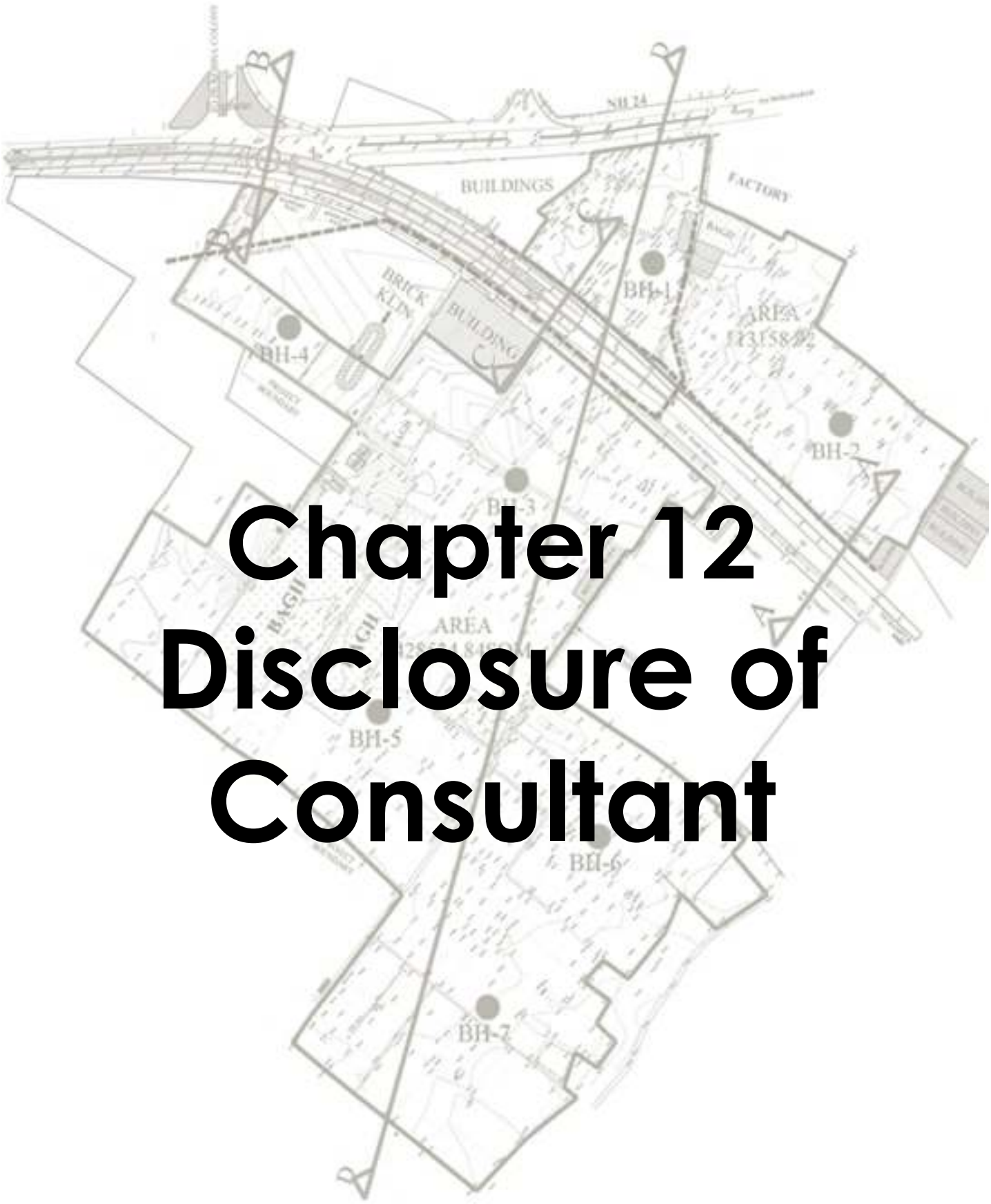
A proper disaster management plan including safety measures during construction phase, proper fire-fighting system and procedures for safety during natural calamity shall be put into place prior to start of site preparation activities.

11.6 PROJECT BENEFITS

The project shall lead to value addition to the existing infrastructure facility such as public transport, water supply, telecommunications, etc. It will also provide all kinds of facilities within the township so as to make it self- sustained. The propose project will enhance the quality of life, equity, and social well-being through community support and awareness. The local people shall be given employment in the project, thus bringing about economic benefits to the economically backward local population. As per MoEF&CC's OM dated 1st May, 2018, 1.5% (Rs. 5.54 Crores) of the project cost is to be spent on CER (Corporate Environment Responsibility) activities.

11.7 ENVIRONMENT MANAGEMENT PLAN

The Environmental Management Plan (EMP) consists of description of the administrative aspects of ensuring that mitigative measures are implemented and their effectiveness monitored, after approval of the EIA. The capital cost for EMP during the construction phase have been estimated to be Rs 5.95 lakhs while the annual recurring cost will be Rs. 1.47 lakhs. The EMP cost during the operation phase has been calculated to be Rs. 64.25 Lakhs as capital cost and Rs. 14.25 lakhs as annual recurring cost.



Chapter 12
Disclosure of Consultant

12. DISCLOSURE OF CONSULTANTS

12.1 INTRODUCTION TO THE FIRM

Greencindia Consulting Private Limited (GCPL) is an environmental consultancy organization, manned by a highly qualified, experienced and multidisciplinary team of scientists and engineers. The company has received accreditation from Quality Council of India (NABET-QCI) as an EIA Consultancy organization. The company has its own sophisticated in-house laboratory which is accredited to NABL.

The primary aim of GCPL is to sensitize policy planner and local people about their development needs through capacity building process. The company facilitates managerial and technical expertise to people and associations for development of areas and regions.

GCPL has undertaken more than 110 EIA and other associated studies and clearances for township & area development projects, mining projects, thermal power projects; airports, road and highways; special economic zones (SEZs); urban infrastructure projects, etc.

GCPL has been appointed by the Project proponent to carry out Environment Impact Assessment Studies for the proposed project. The agreement for the same is attached as **Annex 12.1**.

The main objects of the Company are as follows;

- To carry on the business of providing all types of consultancy services related to Social And Environmental Impact Assessment, Environment Action Plan, Tribal Development Plan, Resettlement and Rehabilitation Action Plan, Project Information Report, Detailed Project Report, Need Assessment Report, Corporate Social Responsibility Plan, Forest Diversion Plan, Wildlife Conservation Plan, Drainage Plan and Hydrogeology Environment, Social & Land related legal services and any other consultancy services and studies related to urban development, rural development, environment, forest and legal aspects.
- To provide consultancy services in environment monitoring, sample collection of air, water, soil, meteorological data and publish testing results for the collected samples
- To undertake research study in the field of environment, social, legal, agriculture, urban planning, rural planning, alternate sources of energy etc. and provide consultancy/advisory/training services in these field to government, quasi-government, non-government and private institutions.
- EPFI reporting, environmental and social impact assessment according to IFC guidelines and equator principles.

12.2 AREAS OF EXPERTISE

- Environmental Impact Assessment
- Environmental Management Plan

- Disaster Management Plan
- Risk Assessment
- Rehabilitation & Resettlement Plan
- Pre-feasibility Report
- Detailed Project Report
- Geo-Technical Investigation
- National, Regional and Urban Plans
- Management Information System and Geographic Information system
- Urban Infrastructure Development including Water Supply and Solid Waste Management
- Environmental Monitoring and Assessments
- Impact Assessment Formulate Policies & Mitigation Measures R&R
- Natural Resource Management
- Terminal Planning and Design
- Institutional Strengthening
- Development, Functional and Strategic Planning and Design
- Preparation of Manuals
- Training Programmes

12.3 ACHIEVEMENT OF THE COMPANY

Greencindia Consulting Private Limited (GCPL) (formerly GIS Enabled Environment & Neo-graphic Center) is an ISO 9001:2008-QMS, 14001:2004-EM and 18001:2004-OHSAS certified company. The company is accredited with QCI-NABET since 2010. We have completed Two RA & Two SA. We are accredited for following sectors: -

- Townships & Area development projects.
- Thermal Power Plants.
- Mining Project-Open Cast & Underground Mining.
- Coal Washery.
- River Valley Projects.
- Metallurgical Industries (Ferrous and Non-Ferrous).
- Industrial Estate/Parks/Complexes/areas, export processing zones, special economic zones, biotech parks, leather complexes.
- Highways.
- Cement Plants.

- Oil & gas transportation pipelines.
- Common Municipal Solid Waste Management Facility.
- Airports.
- Buildings and construction projects.

12.4 BRIEF RESUME OF THE COMPANY

GCPL comprises of group of professionals drawn from development related fields. The core members of GCPL team hold experiences in Developmental Planning, Pollution Control, Economic Analysis, Social Work and Information Technologies. In addition there is a panel of senior associates and young voluntaries facilitating the various programmes. The brief resume of the Environment Coordinator and Functional Area experts (Core Functional Areas & Significant Functional Area) are discussed below:

Sl. No.	Name of Expert	FAA/Team Member	Years of Experience	Area of Specialization	Involvement (Period & Task)
1	Rahul Singh	-	20	EC-Township & Area Development projects	**FEBRUARY 2019 TILL DATE** ▪ Selecting the team to be involved in the EIA report. ▪ Compiling Form-1 of the notification, 2006 based on personal understanding and from inputs from the Technical Report, site Plans, Site Visit and communication with client. ▪ Visiting the site for appropriate duration for the selection of sampling locations and deciding the type of samples in consultation with the FAEs. ▪ Reviewing the process write-up ▪ Developing the Final EIA report and circulating the same amongst EIA team members for final feedback and ensuring coverage of the respective functional areas FA in the EIA.
Core Functional Areas					
2	Dr. Subinoy Mondal	-	10	Water Pollution-WP	**FEBRUARY 2019 TILL DATE** ▪ Monitoring location selection for ground water and surface water ▪ Assessment of Impact associated with the project operation activities ▪ Development of Water Management Plan.
3	Dr. Seema Awasthi	-	24	Municipal Solid Waste-MSW	**FEBRUARY 2019 TILL DATE** ▪ Quantitative assessment of wastes to be generated during construction & operation phase. ▪ Development of solid waste Management Plan
Significant Functional Area					
4	Rahul Singh	*Bikash Ruj*	20	Land-use- LU	**FEBRUARY 2019 TILL DATE** ▪ Development of Land-use Map

Sl. No.	Name of Expert	FAA/Team Member	Years of Experience	Area of Specialization	Involvement (Period & Task)
					▪ Impact of project on surrounding Land use ▪ Assistance during development of project management plan. ▪ Mitigation Measures due to change in Land uses by the project
5				Socio-economy-SE	▪ Assessment of social impact associated with project ▪ Assistance during development of project management plan
6	Dipannita Das	-	7	Ecology & Biodiversity-EB	**FEBRUARY 2019 TILL DATE** ▪ Survey of existing flora & fauna in the study area ▪ Assessment of impact associated with project ▪ Selection of species for greenery development ▪ Assistance during development of project management plan
8	K.D. Choudhury	Rahul Singh	45	Air Pollution Monitoring Prevention Control-AP	**FEBRUARY 2019 TILL DATE** ▪ Assessment of Impact associated with the project operation Activities ▪ Assessment of Impact Associated with vehicle movement Operation ▪ Development of Management Plan to control the air pollution & its mitigation
		-		Noise-N	**FEBRUARY 2019 TILL DATE** ▪ Assessment of impact associated with project ▪ Assistance during development of project management plan
9	Dr.P.C Kuniyal	-	15	Soil Conservation (SC)	**FEBRUARY 2019 TILL DATE** ▪ Assessmentof soil quality ▪ Assistance during development of project management plan
10	Dr.Manoj Kumar	**Bingshati Mondal	28	Hydrology, Ground Water & Water Conservation-HG	**FEBRUARY 2019 TILL DATE** ▪ Water table of the area in pre-monsoon and post monsoon season ▪ Development of management plan

GCPL is accredited under QCI-NABET scheme for accreditation of EIA consultants organizations vide certificate number: **NABET/EIA/1619/RA0058** on **June,28 2017** for Building and large construction projects and Townships & Area Development Projects, Thermal Power Plants, Metallurgical Industries (Ferrous only)-both primary & secondary, Industrial Estate Planning, Common Municipal Solid Waste Management, Highways, Railways, transport terminals, Cement Plants, MRTS, Building and large construction projects and Mining Projects (open cast only). Validity of the accreditation is extended till **March**, 2020 vide certificate no. **QCI/NABET/EIA/ACO/19/1186** (**Annex 12.2**).

12.5 Accredited Laboratory

The analytical tests for GCPL are conducted by **M/s Envirotech East Private Limited, Kolkata** which was accredited by MoEF&CC (refer to **Annex 12.3**). GCPL has signed MoU with **M/s Envirotech East Private Limited** (**Annex 12.4**) for specialized testing and analysis of samples from their laboratory.