

CONCEPTUAL PLAN
Proposed
Expansion of Base Hospital
At
Village- Khatyari, Pargana- Baramandal
Tehsil & District- Almora
Uttarakhand

Vide Govt. Order -1122/XXVII (1)/2014-64/2004 II Cover dated
29/03/2014

Proposed Total Plot Area = 63753.69 m²

Expansion Built Up Area = 31420.50 m²

Total Build up Area = 43494.08 m²

Proposed Build up Area=31420.50 m²

Schedule 8(a); Cat.B2

Being Developed by
Uttar Pradesh Rajkiya Nirman Nigam Ltd.
Base Hospital Unit
Tehsil & District- Almora, Uttarakhand



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EXECUTIVE SUMMARY

This document presents the findings of the Environmental Pre Feasibility of the construction of **Base Hospital** Almora at Village- Khatyari, Tehsil-Almora, Dist.- Almora, Uttarakhand being developed by UPRNN Ltd, Base Hospital Unit, Almora, Uttarakhand. **SAWEN Consultancy Services Pvt. Ltd., Lucknow** was contracted by UPRNN to secure Environment Clearance from MoEF/ SLEAC and No Objection Certificate (NOC) from Uttar Pradesh Pollution Control Board (UPPCB) for the proposed institutional building.

The proposed **Base Hospital** is an institutional development project having **total plot area** of **63753.69 m²**. The project provides adequate green belt development in the plot area to create the proper and sustainable environment. Parking facilities shall be appropriately provisioned by developing open parking. The project provides greenery and open spaces, thereby making available more area defining the quality of work environment.

The land is having total **built up area** of **43494.08 m²** while the **proposed built up area** is **31420.50 m²** for the institutional project will be easily accessible by State Highway-37 & Almora Road, the proposed project site is located near the medical college at Almora and well connected to various places, through national highways, rail links, bus ways and telecommunication. The estimated cost of the project will be **Rs. 168.98 including renovation works**. The UKPCL will provide necessary expected Electric load of **2421 KVA** for proposed institutional project by **02 nos. of transformer (02x 1600 KVA)**. The power back up for essential load shall be provided through **01 no. of DG Sets (01 X 500 KVA) & 02 no. of DG Sets (02 x 1010 KVA)** will be installed.

The development will also have green area and the other facilities required for institutional projects. Appropriate fire fighting measures including exit and exit way marking signs, emergency lights, ventilation, essential emergency electrical services and stationary fire pump (jockey) shall be provided for the proposed project.

In the layout, some area has been reserved for landscaping and a vision to create a buffer to help in creation of calm, serene and cool environment for institute and act as buffer between the building area and the adjoining traffic routes. Landscape planning on **37701.39 m²** will be provided with ecological perspectives for the proposed project taking into consideration of urban biodiversity and native species.

The water with overall requirement of **407.5 KLD** shall be managed by spring supply (Gadhera). The DG Set discharge shall be through stack of sufficient cumulative stack height of **10.0 m** above the tallest building of **L+G+3** as per guidelines of CPCB. Noise level shall be maintained by providing acoustic enclosures in DG sets and traffic norms will be followed within the institutional building project.

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The **70 KLD STP** plant based on FAB technology has been proposed to produce tertiary treated effluent that will meet GSR422 (E) dated 19.05.1993 effluent discharge standards. The drainage system will collect all the waste water discharge from the buildings and direct it into the tertiary sewage treatment plant for utilization of treated water for cooling, flushing with Zero discharge and the **300 KLD ETP** has been proposed, after post treatment the treated water shall be used for the gardening purpose within the institute.

Natural slope of the area will be retained and will be graded to fall towards the roads or drain paths and storm water will be made to percolate to **06 nos.** of recharge pit proposed for ground water recharge. For traffic noise, plantation along the traffic route shall be provided to act as a noise barrier.

It has been roughly estimated that of **612.0 Kg/day** of municipal waste and **140.0 Kg/Day** Bio Medical Waste shall be generated from the institutional building. Required Parking for the institutional building is fulfilled by providing open parking facilities for the proper management point of view.

CHAPTER 1: INTRODUCTION

The Almora district is a district of Uttarakhand and is located at 29.62°N 79.67°E. Perched on a ridge at the southern edge of the Kumaon Hills in the Himalayas range, Almora has an average elevation of 1651 meters.

It is observed that the district acquires a shape of a horse saddle shaped hillock. Surrounded by the thick forests of pine and fir trees, the city is neighbored rivers of Kochi and Suyal. Almora got its name from a plant, Kilmora, growing there in the region. Located over 5400 feet from the sea level, the Almora district is surely a place with great weather, which is cold most of the times, with occasional rain. The 1190 square meter area of Almora district is large enough for people with different culture and religion to live here happily, and have a comfortable life. Almora is surrounded by other districts of Uttaranchal including Bageshwar and Chamoli on Northern side, Pauri on western side, Nainital on southern and Champawat on the eastern side.

Health is considered as a major indicator for calculating quality of life and overall development of the city. According to the Rural Health Statistics 2012, there is a significant shortage of specialists in the state with a shortfall of nearly 85% in surgeons, 76% in obstetricians & gynecologists, 86% in physician and 66% in pediatricians in the CHCs. As per the report, only 10 CHCs in the state has all the four specialists have available. Besides, there also exists a shortfall of 71% for the position radiologists in the CHCs and 74% for the position of lab technicians across the PHCs and CHCs.

Position	Sanctioned	In position	Vacant	Vacant (%)
Doctors (Allopathic)	2429	1259	1170	48%
Specialist	1209	304	905	75%
Physiotherapist	46	37	06	13%
Staff Nurse	975	871+305(NRHM)	+201	0%
X-Ray Technician	132	63	69	52%
Pharmacist	772	762	10	01%
Lab technician	303	199	104	34%
OT Technician	06	03	03	50%
MPW (Male)	-	195	0	0%
ANMs	2251	2480 (214 2 nd ANM)	0	0%

Source: Uttarakhand State PIP 2014-15

The proposed Base Hospital Almora comprises of following medical departments:

S.N.	EXISTING/RENOVATION BLOCKS	PROPOSED NEW BLOCKS
1.	O.P.D. BLOCK	HOSPITAL STORE & ANCILLARIES BLOCK
2.	OPERATION THEATRE (D.U)	WARD BLOCK
3.	PRIVATE PAYING WARD	CLINICAL DEPARTMENT+ LECTURE THEATRE
4.	EMERGENCY BLOCK	CLINICAL DEPARTMENT+ LECTURE THEATRE
5.	VACCINE ROOM & ADMIN BLOCK	COMMUNITY BLOCK+ BLOOD BANK+PHYSIOTHERAPY
6.	ORTHOPAEDIC WARD	SERVICE BLOCK
7.	GENERAL WARD BLOCK	ESS BLOCK
8.	REGIONAL DIGNOSTIC BLOCK	OPD + OT BLOCK
9.	TRAUMA CENTRE	GUARD ROOM
10.	NURSE HOSTEL	INTERNS HOSTEL
11.	TYPE-IV RESIDENCE	RESIDENT DOCTORS HOSTEL
12.	DR. RESIDENCE	-
13.	TYPE-II RESIDENCE	-

1.2 ENVIRONMENTAL CONCERNS OF BUILDING & CONSTRUCTION PROJECT

Building account for about a third of energy consumption world-wide and with commercial/residential buildings contributing slightly more than half of that percentage. From 1980 to 2006, total building energy consumption worldwide has increased more than 46% whether such growth rates will continue in the future is uncertain. Use of water by buildings worldwide has grown significantly between 1985 and 2005. Such increases in water use are occurring in the context of stresses to the water supply caused by recent droughts and growing concerns about drying trends in the climates of Indian Subcontinent.

1.2 LOCATION:

The proposed construction of proposed Base Hospital is located at Vill.- Khatyari, Tehsil- Almora, Dist: - Almora, Uttarakhand.

1.3 BACKGROUND:

This project is up gradation of **200 Bedded Base Hospital (Goverdhan Tiwari Govt. Base Hospital)**. The proposed project will fulfill the demand of better Medical Facilities for population of Almora.

Demographics:

An official Census 2011 detail of Almora, a district of Uttarakhand has been released by Directorate of Census Operations in Uttarakhand. Enumeration of key persons was also done by census officials in Almora District of Uttarakhand.

In 2011, Almora had population of 622,506 of which male and female were 291,081 and 331,425 respectively. In 2001 census, Almora had a population of 630,567 of which males were 293,848 and remaining 336,719 were females. Almora District population

constituted 6.17 percent of total Maharashtra population. In 2001 census, this figure for Almora District was at 7.43 percent of Maharashtra population.

There was change of -1.28 percent in the population compared to population as per 2001. In the previous census of India 2001, Almora District recorded increase of 3.67 percent to its population compared to 1991.

1.4 IDENTIFICATION OF PROJECT AND PROPONENT

The proposed construction of Base Hospital at Vill.- Khatyari, Tehsil & Dist.- Almora, being developed by UPRNN Ltd, Base Hospital Unit, Almora, Uttarakhand.

As per the EIA Notification, 2006, the project having built up area more than 20,000 m² requires Environmental Clearance from SEIAA, but as per Water Act, 1974 & Air Act, 1981 every project required consent to establishment (NOC) from the respective State Pollution Control Board, before commencement of project.

The proposed construction of Base Hospital Almora, with **Built up area 43494.08 m²** which is > 20000 m² hence the project requires environmental clearance from SEIAA & also falls under the preview of NOC from the UPPCB.

1.5 BRIEF DESCRIPTION OF NATURE OF THE PROJECT

The basic concept of the project is as:

- Modern Health Care facilities
- Quality based services
- Good environment
- High quality infrastructure development
- Employment opportunities at one place
- Well planed connectivity emphasizing the **walk to work concept**.

The main purposes of the Plan are:

1. Enhanced in infrastructural development and up gradation of public health care & institutional spaces.
2. The proposed project is mainly health care facility to take care of patient's health.
3. The components of assistance under the scheme include all urban infrastructure development projects, extensive green coverage including water supply and sewerage.
4. To achieve safe, healthy, aesthetic and socially pleasing environment in the institute.
5. To make open spaces available for the administrative and visitors.
6. To ensure efficient use of resources.

The main objective of the project is as follows:

1. To promote a healthy relationship between hospital development and environment particularly emphasizing on low income and weaker section;
2. Creation of a modern building design process, which will include government, designers, users and managers;

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3. Under this project well developed surface parking for visitors and ambulance parking for the hospital management is established and green belt development also done.
4. Reinforcement of natural infrastructure;
5. To make the hospital highly protective to overcome every emergency situations.
6. Development of a monitored landscape management program.

The proposed development will cover rapid and time bound urban infrastructure construction, improvement & maintenance of ecological features. This land is needed to be developed for a Base Hospital with provision of all basic amenities and facilities for creation of quality spaces to the public assets.

1.5 NEED FOR THE PROJECT AND ITS IMPORTANCE TO THE REGION

District Almora gets a high percentage of patients from Bageshwar and Pithoragarh, since both these districts surrounding north east and east of Almora do not have adequate health facilities delivering comprehensive secondary care. It has been ascertained, through consultation with health service providers that, apart from district Almora 40% of population of Bageshwar and Pithoragarh are coming to Almora town seeking secondary care and this is the secondary catchment population served by district level facilities of Almora.

The base Hospital already exists with 200 Bed capacity and there is high need to upgrade it to 500 Bedded Hospital. The present proposal is about expansion of existing 300 bedded hospital to 500 bedded hospital.

1.6 SITE HISTORY FOR PROPOSED PROJECT AND ITS APPROVAL

The project is an expansion case of 300 Bedded base hospital to 500 bedded base hospital involving certain modification / renovation of old building structures too. The site originally is base Hospital at Vill.- Khatyari, Tehsil & Dist.- Almora . No new land use has been acquired for the project. UPRNN Ltd., Base Hospital Unit, Almora, is serving as construction body.

1.7 LAND USE- WITH REFERENCE TO PROPOSED LOCATION

The project site is old district base hospital under institutional land use. Approach Road and State Highway- 37 is located towards SE from the project site.

1.8 EMPLOYMENT GENERATION (DIRECT & INDIRECT) DUE TO THE PROJECT

The proposed construction of Base Hospital at Village- Khatyari, Tehsil & Dist. - Almora U.K. provide better health care facility for the public. The benefit of constructing a base Hospital is related to the direct employment to the people associated with the construction. It provides employment to skilled and unskilled laborers during construction 200 nos. of labours are working for the project. Additional employment

opportunities will lead to a rise in the income and improve employment opportunities for nearby population. The proposed facility will also generate jobs for the women labourers during construction phase. This will considerably reduce their travel time in any employment and therefore enable them to attend the childrens and their nutritional demands with house hold chores.

1.9 ENVIRONMENTAL LEGISLATIONS APPLICABLE TO THE PROJECT:

- 1. The Water (Prevention and Control of Pollution) Act, 1974**
 - a. The Water (Prevention and Control of Pollution) Rules, 1975 - Schedules
 - b. Central Board for the Prevention and Control of Water Pollution (Procedure for Transaction of Business) Rules, 1975
 - c. The Water (Prevention and Control of Pollution) CESS Act, 1977
 - d. The Water (Prevention and Control of Pollution) Cess (Amendment) Act, 2003
- 2. The Air (Prevention and Control of Pollution) Act, 1981**
 - a. The Air (Prevention and Control of Pollution) Rules, 1982 and Schedules
 - b. The Air (Prevention and Control of Pollution) (Union Territories) Rules, 1983
- 3. The Environment (Protection) Act, 1986**
 - a. The Environment (Protection) Rules, 1986 and Schedules
 - b. Environment (Protection) Third Amendment Rules, 2002
 - c. Rules for the Manufacture, Use, Import, Export and Storage of Hazardous Micro Organisms Genetically Engineered Organisms or Cells, 1989
 - d. The Environment (Protection) (Second Amendment Rules), 1999 - Emission Standards for New Generator Sets
- 4. Hazardous Wastes (Management and Handling) Rules, 1989**
 - a. The Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989
 - b. Manufacture, Storage and Import of Hazardous Chemical (Amendment) Rules, 2000- Draft Notification
 - c. Hazardous Wastes (Management, Handling & Transboundary Movement) Rules, 2010
- 5. Bio-Medical Waste (Management and Handling) Rules, 1998**
 - a. Hazardous wastes (Management and handling) amendment rules 2000
 - b. Hazardous Wastes (Management and Handling) Amendment Rules, 2002
- 6. S.O.979 (E), [27/8/2003] - Amendments to S.O.763 (E) dates 14/9/1999 Dumping and disposal of fly ash discharged from coal or lignite based thermal power plants on land**
- 7. Municipal Solid Wastes (Management & Handling) Rules, 2000**
- 8. Battery (Management and Handling) Rules, 2000.**
- 9. The Noise Pollution (Regulation and Control) Rules, 2000**
 - a. The Noise Pollution (Regulation and Control) Rules, May 2002
- 10. Re-cycled Plastics Manufacture and Usage Rules, 1999**
 - a. Re-cycled Plastics Manufacture and Usage Amendment Rules, 2002
 - b. The Recycled Plastics Manufacture and Usage (Amendment) Rules, 2003

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11. **Ozone Depleting Substances (Regulation) Rules, 2000**
12. **The Indian Forest Act, 1927**
 - a. The Forest (Conservation) Act, 1980
 - b. The Forest (Conservation) Rules, 1981
 - c. Guidelines for diversion of forest lands
 - d. Forest (Conservation) Rules, 2003
13. **The Wild Life (Protection) Act, 1972 and Schedules**
 - a. The Wild Life (Transactions and Taxidermy) Rules, 1973
 - b. The Wild Life (Stock Declaration) Central Rules, 1973
 - c. The Wild Life (Protection) Licensing (Additional Matters for Consideration) Rules, 1983
 - d. The Wild Life (Protection) Rules, 1995
 - e. The Wild Life (Specified Plants- Conditions for Possession by Licensee) Rules, 1995
 - f. Recognition of Zoo Rules 1992
 - g. The Circular Concerning Joint Forest Management
 - h. The Wild Life (Protection) Amendment Act, 2002
14. **The Public Liability Insurance Act, 1991**
 - a. The Public Liability Insurance Rules, 1991
15. **The National Environmental Tribunal Act, 1995**
 - a. The National Environment Appellate Authority Act, 1997
16. **Provisions of Indian Penal Code**
 - a. Provisions of Criminal Procedure Code
 - b. Provisions of Factories Act, 1948
17. **No.59 of 1960- The Prevention of Cruelty to Animal Act, 1960**
18. **The Biological Diversity Act, 2002**
 - a. Draft Biological Diversity Rules, 2003
 - b. 2-T Oil (Regulation of Supply and Distribution) Order, 1998

CHAPTER 2: PROJECT DESCRIPTION

2.1 PROJECT SUMMARY

The site proposed for construction of base Hospital at Village Khatyari, Pargana- Baramandal, District- Almora, Uttarakhand comprising of well equipped Operation Theatres, Blood Bank, Physiotherapy Block, Interns Hostel, and Community Block etc in the project as below:

Description	Detail		
	Existing(300 Bedded)	Proposed (200 Bedded)	Total(500 Bedded)
Total Plot Area	63753.69 m ²	-	63753.69 m ²
Built Up Area	12073.58	31420.50	43494.08 m ²
Total Road Area	6062.87 m ²	-	6062.87 m ²
Total Green Area	37701.39 m ²	-	37701.39 m ²
Total Ground Coverage	6004.71	7330.43	13335.43 m ²
Max Height of Building	L+G+3	-	L+G+3
Total Expected Population	2107 Personnel	1147 Personnel	3254 Personnel
Total Electric Demand	-	2421 KVA	2421 KVA
Transformer (No. & Capacity)	-	02 x 1600 KVA	02 x 1600 KVA
Standby Power Supply(D.G. Sets)	-	01 x 500 KVA 02 x 1010 KVA	01 x 500 KVA 02 x 1010 KVA
Sources of Water Supply	Spring water	Spring water	Spring water
Total Consumption of Water	260.53 KLD	146.97	407.5 KLD
Total Waste Water Generated	180.32 KLD	116.1	296.42 KLD
Total Fresh Water Requirement	211.03 KLD	132.37	343.4 KLD
Total Reused Water	-	-	81.77 KLD
Total MSW Generated	407.75 Kg/Day	204.25	612.0 Kg/Day
Total Bio Medical Waste Generated	84.0 Kg/Day	56.0 Kg/Day	140.0 Kg/Day
Proposed Rain Water Harvesting	01 Nos.	06 Nos.	06 Nos pits; 01 natural recharge structure.
STP & ETP Capacity	Septic tanks = 05 Nos.	-	70 KLD & 300 KLD respectively
Stack Height		10.03 m	10.03 m
Project Cost	-		168.98 Crore

2.2 PROJECT CATEGORY

The proposed project of construction of a institutional building with **built up area** of **43494.08 m²** which is > 20,000 m²; hence the project requires environmental

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clearance from SEIAA as per the EIA notification 2006 under Schedule 8(a); Cat. B2 & also falls under the preview of NOC from the State Pollution Control Board.

2.3 Project Cost

The project cost of the proposed blocks and renovation of existing blocks is **Rs. 168.98 Crore**

Table 1: Capital Expenditure

S. No.	Description	Cost (Rs. in Lacs)	TIME FRAME
1.	Landscaping	20.0	03 Years
2.	Air Curtains, Dust Mitigation, Emission Control from DG Sets	10.0	06 months
3.	70 KLD STP & 300 KLD ETP	90.0	Before Building Occupancy
4.	Rain Water Harvesting	30.0	06 months
5.	Waste Management	10.0	Before Building Occupancy
6.	Power Backup	30.0	06 months
7.	Solar & Energy Conservation Measures	2.0	01 year
	Total	192.0	-

Table 2: Recurring Expenditure

S. No.	Description	Cost (Rs. in Lacs)
1.	Landscaping	5.0
2.	Air Curtains, Dust Mitigation, Emission Control from DG Sets	2.0
3.	70 KLD STP & 300 KLD ETP	20.0
4.	Rain Water Harvesting	1.0
5.	Waste Management	5.0
6.	Power Backup	4.0
7.	Solar & Energy Conservation Measures	0.50
	Total	37.5

2.4 PROJECT DESCRIPTION WITH PROCESS DETAILS

Major construction elements of the proposed project include foundation treatment as well as other facilities for water supply and drainage, fire-fighting and lighting. The buildings will be of masonry-concrete structures, roads will be made of mass concrete and yard surface will be made of high-strength interlocking concrete blocks. Pollution sources during the construction period consist mainly of mechanical noise, engineering dust, engineering wastewater and construction waste & temporary hutment waste. An analysis of environmental impacts and proposition of environment management plan during construction period for the proposed

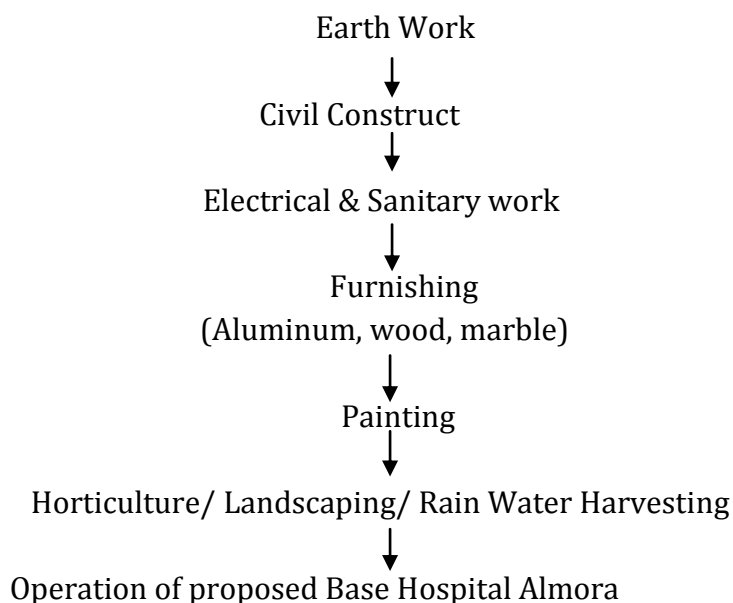
project and proposals on pollution prevention and control measures and managerial requirements may reduce negative impacts by project construction to a minimum.

Construction work of proposed “Base Hospital Almora”:

Process Flow Chart:

Figure 2

The project shall be executed in **24 Months** and the process flow chart is as follows:



2.5 RAW MATERIAL REQUIRED FOR CONSTRUCTION & MODE OF TRANSPORT OF RAW MATERIAL/FINISHED PRODUCT.

List of Raw & Building Materials

i. For Civil construction	ii. For Furnishing
1. Cement	1. Wooden planks, Doors
2. Concrete	2. Gypsum board false ceiling
3. Reinforcement Steel	3. Glass
4. Sand	4. Sanitary fittings & fixtures
ii. For Civil construction	ii. For Furnishing
1. Bricks	6. Paint & Polishing
2. Marbles / Granite	7. Electrical fittings & fixtures
3. Plaster of Paris	8. Air conditioners
4. Steel	9. Aluminum windows
5. Stone aggregate	
10. Fly ash	
11. Water Proofing compound	
12. Tiles	
13. Shuttering plates	

14. M.S Scaffolding

iii Electrical and mechanism equipment

1. PVC wires/cables	5. Fire fighting system
2. Polycarbonate switches/ sockets	6. Fire fighting system
3. Ms boxes / panels	7. MCB, DBS
4. UPS, Transformers	

iv. List of machinery used during construction

Loader	:	loading of materials
Dumper	:	Mud and material handling
Concrete mixer with hopper	:	RCC work
JCB	:	Digging and earth work
Concrete Batching Plant	:	Concrete mixing
Cranes	:	Lifting and moving of materials
Road roller	:	Compacting the earth
Tractor Trolley	:	Carrying & transporting material

During transportation of raw / construction material, a water ditch with its width at 3.5 meter, length at 10 meters and depth at 0.2 meter shall be made at the exit to and from the construction site, in which crushed stones with a diameter at 50 millimeters will be laid, so as to reduce the amount of earth on tires of vehicle to and from the construction site; covers will be made on materials to be transported or they will be transported by enclosed vehicles, routes of transportation vehicles shall avoid environmentally sensitive areas, and vehicle speed shall also be limited.

2.6 DRAINAGE PATTERN AT SITE

The project site lies on the city municipal sewer system. The drainage system shall be designed accordingly to connect through underground drains after sewage treatment have been planned.

2.7 SEWERAGE SYSTEM

The **70 KLD** sewage treatment plant based on FAB technology is proposed at the site. The proposed project will be developed with a dedicated and efficient sewage collection system having proper internal connectivity with the proposed sewage treatment plant to ensure the proper treatment of the sewerage to the city sewerage network of area with a sewer network of municipal department, the diameters varying from 150 mm to 900 mm. This sewer network has been upgraded and connected to the newly laid sewer system.

2.8 SOLID WASTE MANAGEMENT

A state of the art system for collection of solid waste from institute has already been put into place through Nagar Palika. Efforts are on for scientific disposal of the waste through MoEF/CPCB/UPPCB approved vendors. The objective is to provide a neat and clean healthy environment in the building. The collection system through garbage chutes has been proposed to develop within the project. From those depots, tippers or carnage vans will cart the waste up to designated disposal site for treatment.

2.9 ELECTRIFICATION/ POWER REQUIREMENT & ITS SOURCE

The Power supply to the city is done by the Uttarakhand Power Corporation Limited (UkPCL). The electrical cables from electric substation will be laid underground. At proposed project site the initial assessment of the development area and the mode of conceptual philosophy of electrical infrastructure development have been thought to include the following main components:

- To cater the power requirements for construction work and to development of the building.
- Sourcing for immediate power requirement.
- The broad layout of the electrical system for the entire building.
- The Sub-Transmission and Distribution Network from substation & transformers.
- Meeting Power demand through standby power supply from DG set.

Total expected power demand of **2421 KVA** shall be met through **02 nos. of proposed transformers (02 x 1600 KVA)** which fulfill the expected demand load for the Base Hospital . **DG Set (01 x 500 KVA) & (02 x 1010 KVA)** shall be provided for standby condition within the proposed group housing project.

2.10 AVAILABILITY OF WATER & ITS SOURCE.

Initially source of water supply is from Khosi Pump Yojna by Jal Nigam which flows through the gravity system. Provision of water supply, i.e. distribution networks, tube wells , overhead tanks have been made accordingly. Mode of water supply will be continuous through springs supply which will be available for 8 hours on an average and considering that municipal supply is also available for storage of water.

2.11 SCHEME FOR WASTES MANAGEMENT/ DISPOSAL

For efficient waste collection management system, the Almora city is divided into Zone, the work relating to primary collection of waste has been decentralized at the zone level where it is supervised by health officers with the assistance of ward level inspectors, Sanitary supervisor. The primary collection involves waste disposal from commercial and institutional places.

Management has fleets of vehicles for collecting and transporting waste from collection points to the disposal site. Each of the vehicles is allotted specific area for collection and transportation to waste disposal site.

Following steps have been proposed by for collection, treatment and disposal of MSW:

Step-1: Collection and Segregation of MSW at source of generation

Step-2: Transportation of MSW to the disposal site

Step-4: Shredding of the compostable waste to desired particle size

Step-5: Treatment of biodegradable waste through composting

Step-6: Disposal of non bio-degradable solid waste into Secured Landfill.

The year 2021 envisages a comprehensive and sustained solid waste management system with modern and scientific answers to collection, transportation and disposal.

CHAPTER 3: SITE ANALYSIS

3.1 CRITERIAS FOR SELECTION OF LAND

Following criteria's were selected for selection of land.

1. a) Proximity to linkage:

It was observed that development pattern generally follows the transportation corridors because of high accessibility development as opposed to haphazard growth, which is seen in most cities. The proposed site is situated at village- Khatyari, Pargana- Baramandal, Tehsil & District- Almora and easily approachable through Almora Ranikhet road in West direction.

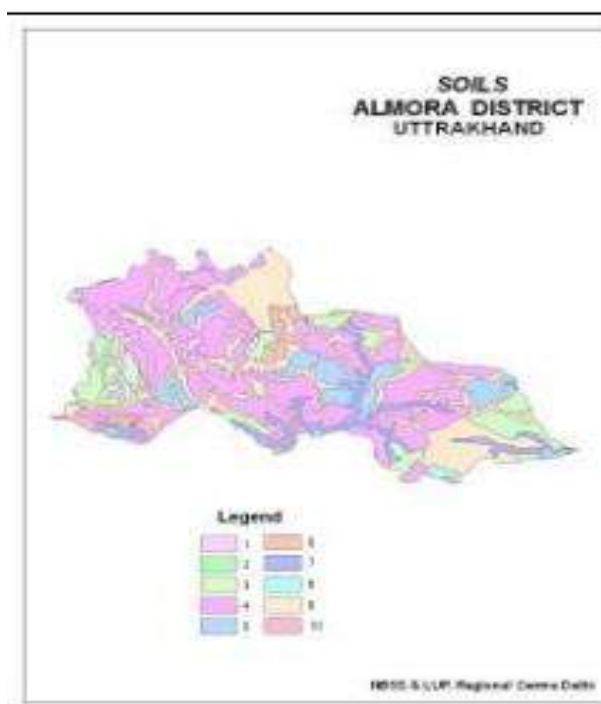
1. b) Proximity to existing settlements:

The areas of project site already existing in a high developed zone and population pressure is likely to witness growth pattern influenced by the surrounding existing institutes, & commercial establishments.

1. c) Ground water availability:

Ground water is an important source of water supply in most of the cities across the country. Unfortunately most of the ground water aquifers in these cities are depleting at an alarming rate due to over exploitation and decrease in recharge supporting areas. Hence, the availability of ground water and location of recharge areas have been considered while locating the land uses.

1. d) Soil type



SOILS OF ALMORA DISTRICT OF UTTARAKHAND	
Soils of Lesser Himalayas	
Summits and Ridges (30-50% Slopes)	
1.	Medium deep, loamy soils, loamy skeletal soils
Side Slopes (30-50% slopes)	
2.	Medium deep, loamy-skeletal shallow loamy soils.
3.	Medium deep, loamy-skeletal shallow loamy soils, severely eroded .
4.	Medium deep, loamy soils
5.	Medium deep, moderate stoniness loamy-skeletal soils
6.	Deep loamy soils and slightly eroded associated with loamy-skeletal soils
Fluvial Valley (3-5% slopes)	
7.	Medium deep, loamy soils
Shivaliks	
Side Slopes (30-50% slopes)	
8.	Medium deep, loamy soils, moderately eroded soils.
9.	Deep, loamy soils and , loamy-skeletal and moderately eroded soils.
Active Flood Plain (0-3% slope)	
10.	Deep, sandy soils

1. e) Geography & Topography

Conceptual Plan- Expansion of Base Hospital, Almora, Village- Khatyari, Pargana- Baramandal, Tehsil & District- Almora, Uttarakhand

Almora is located at 29.62°N 79.67°E in Almora district in Uttarakhand. Almora is situated 365 km north-east the national capital New Delhi and 415 km south-east the state capital Dehradun. It lies in the revenue Division Kumaon and is located 63 km north of Nainital, the administrative headquarters of Kumaon. It has an average elevation of 1,861 m (6,106 ft) above mean Sea Level.

Almora is situated on a ridge at the southern edge of the Kumaon Hills of the Central Himalaya range in the shape of a horse saddle shaped hillock. The eastern portion of the ridge is known as Talifat and the western one is known as Selifat. The Almora Market is situated at the top of the ridge, where these two, Talifat and Selifat jointly terminate. It is surrounded by thick forests of pine and fir trees. Flowing alongside the city are rivers of Koshi (Kaushiki) and Suyal (Salmale). The snow-capped Himalayas can be seen in the background.

The Himalayan state of Uttarakhand is located between 28° 43' - 31° 27' N latitude and 77° 34' -81° 02' E longitude. The State includes 320 km long stretch of the mountains between the Kali River forming the Indo-Nepal border in the east and the Tons-Pabar valleys forming the eastern border of Himachal Pradesh in the west. The geomorphology of the State is completely defined by the Himalayas, being completely land locked. The State has a wide range of geomorphic features like cliffs, rocky slopes, waterfalls, major and minor ridges, river valleys, highly dissected denudation hills, moderate and low dissected denudation hills, river terraces, and various fluvial geomorphic features like point bar, meandering scars, and natural levees. The State is completely affixed by the complex geological setting. In this area, a large variety of rocks are developed in the central crystalline complex of the Greater Himalayas and the Lesser Himalayas, as well as the sub-Himalayas. The area is very sensitive towards mass wasting process. Several rivers which are lifelines to one of the most densely populated areas in the world (the Gangetic Plains of India) originate in this region. Rivers Ganga and Yamuna, which originate at Gangotri and Yamunotri respectively, are the most important rivers of the region. Based on the topography of the area and its geographical location, the temperature varies throughout the region. The average temperature in the State varies from -1.7° C to 42° C. The State is bestowed with a relatively high average annual rainfall of 1229 mm. The ecology of Uttarakhand mostly comprises of forest covers and grasslands. A large variety of flora and fauna found here are usually the rarest species in the world. The diversity in topography, climate, vegetation, life, culture, etc. depicts varied and complex characteristics of the region and hence, the state of Uttarakhand has rich cultural, physical and favorable ecological support for wildlife sanctuaries and endangered plant and animal species. Being a hilly terrain, the roadways are the only means of surface communication with the national railway network extending to rail head at Dehradun, Rishikesh, Ramnagar, Kotdwar, Kathgodam and Tanakpur. The total road length in the region is about 31,929 km. Mainly the

road network is administered by the PWD and comprises of 1,151 km of national highways,

3,788 km of state highways, 3,290 km of major district roads, 2,945 km of other district roads, 15,402 km of village roads and 1,773 km of motor bridges.

1.f) Climate:

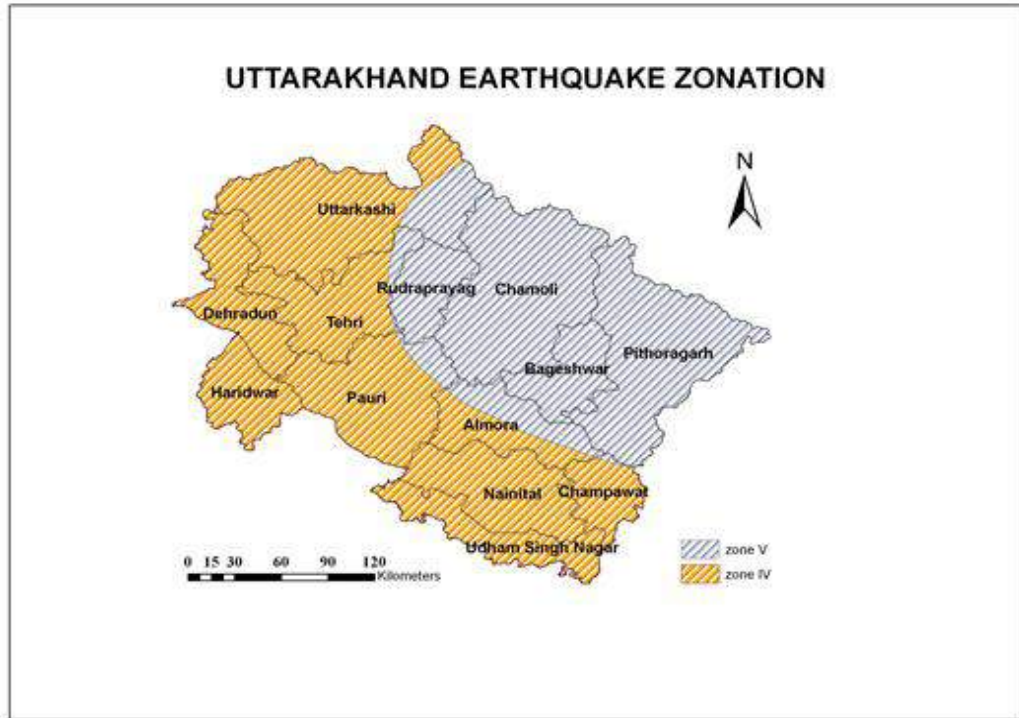
The climate of Almora is characterized by relatively high temperatures and evenly distributed precipitation throughout the year. The main seasons are summer from March to June, the monsoon season from July to November and winter from December to February. In summer, Almora is largely under the influence of moist, maritime airflow from the western side of the subtropical anticyclonic cells over low-latitude ocean waters. Temperatures are high and can lead to warm, oppressive nights. Summers are usually somewhat wetter than winters, with much of the rainfall coming from convectional thunderstorm activity; tropical cyclones also enhance warm-season rainfall in some regions. The coldest month is usually quite mild, although frosts are not uncommon, and winter precipitation is derived primarily from frontal cyclones along the polar front. The Köppen climate classification subtype for this climate is "cwb" (Humid Subtropical Climate).

The average temperature for the year in Almora is 74.3 °F (23.5 °C). The warmest month, on average, is June with an average temperature of 87.9 °F (31.1 °C). The coolest month on average is January, with an average temperature of 55.9 °F (13.3 °C). The average amount of precipitation for the year in Almora is 44.6" (1132.8 mm). The month with the most precipitation on average is August with 13.0" (330.2 mm) of precipitation. The month with the least precipitation on average is November with an average of 0.2" (5.1 mm). There are an average of 46.8 days of precipitation, with the most precipitation occurring in August with 11.9 days and the least precipitation occurring in November with 0.6 days.

1. g) Seismicity of Almora

The Almora district is located in the seismic **zone IV & zone V** as per National Disaster management Authority, Govt. of India.

Conceptual Plan- Expansion of Base Hospital, Almora, Village- Khatyari, Pargana- Baramandal, Tehsil & District- Almora, Uttarakhand



(Source: <http://dmmc.uk.gov.in/pages/display/95-earthquake-zone>)

CHAPTER 4: PROJECT PLANNING

4.1 PLANNING CONCEPT

The proposed project is being developed to offer construction of spacious and well furnished Base Hospital at Vill.- Khatyari, Pargana- Baramandal, Tehsil & Dist.- Almora, Uttarakhand.

4.2 Land Uses of Proposed “Base Hospital “

Table 3: Land Uses

S. N.	Particulars	Existing (A)	Proposed (B)	Total (A+B)	%age
1	Total Ground coverage	6004.74	7330.43	13335.43	21.0
2	Total Landscape Area	37701.39	-	37701.39	59.0
3	Total Road Area	6062.87	-	6062.87	9.5
4	Parking Area	6653.0	-	6653.0	10.0
Total Plot area				63753.69	100.0

Table- Ground Coverage Details:

S.N.	PROPOSED BLOCKS	NOS.OF FLOORS	NOS.OF BLOCKS	GROUND AREA (sqm)	TYPICAL FLOOR AREA (sqm)	TOTAL COVERED AREA (sqm)
1	HOSPITAL STORE & ANCILLARIES BLOCK	G+3	B35	695	2157	2852
2	WARD BLOCK-120 BEDDED	L+G+3	B36A	851.9	3226.6	4078.5
3	WARD BLOCK-120 BEDDED	L+G+3	B36B	851.9	3226.6	4078.5
4	WARD BLOCK-120 BEDDED	L+G+2	B36C	851.9	3226.6	4078.5
5	CLINICAL DEPARTMENT+LECTURE THEARE	G+3	B42	499.55	1303.27	1802.82
6	COMMUNITY BLOCK BLOOD BANK+PHYSIOTHERAPY	G+3	B37	325	1075	1400
7	SERVICE BLOCK	G+3	B38	695	2157	2852
8	ESS BLOCK	G	B41	275	0	275
9	OPD+OT BLOCK	L+G+3	B43	960	3682	4642
10	GUARD ROOM	G		25.18	0	25.18
	TOTAL (A)			6030.43	20054.07	26084.5
	HOSTEL					
11	INTEREST HOSTEL	G+3	B39	795	2486	3281
12	RESIDENT DOCTORS HOSTEL	G+3	B40	505	1550	2055
	TOTAL(B)			1300	4036	5336
	TOTAL COVERED AREA-X=(A)+(B)			7330.43	24090.07	31420.5

Conceptual Plan- Expansion of Base Hospital, Almora, Village- Khatyari, Pargana- Baramandal, Tehsil & District- Almora, Uttarakhand

S.N.	RENOVATION BLOCKS/ EXISTING BLOCKS	NO.OF FLOORS	NOS.OF BLOCKS	TYPICAL FLOOR AREA (sqm)	TOTAL COVERED AREA (sqm)
1.	O.P.D BLOCK	G+1	1	572.07	1177.08
2.	OPRATION THEATER(D.U)	G+1	1	520.74	1041.48
3.	PRIVATE PAYING WARD	G+1	1	520.59	1041.18
4.	EMERGENCY BLOCK	G+1	1	557.81	1115.62
5.	VACCIN ROOM	G+1	1	494.38	988.76
6.	ORTHOPAEDIC WARD	G+1	1	512.83	1025.66
7.	GENERAL WARD BLOCK	G+1	1	465.65	931.3
8.	REGIONAL DIGNOSTIC BLOCK	G+1	1	195.49	383.89
9.	TRAUMA CENTR		9	250.51	531.31
	TOTAL		1	4090.07	8236.28
10.	NURSE HOSTEL	G+1	3	302.95	613.86
11.	TYPE-II residence	G+1	4	417.27	834.54
	TOTAL			720.22	1448.4
12.	RESIDENT DOCTOR HOSTEL				
13.	TYPE-IV RESIDENCE	G+1	4	941.44	1882.88
14.	DR.RESIDENCE	G+1	1	113.92	227.84
	TOTAL		5	1055.36	2110.72
	TYPE-II RESIDENCE(FOR MEDICAL COLLEGE)		1	139.09	278.18
	TOTAL		1	139.09	278.18
	TOTAL AREA -Y:		19	6004.74	12073.58

Total Ground Coverage= X + Y

= 7330.43 + 6004.74

= 13335.43 m²

Build up area= 31420.5 + 12073.58

= 43494.08 m²

4.3 Population details

Table 5: Plotted Population Break Up at Project Site:

S.N.	STAFF DESIGNATION	POPULATION			
		Existing	Proposed	Total	
1.	Admin Staff	Clinical Staff	200	100	300
		Non Clinical Staff	75	25	100
2.	Hostellers	Nurse Hostel	16	-	16
		Type-IV Residence	160	-	160
		Dr. Residence	16	-	16
		Type-II Residence	120	-	120
		Interns	-	100	100

Conceptual Plan- Expansion of Base Hospital, Almora, Village- Khatyari, Pargana- Baramandal, Tehsil & District- Almora, Uttarakhand

		Resident Doctors	-	42	42
3.	Students	lecture Hall	200	-	200
4.	Patients	On Bed	300	200	500
5.	Visitors	OPD	720	480	1200
		Patient's visitors	300	200	500
Total Expected Population			2107	1147	3254

Therefore, the total expected population of proposed Base Hospital will be **3254 personnel.**

4.4 SITE SETTINGS

Nearby Villages:

- Pohal Village – 0.8 Km, NW
- Raikholi Village – 1.41 Km, NW
- Khagmara Kote – 0.6 Km, NE
- Satyali Village – 0.92 Km, SE
- Talar Bari – 2.8 Km, W

Roads:

- Almora Ranikhet Road – 0.16 Km, West
- Almora Road – 0.31 Km, SE
- SH-37 – 0.90 Km, SE

Railway Station:

- Kathgodam Railway Station – 38.6 Km, SW
- Haldwani Railway Station – 45.2 Km, SW
- Ramnagar Railway Station – 54.9 Km, SW

Rivers/Water Body :

- River Kosi – 1.82 Km, SW
- Bhim Taal – 28.9 Km, SW

Hospitals:

- Krishna Hospital & Research Centre – 41.46 Km, SW
- Base Hospital, Haldwani – 43.04 Km, SW

Places of Worship:

- Ma Barahi Mandir – 30.8 Km, SE
- Golu Devta Mandir – 23.8 Km, NW

Schools/Colleges:

- Kumaun University – 0.8 Km, East
- Army Public School – 1.05 Km, East

CHAPTER 5: PROPOSED INFRASTRUCTURE

5.1 CONNECTIVITY (TRAFFIC AND TRANSPORTATION ROAD/RAIL/METRO/WATER WAYS ETC.) WITH IN THE DEVELOPMENT REGION.

5.1.1 Road Network

The delineated project site is located at Vill.- Khatyari, Tehsil & Dist.- Almora, U.K. The proposed site is well connected to various places, like Airport, Railway, Bus Terminus & other parts of the District by road.

The nearest Bus Stop from the proposed project site is:

- ◆ Ramnagar Bus Stop- 54.71 Km, SW

The major road linkages are –

- Almora Ranikhet Road – 0.16 Km, West
- Almora Road – 0.31 Km, SE
- SH-37 – 0.90 Km, SE

5.1.2 Rail Linkages

- Kathgodam Railway Station – 38.6 Km, SW
- Haldwani Railway Station – 45.2 Km, SW
- Ramnagar Railway Station – 54.9 Km, SW

5.2 PARKING DETAILS:

In the proposed project, parking for the Admin Staff, Visitors, Maintenance & Security staffs & for ambulance taxi shall be managed by forming open parking of 6653.0 m².

Parking Required for Hospital Building

Parking Required= 500/15 {1 ECS/15 Beds}
= 33 ECS

Parking Required for Service Block

Parking Required= Built Up area x 1.5/100 m²
= 2852.0(Service block) x 1.5/100
= 42.7 = 43 ECS

Parking Required for residents:

Parking Required for Residents = Educational Occupancy
= 3281+2055/70
=76 ECS

Total ECS required = 33 + 43 +76 = 152 ECS

Existing Provided parking Area = 6653.0 m²

= 6653.0/23 ECS for open parking
= 289 ECS

Hence, the existing parking provision would suffice the need for 500 Bedded Hospital.

Hence justified

5.3 LANDSCAPE AREA DETAIL:

Conceptual Plan- Expansion of Base Hospital, Almora, Village- Khatyari, Pargana- Baramandal, Tehsil & District- Almora, Uttarakhand

Within the proposed project Total Landscape Area is = **37701.39 m²**

5.4 APPROACH ROAD

- The width of the bitumen approach road is 30 m .
- The internal roads have right of way of 6.0 m & 7.5 m wide roads.

CHAPTER 7: ENVIRONMENTAL MANAGEMENT PLAN

7.1 WATER MANAGEMENT (SOURCE & SUPPLY OF WATER).

Total water demand of the commercial building including green areas excluding fire fighting water demand and losses is calculated to be (For 500 Bedded)**407.5 KLD**. About **38.0 KLD** water out of total water demand will be utilized for the irrigation of the green and landscape area proposed inside the project premises. The water demand estimation has been tabulated in Table 7. The one time water requirement for firefighting demand will be **4.0 KLD** based on CPHEEO guidelines, i.e. fire demand for < 50,000 population = 1% of total water demand.

7.1.1 Water supply for green area

The water demand estimated for maintenance of green covers of cancer institute in the non-monsoon period works out to be 38.0 KLD. It has been calculated by assuming 1.0 liters of water required for 1 m² of green area. The salient features for the water supply to the green area will be:

- Garden hydrants will be provided along the supply line so as to access this water to irrigate the nearby green covers;
- The spacing proposed for water hydrant will be in the range from 60 m to 100 m as per the requirement.

Water Use Calculation for the Existing 300 bed Capacity

Water Use	Population	Per Capita in (LPCD)	Water Requirement (KLD)	Waste Water Generation (KLD)
Clinical Staff	200	45	9	7.2
Non-Clinical Staff	75	45	3.4	2.7
Visitors & OPD	1020	15	15.3	12.2
Lecture Hall	200	15	3.0	2.5
Residents + Hostellers	312	86	26.83	21.46
TOTAL DOMESTIC WATER REQUIREMENT			57.53	46.06
Hospital Beds	300	450	135	108
Laundry Washing	-	Lump sum	30.0	24
Landscaping Area	37701.39 m ²	1 l/m ²	38.0	NIL
TOTAL WATER REQUIREMENT			260.53	178.06

- The pressure at outlet of hydrant will be maintained equivalent to 15 m head.

Existing Base Hospital Water Balance

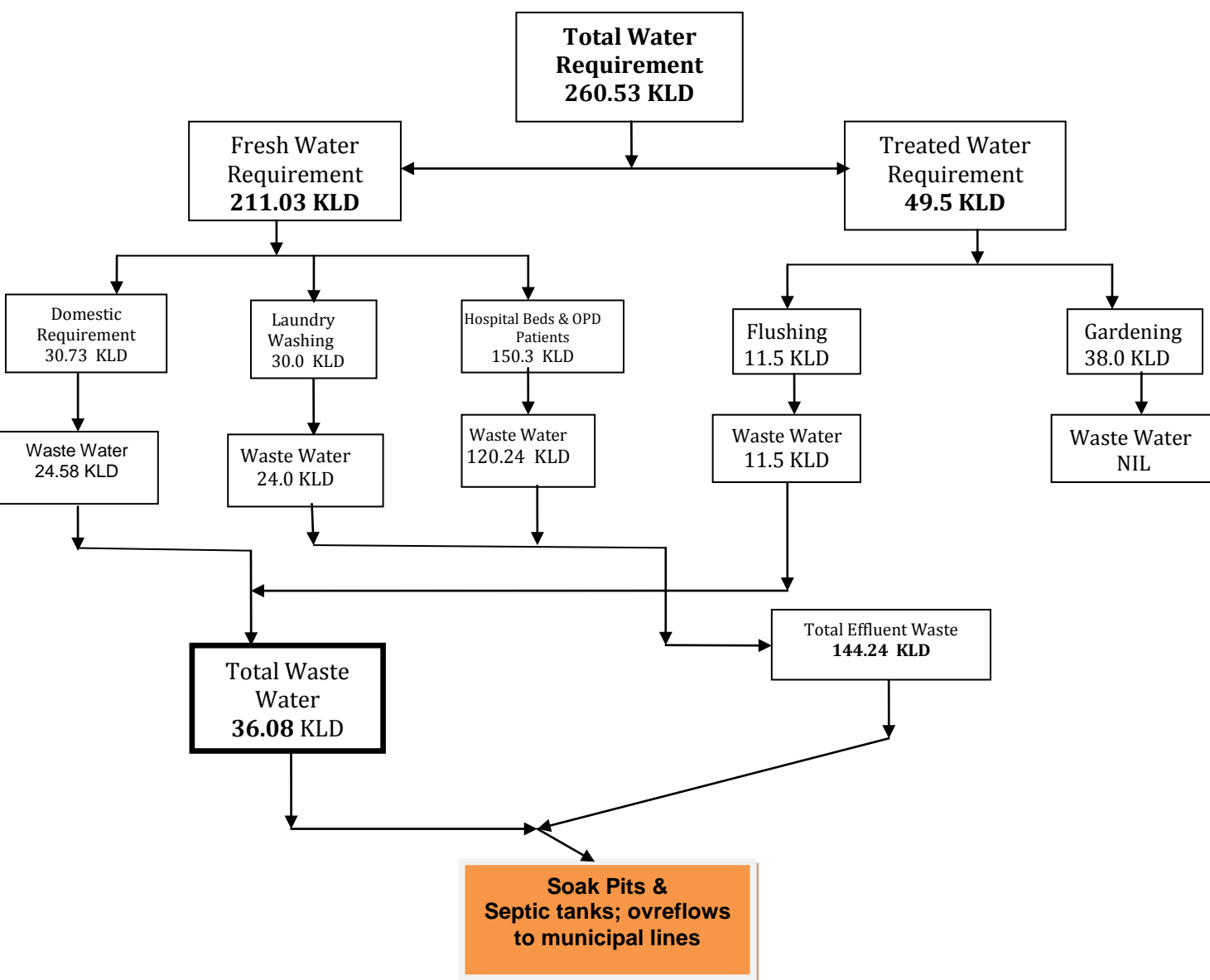


Table 7: WATER USE CALCULATION (Total 500 Bed Capacity)

S. N.	Water Use	Population	Per Capita in (LPCD)	Water Requirement (KLD)	Waste Water Generation (KLD)
1	Clinical Staff	300	45	13.5	10.8
2	Non-Clinical Staff	100	45	4.5	3.6
3	Visitors & OPD	1700	15	25.5	20.4
4	Lecture Hall	200	15	3.0	2.5
5	Residents + Hostellers	454	86	39.0	31.2
TOTAL DOMESTIC WATER REQUIREMENT				85.5	68.5
6	Hospital Beds	500	450	225.0	180.0
7	Laundry Washing	-	Lump sum	50.0	45.0

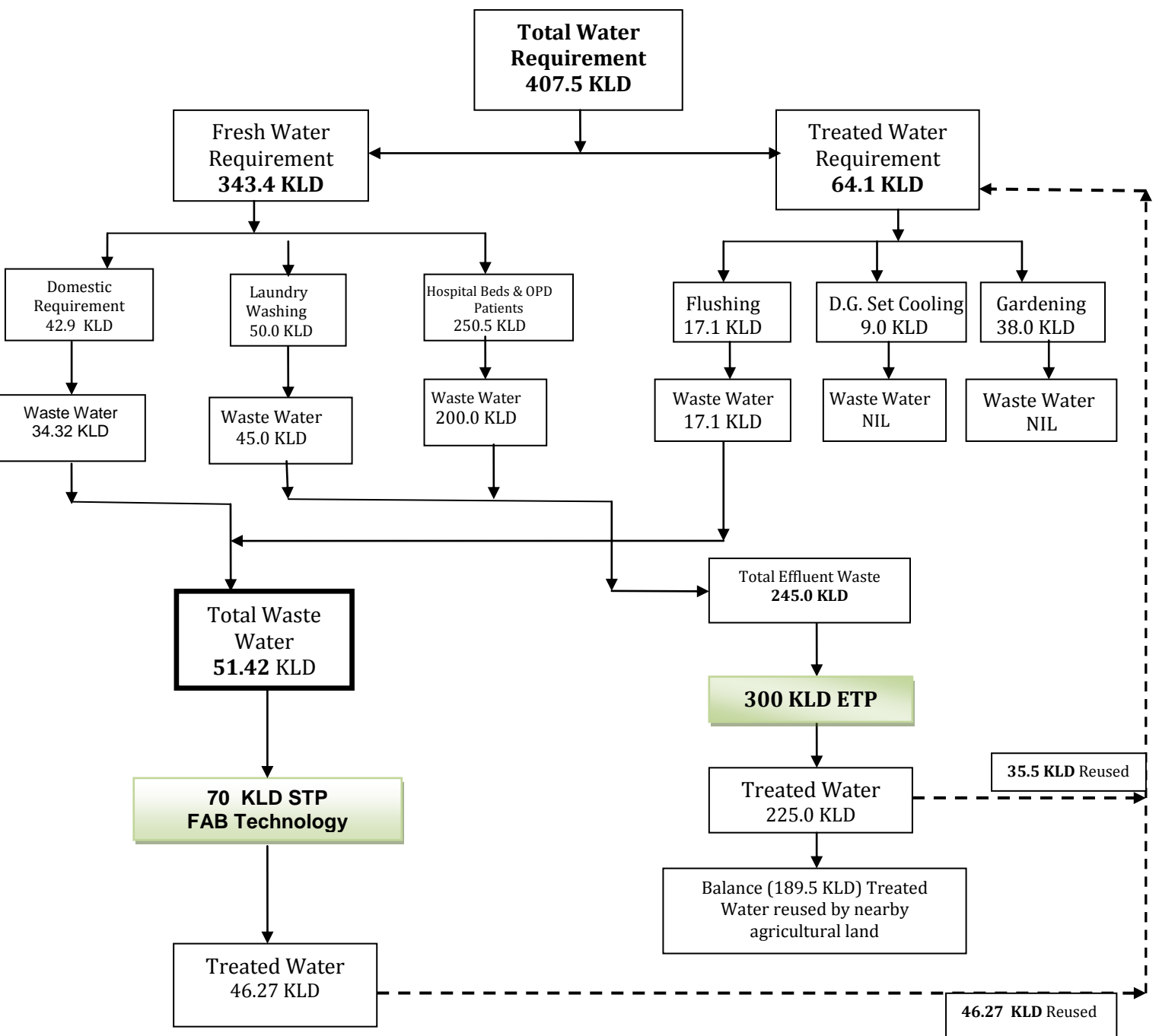
Conceptual Plan- Expansion of Base Hospital, Almora, Village- Khatyari, Pargana- Baramandal, Tehsil & District- Almora, Uttarakhand

	D.G. Set Cooling	02x1010 01x500	0.9 l/KVA/4 hr	9.0	NIL
	Landscaping Area	37701.39 m ²	1 l/m ²	38.0	NIL
TOTAL WATER REQUIREMENT				407.5	293.5

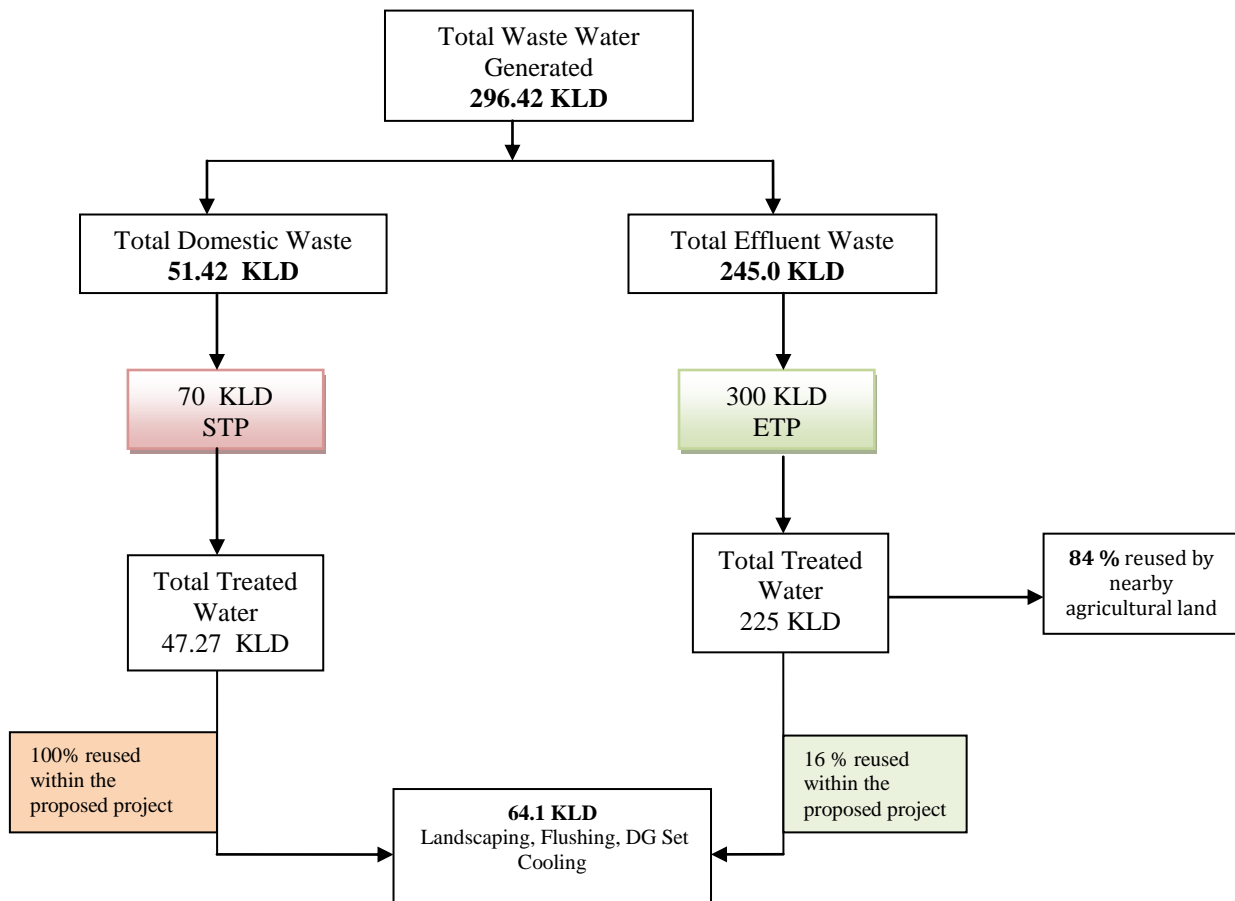
One time Fire Fighting Demand = 4.0 KLD (As per CPHEEO Manual, GOI)

7.1.2 Water Balance Diagram

Figure 6



Treated Water Reuse Cycle:



7.1.3 Sewerage

At the project site of proposed institutional building, 51.42 KLD generated waste water from domestic requirement of the buildings will be treated by proposed **70 KLD STP** based on FAB Technology. The treated water shall be fully reused in the gardening purpose.

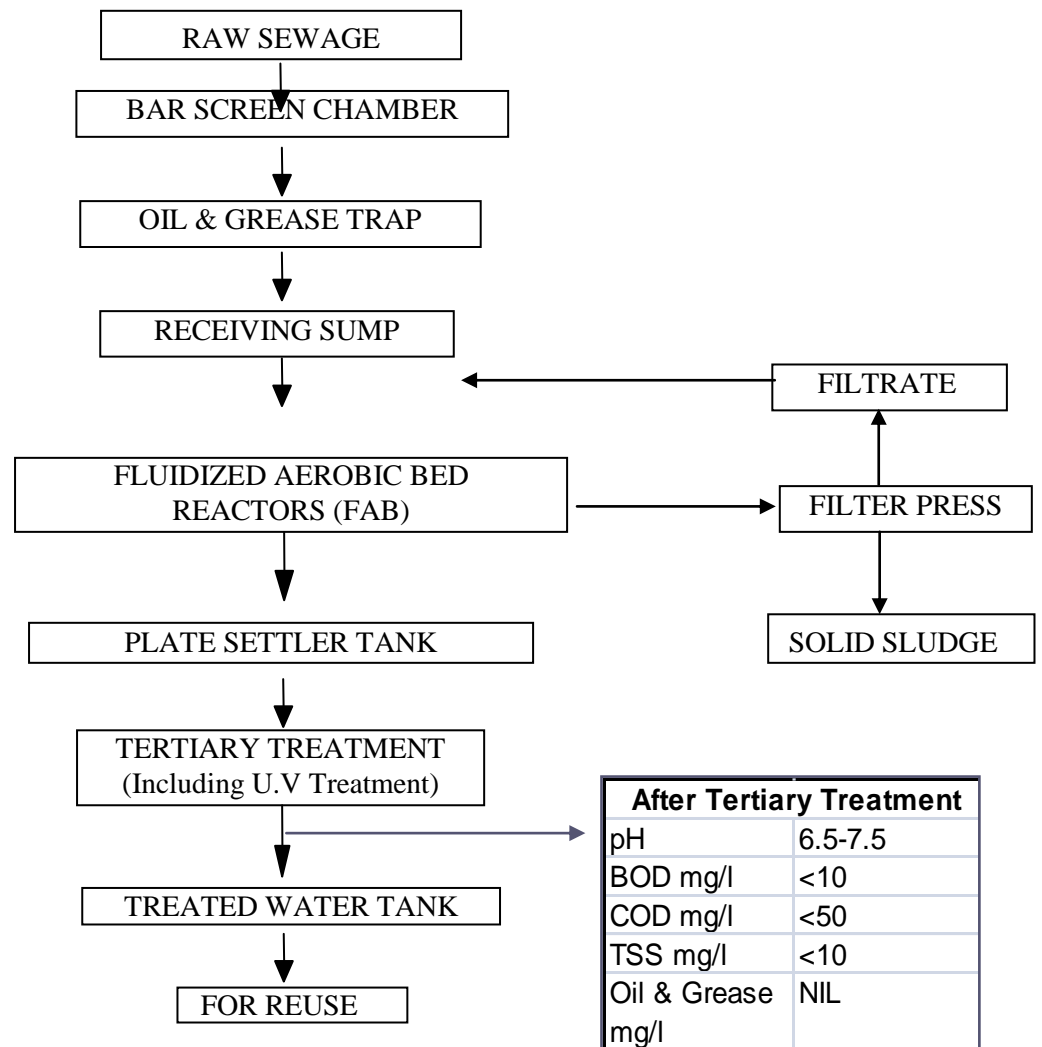
SCHEME OF SEWAGE TREATMENT PLANT:

During operation phase in the proposed institutional building, generated waste water will be treated in proposed 70 KLD STP based on FAB technology.

TREATMENT PROCESS:

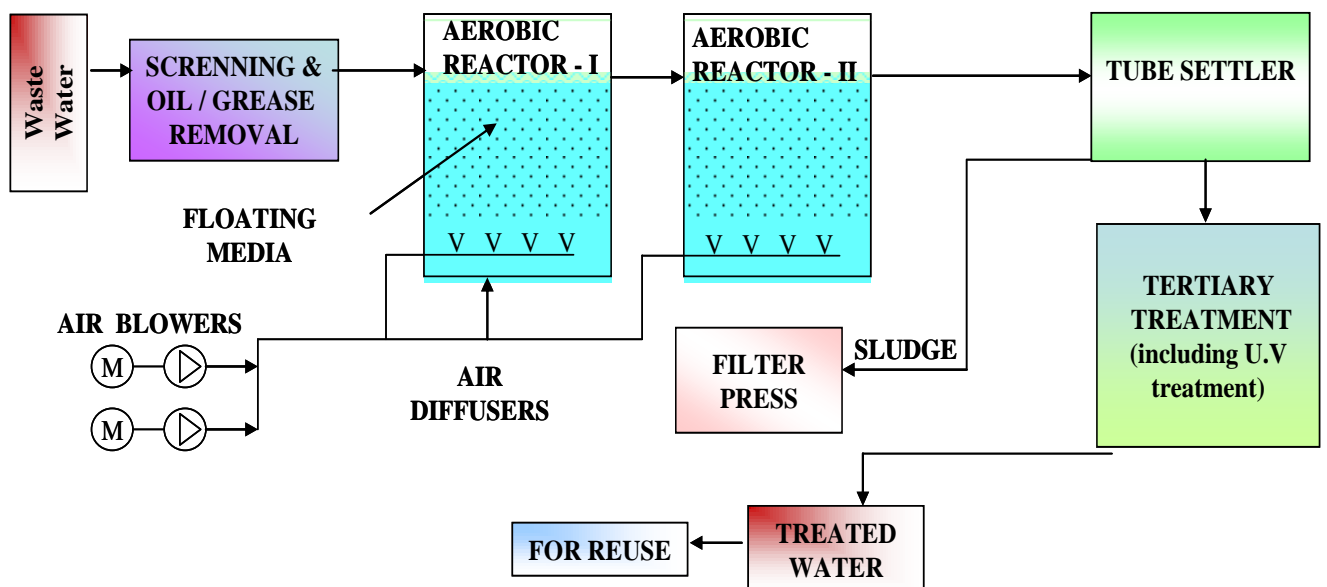
The sewage treatment plant (Fluidizes Aerobic Bed Reactor- FAB) 70 KLD shall propose to be installed to treat the raw sewage.

The process for Sewage Treatment Plant is as follows: (Figure 7)



SCHMATIC DIAGRAM OF SEWAGE TREATMENT PLANT 8)

(Figure



TREATMENT PROCESS FOR FAB

The sewage is first passed through a **Bar Screen Chamber** & an **Oil & Grease Chamber** where any extraneous / floating matter gets trapped.

The sewage is then collected in a **Receiving Sump** where the variations in flow and characteristics are dampened, which otherwise can lead to operational problems and moreover it allows a constant flow rate downstream. Here the sewage is kept in mixed condition by means of coarse air bubble diffusion.

The equalized sewage is then pumped to the **Fluidized Aerobic Bed Reactors (FAB)** where BOD/COD reduction is achieved by virtue of aerobic microbial activities. The FAB reactors run in series. The oxygen required is supplied through coarse air bubble diffusers.

The excess bio-solids formed in the biological processes which are separated in the downstream **Plate Settler Tank**. The clear supernatant is sent to the tertiary treatment section comprising of a **Dual Media Filter** and an **Activated Carbon Filter**, and UV disinfections system. If needed **Softener** shall be provided.

The biological sludge generated from the FAB will be passed through filter press where it will be dewatered and form a cake and then used as manure in green area of the block.

BENEFITS OF USING FAB TECHNOLOGY

Small space requirement

The concept of compact sewage treatment plants is promoted so that expensive conventional treatment is dispensed herewith. The treatment scheme is also versatile, in the sense that units can be re-arranged in any which way the space and pile caps are available.

Lower operating power requirements

The system utilizes aeration tanks of much smaller size, thereby reducing the overall power required in aerating the raw sewage. Since the bio-reactor depth is more, efficient transfer of oxygen takes place, thereby reducing the overall power consumed in treatment.

Simplicity in operation and maintenance

The system adopted has much less moving parts (only pumps and blowers). Further there is no moving part inside the bio-reactor. This gives the advantage of continuously running the bio-reactor system, under widely fluctuating conditions. All the maintenance on the mechanical systems can be done with normal skilled mechanics available.

The system is unique in operation, such that, only inlet and outlet parameters (i.e. raw sewage BOD / COD / TSS /TP and treated sewage BOD / COD / TSS / TP etc.) need to be analyzed. Since the bio-reactor is self sustaining, there is no requirement of

recycling the biomass from the secondary clarifier. Hence, analysis such as MLSS / MLVSS / SVI (sludge volume index) / F / M ratio etc. is not required to be done. This greatly reduces the analytical load on the plant chemist / supervisor, and makes the system very simple to operate and control.

The bio-reactor system adopted in the FAB based STP is provided with nutrients removal, and removal of disease causing E-coli bacteria.

Nutrient removal

The bio-reactor system operates at very food to micro-organisms ratio (F / M ratio). This helps in totally converting the Ammonical nitrogen to nitrate nitrogen. In the process of synthesis of organic substrate, about 40–50% of the total phosphates load is also reduced. The remaining phosphates can be precipitated by addition of aluminum ions dosed in form of Poly Aluminum Chloride (PAC). Phosphates react with aluminum ions and precipitate as aluminum phosphate, which is an insoluble salt. Thus the total phosphates load can be easily reduced by more than 90%.

Coliform removal

The outlet BOD of the bio-reactor system being very low (in other words, hardly any food is available to the E-coli), most of the coliform are killed in the reactor itself. Remaining coliform are killed by nominal chlorine dosing (of the order of 2–3 mg/l). The treated sewage outlet coliform count will conform to WHO standards, with such low chlorine doses. This will also ensure that there is not much residual chlorine.

Sludge handling

The sludge generated in the bio-reactors is totally digested. Since the F / M ratio in the bio-reactors is very low, the excess sludge generation is lower than compared to the conventional ASP system. Normally, this sludge is an-aerobically digested to stabilize the organic matter. The present system does not envisage any sludge digestion (since the sludge is aerobically stabilized in the bioreactors itself), making the system more suitable for operation with less manpower.

The excess sludge is separated in the secondary clarifier, and then disposed off either on drying beds, or can be directly used as soil conditioner.

EFFLUENT TREATMENT

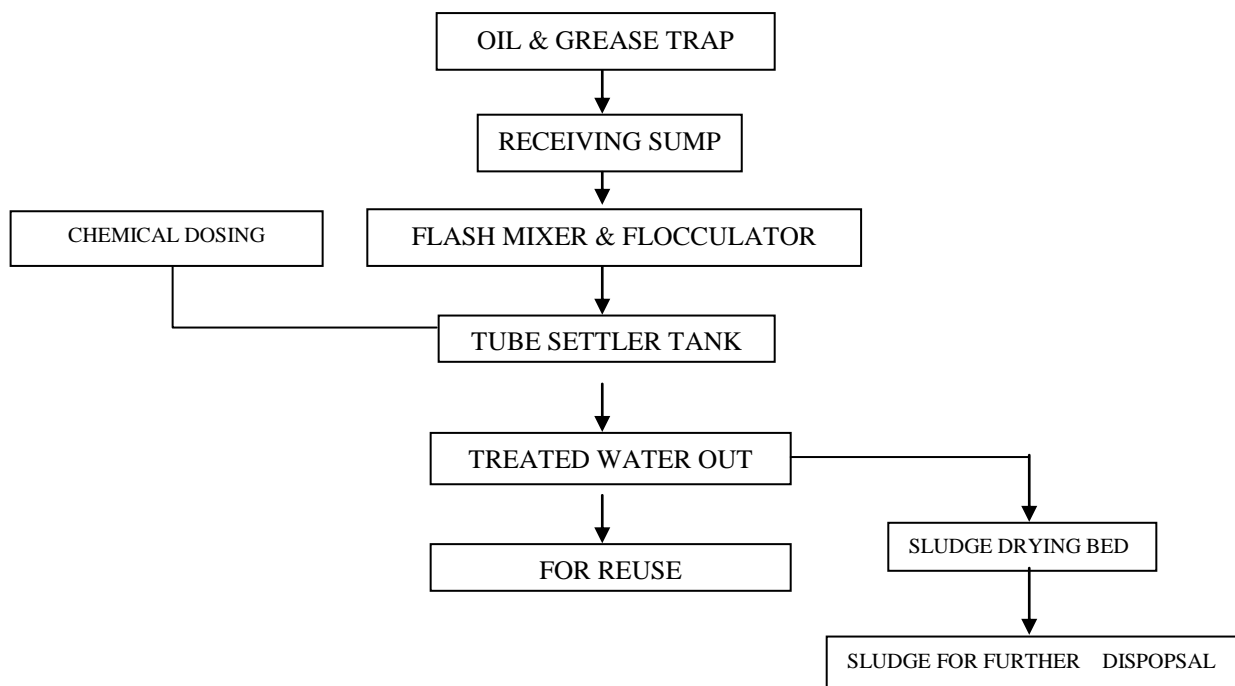
At the project site 245.0 KLD generated waste water from the hospital which includes Laundry, HVAC System and patients waste water, which will be treated at proposed 300 KLD ETP and after post treatment, treated water is used for DG Set Cooling, Flushing & Gardening purposes within the institute.

SCHEME OF EFFLUENT TREATMENT PLANT:

Specific Treatment for Hospital Wastewater: The wastewater of 245.0 KLD generated from hospital shall be treated in a proposed ETP of 300 KLD capacity.

PROCESS FLOW DIAGRAM FOR ETP

(Fig. 10)



PROCESS DESCRIPTION FOR EFFLUENT TREATMENT PLANT

The effluent will be first passed through a Bar Screen Chamber & an Oil & Grease Trap where any extraneous / floating matter would get trapped.

The effluent would then be collected in a Receiving Sump where the variations in flow and characteristics are dampened, which otherwise can lead to operational problems and moreover it allows a constant flow rate downstream.

The equalized effluent will then be pumped to the MIXER & FLOCCULATOR where BOD/COD reduction is achieved by virtue of CHEMICAL DOSING.

The treated suspended matter formed in the process will be separated in the downstream Tube Settler Tank and then the treated water will be reused for existing green belt within the hospital.

FENTON REAGENT TECHNOLOGY FOR TREATMENT OF HOSPITAL WASTE;

In Fenton process, iron and hydrogen peroxide are two major chemicals determining, operation costs as well as efficiency. The Fenton reaction has a short reaction time among all advanced oxidation processes and it has other important advantages. Iron and H₂O₂ are cheap and non-toxic, there is no mass transfer limitation due to its homogenous catalytic nature, there is no energy involved as catalyst and the process is easily to run and control. Fenton's reaction is one of the most effective methods of oxidation of organic pollutants that are oxidative degraded by hydroxyl radicals generated from H₂O₂ in the presence of Fe²⁺ as a catalyst.

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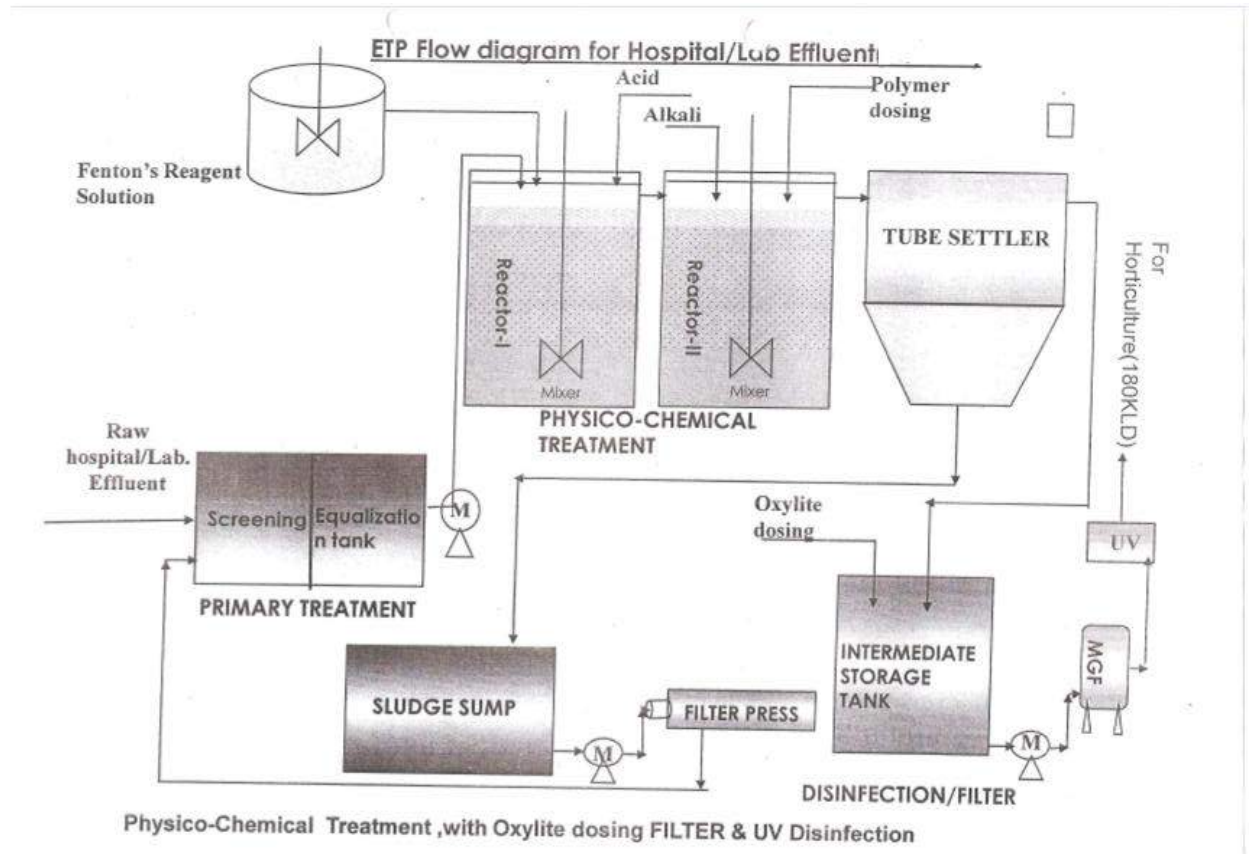
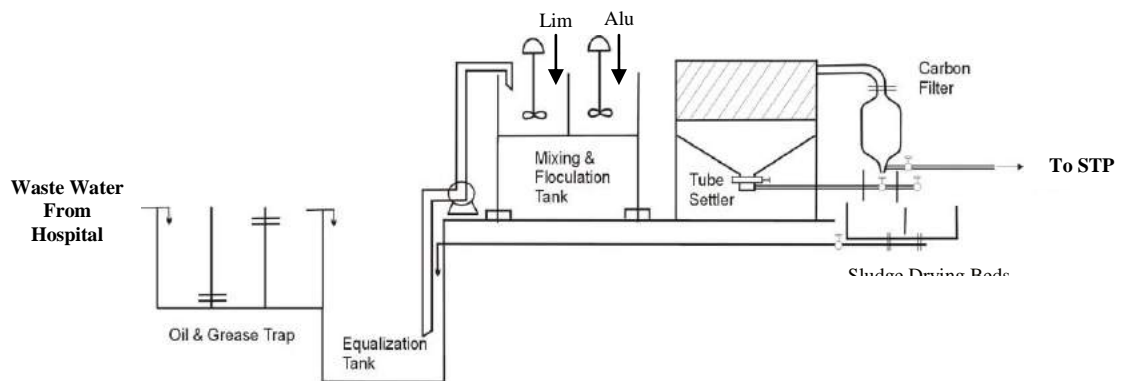


figure: Proposed Fenton Based Technology for waste water treatment of Hospital Effluent

Figure: Schematic of Typical ETP:



7.1.4 Water Conservation & Augmentation

1. For horticulture, a garden hydrant ring with pumping facilities has been

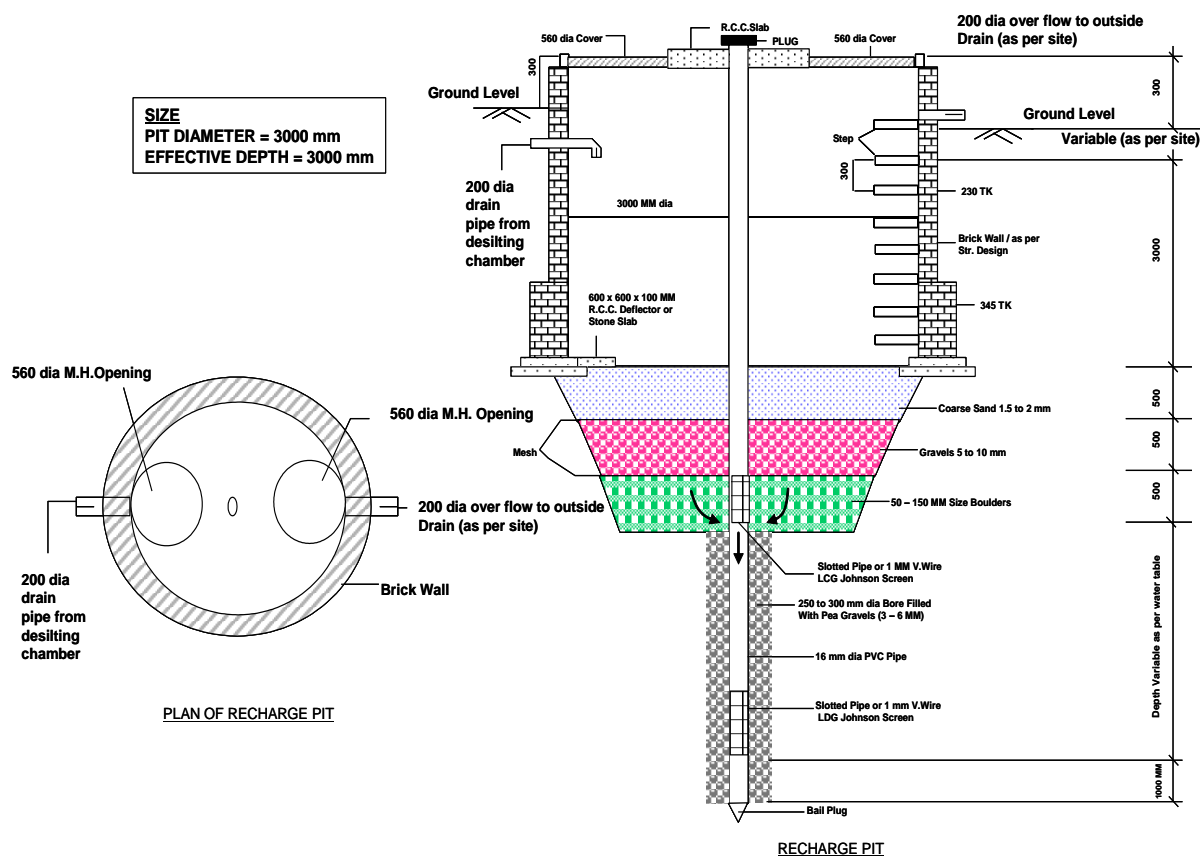
Conceptual Plan- Expansion of Base Hospital, Almora, Village- Khatyari, Pargana- Baramandal, Tehsil & District- Almora, Uttarakhand

proposed.

2. The sewer shall be treated within housing for bringing down the characteristics of sewer within the norms specified by Ministry of Environment & Forest, Govt. of India for safe disposal.
3. The proposed hospital buildings shall get piped water supply through an appropriately designed system and no area shall be having any individual system of water supply (i.e. jet pumps, hand pumps or individual bore well).
4. It is outlined that lakes, ponds and small water storage bodies should be conserved and protected from misuse as well as efficient water harvesting system should be ensured in the construction projects.
5. Taps and other water flushing devices including showers used shall be designed to waste less water.
6. Awareness plays a major role in water conservation. Public messages shall be prominently displayed for water conservation.
7. Water leaks shall be tracked and corrected regularly.
8. Dual flush WC (3 – 6 liters instead of 10 liters) shall be used to optimize the water demand.

7.2 RAINWATER HARVESTING

(Figure 9)



As the district receives 40 mm peak hourly rainfall rainwater harvesting in RWH pits. Construction of Percolation tanks and recharge shafts may be an economical option in

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areas with deeper water levels via roof by channelizing the clean water to rainwater recharging pits, commercial complexes; institutional, etc also rain water harvesting has been made mandatory in Building Regulations.

Rain water from the various roofs will be drained through rain water vertical down take UPVC / MS pipes. These vertical down take pipes will be located at suitable locations inside the shafts or embedded inside the wall. All the terraces will be sloped in a slope of 1:50 or 1:75 sloping towards down vertical pipes. Rain water disposal shall be designed as per NBC i.e. 200 mm dia and 15 m depth of bore for rainfall @ of 40mm/hour rainfall as per NBC.

TABLE 8: QUANTUM OF RAINWATER AVAILABLE FOR HARVEST(FOR THE EXISTING 300 BEDDED)

S. No.	Description of Area	Area considered (m ²)	Harvesting Factor or Collection Efficiency	Average Annual Rainfall intensity (mm)	Total Volume of Water available for Rain Water Harvesting (m ³)
1	Roof-top Surfaces	6004.71	0.8	40	192.15
Grand Total					192.15

Total quantum of rainwater for 0.25 hr. = $192.5/4 = 48.12 \text{ m}^3$

The required dimensions of pit = 3.5 m × 3.0 m × 3.5 m.

Total required nos. of pits= $48.12/36.75 = 1.30 \approx 01$ Recharge pit

The total no. of rainwater harvesting pit shall be 03 with dimensions of 3.5 m × 3.0 m × 3.5 m at peak rainfall intensity of 40 mm.

Required Rain Water Harvesting Pits = 01 Nos

TABLE 8(i): QUANTUM OF RAINWATER AVAILABLE FOR HARVEST(FOR THE PROPOSED 200 BEDDED)

S. No.	Description of Area	Area considered (m ²)	Harvesting Factor or Collection Efficiency	Average Annual Rainfall intensity (mm)	Total Volume of Water available for Rain Water Harvesting (m ³)
1	Roof-top Surfaces	7330.43	0.8	40	234.57
Grand Total					234.57

Total quantum of rainwater for 0.25 hr. = $234.57/4 = 58.64 \text{ m}^3$

The required dimensions of pit = 2.20 m × 1.5 m × 3.0 m.

Total required nos. of pits= $58.64/10 \approx 06$ Recharge pit

The total no. of rainwater harvesting pit shall be 06 with dimensions of 2.2 m × 1.5 m × 3.5 m at peak rainfall intensity of 40 mm.

Required Rain Water Harvesting Pits = 06Nos

TABLE 8(ii): QUANTUM OF RAINWATER AVAILABLE FOR HARVEST (FOR THE TOTAL 500 BEDDED)

Proposed Rain Water Harvesting Pits = 06 Nos. + 01 Nos. = 07

7.3 AIR POLLUTION CONTROL

In order to reduce impact of dust during construction period, enclosure walls with a height of 2 meters or above will be built around the construction site; on-site mixing will be done at enclosed space, cement, lime powder and other construction materials shall be stored at storage yard or tightly covered, discrete materials such as sand and soil will be covered, the building materials to be loaded, unloaded and/or handled shall be covered, closed or sprinkled, and none of them shall be thrown or spread into the air; a water ditch with its width at 3.5 meter, length at 10 meters and depth at 0.2 meter shall be made at the exit to and from the construction site, in which crushed stones with a diameter at 50 millimeters will be laid, so as to reduce the amount of earth on tires of vehicle to and from the construction site; covers will be made on materials to be transported or they will be transported by enclosed vehicles, routes of transportation vehicles shall avoid residential quarters and other environmentally sensitive areas, and vehicle speed shall also be limited.

During operation, only source of air pollution is D.G. Sets emission. Hence proper stack height should be provided above roof top of building.

HVAC, VENTILATION AND BMS SYSTEM

HVAC System Design :

It is proposed to install central water cooled chilled water system consisting of chilling machine, cooling towers, primary and secondary chilled water pumps, Condenser water pumps, Double skin type Air handling units, heat recovery type fresh air units for maintaining the indoor air quality. The design is made as per the building layout and the departmental areas or zones. These zones are broadly classified as follows:

- | | | |
|----------------------------|---|--|
| 1. OPD Area | : | Patient waiting/checkup, tests/nurses .
Cafeteria etc |
| 2. Clinical Services Areas | : | Surgical department, Radiology, X-ray
MRI / CAT Scan, Laboratories. |
| 3. IPD areas | : | ICUs, Nursery, Wards etc. |
| 4. Other areas | : | Unit chiefs/ professors/faculty
Technicians/department offices etc. |

The individual requirements of the above will be considered for designing the system

Basis of Design:

Outside Conditions Summer : Dry bulb temperature 42°C

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		Wet Bulb Temperature 26°C
	Monsoon :	Dry bulb temperature 33°C Wet Bulb Temperature 28.3C
	Winter :	Dry bulb temperature 12°C Wet Bulb Temperature 8°C
Lighting Load	:	2w/ft2 in all areas except OTs
Roof Insulation	:	Which will have 3w/ft2 or as required. All the exposed roof to be insulated with 50 thick and 20 kg/m ³ density expanded polystyrene insulation / or equivalent insulation
Fresh Air	:	12 air changes/ hour
Ventilation	:	10 cfm per person

Inside Design Conditions :

Inside Design Conditions		
Sr. No. Space Name	Temperature	RH%
Pressure type		
1.	°C	
Sample collection Treatment Rooms (±)	23.3 ± 1.1	50 ± 5%
2.		
X-ray/MRI/CAT Scan (-)	23.3 ± 1.1	50 ± 5%
3.		
Labs (-)	23.3 ± 1.1	50 ± 5%
4.		
Administration/ Conferences/academics (-)	26 ± 1.1	60 ± 5%
5.		
Pre/Post IPD (+)	22.2 ± 1.1	50 ± 5%
6.		
Intensive Care Unit (+)	22.2 ± 1.1	50 ± 5%
7.		
Operation Theatres (+)	21.0 ± 1.0	50 ± 5%
8.		
Doctors Rest Rooms (±)	26 ± 1.1	60 ± 5%
9.		
Isolation rooms (-)	23.3 ± 1.1	50 ± 5%
10.		
Patient Room (±)	24 ± 1.1	60 ± 5%

Based on the areas finalized to be airconditioned within base hospital (as per drawings discussed) detailed heat loads based on the above design data and the details the estimated loads for various areas are summarized as below :

(i) Hospital Building :

Sr.No.	Area Description	Area (m2)	Load TR
1.	Ground Floor	3054	200
2.	First Floor	2689	170
3.	Second Floor	3230	190
4.	Third Floor	2952	180
5.	Fourth Floor	3119	190
6.	Fifth Floor	2936	180
7.	Sixth Floor	2936	190

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Total	20916 m2	1300 TR

(ii) Service Building		
=====		
Sr.No.	Area Description	Area (m2)
=====		
1.	Laboratories	600
=====		
(iii) Admin Building	900	75

Air-Conditioning, Heating and ventilation System Design data of the above buildings :

The total air-conditioning load for the above areas works out to be 1350 TR. It is proposed to install central chilled water air cooled type air-conditioning system to provide year round thermal environmental control for the above areas. It is proposed to use 4 Nos. 300 TR Cooling Capacity air cooled Screw compressor type water chilling Machines after taking into account diversity (one standby)after taking diversity, with 4 nos. chilled water primary pumps (one stand by), 4nos chilled water secondary pumps with VFDs(one standby), 3 nos. hot water pumps(One standby), Air Handling Units and Fan coil units as per the requirements at various floors/areas.

The plant shall be installed at the Plant space allocated at a separate plant room building adjacent to the hospital building and chilled water from this plant shall be supplied to various AHUs at the ground floor to sixth floor areas as per requirements. The system shall be complete with electrical panel boards, power cabling, control cabling, earthing and controls.

Local heating systems in OTs and other critical areas will be provided.

Cooling towers will be provided on rooftop of Main Hospital building.

D. G set Stack Height Calculation for Emission Control:

As per the information, **01 D.G. Set of 500 KVA & 02 D.G. Set of 1010 KVA** capacity each shall be installed. For, which cumulative stack height of **21.08 m** above the proposed Institute shall be provided. D.G set will be supplied with acoustic enclosure as per CPCB norms.

Exhaust height: In order to dispose emissions above building height, minimum exhaust stack height would be as follows:

Minimum stack height for D.G. Set:

$$H = h + 0.2 \times \sqrt{KVA}$$

Where, H = stack height of D.G. Set

h = height of Building

$$H = h + 0.2 \times \sqrt{(500 \times 1)KVA} = h + 0.2 \times \sqrt{2520 KVA}$$

$$= h + 0.2 \times 50.2 \text{ m} = h + 10.03 \text{ m}$$

D. G. Set: 2 x 1010 KVA

The exhaust chimney for 1010 KVA D.G. set shall be as per the guidelines of CPCB.

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Total No. of D.G Sets: 02 Nos.

Capacity of D. G. Set: 1010 KVA

Fuel consumption rate= 121.4 Lt/ hr.

Mass of Sulphur burnt = 0.515 Kg/hr.

[max. sulphur content: 0.5% by weight]

No. of mole of sulphur burnt = 16.09 mol/hr

[Molar mass of sulphur: 32 g/mol]

No. of mole of SO₂ formed = 16.09 mol/hr.

SO₂ emission rate (Q) = 1030 g/hr or 1.030 Kg/ hr.

[Molar mass of SO₂: 64 g/mol]

Stack Height = $14 * (Q)^{0.3} = 14 * (2*1.030)^{0.3} = 14*1.242 = 17.38$ m

7.4 SOLID WASTE MANAGEMENT

7.4.1 MUNICIPAL SOLID WASTE (For proposed 500 Bedded)

It is estimated that for 400 persons of the proposed Institute, which includes Clinical & Non Clinical Staff, municipal solid waste @ 0.25 Kg/day/ person shall be generated **100.0 Kg/ day**. And for residents & Hostellers of 454 persons, MSW @ 0.5 Kg/day/person shall be generated **227 Kg/day**. Total of **327 Kg/day**.

Table 9: Municipal Solid Waste

Type of Waste	Color of Bins	Category	Disposal Method	Total Waste (Kg/ day)
Organics	Green	Bio Degradable	Municipal Solid Waste Site	179.85
Paper	Blue	Recyclable	Approved Recycler	42.51
Metals				
Glass				
Textiles				
Plastic				
Ash & Dust	Grey	Non-Bio degradable	Municipal Solid waste Site	104.64
Total				327

Table 10: Waste Generated from Floating Population @ 0.15 Kg/Day

Population	Category	Total Waste	Bio-degradable	Recyclable	Non-Biodegradable
Nos.	Floating	Kg/ day	Kg/day	Kg/ Day	Kg/ Day
1900	Visitors, OPD Patients, lecture Hall	285.0	157.0	37.0	91.0

Therefore, **Total expected MSW: 612.0 Kg/day**

7.4.2 MUNICIPAL SOLID WASTE (For existing 300 Bedded)

It is estimated that for 275 persons of the proposed Institute, which includes Clinical & Non Clinical Staff, municipal solid waste @ 0.25 Kg/day/ person shall be generated **68.75 Kg/ day**. And for residents & Hostellers of 312 persons, MSW @ 0.5 Kg/day/person shall be generated **156 Kg/day**. Total of **224.75 Kg/day**.

Table 9: Municipal Solid Waste

Type of Waste	Color of Bins	Category	Disposal Method	Total Waste (Kg/ day)
Organics	Green	Bio Degradable	Municipal Solid Waste Site	123.62
Paper	Blue	Recyclable	Approved Recycler	29.21
Metals				
Glass				
Textiles				
Plastic				
Ash & Dust	Grey	Non-Bio degradable	Municipal Solid waste Site	71.92
Total				224.75

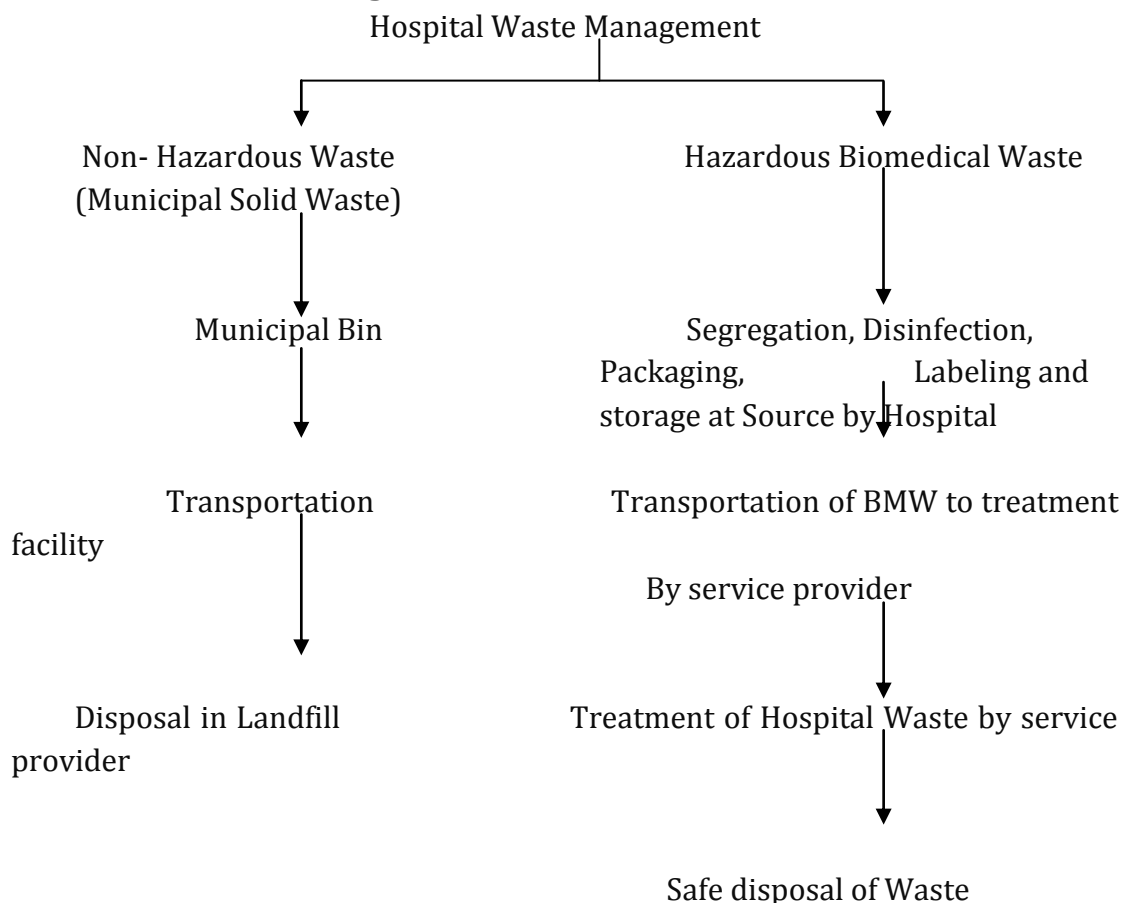
Table 10: Waste Generated from Floating Population @ 0.15 Kg/Day

Population	Category	Total Waste	Bio-degradable	Recyclable	Non-Biodegradable
Nos.	Floating	Kg/ day	Kg/day	Kg/ Day	Kg/ Day
1220	Visitors, OPD Patients, lecture Hall	183.0	100.65	23.79	58.56

Therefore, **Total expected MSW: 407.75 Kg/day**

The solid waste shall be segregated and collected as per the above scheme. These bins will be emptied into the Garbage collection Bin of the ground floor. Service provider from institute will collect the garbage and waste shall be discharged to main bin. The grey and green bins shall be picked up on the instructions of Nagar Palika for disposal. The service provider carries this waste for recycling and rest to the municipal solid waste site. The management shall engage a vendor & they will dispose the waste at the proposed site identified by the Nagar Palika management.

7.4.2 Biomedical Waste Management



Total No. of Hospital Beds = 500
Waste Generation Rate = 0.28 Kg/Bed
Total Waste Generated = 140.0 Kg/day
No. of Existing Hospital Beds = 300
Waste Generation Rate = 0.28 Kg/Bed
Total Waste Generated =84.0 Kg/day
No. of Proposed Hospital Beds = 200
Waste Generation Rate = 0.28 Kg/Bed
Total Waste Generated =56 .0 Kg/day

7.4.3.1 Biomedical Waste

Hospital waste generated during diagnosis, treatment, immunization of human beings. It may include waste like sharps, soiled waste, disposables, anatomical waste, cultures, discarded medicines, chemical waste etc. these are in the form of disposable syringes, swabs, bandages, body fluids, human excreta etc. this waste is highly infectious and can be a serious threat to human health if not managed in a scientific manner. About 0.28 Kg/Bed of rate of biomedical waste is expected to be generated from the 500 bedded base hospital which will be collected as per BMW Handling Rules and then given to UPPCB approved service provider.

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The World Health Organization (WHO) has classified medical waste into eight categories:

- ✓ General Waste
- ✓ Pathological
- ✓ Radioactive
- ✓ Chemical
- ✓ Infectious to potentially infectious waste
- ✓ Sharps
- ✓ Pharmaceuticals
- ✓ Pressurized containers

Table 14: Biomedical Waste Generation

Schedule 1: Categories of Bio-Medical Waste		
Waste Category	Waste Category Type	Treatment and Disposal Options
Category No.1	Human Anatomical Waste (body parts, organs, human tissues etc)	Incineration @/ deep burial*
Category No.2	Animal Waste (animal tissues, organs, body parts carcasses, bleeding parts, fluid, blood and experimental animals used in research, waste generated by veterinary hospitals, colleges, discharge from hospitals, animal houses)	Incineration @/ deep burial*
Category No.3	Microbiology & Biotechnology Waste (waste from laboratory cultures, stocks or micro-organism live or vaccines, human and animal cell culture used in research and infectious agents from research and industrial laboratories, waste from production of biological, toxins, dishes, and devices used for transfer of cultures).	Local Autoclaving / micro waving/ incineration@
Category No.4	Waste Sharps (needles, syringes. Scalpels, blade, glass, etc. that may cause puncture and cuts. This includes both used and unused sharps).	Disinfection (chemical treatment @ @/autoclaving/ micro waving and mutilation/ shredding##
Category No.5	Discarded Medicines and Cytotoxic drugs (waste comprising of outdated, contaminated and	Incineration @ / destruction and drugs disposal in secured landfills

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	discarded medicines).	
Category No.6	Soiled Waste (items contaminated with blood, and body fluids including cotton, dressing, soiled plaster casts, lines, bedding, other material contaminated with blood).	Local autoclaving/microwaving / incineration @
Category No.7	Solid Waste (waste generated from disposal items other than the sharps such as tubing, catheters, intravenous, etc).	Disinfection by chemical treatment @@ autoclaving / micro waving and mutilation. Shredding ##
Category No.8	Liquid Waste (waste generated from laboratory and washing, cleaning, housekeeping and disinfecting activities).	Disinfection by chemical treatment @@ and discharged into drains
Category No.9	Incineration ash (Ash from incineration of any bio-medical waste).	Disposal in municipal landfill
Category No.10	Chemical Waste (chemical used in production of biological, chemicals, used in disinfection as insecticides, etc).	Disinfection by chemical treatment @@ and discharged into drains for liquids and secured landfill for solids.
Note @ There will be no chemical pretreatment before incineration. Chlorinated plastics shall not be incinerated.		
*Deep burial shall be an option available only in towns with population less than five lakhs and in rural areas.		
@@ Chemicals treatment using at least 1% hypochlorite solution or any other equivalent chemical reagent. It must be ensured that chemical treatment ensures disinfection.		
## Mutilation / Shredding must be such so as to prevent unauthorized reuse.		

The biomedical waste generation for 500-bedded base hospital will be around 140.0 Kg/Day. This waste shall be given to CPCB approved recycler/ service provider.

Schedule II : COLOR CODING SYSTEM				
Color Coding	Type of container	Waste category	Transportation	Treatment option / disposal
Yellow	Plastic Bag	Human Anatomical Waste, Discarded medicines,	Red Wheel Chair / local body	Incineration / Deep Burial

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		Cytotoxic drugs		
Red	Disinfected Container / Plastic Bag	Microbiology & Biotechnology, toxins, soiled waste (contaminated with blood & Body fluids, plaster, cotton, dress), Solid Wastes (Disposables)	Red Wheel Chair / local body	Autoclaving / Micro-waving / Chemical Treatment
Blue / White	Puncture Proof Cont	Waste Sharps	In Garbage Trolley	Autoclaving / Micro-waving / chemical treatment and destruction & shredding
Black	Plastic Bag Bio degrade	Incinerator ash (sec landfill), Chemical Waste (neutralize), Household / kitchen waste	In Garbage Trolley	Disposal in secured landfill – Bio degradable – vermin-composting / composting

Schedule III: Label for Bio-Medical Waste Containers/Bags

BIOHAZARD SYMBOL

जैविक परिसंकट चिन्ह



BIOHAZARD

जैविक परिसंकट

CYTOTOXIC HAZARD SYMBOL

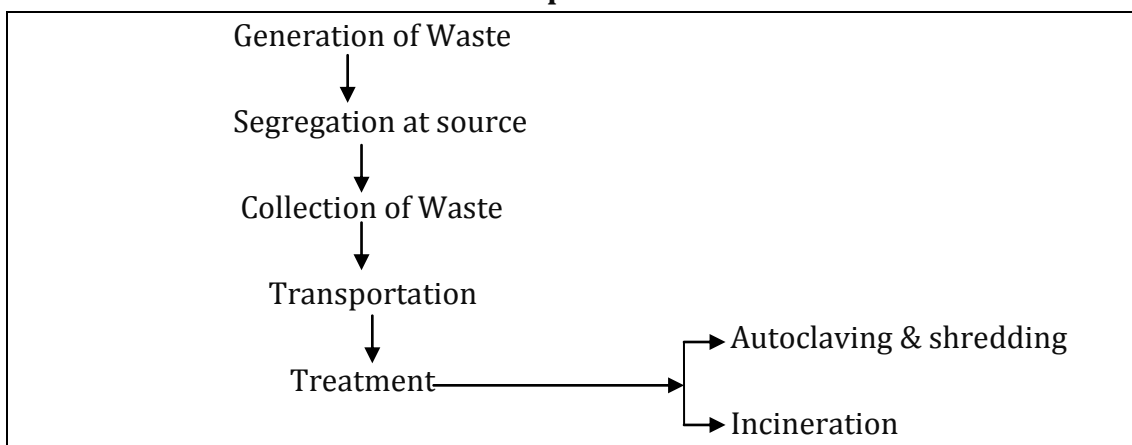
कोषिकाविष परिसंकट चिन्ह



CYTOTOXIC

कोषिकाविष

Procedure of Bio-Medical Waste Disposal



Wet Thermal Technology (Autoclave)

This technology utilizes saturated steam within a pressure vessel at temperature sufficient to kill infectious agents in the waste. Infectious waste with low density is more amenable for autoclaving. High density wastes such as large body part inhibits direct steam penetration and is not conducive for auto claving. Low density plastics bags may be placed in a rigid container prior to autoclaving in order to prevent rupture of bags and consequent spillage of materials.

7.4.3.2 STANDARDS FOR WASTE AUTOCLAVING:

1. The autoclave should be dedicated for the purposes of disinfecting and treating bio-medical waste,

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A. When operating a gravity flow autoclave, medical waste shall be subjected to:

(i) Temperature of not less than 121⁰ C and pressure of 15 pounds per square inch (PSI) for an autoclave residence time of not less than 60 minutes; or

(ii) A temperature of not less than 135⁰ C and a pressure of 31 PSI for an autoclave residence time of not less than 45 minutes; or

(iii) A temperature of not less than 149⁰C and a pressure of 52 PSI for an autoclave residence time of not less than 30 minutes.

(B) When operating a vacuum autoclave, medical waste shall be subjected to a minimum of one pre-vacuum pulse to purge the autoclave of all air. The waste shall be subjected to the following:

(i) A temperature of not less than 121⁰ C and pressure of 15 PSI per an autoclave residence time of not less than 45 minutes; or

(ii) A temperature of not less than 135⁰ C and a pressure of 31 PSI for an autoclave residence time of not less than 30 minutes;

(C) Medical waste shall not be considered properly treated unless the time, temperature and pressure indicators indicate that the required time, temperature and pressure were reached during the autoclave process. If for any reasons, time temperature or pressure indicator indicates that the required temperature, pressure or residence time was not reached, the entire load of medical waste must be autoclaved again until the proper temperature, pressure and residence time were achieved.

(D) Recording of operational parameters

Each autoclave shall have graphic or computer recording devices which will automatically and continuously monitor and record dates, time of day, load identification number and operating parameters throughout the entire length of the autoclave cycle.

(V) Validation test

Spore testing:

The autoclave should completely and consistently kill the approved biological indicator at the maximum design capacity of each autoclave unit. Biological indicator for autoclave shall be Bacillus stearothermophilus spores using vials or spore Strips; with at least 1X10⁴ spores per millilitre. Under no circumstances will an autoclave have minimum operating parameters less than a residence time of 30 minutes, regardless of temperature and pressure, a temperature less than 121⁰ C or a pressure less than 15 psi.

(VI) Routine Test

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A chemical indicator strip/tape the changes colour when a certain temperature is reached can be used to verify that a specific temperature has been achieved. It may be necessary to use more than one strip over the waste package at different location to ensure that the inner content of the package has been adequately autoclaved

7.4.3.3 WASTE IN BLUE BAGS/ CONTAINERS:

As per the BMW , 1998 (amended 2011) after Chemical Treatment & destruction this category of waste can be disposed off. In this category main constituent is needles, which should be destroyed before chemical treatment .

There are two types of needle destroyer available in the market:

- **Manual cutter**
- **Electric needle destroyer**

After needle destruction it should be dipped in container consisting of 1% hypo. After this sharp part shall be segregated from plastic part for disposal. Disinfected waste will be treated by steam sterilization or incineration before landfill disposal. Incineration Ash (Ash from incineration of any bio-medical waste) will be disposed in municipal landfill.

7.4.2.2 SEGREGATION OF WASTE

It should be done at the site of generation of bio- medical waste, e.g. all patient care activity areas, diagnostic services areas, operation theatre labour rooms, treatment rooms, etc., the responsibility of segregation would be with the generator of biomedical waste i.e. doctors, Nurses, Technicians, etc. the Bio medical waste would be segregated as per categories applicable. The collection bags and the containers would be labeled as per guideline of Schedule III, i.e. symbols for bio-hazard and cytotoxic. Those plastics bags which contain liquid like blood, urine, pus, etc, would be put into red color bag for microwaving and autoclaving and other items would be put into blue or white bag after chemical treatment⁵ and mutilation / shredding.

7.5 Hazardous & Electronic Waste Management

Hazardous waste is a waste with properties that make it dangerous or potentially harmful to human health or the environment. Hazardous wastes can be liquids, solids, contained gases, or sludge's and even from compute at offices, simply discarded commercial products, like cleaning fluids or pesticides. All hazardous waste are required to be treated and disposed off in the prescribed manner. The main objective is to promote safe management and use of hazardous substances including hazardous chemicals and hazardous wastes, in order to avoid damage to health and environment.

As regards hazardous waste may be generated at the hospital building, it shall be collected and stored as per the guidelines under Hazardous Waste Management & Handling Rules, 2003. The hazardous waste shall be disposed off to the approved recycler/ service provider of UPPCB.

Type of Waste	Colour of Bins	Disposal Method	Total Waste
Used Oil	Black with Label	Approved Service Provider as	2.0 Kg/day

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		per HWM 2010	
Electronic	Black with Label	Approved Service Provider as per HWM 2010	1.78 Kg/day
Battery			
Medicines			
TOTAL			3.78 Kg/day

Apart from above - Mercury Waste is also anticipated to be generated.

Mercury Use In Health Care Facilities

Some of the mercury based instruments expected to be used for diagnosis purposes by the B. C. Roy Institute are as follows:

- a) Thermometers (used for measurement of body temperatures);
- b) Sphygmomanometers (used for measurement of blood pressure);
- c) Dental amalgam;
- d) Esophageal dilators (also called bougie tubes);
- e) Cantor tubes and Miller Abbott tubes (used to clear intestinal obstructions);
- f) Laboratory chemicals (fixatives, stains, reagents, preservatives);
- g) Mercury-Containing Waste (e.g. Broken Thermometers, Lamps & Batteries) Xylene, Antineoplastic.

Quantification of Mercury Waste Generation

S.No.	Source	Rate of Generation*	Expected No. of Mercury Containing Devices (MCD's) categorized as waste from 470 bedded hospital	Quantity
1.	Thermometers	• Contain about 0.5 gram of mercury (laboratory thermometers contain 2 to 10 grams of mercury)	At least 10/ month	5.0 g/ month
			Lab. Thermometers At least 1/ month	10.0 g/ month
2.	Sphygmomanometers (blood pressure monitors)	• Contain 70 to 90 grams of mercury	At least 02/ month	180.0 g/ month
3.	Cantor and Miller Abbot tubes (also called esophageal bougies and Sengstaken-Blakemore tubes)— Used to clear gastrointestinal [GI] restrictions	• A single set of bougie tubes can contain up to 454 grams of mercury	At least 01/month	454.0 g/ month
4.	Non-Clinical Mercury	• Barometers	At least 01/6	133.33

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S.No.	Source	Rate of Generation*	Expected No. of Mercury Containing Devices (MCD's) categorized as waste from 470 bedded hospital	Quantity
	Sources (sphyg repair kits, barometers, switches, etc.)	contain about 800 grams of mercury	months	g/month
5.0	Other Sources			
5.1	• Staining solutions and laboratory reagents(thimerosal, mercury chloride, immusal, and carbol-fuchin)	- Lump sum	At least 5.0 g/day	150.0 g/month
5.2	• Batteries	- Lump sum		
5.3	• Manometers on medical equipment	- Lump sum		
5.4	• Esophageal dilators (also called Maloney or Hurst bougies)	- Lump sum		
5.4	• Fluorescent and high-intensity lamps	- Lump sum		
5.5	• Tissue fixatives (Zenker's solution and B5)	- Lump sum		
5.6	• Thermostats	- Lump sum		
5.7	• Cleaning solutions	- Lump sum		
			TOTAL	922.33 g/month

[*Ref.: US-EPA standards 1.3, 2.3, 4.0]

~930 g/ month = 11.16 Kg/ Year from proposed 470 bedded Hospital

Or,

Mercury Waste Generation @ 0.02-0.03 Kg/Bed/Year.

Also , Mercury in Building Products may include the following:

Building Product	Approximate amount of Hg*
Fluorescent light bulbs	10 - 50 mg per tube, depending on size and model
High intensity discharge (HID) lamps	10 - 250 mg
Thermostats	3 grams per switch (Some units have as many as 6 switches)
Mercury switches, including: mechanical/tilt switches, reed switches, float switches	3.5 grams - 8 pounds per switch

Flow meters	Often 11 pounds or more
Flame sensors	3 g
Gas regulators and meters	Older gas meters contain approximately 2 g - 4 g of mercury
Boiler guage controls	Some boilers contain 23 pounds - 75 pounds of mercury

Treatment & Disposal Method

Mercury-containing devices do present special disposal considerations due to the quantity of mercury they contain and since they are usually considered to be hazardous wastes when disposed of. As mercury waste is a hazardous waste, the storage, handling, treatment and disposal practices would be in line with the requirements of Government of India's Hazardous Waste (Management, Handling and Trans-boundary Movement) Rules 2010 and amendments made thereof,

- Mercury-contaminated waste would not be mixed with other biomedical waste or with general waste. It would not be swept down the drain and wherever possible,
- It would be disposed off at a hazardous waste facility or given to a mercury-based equipment manufacturer.

The Spill Cleaning Up of Mercury will include the following:

- a. Mercury Suppressant – a solution that will prevent vaporization of elemental mercury.
- b. Mercury Indicator – a powder that changes color to indicate the presence of mercury.
- c. Mercury Absorbent – a powder that amalgamates with mercury to facilitate clean up.
- d. Mercury Aspirator or Vacuum – ranging from a syringe to a dedicated vacuum for mercury and used to suction mercury from surfaces. It is very important that regular vacuum cleaners are not used on spilled mercury, as they spread the contamination through aerosolization of the mercury particles.
- e. Gloves, safety glasses, screw cap container, baggies, towelettes, etc.

7.6 NOISE ENVIRONMENT MANAGEMENT

The main source of the noise pollution is DG sets. The total of 02 D.G sets (1010KVA x 02) & 01 DG Set (500 KVA x 01) shall be installed within the premises of proposed Hospital. D.G sets shall have acoustic covering and meeting all the norms, which are laid down by CPCB. To reduce the noise impacts, plantation shall be done at the periphery and along road side of the proposed hospital.

The main source of the noise pollution would be vehicles like four & two wheelers within premises.

7.7 TRAFFIC MANAGEMENT

Traffic management is the planning implementation and control of transportation services for achieving the desired objectives and also to reduce the noise level in the project scheme. Project proponent shall be responsible for managing all parking and safety issues regarding the use of vehicles inside premises of proposed scheme. To reduce the noise level, it will be ensured that the traffic movement must be smooth and horns will not be used within the parking areas of the scheme. Incoming and outgoing gates will be different, so as to avoid any traffic congestion due to parking. Plantation of the trees near the paved areas and roads of the project site will be done for decreasing the air and also the noise pollution level. The traffic manager and all persons involved with these activities shall do traffic management.

A good control system shall be setup. The following standards shall be maintained for parking areas:

- All vehicles shall have a parking sticker permanently affixed to the driver's side back seat window.
- All vehicles shall be limited to parking in designated spots.
- Vehicles shall enter from Entry Gate and leave from Exit Gate.
- No vehicle shall be parked in fire tender movement areas.
- All vehicle users who disregard policies shall be subjected to fine, or loss of parking privileges.

Speed Limits

In the proposed project scheme, speed limits are set to provide for the safe movement of persons and vehicles 20 Kmph on road ways and 10-15 Kmph in parking lots.

7.8 LANDSCAPING & HORTICULTURE

Natural landscaping is also referred to as sustainable landscaping. It stresses the use of native plants that are beautiful, hardy and that also benefit the local environment. Native plants are especially good at preventing soil erosion, reducing flooding, sustaining wildlife and filtering out harmful pollutants in the soil. Natural landscaping offers a way to reduce the use of chemical pesticides and fertilizers, while introducing natural techniques that are safer for the long-term health of the community.

The Total Landscape Area at plot area of proposed site is 37701.39 m²

Existing Green Belt = At present the green belt is in a random fashion at the site near new OPD block extending towards community block in a linear fashion.

Scattered Tree Patches were also marked near OT block, Service block.

Existing nos. of trees = 62 nos.

Canopy size = 3-4.5 m dia.

Required nos. of trees as per MOEF BYE LAWS = $63753.69 / 80 = 797$ NOS.

Required Nos. of Plantation = $797 - 62 = 735$ Nos.

Proposed Green Belt Area = 12567.13 sqm

Proposed Nos. of Trees = 785 Nos. at spacing of 4.0 m x 4.0 m.

Hence Justified.

Green Lawn and park development area = 25134.26 sqm.

FLORA & FAUNA PROPOSED FOR HOSPITAL

Flora

The region is immensely rich with 4000 species of plants, having remarkable diversity in its natural vegetation by virtue of its being at a great range of elevation. In addition to its climatic variations, particularly in temperature and precipitation associated with the alignment and altitudes of ranges and nature of valleys, determine the altitudinal growth and variety of vegetation. The flora of this region may be classified into tropical, Himalayan sub-tropical and sub alpine and alpine vegetation. The alpine and sub alpine zones are considered as the most natural abode of the largest number of medicinal plants. Considering the various parameters, the vegetation of this region, can broadly be divided into four parts

Sub-tropical Forest

This kind of forest zone lies between the altitude of 300 m and 1500 m and comprises of the following forest communities

1. Sal (*Shorea robusta*) Community :- This is a deciduous type of plant community ranges from 300 m to 1000 m altitude. The tree species of this community are *Semecarpus anacardium*, Haldu (*Adina cordifolia*), *Bauhinia vahlii*, *Madhuca longifolia*, *Cassia fistula* etc..
2. Chir / Pine (*Pinus roxburghii*) Community :- This evergreen plant community is mainly found in dry hill slopes between 1200 m to 1800 m. The forest floor is often clear. However, *Pyrus pashia*, *Dalbergia sericia*, *Caseana elliptica*, *Syzygium Cumini* are other species grow with pine.
3. Vijaysar (*Engelhardtia spicata*) Community :- It is a deciduous type of plant community found in shady and wet place ranging from 800 m to 1500 m in altitudes. The trees *Sapium onsigne*, *Dalbergia sissoo*, *Syzygium cumini* are few among other species.
4. Ramal (*Macaranga pustulata*) Community :- This is a deciduous plant community mainly found on eroded slopes or riverine area. This community has mainly *Mallotus philippinensis*, *Toona serrata* etc plants.
5. Faliyal Oak (*Qurecus gloca*) Community :- This is evergreen community found in shady and moist place upto 1500 meter altitude. The trees such as *Pyrus pashia*, *Emblica officinalis* and shrubs *Callicarpa arborea*, *Rubus ellipticus* are the other associates of this community.
6. Chair Pine and Bany Oak Community :- This community is mainly found between the altitude 1500 m to 1800 m. *Myrica esculenta*, *Rhododendron arboreum*, *Pyrus pashia* etc are the other tree species of this community.

Sub-temperate forest

The forest communities of this zone are generally found 1800 m to 2800 m altitude. The plant communities which belong to this zone are :-

1. Deodar (*Cedrus deodara*) Community :- The evergreen communities of plants is found between 1800 m to 2200 m altitude. The shrubs which belong to this community are *Rubus ellipticus* and *Berberis asiatica*.
2. Utis (*Alnus Nepalensis*) :- This deciduous plant community generally found between 1400 to 2200 m altitude. Some of the important species of this community are *Rubus ellipticus* and *Betula alnoides*.
3. Horse chestnut (*Esculus indica*) Community :- This deciduous community occurs between 2000 and 2500 m altitude. The species of trees which belong to this community are *Betula alnoides*, *Juglans regia* and *Litsea umbrosa*.
4. Kal (*Pinus walechina*) Community :- This ever green forest resides from 2100 mts to 2800 mts altitude.
5. Banj oak (*Quercus leucotriochophora*) Community :- This is also an evergreen plant community found between 1800 m and 2200 m altitude.
6. Rianj Oak (*Quercus lanuginosa*) Community :- Same as above two this community is also evergreen and is found from 2000 to 2500 m in altitude. *Myrica esculenta*, *Betula alnoides*, *Pyrus pasia* are among the other tree species of this community. This community also attains the same altitudinal range as mentioned for banj oak forest.
7. Tilonj oak (*Q florebunda*) Community :- This community occurs between 2200 m and 2700 m altitude. The co-dominant species of this forest are *R.arboreum*, *Lyonia ovalifolia*, *Litsea umbrosa* etc.

Sub Alpine Forest Community

This plant community is found from 2800 to 3800 m altitude. Bhoj patra, *Betula utilis* Kharsu oak, *Q.semecarpifolia* and Silver fir (*Abies pindrow*), are the main species of this community.

Alpine Community

The most interior community of this region lies between 3800 and 5000 m altitude. Low shrubs and grassy meadows are more common categories of this community. With the increase in altitude the plant shape become more small and cushion like.

Fauna

The sub-alpine zones of Almora and outskirts are a natural sanctuary for leopard, Langur, Himalayan black bear, kakar, goral etc. Whereas the high

Conceptual Plan- Expansion of Base Hospital, Almora, Village- Khatyari, Pargana- Baramandal, Tehsil & District- Almora, Uttarakhand

altitude zones abound musk deer, popularly called Kastura Mrig, snow leopard, blue sheep, thar etc. The entire zone is rich in a remarkable variety of birds possessing plumage of magnificent design and colours like peacock, which include grey quail, Kala Titar, Whistling thrush, Chakor, monal pheasant cheer pheasant, koklas pheasant etc. The relation between the fauna and their favorite flora would be clear from the following table :-

Forest Type	Wild Life / Birds
Sub-tropical	Tiger, Chital (<i>Axis axis</i>) Leopard (<i>Panthera Pardus</i>), Fox (<i>Vulpes vulpes montanus</i>), Boar (<i>Sus scrofa</i>)
Tropical rain Forest	Goral (<i>Nemoahaedus goral</i>), Kalij Pheasant (<i>Lophura leucomelana</i>), Peora Patridge (hill Patridge, Chir Pheasant)
Mixed Cane Forest	Himalayan Thar, Monal, Koklas
Khusoo Forest	Musk Deer (<i>Moschus moschiiferus</i>), Himalayan Thar, Black Bear
Sub Alpine	Blue Sheep / 'Bharal' (<i>Pseudois nahoor</i>) Monal
Alpine	Snow Leopard (<i>Panthera Uncia</i>), Monal, Black Beer, Marmot, Bharal, Snow Cock (<i>Tetraogallus himalayensis</i>), Snow Patridge (<i>Lerwa lerwa</i>) etc.

SHRUBS/ HERBS PROPOSED TO BE PLANTED

Avenue Trees: *Alstonia scholaris*, *Anthocephalus kadam*, *Araucaria cookii*, *Azardicta indica*, *Bambusa vulgaris*, *Bauhinia blackeana*, *Bauhinia purpurea*, *Cassia fistula*, *Cassia javanica*, *Calistemon lanceolatus*, etc.

Shrubs: *Acalypha hisipida* cat tail, *Acalypha w green*, *Acalypha w red*, *Acalypha tricolour*, *Acocanthera spectibilis*, *Allamanda nerifolia*, *Bauhinia acuminate*, *Bauhinia tomentosa*, *Beloporine guttata*, *Caesalpinia pulcherrima*, *Calliandra emarginata*, *Cassia biflora*, *Cassia alata*, *Cassia laevigata*, *Clerodendron macrosiphon*.

Palms: Fox tail palm, *Cycus revoluta*, *Pheonix slyteris*, Champagne palm, *Royestinia regia*, *Raphis palm*, *Thrinax parviflora*, *Latania lontaroides*, *Livistonia rotundifolia*, *Washingtonia filifera*.

Initially grassing would be done with doob grass including watering and maintenance of the lawn for 30 days or more till the grass forms a thick lawn. The project proponent has proposed for landscaping in an area of **37701.39 m²** with ornamental plants and trees to maintain aesthetic environment in area of the proposed project as per above plan. The proposed project will have various trees/ornamental plants to be planted all over the landscape area. Plantation of avenue trees by the road side in 0.60 m dia. holes, 1 m deep dug in the ground shall be done and mixing the soil with decayed farm yard manure.

Proposed Solar Energy Conservation Measures

Total Hot Water Requirement:

Hospital @ 50 liters per bed per day (50x500) = 25000 lpd

As per the latest Energy Conservation Building Code, 20% of hot water requirement has to be met through solar heating systems. This will require terrace / exposed areas. A solar hot water system of 1000 liter per day capacity has been proposed for the terrace.

PROPOSED ENERGY EFFICIENCY MEASURES

1. Setting appropriate temperatures, ensuring that cooling and heating equipments and controls are operated and managed correctly.
2. Inception of solar water heating system.
3. CFL & LED's have been proposed in place of incandescent lamps.
4. Minimized diesel generation by using steam generation.
5. Waste steam shall be utilized to preheat water.
6. Improving Power Factor
7. Electric Heaters has been replaced with solar heaters.
8. Light Sensors at all patient area , health check up and OPD.
9. Periodical energy audits.

CHAPTER 8: RISK ASSESSMENT & EMERGENCY PREPAREDNESS PLAN

RISK ASSESSMENT

The phases of an emergency includes:

1. **Risk assessment**
2. **Mitigation**
3. **Preparedness**
4. **Response**
5. **Recovery**

Areas of Risk includes:

- **Naturally occurring events**
- **Technological events**
- **Human related events**
- **Events involving hazardous materials**

RISK = PROBABILITY X IMPACT

The risk assessment of the proposed health care campus reveals following critical areas:

TABLE 17: RISK ASSESSMENT

S. No	Area	Assessment		Probability Rating*	Anticipated Impact	Impact Rating#	Risk Rating
1	Naturally Occuring Event	Flood	Causative Factor- River Kosi-1.82 Km, SW	Possible	The slope of Koisriver basin lies from North- East to South West. The proposed project lies westwards from the Kosi river. As per past record available no flood situation has arisen. Therefore, under worst case scenario the anticipated risk has been shown to affect Minor or limited or short term service interruption of the project.	Marginal	C4
2	Human Related Events	Mass Casuality	Disease Spread, Trauma	Highly Likely	death of staff or patient	Serious	A7
		Bomb Threat	-	Likely	Injury, illness or death of staff or patient	Serious	B7
3	Technological Event	Electrical Failure	Failure of 300 KLD Effluent Treatment Plant designed on continous flow of 12.5 KL/hr hospital waste of general specialities, diaganostics and other para clinical services and domestic effluent.	Likely	Moderate physical plant or equipment damage requiring moderate replacement costs and recovery time; Adequate drainage system to control flow of effluent to the discharge point. Drain= 300 Ø RC.C Slope 1: 350. UPS & Inverter load has been proposed for waiting & common area, OT complex, block 3 and service room area and Fire Fighting.	Marginal	B4
		Transporation Emergenc y	Requirement of Emerergency Ambulances, Battery Operated Transport from Entrance to OPD/ Trauma	Highly Likely	Significant/widespread or long term service interruption. The proponent has covered adequate ambulance facility- with staff to combat such situation	Serious	A7
		Fire	During Evacuation -Patients are dependent on staff	Likely	Fire protection installations, fire compartments, smoke ventilation, safety equipment and fire safety design incorporated; approach road adequate for 45 tonne fire tender movement; The geometry of the building is designed so that patient transport is possible in beds	Serious	B7
4	Events involving hazaradous material	HazMat Incidence	Mercury Contaminated & biomedical waste	Possible	Daily BMW & mercury contaminated waste dispoal has been planned but no design safety for storage facility covered in the project design.	Sero ius	7
		Radiologic al Exposure		Possible			

Probability Rating Description *	Detail
Highly Likely (A)	nearly 100% probability in next year
Likely (B)	between 10 and 100% probability in next year, or at least one event in next 10 years
Possible (C)	between 1 and 10% probability in next year, or at least one event in next 100 years
Unlikely (D)	less than 1% probability in next 100 years
Impact	Detail

Rating Description #	
Catastrophic (11-12)	Facility cannot provide necessary services without extensive assistance from provincial or federal resources
Critical (8-10)	Facility can provide a normal level of service with assistance from outside the local community or region; or, facility can provide a minimal level of service with normal resources
Serious (5-7)	Facility can provide a normal level of service with assistance from within region or within local community; or, facility can provide a reduced level of service with normal resources
Marginal (3-4)	Normal level of functioning or increased level of service required from within

Earthquake

The study area falls within seismic zone IV as per seismic zone map of Indian Standard IS 1893. Therefore, at the time of designing and construction of the bASE hOSPITAL, ALMORA, the design parameters shall be considered in compliance with IS 1893 with due consideration of prevailing MDDA construction & development guidelines together with National Building Code. The mitigation of earthquake has been assessed and shall be ensured in the construction of Hi-rise buildings.

8.1 FIRE FIGHTING

As most of the material and finished products are inflammable, no smoking and no fire will be allowed. In case of fire, fire extinguisher will be used. Fire extinguishers are put at the entrance of storage rooms. The Fire Extinguisher System has been provided as per fire safety plan in all floors of the institute. The phone number of nearest fire service stations has been displayed at various points and also near the fire extinguishers.

The proposed project is to provide with fire protection arrangements such as, Wet Riser system (as per N.B.C standards), Hose Reel (as per I.S – 3844 standards), Yard Hydrant and Automatic Sprinkler System in every building. Manual call points, Automatic Detection System in every building, portable appliance, Exit signs, P. A. System, Mechanical Ventilation, Smoke extraction system, Pressurization shafts, staircase etc. for fire safely point view.

There is no objection for the construction of institutional building as subject to the compliance of the following fire safety recommendations:

1. **Access:** It must be ensured that the access roads all around the building must be kept clear all the time for free movement of fire engines and 4.5 m head clearance shall be provided. The access internal road shall be provided as per approved plan.
2. **Exit Requirements:** Exit requirements shall be in accordance with provision as per National Building Code of India Part – IV (Clause 8.1 to 8.15.1).
 - (a) **Means of escape/exit shall be continuous and unobstructed way of exit travel from any point in the building to a public way.** All exit doorways shall open towards means of escape that is away from, but shall not obstruct the travel along any exit. No door when opened shall reduce the required width of staircase/corridor/passage way.
 - (b) **All exit and exit way marking signs, emergency lights shall be on separate circuit/laid in separate conduit, exit signs must be illuminated and wired to independent circuit supplied by alternate source of power supply.** The wiring

and all accessories in the electrical circuit shall be fire resistant and low smoke material duly ISI marked.

3. **Material for construction:** The material used for construction of the building shall be of non-combustible. The interior finish materials shall be of very low flame spread ability, i.e. Class-I. All the fabric used for seats, curtain, covering on sidewall, matting carpeting etc. shall also have Class-I rating as prescribed in NBC part-IV.
4. **Compartmentation:** The building shall be suitably compartmentalized so that the fire/smoke remain confined to the area where fire incidents has occurred and mechanically exhausted as approved in the meeting, so smoke does not spread to the remaining part of the building.

The services, standby generator, store etc. must be segregated from other by erecting fire-resisting wall of not less than 2 hours rating. Each of the compartments must be individually ventilated and the opening for entry into each of these compartments must be fitted with self-closing fire/smoke check doors of not less than one hour fire rating fitted with magnetic latches.

All electric cables shall be laid in separate shafts shall be sealed at every floor with fire resisting material of similar rating. The partition wall in between and all around the shafts shall also be of minimum two hours fire rating.

Under no circumstances, two services shall pass through the same shaft, i.e. separate shaft be used for different purpose.

The entry to the staircase from all levels shall be segregated with a self-closing fire/smoke check door of not less than 1 hour fire rating. All vertical and horizontal opening at each floor level in entire building shall be sealed properly with the non-combustible material. Wherever false ceiling/suspended ceiling is provided, the same shall be of non-combustible in nature and that the compartmentation shall be extended up to ceiling level.

5. **Ventilation:** The building shall be provided with the ventilation strictly in accordance with Part-VIII Section-I and Clause D-1.6 of Part IV of National Building Code of India Mechanical ventilation system having interlocking arrangements as well as upper floor also. Extractor system shall be designed to permit 30 air changes per hour in case of fire in basement. The smoke extraction system shall be designed as per NBC Part-IV and approved by the department.
6. **Air Conditioning System:** Air conditioning system shall conform to Section-3 Part-VIII and Clause D-1.17 of Part-IV National Building code of India 1983. Following points shall be ensured.
 - All ducting shall be constructed of substantial gauge metal conforming to IS: 655. Air duct serving main floor areas, corridors etc. shall not pass through the staircases enclosures.
 - Automatic fire dampers shall be provided in the ducts at the inlets of the fresh air and return air of each compartment/floor.
 - Automatic fire dampers shall be closed automatically upon operation of a detector sprinkler.

- The air ducts for every floor/compartment shall be separated. In no way inter-connected with the ducting of any other compartment
 - Under no circumstances, plenum shall be used as “Return Air Passage” for air conditioning purposes.
7. **Essential Emergency Electrical Services:** Separate electrical circuits to feed emergency services such as fire fighting pumps, lifts, staircase and corridor lighting blowers, panel and such a smoke venting and signage circuit shall be laid in separate conduit so that fire in one circuit will not affect the others. Master switches controlling essential services circuits shall be clearly labeled. The electrical wiring shall be provided in metal conduits. MCBs and ELCB shall be installed. The electrical services shall be strictly in accordance to Clause D.1.12 of Appendix-‘D’ of NBC Part-IV fire resisting cables shall be used.
Power supply cables and the ducting shall not be taken through the staircase or any passage way used as an escape route. All the cables shall be only of Fire Resistant Low Smoke type.
 8. **Emergency Power Supply:** The standby electric generator shall be installed of adequate capacity to supply power to staircase and corridor lighting circuit, lifts, exit signs and fire pump in case of failure of normal electric supply. The generator shall be capable of taking starting current of all the machines and circuits stated above simultaneously and must be automatic in action.
 9. **Static Water Tank:** The underground water storage tank of the adequate quantity shall be provided. The replenishment through bore well or from the town main shall be ensured. This shall conform to the requirements given in National Building Code of India Part-IV. An additional overhead tank as proposed on the terrace shall be provided for fire-fighting as an alternative source of water supply. The underground water storage tank shall be approachable by the fire engine.
 10. **Stationary Fire Pump:** Two electrically driven pumps – one each for Wet Riser and sprinkler system with 70 meters head shall be provided for wet riser and sprinkler system so as to give adequate pressure of 3.5 kg/cm² at the farthest point. The standby diesel engine driven pump of similar capacity and the two-jockey pumps – one each for wet riser and sprinkler system shall be installed. All the pumps shall be automatic in operation shall be provided. The pumps shall have positive suction.
 11. **Automatic Sprinkler System:** The system shall be installed in entire building in accordance with BIS 15105/2002. Flow alarm switch/gang shall be incorporated in the installation for giving proper indication/sound. The pressure gauge shall also be provided near the testing facility. The entire system including pump capacity & head, size of pipe network, housing control panel etc. shall be provided in accordance to relevant code. Fire service inlet shall also be provided at ground floor level. Testing/flashing facilities shall be provided at each floor. The welding shall not be done for the pipe less than 50 mm diameter.
 12. **Wet Riser:** The wet riser system shall be provided in the building as per NBC -05 standards.

13. **Hose Boxes, Fire Hose and Branch Pipe:** Hose boxes of suitable dimension shall be provided near each internal hydrant. Its design shall be such that it can be readily opened in an emergency.
Each box shall contain two lengths of 63 mm diameter, 15 m length, rubber lined delivery hoses conforming to IS:636 complete with 63 mm instantaneous coupling conforming to IS:903 and short branch pipe conforming to IS:903 with a nozzle of 16 mm diameter.
14. **Hose Reel:** A hose reel near each internal hydrant containing 30 m of length of 20mm bore terminating into a shut-off nozzle of 6.5 mm outlet connected directly to riser shall be provided. This will conform to IS: 3844.
15. **Automatic Detection System:** Automatic fire detection (smoke/heat) shall be provided in all the areas of the building and shall conform to IS: 2189/1999.
16. **Portable Fire Extinguishers:** The portable fire extinguishers of water CO2 type and CO2 type ISI mark shall be provided as marked on the plans. The number of the fire extinguishers may have to be increased later when the layout of the partition etc. is known. All the fire extinguishers will be installed and maintained in accordance with IS: 2190-1992.
17. **Public Address System:** The public address system shall be provided having loud speakers on each floor level at strategic location. The microphone, amplifier and control switches of public address system shall be installed in the fire control room.
18. **Lighting Protection:** The lighting protection shall be provided in the building as per IS: 2309.
19. **Intercommunication System:** An emergency inter-communication system shall be provided in the entire complex. The instrument shall be provided in the common areas on each floor.
20. **Yard Hydrants:** Yard hydrants shall be provided in the building as per BIS specifications.

CHAPTER 9: ANALYSIS OF PROPOSAL (FINAL RECOMMENDATIONS)

On the basis of information provided by the Project proponent and the other data procured from the Government Agencies, Census Report, IMD etc., and the data generated by the Consultants and analysis of generated information, the following generalized conclusions can be drawn.

1. In the proposed project, construction will be developed at proposed total plot area of **63753.69 m²**.
2. UKPCL will provide necessary expected power demand through **02 nos. of transformer** (02 X 1600 KVA) to proposed institutional building , The essential power back up shall be provide through **01 no. of D.G Set (01 X 500 KVA) & 02 nos. of D.G Set (02 x 1010 KVA)** capacity.
3. The water demand shall be **407.5 KLD** managed by using spring water.
4. The daily fresh water requirement would be **343.4 KLD** and **64.1 KLD** treated water shall be utilized for flushing, D.G. cooling, & after treatment of **70 KLD** proposed STP & 300 KLD ETP within the institute. It has been proposed that gardening, flushing & D.G. Set cooling requirement shall be met by treated water reuse.
5. The rain water harvesting will improve ground water quality. **Six (06)** number of rain water harvesting pits will be provided at proposed site to recharge the ground water.
6. Ambient air quality shall remain within the prescribed standards. The recognized sources of air pollution in the area are transport system. Efficient Traffic Management shall be regularized within the project to control air and noise pollution.
7. Noise level shall be maintained. For traffic noise, plantation along the traffic route shall be provided to act as a noise barrier.
8. The **612 Kg/Day** generated solid waste and **140.0 Kg/Day** Bio Medical Waste shall be segregated at source and managed through Nagar Palika and approved vendor for bio medical waste management at designated site.
9. Appropriate fire fighting measures including entry and exit way marking signs, emergency lights, ventilation, essential emergency electrical services and stationary fire pump and automatic sprinkler system shall be provided for the buildings at proposed project.
10. At proposed project, landscape will be developed in an area covering **37707.39 m²** of the ground with various shrubs & trees planted.
11. The impacts, which have been identified in the planning, development and construction phase, will be transitory and enough provisions have been made to mitigate them. The construction & operation phase will have both positive & negative impacts. But negative impacts will be made positive through environmental control measures. The health services development, greenery and rainwater harvesting are positive impacts.

The benefits relate to the direct employment associated with the construction and during operation of the building. The proposed facility would also generate jobs for the women labours during construction phase. Women are likely to get job during

construction phase. The facilities provided during construction to women labours, will considerably reduce their travel time in any employment and therefore enable them to attend to their children, their nutritional demands and also household chores.

The environment friendly technological alternatives will be considered for the given project with regard to construction material, layout, orientation, cooling, heating, vertical fenestration etc. The individual building/ towers developers will comply with the norms of MoEF & ECBC which will be a part of their development agreement.

The site is advantageous for development of this project due to the following reasons:

1. The site has good provision for drainage facilities.
2. The climatic conditions are suitable.
3. The connectivity of the site by rail, road and air is very much ensured keeping in view the existing and proposed development.
4. The easy availability of nearby institutional and community facilities.
5. The landscape area along with storm water drainage and STP plant will ensure purification of waste water respectively.
6. Surface parking provision will reduce generation of dust and air pollution within project premises
7. Proposed site is a prominent place where an uninterrupted power supply would be ensured.

The site is strategic for developing proposed institutional building of Base Hospital at Gram- Khatyari, Tehsil & Dist.- Almora, U.K.

CHAPTER 10: DISCLOSURE OF CONSULTANT

The consultants engaged for the preparation of EIA/EMP of the proposed project are M/s SAWEN Consultancy Services Pvt. Ltd. The information about the company is as follows:

INTRODUCTION

SAWEN has provided a vast range of consultancy services; Environment Impact Assessment Studies (EIA), Environment Management Plans (EMP), Environmental Training & Education, R&R Survey. Environmental Audit, Bio diversity studies, Socio Economic Studies, Mine Plans, Risk Assessment and Disaster Management, Solid Waste Management, Ground Water Studies, Rain Water Harvesting Study, water shed management studies, water & effluent management studies, water balance studies, land use mapping green belt designing, zonal mapping etc. to all sectors of economy notably Government Sector, Semi –Government Sector, Corporate Sector and reputed Private Sector.

SAWEN is a multi disciplinary professionally managed consultancy group providing consultancy on all aspects related to Environment & Pollution control and undertake study of environmental parameters, through two complementary companies SAWEN Consultancy Services & SAWEN Projects & Laboratories Pvt. Ltd

Legal Status of Organization

Pvt. Ltd. Company

Date of Registration/ Incorporation

SAWEN Consultancy Services was established in the year 1993.

UTTAR PRADESH POLLUTION CONTROL BOARD REGISTRATION NO.:

G35962/21/Paryavaran/S/1/99 dated 07 .09.1999

An ISO 9001:2008 Certified Quality Standard Company

Certificate No.: RQ91/JA/254.

Certificate Issue Date: 16.08.2011

EIA CONSULTANTS ACCREDITATION SCHEME (QCI-NABET) REGISTRATION NO.:

118

NABL ACCREDITATION CERTIFICATION NO.: T-2091

SERVICES & EXPERTISE

We are monitoring environmental impact & providing services of pollution control systems to Institution, Thermal Power Plant, New Construction projects, Highways, Township & Area Development,

Mineral Beneficiation Plant, Chemical Fertilizers, Municipalities, UPSLRP, UPDASP, NHAI, UPSHA, Cluster mining, Mine- surface and underground for all minerals & metals, Polymer, distilleries, sugar industry, Leather, Petrochemical, Electroplating & other polluting industries.

So far the following EIA/ EMP projects have been executed

Sector	Numbers
Building & Large Construction	51
Township & Area Development	05
Thermal Power Plants	03
Highways	15
Sugar industry	13
Mineral Beneficiation	01
Chemical Fertilizers	04
Pulp & Paper Industry	03

Leather Industry	03
Textile Industries	03
Airport	04
Electroplating & Metal Coating	04
Food Processing	04
Minor Mineral Mining	200
Major Mineral Mining	60

PERSONNEL

SAWEN is a group backed by the vision of experienced and dedicated scientists, engineers, and management professionals having expertise in the field of Environment, Civil, Architecture, Structural Engineering, Chemical Engineering, Agricultural, Horticultural, & Rural Development & Road Rehabilitation Projects.

EIA COORDINATORS

S. No.	Name
1	Dr. Rajesh Kumar Singh
	M.Sc.(Chem.)
	Ph.D. (Chem.)
2	Dr. Dharam Raj Singh
	M.Sc. (Chem.),
	Ph.D (Chem.)
3	Dr. Arpita Sinha
	M.Sc (Env. Science),
	Ph. D (Env. Science),
	PGD Env. Protection Law
	NET-Lecturership
4	Pankaj Pande
	M.Sc (Geology)

FUNCTIONAL AREA EXPERTS

S. No.	Name	Functional Area/s Applied for (as per abbv. given below)
		In-house expert/s
1	Dr. Rajesh Kumar Singh	Air Pollution Control
		Water Pollution Control
		Air Quality Modeling
		Risk & Hazard management
2	Dr. Dharam Raj Singh	Solid & Hazardous Waste Management
3	Dr. Arpita Sinha	Solid & Hazardous Waste Management
		Noise & Vibration
		Soil Science
		Ecology & Biodiversity

S. No.	Name	Functional Area/s Applied for (as per abbv. given below)
4	Mr. Satyendra Singh	Socio-Economic
5	Arch. Arvind Gupta	Land Use
6	Mr. Pankaj Pande	Hydrology, ground water & conservation
7	Mr. Pankaj Pande	Geology
8	Mr. Sanjay Srivastava	Socio-Economic
Empanelled expert		
9	Rama Shanker Shukla	Land Use

TESTING LABORATORY

Name	Designation	Academic and Professional Qualifications*	Experience related to present work (in years)
Dr. R. K. Singh	Managing Director	Ph. D. Chemistry (Organic) M. Sc. Chemistry (Organic)	17 years
Dr. Arpita Sinha	Management Representative / Quality Manager	Ph. D Environmental Sciences M. Sc Environmental Sciences P.G. Diploma (Environmental Protection Law)	08 years
Mr. S. K. Singh	Deputy Quality Manager	LL.B. B.SC. (Zoology & Botany) P.G. Diploma (Environmental Protection Law) Diploma in Rural Development	14 years
Mrs. Kalpana Singh	Lab Incharge / Technical Manager	M. Sc Chemistry (Organic) B. Sc (Chemistry & Botany)	20 years
Mr. Anurag Singh	Field Leader Monitoring	B. Sc (Chemistry & Botany)	02 Years
Mr. Vikas Thakur	Field Leader	PCM Intermediate	05 Years
Mr. Pramod Tiwari	Lab Chemist	B. Sc (Chemistry & Botany)	05 Years
Ms. Anjali Mishra	Environment officer	P.G. Diploma (Environmental Protection Law) B.Tech.(Biotechnology)	04 Years

-End of Conceptual Plan