ENVIRONMENT IMPACT ASSESSMENT REPORT

For

PROPOSED ALL INDIA INSTITUTE FOR MEDICAL SCIENCES (AIIMS) UNDER PMSSY

At

Khasra Nos. 103/97/92/69/1,103/97/92/69/2, 102/97/92/69/2/1, Village- Changer plasian, Khasra Nos. 9/1, 7,5,10,316/14/2,6,402/208/3/1 Village- Noa, Khasra Nos. 86 ,1510/87/1, 99, 300/1 Village-Rajpatra, Tehsil- Sadar, District- Bilaspur, HP

Developed by

M/s NBCC (India) Ltd.

FILE NO. - **HPSEIAA/2018/601**; PROPOSAL NO.**SIA/HP/NCP/29997/2018**

MONITORING PERIOD

15th SEPT.2018 to 15th DEC. 2018

PLOT AREA & BUILT UP AREA

Site area- 243.98 acre/98.73 hectare; Built up area- 1, 65,011 m^2

ENVIRONMENT CONSULTANT & ACCREDITATION

AMALTAS ENVIRO INDUSTRIAL CONSULTANTS LLP (AEC);

(Certificate no.-NABET/EIA/1518/IA 0017)

LABORATORY CONSULTANT & ACCREDITATION

J.P TEST & RESEARCH CENTRE

NABL Accredited Laboratory (Certificate No. - Chemical: T 4181 & Biological: T 4182)

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1. INTRODUCTION

PREAMBLE

EIA is a technical exercise, to establish baseline environmental condition to predict environmental impact, assess their significance and provide recommendations for their mitigation. The impact assessment covers both construction and operation phase of the development. The report covers areas such as noise, air quality, ecology, water quality, hydrology, local architecture, landscape & visual character, sustainability and socio-economics. Early identification and characterization of critical environmental impacts allow the public and the Government to form a view about the environmental acceptability of a proposed developmental project and what conditions should apply to mitigate or reduce those risks and impacts. The report describes how the project has been improved through the EIA process.

This report has been prepared as per the EIA Notification, 2006 & its amendments, EIA Guidance Manual for Building, Construction, Township and Area Development projects as guiding documents. Based on the Terms of Reference (ToR) issued by the SEIAA, HP and additional ToR points suggested by committee in 62nd SEAC, HP meeting held on 11/01/2019

ENVIRONMENT CLEARANCE PROCESS

As per EIA Notification, 2006 & its amendments, all building construction and area development projects covering an area of equal or above 50 ha and/ or built up area greater than 1, 50,000 m^2 are designated as 8 (b) projects and are required to obtain prior environmental clearance from State Environmental Impact Assessment Authority (SEIAA). The application for environmental clearance shall comprise submission of Form 1, Form 1A, and Conceptual Plan along with EIA/EMP Report incorporated proposed ToR in SEIAA. After recommendations from Hon'ble SEAC, SEIAA issues the approved ToR with additional points if needed. The EIA shall be prepared on the basis of approved ToR issued from SEAC and will be submitted to the SEAC for appraisal and due recommendation and suggestions. Following the appraisal of the project to the satisfaction of the SEAC and SEIAA, Environmental Clearance shall be granted.

Since, the project covers an area of 98.73 hectare and a built up area of 1, 65,011 m^2.

The project is categorized as 8(b) project, under the EIA Notification, 2006 and requires environmental clearance from the SEIAA, Himachal Pradesh. As per EIA Notification 2006 and its amendments, Proposal along with proposed ToR was submitted to SEIAA, HP on 27.11.2018. After recommendations and suggestions from SEAC, approved ToR was issued in 39th SEIAA meeting held on 12th Jan 2019 for carrying out the Environmental Impact Assessment study.

Annexure 1-Approved Term of References and its point wise compliance

The present EIA report has been prepared based on the base-line data generated during post monsoon season (Sept-Dec, 2018)

OBJECTIVE OF ENVIRONMENT IMPACT ASSESSMENT

- To ensure that the environmental considerations are explicitly addressed and incorporated into the development and decision-making process.
- To anticipate and avoid, minimize or offset the adverse significant biophysical, social and other relevant effects of development proposals.
- To protect the productivity and capacity of natural systems and the ecological processes this will maintain their functions.
- To promote development that is sustainable and optimizes resource use as well as management opportunities.

GENERIC STRUCTURE OF ENVIRONMENT IMPACT ASSESSMENT

The environmental impact assessment has been carried out to assess the impact of the proposed project on various environmental components. The methodologies and findings of the study are detailed in the EIA Report along with other relevant information under the different chapter headings as under:

Introduction - Provides background information about the project falls in the category as defined in EIA Notification 2006 and the amendment made thereof based on area statement and the developers along with the legal environmental requirements of the project. The scope and EIA methodology adopted in preparation of EIA report have also been described in this chapter.

Project Description – Briefly discusses the project features while elaborating on components bearing environmental consequences.

Description of the Environment – Discusses the baseline data of environmental attributes such as air, water, soil, noise and socioeconomic environment of the area based on primary and secondary data collection at the site. Study of existing environment at the site and in the study area comprising base-line and environmental quality after receive of new development during construction & operation of the project.

Anticipated Environmental Impacts & Mitigation Measures – Predicts the environmental impacts of the various components of the project during construction and operation phases to highlight concern areas requiring mitigation measures. Accordingly, it also suggests controls and mitigation measures to offset/ minimize the adverse impact while optimizing the positive benefits from the project.

Analysis of Alternatives (Technology and site) – Explores the alternative sites and plans that have been considered for the project and evaluates the different scenarios in the environmental context.

Additional Studies – Discusses any study that has been carried out for the purpose of better understanding of the environmental impacts of the project. It also highlights any pertinent findings from the study that will aid decision-making.

Environmental Monitoring Programme – Outlines a monitoring programme for the different environmental components during the construction and operation phase for evaluation of the environmental status of the region against the project development.

Project Benefits – Brings out the positive impacts from the project.

Environmental Management Plan – Organizes the suggested mitigation measures to aid implementation through formulation of performance indicators, reporting structure and pronounced implementation periods.

Summary & Conclusion – Summarizes the important report findings and concludes on the environmental sustainability of the project.

Disclosure of Consultants engaged – gives the names of the technical team involved in the report preparation with accreditation of consultant from the quality council of India.

ENVIRONMENT IMPACT ASSESSMENT METHODOLOGY

The project may have impact on environment attributes such as air, water, noise level and soil quality, hydrology and drainage pattern and meteorology of surrounding environment due to on-going project. In assessing the environmental impact, collection, collation and interpretation of baseline data is of prime importance. Long term data sets help us to get better assessment.

The objective of EIA is to predict and address potential environmental problems/concerns at an early stage of project planning and design as the infrastructure development has adverse impact on environment. EIA/EMP assists in the decision making process by identifying the key impacts/ issues as a results of the activities and formulating mitigation measures, leading to an improvement in environmental quality.

In order to achieve these objectives, the following procedures have been adopted for the study:-

- Collection, collation and analysis of regional and local environmental status for various environmental attributes (like topography, geology, ambient air quality, meteorology, water quality, noise level, soil characteristics and land use, transport, settlement status and socio economic aspects etc.) to assess base-line status of the project.
- Identification of environmental impacts leads to assessment of impact on the base-line status which will decide the feasibility of the project and suggests mitigation measures to control pollution with respect to standards applicable for the area.
- Evaluation of impacts leading to preparation of environmental management and monitoring plan.
- Addition study will cover disaster management plan during construction and operation phase of the project.

- Environment Monitoring Plan and annual budget – one time and recurring cost of EMP will be discussed in Separate chapter.
- Project cost and schedule and project benefit will be discussed along with disclosure of consultants.

This report is based on scientific principles and professional judgment with resultant subjective interpretation. Professional judgments expressed herein are based on the available data and information.

PROFILE OF THE PROJECT AND PROJECT PROPONENT

NBCC (India) Limited (formerly National Buildings Construction Corporation Limited) is a **Navratna Central Public Sector Undertaking** which trades publicly in the market and is largely owned by the Government of India.

It engages in the Real Estate Development & construction business and also provides Project Management Consultancy. NBCC's mission is to be a leading company, with high brand equity in construction business, offering sustainable, innovative and cost effective construction products and services contributing to National wealth, upholding responsibility for the environment, and promoting well-being of all stakeholders including employees, customers, shareholders and society

NAME AND CONTACT ADDRESS

As the company (M/s NBCC (India) Ltd) is in process of getting approval from competent authorities in respect of construction of "AIIMS medical facility" now therefore company has nominated Sh. SB Singh as authorized signatory to represent the company before the competent authorities for approval purpose.

The contact details are as follows:

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PROJECT BACKGROUND

- The All India Institute of Medical Sciences (AIIMS) was established in 1956 as an institution of national importance by an Act of Parliament to develop patterns of teaching in undergraduate and postgraduate medical education in all its branches so as to demonstrate a high standard of medical education to all medical colleges and other allied institutions in India; to bring together in one

place educational facilities of the highest order for the training of personnel in all important branches of health activity and to attain self-sufficiency in postgraduate medical education.

Objectives of AIIMS

- To develop a pattern of teaching in undergraduate and postgraduate medical education.
- To attain self-sufficiency in postgraduate in medical education.
- Government of India proposes to establish a New All India Institute of Medical Sciences (AIIMS) at Kothipura, District Bilaspur Himachal Pradesh, India, under ***Pradhan Mantri Swasthya Suraksha Yojna (PMSSY)***.
- The proposed AIIMS facility is to be set up in village kathipura, tehsil& district Bilaspur, Himachal Pradesh.
- The site is having total plot area of 243.98 acre (98.73 hectare), which will be developed in 3 phases. Presently development shall take place in phase-I which is having net area of 231.71 acre (93.76 hectare).This shall be 750 Beds super specialty hospital with institutional as well as residential facilities, like Medical College (at undergraduate level with annual intake of 100 students and PG/Doctoral Courses in various Specialty/super-Specialty disciplines) Nursing College, AYUSH block, Auditorium, Dharma Shala, Guest House , Hostels, and other ancillary requirements to make the campus self-sufficient and self – sustainable.

LAND DESCRIPTION

Total land required for the construction of medical facility shall be 1331-19 bighas, out of which 793-13 bhighas land has been transferred from animal husbandry and revenue department. However 538-06 bighas land is under forest department and for transfer of the land application has been submitted for forest clearance.

DESCRIPTION OF REGULATIONS AND STANDARDS

Table 1-1 Summary of environmental legislation, policy and guidelines as applicable

Legislation	*Areas/ Activities Covered*
Environment (Protection) Act, 1986 with Rules.	• ***Overall Environment Protection*** • ***Compliance to environmental (Air, Water, Noise) Standards issued under EPR 1986***

EIA Notification, 1994, 2006,2009 & subsequent amendments	• ***Prepare EIA / EMP report*** • ***Obtain Environmental Clearance from MoEF/SEIAA***
Air (Prevention and Control of Pollution) Act, 1981 with Rules. Water (Prevention and Control of Pollution) Act, 1974 with Rules.	• ***Protection of air and water quality*** • ***Consent to Establish (CTE) for establishing and Consent to Operate (CTO) for activities causing air and water pollution from SPCB*** • ***Compliance to National Ambient Air Quality Standard and standards related to water quality***
Water Cess Act, 1977, Amended 2003	• ***Paying water cess to pollution control board for consumption of water***
Noise Pollution (Regulation and Control) Rules, 2000, Amended 2010	• ***Compliance with ambient noise and emission standards in accordance to use classification for the area***
Hazardous and Other Waste (Management and Transboundary Movement Rules, 2016)	• ***Obtaining Authorization from SPCB for handling and storing of hazardous waste like waste oil and lubricants*** • ***Following guidelines for handling and storing of such hazardous waste***
Wildlife Protection Act, 1972, amended 2010	• ***Lays down rules and regulations pertaining to Wildlife Sanctuaries, National Parks.*** • ***Obtain NBWL Clearance if site is within protected radius of WLS/NP/ Protected Areas***
Solid Waste Management Rules,2016	• ***Management (Collection, Handling, Intermediate Storage) of domestic waste from residences***
Fly ash Notification, 2007	• ***Use of fly ash (wholly or partly) in building construction wherever it costs same or less than the clay, limestone, sand etc. and is not technically infeasible, compliance of which shall be the duty of the person/ agencies undertaking construction***

2. PROJECT DESCRIPTION

SITE LOCATION AND ITS SURROUNDINGS

Project site is located at Khasra Nos. 103/97/92/69/1,103/97/92/69/2, 102/97/92/69/2/1, Village- Changer plasian, Khasra Nos. 9/1, 7,5,10,316/14/2,6,402/208/3/1 Village- Noa, Khasra Nos. 86 ,1510/87/1, 99, 300/1 Village-Rajpatra, Tehsil- Sadar, District-Bilaspur, HP

Project site is located in village kathipura, spreading over an area of 243.98 acre. Site co-ordinates with project location are as follow.

Table 2-1-Geographical co-ordinates of the site

Description	Details
Corner-1	31°17'35.03"N 76°46'34.93"E
Corner-2	31°17'36.88"N 76°46'38.47"E
Corner-3	31°17'36.69"N 76°46'43.80"E
Corner-4	31°17'36.22"N 76°46'48.96"E
Corner-5	31°17'35.83"N 76°46'54.28"E
Corner-6	31°17'36.88"N 76°47'2.41"E
Corner-7	31°17'36.13"N 76°47'8.76"E
Corner-8	31°17'31.95"N 76°47'12.83"E
Corner-9	31°17'31.83"N 76°47'2.20"E
Corner-10	31°17'31.95"N 76°47'12.83"E
Corner-11	31°17'25.55"N 76°47'16.06"E
Corner-12	31°17'22.05"N 76°47'8.81"E
Corner-13	31°17'23.04"N 76°46'54.20"E
Corner-14	31°17'18.30"N 76°46'49.75"E
Corner-15	31°17'8.63"N 76°46'59.49"E
Corner-16	31°17'8.30"N 76°46'43.98"E
Corner-17	31°17'11.57"N 76°46'42.67"E
Corner-18	31°17'10.83"N 76°46'36.20"E
Corner-19	31°17'15.78"N 76°46'41.51"E
Corner-20	31°17'23.10"N 76°46'42.53"E
Corner-21	31°17'25.21"N 76°46'44.28"E

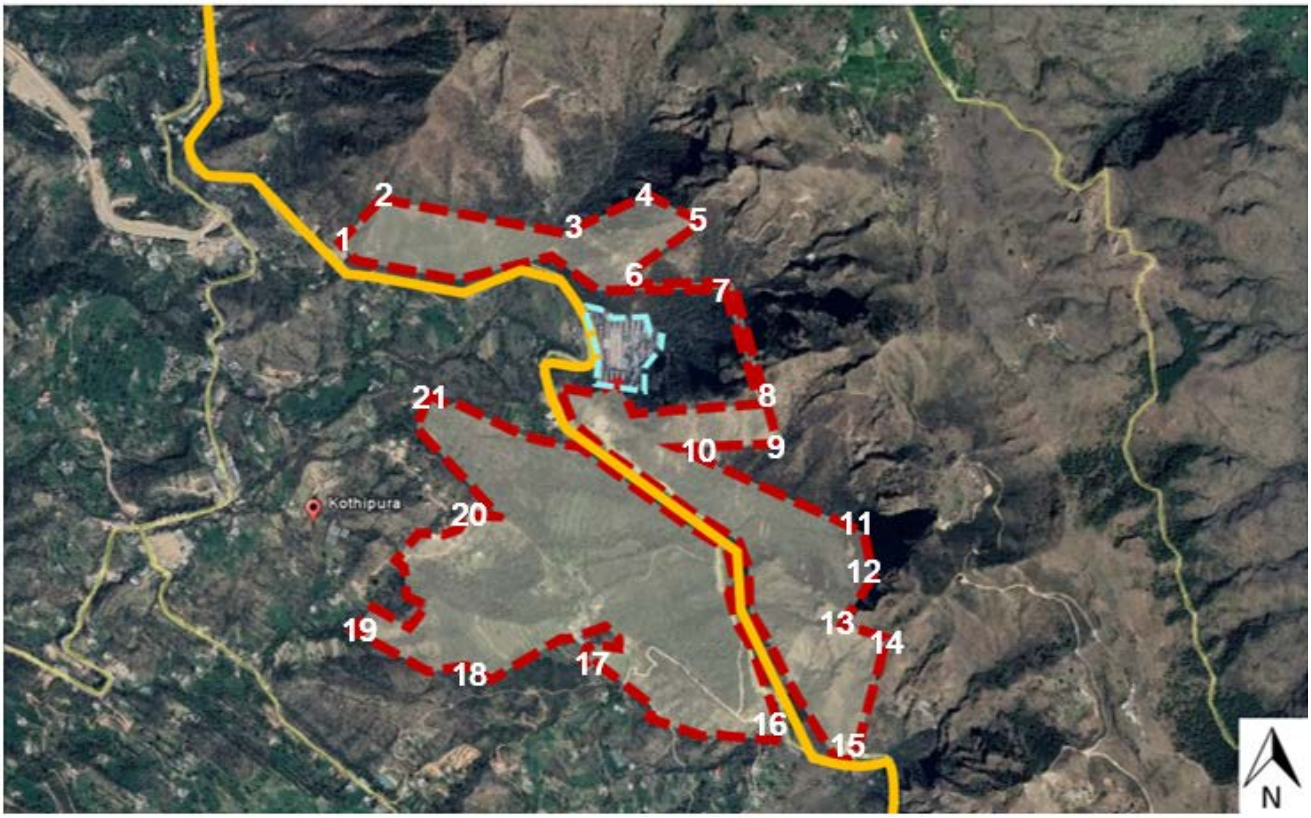


Figure 2-1 project boundary with site co-ordinates

SITE CONNECTIVITY

Project site allotted for proposed facility is comes in village changer plasian, Noa and Rajpatra. Site is divided by NH 205 (Shimla-kangra/Shimla Ghumarwin road). At present, road transportation is less as habitation around the site is scarce, however JNV kathipura is adjacent to the site. Surroundings and sensitivity areas within 15 km are stated below.

Table 2-2- Project site and surroundings

S.No.	Particulars	Name	Distance 'n' Direction (approx.)
1.	Nearest Railway Station	Kiratpur Sahib Railway Station Bharatgarh Railway Station Anandpur Sahib Railway Station	23.85 km in SW 26.67 km in SSW 26.84 km in WSW
2	Nearest Airport	Shimla Airport	34.85 km in SE
3	Nearest Populated Area	Kothipura Parangal Gowahan Changar Palasiyan	0.64 km in SSW 0.21 km in N 0.87 km in SW 0.64 km in ESE
4	State Boundary	Himachal Pradesh - Punjab state border	15.95 km in WSW
5	Nearest Roads	Road toward nauni Shimla Kangra Road/NH 205	Approx. 0.16 km in NW In between the site
6	Nearest School	DAV School Jawahar Navodaya Vidhyalaya Government Sr. Sec School Anand Marg Primary School	4.42 km in N 0.76 km in SE 0.84 km in SSW 1.47 km in NW
7	River	Sutlej River	2.94 km in WNW

(Source: Google Earth Pro)

AREA DETAILS

Total site are of the proposed AIIMs facility is 243.98 Acre, However the construction and development shall be proceed in phased manner (Phase I, II & III), at presently, planning and construction under phase I is being proposed which is having plot are of 231.71 acre. The proposed site shall be having healthcare facility, academic & residential components. Planning is done in such a way so that the disturbance to natural topography and vegetation shall be minimal. Major components of proposed site are as follow.

1. 750 bedded hospital including Ayush.
2. Teaching block for 100 MBBS students.
3. Nursing college for 60 students
4. Admin block
5. Type 2, 3,4,5,6 housing
6. Hostels: UG, PG & nursing hostel
7. Dining halls
8. Auditorium
9. Night shelter & amenities
10. Guest house
11. Food court
12. Service blocks

Detailed area statement given in table below.

Table 2-3-Area statement

S.No.	Particulars	Area (m^2)	Area (Acre)
1.	**Total Area of Plot (A)**	9,87,352.03	243.98
2.	**Plot area under phase-I (B)**	9,37,697.10	231.71
3.	Permissible Ground coverage (@35% of B)	3,28,193.985	
4.	Proposed Ground coverage for hospital(@6% of B)	56,261.83	13.90

5.	Proposed GC for Residential (@ 3% of B)	28,130.91	6.95
6.	Permissible FAR for hospital (@1.5) Permissible FAR for residential (@ 1.75)	14,06,545.65 16,40,969.925	
7.	Proposed FAR For hospital For residential block	1,20,723 71,524 49,199	
8.	Proposed Green area (@37.05 % of B) • Area under green belt • Organized green	3,27,188.34 45,658 2,81,530.34	80.85
9.	Open Area	5,26,116.02	130
10.	Stilt area (academic parking)	900	
11.	**BUILT UP AREA**	**1,65,011**	
12.	Road area	60,500	
13.	Non FAR Area	43,388	
14.	Height of the building	29mtrs	

LEGEND : -

01 - PHASE I - OPD & DIAGNOSTICS
PHASE II - AYUSH **(2 floors)**
02 - HOSPITAL BLOCK **(7 floors)**
03 - ACADEMIC BLOCK **(6 floors)**
04 - HOSTELS
05 - TYPE II & III RESIDENTIAL ZONE **(9 floors)**
06 - TYPE IV & V RESIDENTIAL ZONE **(9 floors)**
07 - DIRECTOR'S RESIDENCE **(2 floors)**
08 - NIGHT SHELTER & AMENITIES **(2 floors)**
09 - SERVICE BLOCK (ESS 2/3 & HVAC PLANT)
10 - CONVENTION CENTRE **(2 floors)**
11 - GUEST HOUSE **(2 floors)**
11a - CLUB
12 - PARKING
13 - STP
14 - GRAND ARRIVAL PLAZA
15 - MAIN RECEIVING STATION
16- DINING / CONVENIO
17- PUMP ROOM
17a - PUMP ROOM FOR HOUSING ZONE
18- FOOT OVER BRIDGE
19- UNDERPASS
20- BUS / TAXI / AUTO / E-RICKSHAW STAND
21- ENTRY TO SERVICE ROAD FOR AIIMS
22 - MAIN GATE
23 - GATE 1 (MAIN ENTRY TO AYUSH BLOCK)
24 - GATE 2 (MAIN ENTRY TO CONVENTION CENTRE
24a - CONVENTION PLAZA
25 - GATE 3 (ENTRY TO HOUSING ZONE)
26 - WATER BODY
27 - SHOPPING BLOCK
28 - CENTRAL GREEN
29 - PLAY FIELD
30 - FOOD PLAZA
H HELIPAD

***Figure 2-2** showing proposed components of the site*

PROJECT COST

Total project cost of the site is 1,138 crores.

POPULATION DENSITY

During the construction phase

The total manpower requirement during construction phase of the area will be an approximate 1000-1500 person which includes workmen, labourers, supervisors, engineers, architect and manager

During the operational phase

Proposed AIIMS facility shall have 750 beds hospital block with Ayush, teaching block for 100 students, 52 beds facilities in night shelter, auditorium of 600 seats capacity and other facilities. Total population for the proposed facility has been calculated as 9,663 persons including residents, teaching and non-teaching staff and visitors.

The detailed population breakup is given in the tables below.

Table 2-4-Population details for proposed area

S. No.	*Description*	*Floor Area (m^2)/DU*	*Occupant Load, Floor Area in m^2/Person*	*Total Population*
A.	**Hospital Building**	G+6		
	No. of Beds (IPD)	720 beds	*1 person/bed*	720
	Regular Staff			300
	• Doctors		*10 m^2/person*	
	• Administrative Staff			
	• Nurses/Ward Boys			
	Attendants		*1 person/bed*	720
	OPD		*10 m^2/person*	5,000
	Visitors			67
B.	**Ayush Block**	G+1		
	Beds	30 beds		30
	Regular staff		*10 m^2/person*	10
C.	Medical & Nursing College	S+G+5		
	MBBS students	100 seats	*1 person/seat*	100
	Nursing students	60 seats	*1 person/seat*	60
D.	Guest House	G+1	*1 person/room*	10
E.	Hostels			
	Nurse hostel	G+ 9 (123 rooms)	*3 persons/room*	369
	UG boys hostel	G+5 (104 rooms)	*2 persons/room*	208
	UG girls hostel	G+2 (44 rooms)	*2 persons/room*	88

	PG Hostel For boys For girls For Married	 G+5/7 (272 rooms) G+5 (117 rooms) G+4 (130 rooms)	 *1 person/room*	 272 117 130
	Visitors			15
F.	Housing Type II & III Type IV & V Director's residence	 G+7/3 (100 units) G+8 (36 units) G+2 (2 units)	 *5 persons/unit*	 500 180 14
	visitors			35
G.	Shopping area staff visitors	G (200 m^2)	*3 m^2/person*	 7 59
H.	Night shelter & amenities	G+1 (52 beds)	*1 person/bed*	52
I.	Auditorium	G+2 (500 seats)	*1.2 × no. of seats*	600
	Total Population (A-I)			**9,663**

WATER DEMAND PER CAPITA AND WASTEWATER GENERATION

FRESHWATER DEMAND AND SOURCE

CONSTRUCTION PHASE

The water requirement during the construction phase comprises of (i) fresh water for labourers, (ii) construction water.

Table 2-5-water demand during construction phase

Description	**Area in m^2 (Total)**	**Total Occupancy**	**Rate of water demand**	**Total water requirement**
Labors	-	250	45 lpcd	11.25 KLD
Water curing	1,20,723	-	17.81 kl/m^2	2,150 ML

(Source:- Assessment of water resource consumption in building construction in India,S. Bardhan, Dept. of Architecture, Jadavpur University, India)

It is estimated approx. 11 KLD of fresh water will be required for drinking purpose which will be imported in form of bottled cans from the local fresh water supplier during the days of construction.

It is envisaged that approx. 2,150 ML of treated/fresh water will be required for the water curing of building structures.

OPERATIONAL PHASE

Total water demand for the project including main and other uses will be 1,372 KLD. Main source of supply shall be municipal supply. The domestic Water demand for the

building shall be approx. 768 KLD. For any shortage, the water shall be augmented from the tube well/ tanker water for the proposed buildings after obtaining proper permission from the concerned department, if required.

There will be a dual plumbing system for use of water for different applications thus saving on the high quality water. Installation of dual plumbing for using recycled water will save the potable water from authorized water agency. There will be two pipe lines, one supplying freshwater for drinking, cooking etc. And other for supply of recycled water for flushing, landscape irrigation, etc. this will result in saving of fresh water demand and life of existing sewerage will be improved. Other water conservation measure shall also be adopted to conserve water.

Table 2-6-water conservation measure

Measures	Type
Water Conservation Fixtures	Dual plumbing cisterns, Dual flushing system, low flow taps, low flow urinals, sensor-based taps in commercial areas and facility areas, low faucet taps, low flow showers, tap aerators, auto control valves and pressure reducing devices
Monetary Measures	Metering (flow water) and pricing of water
Leakage Prevention	Timely detection of leakages in pipeline & tanks
Wastage Prevention	Alarms for filling of tank
Storm water harvesting	Storm water collection and recharging system. Recharge pits to be provided for recharging collected rain water to ground.

Storage structures in form of underground tanks will be constructed within the project site for storage of water. Storage shall be provided for one day requirement. Detailed water consumption at the site is given in table below.

Table 2-7-Water demand for the operational phase

Sl. No.	Description	Total Population/Area in (m^2)	Unit water Consumption (LPCD)	Total Water Requirement (KLD)
1.	***Main Uses***			
a)	***Hospital Block***			
	IPD (Patients)	750	450	337.5
	Regular Staff	310	45	13.95
	OPD	5,000	15	75
	Attendants	750	45	33.75
	College Staff+ Students	160	45	7.2
	Visitors	67	15	1.005
b)	***Night Shelter***	52	135	7.02
c)	***Auditorium***	600	45	27
d)	***Shopping Complex***			0

	Visitors	59	15	0.885
	Staff	7	45	0.315
e)	***Hostels***			0
	Residents	1184	135	159.84
	Visitors	15	15	0.225
f)	*Residential units*			0
	Residents + servant qtr.	694	135	93.69
	visitors	35	15	0.525
	Dining (100 capacity)	3 meals	35	10.5
	Sub- Total of main uses			**768.405**
	Say			768 KLD
2.	***Other Uses***			
a)	***OT, blood bank, lab.***			30.00
b)	***laundry***	(@3.0 kg linen per bed) (2,250 kg)	20 l/kg/day	45.00
c)	***Landscape area***	(2,81,530.34)	1 ltr/sq.mtr	282
d)	***DG cooling***	(16,750 kVA)	0.9lt/hr/kVA	90.45
e)	***HVAC***	(3,200 TR)	7lt/TR/hr	157
	Sub-Total (KLD) of other Uses			***604.45***
	Say			***604 KLD***
	Grand Total (1+2)			***1,372 KLD***

Table 2-8-Wastewater calculation with respect to ETP

S. No.	Description	Quantity (KLD)
01	Fresh and flushing water requirement for the hospital including: • IPD (@15% of total IPD water requirement) • OPD (@5% of total OPD water requirement) • OT, Blood bank, Laboratory Laundry-750 beds (20 lt/kg/bed) (2,250 kg)	129.37 50.62 3.75 75
02	Wastewater going to ETP @ 80% of (129.37 KLD)	103.49 say 104 KLD
03	**ETP Capacity**	**125 KLD**

Table 2-9- Wastewater Calculation with respect to STP

S.No.	Description	Quantity (KLD)
01	Fresh water requirement for the other blocks (excluding IPD, OPD,) @ 70% of (768 – 129.37 = 713.63 KLD)	500 KLD
02	Flushing water requirement for the other blocks @ 30% of (768-129.37 = 713.63 KLD)	214 KLD
03	Wastewater Generation @ (80% of Freshwater + 100% of Flushing)	614 KLD
04	**STP Capacity**	**735 KLD**

Table 2-10- Summary of Water available for Reuse and Recycle

S.No.	Description	Quantity (KLD)
A)	**Recycled Water Available *@90% of Waste Generated***	**491 KLD**
B)	**Recycled Water Required**	**743**
01	For Flushing Purposes	214
02	For Landscape	282
03	HVAC cooling +DG Sets	247
	Make up water required (B-A)	**252 KLD**

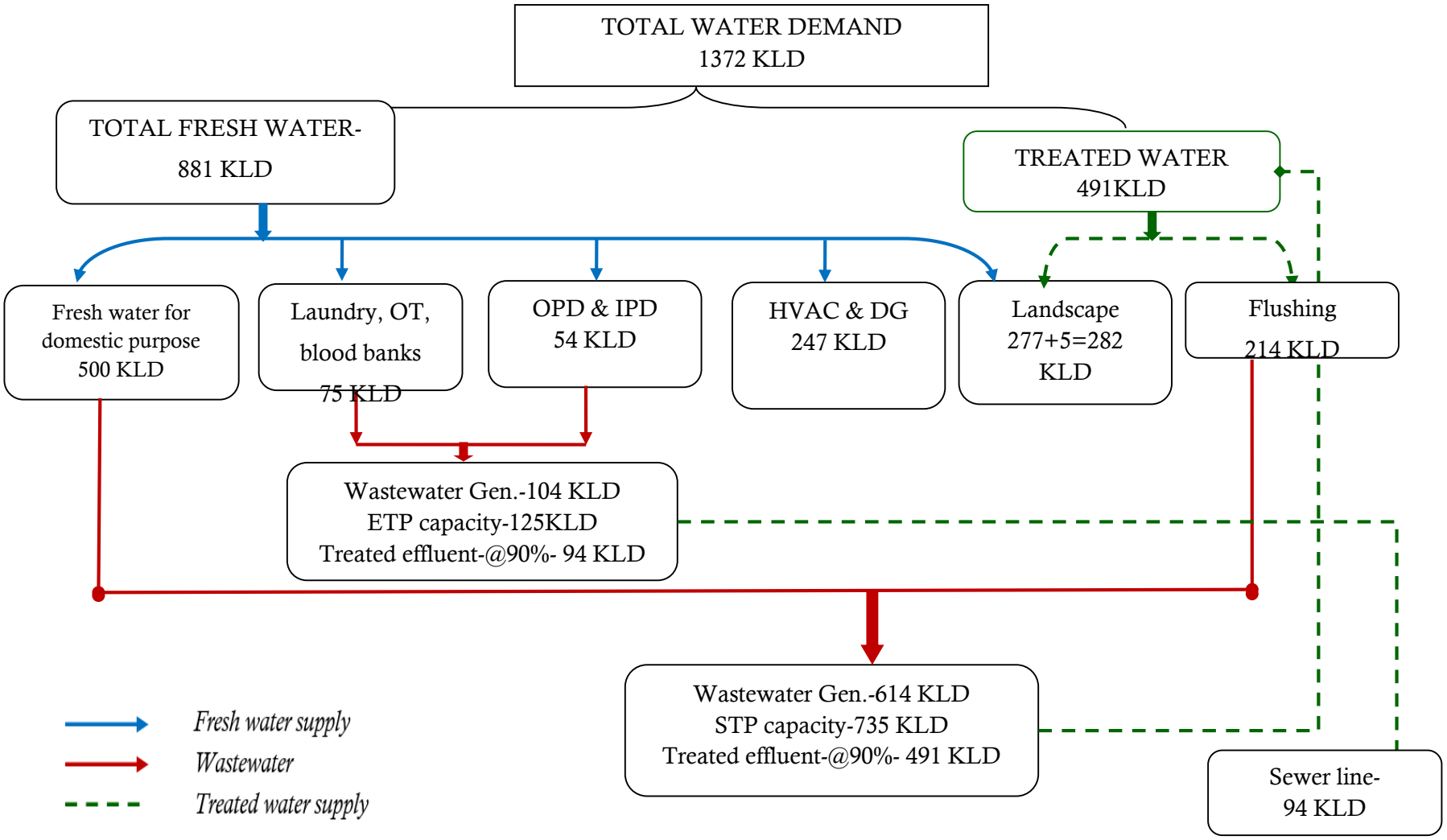


Figure 2-3-Water balance diagram for non-rainy season

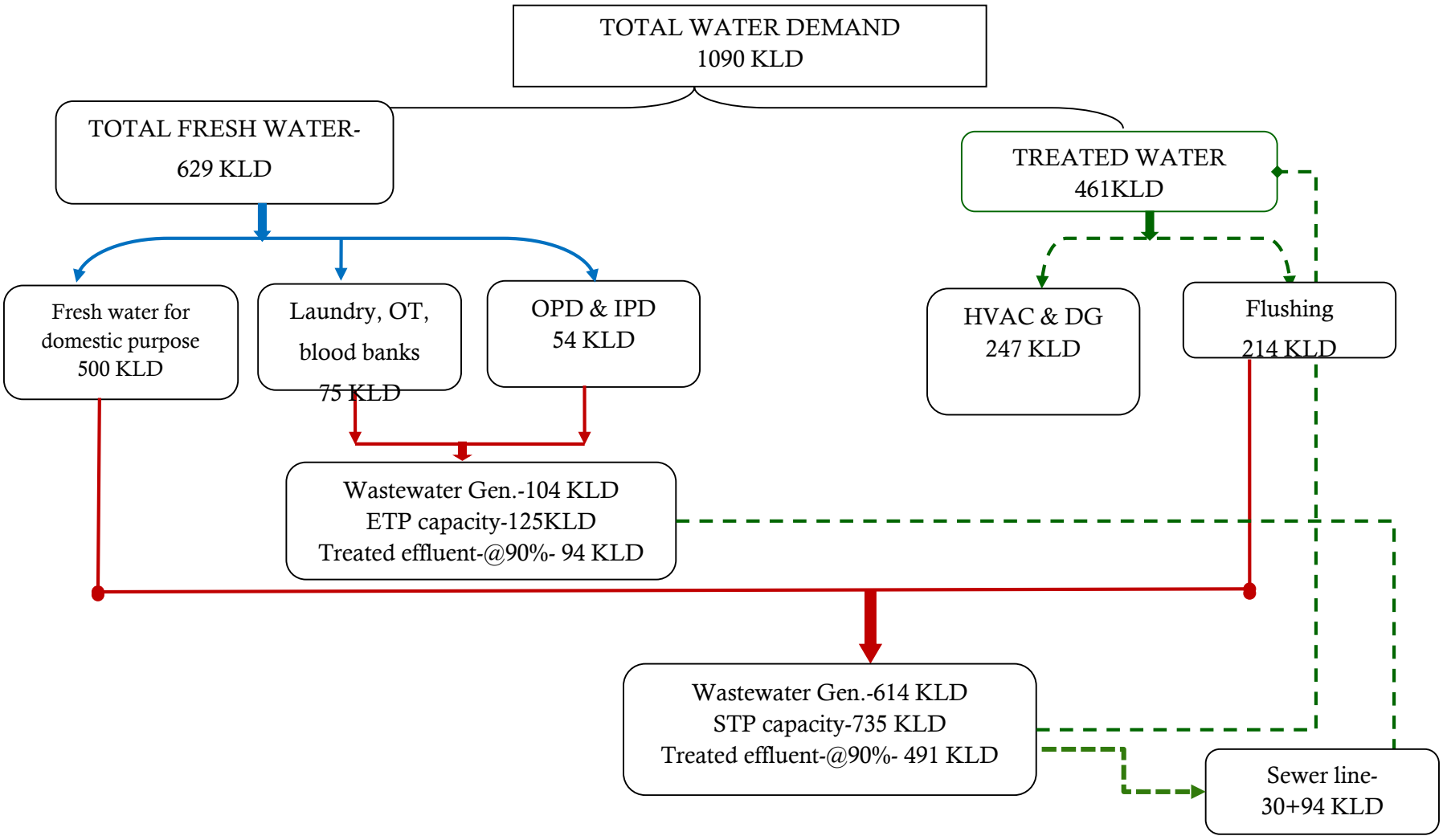


Figure 2-4- Water balance diagram for rainy season

WASTEWATER GENERATION AND TREATMENT

DURING CONSTRUCTION PHASE

The quantity of sewage generation during the construction phase will be approx. 4.68 KLD. Thus, the sewage will be treated by providing small septic tanks, soak trenches and Sulabh Shauchalaya type mobile toilets.

DURING OPERATIONAL PHASE

Quantity of sewage generated during operational phase from residential and other hospital facilities shall be approx. 614 KLD, however the effluent generate from the hospital's OT, blood bank, IPD etc. shall be approx.104 KLD. The domestic sewage will be treated through sewage treatment plant of capacity 735 KLD, and hospital effluent generated shall be treated in ETP of 125 KLD. After treatment, effluent shall be disposed to the municipal drain .However the treated domestic wastewater shall be recycle and re use within premises. The treated sewage will be re used for flushing (214 KLD) greenbelt development (277 KLD), surplus treated water requirement during non- rainy season shall be met via fresh water supply. However during rainy season treated water shall suffice water requirement for flushing and HVAC cooling.

SEWAGE TREATMENT TECHNOLOGY

The design of sewage network shall be done in accordance with the CPHEEO guideline, NBC guidelines and reverent Indian Standards. Sewage generation is assumed to be 100% of flushing water and 80% of domestic water.
The following parameters/ site conditions shall be kept in mind when designing the sewage, Sludge and storm water drainage system.

- Natural slope of the area.
- Layout of different facility in the complex;
- Possibility of using complete or part of the existing sewage network;
- Sub-soil water table;
- Provision of Sewage lifting station; (if required)
- Provision of venting arrangement for manholes;
- Construction of manholes & laying of pipes considering ground condition;
- Termination of vent cowl at terrace level;
- Provision of adequate slope for horizontal header in the under slung pipes especially for public toilets

- Sewage flow starts with fractional capacity and builds up to full capacity in due course. An operational plan to meet this demand from a low flow to full flow will be part of the design.

An external sewage network shall collect the sewage from all units, and flow by gravity to the proposed sewage treatment plant.

Following are the benefits of providing the Sewage Treatment Plant in the present circumstances:

- Reduced net daily water requirements, source for Horticultural purposes by utilization of the recoverable waste water.
- Reduced dependence on the public utilities for water supply and sewerage systems.
- Sludge generated from the Sewage Treatment Plant shall be rich in organic content and an excellent fertilizer for horticultural purposes.

Wastewater details are given in below

Table 2-11-Wastewater Details

Particulars	Quantity	
Daily load	614 KLD	
Duration of flow to STP	24 Hours	
Temperature	32^0 C	
	Inlet	Outlet (Treated Wastewater)
pH	6.0 – 8.5	6.0-8.5
S.S. (mg/l)	200-450	Less than 20 mg/l
BOD5 27^0 C (mg/l)	250-400	Less than 10 mg/l
COD (mg/l)	600-800	Less than 30 mg/l
Oil & grease ABS (mg/l)	Up to 20 mg/l	Less than 05 mg/l
E. coli	$>10^6$ MPN	$< 10^3$ MPN

Technology

The technology is based on attached growth aerobic treatment followed by clarification by a tube settler. Lime will be dosed in for suppression of foaming tendencies. The clarified water will be filtered in a pressure sand filter after dosing of coagulant (alum) for removal of unsettled suspended impurities. This water will be passed through an activated carbon filter for removal of organics. The filtered water from ACF is then chlorinated & stored in the flushing tank. The attached growth fluidized aerobic bed reactor (FAB) process combines the biological processes of attached & suspended growth. It combines submerged fixed film with extended aeration for treatment of the waste water.

The waste water after screening is collected in an equalization tank. The equalization tank is required for preventing surges in flow & facilitating equalization of characteristics over the entire quantity of effluent in a given time. A provision for pre-aeration is made in the equalization tank in order to ensure mixing & to prevent the sewage from going septic.

The equalized sewage is then pumped into the FAB reactor for biological processing. The water enters the bottom of the reactor & flows up through the fixed film media which grossly enhances the hydraulic retention time & provides a large surface area for growth

of biological micro – organisms. The FAB reactor is aerated by fine pore sub – surface diffusers which provide the oxygen for organic removal. The synthetic media floats on the water & the air agitation ensures good water to micro-organism contact.

The FAB treatment is an attached growth type biological treatment process where in, the majority of biological activity takes place on the surface of the PVC media. Continuous aeration ensures aerobic activity on the surface of the media. Micro – organisms attach themselves on the media & grow into dense films of a viscous jelly like nature. Waste water passes over this film with dissolved organics passing into the bio-film due to concentration gradients within the film. Suspended particles & colloid may get retained on this sticky surface where they are decomposed into soluble products. Oxygen from the aeration process in the waste water provides oxygen for the aerobic reactions at the bio-film surface. Waste products from the metabolic processes diffuse outward & get carried away by the waste water or air currents through the voids of the media.

The aerated effluent passes into a tube deck settler for clarification. The theory of gravity tube settler system is that the carrier fluid maintains laminar flow in the settling media at specified maximum viscosity. These two parameters of a carrier fluid, flowing through a hydraulic configuration, will determine the velocity gradients of the flow, the height of boundary layer at the inclined surface and the residence time within the media.

The carrier fluid must be viscous Newtonian, exhibiting a Reynolds number of less than 1000 and preferably, a number under 400. The laminar flow, through the inclined tubes, will produce velocity gradients sufficiently large to form an adequate boundary layer, where the velocity of fluid approaches zero. Boundary layers are necessary in functioning tube settlers, to allow suspended solids to separate from the viscous carrier fluid. Under gravitational forces, they will settle to the hydraulic surface of the tube and subsequently from the clarifier media.

Since the tubes are inclined at 60 degrees, solids settled on the tubes are continually discharged down. This downward rolling action increases particle contact and hence further agglomeration, which increases the sludge settle ability. Studies show that these agglomerated sludge particles can have a settling rate in excess of ten times the settling rate of the individual floc particles in the influent. These heavy agglomerated masses quickly slide down the 60 degree inclined tube and settle at the bottom of the tank.

Excess sludge from the bottom of the Tube settler shall be transferred into an adjoining aerobic digester cum thickener tank. In this tank sludge shall be aerated. The air shall be shut off periodically and supernatant water will be led back into the Equalization Tank. This way the sludge shall be thickened and its volume shall be reduced. The thickened sludge will be further solidified using a centrifuge or a filter press and the solid cakes will be used as manure in horticulture.

The treated and disinfected water from the Chlorine Contact Tank will be passed through a Multigrade Filter, an Activated Carbon Filter and a Softener and then stored in a Treated Sewage Water Tank. Water from this tank will be used for the Cooling of DG system and for horticulture and other recreational activity within the site.

Preventive measures to Avoid Leaching

Treated sewage from Sewage Treatment Plant will be conveyed to Treated Sewage Tank through pipelines. All the joints from piping system will be checked periodically and carrying treated wastewater pipes will be laid in conduits wherever road crossings are expected. Thus no leaching of treated sewage into nearby water courses shall take place. Supervisors will be employed for overall operation & maintenance of water supply, waste water treatment and other utility services.

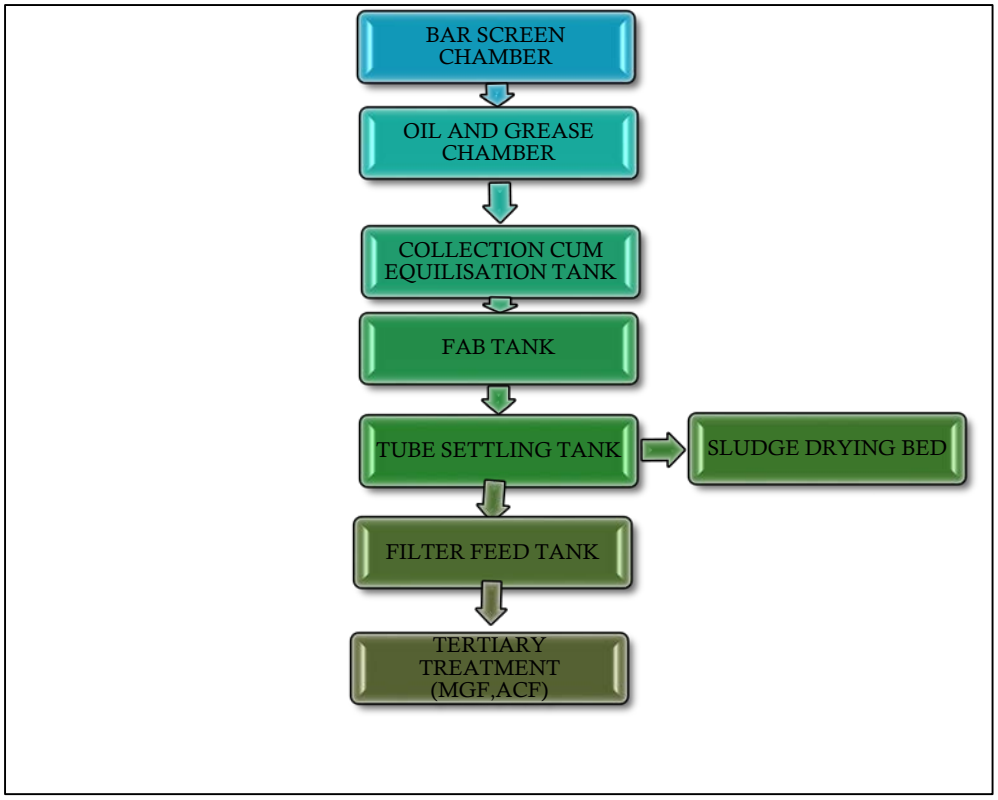


Figure 2-5-Process and Instrumentation of STP technology

EFFLUENT TREATMENT TECHNOLOGY

The main objective of Effluent Treatment Plant (ETP) is to remove as much of the suspended solids and organic matter as possible before the waste water is discharged back to the environment. When untreated wastewater mixes with groundwater it can create significant health risks by causing serious infectious diseases to people who have suppressed immune systems.

1. Preliminary Stage: This stage is also called as pretreatment which is the most essential treatment process in most of the ETP. It involves bar screens which comes in variety of shapes and sizes to remove large sized suspended solids like paper, plastics, metals, debris, rags and many such from incoming raw wastewater/sewage. If these materials are not removed then they may cause serious damage to plant equipment's. When wastewater enters into grit chamber, it slows down the flow of water and thereby removes sand, grit, sand stones and this process is called as sedimentation.

2. Primary Stage: It uses physical and chemical methods to improve the quality of the wastewater which was not achieved in previous stage. When wastewater enters to sedimentation tank or primary clarifiers, heavier solid particles settle to the bottom of the tank and lighter particles will float up and will be skimmed off from top of the surface using a process called skimming and thereby removing 60-65% of total suspended solids from liquid wastewater. This stage may use grit chamber to remove grit. The settled solid is known as primary sludge which will send to sludge digester for further processing. Now partially clarified water flows on to the next stage.

3. Secondary Stage: This is the stage which can remove about 80-90% of organic matter by using a process called biological treatment methods. Most of the hospital ETP uses "activated sludge process" in which liquid wastewater enters into aeration tank where wastewater mixes with air to encourage the growth of microbes and hence breakdown of organic matter takes place. When aerated water enters into secondary clarifier, floatable matter will be removed and heavier matter settles to bottom which is called as "active sludge" or secondary effluent. Part of the sludge which still contains microbes will be re-circulated back to aeration tank to increase the rate of organic matter decomposition. The left over microorganisms are handled separately in next stage called disinfection.

4. Tertiary stage: This is the final stage which is also known as disinfection stage. This stage removes any residual suspended solids and other materials which were not removed in previous stages. The effectiveness depends on the quality of the water being treated. The major objective of disinfection is to reduce number of microorganisms in the waste water to be disposed into the natural environment. Disinfection technologies consist of ozone, chlorine, and Ultraviolet (UV) rays to eliminate toxic chemicals that exist in the wastewater. This stage removes nitrogen, phosphorous and other toxic contaminants.

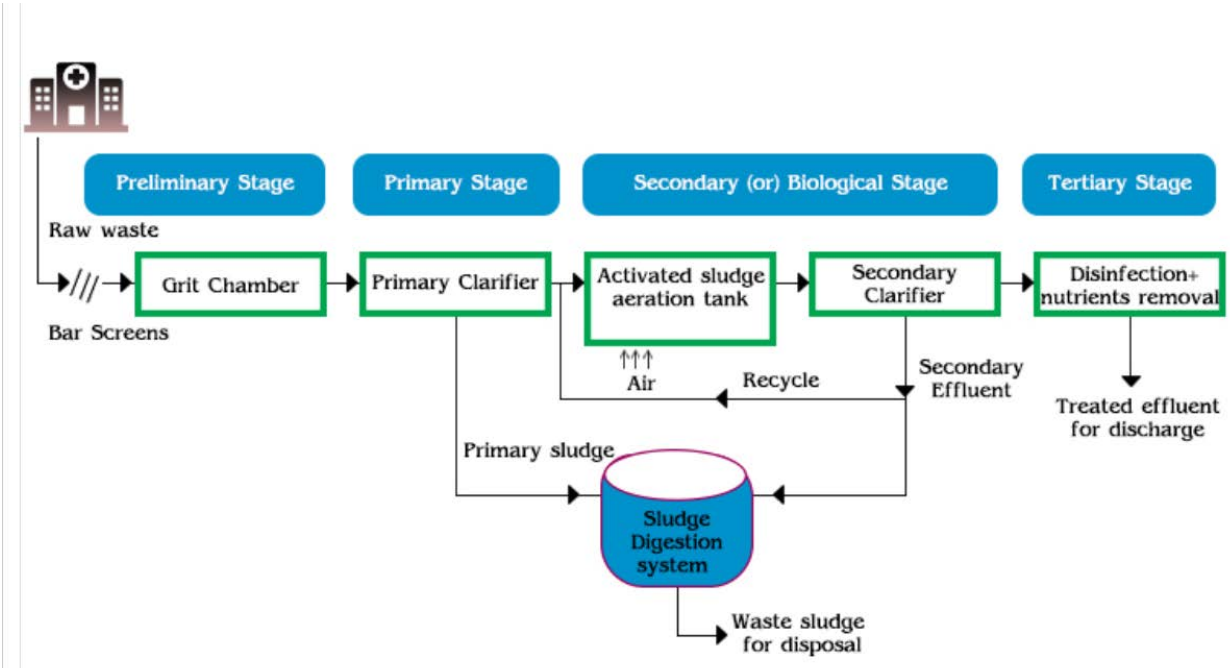


Figure 2-6-Conventional treatment process in ETP

PARKING DETAILS

The site is having emergency as well as OPD entry exit from the service road of 15 mtrs which is proposed to ease the traffic load from NH-205 which is passing through the site.is proposed at site. However the internal roads of various dimension are also proposed at site. Adequate provision shall provide for vehicle parking at the project site not to disturb the traffic and allow smooth movement at the site.

Proposed project will be having open and stilt parking. The parking space criteria and area requirement provided are summarized in the below tables. Parking details are as per local Building Bye Laws.

Table 2-12-Parking Required

(As per the EIA guidance Manual from MoEF& CC)	
Parking required for Hospital block for Residential block	 1 ECS @ 30 beds = 750 beds = 25 ECS 1 ECS @ 100 m^2 of proposed FAR = 1 × 49,199/100 = 492 ECS
Parking Required as per MoEF&CC	**= 569ECS**
As per the State Building Bye Laws	
Parking required For Hospital For Academics For Residential For Guest House For Night shelter and amenities For auditorium	 1.5 ECS @ 100 m^2 of area = 1.5 × 75,000/100 = **1,125 ECS** 1.5 ECS @ 100 m^2 of area = 1.5 × 23,350/100 = **350 ECS** 1 ECS @ 100 m^2 of area = 1 × 17,227/100 = 172 ECS 1 ECS @ 100 m^2 of area = 1 × 1,140/100 = **12 ECS** 1 ECS @ 100 m^2 of area = 1 × 2,025/100 = **20 ECS** 1 ECS @ 100 m^2 of area = 1 × 2,850/100 = **29 ECS**
Parking required as per state Building bye Laws	**= 1,708 ECS**

Table 2-13-Parking Proposed

For Hospital & Other facilities	
Proposed area in open	38,548 m^2
Parking Proposed(23 m^2/ECS)	38,548 /23 = 1,676 ECS
Parking Proposed (Stilt) Parking proposed (28 m^2 /ECS)	900 m^2 900 m^2/28 m^2 – 32 ECS
Total ECS Proposed	**1,708 ECS**

RAINWATER HARVESTING AND STORM WATER DRAIN

A rainwater harvesting system comprises components of various stages -transporting rainwater through pipes or drains, filtration, and recharging the ground water through tanks. Percolation structures will be constructed for ground water recharge.

Runoff from the first spell of rain carries a relatively large amount of pollutants from the air and catchments surface so the system will be provided with a filtration pit consisting of layers of sand, gravel and pebbles of relevant sizes to remove impurities from the collected rainwater.

NEED FOR RAINWATER HARVESTING

Surface water is inadequate to meet the daily demand and we have to depend on ground water.

- Due to rapid urbanization, infiltration of rain water into the sub-soil has decreased drastically and recharging of ground water has diminished.
- Rainwater harvesting prevents the flooding of low-lying areas in the site.

The storm water disposal system for the premises shall be self-sufficient to avoid any collection/stagnation and flooding of water. The amount of storm water run-off depends upon many factors such as intensity and duration of precipitation, characteristics of the tributary area and the time required for such flow to reach the drains. The drains shall be located near the carriage way along either side of the roads. Taking the advantage of road camber, the rainfall run off from roads shall flow towards the drains. Storm water from various areas/shall be connected to adjacent drain by a pipe through catch basins. Therefore, it has been calculated to provide 20 rainwater harvesting reservoir at selected locations, which will catch the maximum run-off from the area.

1. Since the existing topography is congenial to surface disposal, a network of storm water pipe drains is planned adjacent to roads. All building roof water will be brought down through rain water pipes.
2. Storm water system consists of pipe drain, catch basins and seepage pits at regular intervals for rain water harvesting and ground water recharging.

Rain water harvesting has been catered to and designed as per the guideline of CGWA. The recharge structure of various volume is constructed for recharging the water. Inside the recharge structure, a recharge bore is constructed having adequate diameter with PVC slotted pipe up to a layer where sandy aquifers/ deeper aquifer permeable layers exist. The bottom of the recharge structure will be kept 5 m above this level. At the bottom of the recharge well, a filter media is provided to avoid choking of the recharge bore. Design specifications of the rain water harvesting plan are as follows:

- Catchments/roofs would be accessible for regular cleaning.

- The roof will have smooth, hard and dense surface which is less likely to be damaged allowing release of material into the water. Roof painting has been avoided since most paints contain toxic substances and may peel off.
- All gutter ends will be fitted with a wire mesh screen and a first flush device would be installed. Most of the debris carried by the water from the rooftop like leaves, plastic bags and paper pieces will get arrested by the mesh at the terrace outlet and to prevent contamination by ensuring that the runoff from the first 10-20 minutes of rainfall is flushed off.
- No sewage or wastewater would be admitted into the system.
- No wastewater from areas likely to have oil, grease, or other pollutants has been connected to the system.

Table 2-14-Calculation for Storm water load

S. No.	Type of Surface	Catchment's Area (A)		Run off Coff. [C]	Rainfall Int.(mm/ hr) (I)	Discharge (Run Off) [Q=10CIA] m^3/hr	Total (m^3/hr) [Q]
		sq. m	Ha.				
1	Building						
G.C. Area		56,261.83	5.6	0.60	120	10×0.60×120×5.6	4032
Green Area		3,27,188.34	32.71	0.20	120	10×0.20×120×32.71	7850.4
Paved Area		60,500	6.05	0.75	120	10 ×0.75×120×6.05	5445
Total storm water volume calculated -**17,327.4 m^3/hr**							
2	Considering 15 mins (0.25) retention period						4331.85
3	Volume of Rain water harvesting structure					10 × 5 × 5	250 m^3
4	Total No. of Rain water harvesting structure required						17
5	Total No. of Rain water harvesting structure proposed						20

ELECTRICAL POWER REQUIREMENT AND BACK UP

The electrical load requirement has been calculated on the basis of covered area of various buildings/ blocks as per NBC 2016. State electricity board shall provide electric supply on 33 kV for meeting electrical load requirements of AIIMS, Bilaspur, by establishing 33/0.433 KV.

Table 2-15-Electrical Load Details

Power Requirement	Details
Transformer Selection	• Demand load estimated for the building is approx. **11,981 KVA.** Three Nos. 33/ 0.433 kV Electric Substations will be established

	1. ESS-1 [Hospital Block]-Transformers- **5 × 2000 KVA** each (4W+1S) are proposed with RTCC Panels. Location of ESS-1. It will meet the electric load requirement of Hospital Block, Residence Zone Type-IV & V, Director's Residence, and Guest House etc. 2. ESS-2 [Residential Admin Block] - **3 × 1600 KVA** (2W+1S) are proposed with RTCC Panels. Location of ESS-2. It will meet the electric load requirement, Academic Block, Residential Zone Type-II & III, Dharamshala, AYUSH Block, etc. 3. ESS-3 [Service area] - **4× 1600 KVA** (3W+1S) are proposed with RTCC Panels. Location of ESS-3. It will meet the electric load requirement of Hostel Blocks, ESS/HVAC Plant, and STP etc.
Source of Power Supply	HPSEB
DG proposed	ESS-1(Hospital Block)- **4 × 2000 kVA** each ESS-2 (Residential Admin block)- **3× 1250 kVA** each ESS-3 (Service area)- **4 × 1250 kVA** each
Stack Height	As per CPCB norms and Local Authority

HSD (HIGH SPEED DIESEL) UG STORAGE TANK & PUMPING SYSTEM:

HSD Storage Tank & Pumping System shall be provided for continuous pumping of HSD to the DG Sets installed in various substations. Underground HSD tanks shall be located as per CPCB/NFPA /Local bylaws. Underground Diesel storage tank of **3 × 20 KL** capacity along with Auto fuel transfer system comprising of suitable number and capacity of fuel pumps (working & standby) with underground pipeline from underground diesel tank up to the buffer diesel tanks in ESS-1, ESS-2 and ESS-3 shall be provided. Fuel Transfer Pumps shall be flame proof, rotary gear, positive displacement type or as required for HSD pumping application. Underground tanks, buffer tanks, piping, fuel pumps, valves, cabling, control/ level switches, earthing etc. shall be provided as per CPCB/NFPA/NBCC/Local bylaws.

Necessary licenses or approvals for diesel storage shall be obtained before installation of UG diesel storage tank and pumping station from Local Administration and Chief Controller of Explosives, Petroleum & Explosives Safety Organization, and Bilaspur.

EARTHING SYSTEM

Earthing with Maintenance free Chemical earthing system/GI Earthing System/Copper Earthing system, as required, shall be provided for earthing sub stations equipment's, Electrical Panel boards, UPS and other Equipment /installations in each building. Earthing shall be in conformity with provisions of rule 32,61,61, 67 & 68 of Indian

Electricity Rules 1956 & as per IS-3043 as amended up to date. Copper/GI earth strips shall be used for connecting the Electrical equipment's and Medical equipment's with earthpits as required. Earth leakage circuit breakers shall be provided in the DBs for individual units. Separate and distinct earth stations with insulated electrode shall be provided for the following:

- HT Panels
- Main LT Panels & LT Distribution Panels
- UPS system – Body & Neutral
- EPABX & LAN Server
- Transformers - Neutral & Body
- DG Sets - Neutral & Body
- Laboratory
- Modular OT's
- Lifts
- All types of Medical Equipment
- Any other equipment as required.

All three phase electrical installations shall be provided with double Earth connection and single phase electrical installations with one Earth connection as per IS specifications & NBC 2016.

FIRE DETECTION / ALARM SYSTEM

Addressable Intelligent fire detection and Alarm system of latest technology with Fire alarm panels, multi Sensor detectors, smoke detectors, heat detectors, beam detectors, response indicators, manual call point and hooters, light strobe etc. shall be provided. It shall meet the requirement of NBC 2016/NBCC Specifications/ State By laws. License/Approval of Local Fire Authorities shall be provided for the complex. There shall be the proper Zoning of the complex/buildings considering the Non Critical & Critical areas (critical area like OT, ICUs Labs, sterilise zones etc.) in the Hospital Block or in the other buildings. Repeater panels shall be provided in various buildings as required.
There shall be Independent fire panel for Hospitals, Medical and Nursing college, AYUSH block, Hostels, Guest House, Auditorium, multi-story residential buildings etc. and all fire control panels shall be interconnected with each other. Fire Detectors and devices of other ancillary buildings/ blocks shall be connected to Fire Control Panel of the nearest building through necessary cables in DWC HDPE pipes. The monitoring of whole complex shall be in the Main Fire Control Room of Hospital Building. For Central Monitoring of all the Fire Panels, necessary devices like PC, Printer, modules & Software etc. of latest technology with minimum 1 TB hard disk shall be provided in the Control room. Fire

Alarm control Panel shall not have more than 159 devices and 159 detectors in one loop. The details of the system proposed shall be as follows:

- Addressable intelligent dual type Fire Detectors is suggested.
- Detectors should be with inbuilt short circuit isolator & automatic addressing. Detectors should be installed as per coverage defined in NFPA 72. It should include all rooms, halls, storage areas, basements, attics, lofts, and spaces above suspended ceilings including plenum areas utilized as part of the HVAC system. In addition, coverage should include all closets, elevator shafts, enclosed stairways, dumbwaiter shafts, chutes, and other subdivisions and accessible spaces.
- Each detector & devices shall have integrated short circuit isolator.
- Suitable numbers of input/ output (C/M) relay modules are suggested for connecting other equipment like Electrical Panels, lifts, firefighting system, AHUs etc.
- Spacing between two detectors shall not be more than 8 Mtr. or it shall be as per relevant code & manufacture standards.
- Cabling shall be with Fire Survival Armoured copper cable.
- Suitable addressable loop powered sounders/ hooters for 100db sound level are suggested.
- Addressable manual call boxes shall be provided near all exits, stair cases, lift lobbies etc. as per relevant Norms.
- The Response Indicators shall be used in the waiting areas, Corridors, Common Area, conference Hall or in large room etc.
- Microprocessor IP based fire alarm control panel (fully redundant) for number of required loops with 24 hrs. Battery backup with LCD display, printer etc. shall be located in the fire control room.
- Fire Alarm Panels shall be integrated with PA system and with BMS also.
- Two Way communication Fire Fighters Telephone Jack & Handset with necessary accessories are to be provided in all the buildings as required.

SOLID WASTE GENERATION

Solid waste would be generated both during the construction as well as during the operation phase. The solid waste expected to be generated during the construction phase will comprise of excavated materials, used bags, bricks, concrete, MS rods, tiles, wood etc. The following steps will be followed for the management solid waste:

- Construction yards are proposed for storage of construction materials.
- The excavated material such as topsoil and stones will be stacked for reuse during later stages of construction.
- Excavated top soil will be stored in temporary constructed soil bank and will be reused for landscaping**.**
- Remaining soil shall be utilized for refilling / road work / rising of site level at locations/ selling to outside agency for construction of roads etc.

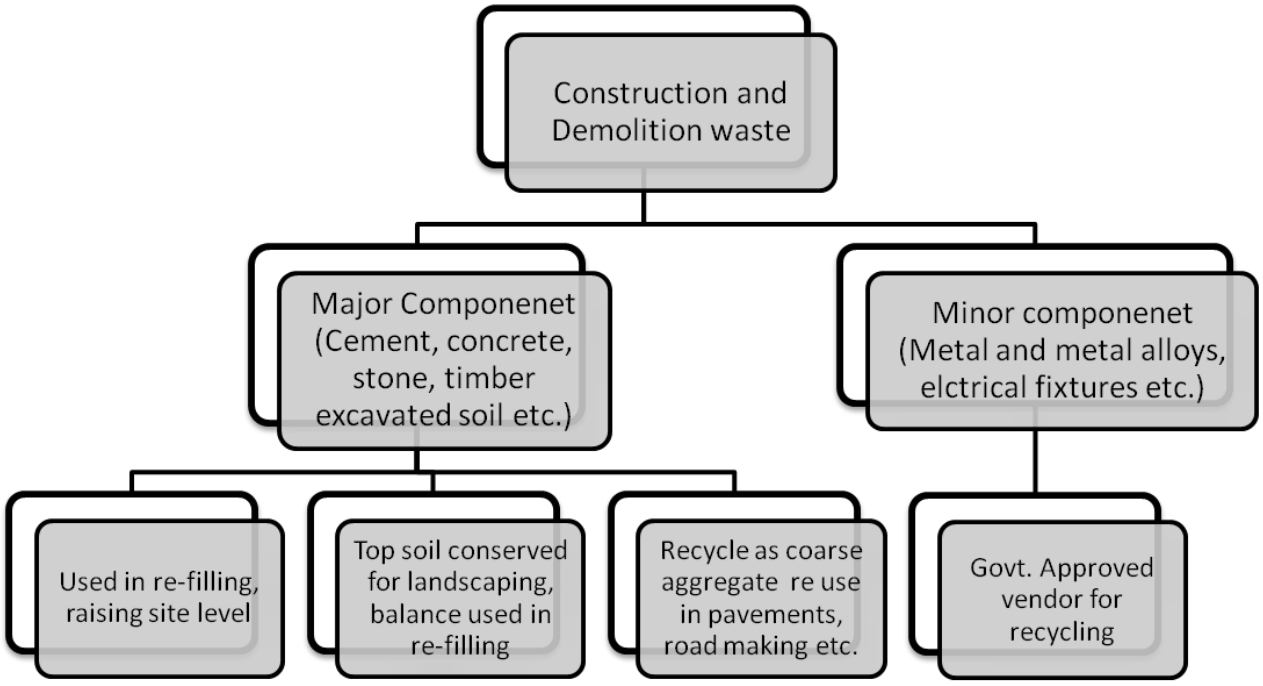


Figure 2-7-Waste Management-Construction Phase

DURING OPERATIONAL PHASE

The project will adopt a systematic approach for solid waste collection and disposal. Solid waste generated from the project will be collected properly and will be managed as per MSW Rules, 2016.

- Municipal waste shall be mainly categories in two classes. 1. Bio degradable Waste 2 Non- biodegradable Waste. The biodegradable portion dominates the bulk of MSW. This is mainly due to food and paper waste.
- These solid wastes will be collected separately by putting three types of separate bins at the source of generation.
- It is estimated that maximum solid waste generation would be about 3,324 kg/day; Following are the solid waste generation rate has been considered as is given table.

Table 2-16: Calculation of Solid Waste Generation

Category	Counts (heads)	Waste Generated (kg/day)
Waste Generation from hospital and residential blocks		
• **Residents** • **Staff** • **Visitors**	1,888@0.5kg/day 1,849@0.25kg/day 5,176 @0.15kg/day 750 @1.5 kg/day	944 462.25 776.4 1,125

• **Hospital beds**		
Landscape Waste (80.85 Acre)	@ 0.2 kg/acre/day	16.17
Total Waste Generated		3,324.82 kg/day
Bio medical waste generation (@15% of waste from IPD)		Approx. 168.75 kg/day
Biodegradable waste		Approx.1,828 kg/day
Non-Bio degradable waste		approx. 1,329.528kg/day
Inert waste		approx. 166 kg/day

COLLECTION AND SEGREGATION OF WASTE

For Domestic Waste

- A door to door collection system will be provided for collection of domestic waste in colored bins from every unit.
- The local vendors will be hired to provide separate colored bins for dry recyclables and Bio-Degradable waste.
- For waste collection, adequate number of colored bins (Green and Blue & dark grey bins– separate for Bio-degradable and Non- Bio-degradable) are proposed to be provided at the strategic locations of the area.
- Litter bin will also be provided in open areas like parks etc.

TREATMENT OF WASTE

Domestic Waste

Bio degradable Waste

- Bio-degradable waste will be subjected to the compost/resultant will be used as manure.
- STP sludge is proposed to be used for horticultural purposes as manure.
- Horticultural Waste is proposed to be composted and will be used for gardening purposes.

Recyclable Waste

- The cropped grass will be spread on the green area. It will act as manure after decomposition.
- Recyclable wastes like paper, plastic, metals etc. will be sold off to recyclables.

ORGANIC WASTE CONVERTER

The garbage will be collected and stored in garbage collection room and segregated as Biodegradable waste, Non-Biodegradable waste and Recyclable waste using different color coded bins

- Bio degradable waste will be treated by OWC and used as a manure for gardening area
- Recyclable wastes are inert waste which will be disposed through authorized recyclers.

- The total excavated earth material will be used for refilling in the low-lying area.

TECHNIQUE FOR DISPOSAL OF BIODEGRADABLE WASTE

Organic Waste Converter

The Mechanical Composter involves a biomechanical process which decomposes bacteria and produces odourless pre-organic compost in 15 minutes. The machine occupies small area and provides a cleaner and better environment.

Working Principle

Mechanical Composter converts the organic waste into odourless, pre-compost manure in 15-20 minutes. The organic waste, free from foreign particles is fed into MC. The shredder reduces the organic waste into the optimum particle size for composting. Then it is mixed with moisture absorbing materials and Useful microorganisms. This mixture is then blended for a homogeneous mixture and is converted into pre-compost manure in 20 minutes. The pre-compost manure is then fed into aerated compost blocks or 12 - 15 days. The compost blocks or piles are specially designed for the pre-compost manure to have proper aeration and suitable environment to mature. The final manure will be rich in nutrients and used for the development of green belt.

Salient Features of Organic Waste Converter (OWC)

- Quick, easy to operate, less space requirement and odour free manure compared to other waste conversion process
- Immediate and hygienic disposal of food waste
- Waste minimization strategy followed by 3R Technique (Reduce, Reuse, Recycle)
- Savings on Purchase of Manure for landscape
- Savings on Waste Disposal Expenses
- Elimination on the usage of chemical fertilizers
- Carbon credit revenue in the future

Optimum Conditions for Composting

During Composting process, optimum conditions shall be maintained to achieve better compost value. The parameters mentioned below shall be maintained accordingly during operation.

Table 2-17-Optimum condition for composting

S.No.	Parameters	Values
1.	C/N ratio	30: 1
2.	Particle Size	1/8 to 2 inches
3.	Oxygen	15 % - 20 %
4.	Temperature	55 - 65.5 ^{0}C
5.	Moisture	40 % - 60 %
6.	pH	6.5 - 7.5

Table 2-18-Characterstic of Final Compost

S.No.	Parameters	Concentration (% except pH)
1.	Total Nitrogen	1.3
2.	Total Phosphorus	0.2-0.5
3.	Total Potassium	0.5
4.	Organic phosphorus	0.054
5.	pH	8.6
6.	Moisture	45-50
7.	Organic Matter	30-70

Figure 2-8-Organic Waste Convertor

Benefits of organic waste converter:

- Large quantity of solid waste is converted to fertilizer in a very short period
- This fertilizer can be sold as compost to farmers, or used for gardening
- Machine requires less space and the efficiency is high
- Manpower and maintenance are very less
- This is one of the latest techniques of managing solid waste.

DISPOSAL

Recyclable and non-recyclable wastes will be disposed through Govt. approved agency. Hence, the Municipal Solid Waste Management will be conducted as per the guidelines of Municipal Solid Wastes (Management and Handling) Rules, 2000 and amended Rules, 2016. Solid waste management Scheme is depicted in the following figure.

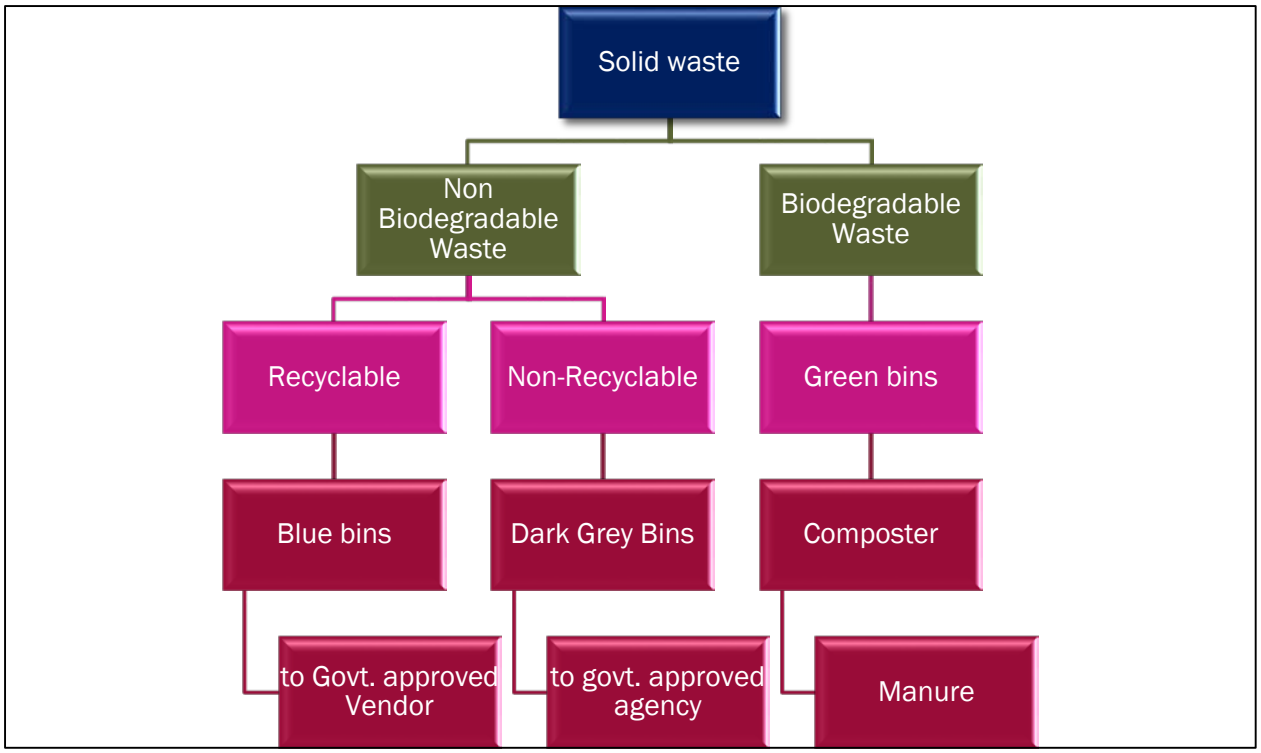


Figure 2-9: Solid Waste Management Scheme -Domestic Waste

FOR HOSPITAL WASTE

BIO-MEDICAL WASTE

COLLECTION AND SEGREGATION OF BIO MEDICAL WASTE

- Collection of bio medical waste will be done as per the bio Medical waste (Management and Handling) Rules 2016.
- General health-care waste will be collected the stream of domestic refuse for disposal.
- Sharp Objects will be collected together, regardless of whether or not they are contaminated. Containers will be puncture-proof (usually made of metal or high-density plastic) and fitted with covers.
- Highly infectious waste will be, whenever possible, be sterilized immediately by autoclaving. It therefore needs to be packaged in bags that are compatible with the proposed treatment process: red bags, suitable for autoclaving, are recommended.
- Small amounts of chemical or pharmaceutical waste will be collected together with infectious waste.
- Waste will be collected and stored in color coded bins.

TREATMENT OF WASTE

Bio Medical waste will be sterilized & compacted trough Integrated Shredder & Sterilizing Machine (ISS) before final disposal to the authorized vendor.

Cat.	Type of Bag/ Container used	TYPE OF WASTE	Treatment /Disposal options
Yellow 	non-chlorinated plastic bags Separate collection system leading to effluent treatment system	**a) Human Anatomical Waste** **b) Animal Anatomical Waste** **c) Soiled Waste** **d) Expired or Discarded Medicines** **e) Chemical Waste** **f) Micro, Bio-t and other clinical lab waste** **g) Chemical Liquid Waste**	Incineration or Plasma Pyrolysis or deep burial*
Red 	non-chlorinated plastic bags or containers	**Contaminated Waste (Recyclable)** tubing, bottles, intravenous tubes and sets, catheters, urine bags, syringes (without needles) and gloves.	Auto/ Micro/Hydro and then sent for recycling. not be sent to landfill
White 	(Translucent) Puncture, Leak, tamper proof containers	**Waste sharps including Metals**	Auto or Dry Heat Sterilization followed by shredding or mutilation or encapsulation
Blue 	Cardboard boxes with blue colored marking	**Glassware**	Disinfection or auto/ Micro/hydro and then sent for recycling.

Figure 2-10-Hospital/bio medical waste management

LANDSCAPE DETAILS

Total green area proposed for project is 3, 27,188.34 m^2 (37.05% of plot area under phase I). A combination of evergreen and ornamental, shrubs and ground covers planted along the sides of the road and in open space and set back area within the complex layout. Landscaping is an important element in altering the microclimate of the place. Proper landscaping reduces direct sun from striking the buildings and heating up building surfaces, prevents reflected light carrying heat into a building from the ground or surfaces, creates different air flow patterns and can be used to direct or divert the wind advantageously by causing a pressure difference. Shade created by tress & the effects of grass & shrubs reduce air temperature adjoining the building and provide evaporative cooling.

Table 2-19-Landscape area details

Plot area under phase I	**9,37,697.10 m^2**
Landscape area Proposed	3,27,188.34 m^2
As Per MoEF Guidelines	One tree per 80 m^2 of total area out of which minimum 50 % to be in the category of evergreen trees.

Trees Required	11,721 trees
Nos. of trees at site to be cut	568 trees
Compensatory plantation proposed	8,239 Trees within site
No of saplings proposed at site	3,533+8,239
No. of trees proposed	11,772 trees
Shelter/Green belt area	45,658 m^2
Shrubs, herbs, lawns, parks & climber plants, avenue plantation	2,81,530.34 m^2

Project site falls in north-western part of Himachal Pradesh which is known as western Himalaya region as per the agro climatic zones of India, and the climate is sub-humid to humid with warm summer and cold winters. The soil moisture regimes are udic and ustic and the temperature regime, thermic to hyper thermic. The altitude varies from about 300 to 1000 m above msl. The area is drained by Sutlej and Beas rivers and their tributaries. The natural vegetation consists of Sal (*shorea robusta*), Toona (*cederala toona*), Eucalyptus (*e. glohulus*), Babool (*acacia arubica*), Dhaman (*ghrewia optiva*) and Mango (*mangifera indica*), mostly found on lower slopes. On steep slopes Forest species like Pine: (*pinus roxburghii*) and bushes are dominant. Recommendation of plants/trees for the development of greenbelt as CPCB guidelines is as follow.

Table 2-20-Recommended plant list

S. No.	S.N.	C.N.	E/D	CSA (m^2)	LA (m^2)	CS	S/T to air pollution
1.	*acacia catechu*	khair	E	108.42	109.98	Oblong	T
2.	*acacia dealbata*	Silver wattle	E	112.32	110.52	Oblong	T
3.	*acacia nilotica*	Babul	E	8293.74	135.70	Spreading	T
4.	*Anogeissus latifolia*	Dhaura	E	67542.82	140.23	Oblong	T
5.	*Aphanamixis polystachya*	Harin	E	10826.95	1566.4	Oblong	T
6.	*Bauhinia acuminata*	Kanchan	D	109.8	69.46	Oblong	T
7.	*Bauhinia purpurea*	Khairwal	D	625.2	107.3	Oblong	T
8.	*Bauhinia racemosa*	Kotapuli	D	136.9	73.4	oblong	T
9.	*Butea monosperma*	Porasu	D	38592.1	448.6	Oblong	T
10.	*Callistemon citrinus*	Bottle brush	E	45997.2	214.01	Conical	T
11.	*Clerodendrum infortunatum*	Bhant	E	854	47.9	Round	T
12.	*Dalbergia latifolia*	Black wood	D	21723.2	187.9	Round	T
13.	*Dendrocalamus strictus*	Banskaban	D				T

14.	*Emblica*	Amla	D	17381.2	140.64	Oblong	T
15.	*Eucalyptus*	Lemon scented gum	E	52447.63	48.37	Conical	T
16.	*Ficus benghalensis*	Banyan tree	E	236493.67	119.10	Spreading	T
17.	*Ficus benjamina*	Pakur	E	87326.12	29.27	Spreading	T
18.	*Gardenia resinifera*	Dikamali	D	572.36	61.17	Oblong	T
19.	*Ixora arborea*	Rubiaceae	E	57.04	54.2	Oblong	T
20.	*Ixora coccinea*	Rangan	E	183.26	69.70	Oblong	T
21.	*Lantana camara*	Arippu	E	324.58	48.69	Spreading	T
22.	*Lawsonia*	Mehedi	E	71.85	77.8	Round	T
23.	*Mallotus philippensis*	Kamala	E	30497.8	58.3	Oblong	T
24.	*Moringa oleifera*	Mulaga	D	23450.1	14730	Oblong	S
25.	*Nerium indicum*	Karabi	E	5747.63	32.62	Oblong	T
26.	*Nyctanthus*	Harsingara	D	546.3	88.1	Oblong	T
27.	*Prosopis cineraria*	Sami	E	13430.6	54.23	Spreading	T
28.	*Sapium sebiferum*	Makhan tree	D	24980.3	74.2	Round	T
29.	*Tabernaemontana divaricata*	Tagar	E	128.67	47.81	Round	T
30.	*Zizyphus mauritiana*	Ber	E	2638.17	24.08	Round	T

(Source: Guidelines for developing Green Belts by CPCB, 2000)

[**S.N**. - Scientific Name, **C.N**.-common Name, **E/D**-Evergreen/Deciduous, **CSA**-Crown Surface area (estimated), **L.A. -** Leaf area, **C.S.**-Crown shape, **S.I.**-Stomatal Index, S/T-sensitive/Tolerant]

3. DESCRIPTION OF BASELINE ENVIRONMENT

This chapter provides the details pertaining to existing environment settings in the study area of the proposed medical facility in district Bilaspur. Study Area: An area within 10km radius from the periphery of project site earmarked for medical facility has been considered as the Study Area of the proposed project.

The generation of baseline data comprises of site visits, primary environmental monitoring, ecological surveys, social surveys, processing of satellite imagery and secondary data review from established sources such as Indian Meteorological Department, Census of India etc. M/s JP research Centre was engaged to carry out the environmental monitoring for eight weeks extending from September - December, 2018. The monitored parameters included - ambient air quality, water quality, soil quality, noise levels, and traffic survey of the study area.

METHODOLOGY

The baseline assessment is based on project site area assessment and reconnaissance survey of the study area of 10 km radius around the site boundary.
The studies were conducted by considering the following:

- The various environmental attributes were divided into primary and secondary studies. Primary attributes such as air environment, water, soil, noise, traffic, flora and fauna and socio-economic aspects were assessed by conducting field studies and on-site monitoring and review of the past studies conducted; and
- Secondary attributes such as land use studies, geology, physiological characteristics, have been assessed by literature review of studies conducted in the past and by various government publications and departments and other related past studies and literature etc.
- Primary environmental baseline data viz. ambient air quality, water quality, soil quality, noise level and traffic density was collected during September, 2018 to December, 2018 as per norms and standards prescribed by CPCB.

Map of the study area and 10 km radius clearly delineating the location of various monitoring stations (air/ water / soil and noise) superimposed with location of habitats is presented in this chapter. Site surroundings within the 5 km of the project site is shown below in **Figure 3-1**

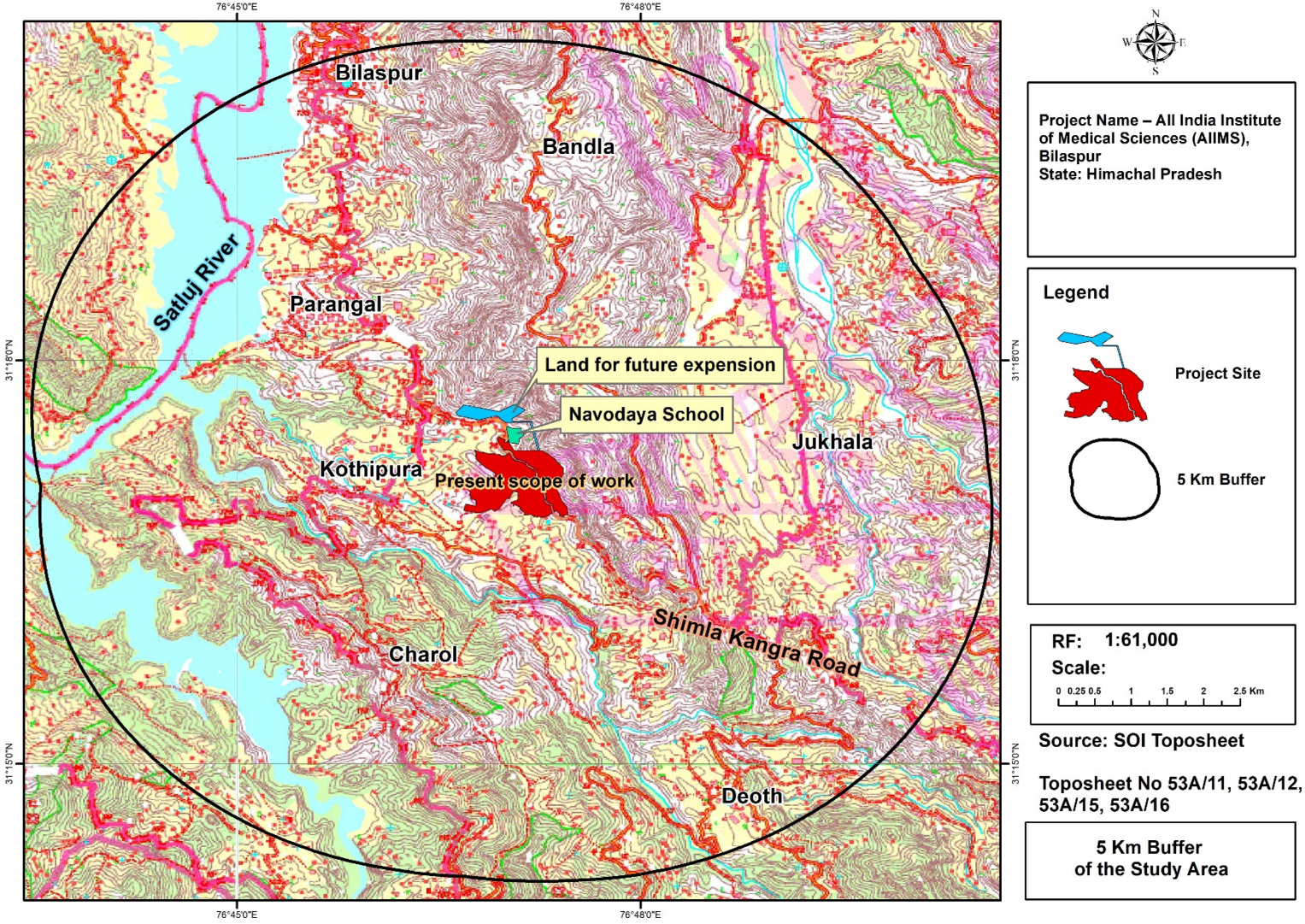


Figure 3-1- site and its surroundings within 5 km

The various parameters surveyed and studied for the baseline study are discussed in the following sections components.

1. Land Environment
    - Site setting ,topography
    - Physiography and Drainage Pattern
    - Geomorphology, Geology and Seismicity
    - Hydrogeology
2. Meteorology
3. Air Environment
4. Ambient Noise Level
5. Water Environment
6. Soil Quality
7. Existing land use pattern
8. Ecology Environment
9. Solid waste and management
10. Socio-economic status

LAND ENVIRONMENT

SITE SETTING, TOPOGRAPHY

Himachal Pradesh is situated in the heart of Western Himalayas. The state is almost wholly mountainous with altitude varying from 300 meters to 7000 meters. Project site falls in district Bilaspur which is in southern part of himachal Pradesh. The Bilaspur district lies between 31^0 12' 30'' and 31^0 35' 45'' North latitude and between 76^0 23' 45'' and 76^0 55' 40'' East longitude in the outer hills of the Himalayas next to the Punjab plains and forms a part of the basin of river Satluj which flows meandering across it for about ninety kilometers. It covers an area of 1,167 sq. kms. Its boundaries touch Una, Hamirpur, Mandi and Solan districts. Satluj is the main river which passes through the middle of the district and divides it into almost equal parts.

The project area has somewhat hilly terrain and comprises of Pasteur, agricultural and open scrub forest land. The average elevation of the district is about 1500-1665 ft above msl. The site is having variation in contour levels with present topography depicting the drainage towards govind sagar.

PHYSIOGRAPHY

Physiographically Himachal Pradesh has been identified into four divisions

Outer Himalaya or the Shiwalik hills- consists of low hills of Shiwalik zone with an elevation of 600 to 1200 m. Shiwaliks are monoclinal hills dipping with steep scarps facing southward and merging with the small tract of Indus plain which has a general slope towards south-west. To the 4 north the Shiwalik gently dip to the structural and longitudinal valleys called Duns. Shiwaliks represents the youngest part of the Himalaya, they are prone to erosion and their morphology comprises of highly dissected and rugged residual terrain, hogback ridges, earth pillars, rilled earth buttresses of conglomerate formations, talus cones, choe divides and terraces etc. The duns or valleys are drained by network of streams and rivers. This zone is about 50 km wide in the west and about 80 km wide in Kangra valley and again tapers to smaller width in Nalagarh and Kyarda Duns in east. The crest line are known by many names like Hathi Dhar, Sikandar Dhar, Chaumukhi range, Solasinghi Dhar, Ramgarh Dhar, Naina Devi Dhar and Dharti Dhar.
Lesser Himalaya or Central Zone can be divided into two zones, the ***Lower Himalayas*** towers abruptly from the north of the duns with steeper southern facing slopes than northern characterized by deep gorges and sharp rides. This zone mainly includes the Dhauladhar. The ***Middle Himalayas*** lying further north are steeper and the peaks remain under permanent snow cover perennially like the Pir Panjal ranges. The average elevation ranges from 1000 to 4000 m and width from 60 to 80 km. The Dhauladhar and Pir Panjal ranges are conspicuous and quite distinct in the west and form the southern and northern watershed of Ravi Basin. Dhauladhar extends further east into the Beas valley and crosses the Satluj river near Rampur. Pir Panjal forming the southern watershed of the Chandrabhaga in Chamba and Lahaul Spiti districts joins the Great Himalayan range north of Deo Tibba and Rupi Valley (Parbati River). Some minor ranges of lesser Himalaya are Dagni Dhar, Mani Mahesh and Dhog Dhar in the Ravi valley; Jalori Dhar and Shikari Dhar in Beas and Satluj basins and Nagtibba range, Mussourie range and Shimla hills in the Yamuna basin east of the great Himalayan Divide.

Great Himalaya or Central Zone are the highest mountain ranges that run across the nort eastern border of himachal through Lahaul Spiti and Kinnaur districts. The elevation of the great Himalaya ranges between 5000 and 7000 m, and it has several passes having elevations between 4500m. This towering snow-clad mountain wall is a store house of many glaciers and acts as a source of many rivers; it also plays an important role in

governing the climatic condition of the state as it acts as a barrier against the northward movement of the southwest monsoon. It forms the northern watershed of the Chandrabhaga (Chenab) basin and separates it from Spiti basin and further east it forms watershed between Spiti and Beas basins. It is cut across by Sutlej before it enters the Utter Pradesh Himalaya with extension to Badrinath/Kedarnath.

Trans-Himalaya or Zanskar range is the easternmost range of Himachal Pradesh. The average elevation is 3,000m and its peaks rise over 6,500m. It forms the northern watershed of the Spiti and Sangla valleys in Kinnaur and roughly forms the Indo-Tibetan boarder. Sutlej cuts across the Zanskar range forming a deep gorge. In the south-eastern part of Kinnaur, one prominent range comes out of it towards west-northeast in the form of Kinnaur-Kailash range. The topography comprises of wide snowfields, cirques, glaciers, U-shaped and hanging valleys moraines etc

DRAINAGE

Bilaspur district is located on Siwalik ranges and forms part of the lesser Himalayas. It has a diverse landscape of hills, valleys with piedmont zone. There are seven main hill ranges i.e. Naina Devi, Kot, jhanjiar, Tiun, Bandla, Bahaurpur and Ratanpur constituting the hill system. The elevation of the lowest point is about 290 m amsl and of the highest peak i.e. Bhadurpur hill is 1980 m amsl. The major river that passes through the middle of the district from east to west is Sutlej. It enters the district near a place known as Kasol in the north-west and after traversing a course of 90 km, it leaves near Naila and enters the territory of Punjab in the south-west. The Sutlej is joined by several tributaries from both sides. The main three tributaries are Ali Khad, Gamrola Khad and Seer Khad. The length of Ali khad is about 26 km. It arises in Shimla district and after passing through Bahadurpur Dhar joins the river Sutlej at Bilaspur. Gamrola khad also arises in Shimla district and after draining the Rattanpur Dhar joins the river about 5 km downwards from Bilaspur town. Seer Khad which is the third tributary of Sutlej originates at Wah Devi which is 10 km from Sarkaghat in Mandi district. After draining Kot-Ki-Dhar and a greater portion of Ghumarwin tehsil, it joins Sutlej River at village Serimatla which is about 15 kms downwards from Bilaspur town.

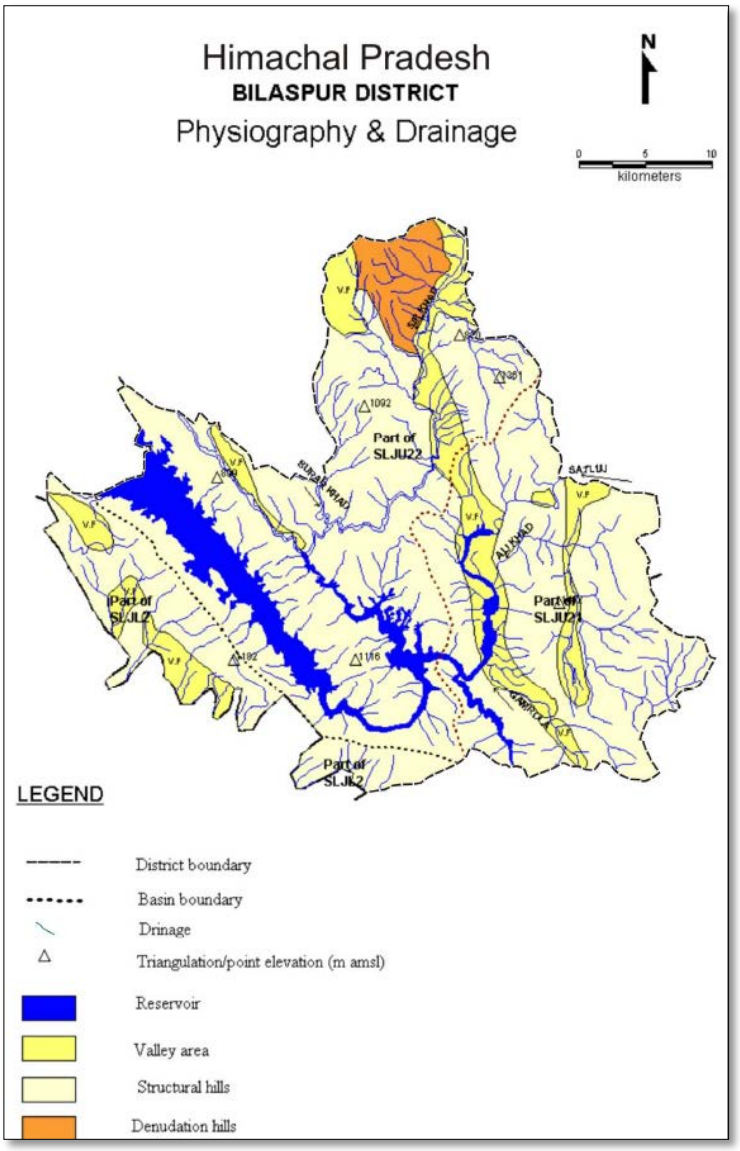


Figure 3-2 Physiographic & drainage map of the district

GEOLOGY

The state has a general increase in elevation from west to east and from south to north with Outer Himalaya, Lesser Himalaya, Greater Himalaya and Tethys Himalayan zone as four physio-geographic regions. Within these giant ranges exists a number of smaller ranges viz. Pir Panjal, Dhauladhar and Zanskar. The complicated geology of the region can be categorized in to four broad simplified stratigraphically zones. They are as follows:

1. Outer or Sub-Himalayan zone: Also known as the Shiwaliks, the foothill zone consists predominantly of tertiary formations, comprising of thick detrital rocks, clays and conglomerates. The sub-Himalayan zone rocks comprises rocks varying from oldest to

youngest, the Subathu, Dagshiai and Kasauli deposits, and the Shiwalik Group. At the base of the sequence are the shallow marine rocks comprises of the Subathu deposits. Rocks found in the Shiwaliks are dominantly limestones, mudstones, Red fine-grained sandstones, siltstones, mudstones, thin sequence of shales capped by a hard white-gray quartz rich sandstone and softer green-colored sandstone etc.

2. Lower Himalayan zone: The Lower Himalayan zone lies between the Main boundary thrust and Central Himalayan thrust. This zone is mainly composed of early Proterozoic detrital sediments deposited between approximately 1900 and 1800 million years ago, and subsequently over thrusted during the Himalayan up-liftment onto sub-Himalayan rocks along the Main Boundary Thrust (MBT). The Lesser Himalaya mainly consists of massive quartz intruded by basalts and other crystalline rocks of fossiliferous sediments. The almost complete Paleozoic sediments in the Lower Himalaya is suddenly interrupted by the transgression of the outstandingly different Gondwana rock sequence. This volcanic activity is well preserved in the Pir Panjal range, the formations being known as 'Panjal volcanics' or 'Panjal Traps'. Along the Sutlej section, the Lesser Himalayan Crystalline Sequence crops out within a tectonic window called the Larji-Kullu-Rampur Window. The lower part of this unit is composed of thick mica schist and granitic gneiss.

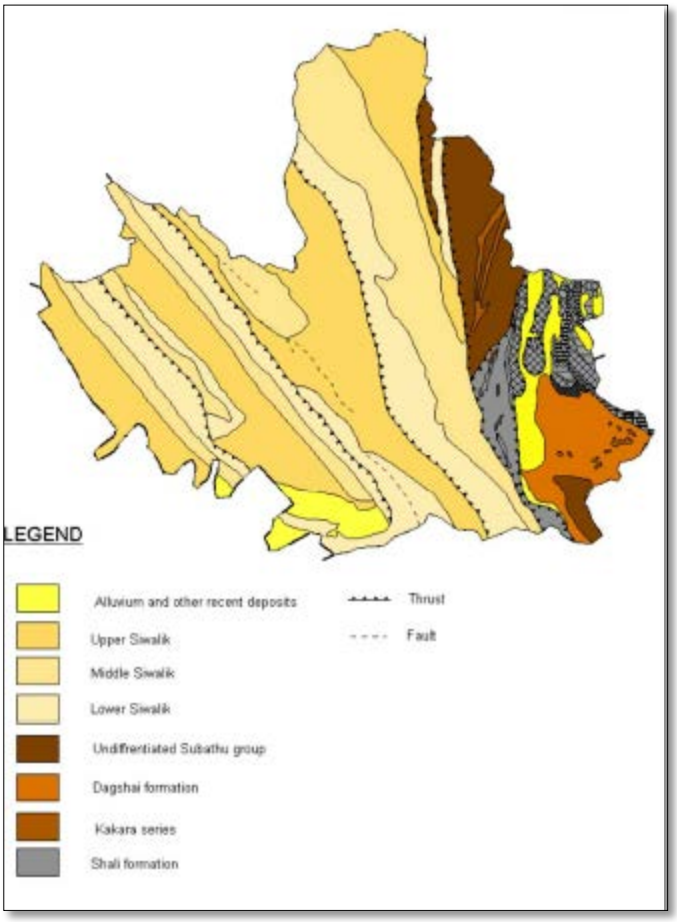
3. Higher Himalayan zone: Along the entire Himalaya, this zone represents the main metamorphic unit forming the crystalline core zone. The Main Central Thrust (MCT), a major 3 fault that accommodated up to 250 km of shortening during collision, encompass the zone at its base.

4. Tethys Himalayan zone: The Tethyan Himalaya corresponds to a nearly continuous, Upper Proterozoic to Eocene sedimentary sequence deposited in the Spiti region. These sediments generally underwent only very low-grade metamorphic. The rusty ferrous slates and Kinnaur Kailash Granite that thrust the Lesser Himalaya over the sub-Himalaya is a characteristic landmark in this region. The Himalayas and the associated eastern ranges remain tectonically active due to continue under thrusting of the Indian peninsula against the Eurasian Plate.

The rock formations occupying the district range in age from pre-Cambrian to Quaternary period. The generalized geological succession in the district is given below

EON	ERA	PERIOD	GROUP FORMATION	DESCRIPTION
Phanerozoic	Cenozoic	Quaternary (Recent to sub-Recent)	Alluvium; fluvial, terrace, piedmont	Sand, silt, clay, gravel, pebble and cobble etc.
			Undifferentiated	Sand, clay, gravel, pebble, cobble and boulders
		Tertiary Pliocene to Mid. Miocene	Upper Siwalik	Soft sandstone, brownish clay, shale, poorly sorted and crudely bedded conglomerate. Boulder beds.
			Middle Siwalik	Grey sandstone, and brownish clay/ shale
			Lower Siwalik	Red and purple sandstone and shale
		Oligocene-Lower Miocene	Subathu Group	Grey sandstone, shale, Clay
			Kasauli Formation	Greenish to grayish hard sandstones
			Daghshai Formation	Dark-red and purple coloured shale
			Subathu Formation	Dark nodular clays
Proterozoic	Upper Proterozoic III Proterozoic II		Krol Formation Shali Formation	Greyish massive dolomites and Limestone Cherty Dolomite, Quartzite and Lime stone

Figure 3-3 Geological map of the district



GEOMORPHOLOGY

Bilaspur district nestles between Siwalik ranges and forms part of the lesser Himalaya. It has a diverse landscape made of the hills, valleys with piedmont zone there are seven main hill ranges i.e. Naina Devi, Kot, jhanjiar, Tiun, Bandla, Bahaurpur and Ratanpur constituting the hill system of District Bilaspur. The district is mostly hilly and has no mountains of higher altitude from the mean sea level. The elevation of the lowest point is

about 290 m and the highest peak is Bhadurpur hill with an elevation of 1980 m msl. Major physiographic units Structural Hill, Denudational hill, and Valley fill
General altitude 610 m amsl
Major Drainages Sutlej Basin Satluj, Ali Khad, Gamrola Khad and Seer khad

SEISMISITY

The entire state is at risk of being affected by a severe seismic event. About 32% of the total geographical area of Himachal Pradesh falls in the very high seismic zone V, while the rest (68%) lies in the high seismic zone IV. Ten out of 12 districts fall in the very high seismic zone. During 1800–2008, about 70% of earthquakes occurred in three districts, namely, Chamba, Lahul and Spiti, and Kinnaur. Three districts, Solan, Hamirpur and Bilaspur, have less than 1% concentration, whereas in Una district, no earthquake has ever been recorded during this period.
The state of Himachal Pradesh lies almost entirely in the Himalayan Mountains, and is part of the Punjab Himalayas. As per the BIS seismic zonation map, Himachal Pradesh falls in Zone IV and from seismicity point of view, the state of Himachal Pradesh which forms a part of NW Himalayas is very sensitive. As per the earthquake hazard map of state , the areas falling in districts Chamba, Kangra, Mandi, Kullu, Hamirpur Bilaspur are very sensitive as they fall in Very High Damage Risk Zone (MSK IX or More) i. e. Zone V, whereas the rest of the areas falls in High Damage Risk Zone (MSK VIII).
Figures below show the Seismic Zone map for India Indicating project location and earthquake hazardous map of Himachal Pradesh is given below.

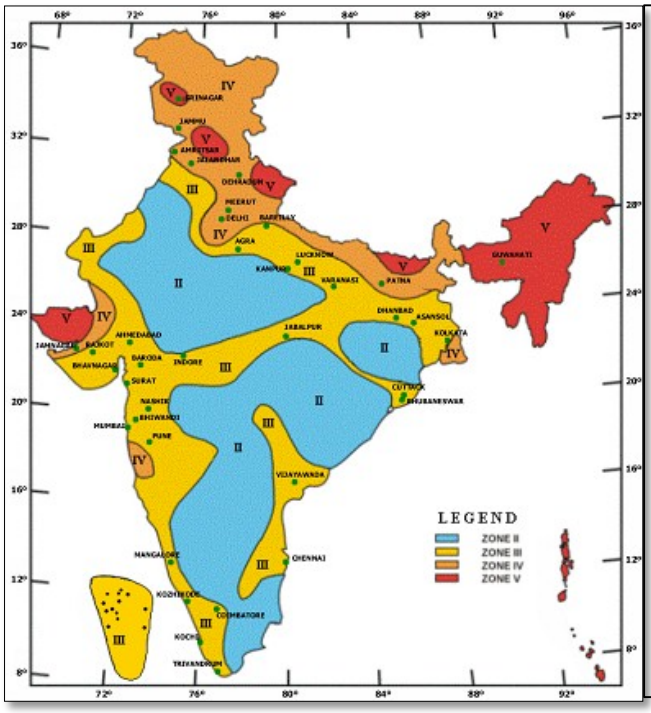


Figure 3-4-seismic zone map for India Showing project state

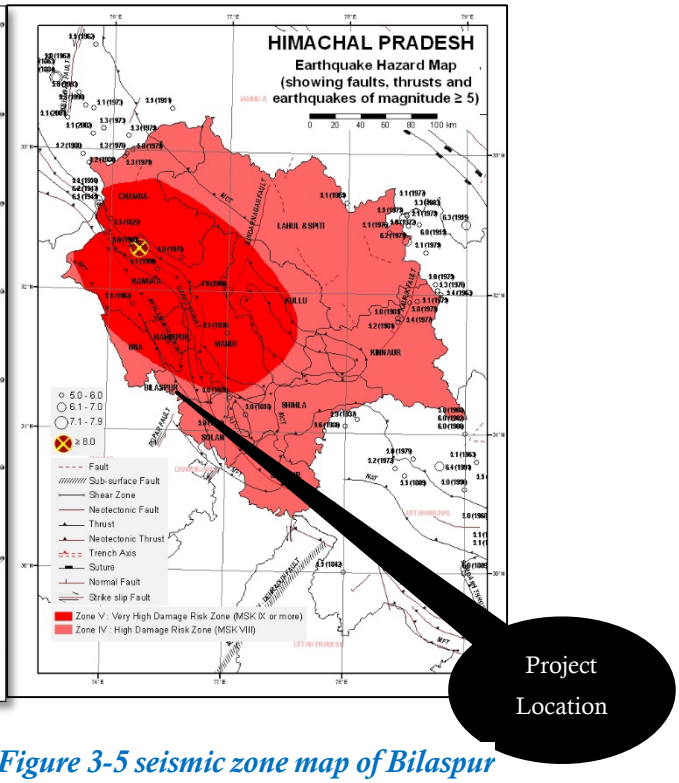


Figure 3-5 seismic zone map of Bilaspur district indicating project location

HYDROGEOLOGY

Hydro geologically, both the unconsolidated valley fill and alluvial formation are occurring in the valley area and semi-consolidated sediments belonging to Siwalik Group form aquifer system in the district. Porous alluvial formation forms the most prolific aquifer system in the valley area where as the sedimentary semi-consolidated formation forms the aquifer of low yield prospect.

The ground water in the Siwalik group of rocks occur under unconfined to semi confined conditions mainly in the arenaceous rocks viz., sandstone, siltstone, gravel & boulder beds etc. The occurrence and movement of ground water is controlled by inter-granular pore spaces and also the secondary fracture porosity. Siwalik sediments underlying hilly/undulating areas where springs (mostly gravity/contact type) and bowries are the main ground water structures apart from the hand pumps. The discharges of the springs, varies from seepages to 0.50 lps. Bowries are dug well type structures constructed on the hill 7 slopes for tapping the seepages. In the low lying areas underlain by Siwalik rocks, dug wells and hand pumps are the main ground water structures that range in depth from 3.00 to 25.00 m bgl, where in depth to water level ranges from 2.50 to 15.00 m bgl. In upland/plateau areas the water level is generally deep. In Beet area, water level more than 60 m below land surface is observed. In valley areas, the ground water occurs in porous unconsolidated / alluvial formations (valley fills) comprising sand, silt, gravel, cobbles / pebbles etc., and forms prolific aquifers. Ground water occurs both under phreatic and confined artesian conditions. Water logging areas are observed in northern part of Jukhola valley. Ground water is being extensively developed in the area by medium tube wells and dug wells, and also by hand pumps. Depth of dug wells ranges from 4.00 to 15.00 m bgl whereas depth to water level ranges from near surface to 6 m bgl in pre monsoon. Yield of shallow aquifer is moderate with well discharges up to 10 lps.

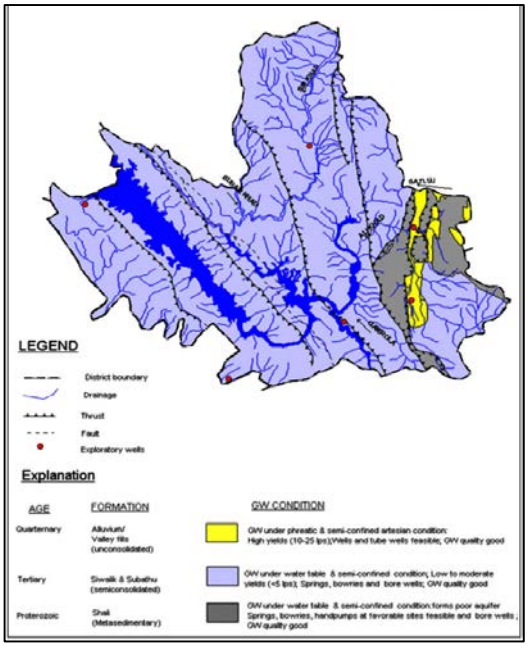


Figure 3-6 Hydrogeological map of the district Bilaspur, HP

METEOROLOGY

Meteorological parameters are responsible for dispersion and diffusion of pollutants in the atmosphere. Thus, the Assessment of the existing meteorological conditions in the vicinity of a source of pollutants is vital for assessing air quality in the area. The main parameters are- temperature, humidity, rainfall, winds and cloud cover. The meteorology and air environment of the area are discussed in subsequent sections.

A. Long Term Meteorological Data

The most recent long-term climate trend data was obtained for the years (1990-2002), from the closest Indian Meteorological Department (IMD) surface station at Solan. Mean monthly normal of atmospheric parameters, wind roses for each month giving the wind direction speed were collected and have been presented table below Most probable wind speed class and wind direction in the area has been assessed and presented.

Table 3-1 Climatologically Summary (obtained from nearest IMD MET Station at Solan (1990-2002)

Month	Temperature (^{0}C)		PPt (mm)	Rainfall Monthly Total (mm)	MEAN Wind Speed (kmph)
	Max	Min			
January	2051	6.64	21.94	813.1	4.4
February	23.40	9.41	34.39	950.7	5.0
March	28.22	13.75	22.48	974.6	5.4
April	35.35	19.62	15.89	1173.8	5.2
May	40.09	24.47	23.77	1492.1	5.6
June	39.69	26.47	85.26	882.1	3.2
July	35.50	26.75	181.90	1377.3	3.1
August	33.79	26.43	198.49	813.1	3.4
September	34.13	23.65	117.20	854.23	3.2
October	32.74	18.14	5.89	974.6	4.4
November	28.27	11.99	7.70	982.45	4.6
December	22.79	7.95	6.25	1402.3	4.8

Meteorological Data Recorded At the Project Site: Site specific meteorological data are collected at site for temperature, humidity and atmospheric pressure. Summary of the data as monthly mean of maximum and minimum values are presented in table below

Table 3-2 Monthly Metrological Data during Study Period

S.No.	Particular		Details
1.	Monitoring Period		Sept. 2018-Dec. 2018
2.	Temp. (^{0}C)	Min	Oct- 33.4°C
			Nov.- 26.4°C
			Dec.- 20.7 °C
			Oct- 17.7°C
		Max.	Nov.- 11.6°C
			Dec.- 7.4°C
3.	Avg. Wind speed (kmph)		Oct.- 7
			Nov,-7.7
			Dec-7.5
4.	Humidity (%)		Oct.-43%
			Nov,-41%
			Dec-34%

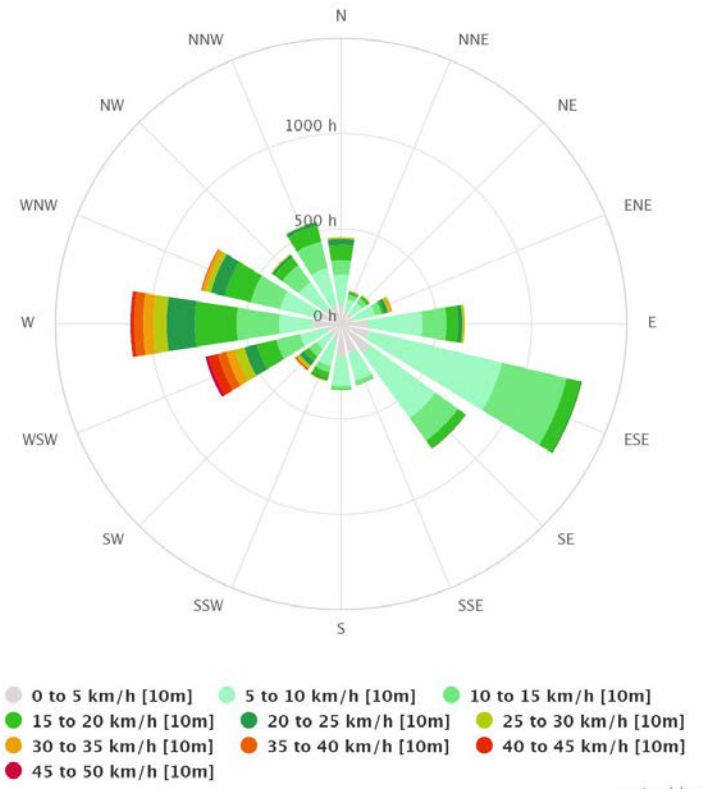


Figure 3-7- Wind rose for the site (Sept-Dec. 2018)

AIR ENVIRONMENT

- An important component of an EIA study is the assessment of prevailing ambient air quality status in the vicinity of project site. The tropical climatic conditions, especially monsoon winds prevailing in India mainly control the transport and dispersion of air pollutants during different seasons. Local topographical features along with predominant winds and weather conditions also play a vital role in dispersion of these air-borne particles.
- The baseline studies for air environment covers reconnaissance, identification of specific air pollutants expected to have significant impacts from the proposed project and assessing their prevailing levels in ambient air at representative locations within the impact zone around the project site. The sources of air pollution during construction and operational phases of the project are as follows:

Sources of Pollution during Construction Phase:

- The construction phase includes site clearance and site preparation, infrastructure development, building construction and demolition, and other related activities, movement of construction vehicles and diesel based machine equipment. All construction sites generate high levels of dust (typically from concrete, cement, wood, stone, silica) During the construction phase of the project, the pollutants anticipated to be emitted are - particulate matter (SPM), carbon monoxide (CO), and Sulphur dioxide (SO2) from all construction activities.

Sources of Pollution during Operational phase:

- The operational phase includes emissions from vehicular movement and negligible emissions from sewage and solid waste handling and disposal. During the operational phase of the project, the pollutants anticipated to be emitted are - nitrogen oxides (NOx), SPM, Sulphur dioxide (SO_2) and CO from vehicle exhaust within the project site.

SITE AREA SPECIFIC AMBIENT AIR QUALITY

Sources of Air Emissions Surrounding the Site

The vicinity of the project site is characterized by rural setup with presence of villages that to sparsely. Local activities in these areas within 2/5/10 kms of study area contribute to very little air pollution.

Site–specific Ambient Air Quality Monitoring

- A site–specific background air quality monitoring program was conducted for the existing project site post-monsoon season, Sept-December, 2018. Background data was collected for SPM, RSPM, SO_2, NOx, CO at various locations, primarily selected on the basis of predominant wind direction, which is West south west direction. The details of the AQ Monitoring locations are presented in table below.
- The basic considerations while designing this air quality examination programme included:
    - Topography;
    - Representative location w.r.t upwind and downwind directions;
    - Representative location w.r.t regional background eg. Urban,semi-urban, rural area;
    - Ecologically sensitive locations within 10 km;
    - Availability of source of Power; and
    - Accessibility.

AAQ monitoring equipment were placed at sensitive receptors (i.e. within or nearby places), where safety and power were provided. Monitors were placed on one-storey dwellings, away from major roads and nearby flow obstructions (i.e. trees).

Table 3-3 Air Quality Data Collected At the Site

Station No.	Location	Distance and direction from Project area	Project area/study area
AAQ1	Project site	0	Core Area
AAQ2	Kothipura village	0.67 km, SW	Buffer area
AAQ3	Prangal	0.78km, NNW	Buffer area
AAQ4	Noa, village	1.21 km,SSW	Buffer area
AAQ5	JNV school	adjacent, NNE	Buffer area
AAQ6	Garnal	1.7 km, NNW	Buffer area
AAQ7	Sai pharryan	2 km, NNW	Buffer area
AAQ8	Nauni	1.4 km, NW	Buffer area
AAQ9	manlohu	1.98 km, W	Buffer area

AAQ10	Changar palasiyan	Adjacent, E	Buffer area

The parameters to be monitored, frequency and number of samples taken at each station are presented in the table below.

Table 3-4 Details of Monitoring Program for Ambient Air Quality

Particulars	Details
Frequency	24hrs, 2 times a week x 8 weeks
Parameters	PM_{10}, $PM_{2.5}$, SO_2, NO_x, CO and Dust Fall
Duration	24 hrs for PM_{10}, $PM_{2.5}$, SO_2, NO_x, hourly Samples for CO

The protocol and analysis procedures followed to examine the collected samples were as per IS-5182 (Indian Standards for Ambient Air Quality Parameters). The applied testing procedures are given below.

Table 3-5-Brief summary of the Methodology followed for analysis of Ambient Air Quality

S.No.	Pollutant	Code of Practice	Method of Measurement
1.	Particulate Matter (size less than 10 µm or PM_{10}	IS-5182 (PART-23):2006 & CPCB Guidelines	Gravimetric
2.	Particulate Matter (size less than 2.5 µm or $PM_{2.5}$		
3.	Sulphur Dioxide (SO_2)	IS-5182 (Part-II):2001 & CPCB Guidelines	Improved West and Geake
4.	Nitrogen Dioxide (No_2)	IS-5182 (Part-VI): 2006 & CPCB Guideline	Modified Jacob & Hochheiser (Na-Arsenite)
5.	Carbon Monoxide (CO)	IS: 5182 (Part-X) & CPCB Guidelines	Non Dispersive Infra-Red (NDIR) spectroscopy

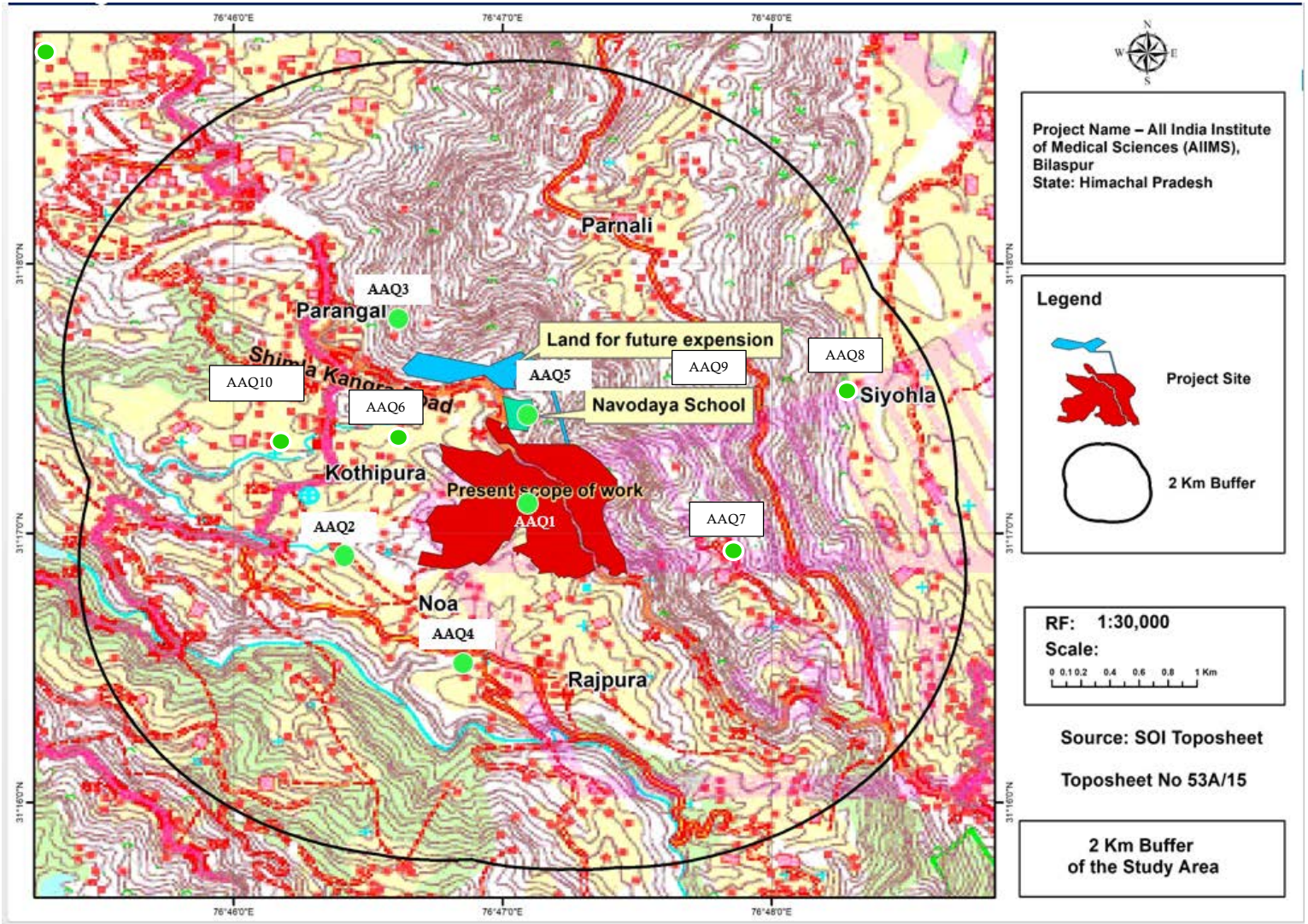


Figure 3-8-Ambient air quality monitoring stations

Table 3-6-ambient air quality in the study area (Sept-Dec.2018)

Parameters	Observed	AQ-1	AQ-2	AQ-3	AQ-4	AQ-5	AQ-6	AQ-7	AQ-8	AQ-9	AQ-10
PM_{10} 24 hourly ($\mu g/m^3$) ***(NAAQS-100)***	Minimum	*46*	*41*	*44*	*47*	*43*	*41*	*40*	*41*	*39*	*41*
	Maximum	68	61	59	65	56	57	55	54	53	54
	Average	57.83	52.17	52.875	56.92	48.67	48.29	47.5	49.625	47.375	48.54
	98^{th} Percentile	67.08	60.54	5	64.54	55.54	56.08	54.54	54	52.54	54
$PM_{2.5}$: 24 Hourly ($\mu g/m^3$) ***(NAAQS-60)***	Minimum	*24.0*	*17*	*23*	*21.42*	*20*	*19*	*18*	*17*	*16*	*15*
	Maximum	38.0	32	32	32	31	30	30	30.25	27	28
	Average	30.8	24.72	25.33	27.61	24.875	24.54	24.29	23.51	20.96	22.01
	98^{th} Percentile	36.6	31.08	31.54	32	30.54	29.54	30	29.675	26.54	28
SO_2: 24 Hourly ($\mu g/m^3$) ***(NAAQS-80)***	Minimum	*BDL*	*BDL*	*BDL*	*BDL*	*BDL*	*BDL*	*BDL*	*BDL*	BDL	*BDL*
	Maximum	7.6	6.8	6.9	7.4	6.8	6.3	6.2	6.2	5.8	6.7
	Average	6.40	6.01	6.1	6.42	5.89	5.77	5.80	5.83	5.5	5.78
	98^{th} Percentile	7.6	6.692	6.832	7.292	6.744	6.27	6.172	6.2	5.6	6.556
NO_x: 24 Hourly ($\mu g/m^3$) ***(NAAQS-80)***	Minimum	*8.46*	*7.9*	*7.1*	*7.5*	*6.9*	*7.4*	*7.1*	*7.5*	7.4	*7.1*
	Maximum	11.7	10.6	10.08	11.5	10.2	10	10.1	10.2	9.6	9.9
	Average	10.25	9.42	9.24	8.97	9.00	9.00	8.85	8.87	8.7	8.88
	98^{th} Percentile	11.62	10.46	10.00	10.95	10.20	9.91	10.01	10.06	9.6	9.81
CO: hourly (mg/m^3) ***(NAAQS-4)***	Minimum	6.40	6.01	*0.264*	*0.25*	5.89	5.77	5.80	*0.24*	0.24	5.78
	Maximum	68	61	0.35	0.37	56.00	57.00	55	0.34	0.23	54.00
	Average	28.80	25.16	0.32	0.30	24.36	24.01	23.57	0.30	0.32	23.02
	98^{th} Percentile	67.74	60.87	0.35	0.36	55.87	56.74	54.87	0.34	0.28	54.00

The analysis of the above results clearly shows that all the monitored values are within limits prescribed by Central Pollution Control Board for PM_{10} and $PM_{2.5}$ respectively. The summary of results is presented in the following sub sections

Inferences

Particulate Matter – PM $_{2.5}$

- The $PM_{-2.5}$ concentrations as observed in the study area varied from a minimum i.e. 15 μg/m^3 recorded at (AQ-10) to maximum i.e. 38 μg/m^3 at (AQ-1). The 98 percentile values ranged from 26.12 μg/$m^3$to 36.21 μg/. All values were observed within the prescribed CPCB standards of 60μg/m^3. The main sources of PM $_{2.5}$ generation are vehicular emission, open waste burning, diesel generator sets. Impact analysis and mitigation measures are given in chapter-4

Particulate Matter – PM $_{10}$

- The PM_{-10} concentrations as observed in the study area varied from a minimum i.e. 39 μg/m^3 recorded at (AQ-9) to maximum i.e. 68 μg/m^3 at (AQ-1). The 98 percentile values ranged from 52.54 μg/$m^3$to 67.08 μg/. Few values were observed to limits the prescribed CPCB standards of 100μg/m^3. Little high values of PM_{10} recorded can be attributed due to dust on the road due to vehicular movement.

Sulphur dioxide (So_2)

- The concentrations of sulphur dioxide in the region were observed below detection level.

Oxides of Nitrogen

- The maximum NO_x concentration observed was 10.8 μg/m^3 at (AQ-2). The minimum value recorded was 6.9 μg/m^3 at (AQ-6). The NOx concentrations were within the prescribe norms of 80 μg/m^3 as per NAAQS

NOISE ENVIRONMENT

- The different sources of noise pollution during the construction phase include vehicles carrying construction and demolition material, operation of construction machinery and equipments at site. During the operational phase of the project, the noise pollution is expected to arise due to increase in vehicular movement in and around the site. Estimated traffic volumes and peaks at the selected locations have

been presented in the results from the traffic baseline sampling study. An assessment of the baseline noise levels at 3 locations within the 2/5 km radius study area was done

Table 3-7- Noise Quality Monitoring Locations

Station No.	Location	Distance and direction from Project area	Project area/study area	Criteria considered / Land use
NQ1	Project Site	0, Centre	Project site	Public Use
NQ2	Kothipura village	0.67 km, SW	Buffer area	Residential
NQ3	JNV School (silence)	adjacent, NNE	Buffer area	silence

The Central Pollution Control Board constituted a Committee on Noise Pollution Control. The Committee recommended noise standards for ambient air and for automobiles, domestic appliances and construction equipments, which were later notified in Environment (Protection) Rules,1986 as given below:-

Table 3-8: Ambient Quality Standards in Respect of Noise

Area Code	Category of area	Noise dB (A) L_{eq}	
		Daytime*	Night time*
A	Industrial Zone	75	70
B	Commercial Zone	65	55
C	Residential Zone	55	45
D	Silence Zone	50	40

(Source: Central Pollution control Board)

Note:

1. *Day time is reckoned in between 6 a.m. and 9 p.m.*
2. *Night time is reckoned in between 9 p.m. and 6 a.m.*
3. *Silence zone is referred as areas up to 100 meters around such premises as hospitals, educational institutions and courts. The Silence zones are to be declared by the Competent Authority. Use of vehicular horns, loudspeakers and bursting of crackers shall be banned in these zones.*
4. *Mixed categories of areas should be declared as one of the four above mentioned categories by the Competent Authority and the corresponding standards shall apply.*

- Noise standards for automobiles, domestic appliances and construction equipment have been notified in Part 'E', Schedule-VI of Environment (Protection) Rules, 1986, as amended on 19th May, 1993, noise standard for vehicles are as given in the Tables below.

Table 3-9- Noise standers for Vehicles

S.No.	Category of Vehicle	Noise limit in dB(A)
1.	Motor cycle ,scooters and three wheelers.	80
2.	Passenger Cars	82
3.	Passenger or commercial Vehicle up to 4 MT	85
4.	Passenger or commercial Vehicle above 4 MT up to 12 MT	89
5.	Passenger or commercial Vehicle above 12 MT	91

(Source: Central Pollution control Board)

The Observations of the noise monitoring were calculated as Leq Day and Leq Night. The results are presented in the and depicted in Table below

Table 3-10: Noise Level Monitoring Result (December 2018)

S.No.	Site	Zone	Limit as per CPCB guideline Leq, dB(A)		Observed Value Leq, dB(A)	
			Day	**Night**	Day	Night
1.	Project site	Medical facility	**50**	**40**	50.1	39.5
2.	Kothipura village	Residential	**55**	**45**	51.8	42.2
3.	JNV	school	**50**	**40**	52.6	41.4

*	*Day time*	*Leq(6.00AM TO 10.00PM)*
	Night time	*Leq(10.00PM TO 6.00AM)*

The noise levels at all the locations were observed within the prescribed CPCB standards except the location 3.

- Noise levels during day time were observed to be in the range of 50.1 to 52.6 dB (A). The maximum noise level was 52.6 dB (A) at NQ3 and a minimum of 50.1 (A) was observed at (NQ-1).
- Noise levels at night time were observed in the range of 39.5 to 41.4 dB (A). The maximum noise level was 42.2 dB (A) was observed at (NQ-2) and a minimum of 39.5 dB (A) at (NQ-1).

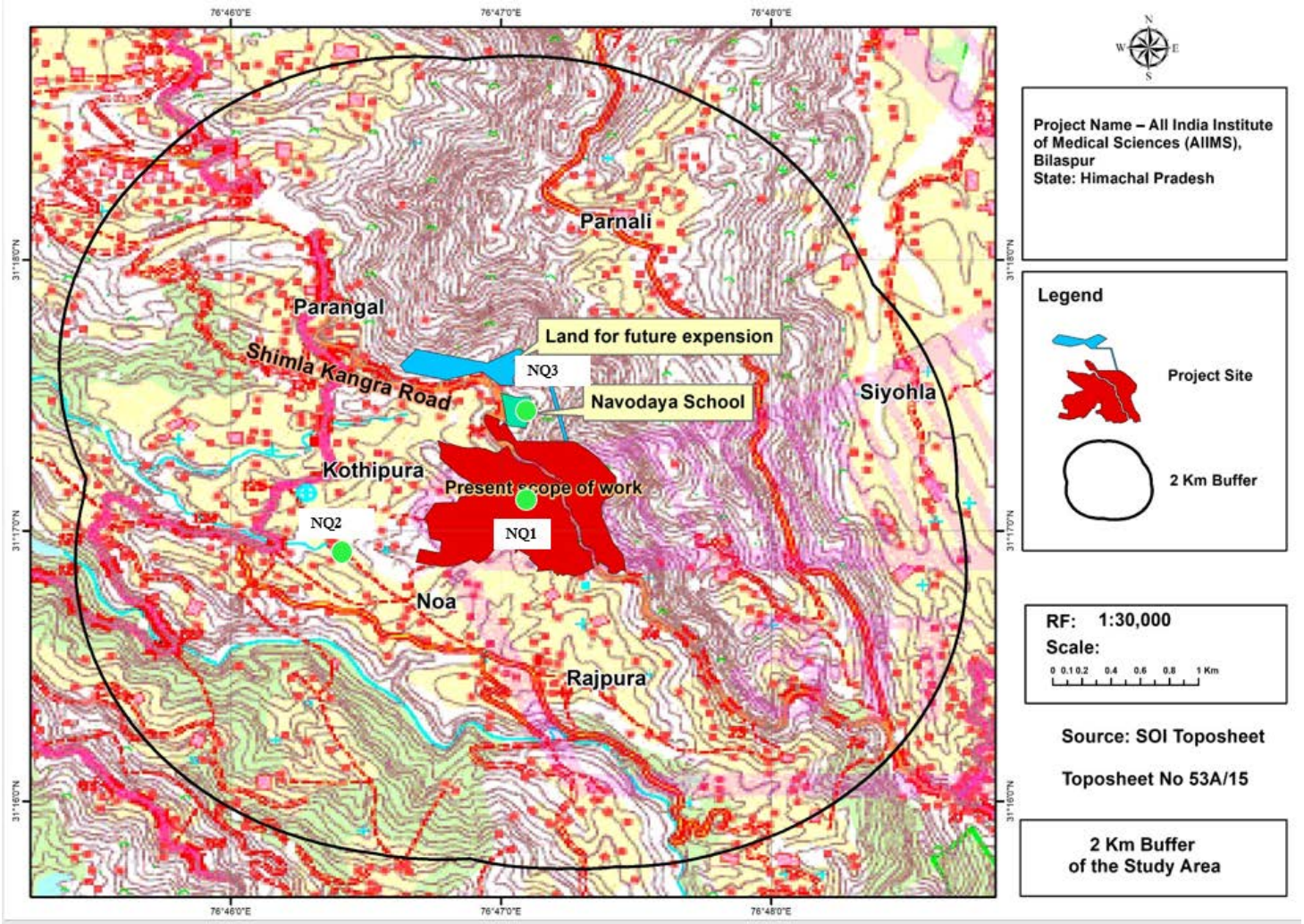


Figure 3-9 Noise Monitoring Station

WATER ENVIRONMENT

- This section discusses status of water resources and water quality in the project area. The data has been collected from various secondary sources and primary survey carried out in the impact zone.
- To assess the existing status of the water environment (pre-project) in the project study area, representative sampling locations for surface water and ground water were selected on the basis of their respective significance within the study area around project site and sent for laboratory testing. The standard methods prescribed for surface and groundwater samplings as well as the analytical procedures for individual parameters were followed in this study.

Water availability in the region

- Water is one of the most vital natural resources of Himachal Pradesh. The state is richly endowed with a hilly terrain having an enormous volume of water from the catchment areas of Satluj, Beas, Ravi and Chenab rivers. As such, the state has enormous potential of water resources in the form of glaciers and rivers but ground water resources are limited. The major consumptive use of water in the State has been for irrigation.
- **Availability of Water resources**: Glaciers: are located in higher Himalayan reaches (above 4000 m) in Pir Panjal, Dhauladhar, Zanskar and Great Himalayan ranges. There are 800 Glaciers in the Himachal Himalayas which are 199 higher in number as compared to the previous report of 601 Glaciers in the state reported in the state development report in 1991. This variation is due to breaking of large glaciers into smaller ones with the increasing temperature in past two decades.
- Surface water Resources: Rivers 90% of Himachal Pradesh's drainage forms the part of Indus river system. Himachal provides water to both the Indus and Ganges basins. The major river systems of the region are the Chandrabhaga or the Chenab, the Ravi, the Beas, the Sutlej and the Yamuna. These perennial rivers are fed by snow and rainfall and are protected by a fairly extensive cover of natural vegetation.

Groundwater Characteristics

- Rainfall is the major source of recharge to groundwater apart from the influent seepage from the rivers, irrigated fields and inflow from upland areas, whereas discharge from ground water mainly takes place from wells and tube wells; effluent seepages of ground water in the form of springs and base flow in streams etc.
- The district has hilly terrain having very high slopes. The valley areas are narrow and isolated. The areas therefore not considered for estimation of the ground water resources being discontinuous aquifers.
- Ground water exploration has been carried out but not in the entire area because of difficulty in approach for heavy machinery.
- However, State Irrigation Department (I&PH) has drilled number of shallow bore wells fitted with hand pump in various parts of the district for domestic use. The depth of these bore wells range between 30 to 45 m. Some of the wells are energized where the discharge is sufficient. These hand pumps are installed in hard rock hilly terrain and also along the river valleys. Tube wells are also installed in all these valleys. The ground water of the district is alkaline in nature. pH of shallow ground water ranges from 7.43 to 8.20. The EC in the area ranges from 190 to 965 µS/cm. Nitrate values range from 6 to 95 mg/l. The chemical quality reveals that the overall ground water quality is good and is suitable for domestic and irrigation use. There is an urgent need to have proper water quality monitoring and checks on regular basis.

Project area-Specific Water Sampling/Monitoring

- The surface and ground water samples were collected from different locations representing ground water and surface water receptor within the Study area. The criteria for selecting the locations of sampling were:
    - Landuse (nearness to habitation/ any waste disposal sites)
    - Drainage patterns (man-made/ natural canals etc)
- Ten (10) surface water samples and eight (8) ground water samples were collected for analysis. Table below gives the location details of the ground water and surface water sampling locations.

Table 3-11: Groundwater and Surface water Monitoring Stations

S.No.	Location	Location Code	Distance from the Project Site (km)
	Surface water		
1.	Bharari (upstream, downstream)	SW-1&2	3.5 km, W
2.	Raghunathpur (upstream, downstream)	SW-3&4	3.6 km,NW
3.	Nayi sahrli (Lake)	SW-7	3.4 km, W
4.	Bahl,pothar (upstream, downstream)	SW-5&6	4.2 km, SW
5.	Mandi (lake)	SW-8	3km, NW
Ground water			
6.	Project site	0,	Core area
7.	pranajal	0.9km, NNW	Buffer area
8.	Nauni	1.4 km, NW	Buffer area
9.	Kothipura	0.67km,SW	Buffer area
10.	JNV school	adjacent, NNE	Buffer area
11.	Rajpura	1.7 km, S	Buffer area
12.	Sai pharyan	2 km, NNW	Buffer area
13.	Changar palsyan	Adjacent, W	Buffer area
14.	Manlohu	1.98 km, W	Buffer area

The ground water samples were analysed for parameters as per IS: 10500 standards and the analysis was undertaken as per IS 3025 and relevant APHA standard methods. In case of surface water, CPCB limits for classification of water were followed for assessment of water quality. Details of monitoring program for surface water quality and ground water quality has been given in below tables. The results of the analysis are also presented in subsequent table.

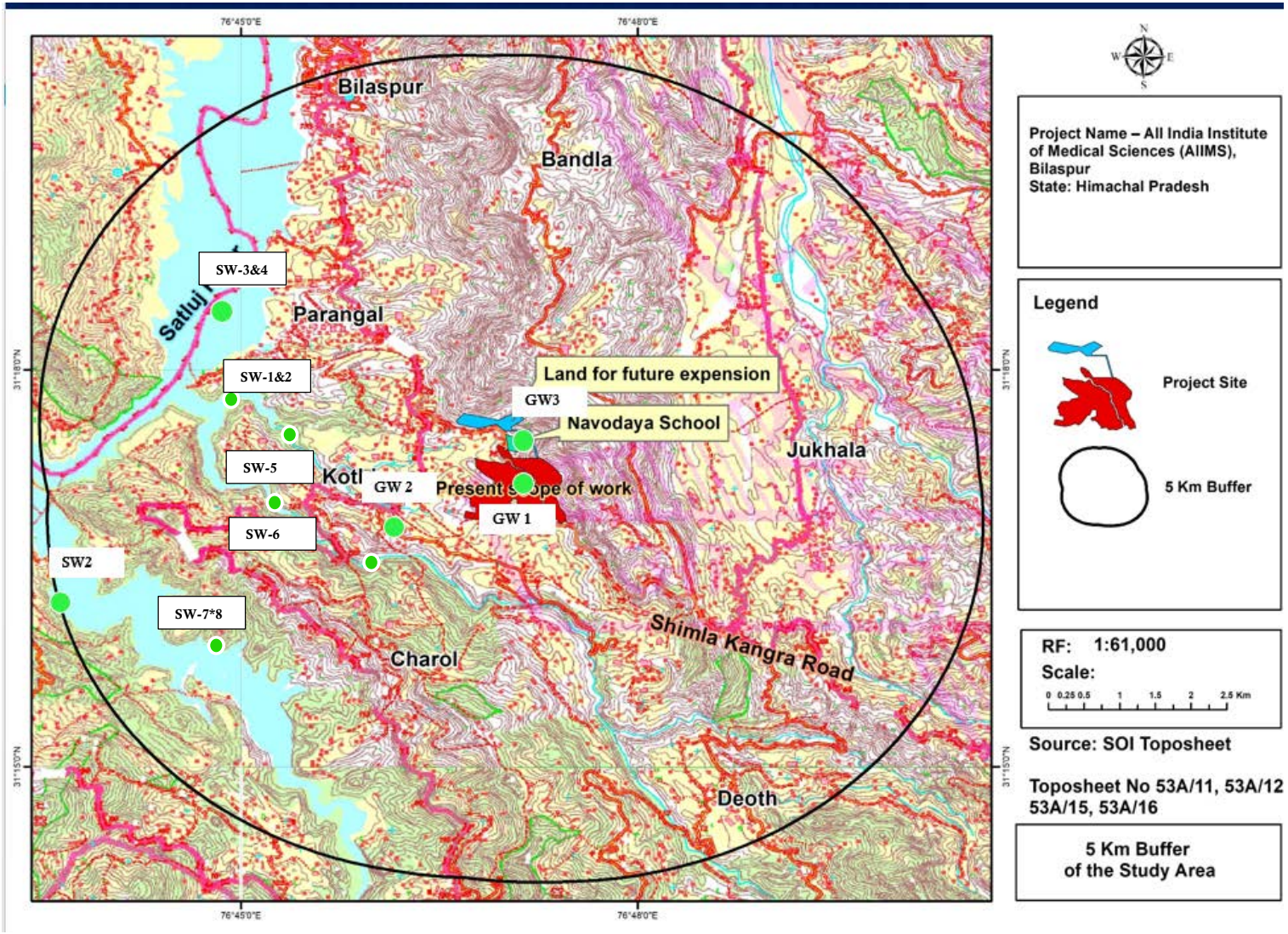


Figure 3-10 Groundwater and surface water monitoring locations marked on topo sheet

Table 3-12: Details of Monitoring Programme for Surface Water

Particulars	Details
Frequency	1 grab sample
Parameters	Parameters as per CPCB Water Use Class
Methodology	Representative sampling across River, collection in sterilized inert sampling bottles and analysis according to standard BIS Methodology

Table 3-13: Details of Monitoring Programme for Ground Water

Particulars	Details
Frequency	4 grab sample for composite sampling from each station once during the Study Period
Parameters	Temperature, TDS, TSS, pH, TH, Ca, Mg, Conductivity, DO, Zn, Cu, Cl, SO_4, NO_3, F, Fe, Pb and Coliform
Methodology	Sample collection in sterilized inert sampling bottles and analysis according to standard BIS Methodology (IS: 10500)

Table 3-14-surface water quality analysis

S.No	Parameters	Unit	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-7	SW-8	SW-9 (lake)	SW-10(lake)
1	pH value	-	7.35	7.42	7.38	7.32	7.47	7.4	7.53	7.49	7.82	7.76
2	Turbidity	NTU	4	6	4	5	12	8	15	10	18	14
3	Conductivity	mmhos/cm	228	242	258	219	261	236	278	243	325	357
4	Total Dissolved Solids	mg/l	140	165	172	137	154	232	184	143	198	210
5	Total Suspended solids	mg/l	18	16	17	16	20	18	26	21	41	34
6	Total Hardness (as $CaCO_3$)	mg/l	102	96	98	90	108	96	114	94	118	128
7	Chlorides (as Cl)	mg/l	17	21	24	19	22	19	28	32	37	45
8	Total Alkalinity as $CaCO_3$	mg/l	80	84	88	74	84	78	92	72	94	89
9	Sulphate (as SO_4)	mg/l	8	10	9	8	10	7	12	8	12	15
10	Nitrate(as NO_3)	mg/l	2.2	1.9	1.6	2.1	2.4	1.8	3.2	2.5	4.8	6.1
11	Fluoride (as F)	mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	0.2	0.2
12	Iron (as Fe)	mg/l	0.12	0.14	0.11	0.11	0.15	0.09	0.16	0.12	0.17	0.16
13	Zinc (as Zn)	mg/l	0.29	0.22	0.25	0.25	0.32	0.18	0.36	0.21	0.35	0.41
14	Calcium (as Ca)	mg/l	30	28.5	29.5	27	28.5	26.5	30.4	24.8	30.4	32.7
15	Magnesium (as Mg^{2+})	mg/l	6.6	6.0	5.9	5.5	9	7.3	9.3	7.8	10.2	11.3
16	Cadmium (as Cd)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
17	Copper (as Cu)	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
18	Nickel (as Ni)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
19	Lead (as Pb)	mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
20	Mercury (as Hg)	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
21	Total arsenic (as As)	mg/l	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
22	Phenolic Compounds (as C_6H_5OH)	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
23	Total Phosphorus as PO4	mg/l	0.08	0.11	0.08	0.11	0.13	0.07	0.14	0.08	0.16	0.19
24	Manganese as Mn	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
25	Cyanide as CN	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

26	Total Chromium (as Cr)	mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
27	Aluminum as Al	mg/l	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
28	Anionic Detergent (MBAS)	mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
29	Oil & Grease	mg/l	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
30	Chemical Oxygen Demand	mg/l	12	14	12	10	16	14	22	18	32	28
31	Bio- Chemical Oxygen Demand as BOD (for 3 Days 27 ˚C)	mg/l	1.5	1.7	1.4	1.2	2.1	1.6	2.7	2.4	3.5	3.2
32	Dissolved Oxygen	mg/l	7.6	7.2	7.7	7.6	7.1	7.4	7.1	7.3	6.6	6.8
33	Total Coliform	MPN/100ml	4	7	9	6	14	9	17	14	170	140

Repercussion

The surface water sample was collected from satluj River upstream and downstream where:

- The Biological Oxygen Demand (BOD) levels were found, i.e. 1.2-3.5 mg /l
- Total coliforms were found to be present within limits in samples from river except sample from pond.
- The pH from all the locations varies from 7.32-7.87.The dissolved oxygen varies from 6.6 mg/l to 7 mg/l.
- Surface water quality was analyzed for parameters as mentioned in the 'Methods of Monitoring & Analysis published by CPCB (Annexure-IV)' and it was rated according to the CPCB Water Quality Criteria against A, B, C, D & E class of water based on parameters identified in the criteria. Water samples were collected as Grab water sample from sampling location in a 5 liter plastic jerrycan and 250 ml sterilized clean glass/pet bottle for complete physico-chemical and bacteriological tests respectively. The samples were analyzed as per standard procedure/ method given in IS: 3025 (Revised Part) and standard method for examination of water and wastewater Ed. 21st, published jointly APHA, AWWA and WPCF. The surface water quality is compared with CPCB water quality criteria mentioned in Table 3.15
- Based on above analysis, the quality of Surface water samples collected from satluj river can be classified as Class "B" of CPCB standards which is categorized as 'Irrigation, Industrial Cooling, Controlled Waste disposal'.

Table 3-15 - Water Quality Criteria as Per Central Pollution Control Board

Designated-best-use	Class	Criteria
Drinking water source without conventional treatment but after disinfection	A	Total Coliforms 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°C 2mg/l or less
Outdoor bathing (Organised)	B	Total Coliforms 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°C 3mg/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 to 9; Dissolved Oxygen 4mg/l or more Biochemical Oxygen Demand 5 days 20°C 3mg/l or less
Propagation of Wild life and Fisheries	D	pH between 6.5 to 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 to 8.5 Electrical Conductivity at 25°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

Table 3-16 Groundwater quality analysis

S. No	Parameters	Unit	Max Requirement as per (IS-10500-2012), Limit		GW-1	GW-2	GW-3	GW-4	GW-5	GW-6	GW-7	GW-8
			Desirable	**Permissible**								
Physical Parameters												
1	pH value	-	6.5-8.5	No Relaxation	7.49	7.58	7.29	7.65	7.83	7.56	7.73	7.79
2	Color	Hazen	5	15	<5	<5	<5	<5	<5	<5	<5	<5
3	Turbidity	NTU	1	5	<1	<1	<1	<1	<1	<1	<1	<1
4	Total Dissolved Solids	mg/l	500	2000	172	235	381	339	373	155	220	292
5	Total Alkalinity as $CaCO_3$	mg/l	200	600	68	82	148	126	152	70	89	98
6	Total Hardness (as $CaCO_3$)	mg/l	200	600	76	115	182	142	140	82	118	134
7	Calcium (as Ca)	mg/l	75	200	21	29	43	37	31	19	27	29
8	Magnesium (as Mg^{2+})	mg/l	30	100	5.7	10.4	18.2	12.1	15.2	8.4	12.3	15
9	Chlorides (as Cl)	mg/l	250	1000	35	52	73	59	79	32	45	51
10	Fluoride (as F)	mg/l	1	1.5	0.1	0.1	0.2	0.1	0.2	0.1	0.2	0.1
11	Sulphate (as SO_4)	mg/l	200	400	14	22	38	42	25	11	19	39
12	Iron (as Fe)	mg/l	0.3	No Relaxation	0.11	0.11	0.16	0.12	0.17	0.1	0.14	0.11
13	Nitrate(as NO_3)	mg/l	45	No Relaxation	5.2	7.3	10.9	13.2	10.8	6.2	7.6	8.5
14	Copper (as Cu)	mg/l	0.05	1.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
15	Boron (as B)	mg/l	0.5	1	<0.1	<0.1	0.1	0.2	0.1	<0.1	<0.1	<0.1
16	Barium (as Ba)	mg/l	0.7	No Relaxation	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

17	Manganese(as Mn)	mg/l	0.1	0.3	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
18	Phenolic Compounds (as C_6H_5OH)	mg/l	0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
19	Selenium (as Se)	mg/l	0.01	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
20	Silver (as Ag)	mg/l	0.1	No Relaxation	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
21	Sulphide (as H_2S)	mg/l	0.05	No Relaxation	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
22	Aluminum (as Al)	mg/l	0.03	0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
23	Zinc (as Zn)	mg/l	5	15	0.14	0.19	0.37	0.24	0.34	0.13	0.18	0.15
24	Cadmium (as Cd)	mg/l	0.003	No Relaxation	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
25	Cyanide (as CN)	mg/l	0.05	No Relaxation	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
26	Lead (as Pb)	mg/l	0.01	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
27	Mercury (as Hg)	mg/l	0.001	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
28	Nickel (as Ni)	mg/l	0.02	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
29	Total Arsenic (as As)	mg/l	0.01	0.05	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
30	Total Chromium (as Cr)	mg/l	0.05	No Relaxation	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
31	Total Coliform	MPN/100ml	Shall not be detectable		Not detected (<2)							
32	*E.Coli*	*E.coli*/100ml	Absent		Absent							

Ground Water quality

Ground Water results are inferred below:

- Levels of Total Dissolved Solids (TDS) vary from Minimum 155 mg/l (GW-6) in to maximum 381 mg/l (GW-3) which is within desirable limit of 500 mg/l.
- The Alkalinity of ground water also within the desirable limit of 200 mg/l at all locations (at site (GW1) 68 mg/l)
- Total hardness levels (76-182 mg/l) within desirable limits at all ground water sampling locations;(at Site GW-3, 896 mg/l) in May 2017.

All the ground water samples were observed to be free of contamination of bacteriological and fecal contamination

SOIL QUALITY

The pre-project status with respect to soil characteristics (physical, chemical and bacteriological), land use pattern in the study area around the proposed project site forms the baseline status of land environment. A soil sampling program was carried out at representative four locations selected in the basis of type of land use (nearness to agricultural fields, drainage, source of pollution etc). The details of soil monitoring locations are given in **Table below**

Table 3-17-Details of Proposed Soil Sampling Locations

Station No.	Location	Distance and direction from Project area	Project area/study area
SQ1	Project site	0	Core Area
SQ2	Kothipura village	0.67 km, SW	Buffer area
SQ3	JNV School	adjacent, NNE	Buffer area
SQ4	Sai pharyan	2 km, NNW	Buffer area
SQ5	Rajpura	1.7 km, S	Buffer area
SQ6	pranajal	0.9km, NNW	Buffer area
SQ7	Nauni	1.4 km, NW	Buffer area
SQ8	Manlohu	1.98 km, W	Buffer area

The parameters to be monitored, frequency and methodology of sampling are as follows in **table 47.**

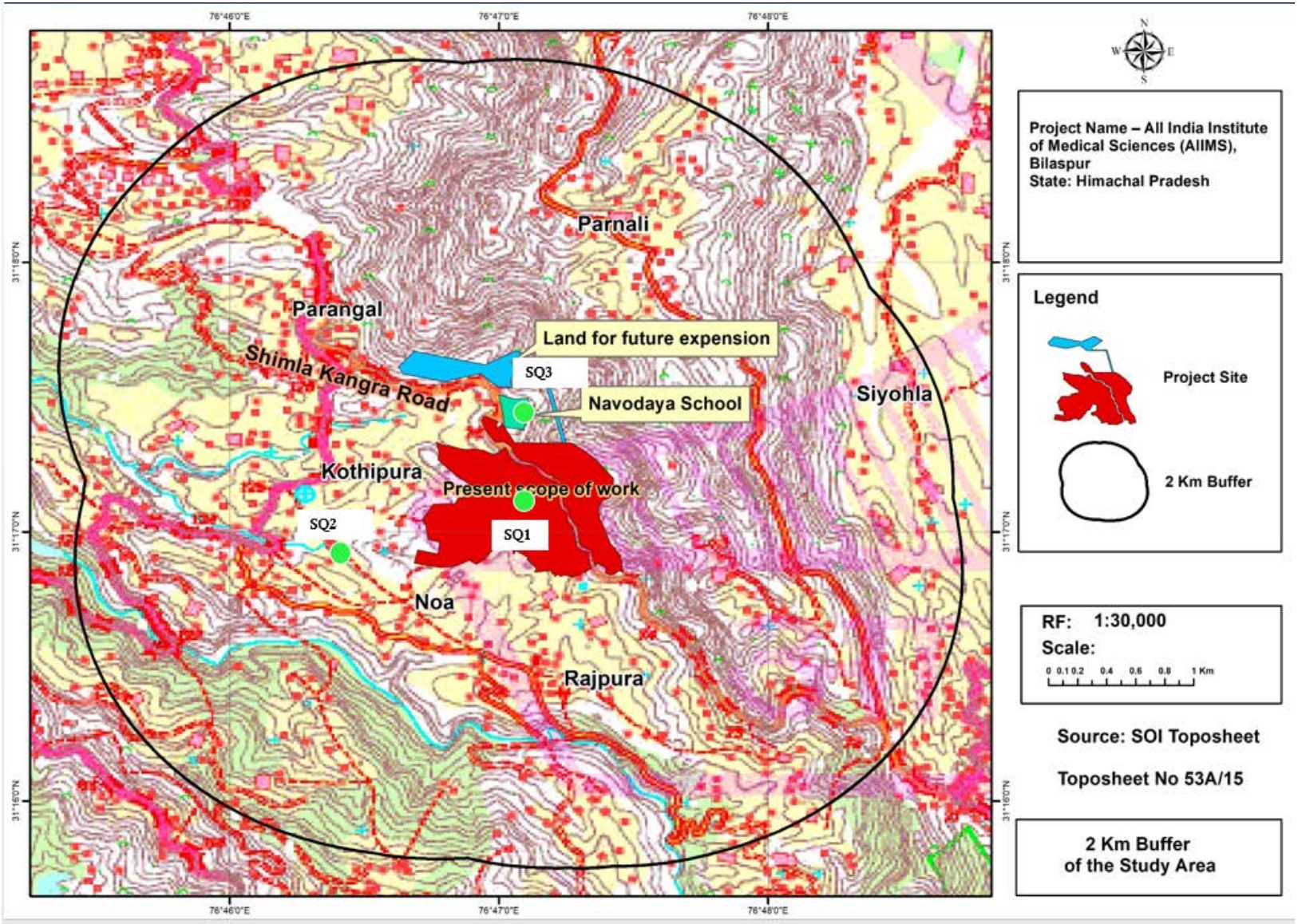

76°46'0"E
76°47'0"E
76°48'0"E
31°18'0"N
31°17'0"N
31°16'0"N
N
W
E
S
Parnali
Parangal
Shimla Kangra Road
Land for future expension
SQ3
Navodaya School
Siyohla
Kothipura
Present scope of work
SQ2
SQ1
Noa
Rajpura
Project Name – All India Institute of Medical Sciences (AIIMS), Bilaspur
State: Himachal Pradesh
Legend
Project Site
2 Km Buffer
RF: 1:30,000
Scale:
0 0.1 0.2 0.4 0.6 0.8 1 Km
Source: SOI Toposheet
Toposheet No 53A/15
2 Km Buffer of the Study Area

Table 3-18: Details of Monitoring Program for Soil Quality

Particulars	Details
Frequency	One grab sample from each station– once during the Study Period
Parameters	Texture, % Moisture, % Sand, % Silt, % Clay, % Organic Matter, Bulk Density, pH, Electrical Conductivity, NKP, Sodium Absorption Ratio, B, Na, Pb, Fe, Zn and Water Holding Capacity
Methodology	Composite grab samples of the topsoil would be collected from 3 depths, and mixed to provide. A representative sample for analysis. They would be stored in PET containers and analyzed at the laboratory

- Soil sampling was done to establish the baseline characteristics so as to assess the anticipated impacts due to proposed project. Soil samples were collected using auger from a depth of 30 cm (sub surface) from the upper surface. Samples were homogenized before testing. The samples were packed in dependable, waterproof containers and analysed as per ASTM, USEPA, IS: 2720, M.L. Jackson (Soil Chemical Analysis). The sampled soil quality results are presented in below table and characteristics are described further.

Table 3-19-Methods for Soil Analysis

S.N	Parameters	Method
1.	pH (30 gms/ 75 ml)	pH meter
2.	Electrical conductivity, µmho/cm (1:5 with water)	Conductivity meter
3.	Texture	Grain size analysis
4.	Chlorides as Cl, % by mass	Volhard's method
5.	Sulphates as SO4, % by mass	Gravimetric method
6.	Magnesium as MgO, % by mass	AAS
7.	Aluminium as Al2O3, % by mass	AAS
8.	Total Phosphorus as P2O5, % by mass	Gravimetric method
9.	Calcium as CaO, % by mass	AAS
10.	Sodium as Na2O, % by mass	AAS
11.	Potassium as K2O, % by mass	AAS
12.	Nitrogen	Kjeldahl method
13.	Sodium absorption ratio	By calculation
14.	Moisture, % by mass	Oven dry
15.	Total Hydrocarbon, mg/kg	Solvent extraction

h

Table 3-20 Soil quality analysis

S. No.	Parameter	Unit	SQ-1	SQ-2	SQ-3	SQ-4	SQ-5	SQ-6	SQ-7	SQ-8
1	pH (1:2.5 Suspension)	-	7.69	7.82	7.89	7.67	7.52	7.48	7.64	7.73
2	Bulk Density	gm/cc	1.41	1.36	1.39	1.45	1.42	1.37	1.43	1.45
3	Conductivity (EC) (1:2 Suspension)	micro mhos/cm	616	577	461	329	171	262	415	495
4	Moisture	%	10	12	14	13	10	9	12	8
5	Texture	-	Sandy Loam	Sandy Loam	Sandy loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam
6	Sand	%	65	60	64	57	61	67	60	68
7	Silt	%	22	23	20	28	24	22	21	19
8	Clay	%	13	17	16	15	15	11	19	13
9	Sodium	mg/kg	93	70	82	105	85	70	96	82
10	Potassium	mg/kg	25	21	26	42	27	29	36	36
11	CEC	meq/100gm	7.2	8.4	7.8	8.3	10.4	9.4	8.9	10.9
12	Nitrogen	mg/kg	38.4	23.6	34.9	48.2	41.3	37.2	42.5	35.2
13	Phosphorus	mg/kg	7.2	7.6	8.3	11.1	9.3	7.3	8.7	8.3
14	Organic Carbon	%	1.7	1.9	2.1	2.7	2.6	1.8	2.5	2.3
15	Calcium	mg/kg	1260	1570	1420	1650	1770	1540	1680	1840
16	Magnesium	mg/kg	102	142	125	118	135	86	154	162
17	SAR	-	0.65	0.55	0.61	0.72	0.52	0.62	0.71	0.59
18	Porosity	% v/V	41.7	43.5	39.4	42.9	44.2	46.5	42.6	39.8

The results of the soil quality analysis were compared with the standard soil classification provided by the Indian Council of Agricultural Research (ICAR) and as given in Table below.

Table 3-21: Standard Soil Classification

Soil Parameters	Classification	
pH	Normal to Saline	6.0-8.5
	Trending to become alkaline	8.5-9.0
	Alkaline	Above 9.0
Electrical conductivity (mmhos/cm)	Up to 1.00 – Normal	
	1.01- 2.00 - Critical to germination	
	2.01-4.00 - Critical for growth of the sensitive crops	
	Above 4.00 – Injurious to most crops	

Source: Indian Council of Agricultural Research, New Delhi

In qualitatively terms, soil texture refers to the feel of the soil material, whether coarse and gritty, or fine and smooth. In general, soil behavior can be inferred from the texture. At project site and within its 5 km radius, soil is sandy loam**.** Total nitrogen content present in the soil available in the region ranges between 23.6-48.2 mg/kg and phosphorus content was observed 7.2-11.1 mg/kg to all the locations monitored. This indicates that soil in the study area having low levels of Phosphorus and Nitrogen. Soil in the study area contains very low quantity of Micronutrient such as Copper and Zinc and Manganese. Land parcels can be classified according to its possible use for irrigation based on soils. As the soils present in study area predominantly is sandy loam, land can be classified as class 1 i.e., the highest level of irrigation suitability and thus the highest payment capacity.

BIOLOGICAL ENVIRONMENT

- Natural ecosystem is a complete community of living organisms and non-living constituents in a given area and their interactions. An ecosystem has self-sustaining ability and controls the number of organisms at any level by cybernetic rules. The basic purpose to explore the biological environment under Environmental Impact Assessment (EIA) is to assess the potential ecological impacts of the proposed project upon ecology and develop adequate mitigation measures to keep ecological impacts within acceptable limits. An ecological survey of the study area was conducted, particularly with reference to listing of species and assessment of the existing baseline ecological conditions in the study area. The main objective of the ecological survey is aimed at assessing the existing flora and fauna components in the study area. Data has

been collected through extensive survey of the area with reference to flora and fauna. With the change in environmental conditions, the vegetation cover as well as animals reflects several changes in its structure, density and composition. The present study was carried out separately for floral and faunal community of core and buffer zone respectively.

Need to Study

The present study was undertaken with the following objectives:

- To assess the nature and distribution of vegetation in and around the project site (within 10 km. radii)
- To assess the animal life spectra (within 10 km radii)

To achieve the above objectives a study area was undertaken. The different methods adopted were as follows:

- Compilation of secondary data with respect to the study area from published literature and various government agencies;
- Generation of primary data by undertaking systematic ecological studies in the area.

SELECTION OF SAMPLING LOCATION FOR THE STUDY OF FLORA AND FAUNA

Core Zone (1^0 Collection site): Core zone is the area where project is to be constructed as the site area is 243.98 acre so it is considered as core zone. All the flora and fauna of core zone has been recorded during the survey.

Buffer Zone (2^0 Data Collection Areas): The zone falling within 10 Km radius around the project area.

METHODOLOGY FOR STUDY OF FLORA

For Primary Data Collection

Five sites were identified within the project site to ensure that the different ecosystem and land-use types in the area are suitably represented. At each site, floristic diversity was studied through quantitative sampling. A quadrate of approximately 20 m x 20 m was used to record species of flora species. Owing to the relatively short duration of the survey, the focus of the floristic observations was limited to the higher flora.

At each site, faunal diversity was studied through direct evidence, in the form of visual sightings or calls, and indirect evidence, such as nests, burrows, droppings, scats, moults, tracks, etc. Owing to the survey being conducted during the daytime only, the focus of the faunal observations remained limited to the diurnally active faunal species, mainly birds.

Different species were observed at different timing during the day

Bird: Birds were watched during dawn.

Nocturnal and Burrowing animals: After Sunset.

Animals: Morning & Evening

Collection of Secondary Data

Secondary data is collected i.e., Compartment History prepared by the Forest Department, Working Plan of the Area other relevant records such as plantation journals and records of wildlife / forest offence cases.

Cropping Pattern: Cereals such as maize and wheat are the main cultivated crops. Beside these crops fruits and vegetables are also cultivated.

FLORA AND FAUNA OF THE STUDY AREA

The Forests in Himachal Pradesh are known for their grandeur and majesty, like a green pearl in the Himalayan crown. This life supporting systems are presently under great stress due to impact of modern civilization, economic development and growth in human and cattle population.

According to National Forest Policy, 1988, at least two thirds i.e 66 of the geographical area should be under forests in hilly states like Himachal Pradesh. However, keeping in view, that about 20 percent of the area is inaccessible and beyond the tree limit, the State Government aims to bring 50 of the geographical area under forest cover (See Map Also).

The forests of the State have been classified on an ecological basis as laid down by Champion and Seth, and can be broadly classified into Coniferous Forests and broad-leaved Forests. Distribution of various species follows fairly regular altitudinal stratification. The vegetation varies from Dry Scrub Forests at lower altitudes to Alpine Pastures at higher altitudes. In between these two extremes, distinct vegetational zones of Mixed Deciduous Forests, Bamboo, Chil, Oaks, Deodar, Kail, Fir and Spruce, are found. The forests of Himachal Pradesh are rich in vascular flora, which forms the conspicuous vegetation cover. The richness and diversity of our flora can be gauged from the fact that, out of total 45,000 species found in the country as many as 3,295 species (7.32) are reported in the State. More than 95 of the species are endemic to Himachal Pradesh and

characteristic of Western Himalayan flora, while about 5 (150 species) are exotic, introduced over the last 150 year.

The total geographical area of Himachal Pradesh based on the Surveyor General of India's data is 55,673 Sq. Km. A. Forest Area by Revenue Department As per village paper prepared and maintained by revenue department based on cadastral survey, the area measured is 45,318 Sq. Km.; and, 10,355 Sq. Km. is still unmeasured without proper surveying and classification. Major part of the unmeasured area falls in the districts of Kinnaur, Kullu and LahaulSpiti.

Natural flora and fauna are organized into natural communities and constantly interact with their physical environment as well as among themselves. They show various responses and sensitivities to outside influences. Hence, for a meaningful assessment is necessary to fully understand the ecological status of the proposed site for any development project before evaluating the probable environmental impact of the project. This impact can be maintained at a minimal level or can even be ameliorated if the probable shift the proposed activities envisaged in the project may induce in the dynamic equilibrium maintained in the ecosystem through the intricate interactions between the operative abiotic and biotic factors.

The sites for terrestrial ecology sampling were identified during the reconnaissance survey and sampling was carried out in December-2018. The study includes listing of flora and fauna in and around 10 km radial from the project site.

Vegetation Study:

To obtain the baseline information of the flora, listing of the vegetation diversity

Table 3-22- List of vegetation diversity recorded in the study area

Sr. No.	Common Name	Scientific Name
1	*Abrus precatorius*	Gunja, Rati
2	*Aegle mormelos*	Bel
3	*Andropogon involute*	Bagar grass
4	*Aristida depressa*	Lambi
5	*Asparagus racemosus*	Sansarmul
6	*Bambusa arundinacea*	Kanta bans
7	*Barleria cristata*	
8	*Barleria cristata*	Sairyk, Jhinti

9	*Bauhinia racemosa*	Karal
10	*Bombax ceiba*	
11	*Butea monosperma*	Dhak, Palah
12	*Caesalpinia crista*	Latakaranj
13	*Cannabis sativa*	Bhang
14	*Carissa spinarum*	Garna
15	*Cassia fistula*	
16	*Cedrela serrate*	Dauri
17	*Cedrus deodara*	Deodar
18	*Chrysopogon fulvus*	Dholu
19	*Cordia dichotoma*	
20	*Cordia myxa*	
21	*Cryptolepis buchanani*	Krishan saribe
22	*Curculago orchioides*	Kali Musali
23	*Cymbonpogon martini*	Makora
24	*Cymbopogon cristatus*	Katrin
25	*Cynodon dactylon*	Dub
26	*Cyperus rotundus*	Nagarmotha
27	*Dendrocalamus strictus*	Bans
28	*Diospyros melanoxylon*	Kinu
29	*Dodonea viscosa*	Mendru
30	*Eleusine indica*	
31	*Emblica officinallis*	Amla
32	*Ficus benghalensis*	Bar, Bargad
33	*Ficus glomerata*	Fagura
34	*Heteropogon contortus*	Sariala

35	*Lantana camara*	
36	*Mangifera indica*	Aam
37	*Melia azadirach*	Drek
38	*Murraya koenigii*	Gandhela
39	*Nerium odorum*	Kaner
40	*Opuntia stricta*	Thor
41	*Oscimum sanctum*	Tulsi
42	*Pinus longifolia*	Chil
43	*Plumbago zeylanica*	Chitrak
44	*Pongamia pinnata*	Karanj
45	*Rauvolfia surpentina*	Sarapagandha
46	*Rhododendron arborium*	Brass
47	*Ricinus communis*	Arand
48	*Saccharutn sara*	Munj
49	*Shorea robush*	Sal
50	*Syzygium cumini*	Jamun

51	*Tagetes erecta*	Gatakri
52	*Terminalia arjuna*	Arjun
53	*Terminalia bellirica*	Bahera
54	*Terminalia chebula*	Harar
55	*Terminalia tomentosa*	Sain
56	*Trifolium alexandrinum*	
57	*Tinospora cordifolia*	Gloe
58	*Vitex negundo*	Bana
59	*Withania somnifera*	Ashvagandha
60	*Zizyphus jujuba*	Ber
61	*Gloriosa superba*	Kalihari
62	*Lannea coromandelica*	Shemat
63	*Boswellia serrata*	Salai
64	*Mallotus philippensis*	Kamla

Faunal Diversity

Common Babbler	***Turdoides caudata***
Common Myna	*Acridotheres tristis*
Hoopoe	*Upupa epops*
House Crow	*Corvus splendens*
House Sparrow	*Passer domesticus*
Indian Cuckoo	*Cuculus micropterus*
Indian roller	*Coracias benghalensis*
Koel	*Eudynamys scolopaceus*
Little Green Bee- Eater	*Merops orientalis*
Oriental Magpie Robin	*Copsychus saularis*
Pied kingfisher	*Ceryle rudis*
Pied Myna	*Gracupica contra*
Red vented Bulbul	*Pycnonotus cafer*
Red-rumped Swallow	*Cecropis daurica*
Rose-ringed Parakeet	*Psittacula krameri*
Spotted Dove	*Spilopelia chinensis*
White-breasted King fisher	*Halcyon smyrnensis*

SOCIO ECONOMIC ENVIRONMENT

This discusses the baseline scenario of the socio-economic environment in the study area and anticipated impacts of the proposed expansion project on the socio-economic environment. The issues under focus in this topic are demographic pattern, economic activity, education and literacy profile, etc. The assessment attempts to predict and evaluate the future impacts of the proposed project on socio-economic environment.

Baseline Socio-Economic Status

Baseline data regarding the socio-economic profile with reference to demographic structure, infrastructure resource base, health status and economic resource base is collected using secondary sources Census data for the year 2011 within 10km radius around project site,

The population of the district has increased by 12.0 per cent during 2001-2011. There are 1061 number of villages falling within the 10km radius of project site. In these 1061villages, total 80,323 households are presents. Total population residing in the study area is 3, 81,956. Out of total population, 50.46% are male and 49.54% are female. Total schedule caste population is 98,989, which is 25.92% of the total population within 10km project boundary. Total schedule tribe's population is 10,693 which is 2.80% of total population

DISTRICT CENSUS HANDBOOK : BILASPUR

DISTRICT PRIMARY

Location code number	District/ CD Block/ Town	Total/ Rural/ Urban	Area in Square Kilometre	Number of households	Total population (including institutional and houseless population)			Population in the age-group 0-6		
					Persons	Males	Females	Persons	Males	Females
1	2	3	4	5	6	7	8	9	10	11
0053	Bilaspur Sadar	Total	512.88	27,800	140,307	72,141	68,166	16,408	8,604	7,804
		Rural	512.88	27,800	140,307	72,141	68,166	16,408	8,604	7,804
		Urban	0.00	-	-	-	-	-	-	-

PRIMARY CENSUS ABSTRACT

CENSUS ABSTRACT

Scheduled Castes population			Scheduled Tribes population			Literates			Total/ Rural/ Urban	District/ CD Block/ Town
Persons	Males	Females	Persons	Males	Females	Persons	Males	Females		
12	13	14	15	16	17	18	19	20	3	2
36,884	19,009	17,875	6,439	3,342	3,097	100,159	56,462	43,697	Total	Bilaspur Sadar
36,884	19,009	17,875	6,439	3,342	3,097	100,159	56,462	43,697	Rural	
-	-	-	-	-	-	-	-	-	Urban	

4. IMPACT ANALYSIS AND MITIGATION MEASURES

This chapter discusses various environmental and social impacts that have been identified, predicted and quantified during the course of this study. These include positive and negative, direct and indirect, local and regional and also reversible and irreversible impacts due to project construction and operation. The impact assessment forms the basis for development of Environmental Management Plan.

The potential impacts during *construction phase* and *operation phase* of the project have been identified and discussed, along with the suggested mitigation measures in following sections.

IMPACT APPRAISAL CRITERIA

The criterion which has been employed to appraise impacts on various social and environmental components is as presented as **Table 4-1** below

Table 4-1 Impact appraisal criteria

Criteria	Sub - Classification	Defining limit	Remarks
Spread: refers to area of direct influence from the impact of a particular project activity.	Insignificant/1 ocal spread	Impact is restricted within the foot prints of the Project boundary	except for ecology (which is defined as limited loss of vegetation only at site)
	Medium spread	Impact is spread up to 3 km from the boundary of the Project	except for ecology (which is defined as loss of vegetation at site including large trees with limited disturbance to adjoining flora & fauna)
	High spread	Impact is spread up beyond3 km from footprint boundary of the Project	except for ecology (which is defined as loss of vegetation at site and/or damage to

			adjoining flora and fauna
Duration: based on duration of impact and the time taken by an environmental component to recover back to its best possible pre-project state	Insignificant / Short Duration	Impact is likely to be restricted for duration of less than 2 years;	the anticipated recovery of the affected environmental component within 2 years
	Medium Duration	When impact extends up to five years	With an anticipated recovery of the affected environmental component within 6years
	Long duration	when impact extends beyond five years;	With anticipated recovery of prevailing condition to happen within 6 years or beyond or upon completion of the project life.
Intensity: defines the magnitude of Impact	Insignificant intensity	when resulting in changes in the environmental baseline conditions is up to 10%	However, it shall be reconsidered where the baseline values are already high.
	Low intensity	when resulting in changes in the baseline conditions up to20%	for ecology it refers to minimal changes in the existing ecology in terms of their reproductive capacity, survival or habitat change
	Moderate intensity	when resulting in changes in the baseline conditions for up to 30%	for ecology, it refers to changes that are expected to be recoverable
	High intensity	when change resulting in the	While for ecology, high intensity refers to changes

		baseline conditions beyond 30%	that result in serious destruction to species, productivity or their habitat.
Nature: refers to whether the effect is considered beneficial or adverse	Beneficial		Useful to Environment and Community
	Adverse		Harmful to Environment and Community

A significance assessment matrix was developed to assess the impact based on the appraisal criteria developed above which is as given in **table below**.

Table 4-2 Assessment matrix for proposed site

Spread	Duration	Intensity	Overall significance	
			Adverse	Beneficial
Local	Short	Low	Insignificant	Insignificant
Local	Short	Moderate	Minor	Minor
Local	Medium	Low		
Local	Medium	Moderate		
Medium	Short	Low	Moderate	Moderate
Local	Long	Low		
Local	Short	High		
Local	Medium	High		
Local	Long	Moderate		
Medium	Short	Moderate		
Medium	Medium	Low		
Medium	Medium	Moderate		
Medium	Long	Low		
Medium	Long	Moderate		
High	Short	Low		
High	Short	Moderate		
High	Medium	Low		

High	Medium	Moderate		
High	Long	Low		
Local	Long	High	Major	**Major**
Medium	Short	High		
Medium	Long	High		
High	Short	High		
High	Medium	High		
High	Long	Moderate		
High	Low	Low		
High	Low	High		

The reversible and irreversible nature of impacts will also be considered. Any minor or moderate impact of irreversible nature will be considered as a moderate and major impact.

The impacts for the proposed project are covered under the following subsections:

- Construction Phase
- Operation Phase

Table 4-3 Impact identification matrix for the redevelopment of proposed site

MAIN ACTIVITIES	ENVIRONMENT AND SOCIAL COMPONENTS																
	Land use	Ecology	Water	resource	Ambient air quality	Soil	resource	Ambient noise	quality	Water quality	Traffic/transport		Social pattern	OHAS	Aesthetic		
CONSTRUCTION PHASE																	
Construction activity																	
Site Clearance	√	√	√			√							√		√		
Excavation					√	√				√							
Transportation & Unloading of construction material					√						√			√			
Storage and Handling of construction material et.					√	√											
Preparation/Mixing of construction material			√		√	√		√		√							
Operation of construction machinery					√	√		√						√			
Construction and Erection of buildings					√	√											
Operation of DG sets					√			√									
Handling and Disposal of construction wastes		√			√	√				√							
Requirement of utilities such as water, power, sanitation facilities		√	√		√	√		√									
Labour engagement																	
Employment of workers																	
Water requirement			√														
Power requirement					√			√									
Waste handling and disposal		√				√											

Sewage disposal				√		√						
OPERATIONAL PHASE												
Employment of labours and staffs										√	√	
Water requirement		√										
Power requirement			√		√							
Waste handling and disposal	√	√		√								
Sewer Generation						√						
Operation of DG sets for power backup			√		√							
Vehicle Movement within the site			√	√	√			√				

IMPACT DURING CONSTRUCTION PHASE

The activities that take place during construction phases of the project are site clearance, operation of machineries, transportation and unloading of materials, demolition of existing structures, construction and erection of buildings. During construction phase, the potential primary and secondary impacts on the environment, their significance and mitigation are discussed in the following sub-sections. It is likely that the following parameters will be impacted:

- Land Environment
- Air Quality
- Ambient Noise Quality
- Water Resources and Quality
- Biological Environment
- Soil
- Traffic &Transport
- Solid Waste
- Livelihood
- Socio-Economic Environment
- Occupational Health and Safety

IMPACT ON LAND ENVIRONMENT

Some of the anticipated impacts on the land environment due to the project are

Change in Land use and Aesthetics: The proposed project is having total area of 98.73 hectare however area to be developed under phase-I is 93.76 hectare. For the site development total 1331-19 bighas land is required, out of this 521-04 bighas and 112-04 bighas land was under possession of department of animal husbandry and 160-05 bighas land is under the revenue department, However 538-06 bighas is forest land involved.

Land from Revenue department and animal husbandry is transferred but area under forest is under process.

The project will involve construction of roads and other infrastructures, green areas, open spaces, residential, institutional and other medical facilities etc. With these upcoming structures, it is expected that the land use pattern of the area will be changed without

compromising on the socio-economic status of the local people. The development of the project will lead to a positive change in aesthetics and visual appeal of the region

Change in Topography: The land parcel almost plain except the non-forest land above NH which is crossing the proposed site in middle, which is having steep slope towards south and south west. And having plain area on other sides. The construction activities such as excavation works for foundations of various project-components, development of drains and erection of the associated structures and buildings will change the topography of the area. However as the land is relatively flat, hence no major change is envisaged

Mitigation Measures

- Cutting and filling operations will be limited, only as and when necessary.
- During excavation works, dumping sites for the excavated muck shall be created within the premises as it would be difficult to transport the muck over hilly slope. In the sites proposed, the topsoil will be preserved in stockpiles. At such locations, the depth of borrow pits shall not exceed 45 cm and it may be dug out to a depth of not more than 30 cm after stripping the 15 cm top soil aside
- The movement and parking of heavy machinery and other vehicles will be restricted to identified routes; thereby limiting the possibility of compaction.
- The project will ensure that the existing elements of the natural environment (ponds, trees etc.) are integrated in the urban design. Natural features will be maintained, preserved and further developed.
- An attempt should be made to preserve, establish and promote a vegetative cover, appropriate to the site prior to the onset of intense rain or windstorms.
- Good housekeeping at labour resting areas and the construction area will ensure the aesthetics of the area.
- All debris and excavation material will be stored securely and removed within a stipulated period.
- Proper routing and adequate capacity of the storm water run-offs drains/garland drains with catch pits will be provided at the construction areas to collect the construction waste water/runoff.

Significance of Impact

- The overall impact is assessed to be moderate, however with the implementation of mitigation measures the impact can be contained with minor residual impacts.

Table 4-4 Impact significance -Land Environment

ASPECT	SCENARIO	SPREAD	DURATION	INTENSITY	OVERALL
Land Environment	Without Mitigation	Moderate	Medium	Moderate	**Moderate**
	With Mitigation	Local	Medium	Low	**Minor**

IMPACT ON AMBIENT AIR QUALITY

During the construction phase, the major pollutant of concern will be particulate matter (PM_{10} and $PM_{2.5}$).The dust emissions will vary substantially from day to day based on the level of activity, the specific operations and the prevalent meteorological conditions. The construction activities will involve:

- PM emissions from excavation activities;
- NOx, SO_2 and CO emissions due to operation of construction equipment's, machinery and vehicular movement.
- PM, NOx, SO_2 and CO emissions from operation of Diesel generator set.

The excavation activities for the Project shall be carried out in phases. Power shall be sourced from the grid during the construction activities;

Anticipated Impact

Dust generated by various construction site activities can make a significant contribution to local air pollution. High levels of dust, combined with other outdoor air pollutants, can cause respiratory problems. Dust also reduces visibility, dirties clothing and buildings, and increases the rate of corrosion. The construction activities and machine operation during the construction phase shall lead to temporary impact on vicinity, as the current ambient air quality parameters have high values then permissible limits however good site practices are the major mitigation measures for prevention or minimization of air pollution from construction activities.

Mitigation Measures

Dust Control Measures

- The humus rich top soil shall be removed and stored in an appropriate manner prior to excavation so that the original soil-profile can be restored while relocating it.
- Wet suppression shall be applied to at least 80 percent of disturbed surface areas on a daily basis especially during dry and windy days.
- Downwash of trucks (especially tyres) shall be done prior to departure from site to reduce the mud and dirt carryout.
- The vehicle speeds on unpaved roads shall be restricted 25 kmph.
- Limited vehicular movement shall be permitted on disturbed soils.
- Contractors shall be required to maintain valid PUC – Pollution under Control certificates and to maintain proper maintenance records for their fleet.
- During material handling, the materials should be dropped from a low height in order to reduce any fugitive dust emissions.
- All areas for storing C&D wastes / construction material shall be demarcated and preferably barricaded particularly those materials that have potential to be dust borne.
- Dry sweeping of work areas shall be prohibited
- Haul trucks should be covered with suitable covering material like tarpaulin sheets to prevent fugitive emissions during transportation of construction materials.

Fuel Emissions Control

- DG sets will be used as a backup source only;
- DG sets will be regularly maintained to comply with emission norms;
- The stack height for DG sets shall be provided as per the CPCB norms;

Significance of Impact

The overall impact is assessed to be moderate, however with the implementation of mitigation measures the impact can be contained with minor residual impacts.

Table 4-5 Impact significance- Ambient Air Quality

ASPECT	SCENARIO	SPREAD	DURATION	INTENSITY	OVERALL
Ambient Air Quality	Without Mitigation	Moderate	Medium	Moderate	**Moderate**
	With Mitigation	Local	Medium	Low	**Minor**

IMPACT ON AMBIENT NOISE QUALITY

Sources of Noise Pollution during Construction Phase

During the construction phase of the site, the sources of noise pollution are expected mainly from:

- Construction equipment and machinery engaged for construction activities (such as excavation, grading, erecting equipment, piling, etc) such as air compressors, backhoe, concrete mixer, concrete mixer, cranes, dump-truck, pile driver, and radial arm saw, DG set etc. The operation of heavy equipment is likely to temporarily increase the ambient noise levels of the area.
- An increase of 1 to 3 dB (A) noise levels of is expected in the adjoining area during day time during peak construction activities.

Anticipated Impact

- Noise generated can cause disturbance to the local population and can even lead to sleep disorder.
- Workers working close to high noise area can be exposed to occupational hazards of noise depending on the duration of exposure.

Mitigation Measures

The project will ensure that the EPC contractors should implement the following:

- The construction areas shall be provided with sheet barriers or temporary walls along the boundary close to any habitations;
- Rubber padding shall be provided in the construction machinery for vibration control; No noise generating activity shall be permitted from 22:00P.M-6:00 AM.
- The EPC contractors will adopt measures such as regular maintenance of its vehicles and repair of its equipment/ machinery.
- Construction workers working near high noise generation shall be provided with ear plugs/ ear muffs to limit exposure to occupational hazards.

Significance of Impact

The overall impact on the noise quality is assessed to be moderate. It is assessed that with implementation of suggested mitigation measures the overall impact can be maintained as minor.

Table 4-6 Impact on ambient noise quality

ASPECT	SCENARIO	SPREAD	DURATION	INTENSITY	OVERALL
Ambient Noise Quality	Without Mitigation	Moderate	Medium	Moderate	**Moderate**
	With Mitigation	Local	Medium	Moderate	**Minor**

IMPACT ON WATER RESOURCE AND QUALITY

The potential impact on water resources and quality from the construction phase of the project arises from the following:

- **Water usage**

The water requirement for the construction phase will include water for construction activities such as dust suppression, curing and formation of concrete mixtures and water for domestic consumption. The water required for both domestic purpose and construction activities will be sourced from IPH Department.

- **Sediment run off from construction area**

Waste water generated from the site during the construction contains suspended materials, spillage and washings from the areas that may percolate in the ground or get mixed with the sewage water. The construction activities will result in disturbance of topsoil rendering it vulnerable to erosion and runoff. The potential impact on water quality can be due to the runoffs from the site which can lead to contamination of adjoining land and ground water.

- **Unplanned disposal of sewage from construction camps**

It is expected that during construction phase there will be generation of sewage from portable toilets. About 80-100 m^3/day of sewage is expected to be generated due to working of 1000-1500 labours at the construction campsite. Improper disposal of sewage can also lead to contamination of nearby water sources.

Mitigation Measures

Following mitigation measures are suggested:

Water Consumption

- Awareness on optimal water consumption shall be provided to the labourers.
- Concrete structures shall be sprayed with water to allow curing and reduce flowing away of water. After curing, the concrete structures shall be painted with curing chemical to reduce further dependence of water for curing.

Effluent/Sewage Disposal

- To minimise adverse impacts due to the discharge of untreated sewage outside the project site, adequate number of portable toilets, soak pits shall be provided onsite for disposal of sewage as per the design aspects of Bureau of Indian Standards;
- The workers shall be strictly instructed and informed to avoid random disposal of wastewater.

Construction Wastewater Management

- Avoid excavation during monsoon season;
- To prevent the runoff from stockpiles generated during excavation, garland drains shall be constructed;
- Segregation and pre-treatment of oil and grease containing effluents from machinery (e.g. use of a grease trap)shall be undertaken prior to discharge into sewer systems;
- Silt fencing shall be provided to protect the water quality in the nearby water bodies from sediments.

Significance of Impact

The overall impact on the water resources is assessed to be moderate, however with the implementation of mitigation measures the impact can be maintained as minor.

Table 4-7 Impact significance Water resources

ASPECT	SCENARIO	SPREAD	DURATION	INTENSITY	OVERALL
Water resource and Quality	Without Mitigation	Moderate	Medium	Moderate	**Moderate**
	With Mitigation	Local	Low	Moderate	**Minor**

IMPACT ON ECOLOGY

The site area except parcel of non-forest land is a flat land with tree cover and vegetation at the site. The survey-area (extending up to 10 km from the boundary of the project site) consists of open scrub. In core zone, around approx. 568 trees have been found however in buffer zone site is having forest wasteland etc. Some of the anticipated impacts on the ecological environment due to the project during construction phase are:

- Species identified in the survey area will be temporarily affected and may be migrated to nearby areas. However, the degree of impact will be low as the disturbance is going to confine to the construction period only.
- The project construction activities will necessarily comprise of removal of vegetation and tree cover. Cutting of approx. 568 trees on the site will involve removal of local floral species found on the site.
- Air, noise and visual disturbance generated during the site development can affect the behavior of fauna (especially bird, butterflies and other insects, reptiles and very small mammalian species) within and also the nearest adjacent habitats.

Mitigation Measures

The following mitigation measures need to be put in place address the potential impacts on ecology due to construction activities:

- The plantation should undertake to mitigate natural vegetation loss and all new plantation undertaken in the project area will involve only native species. Every care will be taken to prevent the introduction of any alien species into the project area.
- Compensatory plantation shall be done.
- The construction contractors shall be instructed to avoid removal of any natural vegetation to the maximum extent possible;
- Tree cutting will be done systematically, depending on the area of construction. A pile of brash and logs in the area shall be kept to develop alternate habitat in the area.
- No hunting activity shall be permitted within and around the project area and strict guidelines will be given to contractors to ensure that such activities are not practiced;
- In case of any wildlife being spotted within the project site, trained personnel from the Forest Department and Wildlife Warden's office and approved experts shall be intimated for rescue of the wildlife;

- The project activities shall ensure measures as suggested for ambient air quality and traffic and transport of material so as to minimize impacts on the ecology of the site and its surroundings;
- Levels of noise shall be maintained at a minimum during construction activities.
- Cutting or lopping of trees shall be avoided. Mature trees and standing trees should not be cut to the extent possible.
- The construction contractors will be instructed to provide fuel for any heating requirements at site and not to use firewood from adjoining areas.

Significance of Impact

The overall impact on the ecology is assessed to be moderate. It is assessed that with implementation of suggested mitigation measures the overall impact on ecology can be maintained as minor.

Table 4-8 Impact significance-Ecology

ASPECT	SCENARIO	SPREAD	DURATION	INTENSITY	OVERALL
Ecology	Without Mitigation	Regional	Medium	Moderate	**Moderate**
	With Mitigation	Local	Medium	Moderate	**Minor**

IMPACT ON SOIL QUALITY

The site area is having non calcic brown soil.These soils show moderate development leading to ABC profiles. Depending upon the physiography, these are characterized by the presence of argillic horizons whereas in certain locations, cambic horizon is of common occurrence. Soil reaction is neutral in most cases and rarely acidic. The texture varies from loamy sand to clay loam. Organic matter content varies from low to medium. These soils are equivalent to Eutrochrepts and hapludalfs according to Soil Taxonomy of USDA. During the construction phase total excavated soil qty is approx. 1, 96,916 cum, the excavation of foundations and basements dewatering from site shall be done. So the anticipated impact on soil quality shall be as follow

Anticipated Impact

- **Installation of heavy construction machinery causing soil compaction:** Movement of heavy vehicles and machinery on unpaved surface can result in compaction of soil which can increase the run off potential thereby decreasing the possibility for recharge. The compaction of soils in the areas meant for temporary uses can render the area less fertile.
- **Soil Contamination**: Potential contamination of soil may occur due to accidental spills of lubricating oil, fuel oil, paint, thinner during their handling and storage
- **Soil Erosion**: Erosion of the top soil may result from exposure of loose soil surfaces to rain and wind during site clearing, earth moving, and excavation activities. The loss of top soil may result in lack of good soil for landscaping and greenbelt development in the later stages
- **Waste Management**: The construction phase will involve generation of construction waste/ debris, waste oil and chemicals from construction machinery and domestic solid waste from campsite etc. The construction phase will involve generation of construction and demolition waste/ debris, waste oil and chemicals from construction machinery and domestic solid waste from campsite etc. There is potential for spread of construction waste to areas outside the construction site and contaminate wells, soil etc. if adequate management measures are not put in place. lists various C&D waste generated during construction phase.

Table 4-9 Quantification of different construction waste generated

S.No.	Constituents	Quantity of Waste generated (tones/annum)
1.	Soil, sand and gravel	4.2-5.14
2.	Bricks and Masonry	3.6-4.4
3.	Concrete	2.4-3.67
4.	Metals	0.6-0.73
5.	Bitumen	0.25-0.30
6.	Wood	0.25-0.30
7.	Others	0.1-0.15

http://www.tifac.org.in/offer/tlbo/rep/TMS150.htm

Mitigation measures

Soil Management

- Topsoil (upper 30 cm) shall be removed prior to commencement of bulk earthwork and reused later for landscaping purpose .This is done to ensure that the good quality top soil is not lost;
- Minimum clearance of trees shall be carried out and the vegetative cover shall be redeveloped wherever possible;
- The excavated soil material shall be stacked in earmarked areas only;
- Excavated soil shall be used/transported at the earliest for filling low lying areas at the site; It will be the responsibility of the Contractor to get the permission for yard for dumping the surplus excavated earth from local authority

Soil Erosion Control Measures

- Major activities pertaining to site grading and excavation for foundation and backfilling shall be avoided during monsoons and shall be planned for dry season.
- Retention wall or bund shall be provided around the storage areas for excavated soil and other construction material to check the flow of sediments with storm water in case of rain;
- Completed earthworks shall be re-vegetated as soon as possible

Soil Compaction

- Movement of heavy machinery in the site area shall be restricted to minimize the possibility of compaction;

Prevention of Contamination by Waste Management

Construction and Demolish Waste

- Excavated materials shall be used for backfilling material in other locations simultaneously;
- Construction wastes from site such as metal cuttings debris, plastic packing material, wooden logs etc will be segregated and kept in specially identified waste bins.
- The recyclable items like metal and plastic shall be stored separately and sent to recyclable industry
- Potentially hazardous waste shall be segregated from non-hazardous construction site debris.

- The contractor shall educate the workers and subcontractors about hazardous waste storage and disposal procedures;
- C& D Management rules 2016 shall be followed strictly.

Significance of Impact

The overall impact on the soil resources is assessed to be moderate. It is assessed that with implementation of suggested mitigation measures the overall impact on soil resource can be maintained as minor

Table 4-10 Impact significance-Soil Resource

ASPECT	SCENARIO	SPREAD	DURATION	INTENSITY	OVERALL
Soil Resource	Without Mitigation	Regional	Medium	Moderate	**Moderate**
	With Mitigation	Local	Medium	Moderate	**Minor**

IMPACT ON TRAFFIC AND TRANSPORT

The construction phase will entail transportation of construction materials and movement of labour. It is expected NH 205 will be mainly used for this purpose, which is passing through the site.

The potential impact due increase in traffic and transportation during construction phase would be:

- Increased potential for traffic hazards on the adjacent roads of the area, due to the construction activities.
- The condition of roads may deteriorate during the construction phase due to frequent movement of heavy vehicles and equipment.
- Disruption of traffic is anticipated on connecting roads due to unplanned entry to the site, parking of trucks, breakdowns, etc.

Mitigation measures

The movement of traffic entering the site shall be properly managed so as to cause minimum problems to local users on this road;

- The EPC contractors will undertake consultation with local Police prior to movement of the construction traffic particularly for the movement of heavy machinery;
- The construction vehicles shall be allowed to move in the site only through exclusive entry and exit points;
- Adequate training shall be given to the drivers of construction vehicles for speed restrictions; and Roads damaged due to project vehicle shall be repaired and maintained at regular intervals during the construction period.
- Transportation movement shall be done during non-peak hours.

Significance of Impact

The overall impact on the traffic and transportation is assessed to be moderate to high. It is assessed that with implementation of suggested mitigation measures the overall impact can be maintained as moderate.

Table 4-11 Impact significance- Traffic and Transportation

ASPECT	SCENARIO	SPREAD	DURATION	INTENSITY	OVERALL
Traffic and Transport	Without Mitigation	Regional	Long	High	**Major**
	With Mitigation	Local	Long	Moderate	**Moderate**

IMPACT ON SOCIO ECONOMIC ENVIRONMENT

The construction activities might bring about certain impacts which might affect the population in nearby villages. The impacts enlisted below are limited to construction phase only and can be mitigation by implementing proper measures, as mentioned in the later section.

- The construction activities and big machineries which will be operated in the construction phase are bound to generate a higher decibel of noise which might disturb the local adjoining residential area for a very short duration. In addition, during the operation phase, the vehicular movement of buses and cars will also tend to create higher noise exposure in the surrounding villages.

- With the commencement of construction activities, accumulation of water in the dugout areas of the site might result in being breeding place for mosquito breeding and spread of vector borne diseases.
- Once the construction activities commences, problem of traffic congestion in the area might arise because of movement of heavy vehicles, to and fro from the site.

Mitigation measures

The following mitigation measures can be implemented to counter the probable impacts that might emerge:

- Locals from nearby areas will be engaged in all construction activities and during the operation phases, as per their skill set, to supplement their income.
- Once the construction activities commences, care should be taken that drivers will valid licenses should only operate vehicles hauling the big machineries. A speed limit should be determined and followed for all vehicles passing that particular route.
- The operations of big machines will be restricted to day time only No noise generating activity will be permitted from 22:00P.M-6:00AM ;To minimize adverse impacts due to the discharge of untreated sewage outside the project site, adequate number of portable toilets, soak pits shall be provided onsite for disposal of sewage.
- The project will ensure that the existing elements of the natural environment (ponds, trees etc.) are integrated in the urban design. Natural features will be maintained, preserved and further developed.
- Preference of giving the locals from the area an opportunity of being hired in various jobs that might emerge during the course of the project activities should be made available.

IMPACT ON OCCUPATIONAL HEALTH & SAFETY

The workers engaged in construction activities will be exposed to occupational health and safety hazards and risks. Falls from elevation associated with working with ladders, scaffolding, and partially built or demolished structures are among the most common cause of fatal injury at construction sites.

- Construction activities may also pose significant hazards related to the potential fall of materials or tools, as well as ejection of solid particles from abrasive or other types of power tools which can result in injury to the head, eyes, and extremities.
- The workers will also be exposed to temporary hazards such as physical contact, spills, dust, emissions, and noise due to vehicular movement and use of lifting equipment in the movement of machinery.

The key health and safety concerns associated with construction activities are:

- Injury due improper handling, operation and execution
- Occupational hazards like high noise, electric shocks etc.
- Trip and fall, inadequate fall safe arrangements
- Diseases from unhygienic surrounding
- Exposure to hazardous substances etc.

Mitigation measures

The contractor will ensure that:

- The construction staff and contractors involved in the construction activities shall be trained on the necessary precaution and safety practices prior to commencement of construction activity
- The necessary safety measures shall be taken up before and during the construction activities for all electrical driven machinery
- A work permit system shall be implemented for all works related to working at heights (typically when working over 2m and above) .All works related to working at heights shall be undertaken only during the daytime when sufficient sunlight is available;
- Workers shall be provided with required PPEs to be used at site;
- All excavation activities shall be conducted in supervision of the site contractor;
- Proper signage shall be provided in places of excavated areas;
- Storage of explosives and blasting activities (if required) shall be undertaken as per the requirements of PESO and established good practices.

- The switchyard building and transformer areas shall be provided with adequate fire extinguishers and sand buckets at all strategic locations to deal with any incident of fire;

Significance of Impact

Table 4-12 Impact significance-Occupational Health & Safety

ASPECT	SCENARIO	SPREAD	DURATION	INTENSITY	OVERALL
Occupational health and safety	Without Mitigation	Regional	Medium	Moderate	**Moderate**
	With Mitigation	Local	Medium	Moderate	**Minor**

IMPACT DURING OPERATION PHASE

During operation phase, the potential primary and secondary impacts on the environment, their significance and mitigation are discussed in the following sub-sections. It is likely that the following parameters will be impacted:

- Land Environment
- Air Quality
- Ambient Noise Quality
- Water Resources and Quality
- Ecology
- Solid Waste Management
- Traffic &Transport
- Socio-Economic Environment

IMPACT ON LAND ENVIRONMENT

Some of the anticipated impacts on the land environment due to the project are:

- **Change in Runoff and Drainage pattern:** With the development of the project, pervious vegetative area will be replaced by impervious and paved surfaces leading to lesser infiltration and thereby increased runoff. This can lead to more localized flooding.

- **Potential Loss of Green spaces:** Tree cutting during construction phase will involve potential loss of green space as well as ecological biodiversity.

Mitigation measures

- Bios wales shall be developed on the green areas in order to reduce surface runoff and enhance infiltration and groundwater recharge. Bios wales are conveyance systems carrying storm water runoff that provide an alternative to storm sewers. They improve the water quality by infiltrating the first flush of storm water runoff and filtering the large storm flows;
- They consist of a shallow channel with gently sloped sides and filled with deep-rooted native plants. Bios wales utilize existing natural drainage for maintaining the flow of water they convey. Once established, they require less maintenance than turf grass because they need less water and no fertilizer.

Significance of Impact

Table 4-13 Impact significance-Land Environment

ASPECT	SCENARIO	SPREAD	DURATION	INTENSITY	OVERALL
Land Environment	Without Mitigation	Regional	Medium	Moderate	**Moderate**
	With Mitigation	Local	Medium	Moderate	**Minor**

IMPACT ON AIR ENVIRONMENT

- A site–specific baseline air quality monitoring program was conducted for the existing project site and the results are briefed in above section 3.4. Existing baseline condition reveals that concentration of CO, NOx, SO_2 are below the prescribed limits by NAAQS. However, concentrations of PM_{10} and $PM_{2.5}$ are higher than limits by NAAQS of 100µg/m^3 and 60µg/m^3 respectively. High levels of concentration as evaluated from baseline monitoring are due to prevailing smog in the city which has been formed by burning of crop residue.
- The major impacts on ambient air could be vehicular emissions from increase in traffic volume and emission from power backup/ DG sets.
- It is proposed that power will be mainly supplied from the HPSEB; however scenarios of power failures are expected during operation phase of the project.

Diesel generator sets have been proposed to provide the power back up for the proposed facility.

- All the above activities will generate emissions and may affect the local air quality.

Mitigation measures

Power backup Supplies

The DG sets shall be provided for power back up in case of any power failure. Following precautionary measures shall be taken care of:

- DG sets shall be located downwind of the residential areas;
- Stack heights for DG sets shall be maintained as per CPCB/ MoEFCC norms;

Vehicular Emissions

- Vegetative barriers in the form of green belt shall be provided around the project complex which will minimize the built up of pollution level by acting as pollution sinks.

Significance of Impact

The overall impact on ambient air quality is assessed to be moderate. It is assessed that with implementation of suggested mitigation measures the overall impact on ambient air quality can be maintained as minor.

Table 4-14 impact significance -ambient air quality

ASPECT	SCENARIO	SPREAD	DURATION	INTENSITY	OVERALL
Air Environment	Without Mitigation	Medium	Medium	Moderate	**Moderate**
	With Mitigation	Local	Medium	Moderate	**Minor**

IMPACT ON NOISE ENVIRONMENT

Noise level survey was carried out with respect to the proposed project in order to assess the background levels. The noise levels at 8 locations within the radius of 10 km of the project area conform to the standards prescribed by CPCB for residential zones.

The proposed development will involve activities that will generate noise. The major activities which can emit noise are as follows:

- Increase in traffic along the road due to the proposed site will increase the noise level at intersections and highways.

Mitigation Measures

- DG sets shall be provided with acoustic enclosures;
- Trees with heavy foliage shall be planted as vegetative barriers to minimise the noise pollution
- Traffic analysis shall be done and better alternatives should be found.

Significance of Impact

The overall impact on the noise levels in the area will be moderate with the commissioning of the operations and increase in traffic ; however with the implementation of suggested buffer areas, green barriers and attenuation measures the overall impact can be maintained as moderate to Minor.

Table 4-15 Impact Significance -Ambient Noise Quality

ASPECT	SCENARIO	SPREAD	DURATION	INTENSITY	OVERALL
Noise Environment	Without Mitigation	Local	Long	Moderate	**Moderate**
	With Mitigation	Local	Medium	Low	**Minor**

IMPACT ON WATER ENVIRONMENT

The project will use water from the allocated reservoirs of Kol dam via IPH to meet the requirement. No ground water usage will be made for any of the activities.

- The recycled water will be used for the non-potable water requirements of the site such as flushing and DG cooling. The use of treated wastewater to meet the water requirements for the project shall reduce the stress on the water resources in the region. The entire treated wastewater shall be reused and there will be no discharge of untreated sewage on land or in any surface water body.

- With the project proposing to implement the rainwater harvesting for the ground water recharge, conservation through awareness programs to bring about greater water efficiency, and reuse of treated wastewater on the proposed site during operation of the project for use in horticulture and other auxiliary purpose, the impact on water resources would be minimized.

Mitigation Measures

Water Conservation

The following measures are recommended to reduce the water usage:

- Water meters conforming to ISO standards shall be installed at the inlet point of water uptake and the discharge point to monitor the daily water consumption and identify leakages if any. In charge shall be responsible for carrying out systematic leak tests all year round;
- Appropriate flow restrictors shall be installed for economizing on water consumption. The flow restrictors shall be typically sized for following discharge:

Flushing	3/6LPF
Wash Basin	8.3LPM
Shower	9.5LPM
Kitchen Sink	9.5LPM
Urinal	2LPF

* LPF= liters/flush, LPM-Liters/min

Source: EIA manual for large construction projects, MoEF&CC

- Efficient Water saving devices/ fixtures shall be installed in kitchens and toilets to reduce the water consumption per flush. Dual flush systems can be installed to allow different quantities of water for flushing of solids and liquids.
- Dual plumbing shall be made installed to segregate the fresh water use with supply of recycled water for non-potable water requirements such as flushing, horticulture, etc.
- The location of harvesting structures should be such that it is not exposed to any hazard of water contamination from any other sources.

Wastewater Management

Water Conservation In charge shall periodically monitor the quality of rainwater to be used for landscaping. Water used for landscaping should conform to the BIS irrigation standards

Parameters	Values
TDS (mg/l)	2100
Chlorides as chlorine(mg/l)	500
Boron(mg/l)	2
Sulphates(mg/l)	1000
Conductivity(us/cm)	2.25
pH	6-8

- Before the onset of rainy season, the rain water storage tank should be flushed off all the sediments and debris.
- The water used for cooling purpose (recycled water) shall be tested for hardness. It is recommended that water with hardness less than 50ppm shall be used for air conditioning applications. The STP In charge should analyse the quality of treated water before using it for cooling purpose in order to prevent any scale formation or corrosion.
- The water supply and wastewater lines shall be colour coded to differentiate;
- The wastewater from the hospital building shall be treated in in-house ETP, surplus treated wastewater shall be discharge to nearby drain.

Significance of Impact

The overall impact on the water resources and quality is assessed to be minor considering the existing allocation and zero discharge of wastewater from STP

Table 4-16 Impact Significance –Water resource and quality

ASPECT	SCENARIO	SPREAD	DURATION	INTENSITY	OVERALL
Water Resource and Quality	Without Mitigation	Local	Long	Moderate	**Moderate**
	With Mitigation	Local	Medium	Low	**Minor**

IMPACT DUE TO SOLID WASTE MANAGEMENT

The project will generate approximately 3.32 tonnes/day of MSW and approx. 0.16 tonnes per day during operational phase. The potential impacts associated with disposal of solid waste include the following:

- Inadequate collection and treatment of municipal solid waste can lead to unhygienic conditions leading to spread of diseases and other vectors
- Improper transportation of municipal solid waste may lead to generation of odour;
- The accumulation of waste along streets can clog drains and cause localized flooding;

Mitigation Measures

- An integrated solid waste management will be put in place for collection, transport, treatment and disposal of solid waste generated from the activities; Municipal solid waste Management and handing rules, 2016 shall be followed.
- The e-waste generated shall be sold to Authorised recyclers in accordance with e-waste Management Handling Rules, 2016.
- The recyclable waste like glass, metal, plastics, paper etc shall be collected separately and sold to authorized recyclers/ vendors.
- An onsite organic waste convertor has been planned in approx. 1000 m^2 area inside project premises for processing of kitchen and garden waste
- For the hospital's bio medical waste, BMW treatment facility shall be proposed within the site premises.

Significance of Impact

The overall impact of the solid waste generated from the commissioning of the project is moderate; however with the implementation of suggested collection, treatment and disposal measures the overall impact can be maintained as minor.

Table 4-17 Impact Significance –Solid waste management

ASPECT	SCENARIO	SPREAD	DURATION	INTENSITY	OVERALL
Solid Waste	Without Mitigation	Local	Long	Moderate	**Moderate**
	With Mitigation	Local	Long	Low	**Minor**

IMPACT ON TRAFFIC & TRANSPORT ENVIRONMENT

A well planned transport infrastructure with adequate public transport infrastructure already exists near the area, the potential impacts on traffic and transport for proposed project include the following:

- Increase in traffic volume due to proposed developments and likelihood of congestion on the existing and proposed road network;
- Random parking of vehicles and unplanned loading/ unloading areas can lead to confusion.

Mitigation Measures

Traffic Analysis:

This includes various transport improvement strategies and proposed alternatives keeping in mind the vehicular density of the area surrounding project site, Alternatives are proposed in order to reduce the traffic congestion due to goods and passenger movement on the roads connecting to the project site. In order to accommodate the increased traffic, following measures have been suggested:

- Traffic diversion shall be encouraged by proposing alternate routes.
- Hierarchy in roads should be adopted to segregate the traffic according to the size, frequency and density of traffic.
- Comprehensive traffic and travel surveys shall be conducted every 5 years to monitor traffic characteristics and travel behavior to develop strategies for effective transportation.

Planning of pedestrian facilities:

Pedestrian facilities shall be planned for movement of pedestrians on all major corridors and junctions in the study area. The pedestrian facilities which shall be provided for the safe movement of pedestrians are

- Footpaths along the road
- Zebra markings
- Grade-separated pedestrian facilities viz. subways and pedestrian over-bridge for across movement of pedestrian.

- Pedestrian Guard Rails, Road safety Signage and overhead signs shall be placed on a structurally sound gantry or cantilever structure made of circular pipes or steel sections

Significance of Impact

The overall impact on the Traffic in the area will be moderate as the future traffic projections are considered in planning roads and RRT; timely implementation of suggested roads infrastructure and management measures can maintain the impact as moderate

Table 4-18 Impact Significance –Traffic

ASPECT	SCENARIO	SPREAD	DURATION	INTENSITY	OVERALL
Traffic	Without Mitigation	Local	Long	Moderate	**Moderate**
	With Mitigation	Local	Medium	Moderate	**Moderate**

IMPACT ON SOCIAL ECONOMY AND LIVELIHOOD

Once project becomes operational, certain impacts might emerge which will affect the local population positively. The anticipated impacts have been given below:

- With the onset of new project activities, employment opportunities might increase among the local population. The unskilled local population of the adjoining areas will find job opportunities as drivers, security guards, cleaners, housekeeping etc. which will improve their economic condition.
- With the execution of the project, there will be more transport facilities plying to the area thus, benefitting the population living in the area in the long run.

The expected improvement of the following public amenities in the area due to project development.

- Improve building structures with Green building concepts
- Proper garbage disposal system; smooth traffic movement;
- Aesthetics of the surroundings will improve.
- Establishment of proper connectivity of internet facilities in the area;

Significance of Impact

The overall impact on socio-economic scenario will be positive which when coupled adequate management measures can improve the economic scenario of the region with a moderate to high intensity of change.

Table 4-19 Impact Significance –Socio-economic Environment

ASPECT	SCENARIO	SPREAD	DURATION	INTENSITY	OVERALL
Socio-Economic Environment	Without Mitigation	Local	Long	Moderate	**Moderate**
	With Mitigation	Local	Long	High	**High**

5. PROJECT JUSTIFICATION AND ANALYSIS OF SITE ALTERNATIVES

This section of the report presents the alternatives considered for selecting the site and justification for the project. The following scenarios have been considered for assessing the need of the project in the existing settings of the area:

- Project versus No-project Scenario;
- Alternatives considered for selection of site;

PROJECT VERSUS NO PROJECT SCENARIO

A healthy citizen contributes to the making of a healthy nation. The Government of India has introduced various health programmes and policies to improve the Indian citizen's standard of living. Government aided schemes and Government for the health and welfare of the citizens. The people of the country are one of its most valuable resources. These programmes are aimed at increasing the standard of health of the people and decreasing the incidence of disease and death due to illness. The government aided schemes include immunization drives, special steps to deal with epidemics, programmes for elimination of dangerous diseases, and numerous education and training programmes. For the improvement of health of citizen the Central Government introduced and implemented several scheme since India's Independence in 1947. The Ministry of Health and Family Welfare is the main agency which monitors these programmes in India. The health scheme of Central Government are intended to increase the standard health of the people by controlling and preventing measures.

India's health expenditure is 5.6 per cent of GDP, whereas most established market economies spend 7-10 per cent of GDP on health. USA spends over 14 per cent. US has 2,340 doctors as compared to India's 143 doctors for every 10,000 people on an average, 80 out of every 1,000 children die. This figure is just 9 in the US and 30 for every 1,000 in Thailand. Life Expectancy in India is amongst the lowest at 55.5 years compared to US at 75.5 years and 66.5 years for Thailand. Compared to Brazil's 4300 beds, India has only 1,600 beds.

As per information furnished by Medical Council of India at present there are 6, 83,682 allopathic registered doctors in the country. Apart from this, there are 271 medical colleges with 31,172 annual intake capacity and students passing out from these medical colleges every year are also adding to the strength of doctors in the country. In order to expand the facilities of Medical Education and health related services, under Pradhan Mantri Swasthya Suraksha Yojana (PMSSY) the Government has decided to set up six AIIMS like institutions in milder served-states and also to upgrade 13 existing Government Medical College / Institutions in ten States.

Proposed AIIMS facility is proposed under PMSSY, The establishment of new AIIMS will serve the dual purpose of providing super specialty health care to the population while also help create a large pool of doctors and other health workers in this region that can be

available for primary and secondary level institutions / facilities being created under National Health Mission (NHM).

ALTERNATIVES CONSIDERED FOR SELECTION OF SITE

Earlier for setting up the proposed medical facility these districts Shimla, Bilaspur, Kangra, and Hamirpur were considered. However finally Bilaspur district was consider as final site on the basis of these two factors

1 Land requirement

2 Proximity to the other districts

Other important aspects consider to final the site were.

a. Physical settings;

b. Environmental Considerations and;

c. Social Considerations;

Table 5-1 Site suitability analysis

S.No.	Parameters	Site consideration
		Physical settings
1.	**Topography**	The state has a very complex topography with an altitudinal range of 350 meters to 6975 meters above mean sea level. Most of the state is enveloped by lofty mountains hills and river valleys, apart from the areas bordering Punjab plains, which have lower elevations. 70% of the state is covered by steep to very steep sloping lands like in districts of Lahaul & Spiti, Kinnaur, northern parts of Chamba, Kangra, Kullu, and Shimla. 19% of the state is covered by moderate to moderately steep slopes covering the districts of Sirmaur, Solan, southern parts of Chamba, Kangra, Kullu, Shimla and river valleys. ***The remain 11% of level to gentle sloping land is seen in parts of southern Kangra, Mandi, dun valleys of Una, Hamirpur, Bilaspur, Sirmaur and Solan***
2.	**Location and Connectivity**	District Bilaspur is connected by all-weather roads with all important cities and towns of the State and the nation. National Highway No. 205 (Shimla-kangra/Shimla Ghumarwin road) passes through the district. There is no rail track in district. Thus the development of the district is wholly dependent on roadways. Road system is the lifeline of the population of the district. All the blocks are linked with district headquarter through metalled roads.

3.	**Land use**	Present land use area under site is agricultural land, land under animal husbandry department and forest land, so land conversion is mandatory
Environmental consideration		
4.	**Water resource and availability**	It is proposed to meet potable water demand from the Kol dam
5.	**Ecology**	Parcel of the forest land comes in site premises which supports relatively high biodiversity with existing vegetation of relatively good ecological value.
6.	**Noise**	No significant noise source is envisaged in the nearby site area
7.	**Wastewater/Sewerage System**	At present no sewage system is established in the area, However In-house STP as well as ETP shall be installed for proposed project.
Social Consideration		
8.	**Resettlement & Rehabilitation issues**	The site is was in possession of the Department of animal husbandry and agricultural department which was transferred to AIIMS facility However Land under forest department is recommended to be transfer as land portion require for site development comes under waste land as per DFO recommendations. As issue of resettlement comes, the compensatory plantation will be done on forest land only s as no non forest land is available in the region. However, as part of area development, the locals may be considered to be employed during construction and operation phases based on their skills.

SITE SELECTYION CRITERIA

A system for various environmental and social aspects was developed to carry out the evaluation of site. A set of seven parameters were considered for the selection of a site. The details of the parameters and the rationale for selection of these parameters have been provided in Table

Table 5-2 Rationale for selected parameters

Subject Group	Parameter	Rationale	Remarks
Land Use	**Land Use**	The existing land use of the potential site and its planned land use are considered as important factors for site selection.	The existing land cover falls under animal husbandry dept., HP, Revenue depart, & Forest department HP,

			The land under forest department is waste land having forest with open scrub and other lands are also transferred to proposed site land use so land use shall be changed. Compensatory afforestation has been proposed over degraded forest land, double in extent to the forest land being diverted, in Shri Naina Devi Range of Bilaspur Forest Division. Block No. /Compartment No. /Survey No. /-53A/15, 53A/11 area = 82 ha.
Infrastructure	Water Source , Sewer and Electricity	The development should have an identified water supply and sewerage system	Potable water supply for the proposed site has been planned to take from Kol Dam For the wastewater treatment in house STP and ETP shall be proposed. For the Electricity, power connection shall be taken from state electricity board
Environmental Sensitivity	Proximity to	The site should be as far from ecologically sensitive areas as possible	The proposed site not located within the eco sensitive zone of

	ecologically sensitive features		protected area notified under wildlife protection act, 1972 Nearest protected area is Chandi Wildlife sanctuary of wildlife division, Shimla is located at aerial distance of approx. 31 km from proposed site.
Connectivity	**Proximity to NH and SH**	This aspect offers inter nodal/modal connectivity and potential for regional and local bus based rapid transit system	NH 205 (Shimla-kangra/Shimla Ghumarwin road) is crossing and dividing site.

Based on the site suitability analysis, proposed location is the best option for development of medical facility.

6. ADDITIONAL STUDIES (DISASTER MANAGEMENT PLAN)

A disaster is an event trigger by natural or man-made causes that lead to sudden distribution of normalcy of life, causing widespread damage to life and property. Distribution can be caused due to occurrence of frequent hazards like earthquakes, fires, cyclones, terrorism, and chemical explosions. Level of risk majorly depends upon the various hazards for which any specific area is prone to also on the various physical, social-economic and institutional parameters. This chapter will cover an outline of disaster management plan to handle emergency situations as identified for the project and their respective emergency response

PURPOSE AND OBJECTIVE

The objective of emergency response is to:

- Ensure safety of people; protect the environment and safeguard commercial considerations of the project and the community;
- Immediate response to emergency situation with effective communication network and organized procedures;
- Obtain early inputs of emergency conditions so as to prevent impact on personnel, community, assets and environment;
- Safeguard personnel to prevent injuries or loss of life by:
- Protecting personnel from the hazard;
- Evacuating personnel from the site when necessary;
- Minimize the impact of the event on the project, community and the environment by:
    - Limiting the hazard as far as possible;
    - Limiting the potential for escalation; and
    - To localise the spread of impact.

For meeting the emergencies caused by major accidents, planning response strategies are termed as **Disaster Management Plans (DMPs).** DMPs cannot be considered in isolation or act as a substitute for maintaining good safety standards in premises of every facility.

The best way to protect against major accidents occurrence is by maintaining very high levels of safety standards.

Generally, the following five phases are involved in an emergency:

- **Discovery and Notification**: An event with an imminent threat of turning into an accident must first be discovered and the discoverer quickly notifies the same to the Auxiliary Team Controller, who will eventually inform safety officer.
- **Evaluation and Initiation of Accident Control**: Based on the evaluation of available information, the safety officer makes a rapid assessment of the severity of the likely accident and initiates the best course of action.
- **Suppression and Counter Measures**: Action is first taken to contain and control the accident by eliminating the causes which may lead to the spread of accident. Measures are also taken to minimize the damage to personnel, property and environment.
- **Clean-up and Disposal**: After the accident is effectively contained and controlled, the clean-up of the site of the accident and safe disposal of waste generated due to the accident are undertaken.

Documentation: All aspects of accidents, including the way it started and progressed as well as the steps taken to contain and the extent of the damage and injury, must be documented for subsequent analysis of accident for prevention in future, damage estimation, insurance recovery and compensation payment. It may be noted that some aspects of documentation, such as, photographs of the site of accident and main objects involved in the accident, survey for damage estimation, etc. may have to be carried out before the clean-up and disposal phase. However, the effort in all cases is to recommence the operation as soon as possible.

IDENTIFIED EMERGENCY SITUATIONS

Broadly, the emergency situations identified for the premises of site can be classified as:

NATURAL HAZARD

- These are often sudden and intense resulting into considerable destruction, injuries and deaths. Population is the key factor inside premises; which is likely to perceive major impact because of magnitude and frequency of the hazard.
    - Flood
    - Earthquake
    - Landslide
    - Avalanches

MAN-MADE HAZARD

- These are anthropogenic in nature, can be sudden or progressive, which impacts with such severity that the affected community has to respond by taking immediate and exceptional measures including help from outside the community.
        - Fire and Explosion
        - Structural Collapse
        - Electrocution
        - Bomb Threat
        - Road Accidents and transportation of hazardous material, if any;

Each of the above events, which are not limited to these only, will be assessed in detailed as to the possibility of occurring during general operations of the premises, any construction activity, or non-routine activities along with the consequences that the event may cause.

6.2.1 PREPAREDNESS FOR THE EMERGENCY

The goal of preparedness for any emergency is to achieve a satisfactory level of readiness to respond to any disaster in order to save lives, minimize disaster damage, and enhance disaster response operations. The basic approach towards emergency preparedness will comprise of the following activities:

- Identify all risk associated with each building tower, so as to anticipate the actions to be taken as an emergency response be required.
- Establish an Auxiliary Management Team (AMT) to implement Emergency Procedures at each building;

- Develop a work plan with details regarding the course of action to be followed in order to minimize personal injury and property damage in the event of fire, flood, loss of ground, or natural disaster.
- Train the personnel in planning and responding to an emergency;
- Prepare a facility-wide, list of names and telephone numbers which will be available at each building in the premises. The list will include details of all management, trained emergency responders, and Fire and Police Departments.
- Test the arrangements and procedures in practice, as often as appropriate;

ROLES AND RESPONSIBILITIES

The details given in the subsections identify the inter-linkage and synchronization among the following:

- Site Main controller for each block
- Auxiliary Team controller with designated officers for the emergency management will be called Auxiliary Management Team (AMT);
- External agencies for local support

The primary roles of ***Site Main controller*** are to:-

- Respond to the on-site response plan in case of any emergency pertaining to the site;
- Utilize site and local resources;
- Set up Emergency Control Centre to direct emergency operations.
- Assess the magnitude of the situation and decide if evacuation is required from the affected areas;
- Direct the safe shutting down of the installations in consultation with ATC and other important officers, if necessary.
- Liaison with District Magistrate, Police, Fire Brigade and other agencies, if necessary in coordination with communication/liaison officer.
- Communicate all the things to Auxiliary Management Team via Auxiliary Team Controller till the affected area is cleared.
- Declare the "All Clear Situation" after the emergency is cover.

Auxiliary Management Team (AMT)

AMT at the operating site under its control will have following role:

- Control the emergency and render the building or premises safe by the application of local resources; and Support the local response effort by co-coordinating additional equipment, personnel, and other external resources.
- The auxiliary Management Team will comprise of:

Auxiliary Team Controller–shall be the person who will supervise the following officers, forming as a team.

- Fire/ Safety Officer;
- Evacuation Officer;
- Communication/Liaison Officer and;
- Medical Officer.

The primary roles of ***Auxiliary Team controller*** are to:-

- Coordinate with Site Main Controller to address the emergency with the help of Auxiliary Management Team.
- Provide advice on possible effect on areas and outside the premises to the local & district administration about the incident and probable need for evacuation;
- Direct all the operations within the affected areas with priorities for safety personnel minimize damage to the property and environment;
- Ensure that the non-essential staff, workers of the areas affected are evacuated to the gathering areas and the area is searched for casualties;
- Direct the supervisor of the affected areas for the safe guarding of the personnel, minimize the damage to site and environment;
- The role of the members of Team is a detailed below:

Fire/ Safety Officer

- Reports to Auxiliary Team Controller and assist him in all matters;
- Consult site supervisor of the area regarding special precautions such as type of material involved in fire;
- Arrange first aid to the casualties and other emergency equipment's;

- In post-accident condition to gather information on the material /equipment involved in the accident and its danger potential, its effect on humans and environment;
- Assist site controller in maintaining the emergency equipment; and Assist the site controller in conducting / evaluating mock drills.
- All the fire fighters shall work under his guidance at the time of emergency.

Evacuation Officer

- Proceed to emergency area and report to Auxiliary Team Controller and acts as per the instructions;
- Consult the affected area site supervisor for evacuation of the employees;
- Advice all the employees expect auxiliary management team to assemble at gathering area;
- If required nearby employees also to be evacuated;
- To perform head count at gathering area and shall record names;
- Compare the names with the attendance list if any missing inform to Auxiliary Team Controller.
- Proceed to the emergency area and report to the Auxiliary Team Controller after getting the information regarding emergency through telephone or through messengers; He will reserve specified messengers to act as runners between the auxiliary main controller and himself;
- He handles all the transmission to the emergency control centre and dispatched from it, including those to outside agencies and technical information source;
- As per the auxiliary main controller's instructions, he will pass information to other members, if required.

Communication/Liaison Officer

- As soon as he receives the information he should proceed to the emergency control center and report to the auxiliary main controller;
- He has to co-ordinate with all the outside agencies who offer assistance to an emergency response supporting team;
- He shall know who represents the various agencies and where and how to contact them;

- Some of the agencies liaised with are the law, enforcements, public fire services, red cross, rescue and emergency services, local government officials (Police), utility personnel (telephone, electrical, water), health officials, hospitals and ambulance services, lawyer for legal advice (if necessary).
- He is to ensure that casualties received adequate attention and the alternate transport, when in need;
- When emergency is prolonged he shall co-ordinate with supply officer to arrange for the relief of rescue or firefighting personnel and organize refreshments or catering facilities;
- He is responsible for evacuation of the nearby area people, if situation warrants.

Medical Officer:

- On receipt of information keep him ready and alert his staff to attend serious and urgent cases;
- The medical officer is responsible for providing first aid to those injured/ rescued and making that they are promptly transported for further treatment if required;
- Co-ordinate the supply officer for medical supplies;
- He should familiar with antidotes for specified materials.

SPECIFIC EMERGENCY RESPONSE PROCEDURE

Actions are mainly procedures which are to be performed during or immediately after a disaster to minimize suffering and losses through emergency communication, medical assistance, evacuation and search and rescue. Procedures for such events are required and must be understood by all staff, which to be detailed out at later stage.

Procedure: Fire

A fire is the unplanned and undesired combustion of materials that poses a threat to employees, visitors and property.

The purpose should be to reduce the possibility of a fire in the practice, as well as specify the equipment and policies that are to be used in case of a fire. The designated fire officer

makes it mandatory to ensure that every employee is taught how to use a fire extinguisher. Fire extinguishers are to be located at conspicuous locations with basic instructions.

Procedure is as follows:

- On hearing the alarm designated fire officer shall immediately contact the Control Room extension to confirm the location and extent of the fire.
- To inform Auxiliary Team Controller;
- Proceed to the location of the fire and take charge of the operation.
- Depending on the extent of the fire or its potential for spreading, he shall utilize the resources at his command to contain or extinguish the fire until the fire brigade arrives.
- All Staff with no designated fire duties shall see that their work area is left safe and report immediately to the nearest assembly point.
- Account for all staff on record.
- Inform the security personnel at the gate to expect the fire brigade and to direct them by the chosen route.

Procedure: Earthquake

An earthquake is a sudden shaking of the earth caused by the breaking of rock beneath the earth's surface and followed by a series of vibrations. Earthquakes can cause buildings and bridges to collapse, telephone and power lines to fall.

Procedure is as follows:

All persons shall protect him/ her as best as possible during an earthquake by finding the nearest safe location, such as:

- Beneath a study desk
- Between a door structure
- In a wide open area
- Outside and away from the building
- All persons must leave the building after the shaking stops.

Procedure: Bomb Threat

Actions taken in response to such a threat should be prompt and assure the safety of residents while a bomb threat may be a hoax, all such threats should be treated seriously.

Procedure is as follows:

- Do not touch anything electrical including turning lights on or off.
- Do not take a phone off the hook or replace it.
- Do not use radios or cellular telephones.
- Do not move anything that looks out of place,

If a suspected bomb device is found, take note of the location, but do not touch it. Notify the police regarding the where about of any suspected bomb device. Once it is determined that a bomb threat has been made, the Site Main Controller will coordinate evacuation of the facility by telling residents that there is a gas leak or similar condition that requires immediate evacuation.

Procedure: Flood

The carrying capacity of the rivers is decreasing due to siltation, garbage dumping, and sand mining in the rivers. The flood plains are also getting encroached. Thus, the rivers are not able to absorb the additional rains which cause flood.

What to do

- Do not walk, swim, or drive through flood waters
- Stay off of bridges over fast-moving water
- Move to higher ground or a higher floor
- Follow the routes specified by officials
- Appliances that may have been flooded pose a risk of shock or fire when turned on. Do not use any appliances, heating, pressure, or sewage system until electrical components have been thoroughly cleaned, dried, and inspected by a qualified electrician

In case of landslide

Landslides occur in a variety of environments, characterized by either steep or gentle slope gradients: from mountain ranges to coastal cliffs or even underwater, in which case they are called submarine landslides. Gravity is the primary driving force for a landslide to occur, but there are other factors affecting slope stability which produce specific conditions that make a slope prone to failure.

What to do

- Find cover in the section of the building that is furthest away from the approaching landslide.
- Take shelter under a strong table or bench.
- Hold on firmly and stay put until all movement has ceased.
- Move quickly away from its likely path, keeping clear of embankments, trees, power lines and poles.
- Stay away from the landslide. The slope may experience additional failures for hours to days afterwards.

7. PROJECT BENEFITS

Good health is a pre-requisite for human productivity and developmental process. It is essential for economic and technological development. Health is a common theme in most cultures. In fact, the concept of health is found as a part of cultures of all communities. Among definitions still used, probably the oldest is that 'health is the absence of disease'. In some cultures, health and harmony are considered equivalent.

The Pradhan Mantri Swasthya Suraksha Yojana (PMSSY) was launched with the objective of creation of capacity in medical education, research and clinical care in the under sewed areas of the country.

This section includes the benefits accruing to the locality, neighborhood, region and nation as a whole. It aims at bringing out the details of benefits of developing the project.

- Due to the proposed project the revenue of the local municipal will increase because of permission and municipal taxes, sales taxes etc. The business like super markets, provisional stores, medical shops, hotels, etc will come up to cater the needs of the customers which will benefit existing areas
- Improvement in the social infrastructure like roads, railways, housing, water supply, electrical power, drainage etc.: Development of total infrastructure with all the amenities with development of AIIMS, Providing road transportation facilities by providing bus stop near the site
- Environmental benefits – Use of renewable energy to reduce power consumption load of region, developing greenbelt to enhance aesthetic view as well as cater air pollution, Provision of rainwater harvesting structure to recharge ground water, Providing STP and ETP to treat wastewater and reuse and recycle within the premises.Employment potential skilled: semi-skilled and unskilled labour both during construction and operational phases of the project:
- The main advantage of the construction sector is direct employment generation Absorbs rural labour and unskilled workers (in addition to semi-skilled and some skilled) Provides opportunity for seasonal employment thereby supplementing workers income from farming and Permits large-scale participation of women workers both during construction and operation phase.

8. ENVIRONMENTAL MANAGEMENT PLAN AND ENVIRONMENTAL MONITORING PROGRAM

The Environmental Plan (EMP) is specified in order to describe the mitigation measures for all the impacts associated during all the phase of the project. The EMP intends to delineate the monitoring and management measures to minimize such impacts by allocating management responsibility and suggesting skill requirement for implementation of these measures effectively. The project proponent should ensure that all the contractors should comply with the EMP while executing various activities of the project.

For an effective implementation of monitoring and management plan, an organization structure defining the roles and responsibilities of various officers is proposed below. An environmental monitoring plan specifying the parameters, monitoring schedule and a comprehensive environmental management plan identifying the impacts and mitigation measures are included in the sections below

ORGANIZATION STRUCTURE FOR IMPLEMENTATION OF EMP

A project management team will be formed by NBCC to manage the proposed project during construction and operation phase.

It will comprise of Project manager, Planning, Engineering, Finance and Operation Departments. The team will handle the following responsibilities:

Environment Management

- Periodic review of environmental status;
- Implementation and maintenance of green buffer areas;
- Management of water bodies;
- Review of STP operations;
- Monitoring of collection and treatment of waste;
- Compliance to conditions stipulated in Environmental Clearances (EC) and consents;
- Implementation of EMP;
- Undertake awareness activities for industries and residential areas.

Social Management

- Undertake continuous engagement with local community;
- Address grievances of the industries, local community and residents.

ROLES AND RESPONSIBILITIES

To achieve the above objectives, the adopted organization structure of the project management team is discussed below:

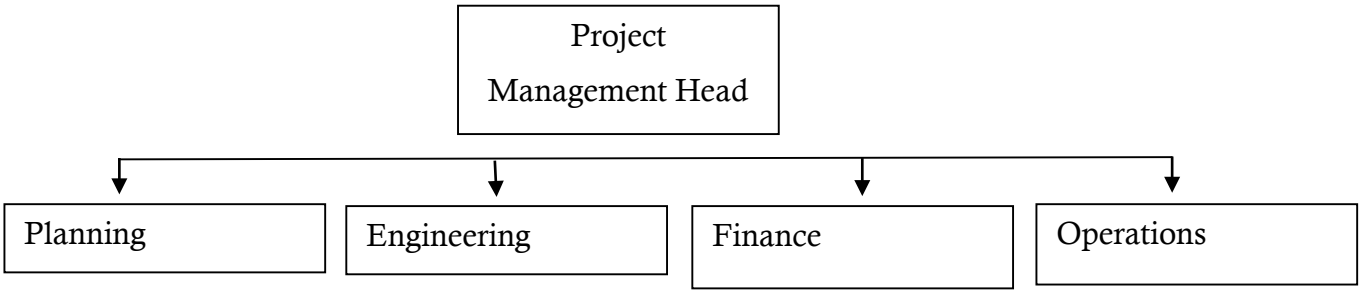


Figure 8-1- Organization Structure:

Note: This is only a proposed hierarchal grouping; the project proponent should be able to develop a similar hierarchal group as per his company requirement.

It is proposed that the Project Management Team project will be collectively responsible for:

- Review/ inspection of STP/ETP
- Management of water bodies
- Landscaping, Maintenance of green buffers
- Compliance conditions of Environmental Clearance and consents
- Implementation of EMP
- Monitoring and disposal of waste
- Awareness activities, if any
- Reporting any accidents related to health and safety- fire hazards, general hazards and preparation of action reports

Inspection and Auditing

- It will be ensured that all the contractors comply with the requirements of conditions for all applicable permits and guidelines;
- The inspections and audits will be undertaken by Project Management Team directly or through external agencies/experts;
- The inspection and audit findings of project team will be implemented by the contractors in their respective areas.
- The entire process of inspections and audits will be documented;

Review Mechanism

Reporting of environmental, health, safety and social performance reports or check list, incident record register etc. will be developed and implemented through a program of reporting and reviewing throughout the project.

- Reports from inspection, audits and other improvement program will be regularly communicated;
- The communication process will involve regular team briefings, group meetings and meeting with stakeholders;
    - All contractors engaged will be required to adhere to the reporting requirements in terms of timely report submission with required details;
    - All complaints and enquiries will be addressed with records maintained in an assigned register by the safety officer of each contractor;
    - Internal and external reporting mechanism will be developed, internal reporting will comprise of the concerned officials from project management team, the representatives of the contractors and the top officials of CPWD and the internal reporting will be undertaken on quarterly basis while the external reporting will be undertaken yearly.

ENVIRONMENTAL MONITORING PLAN

To ensure the effective implementation of the Environmental Management Plan (EMP), it is essential that an effective monitoring program should be designed and carried out. It provides basis for evaluating the efficiency of mitigation measures and suggest further actions that need to be taken to achieve the desired effect.

The monitoring programme should include:

- Visual observations;
- Selection of environmental parameters at specific locations; and
- Sampling and regular testing of these parameters

MONITORING METHODOLOGY

Monitoring methodology covers the following key aspects:

- Components to be monitored;
- Parameters for monitoring of the above components;
- Monitoring frequency;

- Monitoring standards;
- Responsibilities for monitoring; and
- Monitoring cost

MONITORING STANDARDS

The Central Pollution Control Board (CPCB) has developed National Standards for Effluents and Emission under the statutory powers of the Water (Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act, 1981. These standards have been approved and notified by the Government of India, Ministry of Environment & Forests, under Section 25 of the Environmental (Protection) Act, 1986. Till now, Effluent standards for 37 categories of industries and Emission Standards for 31 categories of industries have been evolved and notified besides standards for ambient air quality, ambient noise, automobile and fuels quality specifications for petrol and diesel

Ambient air quality

National Ambient Air Quality Standards (NAAQS), as notified under Environment (Protection) Rules 1986 and revised through Environment (Protection) Seventh Amendment Rules, 2009 are given in table below:

Table 8-1 National ambient air quality Standard

Pollutant	Time Weighted Average	Concentration in Ambient Air	
		Industrial, Residential, Rural and other Areas	Ecologically Sensitive Area (Notified by Central Government)
Sulphur Dioxide (SO_2), µg/m³	Annual *	50	20
	24 Hours **	80	80
Nitrogendioxide (NO_2), µg/m³	Annual *	40	30
	24 Hours **	80	80
Particulate Matter (Size less than 10µm) or PM_{10}, µg/m³	Annual *	60	60
	24 Hours **	100	100

Annual arithmetic mean of minimum 104 measurements in a year taken twice a week, 24 hourly at uniform interval

*** 24 hourly or 8 hourly or 01 hourly values as applicable shall be complied with 98% of the time in a year. 2% of the time they may exceed, but not on 2 consecutive days. Note: Whenever and wherever monitoring results on two consecutive*

Particulate Matter (Size less than 2.5µm) or $PM_{2.5}$, µg/m³	Annual *	40	40
	24 Hours **	60	60
Ozone (O_3) , µg/m³	8 Hours *	100	100
	1 Hour **	180	180
Lead (Pb) , µg/m³	Annual *	0.50	0.50
	24 Hours **	1.0	1.0
Carbon Monoxide (CO), mg/m³	8 Hours **	02	02
	1 Hour **	04	04
Ammonia (NH_3), µg/m³	Annual *	100	100
	24 Hours **	400	400
Benzene (C_6H_6), µg/m³	Annual *	05	05
Benzo(a)Pyrene (BaP) Particulate phase only, ng/m³	Annual *	01	01
Arsenic (As), ng/m³	Annual *	06	06
Nickel (Ni), ng/m³	Annual *	20	20

days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigation.

(Source: Central Pollution Control Board)

Water quality standard

The designated best use classification as prescribed by CPCB for surface water is as given in below

Table 8-2- Primary water quality criteria for designated best use class

Designated-Best-Use	Class of water	Criteria
Drinking Water Source without conventional treatment but after disinfection	**A**	• Total Coliforms Organism MPN/100ml shall be 50 or less • pH between 6.5 and 8.5 • Dissolved Oxygen 6mg/1 or more • Biochemical Oxygen Demand 5 days 20°C 2mg/1 or less

Outdoor bathing (Organized)	**B**	• Total Coliforms Organism MPN/100ml shall be 500 or less pH between 6.5 and 8.5 Dissolved Oxygen 5mg/1 or more • Biochemical Oxygen Demand 5 days 20°C 3mg/1 or less
Drinking water source after conventional treatment and disinfection	**C**	• Total Coli forms Organism MPN/100ml shall be 5000 or less pH between 6 to 9 Dissolved Oxygen 4mg/1 or more • Biochemical Oxygen Demand 5 days 20°C 3mg/1 or less
Propagation of Wild life and Fisheries	**D**	• pH between 6.5 to 8.5 Dissolved Oxygen 4mg/1 or more • Free Ammonia (as N) 1.2 mg/1 or less
Irrigation, Industrial Cooling, Controlled Waste disposal	**E**	• pH between 6.0 to 8.5 • Electrical Conductivity at 25°C micro mhos/cm Max.2250 • Sodium absorption Ratio Max. 26 • Boron Max. 2mg/1
	Below-E	**Not Meeting A, B, C, D & E Criteria**

(Source: Central Pollution Control Board)

As per the EHS guidelines, the treated sewage discharge is to meet the guidelines provided in below table

Table 8-3 Treated sewage discharge guidelines

S.No.	Parameters	Guideline Values
1.	pH	6-9
2.	BOD	30 mg/1
3.	COD	125 mg/1
4.	Total Nitrogen	10 mg/1
5.	Total Phosphorous	2 mg/1
6.	Oil and Grease	10 mg/1

7.	Total suspended solid	50 mg/l
8.	Total coliform Bacteria	400 MPN*/100 ml

**MPN-Most Probable Number*

Ambient Noise Standards

As per EHS guidelines, for residential, institutional and educational area, the one hourly equivalent noise level (Leq hourly) for day time is 55 dB (A) while the Leq hourly for night time is prescribed as 45 dB (A).

Noise standards notified by the MoEF&CC vide gazette notification dated 14 February 2000 based on the A- weighted equivalent noise level (Leq) are as presented in table below.

Table 8-4Ambient Noise Standards

Area Code	Category of area	Noise dB (A) L_{eq}	
		Daytime*	Night time*
A	Industrial Zone	75	70
B	Commercial Zone	65	55
C	Residential Zone	55	45
D	Silence Zone	50	40

(Source: Central Pollution control Board)

Note:

1. *Day time is reckoned in between 6 a.m. and 9 p.m.*
2. *Night time is reckoned in between 9 p.m. and 6 a.m.*
3. *Silence zone is referred as areas up to 100 meters around such premises as hospitals, educational institutions and courts. The Silence zones are to be declared by the Competent Authority. Use of vehicular horns, loudspeakers and bursting of crackers shall be banned in these zones.*
4. *Mixed categories of areas should be declared as one of the four above mentioned categories by the Competent Authority and the corresponding standards shall apply.*

Noise standard for Occupational Exposure

Noise standards in the work environment are specified by Occupational Safety and Health Administration (OSHA, USA) which in turn are being enforced by Government of India through model rules framed under the Factories Act.

Table 8-5-Standard for Occupational Noise Exposure

Total Time of Exposure per Day in Hours (Continuous or Short term Exposure)	Sound Pressure Level in dB(A)
8	**90**
6	**92**
4	**95**
3	**97**
2	**100**
3/2	**102**
1	**105**
¾	**107**
½	**110**
¼	**115**
Never	**>115**

No exposure in excess of 115 dB (A) is to be permitted.

MONITORING PLAN MATRIX

A monitoring plan matrix is being developed to specify the time frame when the environmental control activities need to be carried out, who is responsible and what methods will be used to measure effectiveness. Monitoring plan for various performance indicators for construction and operation phase is summarized in table below

Table 8-6 Monitoring Schedule for Different Environmental Parameters

Component	Monitoring Parameters	Location	Frequency	Responsibility
CONSTRUCTION PHASE				
Air	RSPM, SO_2, NOx, CO	Project Site	Three, 8 –hr, sample per day once every	Project Manager-Environment

			season for two years	
Water Quality	Monitor the effluent released during the project	Project Site	Annual (1 sample/year) for two years	Project Manager-Environment
Noise	Monitoring the noise level due to construction machinery	Project Site	Quarterly (4 samples/year) for two years	Project Manager-Environment
Soil	Organic matter, C, H, N, Alkalinity, Acidity, heavy metals and trace metal. Alkalinity, Acidity	Project Site	1sample/year for two years	Project Manager-Environment
Traffic				Project Manager-Environment
Operational Phase				
Air	RSPM, SO2, NOx, CO	Near DG sets	Quarterly (4 samples/year)at 1 location for 1 year excluding monsoon season	Project Manager-
Water Resource	Monitor the RWH activities		Pre & Post Monsoon	Environment
Water quality	Monitor the grey water quality	Parameters for horticulture use –	Weekly (Continuous)	Project Manager-

		BOD, pH, S.S, Coliforms		
Noise	Monitor the noise due to the additional traffic generated	Equivalent noise levels	Quarterly (4 samples/year) for two years	Environment
Soil		Organic matter, C, H, N, Alkalinity, Acidity, heavy metals and trace Metal. Alkalinity, Acidity.	Quarterly (4 samples/year)at project site for 1 year	Project Manager-
Traffic	Additional traffic on roads due to development of site		Quarterly	Environment

AWARENESS AND TRAINING

Trainings are necessary for effective implementation of environment management plan. Contractors appointed must be made aware of the importance of waste segregation and disposal, water and energy conservation. This awareness can be provided through leaflets and periodic meetings. They should be informed of best environmental management practices. The specific trainings relevant for the personnel at site include the following:

- Collection, transport, treatment and disposal of solid and hazardous waste.
- Monitoring of ground water and wastewater samples
- Techniques for waste minimization, water conservation & energy conservation.
- Applicable environmental, health and safety regulations and compliance requirements for the same.

RECORD KEEPING AND REPORTING

Records should be maintained for regulatory, monitoring and operational issues. Typical record keeping requirements for the proposed project is summarized in table below.

Table 8-7- Record Keeping Requirement

Parameters	Particulars
Solid Waste Handling and Disposal	• Daily quantity of waste received • Daily quantity recycled • Daily quantity sent for landfill
Sewage Treatment	Daily quantity of raw and treated sewage Treated wastewater quality
Regulatory Licence (Environmental)	• Environmental Permits / Consents from MOEF • Copy of Waste manifests as per requirement
Monitoring and survey	Records of all monitoring carried out during different stages of the project
Accidental Reporting	• Date and time of the accident • Sequence of the event leading to the accident • Name of the hazardous waste involved in in the accident • Chemical data sheet assessing effect of accident on health and environment • Emergency measure taken
others	• Log book of compliance • Employee environmental, health and safety records • Equipment inspection and calibration records, where applicable • Vehicle maintenance and inspection records

PROPOSED ENVIRONMENT MANAGEMENT PLAN

An Environment Plan has been developed following the identification of impacts and mitigation measures. The mitigation measures suggested will be as according to the monitoring schedule

The EMP includes the following:

- Mitigations suggested for adverse environmental and social impacts and associated risks;
- Personnel responsible for implementing the mitigation measures at various stages of the project;

The environmental impacts and mitigation measures suggested for various environmental components for the construction and operation phase of the project are provided in **below tables**

Table 8-8 Environment Management Plan-construction phase

S.NO.	COMPONENT	IMPACT IDENTIFIED	SUGGESTED MITIGATION MEASURES	RESPONSIBILITY
1.	Land Environment	• Topography of the area will change. lesser infiltration and thereby increase runoff reduce overall greenery of the area	• Land clearing activities should be kept to the absolute minimum • The movement and parking of heavy machinery and other vehicles will be restricted to identified routes to establish a vegetative cover, appropriate to the site prior to the onset of intense rain or windstorms • Good housekeeping at labour resting areas and the construction area • Proper routing and adequate capacity of the storm water run-offs drains with catch pits	Contractor, Project Management Team
2.	Ambient Air Quality	• Emissions from construction and demolition activities and equipment's, vehicles • Improper handling and storage of construction material • Fugitive dust emissions • Emissions from onsite operation of diesel generators • Burning of waste at sites	• Humus rich top soil should be removed and stored in an appropriate manner • Wet suppression should be applied to at least 80 percent of all inactive disturbed surface • Limited vehicular movement shall be permitted • the heights from which materials are dropped should be reduced • Covering of haul trucks with suitable covering material • DG sets will be used as a backup source only • Demolish waste should be stored in temporary site and transported to the Recycling plant	Contractor, Project Management Team

3.	Ambient Noise Quality	• Noise due to Construction and demolition activities (such as excavation, grading, erecting equipment, razing existing structure. Piling, etc.) • Noise due to operation of heavy equipment and machinery • Movement of vehicles	• Adequate planning to avoid high noise activities to be undertaken. • Acoustic enclosures, noise barriers to be provided in areas of high noise generating sources. • Rubber padding to be provided for vibration control • Limitations on movement of vehicles during night time Construction workers to use ear muffs in areas with potential for high noise generation. • Provision of rubber padding • Regular maintenance of vehicles and repair of equipment. • Noise barriers will be provided between the activities and the receptors. • Restriction on use of equipment generating high noise during night time. • Working hours and construction activities to be limited.	Contractor, Project Management Team
4.	Water Resource and Quality	• Sediment run off from construction area • construction activities will result in disturbance of topsoil • Unplanned disposal of sewage from construction camps • Improper disposal of sewage	• Water should be sprayed on concrete structures to allow curing • Rainwater harvesting system shall be developed for all the labour resting areas • adequate number of toilets (at least 8 toilets per 100 labour) and soak pits • To prevent the runoff from stockpiles generated during excavation silt fencing will be provided to protect water quality	Contractor, Project Management Team

5.	Soil Resources	• Movement of heavy vehicles and machinery on unpaved surface • Potential contamination of soil may occur due to accidental spills of lubricating oil • Erosion of the top soil due to tree cutting • Generation of construction and demolition waste/ debris, waste oil and chemicals	• Topsoil (upper 30 cm) will be removed and stored separately prior to commencement of bulk earthwork • Minimum clearance of vegetation shall be carried out • Excavated soil shall be used/transported at the earliest for filling low lying areas Retention wall or bund shall be provided around the storage areas • Restricted movement of heavy machinery in the site area to minimize the possibility of compaction; • Adequate hazardous waste collection and storage facilities shall be provided Covered garbage bins shall be provided for the construction camps. • Tree plantation should be initiated in construction phase.	Contractor, Project Management Team
6.	Traffic and transport	• The condition of roads may deteriorate during the construction phase • Disruption of traffic is anticipated on connecting roads due unplanned entry to the site	• Construction vehicles will be allowed to move in the site only through exclusive entry and exit points. • Adequate training to the drivers of construction vehicles for speed restrictions and to crew members will be provided. • Roads damaged due to project vehicle will repaired and maintained at regular intervals. • Transportation should be done in non-peak hours	Contractor, Project Management Team

7.	Occupational Health and Safety	• Injury due improper handling, operation and execution • Trip and fall, inadequate fall safe arrangements • Exposure to hazardous substances	• Manual transfer of heavy loads to be minimized by proper work site layout. • Good housekeeping practices to be exercised. • Proper signage to be provided around construction site. • Use of Personal Protection Equipment (PPEs) to be mandated at work site. • Workers to be provided with health and safety training. • Use of temporary fall protection measures in scaffolds and out edges of elevated work surfaces, such as hand rails and toe boards to prevent materials from being dislodged shall be done. • Safety harness to be ensured for workers while working at heights. • First aid and essential medical services to be provided at site	Contractor, Project Management Team
8.	Ecology	• Clearing of vegetation included trees on the site will involve removal of local floral and faunal species found on the site. • Air, noise and visual disturbance may be generated during the site development that can affect the behavior of fauna	• Loss of vegetation would be compensated by the greenbelt development, which should be initiated while construction is being done, however try to retain maximum no of trees. • Adequate compensation as per requirement of forest department shall be made.	Contractor, Project Management Team

Table 8-9- Environment Management Plan-operational phase

S.NO.	COMPONENT	IMPACT IDENTIFIED	SUGGESTED MITIGATION MEASURES	RESPONSIBILITY

1.	Ambient Air Quality	• Emission from power backup/DG sets • Emissions from increase in traffic volume	• DG sets will be located in the downwind direction with respect to residential areas. • SPV developed for overview of power supply shall ensure that the power failure is maintained at minimal. • Stack heights for DG sets to be maintained as per CPCB/MoEFCC norms. • All emission sources to be provided with adequate stack height as per CPCB / MoEFCC norms. • Good housekeeping to be practiced. • Vegetative barriers in form of green belt will be provided around the ECC complex which will minimize the built up of pollution level. • Alternative routes for transportation should be recommend	Project Management Team
2.	Ambient Noise Quality	• Noise due to other facilities around the site • Movement of vehicles	• Sound attenuators / acoustic lining shall be installed in ducts in accordance with requirements • DG sets will be provided with acoustic enclosures; • Trees with heavy foliage will be planted to minimise the noise pollution • A minimum distance of 50m-70m will be provided between the buildings and the rail tracks	Project Management Team

3.	Water Resource and Quality	• IPH which has a reserve quantum thus impact on fresh water resources • Ground water extraction will be done, if unavoidable but after obtaining proper permission from CGWB	• Water consumption will be minimized by a combination of water saving devices and other domestic water conservation measures. Furthermore, to ensure ongoing water • Conservation, an awareness programme will be introduced for the residents. The following section discusses the specific measures, which will be implemented: • Domestic and Commercial Usage • Use of water efficient plumbing fixtures (ultra-flow toilets and urinals, low flow sinks, water efficient dishwashers and washing machines). Water efficient plumbing fixtures • Use less water with no marked reduction in quality and service. • Leak detection and repair techniques. • Sweep with a broom and pan where possible, rather than hose down for external areas. • Meter water usage; employ measurement and verification methods. Monitoring water use is a precursor for management. • Awareness campaign to disseminate knowledge on strategies and technologies that can be used for water conservation. • Landscaping-Plants with similar water requirements shall be grouped on common zones to match precipitation heads and emitters. • Storage tank for rainwater harvesting shall be proposed.	Project Management Team

			• Use of low-volume, low-angle sprinklers for lawn areas. • Select controllers with adjustable watering schedules and moisture sensors to account for seasonal variations, and calibrate them during commissioning. • Selecting a drought resistant grass, and using lawn chemicals and fertilizer sparingly also reduces watering needs. • Place 3 to 5 in. of mulch on planting beds to minimize evaporation. • ***Promoting Reuse of Water after Treatment and Development of Closed Loop Systems*** • To promote reuse and development of closed loop system for water, segregation of two wastewater scheme namely i) Harvested Storm Water ii) Waste water generated. • All along the roads storm water drains would be provided to collect water during rains. • They would be adequately sized to prevent over flooding of the site.	
4.	Solid Waste Disposal	• Inadequate collection and treatment of domestic waste • Unhygienic conditions, odour problem Localized flooding due to accumulation of waste along streets which can clog drains • Contamination of soil and groundwater • Improper transportation of municipal solid waste	• An integrated solid waste management will be put in place for collection, transport, treatment and disposal of solid waste generated from the activities • The recyclable waste like glass, metal, plastics, paper etc likely to be generated from different land uses, will be collected separately and sold to authorized recyclers/ vendors • For processing of biodegradable waste, an onsite organic waste convertor will be setup	Project Management Team

5.	Socio Economic	• employment opportunities might increase among the local population more transport facilities plying to the area • Coming up of commercial complex catering to staff employment as well as small business shops,	• The project level project implementation agency to undertake CSR program to ensure communal harmony and cooperation. • Mechanism to train and improve the skill sets of the local community.	Project Management Team

EMP BUDGET

Table 8-10-EMP Budget

S.No.	EMP Details	Remarks	Capital Cost	Operating Cost (INR) /annum
CONSTRUCTION PHASE				
1.	Environment monitoring during construction	As per requirements of EC and Consent to Establish		20,00,000
2.	Sheet Barrier for Noise reduction	Incorporated into Construction contractors scope	4,00,000	50,000
3.	Portable Toilets for workers	Either rented or procured	25-30,000/unit	7,50,000
4.	Waste Management for Labour Rest room	Incorporated into Construction contractors scope	1,80,000	2,25,000
5.	Dust Control	During moderate operation levels about 5-10 tankers (10m^3) of water will be required on daily basis per package, depending on the season of the year.		1,80,000
	Total			**32,05,000**
OPERATIONAL PHASE				
1.	Rainwater Harvesting storage tank	Integrated in the project cost		2,00,000
2.	Acoustic Enclosures for highnoise generating equipment			40,000
3.	Sewage Treatment Plant	Integrated in the project cost (energy + work force	3,85,000	35,00,000
4.	Air Pollution Monitoring	As per requirements of EC and Consent to Operate	5-6 Crores	6,50,000
5.	Noise Monitoring	As per requirements of EC and Consent to Operate		2,25,000
6.	Solid Waste Management	Integrated in the project cost		32,00,000
7.	Horticulture and landscaping	Integrated in the project cost		24,00,00,000

8.	EHS management team	Environment Cell	22,00,00
9.	Internal Traffic Management	Signage/ signals/ monitoring	2,00,000
	Total		25,06,35,000

9. SUMMARY AND CONCLUSION

Based on the Impact assessment studies and the nature of impacts of the proposed medical facility, it is envisaged that this project is one of the positive steps in developing economic development of the region.

It can be concluded from the impact matrix that the proposed project would have an overall positive impact. The associated potential adverse environmental impacts are mostly minimal and can be mitigated to an acceptable level by adequate implementation of the measures as stated in the Environmental Management Plan (EMP).

After incorporation of environmental management plans, the environmental sustainability will be improved.

Hence, the proposed project is a welcome development and may be accorded environmental clearance

10. INTRODUCTION OF CONSULTANT

Amaltas Enviro Industrial Consultants LLP (AEC)Is an ISO 9001:2008, is certified company. It has been accredited by Quality Council of India (QCI / NABET) as an Environment Consultancy Organization approved by the Ministry of Environment, Forests and Climate Change (MoEF&CC), Government of India, after meticulous inspections on various quality parameters in terms of Environmental Functional Areas (EFA) and available Infrastructural facilities as per prescribed standards and guidelines of the Ministry.

DISCLOSURE OF CONSULTANT ENGAGED

Name and address of the Consultant	**Amaltas Enviro Industrial Consultants LLP (AEC)** Registered Office at B-1/1244, Vasant Kunj, New Delhi-110070 and Corporate Office at 1104- Vikrant Tower, Rajendra Place, New Delhi-110008.	**ISO 9001:2008 Certified,** **QCI-NABET Accredited.**

Project Name: *Proposed **A**ll **I**ndia **I**nstitute of **M**edical **S**ciences under **PMSSY** at Village-* changer plasian, Noa and Rajpatra*, Tehsil Sadar & District-Bilaspur, Himachal Pradesh*

Quality Council of India

National Accreditation Board for Education & Training

CERTIFICATE OF ACCREDITATION

M/s Amaltas Enviro Industrial Consultants LLP (AEC), New Delhi

B-1/1244, Vasant Kunj, New Delhi-110070

is accredited under the QCI-NABET Accreditation Scheme for EIA Consultant Organizations (Version3) for preparing EIA/EMP reports in the following sectors:

Scope of Accreditation:

Sl. No.	Name of Sector	Cat.
1	Mining of minerals including opencast / underground mining	B
2	Thermal power plants	B
3	Cement plants	B
4	Highways	A
5	Common Municipal Solid Waste Management Facility (CMSWMF)	B
6	Building and construction projects	B
7	Townships and area development projects	B

Note: Name of approved EIA Coordinators and Functional Area Experts are mentioned in IAAC minutes published on website dated Sept 23, and Nov 04, 2016.

The Accreditation shall remain in force subject to continued compliance to the terms and conditions and on successful completion of Surveillance Assessment after 18 months. The renewal of accreditation shall be done through Re-accreditation process prior to expiry date of this certificate within 36 months.

C.E.O
NABET

Certificate No.
NABET/ EIA/1518/ IA 0017

Valid up to
December 27, 2019

NABET is member of International Accreditation Forum (IAF) and Pacific Accreditation Cooperation (PAC).

Figure 10-1- Accreditation from Quality Council of India, QCI

J.P. test research centre is a MoEFCC recognized Environmental Laboratory. This is NABL accredited and provides sampling, monitoring and analysis of all environmental parameters such as Air Quality, Meteorology, Water Quality, Noise, Soil Quality and Traffic Monitoring. JP test house has been appointed by Amaltas for conducting baseline environmental monitoring including ambient air quality, meteorology, water quality, soil quality, noise monitoring on site.

NABL

National Accreditation Board for Testing and Calibration Laboratories

(An Autonomous Body under Department of Science & Technology, Govt. of India)

CERTIFICATE OF ACCREDITATION

J.P. TEST & RESEARCH CENTRE

has been assessed and accredited in accordance with the standard

ISO/IEC 17025:2005

"General Requirements for the Competence of Testing & Calibration Laboratories"

for its facilities at

4/54, Site IV, Sahibabad Industrial Area, Sahibabad, Ghaziabad, Uttar Pradesh

in the discipline of

CHEMICAL TESTING

(To see the scope of accreditation of this laboratory, you may also visit NABL website www.nabl-india.org)

Certificate Number T-4181

Issue Date 10/10/2016

Valid Until 09/10/2018

This certificate remains valid for the Scope of Accreditation as specified in the annexure subject to continued satisfactory compliance to the above standard & the additional requirements of NABL.

Signed for and on behalf of NABL

N. Venkateswaran
Program Manager

Anil Relia
Director

Prof. S. K. Joshi
Chairman

Figure 10-2- NABL Certificate