DRAFT EIA /EMP REPORT

For

COMMON EFFLUENT TREATMENT PLANT (CETP) AND RECOVERY FACILITY

At

VILLAGE KAINDUWAL, DISTRICT SOLAN, HIMACHAL PRADESH

For

M/s Baddi Infrastructure

Prepared By

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CHAPTER 1

INTRODUCTION

1.1 PURPOSE OF THE DRAFT EIA REPORT

The friendly industrial policies of the Himachal Pradesh State have boosted industrialization in the region of Baddi-Barotiwala-Nalagarh stretching from Barotiwala to Nalagarh forming an industrial corridor. The industries in the area have formed an association called Baddi Barotiwala Nalagarh Industrial Association (BBNIA) which is playing a key role in creating and maintaining very healthy communication between government, industries and society at large, besides dissemination of information to its constituent members.

M/s Baddi Infrastructures Limited of BBNIA is planning to install Common Effluent Treatment Plant (CETP) to serve the Baddi-Barotiwala industrial area for management of industrial effluents and to protect ecology from deterioration. The CETP is proposed to treat 25 MLD industrial effluents.

The Environmental Impact Assessment (EIA) Notification S.O. 1533, 2006 and its amendment as on April, 2011 makes it mandatory that any developmental activity or any new project or expansion or modernization of any existing project as mentioned in the Schedule of the Notification need prior Environment Clearance from MoEF in the Central or State level before commencement of construction and operation. This Draft EIA report is being submitted for getting environmental clearance for the development of CETP at Kainduwal near Industrial Area in District Solan. The location of the proposed project site is given in **Figure 1.1** and **1.2**.

1.2 CATEGORY OF THE PROJECT

All the CETP units are listed at Serial no. 7(h) of the Schedule of EIA Notification of 14-09-2006 and categorized under Category 'B'. However, this plant is located within critically polluted Baddi area as per CEPI (CPCB, Comprehensive Assessment of Industrial Clusters, Ecological Impact Assessment Series EIAS/5/2009-10, December 2009) and is present at 7 km distance from inter-State boundary with Punjab and Himachal Pradesh, thus attract two general conditions to be categorized as **Category 'A'** Project under EIA Notification, 2006.

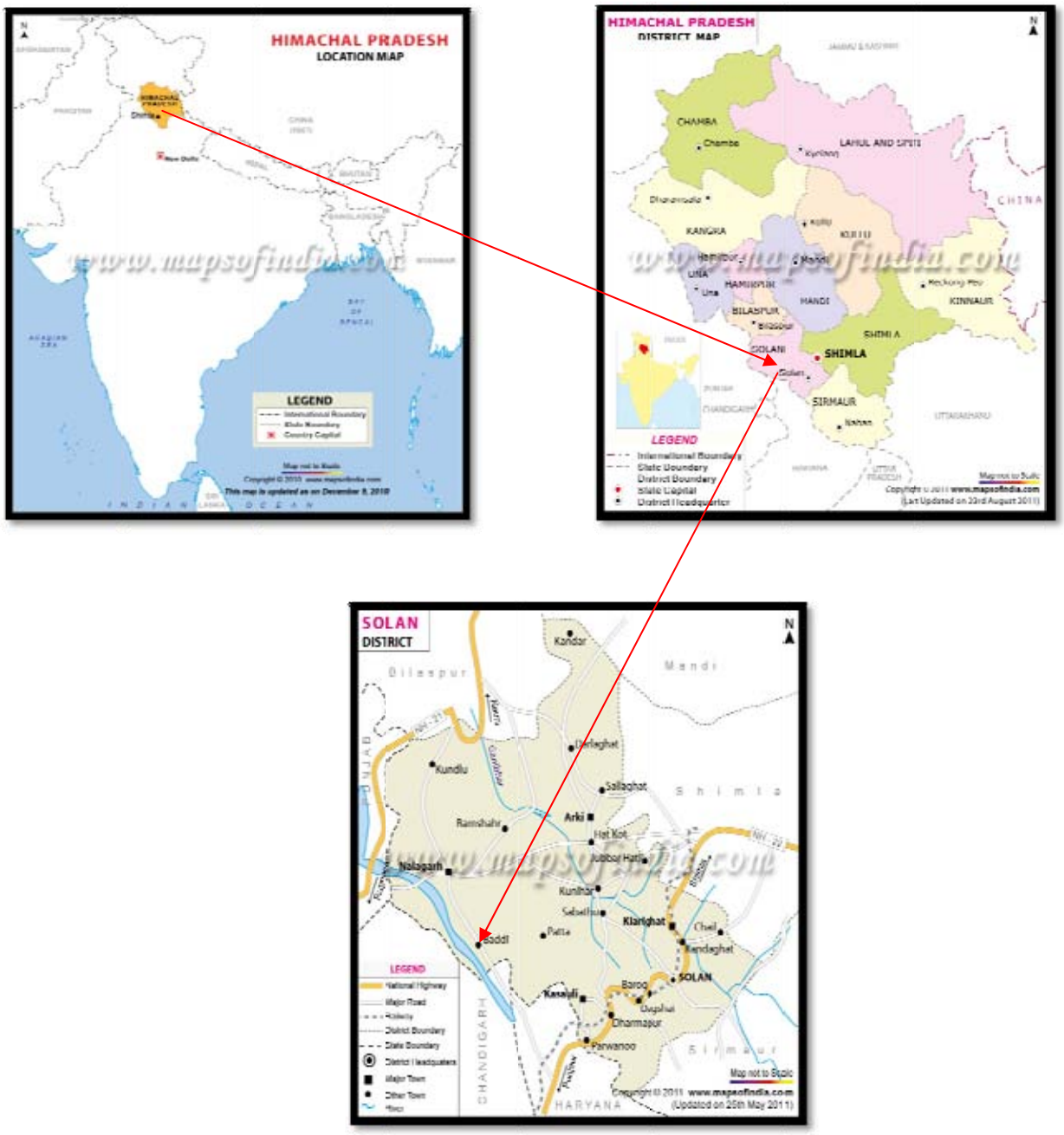


Fig. 1.1: Location of the Project

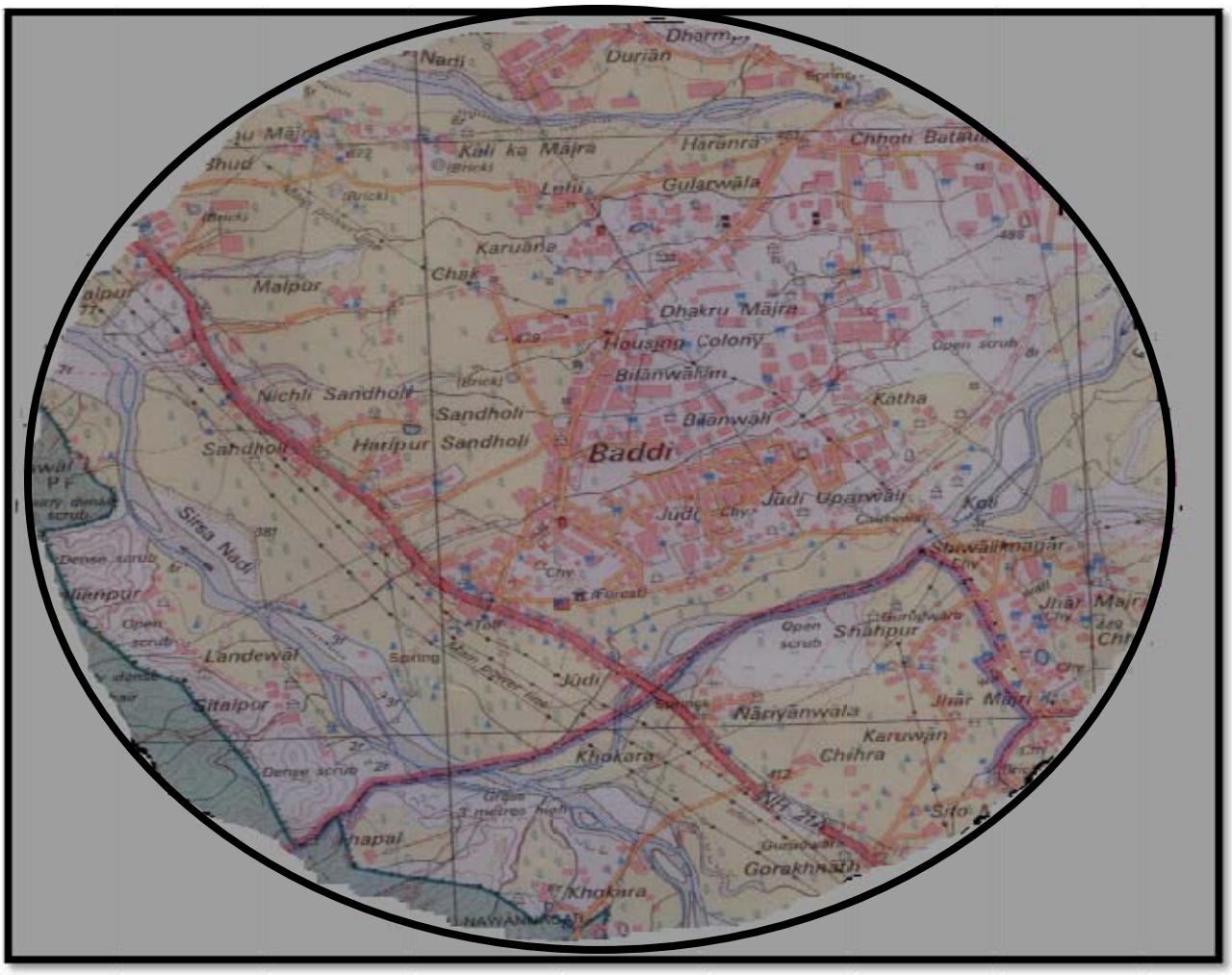


Fig. 1.2: Project Site and Surrounding Area as Depicted on Toposheet

1.3 PROJECT BACKGROUND

The friendly industrial policies of the Himachal Pradesh State have boosted industrialization in the area from Barotiwala to Nalagarh forming an industrial corridor. The rapid growth of industry over the last two decades in Baddi to Barotiwala has been both a benediction in economic prosperity and a bane due to increase in pollution load in alarming proportion. This is reflected in the Comprehensive Environmental Pollution Index (CEPI) reaching its extreme danger level just below 70. The load of nearly one thousand wet processing units in this Himalayan belt has made a severe impact on its serene ecology. This needs an imperative action on the conservation of natural resources to protect the flora and fauna. The Baddi

Barotiwala Nalagarh Development Authority (BBNDA) directed Baddi Barotiwala Nalagarh Industrial Association (BBNIA) to take necessary action to contain the pollution levels. M/s Baddi Infrastructure Ltd. of BBNIA proposes to establish Common Effluent Treatment Plant (CETP) on the site in Village Kainduwal, Distt. Solan, Himachal Pradesh, which falls near the notified Industrial Area as per the Master Development Plan of the area.

In this context, Hon'ble High Court of Himachal Pradesh has taken cognizance of news item appeared in the daily edition dated 20-11-2006 in *The Indian Express* titled "Ecology goes bust as Baddi booms" and registered CWP-PIL No. 13/2006 titled Court on its own Motion vs. State and Others. The setting up of CETP in the Baddi-Barotiwala area is one of the major issue for which the Hon'ble high Court has taken cognizance and given directions from time to time. In compliance to the directions of Hon'ble High Court of Himachal Pradesh, the State Government of Himachal Pradesh has got the final approval for setting up of CETP project under Industrial Infrastructure Upgradation Scheme (IIUS) vide Govt. of India, Ministry of Commerce and Industry, Department of Industrial Policy and Promotion (DIPP), New Delhi vide letter dated 19-11-2010 at a cost of Rs. 80.50 Crores. The cost of CETP component is Rs. 53.80 Crores. However, due to price escalation, the cost of project has enhanced from 53.80 Crores to 56.80 Crores and the same will be funded as under:

i)	Grant from Government of India	: Rs. 38.95 Crores
ii)	Grant from State Government	: Rs. 4.68 Crores
iii)	Industry Contribution	: Rs. 6.16 Crores
iv)	Loan from FIs	: Rs. 4.01 Crores
v)	Gap funding by PCB	: Rs. 3.00 Crores
	Total	**: Rs. 56.80 Crores**

As per the requirement of EIA Notification, M/s Baddi Infrastructure Ltd. had submitted the application to MoEF for approval of Terms of Reference (ToR) on 29th March 2011 and the ToR was approved from MoEF for carrying out the Environmental Impact Assessment study vide letter No. 10-53/2011-IA.III dated 27-09-2011, enclosed in **Annexure 1**. The Draft EIA report has been prepared as per MoEF approved Terms of Reference. The compliance status to the ToR is enclosed as **Annexure 2. The** The undertaking to the effect that the prescribed ToR by the Consultant and by MoEF have been complied with and the data submitted is

factually correct, is given in **Annexure-7.** The report is based on environmental data collected at study area including project site during the period from October to December, 2011 and information from secondary sources.

1.4 DETAILS OF THE PROPONENT

The industries in the Baddi-Barotiwala-Nalagarh Industrial Area have formed an association called Baddi Barotiwala Nalagarh Industrial Association (BBNIA). In order to control the pollution due to industrial effluents, the association thought of establishing a Common Effluent Treatment Plant (CETP) at village Kainduwal near Baddi-Barotiwala industrial area. For this purpose, BBNIA formed a Special Purpose Vehicle (SPV) M/s Baddi Infrastructures Limited to install and operate the CETP to serve the Baddi-Barotiwala industrial area for management of industrial effluents and to protect ecology from deterioration.

The management structure of Baddi Infrastructure is given below:

a) Board of Directors: 7 Directors from Industries, two nominees from the State Government of India and one nominee from Government of India

b) Management: Chief Executive Officer, Chief Financial Officer, Project Management Consultant (Environment). Project Management Consultant (Civil), Junior Engineer and supporting staff.

The CETP is proposed to treat 25 MLD industrial effluent. The Himachal Pradesh State Government has authorized M/s Baddi Infrastructure Limited to set up a CETP near this industrial area. This Firm had been nominated as the sole agency by the Government to collect, deposit, process and dispose such sewage, municipal and industrial effluents in the prescribed manner on payment of fees for such disposal as may be fixed after the approval of the Government,

Name and address of applicant is given below:

Mr. Rajinder Guleria
BBN Industries Association, SWCA Building
Baddi-Barotiwala Road, Baddi,
Dist. Solan, Himachal Pradesh

1.5 NATURE AND SIZE OF THE PROJECT

The CETP is proposed to treat 25 MLD industrial effluents. The company has got total 25 acres of land. Out of this land, 8 acres will be covered under green belt and other forms of greenery. No forest land is involved.

There are 990 units out of 1202 industrial units plots present in 9 industrial areas spread over an area of 5472 bighas. The total number of units as per HPSPCB in Baddi-Barotiwala-Nalagarh area including non-industrial area is 1262. Among these industries, 642 units are reported to be functioning, out of which 130 industrial units are of large and medium scale and 512 units are small scale industry tiny category. As per the M/s Baddi Infrastructure Ltd., all the industries are to join the CETP. Govt. of HP has issued notification to this effect.

The facility will be treating a total of 22570 KLD (22.5 MLD) effluent from the member industries in proposed 25 MLD capacity CETP. The total amount of effluent consists of 12989 KLD effluent from the textile industries, 2432 KLD effluent from Food and Beverage units, 2050 KLD effluent from Paper units, 1961 KLD effluent from Detergents units, 2903 KLD effluent from Pharma units, 42 KLD effluent from Electroplating units and 193 KLD effluent from Miscellaneous units..

1.6 NEED & JUSTIFICATION OF THE PROJECT TO THE COUNTRY & REGION

The Baddi-Barotiwala area is probably the most highly industrialized area in the State of Himachal Pradesh and as such there is not only influx of industries but also due to creation of new industries more workers and man power have joined these two places leading to a substantial increase in the population. The land of original land owners has been acquired by the industries.

The rapid growth of industry over the last two decades in Baddi-Barotiwala area has been both a benediction in economic prosperity and a bane due to increase in pollution load in alarming proportion. This is reflected in the Comprehensive Environmental Pollution Index (CEPI) reaching its extreme danger level of 69.8%. The load of nearly one thousand wet processing units in this Himalayan belt has made a severe impact on its serene ecology. This needs an imperative action on the conservation of natural resources to protect the flora and fauna.

There was the development of fresh industries without providing any infrastructure like CSTP, CETP and MSWP. On 20th August, 2010, The Baddi Barotiwala Nalagarh Development Authority (BBNDA) passed the order to the need for setting up for common effluent treatment plant to treat effluents generated by the industries as well as the sewage on the demand of the public.

The Baddi Barotiwala Nalagarh Development Authority (BBNDA) directed Baddi Barotiwala Nalagarh Industrial Association (BBNIA) to take necessary action to contain the pollution levels. M/s Baddi Infrastructure Ltd. of BBN industrial Association proposes to establish Common Effluent Treatment Plant (CETP) on the site in village Kainduwal, Distt. Solan, H.P. which falls near the notified Industrial Area as per the Master Development Plan of the area.

The setting up of CETP in the Baddi-Barotiwala area is one of the major issue for which the Hon'ble high Court has taken cognizance and given directions from time to time. In compliance to Hon'ble High Court of Himachal Pradesh directions, the State Government of Himachal Pradesh has got the final approval for setting up of CETP project Under IIUS scheme vide Govt. of India, Ministry of Commerce and Industry, Department of Industrial Policy and Promotion, New Delhi letter dated 19-11-2010.

Establishment of CETP will eliminate multiple disposals into surface water and will also lead to single discharge, which will be maintained /controlled by competent agency.

1.6.1 ALL INDIA SCENARIO

Small-scale industries (SSIs) have a very important role in overall industrial development in India and growth of SSI units has been actively promoted by Government of India to induce balanced economic growth and to distribute the benefits of industrial development in an equitable manner. However, the quantum of pollutants emitted by SSIs clusters may be more than an equivalent large-scale industry, since the specific rate of generation of pollutants is generally higher because of the inefficient production technologies adopted by SSIs. Keeping in view the key role played by SSI units and the constraints in complying with pollution control norms individually by these units, The Ministry of Environment and Forests (MoEF) initiated an innovative technical and financial support scheme to ensure their growth in an environmentally compatible manner. The scheme promoted common facilities for treatment of effluents generated from SSI units located in clusters through liberal financial assistance. The

financial assistance provided under this Common Effluent Treatment Plant (CETP) scheme is as follows:

Central Government subsidy - 50% of the project capital cost (subject to conditions)

State Government subsidy - 25% of the project capital cost,

Entrepreneurs' contribution - 25% of the project capital cost (including 15% from loan from Banks/Financial Institutions)

The CETP scheme was instituted initially for a period of 10 years with effect from the year 1991 but MoEF has decided to continue financial assistance under the scheme beyond this period. Most of the 88 CETPs constructed and commissioned so far (**Table 1.1**) were financed under the CETP scheme of Govt. of India.

Table 1.1: State-Wise Distribution of CETPs in India

State	No. of CETPs	No. as % of total	Combined Capacity of CETPs (MLD)	Combined capacity as % of total capacity
A.P.	3	3.4	12.75	2.3
Delhi	11	12.5	133.2	24.1
Gujarat	16	18.2	156.3	28.2
Haryana	1	1.1	1.1	0.2
Karnataka	2	2.3	1.3	0.23
Maharashtra	11	12.5	63.25	11.43
M.P.	1	1.1	0.9	0.16
Punjab	2	2.3	1.535	0.28
Rajasthan	8	9.1	57.7	10.4
Tamil Nadu	29	33	71.15	12.85
U.P.	3	3.4	44.4	8.0
West Bengal	1	1.1	10	1.81
Total	**88**		**559.770**	

1.7 PURPOSE OF DRAFT EIA REPORT

The purpose of EIA/EMP is to critically analyze the environmental impacts due to Construction and Operation Phase of proposed CETP project with respect to effluent transportation, treatment and operation activities, material consumption, hazardous waste

generation and mitigation measures to reduce the pollution and to delineate an Environmental Management Plan along with recommendations and suggestions based on the TORs given by Environmental Appraisal Committee, MoEF.

1.8 SCOPE OF STUDY

- Preparation of Draft EIA report complying with the conditions in ToR given by EAC, MoEF
- Collecting baseline data on different environmental parameters for the period from October to December, 2011
- Impact assessment and suggestion of mitigation measures to minimize the impacts
- Preparation of Environmental Management Plan and Environmental Monitoring Plan
- Primary data generation for preparing Draft EIA/ EMP Report.
- To present the results of EIA/EMP report during the public consultation
- Preparation of Final EIA/EMP report incorporating the issues raised in the Public Consultation and the reply of the proponent/consultant to these issues
- Submission and presentation of salient features of EIA/EMP report to the EAC for getting Environmental Clearance.

1.9 COMPONENTS OF DRAFT EIA REPORT

Depending on nature, location and scale of the project, Draft EIA report contains the following components:

- Air Environment
- Noise Environment
- Water Environment
- Biological Environment
- Land Environment
- Socio-Economic and Health Environment
- Risk Assessment
- Environmental Monitoring Programe
- Environment Management Plan

1.10 COMPLIANCE TO TERMS OF REFERENCE (TOR)

Duly catering to the commonly expected environmental concerns, Terms of Reference (ToR) for the proposed 25 MLD capacity CETP, approved from MoEF was received for carrying out the Environmental Impact Assessment study vide letter No. 10-53/2011-IA.III dated 27-09-2011. The report has been prepared in line with the TOR. The compliance EIA/EMP report to the TOR is given in **Annexure 2**.

1.11 GENERIC STRUCTURE OF DRAFT EIA DOCUMENT

This Draft EIA report presents the existing baseline scenario and the assessment and evaluation of the environmental impacts that may rise during the construction and operational phases of the proposed project. This report also highlights the Environmental Monitoring Program during the construction and operation phases of the project and the post project-monitoring program. In terms of the EIA Notification of the MoEF dated 14th September 2006 as amended Dec 2009, the generic structure of the Draft EIA document will be as under:

Chapter 1: Introduction

Introductory information is presented in this Chapter. The introduction provides a background to the project and describes the objective of this document. This Chapter also includes the outline of the project and its proponent. The purpose and organization of the report is also presented in this chapter.

Chapter 2: Project Description

This Chapter includes Project Description and Infrastructure Facilities delineating all industrial and environmental aspect of the CETP of M/s. Baddi Infrastructure Limited. Construction and operation phase activities as well as process details of proposed scenario. This Chapter gives information about storage and handling, water and wastewater quantitative details, air pollution and control system, sludge storage facility, utilities, greenbelt and safety measures for proposed plant.

Chapter 3: Description of the Environment

This Chapter provides Baseline Environmental Status of Environmental components (primary data) delineating meteorological details of the project site and surrounding area.

Chapter 4: Anticipated Environmental Impacts & Mitigation Measures

This Chapter presents the analysis of impacts on the environmental and social aspects of the project as a result of proposed development and thereby suggesting the mitigation measures.

Chapter 5: Analysis of Alternatives

This chapter includes the justification for the selection of the project site from environmental point of view as well as from economic point of view so that the technology will be affordable to the SSIs in the industrial area. This Chapter also includes the selection of appropriate technology for designing the treatment plant in CETP based on comprehensive treatability study to achieve the desired treatment of industrial effluent.

Chapter 6: Environmental Monitoring Plan

This chapter will include the technical aspects of monitoring the effectiveness of mitigation measures which will include the measurement methodologies, frequency, location, data analysis, reporting schedules etc.

Chapter 7: Additional Studies

This chapter will detail about the Public Consultation sought regarding the proposed project. It will also identify the risks of the Project in relation to the general public and the surrounding environment during construction and operation of the CETP and thereby presents Disaster Management Plan.

Chapter 8: Project Benefits

The realization of the project activity is envisaged to impart benefits to the areas in concern. This Chapter will identify the benefits coming from the project and summarize them.

Chapter 9: Environmental Management Plan

It is the key Chapter of the report and presents the mitigation plan, covers the institutional and monitoring requirements to implement environmental mitigation measures and to assess their adequacy during project implementation.

Chapter 10: Summary and Conclusion

This chapter summarizes the information given in Chapters in this EIA/EMP report and the conclusion based on the environmental study, impact identification, mitigation measures and the environmental management plan.

Chapter 11: Disclosure of the Consultant

Names of consultants engaged in the production of the Draft EIA/EMP report along with their brief resume and nature of Consultancy rendered are included in this Chapter.

CHAPTER – 2

PROJECT DESCRIPTION

2.1 INTRODUCTION

M/s Baddi Infrastructure Limited of BBNIA is planning to install the 25 MLD capacity CETP in which the industrial effluent will be treated in the proposed facility. The Common Effluent Treatment Plant (CETP) has been proposed at Kainduwal, District Solan, Himachal Pradesh. This facility will be treating the 25 MLD waste effluent from the member industries from the industrial area stretching from Baddi to Barotiwala. The Himachal Pradesh State Industrial Development Corporation (HPSIDC) is the nodal agency for the promotion and establishment of industrial units in the state, which function under the Baddi-Barotiwala-Nalagarh Industrial Association (BBNIA).

The CETP is located 22 km from Kalka railway station and 40 km from Chandigarh airport. Baddi District Headquarter is 16.7 km away from the project site.

2.2 TYPE OF THE PROJECT

The Common Effluent Treatment Plant (CETP) is listed at serial no. 7(h) of the Schedule of EIA Notification 2006 and is a Category B project but it attracted two general conditions viz. its closeness to the inter-state boundary with Punjab at around 7km and it is present in critically polluted area based on CEPI, it comes under Category A project.

2.3 NEED FOR THE PROJECT

The stretch from Baddi to Barotiwala in District Solan formed an industrial corridor. The area has been listed in the Critically Polluted Area based on Comprehensive Environmental Pollution Index (CEPI) at Sr. no.47 (Baddi, Himachal Pradesh) by MoEF (O.M. J-11013/5/2010-IA.II(I) dated 13TH January, 2010). The Himachal Pradesh State Industrial Developmental Corporation (HPSIDC) has directed Baddi-Barotiwala-Nalagarh Industrial Association (BBNIA) to take proper steps to control the level of pollution in the area. Hon'ble High Court of Himachal Pradesh has also taken cognizance of the increasing levels of pollution in the area and have given directions from time to time to take steps to control the pollution especially development of Common Effluent Treatment Plant in the region to treat the industrial effluent from small and medium industrial units. Accordingly M/s Baddi Infrastructure Limited proposes to install Common Effluent Treatment Plant to treat the industrial effluent coming from the industrial units from Baddi & Barotiwala Industrial area.

2.4 LOCATION

The proposed location of CETP is near industrial area at village Kainduwal in District Solan, Himachal Pradesh to cater the industries in the Baddi & Barotiwala region. The coordinates of the proposed project site are $30^0$56'28.43''N Latitude and $76^0$46'24.78''E Longitude.

The region lies in the periphery of Solan District which is branded by hills in the north and plains in the south. It is characterized by undulating topography and located in the plains with good connectivity with neighboring states of Haryana and Punjab. The Himachal Pradesh State Industrial Development Corporation (HPSIDC) is the nodal agency for promotion and establishment of industrial units in the state, which functions under the Baddi-Barotiwala-Nalagarh Development Authority (BBNDA) which is playing key role in creating and maintaining very healthy communication between government, industries and society at large, besides dissemination of information to its constituent members.

The Baddi Infrastructure, a Special Purpose Vehicle (SPV), The Board of Directors of which is constituted by nominees from the State Government and Government of India, got 25 acres of land for development of CETP, out of this area about 8 acres will be covered as green belt and other forms of greenery. No forest land is involved. Total cost of the project is 56.80 Crores. The map showing general location and project site is shown in Google map in **Fig. 2.1 to 2.2**.

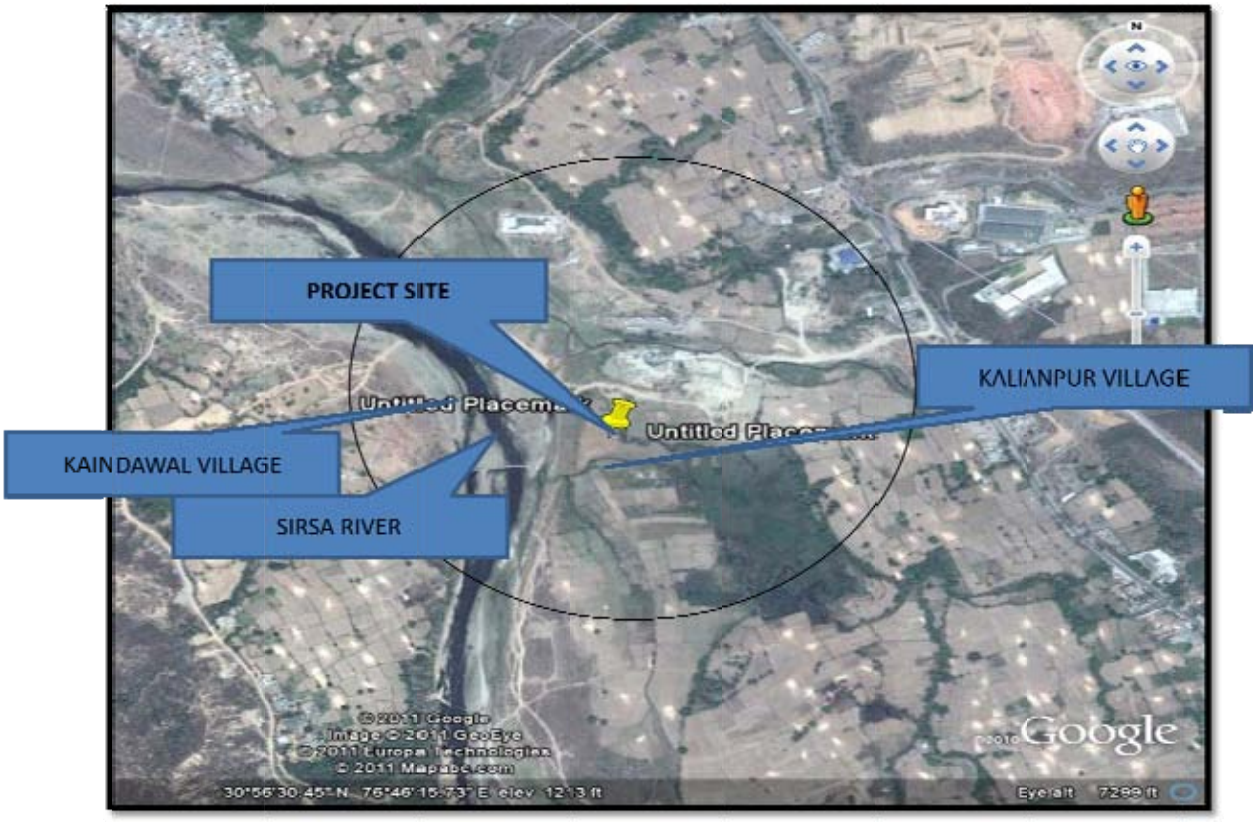


Fig.2.1: Location Map of the Proposed Project (500 m)

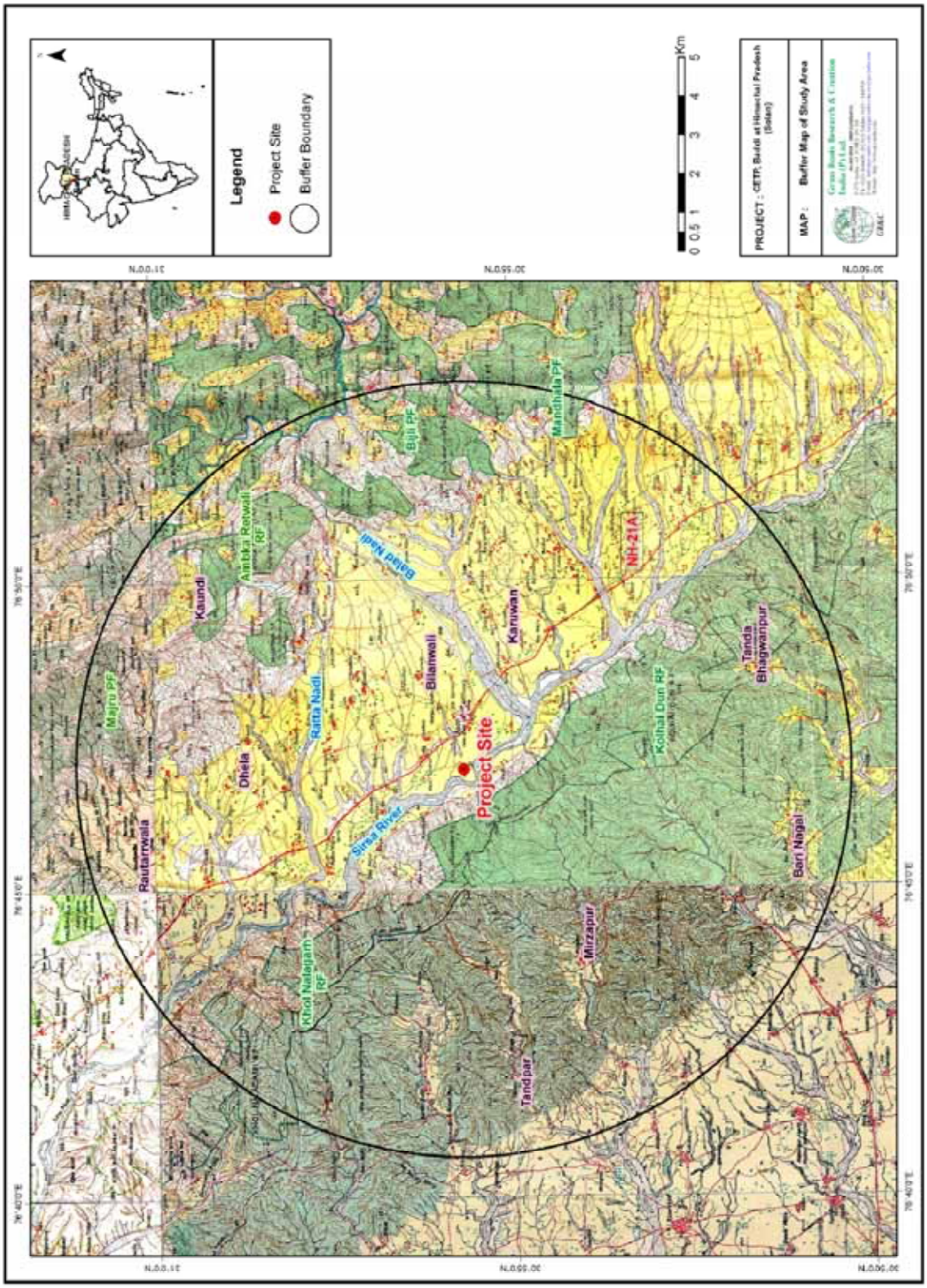


Fig.2.2: Location Map of the Proposed Project (10 km)

The project site is a vacant plot with barren land (**Plate 2.1, 2.2, 2.3 & 2.4**) near Baddi & Barotiwala industrial areas, which has been earmarked for CETP development to treat effluents from industrial areas. No clearance of vegetation or building is required. River Sirsa is on the west of project site and flows from north-west to south direction. The nearest town is Baddi at 750 m Distance. The nearest villages to Project site are given below.

- Kainduval – NW – 150 m
- Sandholi – N – 550 m
- Kalianpur – SW – 450 m
- Landewal – S – 550 m
- Sitalpur – S – 650 m
- Judi – SE – 1000 m
- Khokara – SE – 1500 m

Plate 2.1: View of Project Site from North Direction

Plate 2.2: View of Project Site from South Direction

Plate 2.3: View of Project Site from East Direction

Plate 2.4: View of Project Site from West Direction

2.5 ROAD CONNECTION

National Highway 21A is the main transport spine for Baddi-Barotiwala area and passes 400 m away on the east of project site. It is a 66.275 km long two lane road which originates from the NH22 at Pinjore (Haryana) and ends on the NH21 at Swarghat (Himachal Pradesh). The total length of this road within the special areas is 28 km. The region is well connected to important cities and towns like Chandigarh, Ambala, Pinjore, Solan, Shimala, Kullu, Ludhiana, and Ropar.

Another important road link is Ropar-Nalagarh-Ramshehar-Shimla SH16 which connects Ropar in Punjab to Shimla in Himachal Pradesh passing through Nalagarh. The total length of this road within the special area is about 18 km.

Apart from the above mentioned important links, there exists a huge network of 132 roads within the region. Other districts roads connect the region with Kasauli and Parwanoo in Himachal Pradesh. There are two another road links Bharatgarh road which emanates from Nala garh and another road which emanates from Panjhera and connects to Kisthpur, Punjab. Both the roads form an important link for the regional connectivity.

There is no direct rail connectivity to the region. The nearest railway station is at Kalka (20 km). Another important station is at Ghanauli (Punjab).

2.6 CLIMATE AND RAINFALL

The climate of the region is sub-tropical in the lower reaches of the district and moist temperate in the upper reaches. Generally, the rainy season commences from the first week of July and continues upto the first half of September. Average yearly rainfall in the Baddi-Barotiwala area is about 105 cm with occasional foggy weather. Winter rains generally commence from last week of December and continue upto the end of February. October, November, and March to May are relatively dry months. Due to significant variations in altitudes in the district, the temperature also varies considerably. Minimum temperature goes down below 0^0C in higher reaches during winter and maximum temperature exceeds 40^0C in lower reaches during summer season.

2.7 TOPOGRAPHY

The project site lies in the Doon Nalagarh valley in Solan District of Himachal Pradesh. The Solan District is located in the Shiwalik and lower Himalayan zone. The area is essentially rural except the industrial town of Baddi-Barotiwala.

The Baddi & Borotiwala area is located on a flat terrain which is surrounded by Dharampur Range, Surajpur-Haripur-Mandhala Range and Shivalik Range. Geological formation consists of sand, gravels and clay. The topography of the area is represented by moderate hills and plain valley; average slope is 0.9% to 10 %. The altitude of 10 km radial area around the project site varies from 150 m to 900 m MSL.

2.8 EXISTING LAND USE PATTERN OF THE AREA

The Baddi- Barotiwala & Nalagarh industrial area is spread over an area of 318.74 sq km and has a large cover of green (42%) which includes reserve forests, open and dense forest. The east and west edges are bounded by steep slopes covered with dense and reserve forests. A large number of industrial developments are concentrated in the Baddi-Barotiwala area. Residential pockets are scattered throughout the region.

2.9 SURFACE WATER BODIES AND GROUNDWATER TABLE

Sirsa is the main river stream in this area. It has source in the hills above Kalka in Panchkula District of Haryana and runs North-West along the vase of the Shivaliks eventually joining the Sutlej at Avanjot in Ropar District. The region is drained by tributaries of Sirsa River like Ratla, Ballad, Surajpur choe and Nanakpur emanating from Kasauli Range. Other tributaries of Sirsa are Kundlu ki Khad, Chikni Khad, Khokraka choe, Kali nadi, Pola nala. These are ephemeral streams which remain dry for most of the year and are prone to flash floods during monsoons.

In the Baddi-Barotiwala region, the Chita Kalta nala, Pula nala, Sandholi nala etc. are the minor tributaries that bring water to River Sirsa. These are the natural drains and they usually bring the run off during monsoon season. However, due to industrial development in the region, these nalas or the seasonal drains are effluent channels. During the monsoon, these nalas carry runoff as well as effluents but during the lean period, they are just used as natural industrial effluent drains carrying wastewater from the adjacent industrial clusters. River Sirsa is flowing in the downstream of twin industrial complex, receives the industrial and domestic effluents from this twin industrial complex in addition to the various non point pollution loads from domestic and agricultural sectors. This river has a mainstream channel length of 41 km. the drainage pattern is shown in **Fig. 2.3**.

There are four nalas that are discharging the industrial effluents into Sirsa as follows:

- Housing Board Drain

- Gullerwala nala
- Mahrawala
- Sandholi Drain

The monitoring data shows that the quality of river is quite poor d/s Sandholi drain. BOD level is critical d/s Sandholi drain where it is already 30 mg/l and there are public complaints also regarding the pollution problem of the river.

The groundwater table at the project site was observed to be 1.50 m bgl on the north-west to 2.90 m bgl on south-east of the project site in post monsoon season.

2.10 SIZE OR MAGNITUDE OF OPERATION

The proposed 25 MLD capacity Common Effluent Treatment Plant is to treat heterogeneous effluent being discharged from the industrial area of Baddi &Barotiwala region.

The plant will have treatment consisting of physical, chemical, biological conventional filtration & tertiary treatment units with sludge handling infrastructure. Partial recycle and reuse of the treated effluent in suitable industrial units is also included in the project to meet the eco-friendly system. The project outlay is estimated to be 56.80 Crores with variable recurring expenses of Rs. 12 to 50/KL. Though, in fact, it varies based on the level of pollutants.

Projected untreated pollution load will be: Hydraulic load (22.57 MLD), BOD load (18 tonnes/day), COD load (52 tonnes/day), and TDS load (63 tonnes/day).

2.11 PROPOSED SCHEDULE FOR APPROVAL AND IMPLEMENTATION

1. Land has been allotted for CETP by State Government
2. Application for power availability has been filed with State Electricity Board
3. Application for permission for Borewell to abstract water is being filed.
4. Request for ROU/ROW is being filed with State PWD/National Highway/Industry Department.
5. Consent to Establish is being filed with State Pollution Control Board.
6. Application for Registration with Labour Department has been filed.
7. Sales Tax Number has been applied for.
8. Application for Service Tax number has been filed.
9. Application of NOC from Forest Department is being filed

2.12 SITE SELECTION

Proposed site falls in Zone-IV according to the Indian Standard Seismic Zoning Map. The following guiding factors have been considered while selecting the site for the establishment of CETP.

1. The site is situated near notified industrial area considering the environmental and economic feasibility. Transport of the effluent will be economical and the plot is allotted for the development of CETP, as per approval of the State Govt.
2. The treated effluent discharge standard has been made more stringent with BOD level as 10 mg/l and COD level as 100 mg/l, while retaining the TDS parameter strictly as 2100 mg/l. These stringent parameters have been enforced because of its very location near the rivulet and its very thin flow through the stream, which otherwise remains dry throughout the year. At present the treated effluent from the respective industries is flowing to this rivulet only at the upstream point of the proposed CETP plant. The notable feature is the discharge from the CETP is at the downstream point with much reduced pollutant load due to more stringent newly imposed discharge parameters for the proposed CETP project.
3. The transport of effluent is through a 60 km piping network. Thus, it prevents any possibility of direct contact of untreated effluent with river water.
4. The river is shallow and very lean, surrounded by agricultural land.
5. The highest flood level (HFL) is studied for the last few decades and the construction of CETP will take care of this HFL. The highest flood level is 357.00 m above msl.
6. The land is highly undulating in nature. The treatment system is being created much above the normal water level expected during the rainy season
7. The 25 acre land has been earmarked for the construction of CETP and STP by Himachal Pradesh Government.

2.13 STATUTORY NORMS FOR CETP

In case of Baddi CETP, the proponent has proposed design basis much more stringent norms for the outlet effluent in respect of BOD <10mg/l and COD <100 mg/l to take care of refractory chemicals and also to meet the stipulated standards for other parameters.

The MoEF has suggested the norms for the inlet effluent quality of CETP in case of small scale industries with total discharge upto 25 KLD in **Table 2.1**. The MoEF also suggested discharge standards for treated effluent quality of CETP in **Table 2.2**.

Table 2.1: Standards Laid by Ministry of Environment and Forest, Government of India for Common Effluent Treatment Plants as per Environment Protection Rules, 1986: Inlet Effluent Quality of CETP

A. Primary Treatment	
Parameter for Inlet Effluent Quality of CETP	**Standards (Concentration in mg/l)**
pH	5.5-9.0
Temperature, ^{0}C	45
Oil & grease	20
Phenolic Compounds	5.0
Ammoniacal Nitrogen (as N)	50
Cyanide (as N)	2.0
Chromium hexavalent (as Cr+6)	2.0
Chromium (total) (as Cr)	2.0
Copper (as Cu)	3.0
Lead (as Pb)	1.0
Nickel (as Ni)	3.0
Zinc (as Zn)	15
Arsenic (as As)	0.2
Mercury (as Hg)	0.01
Cadmium (as Cd)	1.0
Selenium (as Se)	0.05
Fluoride (as F)	15
Boron (as B)	2.0
Radioactive materials:	
Alpha emitters, Hc/ml	10^{-7}
Beta emitters, He/ml	10^{-8}
Note: 1. These standards apply to the small scale industries, i.e. total discharge upto 25 KLD/day	
2. For each CETP and its constituent units, the state Board will prescribe standards as per the local needs and conditions; these can be more stringent than those prescribed above. However, in case of clusters of units, the state Board with the concurrence of CPCB in writing, may prescribe suitable limits.	

Source: Guidelines for Management, Operation and Maintenance of Common Effluent Treatment Plants, CPCB publications, Programme Objective Series: Problems/81/2001-2001 and The gazette of India : Extraordinary-Part II- Sec.3(i)pp 10 Dt.27th Feb 1991

Table 2.2: Standards laid by Ministry of Environment and Forest, Government of India for Common Effluent Treatment Plants as per Environment Protection Rules, 1986: Treated Effluent Quality of Common Effluent Treatment Plant

[Concentration in mg/l except pH & Temperature]

Parameters	Into Inland Surface Waters	Public Sewer	On Land for Irrigation	Into Marine Coastal Area
pH	5.5-9.0	5.5-9.0	5.5-9.0	5.5-9.0
BOD (3 days at 27^0C)	30	350	100	100
Oil & Grease	10	20	10	20
Temperature	Shall not exceed 40^0C in any section of the stream within 15 meters downstream from the effluent outlet	45^0C at the point of discharge	--	45^0C at the point of discharge
Suspended Solids	100	600	200	(a) for process wastewater- 100 (b) For cooling water effluent 10 percent above total suspended matter of effluent cooling water
Dissolved Solids (inorganic)	2100	2100	2100	--
Total residual Chlorine	1.0	--	--	1.0
Ammonical nitrogen (as N)	50	50	--	50
Free Ammonia as NH_3,mg/l	5.0	--	--	5.0
Total Kjeldahl Nitrogen (as N)	100	--	--	100
Chemical Oxygen Demand	250	--	--	250
Arsenic (as As)	0.2	0.2	0.2	0.2
Mercury (as Hg)	0.01	0.01	--	0.01
Lead (as Pb)	0.1	1.0	--	1.0
Cadmium (as Cd)	1.0	1.0	--	2.0
Total Chromium (as Cr)	2.0	2.0	--	2.0
Hexavalent Cromium	0.1	2.0	--	1.0
Copper (as Cu)	3.0	3.0	--	3.0
Zinc (as Zn)	5.0	15	--	15
Selenium (as Se)	0.05	0.05	--	0.05
Nickel (as Ni)	3.0	3.0	--	5.0
Boron (as B)	2.0	2.0	2.0	--
Percent Sodium,	--	5.0	60	--

Parameters	Into Inland Surface Waters	Public Sewer	On Land for Irrigation	Into Marine Coastal Area
max				
Residual sodium carbonate, mg/l	--	--	5.0	--
Cyanide (as CN)	0.2	2.0	0.2	0.2
Chloride (as Cl)	1000	1000	600	--
Fluoride (as F)	2.0	15	--	15
Dissolved Phosphate (as P), mg/l, max.	5.00	--	--	--
Sulphate (as SO4)	1000	1000	1000	--
Sulphide (as S)	2.8	--	--	5.0
Pesticides	Absent	Absent	Absent	Absent
Phenolic compounds (as C6H5OH)	1.0	5.0	--	5.0
Radioactive materials (a) Alpha emitters MC/ml, Max. (b) Beta emitters uc/ml, Max.	10^{-7} 10^{-6}	10^{-7} 10^{-6}	10^{-8} 10^{-7}	10^{-7} 10^{-6}
Note: All efforts should be made to remove colour and unpleasant odour as far as possible				

Source: The Gazette of India: Extraordinary-Part i- Sec..3(i)pp11Dt.27.2.91

Before allowing to discharge the effluent into conveyance system, the member units will have adequate storage facility. The effluent to be accepted to the conveyance system will be through flow meters only. The discharge from the storage facility will be allowed only after ensuring that the effluent meet with inlet norms of CETP.

CETP inlet norms for the member units having effluent load > 25 KLD will be as follow :

COD : < 1500 mg/L & BOD < 1000 mg/L

As the charges for treatment have been formulated based on concentration of organic loading, the member unit having complete treatment facility will be benefited.

2.14 TREATMENT TECHNOLOGY

The plant has been designed by absorbing the new technology like conventional filtration, MBBR, micro and nano filtration with Ozonation into the very conventional foot print of

Activated Sludge Process to deal with remaining tricky recalcitrant pollutants to make a solid foundation for a techno-economic viability for investment and recurring expenditure. Simultaneously attempt has been made to do sludge minimization through proper scheme selection. The construction of the plant will be completed within a period of 18 months after the start of construction after getting all the clearances.

2.15 POWER AND FUEL REQUIREMENT

The power requirement of CETP is nearly 4000 KW install load & with the running load of 2750 KW, which will be supplied by Himachal Pradesh State Electricity Board and 3 D.G. sets of total capacity 1600 KVA, one DG set of 1000 KVA and one DG set of 550 KVA for CETP operation and one DG set of 50 KVA for street light, office building and for staff quarters, will be used in emergency with diesel consumption at the rate of 50 l/hr.

2.16 PROPOSED LAND-USE OF PROJECT SITE

Sr. No.	Items	Area (Acres)
1.	CETP area	15.00
2.	Green belt, plantation, garden etc.	8.00
3.	Other facilities like Administrative Building, lab area, roads, parking area, storage area, loading/ unloading area and Space for future expansion etc.	2.00
	TOTAL	**25.00**

2.17 PROJECT DESCRIPTION

During construction phase, temporary labour colony will be established for the construction workers with proper sanitation and drinking water supply.

Suitable seismic coefficients in horizontal and vertical directions respectively will be adopted while designing the structures to mitigate the seismic impacts. During operation phase, D.G. sets will be kept as stand by for use during load shedding. All the D.G. sets will be provided with stack of 2 m height above the height of building as per CPCB norms.

2.17.1 Industrial Scenario

CETP will serve all the existing 990 units in following industrial areas (Baddi-Barotiwala Industrial belt) over an area of 5472 bighas. The map of industrial area showing various

industries is shown in **Fig. 2.4**. The list of industries in the Baddi-Barotiwala industrial belt is given in **Annexure 6**.

- Industrial Area, Baddi
- Industrial Area, BarotiwalaS
- EPIP Phase I, Jharmajri
- EPIP Phase II, Thana
- Apparel Park cum Industrial Area, Katha
- Industrial Area, Lodhi Majra
- HPSIDC Industrial Area, Baddi
- HPSIDC Industrial Area, Dabni
- HIMUDA Industrial Area, Bhatolikalan

2.17.2 Industrial Types

The various types of industries existing are textile, pulp and paper, food and beverages, engineering and metal, footwear, plastics, pharma, soap and detergents, electrical and electronics, automobile, packaging and others. Sector wise, number of industries are given in **Table 2.3**.

Table 2.3: Various Types of Industries in Baddi-Barotiwala Industrial Area

S.N.	Industry Sector	Number of Units		
		Major	Others	Total
1	Textile, Dying, and Spinning	7	20 (Spinning units)	27
2	Pulp and Paper	2	1	3
3	Pharma	20	149	169
4	Soap and detergents	9	28	37
5	Food and Beverages	8	22	30
6	Electroplating and Pickling	Nil	9	9
7	Miscellaneous	Nil	987	987
	Total	46	1216	1262

As per the Baddi Infrastructuree Ltd., all the industries are to join the CETP. Govt. of HP has issued notification to this effect. Major textile players like Vardhman, Birla, Cosome & Deepak spinners constituting about 70% of effluent, with other groups like P&G, Colgate and many others have already paid their share towards capital cost.

2.17.3 Wastewater Generation and Collection at Member Industrial Units

This is a Common Effluent Treatment Plant facility that will be treating the waste effluent from the member industries within the area. Most of the units are in the mean time equipped with their own waste treatment devices. But, the complexity of the effluent characters makes it extremely difficult to meet the statutory standards even despite the best effort made by the entrepreneurs.

The member industries shall treat the effluent to meet the CETP inlet norms stipulated by MoEF under EP Act provisions. The unit must install one Bar and Coarse Screen, one Settler and one Storage tank as per design of CETP Management. In case, already installed, the existing system must get approved from the CETP management. All the discharges like factory sewage, trade effluent, washings etc. must be channelized through storage tank of adequate capacity. In case of segregation in some units, two separate storage tanks are to be provided. Pumping station as per CETP operator's design is to be installed.

The member industries are also required to monitor specified quality parameters and flow rate of the effluent on daily basis and submit the monitoring data to the CETP operator on regular basis. Sealed continuous flow meters will also be installed at the outlet of the CETP to monitor the outlet effluent quantity with sampling point. Charges will be levied as per the formula based on pollutant loading sector wise.

Textile effluent excluding the concentrated dye part, food effluent and paper waste waster are taken together to form the first group, along with their respective factory sewage. They are to be transported from their respective sources to the CETP site through pipe line without blending with other categories. The Pharma units are located in a centered zone; therefore their effluent will also be transported through a separate piping conduit to the CETP. Effluent from large Soap and Detergent units will be transported through pipeline, while tankers will be used to collect effluent from large number of scattered units. The concentrated dye effluents and other small discharge will be lifted through tankers. A number of rubber lined tankers will be used for this purpose. However, the major part of effluent is taken through conveyance network which mitigates the traffic problems.

The existing industries with their respective number and locations are shown in the topographical map attached herewith in **Fig. 2.4**.

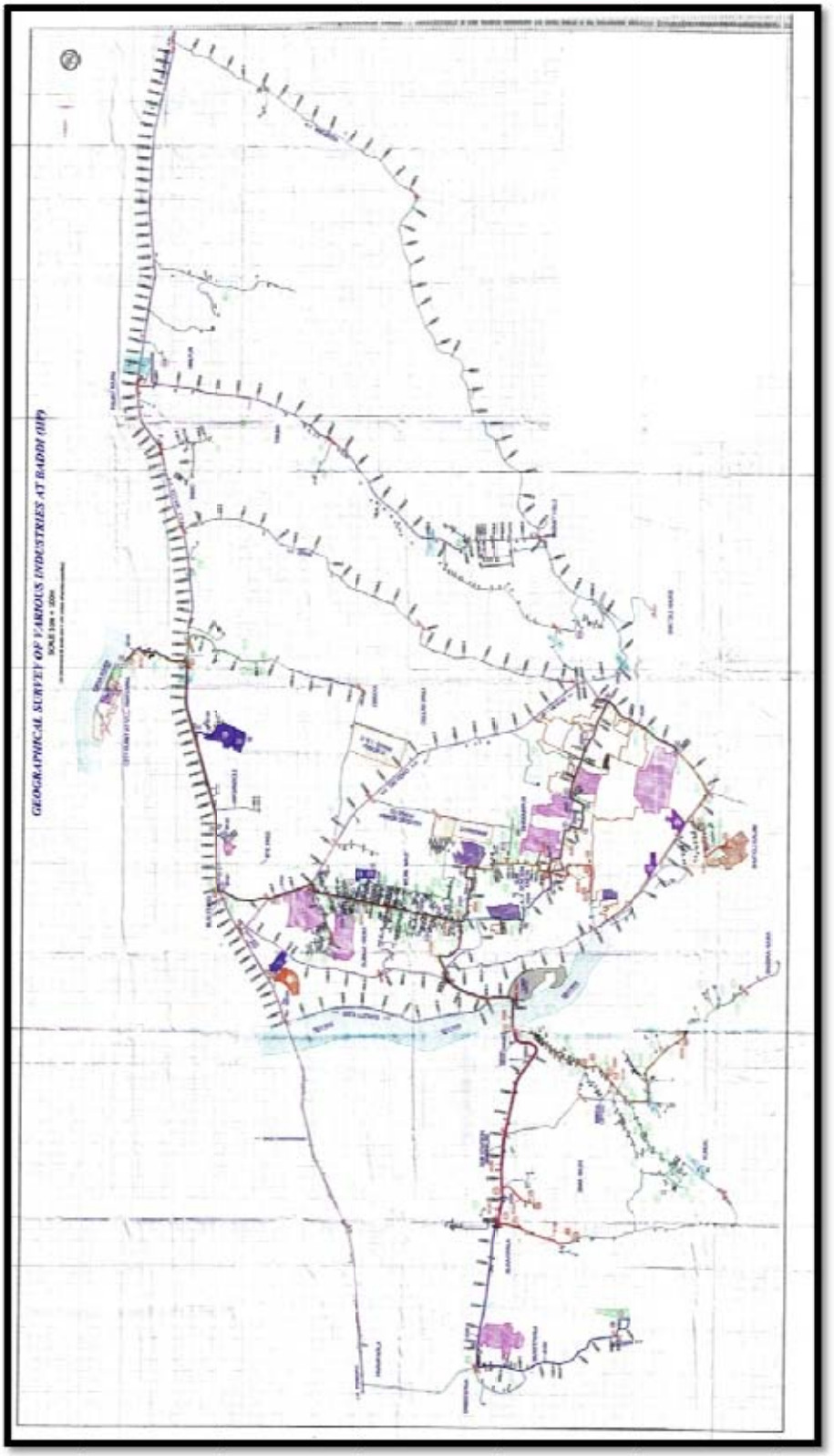


Fig. 2.4: Map of Baddi Industrial Area Showing Various Industries and CETP

2.17.4 Treatability Study

List of industries which received consent from HPSPCB was obtained along with details on water consumption, effluent generation & ETP installation from the concerned regional office of HPSPCB. Questionnaires were sent to industries and information collected during study for characterization of effluents in case of major key players and composite sampling done industry category wise for treatability study. Treatability study was done by grouping effluent streams of different industry sectors to arrive at pollution load and proposed treatment scheme for five categories of effluents. A combination of physico-chemical and biological (ASP) processes was tried in the lab. In addition, nano-filtration system was suggested for two categories of effluents i.e. concentrated dye effluent & pharma effluent with recovery of brine & water respectively.

The design load has been furnished in **Table 2.7** along with characterization and quantification of trade effluent. The factual data was collected through the data sheets circulated among the relevant industries having effluent discharge. The sample analysis in respect of all large and medium industries and randomly in case of small industries was carried out by DPR team for ascertaining the characteristics and load. While estimating the effluent load the average COD, BOD, TDS parameters as well as volumetric loading have been evaluated.

The facility will be treating 12989 KLD effluent from textile industries, 2432 KLD effluent from Food and Beverage units, 2050 KLD effluent from Paper units, 1961 KLD effluent from Detergents units, 2903 KLD effluent from Pharma units, 42 KLD effluent from Electroplating units, and 193 KLD effluent from Miscellaneous units. The facility will be treating a total of around 22570 KLD effluent from the member industries. Overall load profile of Baddi Common Effluent Treatment Plant is given in the **Table 2.4**.

Table 2.4: Overall Load Profile of Baddi Common Effluent Treatment Plant

S. N.	Parameter	Sectors							Total Load
		Textile	Food & Beverage	Paper	Detergent	Pharma	Electro-plating	Misc. Major Units	
1	Volumetric loading, KLD	12989	2432	2050	1961	2903	42	193	22570
2	Average COD/day, kg COD/day	14300	8232	1086	18606	8271	203	902	51600
3	Average BOD load, kg BOD/day	4661	4411	429	4706	3466	2	21.4	17696

S. N.	Parameter	Sectors							Total Load
		Textile	Food & Beverage	Paper	Detergent	Pharma	Electro-plating	Misc. Major Units	
4	Average TDS load, kg TDS/day	43229	4039	2388	5343	7001	360	189	62549
5	Non-biodegradable load, kg/day	2648	--	13.5	6841	--	200	849	--
6	Average COD, mg/l	1101	3384	530	9488	2849	4788	4675	--
7	Average BOD, mg/l	359	1813	209	2400	1194	46	111	--
8	Average TDS, mg/l	3328	1661	1165	2724	2412	9747	980	--
9	Average COD/BOD	3.1	1.9	2.5	4.0	2.4	--	42.1	--

Based on treatability studies by DPR team, the waste effluents have been categorized into five categories as given below:

CATEGORY 1: Effluent from textile, excluding conc. cotton dye effluent, paper. Food and beverage units- 15.55 MLD

CATEGORY 2: Detergent effluent- 2 MLD

CATEGORY 3: Pharma effluent- 2.9 MLD

CATEGORY 4: Conc. cotton dye effluent- 2 MLD

CATEGORY 5: Effluent of Electroplating and Pickling Units- 0.42 MLD

The factory sewage will be received along with CATEGORY 1, 2 and 3. The sewage load from different units is given in **Table 2.5**.

Table 2.5: Sewage Load from Different Industrial Units

S.N.	Sources	Sewage Load, KLD
1	Textile, Food and Paper Units	495.25
2	Pharmaceuticals	363.45
3	Soap and detergents	192.5
4	Total of above Units	1051.2
5	provisional	1051.2
6	Future aspects	2000
7	Total Sewage Load	4102.4

The existing industrial units have their own Effluent Treatment Plants (ETPs) and the loads have been calculated on the basis of untreated effluent, so that the proposed CETP delivers results even under the worst conditions.

2.17.5 Treatment Scheme

The variation of effluent characteristics on a very wide spectrum could be exploited in the categorization of wastewater streams into various sections to serve the very objective of loading the effluent treatment cost and meeting the stringent standards aimed at. Such separation of effluents into the various sections as per the effluent characteristics is absolutely necessary. Otherwise, the treatment cost will get enhanced causing an unnecessary embarrassment.

The plant has been designed by absorbing the new technology like micro and nano filtration technology, MBBR, Ionization etc into the very conventional activated sludge process to deal with tricky recalcitrant pollutants to make a solid foundation for a techno-economic viability for the investment and recurring expenditure. Simultaneously, attempt has been made to do sludge minimization through proper scheme selection.

Based on the treatability studies, Five Treatment Systems have been designed. Schematic flow diagrams are shown in **Fig. 2.11** while the individual Flow Diagrams are given in concerned treatment as described below.

Treatment of Stream-I

Based on the treatability study, the combination of textile, food & paper have been found to be the ideal one in controlling the BOD, TDS and the refractory levels. A simple biological treatment can achieve these objectives with simultaneous effluent clarification. As shown in the study, this is feasible only if the concentrated dye effluents with high concentrated saline dye effluents is segregated out of the above three resultant waste streams. The treatment scheme for textile, food & paper effluent is shown in the hydraulic flow diagram in **Fig. 2.5**.

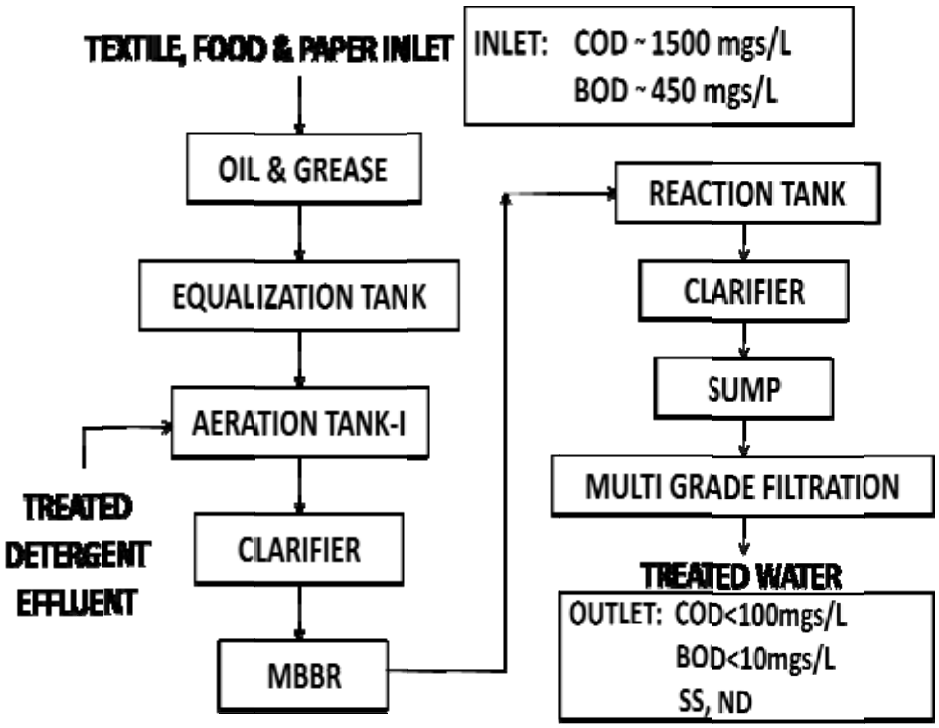


Fig. 2.5: Flow Diagram for the Treatment of Textile, Food & Paper Effluent

From volumetric loading point of view the entire discharge is estimated to be 16 MLD, if the concentrated effluent is excluded from this part. This contributes nearly 2/3 rd portion of the total effluent. Another important aspect is that such effluent is concentrated in a certain zone. Therefore, the transportation of effluents in the CETP site has to be carried out by some conduit system instead of any tanker conveyance. Because it is an open fact that tanker system is always costlier than the pumping transportation system from the source to the CETP site. The loading of the transportation cost will also reduce the overrate cost on the overall waste management system.

Thought the level of suspended solids in such type of effluents in expected to be low it is occasionally found to be contaminated with inorganic or biological sludge. Hence, with a factor of safety it means essentially a presenter prior to any sort of treatment is important.

Thus the segregated dilute effluent from textile processes paper and food effluents could be collected into an equalization tank after passing through a bar screen, coarse screen

followed by an air activated oil and grease trap for the separation of insoluble bigger size particles and the separation of minor amount of oil or greasy matter present in the effluent.

Since the effluent is laden with some sludge or settable solids, the equalization tank will be equipped with air sparing system in order to keep them in suspended mode preventing its deposition at the bottom which would be otherwise a serious nuisance as far as the maintenance point is concerned. There are three such equalization tanks with provision of common pumping device in between the two consecutive compartments. The basic objective is to clean the tank whenever it is necessary while the other is in operation. Thus, it would help the uninterrupted 24 hours storages facility with simultaneous maintenance operation without any hindrance.

The resultant stream would then be withdrawn at the design flow rate and would be taken into a presenter fitted with mechanical scrapper for the separation of suspended solids or if any. The clarifier effluents would then passed into the aeration chamber. The aeration system has been designed with the principle of activated sludge process but would function with a very high food to microorganism ratio (F/M) this would facilities to handle high amount of BOD load in a small volume. A specified MLVSS has to be maintained in the aeration chamber as per the influent load characteristics. The mixed liquor containing MLVSS would then flow to a secondary clarifier for the separation of biomass. The clarified effluent thereafter passed into aeration tank-II which will be made functional with the principle of attached growth by adopting MBBR technology. The attached growth model has been preferred over suspended growth model for the purpose of meeting very low BOD (less than 10 mg/L) and with the modular concept enhanced load in future could be handled efficiently because of the very low retention time is required to achieve a high treatment efficiency in MBBR module.

High hydraulic volume in both the cases have been preferred in order to derive the high efficiency of oxygen transfer of submerged aeration system. Another important point here is that the activated sludge process will be operated for accelerating the growth kinetics which will help in the management of residual refractory chemicals which are encountered in each type of waste to some extent (may be negligible). Hence, continuous wastages of biomass and its withdrawal from the reactor would definitely help in obtaining the treated effluent of very high quality.

The treated effluent at this stage would attain BOD level less than 10 mg/l; it would be free from turbidity. Thus the appearance will be crystal clear but some times the textile process

house may cause some unwanted mixing or a routine mixing of colored wash effluents with this resultant stream making it colored little bit. As a factor of safety such effluents with this resultant stream making it some reaction tanks for physic-chemical treatments and subsequently passing through clarifiers for the removal of sludge from the treated effluent containing flocks. A dosing of necessary chemicals like coagulants, alkali or other chemicals may be added into an intermediate sump and would be pumped to a multigame filter system prior to its disposal to a river bed.

A small quantity of the treated effluent would pass through a fish pond for the assessment of its eco-friendly nature. The discharge parameters of such streams named as stream-I are shown in the following **Table 2.6**.

Table 2.6: Food, Textile & Paper Treated Effluent Discharge Parameters

S. No.	Parameters	Value	Unit
1.	Total flow	20	MLD
2	Appearance	NIL	
3	pH	6.0-8.0	
4	Suspended Solids	<50	mg/l
5	COD	<100	mg/l
6	BOD	10	mg/l
7	TDS	<2100	mg/l
8	Surfactants	<2	mg/l
9	Sulphide	<2	mg/l
10	Hexavalent Cr	<0.5	mg/l
11	Oil & Grease	<5	mg/l
12	Bioassay	90% Survival	
13	Phenolic Compounds	<1	mg/l

The inorganic or organic sludge from the settlers would be taken into a sludge sump for its processing through decanters. A part of biosludge would be returned to the aeration chamber-I in order to maintain the desired MLVSS concentration. Hence, the treatment scheme of Stream-I ends here.

Treatment of Stream-II

Stream-II represents the detergent effluents, it has its own storage tank and its separation form the other streams has been ensured. The speciality of detergent sector is that it

has a number of large units and the number of small units are too many scattered over a wide spread area. Another major point of detergent sector is that is has a very high COD and BOD load.

The quantum of overall generation of detergent effluents is estimated to be 2 MLD, where the large scale sector contributes 1.9 MLD whereas other 30 units contribute only 44 KND. Due to high COD and BOD load and presence of high amount of surfactants, the detergent effluent is required to have its own treatment different from the former one.

A tanker system is being contemplated here to carry the effluent from the scattered units into the treatment site.

The treatment scheme for detergent effluent is shown in the hydraulic flow diagram in **Fig. 2.6**.

Stream-II, will also pass through a bar and coarse screen followed by an oil and grease trap and would finally be taken into an equalization storage tank. The initial COD load of such effluent is very high but it has responded well to physic-chemical treatment with removal efficiency of nearly 70%. Therefore the detergent effluent from the equalization tank will be taken to the reaction tank where the chemicals are to be dosed from the respective tanks as done in the previous one.

The mixed effluent would be taken to a primary clarifier for the separation of sludge slurry and thereafter it would be taken to aeration tank following the principle of activated sludge processes. And thereafter it would run into a secondary clarifier for the separation of biomass. The treated effluent at this stage will contain high content of the refractory chemicals which will be imparted a chemical treatment for the degradation of such refractory chemicals assumed to surfactants. After chemical treatment, it will get mixed up into aeration chamber-I where the stream-I is taken up for biological treatment.

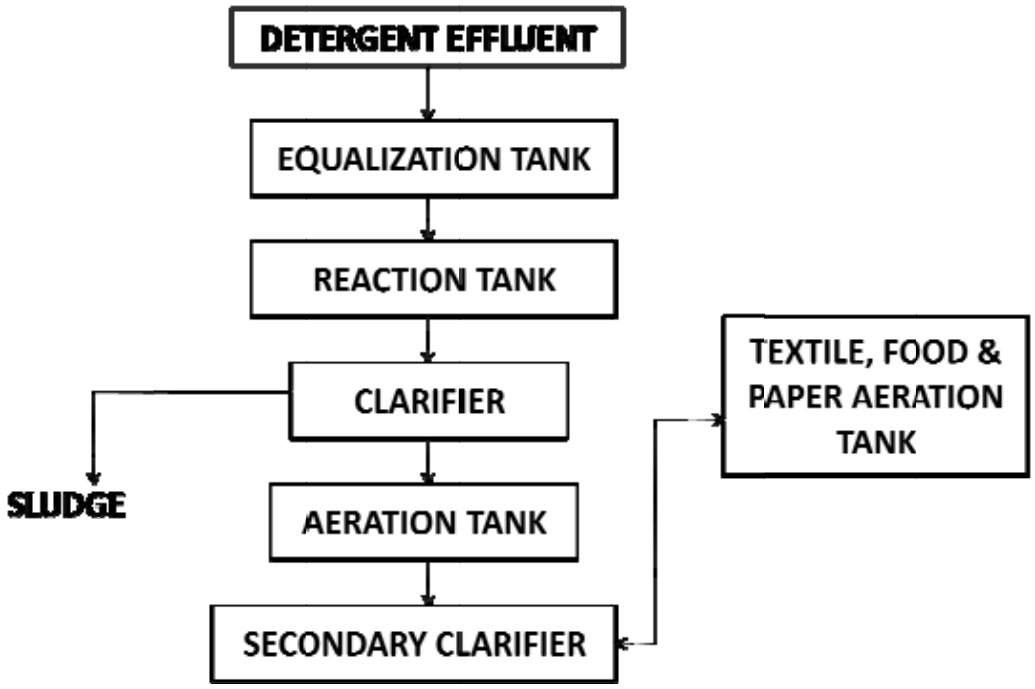


Fig. 2.6: Flow Diagram for the Treatment of Detergent Effluent

Treatment of Stream-III

The Pharma effluent represents this effluent category and would be classified as Stream-III effluents. Pharma units are located in a centered zone that's why its transportation through a separate piping conduit would care of most of such units. The treatment scheme for Pharma effluent is shown in the hydraulic flow diagram in **Fig. 2.7**.

Like the previous ones, the Pharma effluents would be passed to bar and coarse screen and oil and grease strap and then it would be taken into an equalization tank. The effluents would be passed through a presettler for the separation of unwanted sludge or suspended solids and subsequently it would be taken to an aeration tank designed on the principle of ASP system. The effluent would then pass through a secondary clarifier for the separation of biomass. Subsequently, it would undergo through chemical treatment & it would be taken to a storage sump. The clarified effluent would then be passed through a multigrade filter and a series of micro filtration assembly and then into nano filtration for the separation of recalcitrant materials here - commonly suspected to be the drugs here which kill the growth of biomass. The nano permeate is a very high purified water may be used for different industrial application instead of being disposed to a river bed. While the nano reject will pass through ozonolysis or

strong chemical oxidation or adsorption process for the removal of recalcitrants and the treated concentrated part would be recycled into the loop. The nano filtrate water characteristics are shown in **Table 2.7**.

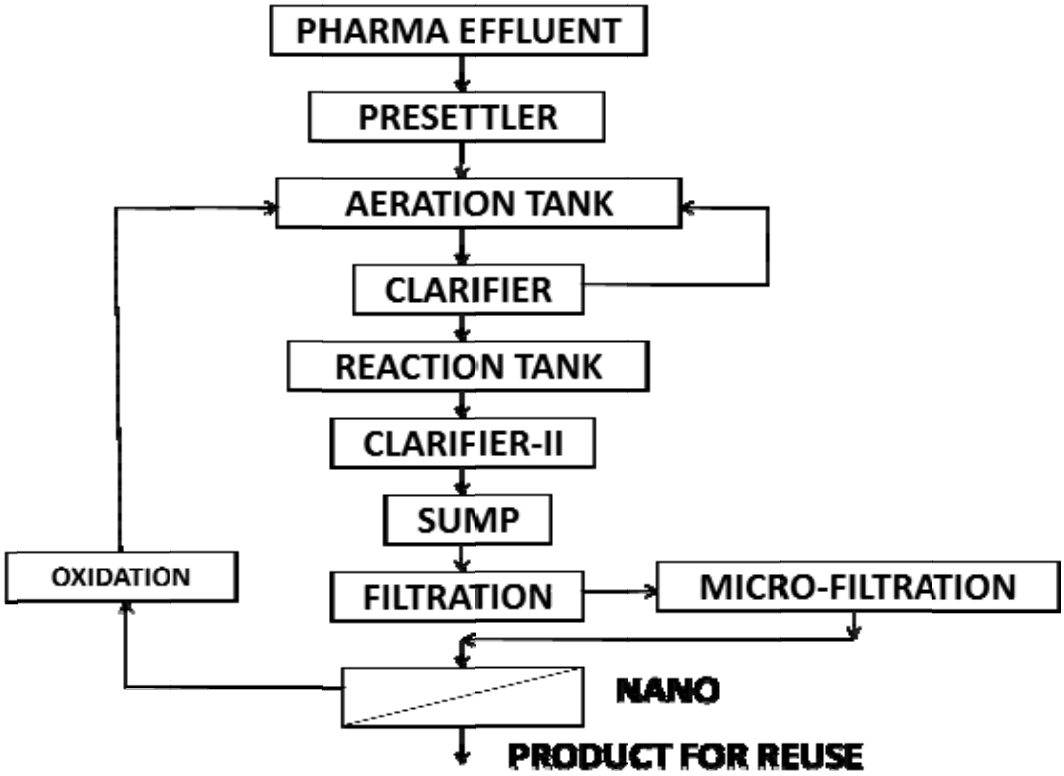


Fig. 2.7: Flow Diagram for the Treatment of Pharma Effluent

Table 2.7: Pharma Treated Effluent Discharge Parameters

S. No.	Parameters	Value	Unit
1.	Total Flow	2.7	MLD
2	Appearance	NIL	
3	pH	6.0-8.0	
4	Suspended Solids	<10	mg/l
5	COD	<10	mg/l
6	BOD	<10	mg/l
7	TDS	<1700	mg/l
8	Surfactants	<2	mg/l
9	Sulphide	<2	mg/l
10	Hexavalent Cr	<0	mg/l

S. No.	Parameters	Value	Unit
11	Oil & Grease	<5	mg/l
12	Bioassay	100% Survival	
13	Phenolic compounds	<1	mg/l

Treatment of Stream-IV

Concentrated dye effluent in cotton packaging plants represents this category. The special characteristic of this effluent is that it has a very high level of TDS content. Its salinity level would be 30000 to 80000 mg/L. The second characteristic of this effluent is that it contains hydrolyzed reactive dye stuff which makes this stream intensively coloured. Such stream of course has a very low level of BOD unlike the other streams described so far. Hence, the processing of such effluents may not require a mandatory biological treatment but the removal of hydrolyzed dye stuff and its accessory organic chemical which are mostly surfactants are to be removed from the waste streams if this specific stream is intended for its reuse and its recycling. Such reuse and recycling will result in controlling TDS in effluent discharged from Textile industry.

The separation of stream from the other ones is a not only a pre requisite but an essential principle of the overall effluent management since its blending with the other stream obviously elevates the TDS level which requires a costly and intensive technical management upsetting the overall techno-economic scenario.

The treatment scheme for Concentrated Dye effluent is shown in the hydraulic flow diagram in **Fig. 2.8**.

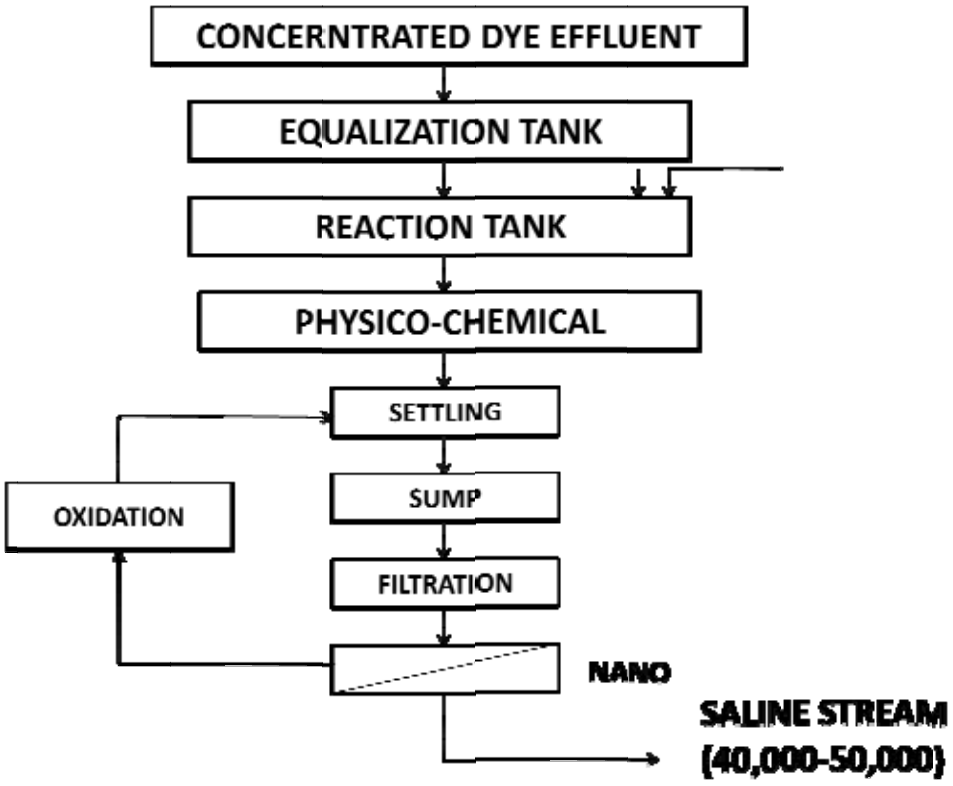


Fig. 2.8 : Flow Diagram for the Treatment of Concentrated Dye Effluent

The treatment of this specific effluent needs primarily segregation in the process house as the first and foremost step. Unnecessary dilution of TDS factor is also a deterrent factor for its efficient reclamation. Therefore, the higher the salinity the better it is. The conveyance of concentrated effluent is proposed through a tanker system into the CETP site. From the equalization tank it directly enters into a reaction chamber commonly known as decolourization system. Decolourization is accomplished through a number of chemicals or by ozonolysis. This has to pass through a physic-chemical treatment for further clarification. Subsequently, it will pass through a specially designed strainers, multigrade filters, activated carbon and finally through a series of cartridge filters taken through nano filtration system. Which efficiently separates out the organic contaminants allowing the saline water to pass through the nano filters.

Such saline water will be recycled back into the process house. A material balance is necessary for this purpose and some feasibility study is needed to study the impact of saline water on dyeing.

Treatment of Steam-V

The fifth class represents the miscellaneous effluents, its quantum is estimated to be 235 KLD. The hexavalent chromium is the most toxic here, which will be reduced to trivalent bond by a suitable reducing agent under acidic pH. It contains a high rich of effluents which will be utilized as a necessary dosing chemicals in the physic-chemical treatment. The excess part remaining if any after the material balance will be neutralized in any settler used in the primary treatment. The characteristics of recovered saline water are represented in **Table 2.8**. The miscellaneous quantum is too small to be treated separately.

Table 2.8: Miscellaneous Treated Effluent Discharge Parameters

S. No.	Parameters	Value	Unit
1.	Total Flow	235	MLD
2	Appearance	NIL	
3	pH	6.0-9.0	
4	Suspended Solids	<100	mg/l
5	COD	-	mg/l
6	BOD	-	mg/l
7	TDS	<2100	mg/l
8	Surfactants	-	mg/l
9	Sulphide	0	mg/l
10	Oil & Grease	<10	mg/l
11	Total Chromium Cr	2	mg/l
12	Phenolic Compounds	0	mg/l
13	Nickel	3.0	mg/l
14	Zinc	5.0	mg/l
15	Chromium Hexavalent	0.1	mg/l

2.18 EFFLUENT CONVEYANCE SYSTEM AS PER THE TOPOGRAPHY

To meet the requirement of treatment scheme, the entire Baddi Effluent has been classified into 5 categories as discussed earlier. Textile effluent excluding the concentrated dye part, food effluent and paper waste waster are taken together to form the first group, along with their respective factory sewage. They are to be transported from their respective sources to the CETP site without blending with other categories.

Textile effluent excluding the concentrated dye part, food effluent and paper waste waster are taken together to form the first group, along with their respective factory sewage. They are to be transported from their respective sources to the CETP site through pipe line without blending with other categories. The Pharma units are located in a centered zone; therefore their effluent will also be transported through a separate piping conduit to the CETP. Effluent from large Soap and Detergent units will be transported through pipeline, while tankers will be used to collect effluent from large number of scattered units. The concentrated dye effluents and other small discharge will be lifted through tankers. A number of rubber lined tankers will be used for this purpose.

In order to facilitate the mode of transportation, effluent conveyance through pipe is designed here.

The entire path of 18 km consists of a main header with its branches reaching to the concentrated units. As per the topographical presentation, the header starts from C where the branches from M/S Auro Dying, Auro Textile and M/S Birla Textile get merged into it. Kandhari beverage, etc. and on other extreme region Haripur paper mills, Himachal fibre effluent are converged into it at the points G and D, respectively. The conduit ultimately reaches to the CETP site along the road. On the topographical presentation, the entire traverse path has been divided into number of segments for ascertaining the pipe diameter and pressure drop. The cumulative design flow taken has been kept on the higher side than the estimated average flow passing through the conduit. The low pressure drop in each branch/header segment and its corresponding low velocity indicates that adequate factor of safety has been considered. Since in each segment actual velocity is less than the design velocity based on which the pressure drop has been estimated.

All the headers for three types of effluent streams are getting merged at point ‘I’ where from they run parallel to CETP. Pipes will have manholes of adequate dimension at an interval of 200 m centre both at the header and branch lines for diagnostic purpose in case of trouble shooting.

All the pipes will be sealed in the concrete 30cm below the ground and would run parallel to the road on the side. The boaster stations will be decided at the appropriate points. All the pipes will be fitted with pressure gauge etc. which will be used in the assessment of flow rate and will help the maintenance staff for trouble shooting. The booster stations will ensure the desired flow with or without clogging.

The material of construction of pipe will be FRP with a pressure rating 10 to 12 kg/cm^2. Much above the operating pressure taking care of thermal expansion safety factor.

The effluent may be acidic or alkaline due to single point discharge from the unit hence, FRP ppe will not be affected. The effluent is expected to contain suspended solids which may upset the design pressure otherwise the low friction factor will eliminate this problem, keeping the low pressure drop over the entire length. Moreover, FRP has temperature tolerance. Hence, discharge of 60^{0}C is not going to affect the transportation process. At the manhole flange joint is being provided for easy maintenance. All the branches for the disposal to the header or sub header must be done through pumping with desired pressure.

2.19 RECYCLE AND RESUSE POTENTIAL OF TREATED EFFLUENT

In order to reuse the treated effluent, the effluent segregation has been carried out in a meticulous way for solving the TDS problem and refractory chemical complication. Major portion of the treated effluent will be recycled and reused and a small fraction, if in excess, will be discharged in Sirsa River after conforming to the discharge Standards.

The recovery and reuse of the respective streams are enumerated below:

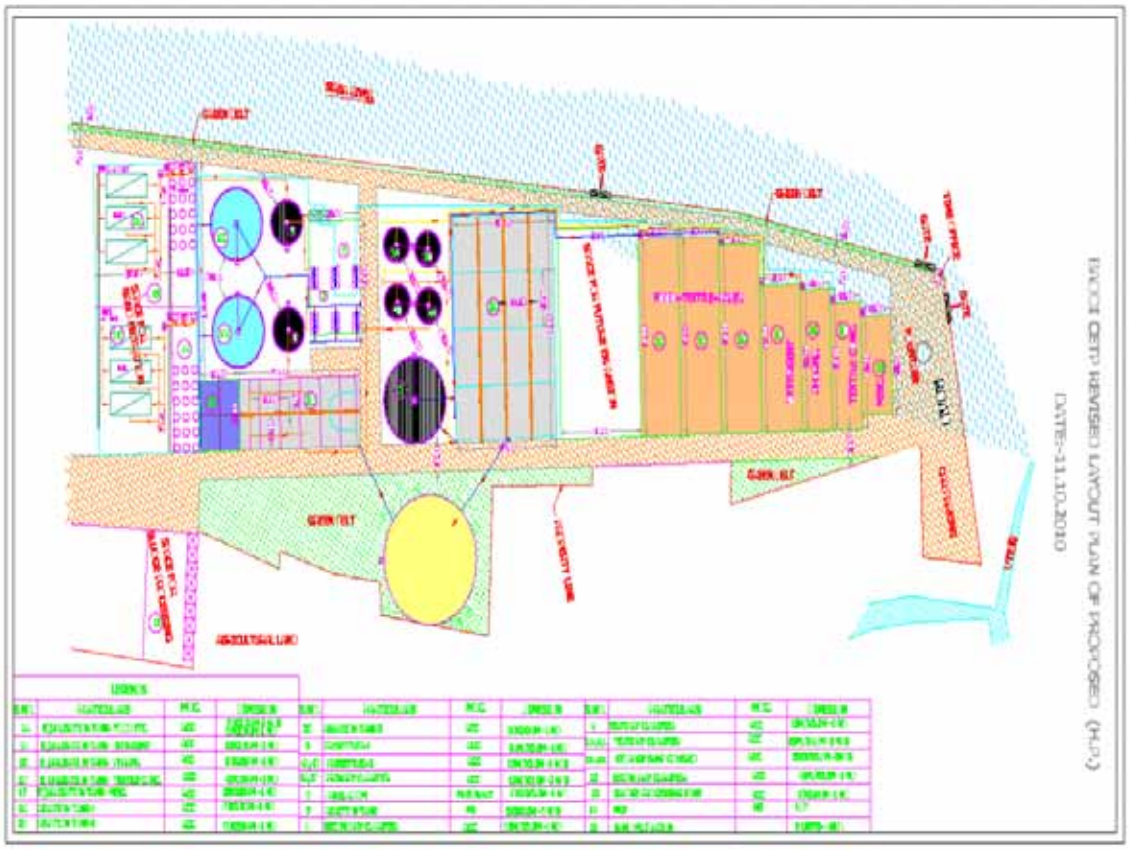
1. Pharma effluent will yield the nano-permeate of less then 10 mg/l COD and TDS <1500 mg/L. This could be reused in any industry barring Food or Pharma Sector. Extent of recovery is envisaged to be 2200 KLD.
2. Textile dye effluent will yield high saline water with TDS 40,000-50,000 mg/L. This could be reused in the textile cotton dyeing process. This will be 2,000 KLD.
3. The major part of water will be reclaimed through textile, food, paper and sewerage contributing to 20 MLD under full capacity utilization. This could be reused in the Paper and Textile Sector other than Food and Pharmaceutical.

   However, in the beginning 20% treated effluents say 2000 KLD could be recycled.

2.20 DESIGN OF COMMON EFFLUENT TREATMENT PLANT (CETP)

The project site showing lay out plan of CETP and surrounding green belt is presented in **Fig. 2.9**.

Fig.2.9: Project Site Showing the Green belt Area around the CETP Plant



The details of various units of CETP are as given below:

1.	Equalisation Tank (Food, Textile, Paper) -	(70mx20mx4m) – 2 nos.
2.	Equalisation Tank (Food, Textile, Paper) -	(67mx20mx4m) – 1 no.
3.	Equalisation Tank (Detergent) -	(50mx20mx4m) – 1 no.
4.	Equalisation Tank (Pharma) -	(50mx15mx4m) – 1 no.
5.	Equalisation Tank (Textile Conc.) -	(45mx15mx4m) – 1 no.
6.	Equalisation Tank (Misc) -	(35mx15mx4m) – 1 no.
7.	Aeration Tank - 1	(80mx50mx4m) – 1 no.
8.	Aeration Tank - 2	(60mx25mx4m) – 1no.
9.	Aeration Tank - 3	(20mx25mx4m) – 1 no.
10.	Presettler – 1-	(30mØx3.5m) – 1 no.
11.	Presettler - 2 -	(12mØx3.5m) – 2 no.
12.	Primary Clarifier -	(12mØx3.5m) – 2no.
13.	Panel Room -	(40mx25mx5.5m) – 1 no.
14.	Reaction Tank -	(5mx3mx2.5m) – 6 nos
15.	Secondary Clarifier -.	(15mØx3.2m) – 1 no
16.	Tertiary Clarifier-	(15mØx3.2m) – 1 no
17.	Tertiary Clarifier	(25mØx4.0m) – 2 no
18.	Storage Tank/Sump covered –	(35m x 37m x 3.0 m) - 3 nos
19.	Secondary Clarifier –	(45mØx3.2m) – 1 no.
20.	Sludge sump for Sludge Processing Zone –	(46m x 25m x 4m) – 1 no.
21.	MGF - LOT	
22.	Nano Filtration (4 MLD) -	2 Units

A contract agreement has been made between M/s Baddi Infrastructure and M/s UPL Environmental Engineers Ltd. For designing, procuring, providing, construction, installing and commissioning (EPC) and conducting 3 months successful trial run and acceptance of CETP of 25 MLD capacity.

2.21 SLUDGE GENERATION AND DISPOSAL METHODS

There are major three types of sludge formation during the treatment or recovery process:

a) Bio Sludge - 5779.8 kg/Day say 6 tonnes

b) Chemical inorganic hazardous sludge (24 tonnes/day) formed during the chemical the chemical or coagulation process for effluent clarification

c) Primary Sludge obtained from pre-settler before actual treatment.

Disposal of the sludge will be carried out as given below:

- Bio sludge will be used as manures after testing and confirming to the.
- The 24 tonnes of hazardous waste generation from the proposed activity is ETP sludge, used oil, and discarded containers. ETP sludge will be sent to Shivalik Solid Waste Management Facility for final disposal. Chemical Sludge will be sent to SHIVALIK SOLID WASTE MANAGEMENT.
- Used oil will be sold to registered dealers.
- Discarded containers will be decontaminated and given to state authorized vendors.

2.22 SOLID WASTE GENERATION AND ITS DISPOSAL

The 10 tonnes of bio-sludge, that will be generated from biological treatment plant, will be used as manures after testing and meeting with guidelines for manure or otherwise will be sent to Solid Waste Disposal Facility along with chemical sludge produced during treatment in CETP.

2.23 WATER REQUIREMENT AND WATER BALANCE

The total quantity of water required for CETP will be 50 KLD which will be provided by Public Health Department. The number of working people will be approximately 100. Considering water consumption of 45 l/d/capita, the domestic water requirement will be 4.5 KLD. Considering the floating population of 100, the domestic water requirement for them will be 1.5 KLD. There will be use of some water for .the preparation of sensitive dosing chemicals to be used in the microfiltration and washing of membrane to an extent of 34 KLD. There may be requirement of make up water for the purpose of cooling of equipment of 10 KLD.

The water required for dust suppression and washing is not included in the water requirement. The treated effluent will be used for irrigation of green belt, dust suppression and for washing. This amount will be (120KLD+30KLD+30KLD) being equal to 180 KLD. In this way, 180KLD water will be saved. Similarly, it is planned to recycle and reuse most of the trated effluent in member industries, thus saving the freshwater requirement as a whole in industrial area. The flow diagram of Water Balance is shown in **Fig. 2.10.**

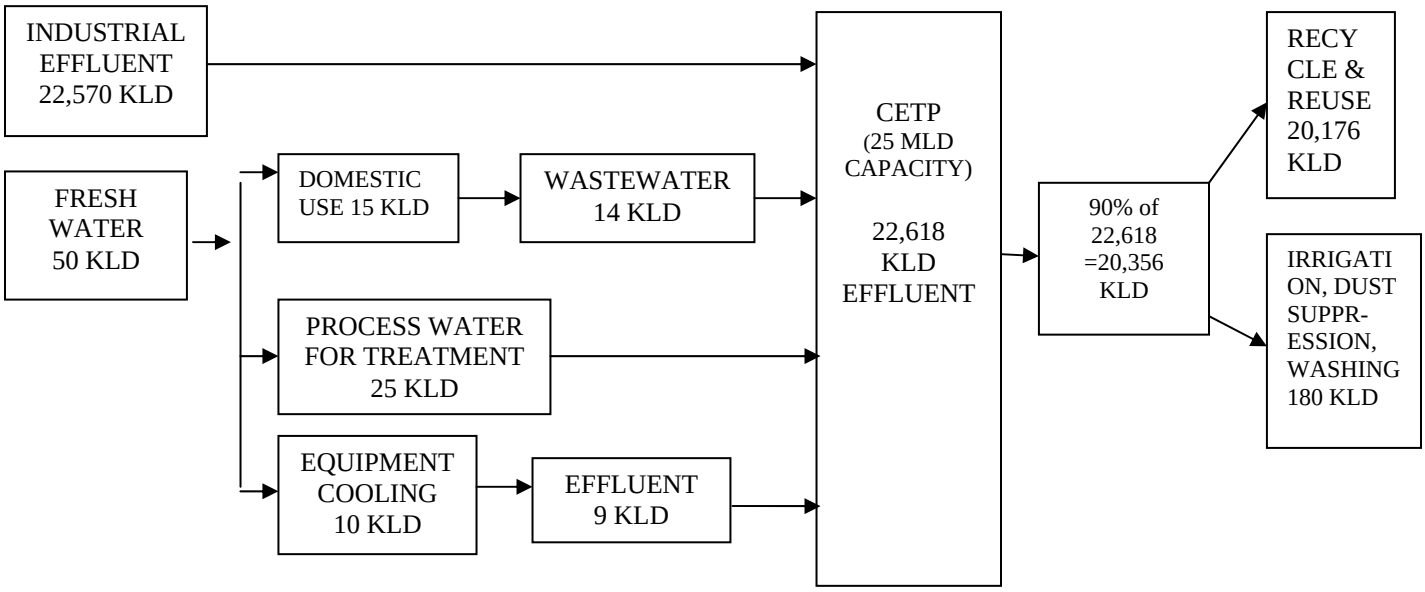


FIG. 2.10: Water Balance for the Proposed CETP

2.24 TRAFFIC ARRANGEMENT INSIDE PROJECT SITE FOR EFFLUENT CARRYING TANKERS

1. Total effluent to be carried by Tanker is about 2 MLD (including from all scattered small scale industries)
2. For carrying effluent through tankers the proponent proposes to use containers which are fully closed and having spillage kit to prevent the leakage of Effluents ,
3. Driver would be Trained/Educated for the proper traffic management inside the Project Site

2.25 COST OF THE PROJECT

Cost of the project is estimated to be 56.80 Crores.

2.26 SYSTEM DEVELOPMENT ON EFFLUENT CHARGES ESTIMATION

The system developed for effluent charges estimation is given in **Table 2.9.** The pollution based Basic Treatment Charges are estimated as per formula given below.

- Basic treatment cost = [0.02So+0.03(C-2.5So)+0.005Css+0.01x(C1-2100)] Rs./KL

where, So = BOD in mg/l
C = COD in mg/l
Css = Suspended Solids in mg/l
C1 = TDS in mg/l

Table 2.9: Details of Effluent Charges Estimation

S. N.	Sector	Basic Treatment Cost (Rs./KL)	Conveyance (Rs.)	Maintenance (20%) (Rs.)	Depre-ciation (Rs.)	Profit (15%) (Rs.)	Total (Rs.)
1	Textile, food, paper & sewage	6.0	2.0	1.0	1.5	1.5	12
2	Soap & detergent	10	2.0	2.0	2.0	2.0	18
3	Pharma	16	2.0	4.0	4.0	3.0	29
4	Textile dye effluent	14	2.0	4.0	4.0	3.0	27
5	Misc.	50	-	-	-	-	50

2.27 MAJOR ASPECTS OF MITIGATION MEASURES INCORPORATED INTO THE PROJECT

The major issues in common effluent treatment plant are to meet the prescribed standards of inlet and outlet effluent, and to achieve zero liquid discharge (ZLD).

To achieve above objectives following mitigation measures will be implemented:

- For proper management of the CETP, Baddi Infrastructure Ltd. acts as special Purpose Vehicle (SPV)
- The individual industries were made to get equipped with their own waste treatment devices, so that the inlet effluent quality to CETP will meet the prescribed standards.
- Every member industry will monitor the specified parameters of effluent and its flow and the data will be submitted to CETP operator. A Memorandum of Association (MoA) has been executed between Baddi infrastructure Ltd and the member industries to this effect.
- Economical and environmental friendly method of effluent collection system at member units level
- A legal agreement (MoU) between the Baddi Infrastructure Ltd and its member units have been executed **(Annexure 3**) and cost recovery formula has been developed.
- Member industries of CETP shall regularly pay their shares towards meeting the treatment cost and operation and maintenance of CETP

- Adequate linkages with treatment, storage and disposal facility (TSDF) for disposal of hazardous waste generated from the facility will be ensured.
- Inlet and outlet effluent standards of the CETP will be complied with irrespective of the degree of treatment i.e. primary, secondary or tertiary. Continuous flow meters will be installed at the outlet of the CETP to monitor the same.
- Parameters specified by HPSPCB will be monitored online at the outlet of CETP.
- Adequate measures will be taken to control air pollution, noise levels, water pollution, apart from having proper land-scaping and green belt & plantation development.
- The layout of project site showing the area allotted for green Belt/plantation is shown in **Fig. 2.9**.
- Social welfare measures will be undertaken
- Occupational Health and Safety Plan will be formulated and implemented

CHAPTER-3

DESCRIPTION OF ENVIRONMENT

3.1 INTRODUCTION

Information on the existing environmental status is essential for assessing the likely environmental impacts of the project. In order to get an idea about the existing state of the environment, various environmental attributes such as meteorology, air quality, water quality, soil quality, noise level, ecology and socio-economic environment have been studied/ monitored. The base line environment status around the project site serves as the basis for identification, prediction and evaluation of the impacts due to proposed activity. In order to predict anticipated of the project, it is necessary to have baseline information of environment.

3.2 PURPOSE

Baseline monitoring for different components are carried out for the purpose to determining the range of variation of the system and establishing reference point against which changes can be measured.

Baseline studies include collection of data on relevant biophysical, social and economic aspects provide a reference point against which the characterstics and parameters of impact related changes are analyzed and evaluated. The interaction of baseline environment and anticipated impacts are the basis for the environmental management plan for the proposed activity.

3.3 STUDY AREA

The present report covers baseline environmental data generated in the study area (10 km radius all around the project site for land use and the sample selection for monitoring.

Baseline environmental data generation for air, water, noise and soil quality monitoring around the project site was conducted from October 2011 to December 2011 (Post-Monsoon season).

3.4 BASELINE MONITORING OF ENVIRONMENTAL COMPONENT

In order to get an idea about the existing state of the environment, various environmental attributes such as meteorology, air quality, water quality, soil quality,

noise level, ecology and socio-economic environment have been studied/monitored.

3.4.1 Meteorology

The Meteorology of the area of the Project is well known. The Solan District falls under climatic type- Sub tropical monsoon, Mild winter, Dry winter, hot summer. The general trends of various meteorological data viz. Rainfall, Temperature, Humidity, Wind speed, Wind direction, Solar Radiation and Humidity have been established from the secondary data from Class-'A' meteorological observatory in Chandigarh located at Latitude 30^0 43' and Longitude 76^0 51' and situated at 8 km northwest of Chandigarh, 346m above mean sea level. The observatory is by Central Soil and Water Conservation Research and Training Institute (CSWCRT), Research Center, Chandigarh. The Meteorological data over the 30 years is summarized by CSWCRT Research Center and listed in Table 3.1. The predominant wind direction is from North-West to South-East, and the predominant wind speed is 2.1-3.6 m/s.

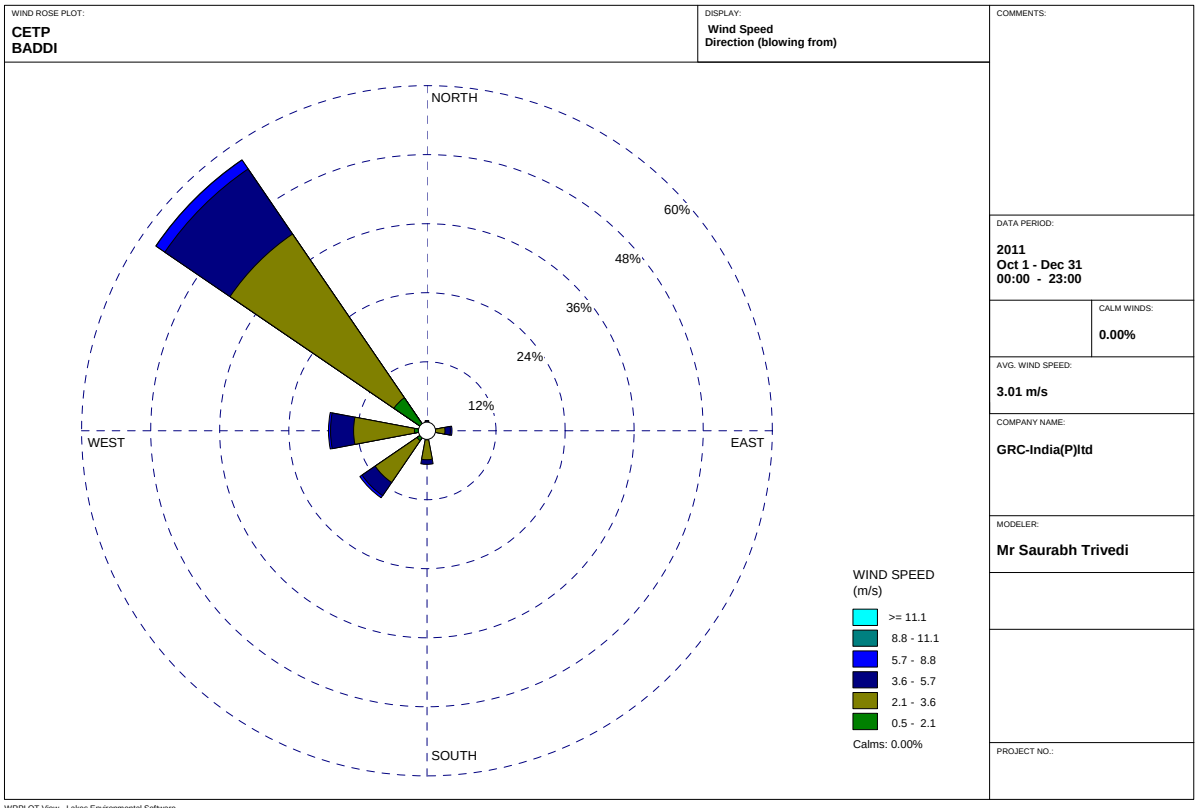
Table 3.1: Meteorological Data (Average of 30 years data) (1975-2005)

Month Period	Rainfall (mm)	Rainy days	Mean Temperature (^{0}C)		Wind Velocity (km/hr)	Relative Humidity (%)		Bright Sunshine (hrs)	Solar Radiation (gm cal/cm^2)
			Max	Min		I	II		
Jan	42.7	3	20.4	6.9	3.8	79	57	6.6	248.2
Feb	39.2	2	22.9	8.7	4.6	76	49	7.6	311.5
Mar	38.6	3	29.1	13.6	5.7	64	41	7.8	382.3
Apr	14.6	1	34.8	19.5	6.2	52	32	9.3	441.9
May	36.1	2	38.2	23.2	6.8	45	31	9.5	447.4
Jun	118.1	6	38.0	25.6	6.4	59	42	7.9	415.8
Jul	314.2	11	33.6	25.1	4.8	82	68	6.1	318.0
Aug	307.8	12	32.7	24.4	3.5	86	72	6.2	347.5
Sep	133.1	6	33.2	22.2	3.3	82	59	8.3	398.0
Oct	19.3	1	31.9	18.0	4.3	67	44	8.9	357.9
Nov	11.1	1	27.2	12.4	4.4	66	43	8.3	289.7
Dec	26.3	2	22.2	8.1	3.8	74	49	7.2	248.9
Annual	1101.1	51	30.4	17.3	4.8	69	49	7.8	354.2

(Source: CSWCRT, Chandigarh)

Figure 3.1: The Wind-rose Diagram for Three Months

(October 2011 to December 2011)



(Source: CSWCRT, Chandigarh)

3.4.2 Air Environment

To quantify the impact of the project on the ambient air quality, it is necessary at first to evaluate the existing ambient air quality of the area. The existing ambient air quality, in terms of Particulate Matter - 10 (PM_{10}), Particulate Matter- 2.5 ($PM_{2.5}$), Sulphur-dioxide (SO_2), Oxides of Nitrogen (NO_x), and Carbon Monoxide (CO), has been measured through a planned field monitoring.

To assess the ambient air quality level, 5 (five) monitoring stations were set up. **Table 3.2** gives location of the ambient air quality monitoring stations.

Monitoring Schedule

Ambient air quality monitoring was carried out twice a week with a frequency of 24 hours for 12 weeks.

Methods of Sampling and Analysis

Fine particulate Sampler APM MFC550 was used for monitoring Particulate Matter ($PM_{2.5}$ and PM_{10}); gaseous pollutants like SO_2, and NOx was collected by Gaseous Pollutant Sampler APM 433 and CO was monitored by Serinous 30 CO Analyser with NDIR detector.

Table 3.2: Location of Ambient Air Quality Monitoring Stations

Locations	Locations Code	Direction	Distance
Project Site	AAQ1	-	0 km
Barotiwala	AAQ2	SE	6 km
Kohra	AAQ3	SE	7.5 km
Kishanpura	AAQ4	NW	4.5 km
Baddi	AAQ5	NE	**3.4 *km***

Method for Measurement of Particulate Matter, SO_2 & NO_X

Method for measurement of Particulate Matter (PM_{10}) in ambient air is done by Cyclonic Flow Technique. Particles with aerodynamic diameter less than the cut-point of the inlet are collected by a filter. Ambient air at the monitoring location is sucked through a cyclone. Coarse and non-reparable dust is separated from the air stream by centrifugal forces acting on the solid particles and these particles fall through the cyclone's conical hopper and get collected in the sampling cap placed at the bottom. The fine dust (<10 microns) forming the particulate matter (PM_{10}) passes the cyclone and is retained on the filter paper The mass of these particles is determined by the difference in filter weights prior to and after sampling. The concentration of PM_{10} in the designated size range is calculated by dividing the weight gain of the filter by the volume of air sampled. A tapping is provided on the suction side of the blower to provide suction for sampling air through a set of impingers for containing absorbing solutions for SO_2 and NOx. Samples of gases are drawn at a flow rate of 0.2 liters per minute. The APM MFC 550 is used for $PM_{2.5}$. This system is a manual method for sampling fine particles ($PM_{2.5}$ fraction) and is based on Impactor designs standardized by USEPA for ambient air quality monitoring.

$PM_{2.5}$ & PM_{10} have been estimated by gravimetric method. Improved West and Gaeke method (IS-5182 part-II, 1969) has been adopted for estimation of SO_2 and Modified Jacobs-Hochheiser method (IS-5182 part-VI, 1975) has been adopted for the estimation of NO_X.

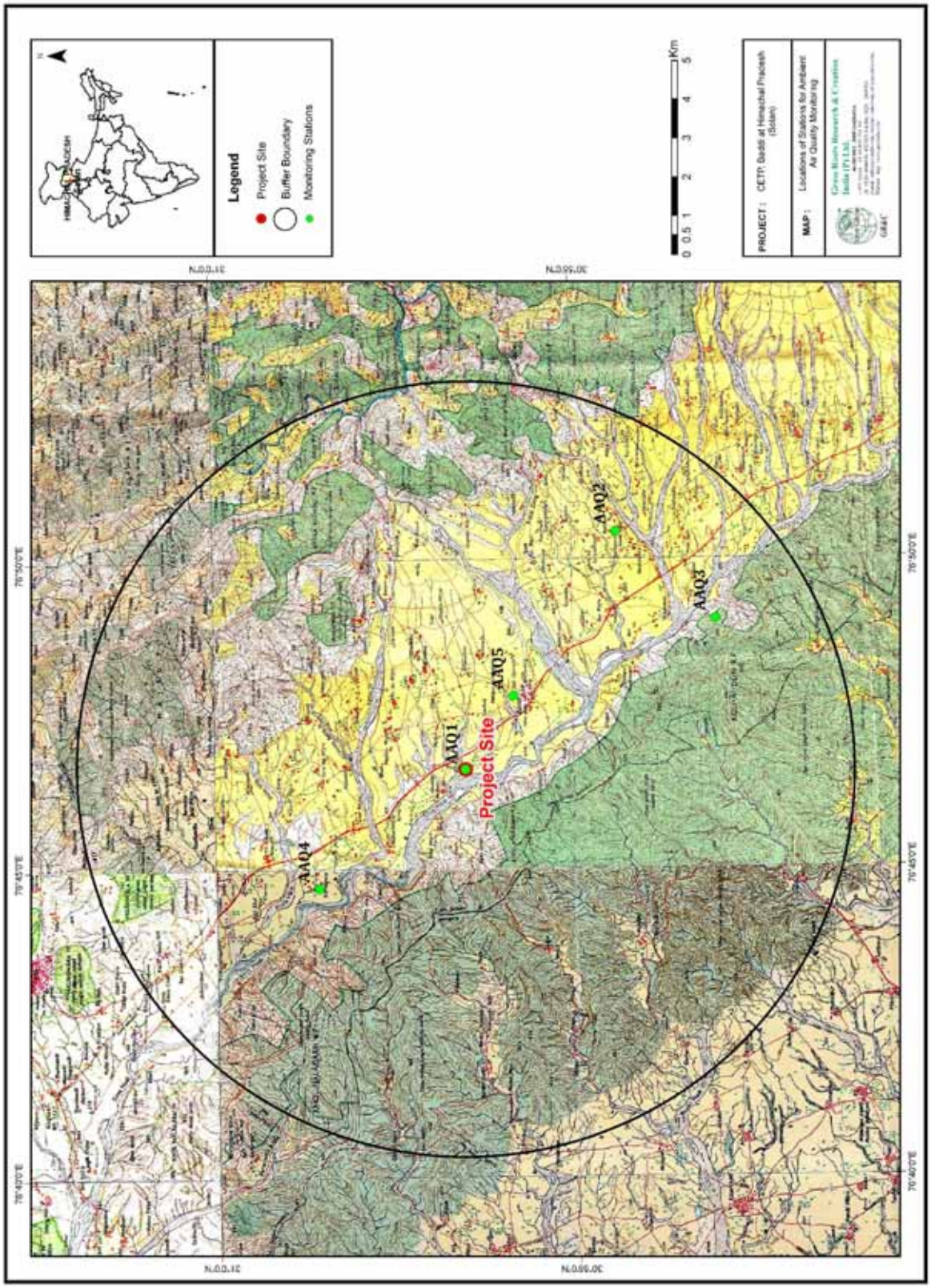


Fig. 3.2: Locations of Ambient Air Monitoring

Method for Measurement of Carbon Monoxide – NDIR method

Instrument used: Ecotech Serinus 30 Carbon Monoxide: This analyser is used to measure CO in ambient air, in the range of 0-200 ppm (220mg/m^3) to a sensitivity of 0.05 ppm i.e. 55µg/m^3). The Serinus 30 combines the benefits of Microprocess control with Non-Dispersive Infrared Spectrophotometry technology. CO Concentration is automatically corrected for gas temperature and pressure changes.

RESULTS AND DISCUSSION

The results of AAQ monitoring are given in **Annexure 4** in detail and summarized in the tables given below. The results when compared with National Ambient Air Quality Standards (NAAQS) of Ministry of Environment and Forests (MoEF), 16th November 2009 (**Annexure 5**) for "Industrial, Residential, Rural and Other Areas" show that the average values of ambient air quality parameters are well within the stipulated limits.

The results of ambient air quality monitoring are summarized below:

Ambient Air Quality with Respect to $PM_{2.5}$

The values of Particulate Matter ($PM_{2.5}$) in study area are presented in **Table 3.3(a)**. The seasonal maximum, minimum and average values of $PM_{2.5}$ observed at the project site were 44.9 µg/m^3, 39.2 µg/m^3 and 41.1 µg/m^3 respectively. The 98th percentile values of PM2.5 varied at different stations from 43.8 µg/m^3 (AQ1), 48.6 µg/m^3 (AQ2), 46.8 µg/m^3 (AQ3), 44.2 µg/m^3 (AQ4) and 47.6 µg/m^3 (AQ5). All these values are below the stipulated standard of 60 µg/m^3.

Table 3.3 (a) Ambient Air Quality with respect to $PM_{2.5}$

Concentration in µg/m^3					
Location	**AQ 1**	**AQ 2**	**AQ 3**	**AQ 4**	**AQ 5**
Min	39.2	40.5	38.3	35.4	40.4
Max	44.9	49.6	47.6	44.8	48.4
Average	41.1	43.9	42.9	40.6	43.0
98 Percentile	43.8	48.6	46.8	44.2	47.6

(Source: GRC India Training and Analytical Laboratory)

Ambient Air Quality with respect to PM_{10}

The values of Particulate Matter (PM_{10}) in study area are presented in **Table 3.3(b)**. The seasonal maximum, minimum and average values of PM_{10} observed at the project site were 83.5 µg/m^3, 65.5 µg/m^3 and 71.7 µg/m^3 respectively. The 98th percentile values of PM10 varied at different stations from 82.6 µg/m^3 (AQ1), 91.5 µg/m^3 (AQ2), 88.2 µg/m^3 (AQ3), 79.3 µg/m^3 (AQ4) and 89.4 µg/m^3 (AQ5). All these values are below the stipulated standard of 100 µg/m^3.

Table 3.3 (b) Ambient Air Quality with respect to PM_{10}

Concentration in µg/m^3					
Location	**AQ 1**	**AQ 2**	**AQ 3**	**AQ 4**	**AQ 5**
Min	65.5	75.4	72.5	64.2	76.2
Max	83.5	92.5	88.7	80.3	91.4
Average	71.7	81.3	80.9	69.3	81.1
98 Percentile	82.6	91.5	88.2	79.3	89.4

(Source: GRC India Training and Analytical Laboratory)

Ambient Air Quality with respect to SO_2

The values of Particulate Matter (SO_2) in study area are presented in **Table 3.3(c)**. The seasonal maximum, minimum and average values of SO_2 observed at the project site were 10.8 µg/m^3, 6.1 µg/m^3 and 7.8 µg/m^3 respectively. The 98th percentile values of SO2 varied at different stations from 10.2 µg/m^3 (AQ1), 12.7 µg/m^3 (AQ2), 11.1 µg/m^3 (AQ3), 9.4 µg/m^3 (AQ4) and 12.2 µg/m^3 (AQ5). All these values are below the stipulated standard of 80 µg/m^3.

Table 3.3 (c): Ambient Air Quality with respect to SO_2

Concentration in µg/m^3					
Location	**AQ 1**	**AQ 2**	**AQ 3**	**AQ 4**	**AQ 5**
Min	6.1	8.5	7.2	5.8	8.2
Max	10.8	13.1	11.6	9.7	12.8
Average	7.8	10.1	8.8	7.4	9.8
98 Percentile	10.2	12.7	11.1	9.4	12.2

(Source: GRC India Training and Analytical Laboratory)

Ambient Air Quality with respect to NO_x

The values of Particulate Matter (NO_x) in study area are presented in **Table 3.3(a)**. The seasonal maximum, minimum and average values of NO_x observed at the project site were 21.6 µg/m^3, 15.8 µg/m^3 and 17.2 µg/m^3 respectively. The 98th percentile values of NOx varied at different stations from 20.9 µg/m^3 (AQ1), 25.3 µg/m^3 (AQ2), 23.4 µg/m^3 (AQ3), 19.5 µg/m^3 (AQ4) and 24.3 µg/m^3 (AQ5). All these values are below the stipulated standard of 80 µg/m^3.

Table 3.3 (d): Ambient Air Quality with respect to NOx

Concentration in µg/m^3					
Location	**AQ 1**	**AQ 2**	**AQ 3**	**AQ 4**	**AQ 5**
Min	15.8	16.7	15.1	13.5	15.8
Max	21.6	26.4	24.7	20.7	25.6
Average	17.2	19.9	17.4	15.7	18.2
98 Percentile	20.9	25.3	23.4	19.5	24.3

(Source: GRC India Training and Analytical Laboratory)

Ambient Air Quality with respect to CO

The values of Particulate Matter (CO) in study area are presented in **Table 3.3(e)**. The seasonal maximum, minimum and average values of CO observed at the project site were 1160 µg/m^3, 730 µg/m^3 and 890 µg/m^3 respectively. The 98th percentile values of CO varied at different stations from 1150.8 µg/m^3 (AQ1), 1227.8 µg/m^3 (AQ2), 1087.7 µg/m^3 (AQ3), 1046.2 µg/m^3 (AQ4) and 1207.0 µg/m^3 (AQ5). All these values are below the stipulated standard of 4000 µg/m^3.

Table 3.3 (e): Ambient Air Quality with respect to CO

Concentration in µg/m^3					
Location	**AQ 1**	**AQ 2**	**AQ 3**	**AQ 4**	**AQ 5**
Min	730.0	835	820	710	810.0
Max	1160.0	1260	1090	1060	1230.0
Average	890.0	997.3	975.4	886.0	997.5
98 Percentile	1150.8	1227.8	1087.7	1046.2	1207.0

(Source: GRC India Training and Analytical Laboratory)

3.4.3. Noise Levels

Noise is one of the most undesirable and unwanted by-products of our modern life style. It may not seem as insidious or harmful as air and water pollutants but it affects human health and well-being and can contribute to deterioration of human well-being in general and can cause neurological disturbances and physiological damage to the hearing mechanism in particular. It is therefore, necessary to measure both the quality as well as the quantity of noise in and around the site.

Methodology

The intensity of sound energy in the environment is measured in a logarithmic scale and is expressed in a decibel, dB(A) scale. In a sophisticated type of sound level meter, an additional circuit (filters) is provided, which modifies the received signal in such a way that it replicates the sound signal as received by the human ear and the magnitude of sound level in this scale is denoted as dB(A). The sound levels are expressed in dB(A) scale for the purpose of comparison of noise levels, which is universally accepted by the international community.

Noise levels were measured using an Integrating sound level meter manufactured by Pulsar Instruments Plc, Model NO. 91 (SL.No.B21625). It has an indicating mode of Lp and Leq. Keeping the mode in Lp for few minutes and setting the corresponding range and the weighting network in “A” weighting set the sound level meter was run for one hour time and Leq was measured at all locations.

The day noise levels have been monitored during 6.00am to 10.00pm and night noise levels, during 10.00 pm to 6.00 am at all the 5 locations, which covers residential areas, highways, industrial areas, commercial areas, and silence zones, if available within 10 km radius of the study area.

Sampling Locations.

A preliminary survey was undertaken to identify the major noise generating sources in the area. The noise survey was conducted to assess the background noise levels in different zones. Gazettes Notification (S.O. 123(E)) of MoEF dated February 14, 2000 on ambient air quality standards has different noise levels for different zones viz. industrial, commercial, and residential and silence zones. Five sampling locations were selected for the sampling of noise levels. The sampling locations are given in **Table 3.4**.

Table 3.4: Noise Level Monitoring Stations in the Study Area

Code	Locations	Type of area	Direction	Distance
NQ1	Project Site	Industrial Zone	-	-
NQ2	Kishan pura	Residential Zone	NW	4.5 km
NQ3	Malhotra Super Speciality Hospital	Silence Zone	SE	7.30 km
NQ4	Barotiwala	Industrial Zone	SE	6.0 km
NQ5	Baddi	Commercial zone	NE	2.4 km

Ambient Noise Standards

Ministry of Environment & Forests (MoEF) has notified the noise standards vide gazette notification dated February 14, 2000 for different zones under the Environment Protection Act (1986). These standards are given in **Table-3.5.**

Table 3.5: Ambient Quality Standards in respect of Noise

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

Note:

1. Daytime is from 6.00am to 10.00 pm and Nighttime is from 10.00 pm to 6.00 am.
2. Silence zone is defined as area up to 100 meters around premises of hospitals, educational institutions and courts. Use of vehicle hours, loud speakers and bursting of crackers are banned in these zones

(Source: CPCB Guidelines)

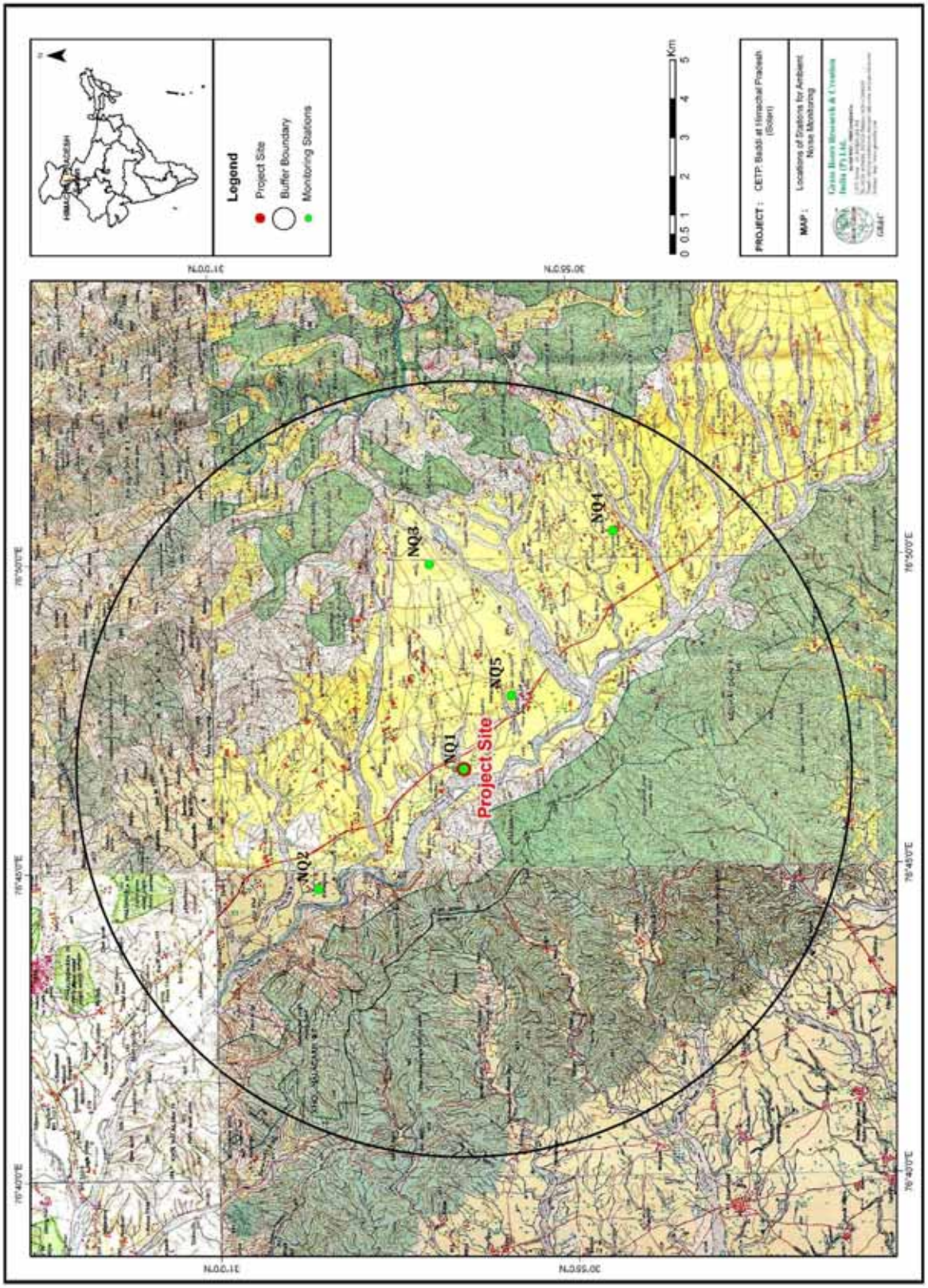


Fig. 3.3: Locations of Ambient Noise Monitoring

RESULTS AND DISCUSSION

The noise data compiled on noise levels during April 2011 is given in **Table 3.6**. It can be seen that the night time Leq (Ln) varies from 39.1 to 51.8 (A) and the daytime Leq (Ld) varies from 48.6 to 63.4 (A) within the study area. The noise levels are higher at industrial zone and commercial zone than those recorded at project site, residential zone and silence zone which is due to lesser human activity in these areas. The status of noise quality within the 10 km zone of the study area is, therefore, within the CPCB standards.

Table 3.6: Hourly Leq Noise Level in the Study Area (Mar-2011 to May-2011)

Noise Quality data Nov.2011						
S.No.	**PROJECT SITE**	**ZONE**	**LIMIT (as per CPCB Guidelines),Leq dB(A)**		**RESULT (Leq)**	
			DAY*	**NIGHT***	**DAY***	**NIGHT***
1	Project Site	Industrial Zone	75	70	58.6	45.4
2	Kishanpura	Residential Zone	55	45	52.6	41.5
3	Chitkara University	Silence zone	50	40	48.6	39.1
4	Barotiwala	Industrial Zone	75	70	63.4	51.8
5	Baddi	Commercial Zone	65	55	61.9	49.2
*	Day time	Leq(6.00AM TO 10.00PM)				
	Night time	Leq(10.00PM TO 6.00AM)				

(Source: GRC India Training and Analytical Laboratory)

3.4.4 Water Environment

Water Quality

Water quality assessment is one of the essential components of EIA study. Such assessment helps in evaluating the existing health of water body and suggesting appropriate mitigation measures to minimize the potential impact from development projects. Water quality of ground water has been studied in order to assess proposed water-uses in construction, drinking, cooling and horticulture purpose.

The water quality at the site and other locations within the 10 km impact zone was monitored during October 2011 to December 2011. The locations of the monitoring sites are depicted in **Figure 3.4 and Figure 3.5** and **Table 3.8** and the result of the monitoring and analysis of ground water and surface water is presented in the **Table 3.9(a), 3.9(b), 3.9(c)** and **Table 3.10(a), 3.10(b), 3.10(c)**.

Sampling Frequency and Sampling Techniques

Parameters for analysis of water quality were selected based on the utility of the particular source of water as per MoEF guidance. Hence quality of ground water was compared with IS: 10500: 1991 (Reaffirmed 1993 with Amendment No.3 July 2010) for drinking purposes. Surface water quality was analyzed for parameters as mentioned in the 'Methods of Monitoring & Analysis published by CPCB (in Annexure IV of CPCB guidelines)' and it was rated according to the CPCB Water Quality Criteria against A, B, C, D, & E class of water based on parameters identified in the criteria. Grab water samples were collected from sampling locations in a 5 liter plastic jerrycan and 250 ml sterilized clean glass/pet bottles for complete physico-chemical and bacteriological tests respectively. The samples were analyzed as per standard procedure / method given in IS: 3025 (Revised Part) and Standard Method for Examination of Water and Wastewater Ed. 21st (2005), published jointly APHA, AWWA and WPCF. The surface water quality is compared with CPCB water quality criteria mentioned in **Table 3.7**:

Table 3.7: Water Quality Criteria as per Central Pollution Control Board

Designated-Best-Use	Class of water	Criteria
Drinking Water Source without conventional treatment but after disinfection	A	• Total Coliforms Organism MPN/100ml shall be 50 or less • pH between 6.5 and 8.5 • Dissolved Oxygen 6mg/l or more • Biochemical Oxygen Demand 5 days 20°C 2mg/l or less
Outdoor bathing (Organized)	B	• Total Coliforms Organism MPN/100ml shall be 500 or less; • pH between 6.5 and 8.5; • Dissolved Oxygen 5mg/l or more • Biochemical Oxygen Demand 5 days 20°C 3mg/l or less
Drinking water source after conventional treatment and disinfection	C	• Total Coliform Organism MPN/100ml shall be 5000 or less;

Designated-Best-Use	Class of water	Criteria
		• pH between 6 to 9; • Dissolved Oxygen 4mg/l or more • Biochemical Oxygen Demand 5 days 20°C 3mg/l or less
Propagation of Wild life and Fisheries	D	• pH between 6.5 to 8.5 • Dissolved Oxygen 4mg/l or more • Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	• pH between 6.0 to 8.5 • Electrical Conductivity at 25°C micro mhos/cm Max.2250 • Sodium absorption Ratio Max. 26 • Boron Max. 2mg/l
	Below-E	Not Meeting A, B, C, D & E Criteria

As per the standard practice, one sample from each station was taken each month in the study period. Sampling was done by standard sampling technique as per the Standard Methods. Necessary precautions were taken for preservation of samples.

Table 3.8: Location of Water Sampling Sites

Location No.	Sample collected from
Ground Water Samples	
GW – 1	Project site
GW – 2	Barotiwala
GW – 3	Baddi
GW – 4	Kishanpura
GW – 5	Kohra
Surface Water Samples	
SW – 1	Sirsa River (up stream)
SW – 2	Sirsa River(down stream)
SW – 3	Balad Nadi
SW – 4	Ratta Nadi

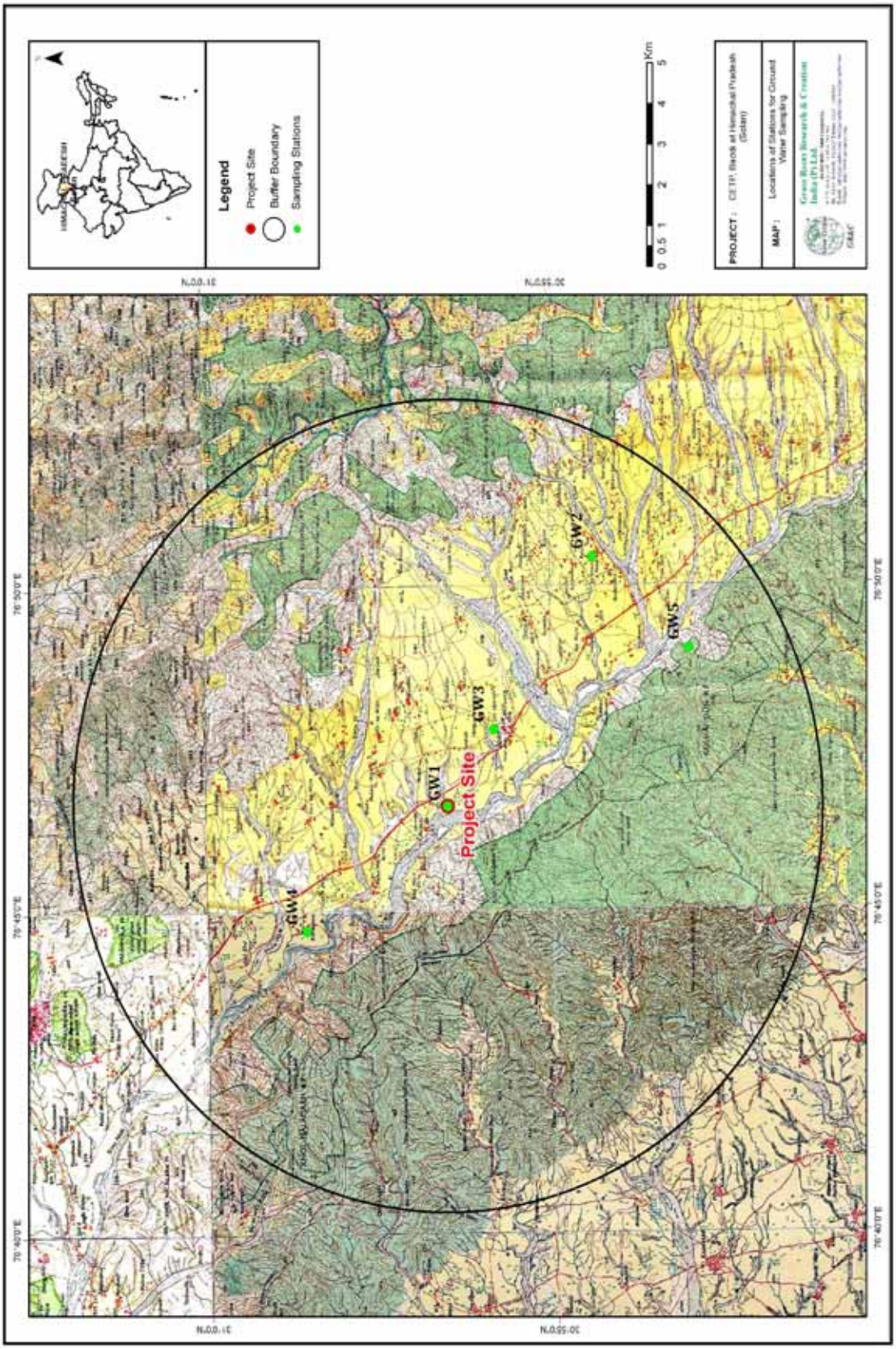


Fig. 3.4: Locations of Ground water sampling Sites

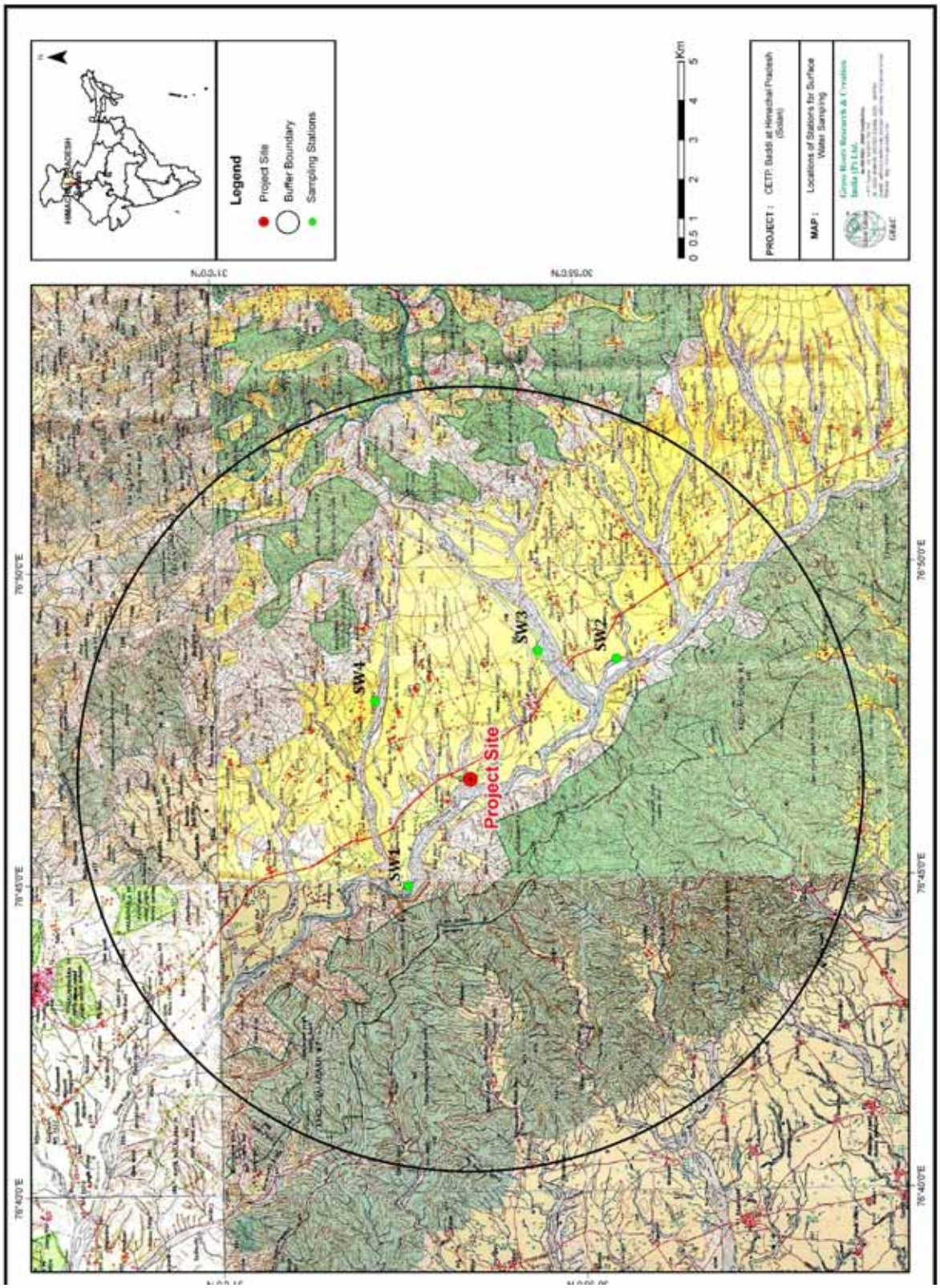


Fig. 3.5: Locations of Surface water sampling Sites

RESULTS & DISCUSSION

The results of the Ground Water analysis are given below:

Table 3.9 (a) Ground Water Quality October 2011

S. No	Parameter	Limit as per IS:10500		GW1	GW2	GW3	GW4	GW5
		Desirable Limit	Permissible Limit	Project Site	Barotiwala	Baddi	Kishanpura	Kohra
1	Colour, Hazen	5	25, Max	<2	<2	<2	<2	<2
2	Odour	Unobjectionable	-	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable
3	Taste	Agreeable	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity, NTU	5	10	<1	<1	<1	<1	<1
5	pH	6.5-8.5	No Relaxation	7.45	7.65	7.84	7.63	7.79
6	Total Hardness (as CaCO3), mg/l	300	600	260	236	220	320	354
7	Iron (as Fe), mg/l	0.3	1	0.18	0.16	0.14	0.19	0.17
8	Chlorides (as Cl), mg/l	250	1000	136	102	88	156	178
9	Fluoride (as F), mg/l	1	1.5	0.5	0.6	0.6	0.4	0.4
10	TDS, mg/l	500	2000	610	457	385	537	694
11	Calcium (as Ca2+), mg/l	75	200	50	48	57	83	74
12	Magnesium (as Mg2+), mg/l	30	100	33	28	19	27	38
13	Copper (as Cu), mg/l	0.05	1.5	<0.01	<0.01	<0.01	<0.01	<0.01
14	Manganese(as Mn), mg/l	0.1	0.3	0.03	0.02	0.05	0.03	0.03
15	Sulphate (as SO4), mg/l	200	400	62	32	24	38	43
16	Nitrate(as NO3), mg/l	45	No Relaxation	3	3	3	5	5
17	Phenolic Compounds (as C6H5OH), mg/l	0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001
18	Mercury (as Hg), mg/l	0.001	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001
19	Cadmium (as Cd), mg/l	0.01	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
20	Selenium (as Se), mg/l	0.01	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
21	Arsenic (as As), mg/l	0.01	No Relaxatio	<0.01	<0.01	<0.01	<0.01	<0.01

S. No	Parameter	Limit as per IS:10500		GW1	GW2	GW3	GW4	GW5
		Desirable Limit	Permissible Limit	Project Site	Barotiwala	Baddi	Kishanpura	Kohra
			n					
22	Cyanide (as CN), mg/l	0.05	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
23	Lead (as Pb), mg/l	0.05	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
24	Zinc (as Zn), mg/l	5	15	0.15	0.14	0.11	0.16	0.14
25	Anionic Detergent (as MBAS), mg/l	0.2	1	<0.01	<0.01	<0.01	<0.01	<0.01
26	Chromium (as Cr6+), mg/l	0.05	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
27	Mineral oil, mg/l	0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01
28	Alkalinity (as CaCO3), mg/l	200	600	240	191	165	173	272
29	Aluminum (as Al), mg/l	0.03	0.2	<0.02	<0.02	<0.02	<0.02	<0.02
30	Boron (as B), mg/l	1	5	0.1	0.2	0.1	0.2	0.1
	Microbiological Parameter							
1	Total Coliform, MPN/100 ml	10 , Max	-	<2	<2	<2	7	6
2	E.coli, MPN/100ml	Absent	-	Absent	Absent	Absent	Absent	Absent

(Source: GRC India Training and Analytical Laboratory)

Table 3.9 (b) Ground Water Quality November 2011

S. No.	Parameter	Limit as per IS:10500		GW1	GW2	GW3	GW4	GW5
		Desirable Limit	Permissible Limit	Project Site	Barotiwala	Baddi	Kishanpura	Kohra
1	Colour, Hazen	5	25, Max	<2	<2	<2	<2	<2
2	Odour	Unobjectionable	-	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable
3	Taste	Agreeable	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity, NTU	5	10	<1	<1	<1	<1	<1
5	pH	6.5-8.5	No Relaxation	7.52	7.74	7.76	7.58	7.81
6	Total	300	600	252	223	242	298	336

S. No.	Parameter	Limit as per IS:10500		GW1	GW2	GW3	GW4	GW5
		Desirable Limit	Permissible Limit	Project Site	Barotiwala	Baddi	Kishanpura	Kohra
	Hardness (as CaCO3), mg/l							
7	Iron (as Fe), mg/l	0.3	1	0.21	0.18	0.16	0.17	0.19
8	Chlorides (as Cl), mg/l	250	1000	120	96	92	137	159
9	Fluoride (as F), mg/l	1	1.5	0.6	0.8	0.7	0.5	0.5
10	TDS, mg/l	500	2000	570	431	394	493	637
11	Calcium (as Ca2+), mg/l	75	200	46	52	54	76	68
12	Magnesium (as Mg2+), mg/l	30	100	33	22	26	26	39
13	Copper (as Cu), mg/l	0.05	1.5	<0.01	<0.01	<0.01	<0.01	<0.01
14	Manganese(as Mn), mg/l	0.1	0.3	0.02	0.03	0.04	0.04	0.05
15	Sulphate (as SO4), mg/l	200	400	57	36	22	41	39
16	Nitrate(as NO3), mg/l	45	No Relaxation	4	3	4	5	5
17	Phenolic Compounds (as C6H5OH), mg/l	0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001
18	Mercury (as Hg), mg/l	0.001	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001
19	Cadmium (as Cd), mg/l	0.01	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
20	Selenium (as Se), mg/l	0.01	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
21	Arsenic (as As), mg/l	0.01	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
22	Cyanide (as CN), mg/l	0.05	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
23	Lead (as Pb), mg/l	0.05	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
24	Zinc (as Zn), mg/l	5	15	0.17	0.15	0.13	0.14	0.15

S. No.	Parameter	Limit as per IS:10500		GW1	GW2	GW3	GW4	GW5
		Desirable Limit	Permissible Limit	Project Site	Barotiwala	Baddi	Kishanpura	Kohra
25	Anionic Detergent (as MBAS), mg/l	0.2	1	<0.01	<0.01	<0.01	<0.01	<0.01
26	Chromium (as Cr6+), mg/l	0.05	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
27	Mineral oil, mg/l	0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01
28	Alkalinity (as CaCO3), mg/l	200	600	232	178	172	160	256
29	Aluminum (as Al), mg/l	0.03	0.2	<0.02	<0.02	<0.02	<0.02	<0.02
30	Boron (as B), mg/l	1	5	0.2	0.1	0.2	0.2	0.1
	Microbiological Parameter							
1	Total Coliform, MPN/100ml	10 , Max	-	<2	<2	<2	4	6
2	E.coli, MPN/100ml	Absent	-	Absent	Absent	Absent	Absent	Absent

(Source: GRC India Training and Analytical Laboratory)

Table 3.9 (c) Ground Water Quality December 2011

S. No	Parameter	Limit as per IS:10500		GW1	GW2	GW3	GW4	GW5
		Desirable Limit	Permissible Limit	Project Site	Barotiwala	Baddi	Kishanpura	Kohra
1	Colour, Hazen	5	25, Max	<2	<2	<2	<2	<2
2	Odour	Unobjectionable	-	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable
3	Taste	Agreeable	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity, NTU	5	10	<1	<1	<1	<1	<1
5	pH	6.5-8.5	No Relaxation	7.61	7.83	7.94	7.68	8.04
6	Total Hardness (as CaCO3), mg/l	300	600	278	248	261	332	368

S. No	Parameter	Limit as per IS:10500		GW1	GW2	GW3	GW4	GW5
		Desirable Limit	Permissible Limit	Project Site	Barotiwala	Baddi	Kishanpura	Kohra
7	Iron (as Fe), mg/l	0.3	1	0.2	0.15	0.17	0.16	0.17
8	Chlorides (as Cl), mg/l	250	1000	128	109	98	145	165
9	Fluoride (as F), mg/l	1	1.5	0.5	0.7	0.6	0.6	0.6
10	TDS, mg/l	500	2000	621	486	427	592	677
11	Calcium (as Ca2+), mg/l	75	200	62	58	60	77	80
12	Magnesium (as Mg2+), mg/l	30	100	30	25	27	34	41
13	Copper (as Cu), mg/l	0.05	1.5	<0.01	<0.01	<0.01	<0.01	<0.01
14	Manganese (as Mn), mg/l	0.1	0.3	0.02	0.03	0.04	0.04	0.05
15	Sulphate (as SO4), mg/l	200	400	62	42	32	47	40
16	Nitrate(as NO3), mg/l	45	No Relaxation	3	4	4	5	6
17	Phenolic Compounds (as C6H5OH), mg/l	0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001
18	Mercury (as Hg), mg/l	0.001	No Relaxation	<0.001	<0.001	<0.001	<0.001	<0.001
19	Cadmium (as Cd), mg/l	0.01	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
20	Selenium (as Se), mg/l	0.01	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
21	Arsenic (as As), mg/l	0.01	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
22	Cyanide (as CN), mg/l	0.05	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
23	Lead (as Pb), mg/l	0.05	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
24	Zinc (as Zn), mg/l	5	15	0.14	0.15	0.15	0.12	0.14
25	Anionic	0.2	1	<0.01	<0.01	<0.01	<0.01	<0.01

S. No	Parameter	Limit as per IS:10500		GW1	GW2	GW3	GW4	GW5
		Desirable Limit	Permissible Limit	Project Site	Barotiwala	Baddi	Kishanpura	Kohra
	Detergent (as MBAS), mg/l							
26	Chromium (as Cr6+), mg/l	0.05	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
27	Mineral oil, mg/l	0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01
28	Alkalinity (as CaCO3), mg/l	200	600	220	168	183	191	240
29	Aluminum (as Al), mg/l	0.03	0.2	<0.02	<0.02	<0.02	<0.02	<0.02
30	Boron (as B), mg/l	1	5	0.2	0.1	0.2	0.2	0.2
	Microbiological Parameter							
1	Total Coliform, MPN/100ml	10 , Max	-	<2	<2	<2	<2	4
2	*E. coli,* MPN/100ml	Absent	-	Absent	Absent	Absent	Absent	Absent

(Source: GRC India Training and Analytical Laboratory)

Results of Ground Water Analysis

Preliminary survey was carried out to identify ground water sampling location, considering its uses for domestic and drinking purposes and other activities. Based on this different locations were selected for ground water sampling in all direction in different villages. The physico-chemical, biological and microbiological characteristics of ground water samples are given in the **3.9(a) to 3.9(c).**

- The total dissolved solids were observed in the range 570 to 621 mg/l which is slightly highly than desirable limit but within permissible limit.
- The total hardness, as $CaCO_3$ was observed in the range of 252 to 278 mg/l, which is within desirable limit.

- The concentrations of calcium observed in the range 46 to 62 mg/l, which is within the permissible limit of 200 mg/l and the concentrations of magnesium was observed in the range 30 to 33 mg/l.
- The concentration of chloride was observed in the range 120 to 136 mg/l which is within desirable limit
- The concentrations of sulphate were observed in the range 57 to 62 mg/l, which is below the desirable limit of 200 mg/l.
- The concentrations of nitrate were observed in the range 3 to 4 mg/l which is well within the desirable limit.
- The concentrations of zinc and cyanide are observed in the range of 0.14 to 0.17 mg/l and <0.01 mg/l, respectively which are well within the desirable limits.
- Total Coliform count is around MPN 10/100 ml and *E.coli* is absent in water samples.

It is, therefore, concluded that the ground water at the site is safe for use as potable water. All the parameters are within the permissible limit. There is no alternative source of drinking water. So this water can be used as drinking purpose.

The surface water quality in the impact zone was assessed through physico-chemical and bacteriological analysis of water samples. The results have been compared with the Surface Water Quality Criteria of CPCB based on designated best uses. The results of the surface water Quality are given below:

Table 3.10(a) Surface Water Quality October 2011

S. No.	Parameter	S.W. 1	S.W. 2	SW3	SW4
		Sirsa River Upstream	Sirsa River Downstream	Balad Nadi	Ratta Nadi
1	pH	7.74	7.64	7.55	7.63
2	Dissolved oxygen, mg/l	1.3	0.9	2.4	2.8
3	BOD (3 Days at 27°C), mg/l	22	26	19	18
4	Free Ammonia (as N), mg/l	0.12	0.12	<0.1	<0.1
5	Sodium Adsorption Ratio	2.78	2.66	2.46	2.68
6	Boron, mg/l	0.4	0.6	0.3	0.3
7	Conductivity, µmhos/cm	644	692	622	618

S. No.	Parameter	S.W. 1	S.W. 2	SW3	SW4
		Sirsa River Upstream	Sirsa River Downstream	Balad Nadi	Ratta Nadi
8	Temperature, (°C)	24	25	23	25
9	Turbidity, NTU	12	15	7	10
10	Magnesium Hardness (as CaCO3), mg/l	60	54	48	38
11	Total Alkalinity (as CaCO3), mg/l	240	196	184	176
12	Chloride (as Cl), mg/l	80	82	64	52
13	sulphate (as SO4), mg/l	16	20	18	12
14	Nitrate (as NO3), mg/l	7	8	5	5
15	Fluoride (as F), mg/l	0.8	0.6	0.6	0.7
16	Sodium (as Na), mg/l	86	78	68	66
17	Potassium (as K), mg/l	7.1	6.2	5.4	5.8
18	TKN, mg/l	4.5	6.1	2.8	3.8
19	Total Phosphorous (as PO4), mg/l	0.31	0.58	0.22	0.26
20	COD, mg/l	124	156	88	76
21	Phenollic compounds (as C6H5OH), mg/l	<0.001	<0.001	<0.001	<0.001
22	Lead (as Pb), mg/l	<0.01	<0.01	<0.01	<0.01
23	Iron (as Fe), mg/l	0.51	0.72	0.28	0.34
24	Cadmium (as Cd), mg/l	<0.01	<0.01	<0.01	<0.01
25	Zinc (as Zn), mg/l	0.08	0.11	0.06	0.05
26	Arsenic (as As), mg/l	<0.01	<0.01	<0.01	<0.01
27	Mercury (as Hg), mg/l	<0.001	<0.001	<0.001	<0.001
28	Chromium (as Cr), mg/l	<0.001	<0.001	<0.001	<0.001
29	TDS, mg/l	450	410	360	318
30	Nickel, mg/l	<0.01	<0.01	<0.01	<0.01
	Microbiological Parameter				
1	Total Coliform, MPN/100ml	1700	2100	700	500
2	*E. coli*, MPN/100ml	700	900	300	220

(Source: GRC India Training and Analytical Laboratory)

Table 3.10(b) Surface Water Quality November 2011

S. No.	Parameter	S.W. 1	S.W. 2	S.W. 3	S.W. 4
		Sirsa River Upstream	Sirsa River Downstream	Balad Nadi	Ratta Nadi
1	pH	7.72	7.82	7.65	7.58
2	Dissolved oxygen, mg/l	2.1	1.8	2.9	3.1
3	BOD (3 Days at 27°C), mg/l	20	24	18	16
4	Free Ammonia (as N), mg/l	<0.1	<0.1	<0.1	<0.1
5	Sodium Adsorption Ratio	2.86	2.6	2.4	2.38
6	Boron, mg/l	0.5	0.5	0.2	0.3
7	Conductivity, µmhos/cm	674	644	612	532
8	Temperature, (°C)	18	19	16	16
9	Turbidity, NTU	10	13	6	8
10	Magnesium Hardness (as CaCO3), mg/l	54	48	42	40
11	Total Alkalinity (as CaCO3), mg/l	232	186	174	158
12	Chloride (as Cl), mg/l	68	72	52	48
13	sulphate (as SO4), mg/l	20	18	16	10
14	Nitrate (as NO3), mg/l	6	7	5	4
15	Fluoride (as F), mg/l	0.7	0.8	0.5	0.6
16	Sodium (as Na), mg/l	84	72	62	60
17	Potassium (as K), mg/l	6.8	5.6	5.2	5.4
18	TKN, mg/l	4.8	5.5	2.4	2.9
19	Total Phosphorous (as PO4), mg/l	0.28	0.51	0.24	0.22
20	COD, mg/l	119	142	70	68
21	Phenolic compounds (as C6H5OH), mg/l	<0.001	<0.001	<0.001	<0.001
22	Lead (as Pb), mg/l	<0.01	<0.01	<0.01	<0.01
23	Iron (as Fe), mg/l	0.48	0.83	0.26	0.38
24	Cadmium (as Cd), mg/l	<0.01	<0.01	<0.01	<0.01
25	Zinc (as Zn), mg/l	0.1	0.13	0.05	0.07
26	Arsenic (as As), mg/l	<0.01	<0.01	<0.01	<0.01
27	Mercury (as Hg), mg/l	<0.001	<0.001	<0.001	<0.001
28	Chromium (as Cr), mg/l	<0.001	<0.001	<0.001	<0.001
29	TDS, mg/l	432	385	342	294
30	Nickel, mg/l	<0.01	<0.01	<0.01	<0.01
	Microbiological Parameter				

S. No.	Parameter	S.W. 1	S.W. 2	S.W. 3	S.W. 4
		Sirsa River Upstream	Sirsa River Downstream	Balad Nadi	Ratta Nadi
1	Total Coliform, MPN/100ml	1100	1400	500	390
2	*E. coli*, MPN/100ml	500	700	230	170

(Source: GRC India Training and Analytical Laboratory)

Table 3.10(c) Surface Water Quality December 2011

S. N.	Parameter	S.W. 1	S.W. 2	S.W. 3	S.W. 4
		Sirsa River Upstream	Sirsa River Downstream	Balad Nadi	Ratta Nadi
1	pH	7.68	7.71	7.58	7.69
2	Dissolved oxygen, mg/l	2.4	2.2	3.2	3.4
3	BOD (3 Days at 27°C), mg/l	18	20	15	14
4	Free Ammonia (as N), mg/l	<0.1	<0.1	<0.1	<0.1
5	Sodium Adsorption Ratio	2.84	2.57	2.6	2.18
6	Boron, mg/l	0.2	0.2	0.2	0.3
7	Conductivity, µmhos/cm	596	588	534	518
8	Temperature, (°C)	8	10	6	8
9	Turbidity, NTU	8	10	6	7
10	Magnesium Hardness (as CaCO3), mg/l	50	44	38	36
11	Total Alkalinity (as CaCO3), mg/l	224	174	160	146
12	Chloride (as Cl), mg/l	60	66	58	42
13	sulphate (as SO4), mg/l	17	15	12	14
14	Nitrate (as NO3), mg/l	5	7	4	4
15	Fluoride (as F), mg/l	0.7	0.6	0.5	0.5
16	Sodium (as Na), mg/l	80	68	64	52
17	Potassium (as K), mg/l	6.4	5.5	5.4	4.8
18	TKN, mg/l	4.6	5.2	2.1	2.4
19	Total Phosphorous (as PO4), mg/l	0.26	0.48	0.18	0.21
20	COD, mg/l	108	136	62	50
21	Phenolic compounds (as C6H5OH), mg/l	<0.001	<0.001	<0.001	<0.001
22	Lead (as Pb), mg/l	<0.01	<0.01	<0.01	<0.01
23	Iron (as Fe), mg/l	0.42	0.71	0.23	0.34
24	Cadmium (as Cd), mg/l	<0.01	<0.01	<0.01	<0.01

S. N.	Parameter	S.W. 1	S.W. 2	S.W. 3	S.W. 4
		Sirsa River Upstream	Sirsa River Downstream	Balad Nadi	Ratta Nadi
25	Zinc (as Zn), mg/l	0.08	0.11	0.04	0.06
26	Arsenic (as As), mg/l	<0.01	<0.01	<0.01	<0.01
27	Mercury (as Hg), mg/l	<0.001	<0.001	<0.001	<0.001
28	Chromium (as Cr), mg/l	<0.001	<0.001	<0.001	<0.001
29	TDS, mg/l	402	350	318	274
30	Nickel, mg/l	<0.01	<0.01	<0.01	<0.01
	Microbiological Parameter				
1	Total Coliform, MPN/100ml	900	1100	340	330
2	*E. coli*, MPN/100ml	400	500	170	130

(Source: GRC India Training and Analytical Laboratory)

Results of Surface Water Analysis

Preliminary survey was carried out to identify surface water sampling location, considering its uses for domestic and drinking purposes and other activities. Based on this different locations were selected for surface water sampling in all direction in different villages. The results obtained for surface water quality are given in the **3.10 (a) to 3.10 (c).**

The surface water samples from the Sirsa River (upstream and downstream of discharge of Balad Nadi), Balad Nadi and Ratta Nadi showed polluted water quality due to discharge of industrial effluent and sewage in them. The Sirsa River was observed to be more polluted at the downstream of the confluence of the Balad nadi with it. The Balad nadi and Ratta nadi are comparatively less polluted than Sirsa River. The salient physico-chemical and microbiological characteristics of these river waters are given below.

- The total dissolved solids were observed in the range 274 to 450 mg/l.
- The total hardness, as $CaCO_3$ was observed in the range of 148 to 24 mg/l.
- The concentrations of magnesium were observed in the range 36 to 60 mg/l.
- The concentration of chloride was observed in the range 42 to 82 mg/l.
- The concentrations of sulphate were observed in the range 10 to 20 mg/l.
- The concentrations of nitrate were observed in the range 4 to 8 mg/l.
- The concentrations of zinc and cyanide are observed in the range of 0.04 to 0.13 mg/l and <0.01 mg/l, respectively which are well within the desirable limit.

Comparing the values of pH, DO, BOD and Total Coliforms with 'Use based classification of surface waters' published by Central Pollution Control Board; it can be seen that the analyzed surface waters is highly polluted and classified as "Below Class 'E'" and can not be used for designated uses of water. Bacteriological examination of surface water indicates the presence of total coliforms, which may be due to presence of human activities in the area and inorganic industrial waste.

3.4.5 Land environment

Land is the most vital resource for sustenance of life and degradations of land due to industrialization, urbanization and population growth is a matter of concern. Therefore, it is necessary to establish the existing land use pattern to optimize the land use as well as minimize degradation due to the developmental activities. Also it is necessary to study the landform of the project site and the quality of the soil as soil erosion further deteriorates the quality of the land.

Topography

The Solan District is located on the Shivalik and lesser Himalayan zone and has mountainous terrain with moderate to high relief. The altidude of the 10 km study area around the project site varies from 500 to 900 m above mean sea level. The topography of the area is represented by moderate hills and plain valley. The average country slope is 0.9% to 10 %. The Baddi-Barotiwala-Nalagarh area is present on the south of Shivalik in the plain area. The area is essentially rural in nature, except the industrial towns of Baddi-Barotiwala and Nalagarh town. The topography is represented by steeply rising hills and restricts the mobility to defined routes and tracks only. However, the hill ranges are aligned in general in northwest southeast direction.

The Project area is criss-crossed by Seasonal Streams and drained by River Sirsa that is flowing in the downstream of twin industrial complex, receives the industrial and domestic effluents from this twin industrial complex in addition to the various non point pollution loads from domestic and agricultural sectors. This river with a mainstream channel length of 41 km originates in the Panchkula District of Haryana and after flowing in Northwest direction it confluences with River Sutlej near Ropar. The River Sirsa flows to the north of the proposed project.

Land use–description

The landuse / landcover of the project site were done to identify the landuse pattern and landcover pattern of the study area. The study of land use in the area enables one to know

about the land that can be used for various development activities envisaged in post project scenario. It also enables to envisage the scenario emerging due to the increase in demand for land with increase in population and the impacts arising due to the interface with the various project activities.

Objectives of the Study

The objectives of the present study are:

- To map the study area with respect to various land use/land cover change over the past 10 years.
- To identify the sensitive areas within 10 km radius around the project site.

Sirsa River is the source of surface water. The settlement areas near to the project site covers mainly the villages like Malpur, Bilanwali, Makhnu majra, Lehi, Thapul and Mohiyapur .The project area within 10 km radius study area and its surroundings are mainly forest and agricultural field.

Methodology

The landuse / landcover pattern has been established based on the analysis of the data received from satellite imagery by making landuse/landcover map with the help of GIS technique. References have been taken from Survey of India toposheet 53A-12, 53 A-16, 53B-9, 53B-13. Also the data based on Census of India, 2001 was referred and landuse study was done within 10 km radius area with limited ground truth verifications. Ground and ancillary information have been used to identify the sensitive places within 10 km radius of the project.

Land Use Pattern

The landuse / landcover pattern of the study area is mainly dominated by the types - agricultural land, waterbodies, settlements, forests and scrub land. The forest land covers the majority of the land which is about 44.64% of the study area, the agriculture landuse cover the second highest pattern of the landuse covering about 34.72 % and scrub land being 16.04%. Settlement area covers 0.21 % of the total land within 10 km radius. The land use data are presented in **Table 3.11** and also highlighted with a pie chart at **Figure 3.6**. The landuse / landcover map is presented in **Figure 3.7**.

Table 3.11: Landuse / Landcover Pattern of the Study area

Type	Area (ha)	Area Percentage (%)
Settlements	68.33	0.21
Scrub Land	5040.85	16.04
Forest	14022.17	44.64
Water Bodies	1373.05	4.37
Agriculture	10906.65	34.72
Total	**31,411.05**	**100**

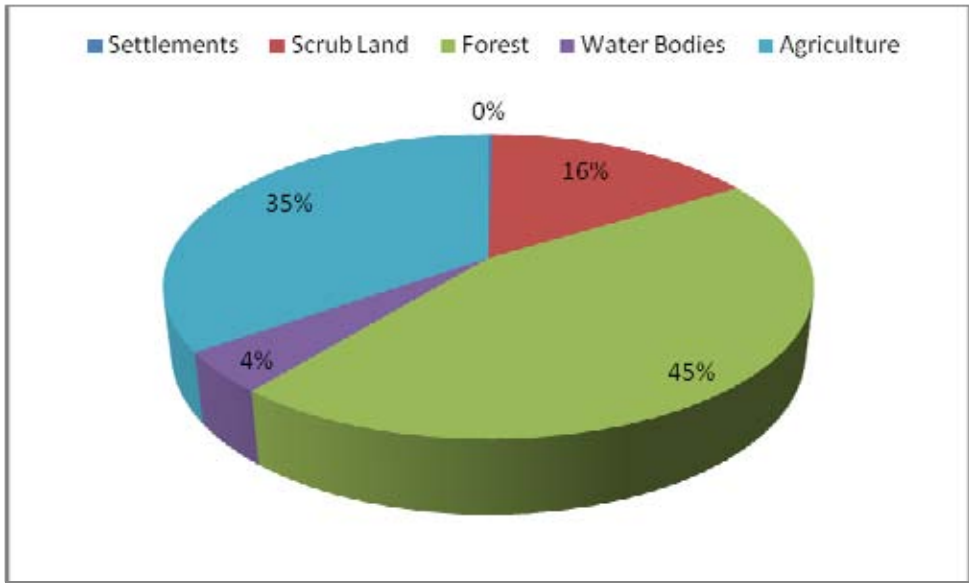


Figure 3.6 Land-use Pattern of the Study Area

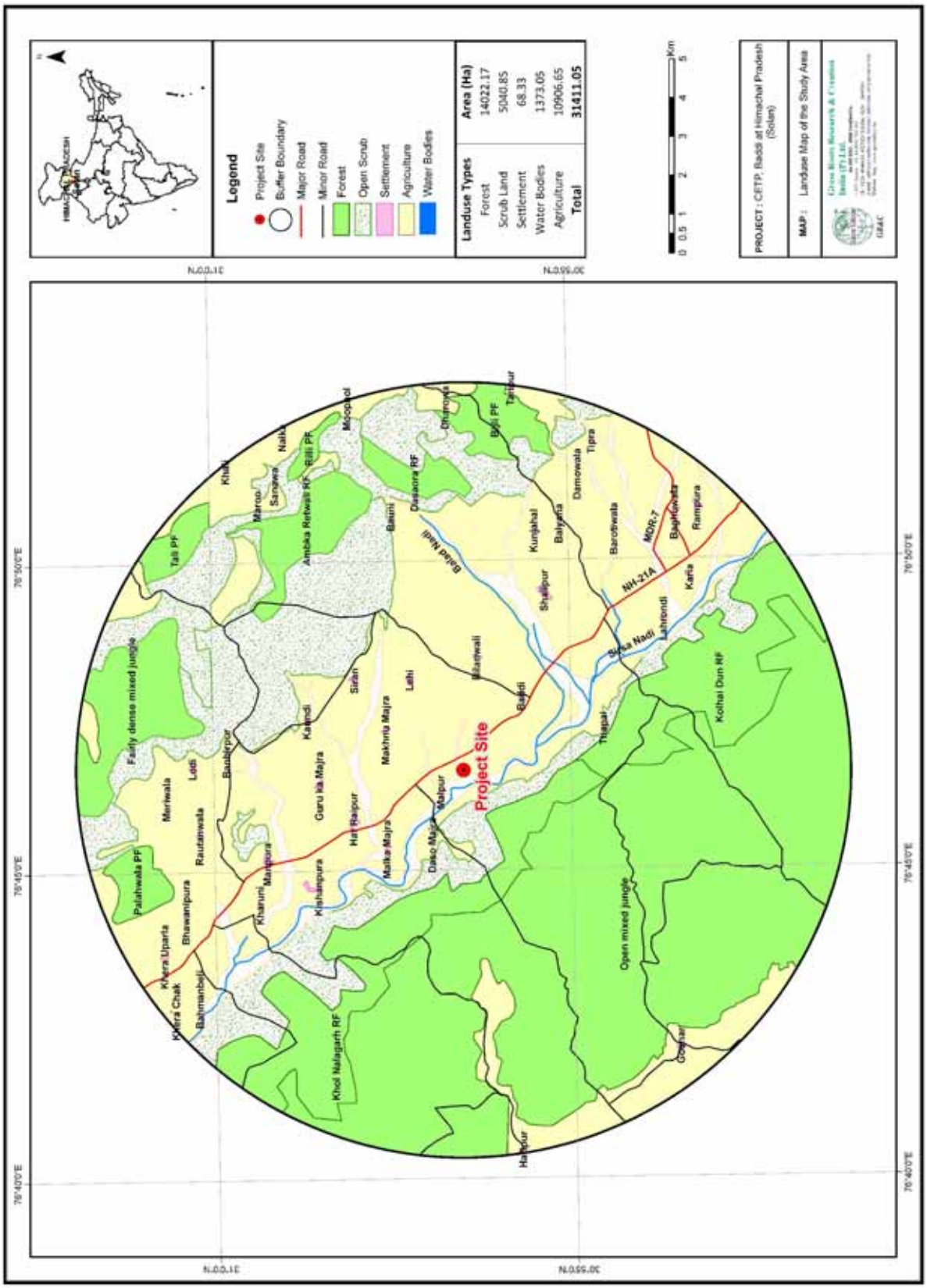


Figure 3.7: Land-use Map of Study Area

Soil Characteristics

The composite soil samples were collected from project site and the study area and were analyzed for characterization. The locations of the monitoring sites are depicted in **Table 3.13**, and **Figure 3.8** and the result of the monitoring and analysis is presented in the **Table 3.14**

Methodology for Soil Sampling and Monitoring

The soil samples were collected in the month of November, 2011 from 5 locations as given in **Table 3.13.** At each of these locations, 5 sub-locations were identified randomly from where soil samples were collected from surface to 30 cm below the surface. These samples collected from five places for each location were homogenously mixed. The samples were filled in polythene bags, labeled in the field with number and site name and sent to laboratory for analysis. **Table 3.12** gives the idea of the frequency and methodology of selection of soil sampling stations and monitoring process.

Table 3.12: Frequency and Methodology for Soil Sampling & Monitoring

Particulars	Details
Frequency	One *grab sample from each station– once during the Study Period
Methodology	Composite grab samples of the topsoil were collected from 5 places and mixed to provide a representative sample for analysis. They were stored in air tight Polythene Bags and analyzed at the laboratory

**Grab sample- a single sample or measurement taken at a specific time or over as short period as feasible*

Table 3.13: Soil Sample Collection Points

Locations	Locations Code	Direction	Distance
Project Site	SQ1	-	0 km
Baddi	SQ5	NE	2.4 km
Kishanpura	SQ4	NW	4.5 km
Barotiwala	SQ2	SE	6 km
Kohra	SQ3	SE	7.5 km

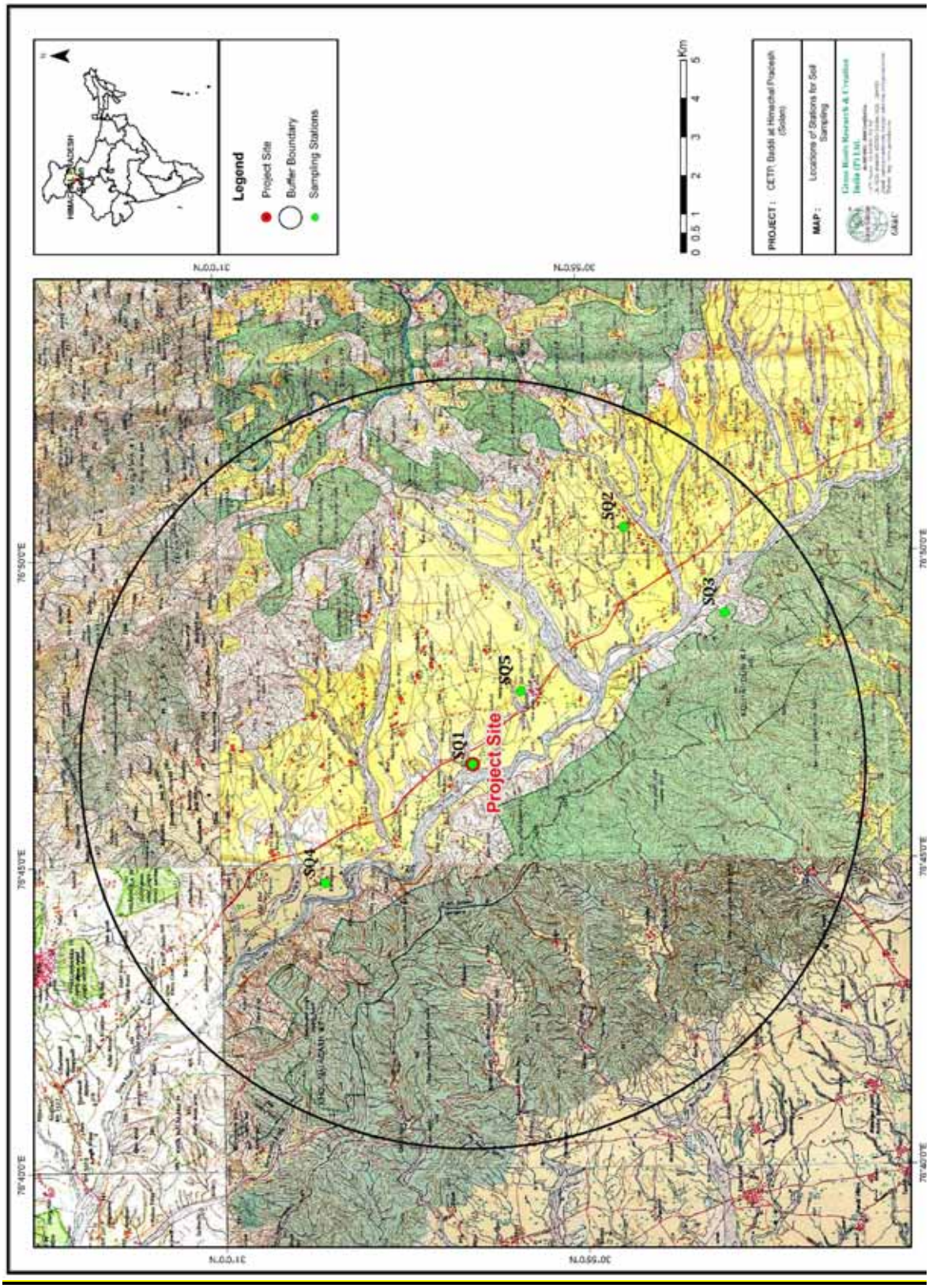


Fig. 3.8: Location of Soil Sampling Sites

Table 3.14: Phyisco-Chemical Properties of Soil

Soil Quality Data -28/10/11							
S. No	**Parameter**	**Unit**	**Project Site**	**Barotiwala**	**Kohra**	**Kishanpura**	**Baddi**
1	Texture	-	Sandy Loam	Sandy Clay Loam	Sandy Loam	Sandy Clay Loam	Sandy Loam
	Silt	%	35.99	12.4	25.88	17.2	15.04
	clay	%	11.07	26.1	17.3	28.24	24.54
	Sand	%	52.94	61.5	56.82	54.52	60.42
2	pH	-	7.85	7.84	7.77	7.62	7.68
3	Electrical Conductivity	µmhos/ cm	231	167	155	184	178
4	Cation Exchange Capacity	meq/100 gm	57.76	48.75	16.83	36.22	24.24
5	Potassium	mg/kg	54.7	33.6	61.4	38.94	59.62
6	Sodium	mg/kg	144	67	113	98	128
7	Calcium	mg/kg	7153.62	6041.72	1667	5432	3246
8	Magnesium	mg/kg	2548.03	2180	942	1024	876
9	Sodium Absorption Ratio	-	0.37	0.18	0.54	0.31	0.51
10	Water Holding Capacity	%	23.42	27.6	25.48	28.94	26.52
11	Porosity	%	38.74	43.81	40.12	41.22	42.54

(Source: GRC India Training and Analytical Laboratory)

Results of Physico-chemical Analysis of the Soil

On the basis of physical analysis of the soil of the study area, most of the soil is loam in nature, in which, clay & sand percentage is predominant.

- Electrical conductivity of the soil measured is 155 to 231
- The value of sodium was in the range 67-144 mg/kg.

- The value of magnesium was in the range of 876-2548.03 mg/kg.
- The value of calcium was in the range 1667-7153.62mg/kg.
- The soil shows a pH range of 7.62-7.85, which is basic probably due to presence of oxides and hydroxides of the basic metals in moderate amount.

The results show that the soils in the study area are fertile in nature

3.4.6 Biological Environment

Literally environment stands for the totality of surrounding conditions. Animals and plants form a vital part of this sum total. Flora and fauna of an area are inter-related to each other and have a very crucial impact on human life. With changes in environmental conditions, structure, density and composition of plants and animals undergo changes as well. The present study was carried out to account for floral and faunal community in study area.

The Baddi Barotiwala Nalagarh area is located on a flat terrain which is surrounded by Dharampur Range, Surajpur-Hamirpur-Mandhala Range and Shivalik Hills. The 10km radial study area has an elevation ranging from 150m to 900 m above msl. The average elevation of Baddi-Barotiwala-Nalagarh industrial area is 372m above msl. The project site is a vacant plot without any vegetation. Only some herbs and grasses are present in the project site.

Biological Environment: Terrestrial Ecology/Aquatic Ecology

The information has been collected through field studies, enquiry with local people, consultation with various government departments and collation of available literature with various institutions and organizations. The summary of data collected from various sources as a part of the EIA study is outlined in **Table 3.15**.

Table 3.15: Summary of data collected from various sources

Aspect	Mode of data collection	Parameters monitored	Frequency	Source(s)
Terrestrial Ecology	Primary data and secondary data	Floral and Faunal Inventory/ Importance	One Season (Winter)	Field studies, literature review
Aquatic Ecology	Primary data	Presence of various species/Importance	One Season (Winter)	Field studies

Methodology

Survey was conducted to evaluate flora and faunal composition of the study area (core and buffer zone). Flora was studied by collecting secondary data and by verifying it through visits to different areas in the study area and through enquiry with the local people.

Primary data on faunal composition was recorded during site visit, interview with local people and secondary data was collected from various sources to get the correct picture of the study area. The major portion of the study consists of forests and agricultural fields and human settlements.

The survey methods used for faunal assessment are:

1. Walkthrough method
2. Direct Observation Method- birds, mammals
3. Enquiry with local people

RESULTS AND DISCUSSION

The study area is undulating with plain Baddi-Barotiwala area and mountains on south-west and north-east direction with elevation varying from 150m to 900m above msl. The Flora and Fauna in the buffer zone of study area thus consists of flora and fauna of Lower Montane Zone having Montane sub-tropical climate in this outer Himalayan Zone.

Terrestrial Flora and Fauna

The project site is an open plot near village Kainduwal. The plot is on the bank of River Sirsa and consists of mainly grass species Ravenna Grass (*Saccharum ravennae*, Family Poaceae). No tree species are present. No faunal species were observed in the project site except some common birds. No sensitive biodiversity area or feeding or roosting site has been observed near or on the project site.

In Buffer zone, the forest land covers the majority of the land which is about 44.64% of the study area, the agriculture land use cover the second highest pattern of the land use covering about 34.72 % and scrub land being 16.04%.

The forests of the study area have been classified on an ecological basis as laid down by Champion and Seth, and can be broadly classified into broad-leaved Forests. Distribution of various species follows fairly regular altitudinal stratification. The vegetation varies from Dry Scrub Forests at lower hills with Shisham and Khair trees to Mixed Deciduous Forests at higher

altitude dominated by deciduous and broad-leaves bushes and trees. Many economically important tree species have been introduced in these scrub forests.. These include Eucalyptus, Neem, Siris, Toot, Drek, Ailanthus, Tun, Amla, Poplar, etc. These wet forests consist mainly of evergreen trees with a sprinkling of deciduous here and there. The broadleaves bushes and trees include *Adhatoda, Azadirachta, Bombax, Butea, Dalbergia, Albizzia, Ficus*, etc.. A large number of herbs form part of the ground flora. Thorny bushes and trees include *Capparis, Ziziphus, Acacia, Mimosa, Lantana* etc. There are a large variety of orchids, bamboo and creepers. . The trees like Chil and Kail, are also found. Pine forests are found in the steep dry slopes of the Shivalik Hills,

The area has a large number of birds, especially sparrows, woodpeckers, doves, pigeons, quails, cuckoos, mynahs, etc. There is no information regarding migratory movement of birds in the study area. The major bird species in the study area are white rumped vulture (*Gyps bengalensis*), rock pigeon *(Columba livia*), spotted Dove (*Streptopelia chinensis*), Indian Robin (*Saxicoloides fulicata*), black drongo (*Dicrurus macrocercus*), Indian cukoo (*Cuculus micropterus*), green bee-eater (*Merops orientalis*), common myna (*Acridotheres tristis*), and Jungle Bush Quail (*Perdicula asiatica*).

The major part of the study area lies under agriculture field and human settlements which restricted the wildlife habitat significantly. Most of the mammalian species reported in the study area are common fox, monkeys, jackal, Indian porcupine and Indian hare. There is neither any wildlife sensitive area nor any corridor for the movement of wildlife present in the study area. There are many small seasonal nallas present in the buffer zone of study area which are the major attraction sites for avifauna. As far as the reptiles community was concerned, rat snake, krait, and house lizard are reported from the study area. Such animals as deer, bluebull, sambhar, hogdeer, chital, etc. are found here, though in very small numbers.

There are no endangered faunal and floral species in project site and the surrounding area around the CETP at Kainduwal. The major animal and plant species found in the area are given in **Table 3.16, 3.17, 3.18**.

Table 3.16: Common Faunal Species found in the Study Area

Sr. No.	Common Name	Zoological Name	Schedule (Wildlife Protection Act, 1972)
1.	Indian porcupine	*Hystrix indica*	IV (4-E)
2.	Indian hare	*Lepus nigricollis*	--
3.	Indian fox	*Valpes bengalensis*	--
4.	Monkeys	*Macaca mulatta*	II (PART- I, 17-A)
5.	Jackal	*Canis aureus*	II (PART-II, 2-B)
6.	Wild Boar, wild pig,	*Sus scrofa*	III (19)
7.	Muntjac, barking deer	*Muntiacus muntjak*	III (2)
8.	Nilgai	*Boselaphus tragocamelus*	III(14)
9.	Sambar deer	*Cervus unicolor*	III(16)
10.	Hog deer	*Hyelaphus porcinus*	--
11.	Chital deer/spotted deer	Axis axis	III(5)

Table 3.17: Common Bird Species Observed in the Study Area

S.N.	Family	Scientific Name	Common Name
1.	Accipitridae	*Elanus caeruleus*	Black-shouldered Kite (Black winged Kite)
2.	Accipitridae	*Gyps bengalensis*	White-rumped Vulture (Indian white backed Vulture)
3.	Accipitridae	*Spilornis cheeela*	Crested serpent Eagle
4.	Charadriidae	*Vanellus indicus*	Red-wattled Lapwing
5.	Columbidae	*Columba livia*	Rock pigeon (Blue Rock Pigeon)
6.	Columbidae	*Streptopelia chinensis*	Spotted Dove
7.	Corvidae	*Dendrocitta vagabunda*	Rufous Treepie (Indian treepie)
8.	Corvidae	*Dicrurus macrocercus*	Black drongo
9.	Passeridae	*Passer domesticus*	House Sparrow
10.	Corvidae	*Rhipidura albicollis*	White throated Fantail (Flycatcher)
11.	Cuculidae	*Cuculus micropterus*	Indian cuckoo
12.	Meropidae	*Merops orientalis*	Green Bee-eater

13.	Muscicapidae	*Saxicoloides fulicata*	Indian robin
14.	Paridae	*Parus mahjor*	Great Tit (Grey Tit)
15.	Phasianidae	*Perdicula aisatica*	Jungle bush quail
16.	Phasianidae	*Gallus gallus*	Red Jungle fowl
17.	Phasianidae	*Pavo cristatus*	Indian Peafowl
18.	Pycnonotidae	*Hypsipetes leucocephalus*	Black bulbul
19.	Sturnidae	*Acridotheres tristis*	Common myna
20.	Sylviidae	*Garrulax lineatus*	Orthotomus sutorius

Table 3.18: Common Plant Species Observed in Study Area

Sr. No.	Local Name	Botanical Name
1.	Aam	*Mangifera indica*
2.	Amaltas	*Cassia Fistula*
3.	Anwala	*Emblica officinalis*
4.	Bahera	*Terminalia belerica*
5.	Ban	*Quercus incana*
6.	Bans	*Dendrocalamus strictus*
7.	Bar	*Ficus benglensis*
8.	Barnasi	*Feronia elephantum*
9.	Bel	*Aegle marmelos*
10.	Silk cotton tree	*Bombax ceiba*
11.	Chamror	*Ethretia laevis*
12.	Chhal	*Anogeissus latifolia*
13.	Shisham	*Dalgergia sisoo*
14.	Chill	*Pinus roxburghii*
15.	Darck	*Melia azadirachta*
16.	Dhak	*Butea monosperma*
17.	Dhamman	*Grewia oppositifolia*
18.	Dhaul	*Erythrina subrosa*
19.	Dhauri	*Lagerstromia parviflora*
20.	Fagura	*Ficus palmate*

Sr. No.	Local Name	Botanical Name
21.	Gamhar	*Trewia nudiflora*
22.	Harhar	*Terminalia chebula*
23.	Jamun	*Syzygium cumini*
24.	Jhingan	*Lannea coromandelica*
25.	Kachnar	*Bauhinia variegata*
26.	Kail	*Pinus wallichiana*
27.	Kakari	*Pistacia integerima*
28.	Kamela	*Malloutus philippinensis*
29.	Kangu	*Flacourtia indica*
30.	Kathber	*Zizyphus mauritiana*
31.	Khair	*Acacia catechu*
32.	Khajur	*Phoenix humilis*
33.	Khaksa	*Cornus macrophyla*
34.	Khirk	*Celtis australis*
35.	Kusum	*Schleichera oleosa*
36.	Major Phalli	*Holarrhena antidysenterica*
37.	Palang	*Acer oblongum*
38.	Pandayan	*Ehretia serrata*
39.	Phaldu	*Mitragyna parviflora*
40.	Pipal	*Ficus religiosa*
41.	Popular	*Populus ciliata*
42.	Pula	*Kydia calycina*
43.	Ritha	*Sapindus mukurossi*
44.	Safed siris	*Albizzia lebbek*
45.	Safeda	*Eucalyptus* sp.
46.	Alal	*Caesalpinia decapetala*
47.	Anchhu	*Rubus ellipticus*
48.	Neem	*Azadirachta indica*
49.	Ban nimbu	*Glycosmis pentaphylla*
50.	Ban gulab	*Rosa moschata*

Sr. No.	Local Name	Botanical Name
51.	Ban chameli	*Jasminum humile*
52.	Ban tambaku, Bhut ka	*Solanum indicum*
53.	Bans	*Bambusa arundinacea*
54.	Banwan	*Myrsine africana*
55.	Basuti, Arusa	*Adhatoda vasica*
56.	Bekhal	*Prinsepia utillis*
57.	Bhang	*Cannabis sativa*
58.	Binda	*Colebrookia oppositifolla*
59.	Charmar	*Artemisia vulgaris*
60.	Chilla	*Casearia tomentosa*
61.	Dhatura	*Datura suaveolens*
62.	Dhau	*Woodfordia fruticosa*
63.	Gandhela	*Murraya kohenii*
64.	Haraunda	*Nyctanthes arboratus*
65.	Kali Kathi	*Indigofera hirsute*
66.	Karaunda	*Carissa spinarum*
67.	Keor	*Holarrhena antidysenterica*
68.	Kingora	*Berberis asiatica*
69.	Lantana, Phulnu	*Lantana camara*
70.	Karir	*Capparis decidua*
71.	Mithiari	*Hedera helix*
72.	Ni, Kall, Kathi	*Indigofera pulchella*
73.	Panibel	*Vitis parviflora*
74.	Panwar	*Cassia tora*
75.	Thor	*Euphorbia royleana*
76.	Trimal	*Zanthoxylum alatum*
77.	Mungh	*Saccharum munja*
78.	Kans grass	*Saccharum spontaneum*
79.	Vetiver	*Chrysopogon zizagioides*

Agricultural Activity

Solan is mainly an agricultural district with net sown area of 23.895 sq km with concentration of industrial clusters in the south and south western part of the District. The irrigation net work in the western and southern parts of the District is well developed and hence the double crop lands are mostly found in these areas. The single crop land is found in the western and middle parts of the District.

Aquatic Flora and Fauna

The Phytoplankton in the rivers are basically dominated by *Oscillatoria* sp., *Raphidiopsis* sp., *Chlorella* sp. and *Scenedesmus* sp. Zooplanktons are basically dominated by Rotifers and Crustaceans. The dominant ones are *Brachionus* and *Keratella*. These are tolerant to pollution and act as indicators of organic pollution of the water bodies. Thus Sirsa River, Balad nadi and Ratta nadi are found to be polluted.

Table 3.19: List of Phytoplankton in River Water Samples

PHYTOPLANKTONS		SIRSA RIVER	BALAD NADI	RATTA NADI
CLASS	GENUS & SPECIES			
Cyanophyceae	*Oscillatoria* sp.	√	√	√
	Microcystis sp.	√	√	
	Raphidiopsis sp.	√		√
	Phormidium sp.		√	
	Merismopedia sp.	√		√
Chlorophyceae	*Chlorella* sp.	√	√	
	Scenedesmus sp.	√	√	√
	Ankistrodesmus sp.		√	√
	Chlorococcum sp.		√	√
Bacillariophyceae	*Navicula* sp.	√	√	√
	Nitzschia sp.	√	√	√
Euglenophyceae	*Euglena* sp.	√	√	√

Table 3.20: List of Zooplanktons in River Water Samples

ZOOPLANKTONS		SIRSA RIVER	BALAD NADI	RATTA NALA
CLASS	**GENUS & SPECIES**			
Rotifera	*Brachionus* sp.	√	√	√
	Keratella sp.	√	√	
	Lecane sp.	√		√
Cladocera	*Ceriodaphnia* sp.		√	√
	Moina sp.			√

3.4.7 SOCIOECONOMIC ENVIRONMENT

Introduction

In this section of the report an attempt has been made to guesstimate Socio-economic effect of a Common Effluent Treatment Plant (CETP) of 25 MLD capacities, proposed to be set up at village Kainduwal, District Solan, Himachal Pradesh.

The key objective of the study is to identify those areas where impact is imminent and make an attempt to assess their intensity. The other objectives of the current study are as follows:

a) To collect baseline data of the study area and build up a data base.
b) To be aware of current socio-economic status of the people living in the study area.
c) To assess the potential impact of the project on socio-economic aspects of the people living in the study area and categorize them on the basis of their gravity.
d) To assess the impact of the project on Quality of Life (QoL) of the people in the study area.

Approach & Methodology

a) A mixture of both quantitative and qualitative approach has been adopted in the current socio-economic study.

b) The study has been conducted based on primary and secondary data. While primary data has been collected through a sample survey of selected households in the study area, the secondary data has been collected from the administrative records of the Government of Uttar Pradesh, Census 2001, district hand books and from the Uttar Pradesh Government portal**.**

c) The details regarding population composition, number of literates, workers, etc have been collected from secondary sources and analyzed. Also village/city/town wise details regarding amenities available in the study area have been collected from secondary sources like Census 2001, and analyzed.

d) Two stage sampling design has been adopted to select the sampling units. The first stage units are census villages in the rural areas and towns/cities in urban areas. The ultimate stage units are households in the selected villages and towns/cities. Probability sampling has been adopted to select the sampling units.

e) Estimation of various parameters has been made based on sample data and bottom top approach has been adopted.

f) On the basis of a preliminary reconnaissance survey, two questionnaires were developed to make it suitable to fulfill the objectives of the study. The questionnaires contained both open ended and close ended questions

g) The data collected during the above survey was analyzed to evaluate the prevailing socio-economic profile of the area.

h) Based on the above data, impacts due to proposed project on the community have been assessed and recommendations for improvement have been made.

Concept & Definition of Terms

a) **Study Area:** The study area, also known as impact area has been defined as the sum total of core area and buffer area with a radius of 10 Kilometers from the periphery of the project site. The study area includes all the land marks both natural and manmade, falling therein.

b) **QoL**: The Quality of Life (QoL) refers to degree to which a person enjoys the important possibilities of his/her life. The ‘Possibilities’ result from the opportunities and limitations, each person has in his/her life and reflect the interaction of personal and environmental factors. Enjoyment has two components: the experience of satisfaction and the possession or achievement of some characteristic.

c) **Household**: A group of persons who normally live together and take their meals from a common kitchen are called a household. Persons living in a household may be related or unrelated or a mix of both. However, if a group of related or unrelated persons live in a house but do not take their meals from the common kitchen, then they are not part of a common household. Each such person is treated as a separate household. There may be one member households, two member households or multi-member households.

d) **Sex Ratio:** Sex ratio is the ratio of females to males in a given population. It is expressed as 'number of females per 1000 males'.

e) **Literates:** All persons aged 7 years and above who can both read and write with understanding in any language are taken as literate. It is not necessary for a person to have received any formal education or passed any minimum educational standard for being treated as literate. People who are blind but can read in Braille are also treated as literates.

f) **Literacy Rate:** Literacy rate of population is defined as the percentage of literates to the total population aged 7 years and above.

g) **Labour Force:** The labour force is the number of people employed and unemployed in a geographical entity. The size of the labour force is the sum total of persons employed and unemployed. An unemployed person is defined as a person not employed but actively seeking work. Normally, the labour force of a country consists of everyone of working age (commencing from 14 to 16 years) and below retirement (around 65 years) that are participating workers, that is people actively employed or seeking employment. People not counted under labour force are students, retired persons, stay-at home people, people in prisons, permanently disabled persons and discouraged workers.

h) **Work:** Work is defined as participation in any economically productive activity with or without compensation, wages or profit. Such participation may be physical and/or mental in nature. Work involves not only actual work but also includes effective supervision and direction of work. The work may be part time or full time or unpaid work in a farm, family enterprise or in any other economic activity.

i) **Worker:** All persons engaged in 'work' are defined as workers. Persons who are engaged in cultivation of land or milk production even solely for domestic consumption are also treated as workers.

j) **Main Workers**: Those workers who had worked for the major part of the reference period (i.e. 6 months or more in the case of a year) are termed as Main Workers.

k) **Marginal Workers:** Those workers who did not work for the major part of the reference period (i.e. less than 6 months) are termed as Marginal Workers**.**

l) **Work participation rate**: The work participation rate is the ratio between the labour force and the overall size of their cohort (national population of the same age range). In the present study the work participation rate is defined as the percentage of total workers (main and marginal) to total population.

FINDINGS OF THE STUDY

Study Area

The field investigation has revealed that the study area of the proposed CETP project is spread over in four sub-districts viz, Arki, Nalagarh, Kasauli and Solan in district Solan, Himachal Pradesh. As many as 30 villages have been found to be located in the study area but there is no urban area as such.

Baseline Data

One of the objectives of the current study is to collect baseline data and prepare a data base. The baseline data has been collected from both primary and secondary sources and Census 2001 is its prime source. The data base is expected to be useful for concurrent evaluation of the project as also for impact assessment studies when the CETP project will become operational.

Demographic Particulars

Table 3.21: Demographic Particulars of the Study Area

S.N.	Description	Number	Percentage to Respective
1	**Total Population**	**12358**	**100**
	Male	7172	58.04
	Female	5186	41.96
2	**Sex ratio (No. of females per 1000 males)**	**723**	

3	**Total Literates**	**7477**	**100**
	Male	4991	66.75
	Female	2486	33.25
4	**Over all Literacy Rate**		**70.76**
	Male		80.06
	Female		57.39
5	**Gender gap in literacy rate**		**22.67**
6	**Total Workers**	**6282**	**100**
	Male	4526	72.05
	Female	1756	27.95
7	**Total Main Workers**	**4783**	**100**
	Male	4157	86.91
	Female	626	13.09
8	**Total Marginal Workers**	**1499**	**100**
	Male	369	24.62
	Female	1130	75.38
9	**Total Agricultural Workers**	**2439**	**100**
	Cultivators	2109	86.47
	Agricultural Labours	330	13.53
	Male workers in total agricultural workers	1100	45.10
	Female workers in total agricultural	1339	54.90
10	**Total Household Industrial Workers**	**130**	**100**
	Male	66	50.77
	Female	64	49.23
11	**Total Other Workers**	**3713**	**100**
	Male	3360	90.49
	Female	353	9.51

Source: Census 2001

Amenities:

Table 3.22: Villages in the Study Area Provided with Various Basic Amenities

S. No.	Amenities	Number of Villages Having the Facility
1	Education	15
2	Power Supply	29

3	Medical Facilities	9
4	Drinking Water Facility	29
5	Post, telegraph and telephone facilities	25
6	Communities Facilities	21
7	Banking Facilities	2

Source: Census 2001

CURRENT SOCIO-ECONOMIC STATUS

Demographic Composition

Population

According to Census 2001, the total population of the study area is 12358, of which 14.5 percent belong to population under 0-6 age group. As there is no urban area, the entire population belongs to rural area. The overall sex ratio has been worked out to be 723 females per 1000 males, which is much lower than the national average of 933 females per 1000 males. Furthermore, around 16.7 percent of the total population belongs to Schedule Caste community and the Schedule Tribe population in the study area is very negligible.

Number of households and household size

The entire population of the study area has been grouped into 2696 households and the average household size is 6. The household size varies between 3 and 9.

Literacy and Literacy rate

The total number of literates in the study area has been worked out to 7477, which is around 60.5 percent of the total population.

The literacy rate of male has been worked out to 80.1 percent as against 57.4 percent for female, creating a gender gap of 22.7 percent.

Workers and Work Participation Rate

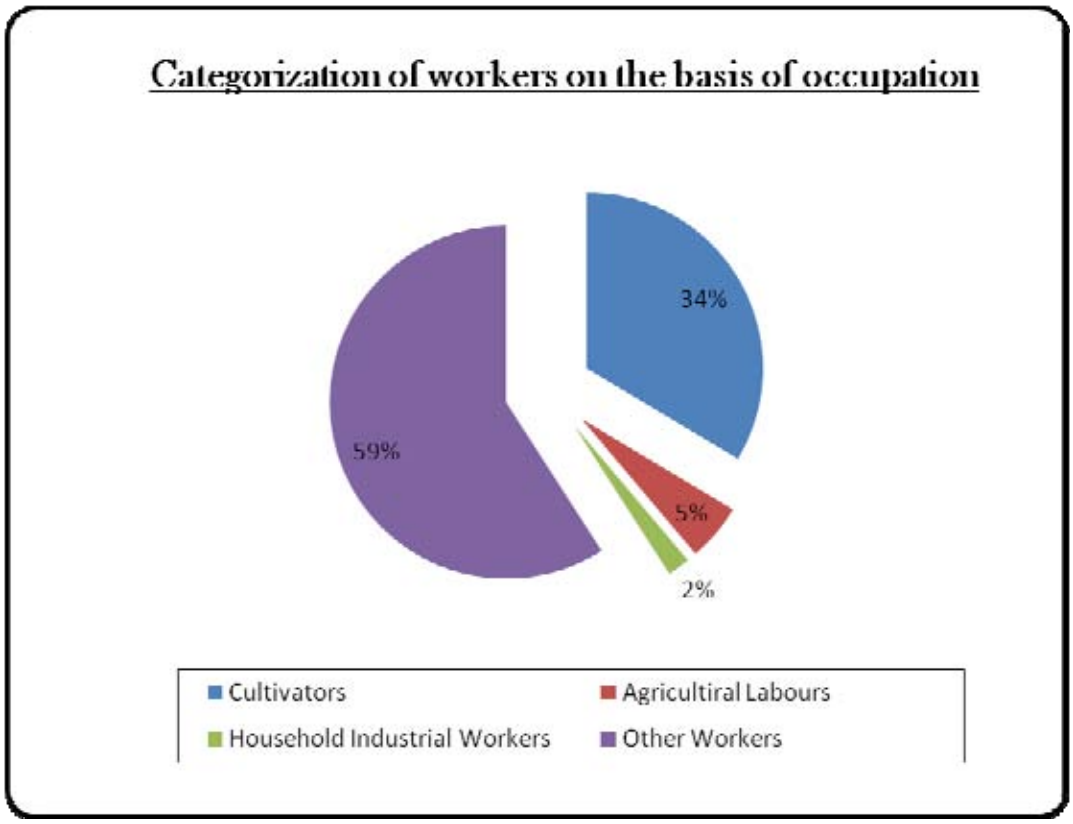
The total number of workers in the study area is 6282, which is 45.2 percent of the total population. Among the total workers 76.1 percent are main workers and the remaining 23.9 percent are marginal workers. The percentage of male in the main workers is 86.9 percent, while it is only 24.6 percent in the case of marginal workers. On the other hand, the percentage share of female in the main workers is only 13.1 percent; it is 75.4 percent in the case of marginal workers. This indicates that male dominates the main workers and female dominates the marginal workers.

The **Table 3.24** and the **Fig. 3.9** below indicate the categorization of workers based on occupation:

Table 3.23: Categorization of workers on the basis of occupation

S. No.	Worker category	Number of workers	% to total workers
(1)	**(2)**	**(3)**	**(4)**
1	Agricultural Workers	2439	38.83
a)	Cultivators	2109	33.57
b)	Agricultural labour	330	5.25
2	Household Industrial Workers	130	2.07
3	Other workers	3713	59.11
Total		**6282**	**100.0**

Fig. 3.9: Categorization of Workers on the Basis of Occupation



The classification of workers based on occupation reveals that 39 percent of the total workers are Agricultural workers. The share of cultivators in the total workers is 34 percent and that of Agricultural labours is 5 percent. Barely 2 percent of total workers are Household Industrial Workers and most of them are 'Other workers' i.e. 59 percent of the total workers, which includes white collar workers, professional workers, shopkeepers, traders and businessmen.

CHAPTER 4

ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental impacts due to the construction and operation stages of the project were predicted. Impacts were evaluated using engineering judgment and comparing with best management practices. The impacts during the construction phase will be temporary in nature for a short construction period.

Adequate environmental management measures will be incorporated during the entire planning of construction and operation stages of the project to minimize the adverse environmental impacts and assure sustainable development of the area. The construction phase will be of around 18 months duration.

Project site will be protected by proper security and fencing to protect it from trespassers and unauthorized persons. The construction material will be stacked at designated place.

The pollution sources, their impacts and proposed mitigation measures are given below.

4.1 AIR ENVIRONMENT

4.1.1 Construction Phase

Impacts

Following impacts are anticipated during the construction phase for a short period of 18 months only.

- Stacking of construction materials may block the passages or roads
- The dust emitted during various activities will pollute the air with particulate matter
- Workers may be exposed low noise levels due to construction equipment

Mitigation Measures

- A dust control plan will be implemented viz. regular daily spraying of water on the roads and dust emission area in the project site.
- Regular maintenance of vehicles and equipment will be carried out. The vehicles having PUC will be used during the construction period and an agreement with the contractor

for water spraying and use of vehicles with PUC as well as use of environmental friendly methods during construction phase will be made.

4.1.2 Operation Phase

Impacts

- Being a project of Common Effluent treatment Plant there will not be any need of combustion process except occasional operation of DG set in case of failure of power. Hence there will not be any regular and continuous point source of flue gas emission. However because of movement of tankers for receiving effluent there will be minor impact on ambient air quality.
- Considering the type of industrial effluent to be received the chances of odour nuisance of chemicals will not be likely to be there. But because operation of biological plant and sludge during process to certain extent there may be chance of occasional odour nuisance.

Mitigation Measures

- More than 90% of the effluent will be transported to CETP through conveyance pipeline. Thus only 10% effluent will be left for vehicular transport through tankers. Thus, road traffic has been minimized to the best possible extent resulting in emission of low level of dust and noise
- Good housekeeping will be maintained in the CETP premises
- The vehicles will be maintained in good running condition by regular servicing and all vehicles will have PUC certificate.
- Roads in industrial area will be maintained in good condition and tarred so that dust emission will be minimum.
- The generators will be used during emergency only during power failure
- The generators would be provided with a stack of proper height (as per E(P) Rules, 1986, item 96) for the proper dispersal of pollutants emitted from the stack.
- The type of effluent going to be treated for CETP is biodegradable in nature with some metal components and refractive chemicals. On standing the biodegradable waste gets decomposed through anaerobic activity causing foul smell. The effluent is stored in equalization tanks provided with air sparging system. The BOD reduction is achieved

through activated sludge process and MBBR technology which does not generate foul smell.

- The aerobic sludge separated from inorganic once is taken through the decanter and the sludge is disposed off through tankers immediately without long standing times. Thus the major cause of foul smell has been eliminated.
- Sometimes the primary sludge mix with bio sludge, but such sludge is alkaline which reduces the smell to the maximum possible extent
- During treatment process, only CO_2 is given out and no smell is emitted.
- Because of peripheral green belt, the odour nuisance will remain minimized.

4.2 NOISE ENVIRONMENT

4.2.1 Construction Phase

Impacts

- The noise will be produced by transporting trucks and heavy machinery like HEMM, concrete mixer etc.

Mitigation Measures

- Construction work will be carried out during day time only.
- The workers working near noise producing machine will be provided with ear plugs.
- Construction equipment and vehicles will be maintained in good running condition

4.2.2. Operation Phase

Impacts

During the operation phase, the sources of noise shall be equipments such as waste treatment machinery, pumps, blowers, Diesel Generator Sets and vehicular movement.

Mitigation Measures

- Noise limit for diesel generator sets (up to 1000 KVA) manufactured on or after the 1st July, 2004 is given as: “The maximum permissible sound pressure level for new diesel generator (DG) sets with rated capacity up to 1000 KVA, manufactured on or after the 1st July, 2004 shall be 75 dB(A) at 1 m from the enclosure surface. The diesel generator sets should be provided with integral acoustic enclosure at the manufacturing stage

itself" Accordingly, "DG sets with integral acoustic enclosure will be purchased and will be installed in acoustic rooms.

- The noise producing machinery will be placed in acoustic enclosures/acoustic rooms to reduce the noise levels.
- Workers working near noisy area shall be provided with ear plugs.
- Roads will be maintained in good condition to reduce the noise due to traffic.
- Peripheral green belt will absorb the noise.

4.3 WATER ENVIRONMENT

4.3.1 Construction Phase

Impacts

- The wastewater produced from labour colony may be a concern for the public health
- Storm water with sediments from excavated material

Mitigation Measures

- During the construction phase, the modular septic tanks will be provided and treated sewage will be used for construction purposes.
- Care will be taken to securely store the excavated material and to reuse it as early as possible in construction or for land filling during land-scaping.
- There will a provision of embankment towards river side, so as to stop the excavated soil going to river.

4.3.2 Operation Phase

Impacts

- Disposal of excess treated effluent, complying with the stringent norms aimed at, in Sirsa River after recycle and reuse will substantially improve the present quality of the river which is presently not in satisfactory condition.
- Because of CETP there will be a controlled discharge of treated effluent, complying to the norms, into the river through single point instead of present multiple point of disposals of untreated/partially treated effluent into the river, the overall impacts on quality of River Sirsa will be positive

Mitigation Measures

- The stoppage of discharge of partially treated/untreated industrial effluent in the Sirsa River will have beneficial impact in gradually restoring the quality of the river.
- The treated effluent from CETP will be recycled and reused to the maximum extent.
- Domestic wastewater from industrial areas and from office / canteen will be treated along with industrial effluent stream
- Presently due to discharge of partially treated / untreated effluent to the Sirsa River, the Total Coliform and *E.coli* count are on higher side in the Sirsa River as per primary data collected during the sampling. The proposed CETP is going to take care of such sewage discharges and will impart treatment until the treated water is fully hygienically safe. Thus, the pathogenic bacterial level in Sirsa River is expected to come down in future drastically.
- The heterogeneous complex character of different industries with wide spectrum of refractive pollutants makes it difficult to meet the stipulated standards all the time. Moreover at present, the discharge standard is highly relaxed with BOD 30mg/l and COD 250 mg/l, whereas TDS, turbidity and colour intensity are in a much relaxed stage. The proposed CETP will meet the stringent parameter of BOD (10 mg/l) and COD (`100 mg/l), in addition to make the treated water highly transparent bringing down the TDS level much below , while successfully dealing with decolorisation phenomenon.
- The partially treated and untreated industrial effluent is mandatorily passed through CETP. Thus it offers double safety in order to meet the stringent norms
- The resultant effect of the above imperative features make the Sirsa River clean compared to the present status, making it attractive for healthy and safe environment. This will bring down the CEPI value from the present level to safe level with direct boosting the further growth of industrial development.
- CETP will be constructed with strong foundation and water proof strong RCC work to avoid any seepage and with enough free pace to avoid spillage
- Rainwater harvesting will be done for groundwater recharge.

- Moreover, toxic effluents likely to be generated from electroplating industries are being stored within an acid proof tank with retention time for 2 days before it gets into CETP inlet.
- At present, the Sirsa River has strong yellow color & turbid in nature. Installations of CETP will avert these problems making it absolutely free.

4.4 LAND ENVIRONMENT

4.4.1 Construction Phase

Impacts

- There may be change in land use pattern
- Overburden and construction waste, if not properly stacked, may pollute the soil

Mitigation Measures

- The project site is an open area without vegetation or human activity, and is allotted for the development of CETP, therefore there will not be any impact on the present land use pattern of the area.
- The overburden and construction waste will be reused as early as possible in the construction and for land filling during land-scaping of project site

4.4.2 Operation Phase

Impacts

- Hazardous chemical sludge produced during the wastewater treatment will be handled in decanter and disposed to authorized Solid Waste Management Facility and will have no impact

Mitigation Measures

- Hazardous chemical sludge will be sent to authorized Shivalik Solid Waste Management Facility
- Primary sludge in some of the cases may contain some toxic elements such as arsenic, cadmium, nickel etc. but the primary sludge is reduced by the way of segregation of the major quantum of biosludge going to be generated. The fewer quanta of generation of hazardous waste & application of decanters will help the CETP operators for its direct disposal into Shivalik Solid Waste Management Facility already installed nearby.

- Bio sludge will be used as manure only after physico-chemical testing and complying with the norms of manure for crops or green belt, otherwise the bio sludge will be sent to authorized Shivalik Solid Waste Management Facility along with chemical sludge
- Record of sludge disposal shall be kept as per Hazardous Waste (Management, Handling and Transboundary) Rules, 2008.

4.5 ECOLOGICAL ENVIRONMENT

4.5.1 Construction Phase

Impacts

- The noise will be produced during construction activity.

Mitigation Measures

- The construction activity will be carried out during day time only. The vehicles will be maintained in good condition to minimize the noise due to traffic.

4.5.2 Operation Phase

Impacts

No impact is envisaged on the flora and fauna of the area due to operation of CETP.

Mitigation Measures

- CETP will have beneficial effect on the environment due to reduction in pollution
- The immediate effect of CETP will be reduction in the discharge pollution load of industrial effluents in the adjoining Sirsa River and this will be helpful in restoring the quality of the river.
- Installation of CETP will eliminate such unwanted eutrophication boosting up the aquatic life with high DO content with necessary nutrients.
- The effluent discharge will comply with the norms aimed at and to the stipulated norms of MoEF and will not be harmful to the ecology of the receiving river.
- Green belt/ plantation will be developed around the CETP
- No biologically sensitive area is present within 10 km radial area

4.6 SOCIO ECONOMIC ENVIRONMENT: ASSESSMENT OF POTENTIAL IMPACTS

4.6.1 Impact on Population Composition

The impact of the proposed project on population composition will be either nil or negligible as only few skilled and managerial staff will be recruited from outside and the rest will be recruited locally.

4.6.2 Impact on Employment Generation

The proposed project is expected to provide employment opportunities to 100 persons, which includes both skilled workers and unskilled workers. It is understood that all the persons to be deployed for various activities will be recruited locally and there is very little scope for migration of people from outside the study area.

The employment potentiality of the project is expected to ameliorate the economic condition of the families of those persons who will get employed in the proposed project. Further, the project will provide indirect employment to about 200 people who will be involved in petty business and service oriented industries. This a positive impact of the proposed CETP project.

4.6.3 Benefits to Women

The proposed CETP project will also generate jobs for the women laborers/ during construction as well as operation phase.

4.6.4 Impact on Health

The proposed effluent plant will certainly be blessings for the people in the neighborhood and the intensity of various diseases is expected to come down appreciably, when the plant operates effectively. Hence, the impact of the proposed CETP project will be positive and needs to be welcomed by all in the study area.

4.6.5 Impact on Income

In India, poverty is widespread. According to an estimate made by World Bank during 2005, 26 percent of the total Indian population falls below the International Poverty Line of US$ 1.25 a day (PPP, in nominal terms ₹ 21.6 a day in urban areas and ₹ 14.3 in rural areas). Himachal Pradesh is however not an acute poverty ridden state as its share in the overall poverty is only 0.3 percent and the per capita income is ₹. 58,493. The family income of those who will be employed in the proposed CETP project will get substantial boost. Similar, is the

case with others who will be benefited by indirect employment. This is a positive impact of the proposed CETP project.

4.6.6 Impact on Consumption Pattern

The field survey has revealed that people in the study area are poor. Increased household income will certainly enhance the consumption pattern of few selected households who would be benefitted by getting employed in the above project directly or indirectly. This is a positive impact of the proposed project which is directly related to employment generation caused by the proposed project.

4.6.7 Impact on utilities

Utilities include supply of water, electricity, gas and sewage facilities. It is likely that the residents in the neighborhood will not face any bottleneck in accessing utility services such as water supply, electricity, gas and sewage facilities due to the upcoming project in the area. Hence, CETP project will hardly make any impact on existing utilities due to construction and operation of the project.

4.6.8 Impact on Historical, Archeological and Architectural Sites

There are no historical or archeological monuments of significance within the study area. Hence, no negative impact is anticipated in this regard.

4.6.9 Impact on Law & Order

As local people will be employed to run the CETP, no law & order problem is envisaged. It is expected that the workers will attend to their duties from their residence and return to their homes after the day's work is over. There would have been law & order problem if the workers were migrants and lived in shanties closed to the area. However, to meet any untoward incident one police post may be set up close to the project area.

4.6.10 Public Perception about the Project

Visit to villages in the study area has revealed that no one is against the proposed CETP project as it would be a savior of health as also a provider of employment to local people. They hoped that the upcoming project will definitely increase their income which in turn will increase their purchasing power. They however, they have demanded that only the local people should be provided with employment and no one else.

The villagers living in the distant villages too were aware of the project but because of ignorance & lack of awareness within the villagers, they could not make any comment.

The detail information about the CETP has to be disseminated through Public Awareness Programmes in local language.

4.6.11 Infrastructural Development

- The increasing infrastructural activity will boost the commercial and economical status of the locality. The CETP facility will be helpful to further boost the industrial development especially small scale industries so that large number of local people will be benefitted.

Public Health

- Temporary hutment for the construction workers will be provided with basic amenities like low cost sanitation facilities, first aid, safe drinking water supply and personal protective equipment etc. The workers will be provided the medical assistance whenever required.
- The workers will be provided regular medical check-up camps and hospital facility.
- The workers will be provided with skill development training and training in risk assessment and disaster management.
- Adequate mitigation measures will be ensured to reduce odor emissions and disease vectors from proposed site to eliminate the nuisance of effluents/sewage.
- Epidemic potential of the river will be minimized due to construction of CETP by not allowing the wastewater to the river which promotes the disease organisms in the river system which is utilized by the local people.
- Equalization tank is kept under air agitated conditions with the help of overhanging air sparging controlled through microprocessor. The pre-aeration will keep the effluent under agitated mode, warding off any development of foul smell therein, as well as altogether elimination of any mosquito breeding within such stored effluents.

Hence the status of sanitation and community will be maintained in good condition at the project site.

Transportation and Communication

The proposed CETP is very well connected by transport and communication facility and will not cause any additional burden and impact on the environment.

4.7 MATRIX REPRESENTATION

The potential impacts during construction and operational stage along with mitigation measures are presented in **Table 4.1** and **4.2** respectively.

The parameters discussed are presented in the form of a matrix. Impact identification matrix is given in **Table 4.3**. The quantification of impact is done using numerical scores 0 to 5 as per the following criteria.

Score	Severity Criteria
0	No impact
1	No damage
2	Slight/short-term effect
3	Occasional reversible effect
4	Irreversible/long term effect
5	Permanent damage

The scores of various parameters and activities are presented in **Table 4.4.**

4.8 CUMULATIVE IMPACT CHART

The total negative impact of various activities on any one parameter is represented as a cumulative score and the cumulative scores of various parameters are given in the form of a cumulative chart presented in **Table 4.4**. Any particular parameter having an individual score greater than 5 or cumulative score of 40 implies serious effects due to the project and calls for suitable mitigation measures. It is evident from the matrices that resultant impact is beneficial to the local population and to the industries due to low impact levels.

Table 4.1: Potential Impacts and Mitigation Measures during Construction Phase

Environ-mental Compo-nent	Sources of Impacts	Potential Impacts	Mitigation Measures	Remarks
Air Quality	• Land preparation and construction activity • Vehicular traffic	• Dust emission • Stacking of construction material may block roads	• Water spraying on haul roads in project site • Regular maintenance of vehicles • Vehicles with PUC	• No remarkable increase in dust emission and other air pollutants • The construction activity will be completed in shortest possible period
Noise	HEMM, heavy machineries and truck movement	• Workers exposed to increased noise near machineries	• Construction work during day time only • Ear plugs to workers • Regular maintenance of machineries and trucks	• Noise will be below stipulated standard of 90 dB(A) for occupational area
Water Quality	• Wastewater produced from labour colony • Excavated material	• Public health concern due to wastewater • Storm water with sediments from excavated material	• Modular Septic tank for wastewater treatment • Secured storage and reuse of excavated material in construction and land filling • Embankment towards river side	Labour colony will be temporary for construction period only.
Land Quality	Land preparation and construction activity	• Change in land use pattern, • Overburden & construction waste may pollute soil	• Project site is open land allotted for CETP so no change in land use pattern, • Reuse of O.B. & construction waste in construction and	• Quantum of excavated O.B. & construction waste will be small

Environ-mental Compo-nent	Sources of Impacts	Potential Impacts	Mitigation Measures	Remarks
			for land fill during land-scaping	
Ecology (terrestrial and aquatic)	Land preparation for construction of CETP	Production of noise	Construction work during day time lonely and vehicles will be maintained in good condition	Increase in noise will be very small
Socio-Economic	Construction of CETP	No adverse impact	Direct and indirect employment opportunities	Improvement in socioeconomic status of local people
Infrastructure & Services	Construction activity require many products from other industries	Development of industries in the area	Commercial and economic development	
Environmental Hazards	Construction of CETP	No environmental hazard		Construction of CETP will not involve blasting activity
Public Health	Labour colony	Insanitary conditions & public health problems	• Low cost sanitation and safe water will be provided • First aid and medical help will be provided • Personal protective equipments will be provided	
Transpor-tation and Communi-cation	Construction of CETP	The project site is well connected with roads and communication means, so no impact on these aspects	--	

Table 4.2: Potential Impacts and Mitigation Measures during Operation Phase

Environmental Component	Sources of Impacts	Potential Impacts	Mitigation Measures	Remarks
Air quality	• Small amount of vehicular movement • Operation of DG generators during emergency only • CETP operation	• Small amount of dust emission due to vehicular movement • Negligible emission of air pollutants due to DG sets • Traces of odour may be produced	• Vehicular movement is reduced due to pipeline conveyance of 90% of effluent • Good housekeeping will be maintained • Vehicles will be maintained in good conditions with PUC; • Roads will be maintained in good condition; • Generators with proper height of stack as per guidelines and will be used during emergency only • Equalization tanks with air sparging system to reduce odour • Aerobic sludge after decanter will be disposed off through tankers immediately • If biosludge is mixed with primary sludge, its alkalinity and aerobic nature will reduce smell to a great extent • Peripheral green belt will minimize odour further	Generators will be used only during load shedding period The CETP is almost odour free due to its design
Noise	Waste treatment pumps, fans, generator and vehicles	Some amount of increase in noise levels	• Noise from generator sets will be within stipulated standards due to acoustic enclosures	Increase in noise levels will be within limits

Environmental Component	Sources of Impacts	Potential Impacts	Mitigation Measures	Remarks
			• Machineries within acoustic enclosures / rooms • Ear plugs to workers • Roads will be maintained in good condition to reduce noise due to traffic	
Water Quality	Disposal of excess treated effluent, complying to the stringent norms aimed at and with that of MoEF, in water bodies	No impact like eutrophication will be there in the River Overall quality of Sirsa River will be improved due to controlled single point discharge of treated effluent complying to the stringent norms aimed at	• Stoppage of discharge of partially treated/untreated effluent in Sirsa river • Recycle and reuse of treated effluent to maximum extent • Domestic sewage from CETP facility and from industrial areas will be treated In the same facility • Treatment of five streams of effluent as per their compatibility to reduce TDS, colour, BOD & COD • CETP will be constructed with strong foundation and water proof RCC work to avoid any seepage • Rainwater harvesting will be done for groundwater recharge	• The polluted Sirsa River will be reclaimed as clean river and will be hygienically safe • The partially treated and untreated industrial effluent and sewage will be mandatorily passed through CETP • Moreover, toxic effluents likely to be generated from electroplating industries are being stored within an acid proof tank with retention time for 2 days before it gets into CETP inlet. • Installations of CETP will avert the

Environmental Component	Sources of Impacts	Potential Impacts	Mitigation Measures	Remarks
				present problem of colour and turbidity in Sirsa River making it absolutely clean
Land Quality	Production of hazardous chemical sludge	No impact due to proper management	• Chemical sludge after reduction in quantity by segregation from biosludge and by decantation will be sent to authorized Shivalik Solid Waste Management Facility • Only biosludge will be used as manure after chemical testing to improve the soil quality, otherwise it will be disposed off to Shivalik SWMF	Record of sludge disposal shall be kept as per Hazardous Waste (Management, Handling and Transboundary) Rules, 2008
Ecology (terrestrial and aquatic)	Operation of CETP	No impact due to insignificant emission through air	• CETP will have beneficial effect on the environment and will reduce the CEPI gradually • Immediate effect will be reduction in the discharge of pollution load to the Sirsa River • Installation of CETP will reduce the eutrophication of Sirsa River boosting up aquatic life and DO content and necessary nutrients • The discharge of	• No biologically sensitive area is present within 10 km radial area

Environmental Component	Sources of Impacts	Potential Impacts	Mitigation Measures	Remarks
			excess treated effluent remaining after recycle and reuse will not only meet the discharge standards and it will not be harmful to the river ecology •Green belt/ plantation will be developed around the CETP	
Socio-Economic	Operation of CETP: Construction Phase and Operation Phase	• Negligible influx of outside people as workers • Beneficial impacts with respect to employment and other socioeconomic aspects	•Local people will be given preference in employment or contract jobs •Generation of primary & secondary employment to local people	Other benefits: • Industrial development • Improvement in aesthetic and hygienic environment • Benefits to women labourers • Public health will be improved • Family income will be improved • Consumption pattern will be enhanced
Infrastructure & Services	Operation of CETP	Infrastructural and industrial development will take place	Commercial and economic development will be possible	Basic utilities like supply of water, electricity, gas etc. will be improved
Transportation and Communication	Pressure on transportation and communica-tion	No impact on transportation & communication as all the facilities are already well developed in the area	--	--
Historical, Archeological and Architectural	CETP operation	No historical, archeological and architectural sites are present in the	--	--

Environmental Component	Sources of Impacts	Potential Impacts	Mitigation Measures	Remarks
Sites		study area		
Law and Order	CETP – construction and operation phase	As local people will be employed with other benefits, no law and order problem will be there.	However to avoid any untoward incident, one police post may be set up close to the project area.	--

CHAPTER 5

ANALYSIS OF ALTERNATIVES (TECHNOLOGY AND SITE)

The proposed site of CETP is selected as per the guidelines of MoEF. The treatment technology and treatment Scheme for the effluents from 990 industrial units has been finalized on the basis of detail data collection on quality and quantity of the effluent produced by the industries, classifying the effluent in 5 categories based on their compatibility from treatment point of view and treatability studies of 5 streams of compatible industrial effluents. The salient features are given below.

5.1 Site Selection

The following guiding factors have been considered while selecting the site for the establishment of CETP.

1. The site is situated in notified industrial area.
2. The 25 acre land has been earmarked for the construction of CETP and STP by Himachal Pradesh Government.
3. The site is situated in such a way that the effluent from different industries will be economically carried to the site either by pipeline or through the tankers
4. The transport of effluent is through a 60 km piping network. Thus, it prevents any possibility of direct contact of untreated effluent with river water.
5. The CETP site has Sirsa River nearby. Therefore the treated effluent discharge standards have been made more stringent. If necessary, the treated effluent complying with the discharge standards may be discharged in the river.
6. The river is shallow and very lean, surrounded by agricultural land.
7. The imposed stringent treated effluent discharge standards are BOD level as <10 mg/l and COD level as <100 mg/l, while retaining the TDS parameter strictly as <2100 mg/l, these stringent parameters have been enforced because of its very location near the rivulet and its very thin flow through the stream, which otherwise remains dry throughout the year. At present the treated effluent from all these industries is flowing to this rivulet only.
8. The highest flood level (HFL) is studied for the last few decades and the construction of CETP will take care of this HFL.

9. The land is highly undulating in nature. The treatment system is being created much above the normal water level expected during the rainy season
10. Proposed site falls in Zone-IV according to the Indian standard Seismic Zoning Map.

5.2. Treatment Scheme

Around 990 industries in the Baddi-Barotiwala industrial area are of different types viz. textile, pulp and paper, food and beverages, engineering and metal, footwear, plastics, pharma, soap and detergents, electrical and electronics, automobile, packaging and others miscellaneous. Thus the physico-chemical nature of the industrial effluents also varied widely from each other. Most of the industries have developed their own treatment plants. However the treatment is not satisfactory due to complex nature of the effluents. From treatment point of view, these industrial effluents were classified into five types based on their compatibility to serve the very objective of loading the effluent treatment cost and meeting the stringent statutory standards, as recently imposed in Baddi locality. Such separation of effluents into the various sections as per the effluent characteristics is absolutely necessary. Otherwise, the treatment cost will get enhanced causing an unnecessary embarrassment.

Treatability studies have been carried out by using different recent technologies and it was ensured that the effluent meet the stipulated standards. Accordingly, the five flow sheets of the treatment systems have been prepared and are presented in **Section 2.17, Figs. 2.5, 2.6, 2.7**, **2.8** and **Tables 2.6, 2.7** and **2.8** of **Chapter 2**.

The plant has been designed by absorbing the new technology like micro and nano filtration technology, MBBR, ozonation etc into the very conventional activated sludge process to deal with tricky recalcitrant pollutants to make a solid foundation for a techno-economic viability for the investment and recurring expenditure. Simultaneously, attempt has been made to do sludge minimization through proper scheme selection.

CHAPTER 6

ENVIRONMENTAL MONITORING PROGRAMME

6.1 INRTRODUCTION

Monitoring is a cornerstone of EIA implementation and follow up. Monitoring is an essential component for sustainability of any developmental project. It is an integral part of any environmental assessment process. Any development project introduces complex inter-relationships in the project area between people, various natural resources, biota and the many developing forces. Thus, a new environment is created. It is very difficult to predict with complete certainty the exact post-project environmental scenario. Hence, monitoring of critical parameters is essential in the post-project phase.

Other components are dependent on the scope and type of monitoring information that is provided. The primary aim of monitoring is to provide information that will aid impact management, and secondarily, to achieve a better understanding of cause-effect relationships and to improve EIA prediction and mitigation methods. Both the immediate and long-term benefits from undertaking monitoring as part of EIA are widely recognized.

Monitoring will be used to:

- measure the impacts that occur during project construction and operation;
- check their compliance with agreed conditions and standards;
- facilitate impact management, e.g. by warning of unanticipated impacts; and
- determine the accuracy of impact predictions and the effectiveness of mitigation measures.

Monitoring of environmental indicators signal potential problems and facilitate timely prompt implementation of effective remedial measures. It will also allow for validation of the assumptions and assessments made in the present study.

Monitoring becomes essential to ensure that the mitigation measures planned for environmental protection function effectively during the entire period of project operation. The data so generated also serves as a data bank for prediction of post project scenarios in similar projects.

6.2 AREAS OF CONCERN

The best way to ensure that the new CETP facility operates in a consistent and environmentally sound fashion is to provide for a rigorous monitoring programme on the guidelines of CPCB and MoEF. The objective of this programme is to comply with MoEF guidelines for inlet effluent and outlet treated effluent.

To keep the record of physical and chemical load from each industry, the member industry will monitor the important physico-chemical parameters in their effluents on daily basis. The flow rate and daily quantity of effluent from member industries will also be maintained by concerned industry on daily basis. The data will be provided to CETP operator for management of CETP.

Treatment efficiency programme for CETP will be established within the treatment plant. The physico-chemical monitoring of selected parameters of influent and outgoing effluent at CETP will be maintained on daily basis. Online continuous flow measurement will also be taken at the outlet of CETP on daily basis.

Therefore, from the monitoring point of view, the important parameters are Quality and flow of effluent from member industries and its compliance to major effluent quality parameters, quality of inlet effluent to CETP and outlet treated effluent from CETP and its compliance to the stipulated standards, surface water and groundwater quality in the buffer zone, air quality, noise, etc. Online monitoring of treated effluent from CETP will also be established which timely indicate the stress on the environment. Suggested monitoring parameters and programmes are described in the subsequent sections.

Well equipped water and wastewater testing laboratory will be established in the project premises.

6.3 SURFACE AND GROUND WATER QUALITY

6.3.1 Construction phase

The Physico-chemical and biological/microbiological characteristics of surface and ground water quality will be monitored once in three months during project construction phase, close to the major construction sites.. The parameters to be monitored are as follows:

Surface and Ground Water

Physico-chemical parameters

- pH
- Salinity
- Conductivity
- TDS
- Turbidity
- D.O.
- BOD
- Phosphates
- Nitrates
- Sulphates
- Chlorides

Biological /Microbiological Parameters

- Phytoplanktons (No. of species and their density)
- Zooplanktons (No. of species and their density)
- Total Coliforms (TC)
- *E. coli*

6.3.2 Operation Phase

Chemical characteristics of select parameters of the effluent will be monitored by member industries on daily basis and the data will be sent to the operator of the CETP.

Chemical characteristics of select parameters and the flow rate of the effluent inlet and the effluent outlet to the CETP will be carried out on daily basis. Preferably online monitoring of treated effluent will be carried out continuously. The data will be sent to State Pollution Control Board.

The Physico-chemical and biological/microbiological characteristics of surface and ground water quality will be monitored once in three months during project operation phase. The parameters to be monitored are as follows:

Industrial Effluent

Flow (per hour and per day)

Physico-chemical Characteristics

- pH
- COD
- Total Dissolved Solids (TDS)
- Suspended Solids (SS)
- Oil & Grease
- BOD
- Phenolic compounds
- Total Kjeldahl Nitrogen
- Ammoniacal Nitrogen (as N)
- Cyanide (as N)
- Total Residue Chlorine
- Chromium hexavalent (as Cr^{+6})
- Chromium (total) (as Cr)
- Copper (as Cu)
- Lead (as Pb)
- Nickel (as Ni)
- Zinc (as Zn)
- Arsenic (as As)
- Mercury (as Hg)
- Cadmium (as Cd)

- Fluoride (as Fe)
- Boron (as B)

Surface and Ground Water

Physico-chemical Parameters

- pH
- Salinity
- Conductivity
- TDS
- Turbidity
- D.O.
- BOD
- Phosphates
- Nitrates
- Sulphates
- Chlorides

Biological/Microbiological Parameters

- Phytoplanktons (No. of species and their density)
- Zooplanktons (No. of species and their density)
- Total Coliforms (TC)
- E. coli

6.4 AMBIENT AIR QUALITY

6.4.1 Construction Phase

Ambient air quality monitoring is recommended to be monitored at three stations close to the construction site. The monitoring will be conducted for three seasons. For each season monitoring will be conducted twice a week for 4 consecutive weeks. The parameters to be monitored are PM_{10}, SO_2 and NOx.

6.4.2 Operation Phase

The ambient air quality monitoring will have to be conducted at three locations. Air quality could be monitored for three seasons in a year. High volume samplers can be used for

this purpose. The frequency of monitoring shall be twice a week for 24 hours for four consecutive weeks. The parameters to be monitored are PM_{10}, SO_2 and NOx. An amount of Rs. 0.15 million/year can be earmarked for this purpose.

6.5 NOISE

For personnel involved in work areas, where high noise levels are likely to be observed during project construction and operation phases. The noise level monitoring during construction and operation phases will be carried out by the project staff with a noise meter. An amount of Rs.0.05 million has been earmarked for this purpose. Neighbourhood (upto radius of 1 km)

It is recommended that during project operation phase, monitoring of residential area and sensitive areas like schools and medicare centres will be conducted within a distance of 1 km radius of the CETP to ascertain noise levels at receptors, taking note of any excessive build-up in any particular direction.

6.6 GREENBELT DEVELOPMENT

Sites of greenbelt development should be monitored once in every month during project operation phase to study the growth of various species and to identify the needs if any, such as for irrigation, fertilizer dosing, pesticides, etc. The monitoring can be conducted by project staff.

6.7 SUMMARY OF ENVIRONMENTAL MONITORING PROGRAMME

The summary of Environmental Monitoring Programme for implementation during project construction and operation phases is given in **Tables-6.1** and **6.2** respectively.

Table 6.1: Summary of Environmental Monitoring Programme for Implementation during Project Construction Phase

S.N.	Aspects	Parameters to be Monitored	Frequency of Monitoring	Location
1	**Surface and Ground Water**			
	Physico-chemical Parameters	pH, temp, Salinity, Conductivity, TDS, Turbidity, D.O., BOD, Phosphates, Nitrates, Sulphates, Chlorides	Once in a season	3 to 4 sites
	Biological & Microbiological	Phytoplanktons (No. of species and their density),	Once in a Six months	3 to 4 sites

S.N.	Aspects	Parameters to be Monitored	Frequency of Monitoring	Location
		Zooplanktons (No. of species and their density), Total Coliforms (TC), *E. coli*		
2	**Ambient Air Quality**	PM_{10}, SO_2, NO_2	Summer, post – monsoon & winter season Twice a week for four consecutive weeks per season	Three sites
3	**Noise**	Equivalent Noise levels	Once per month	Project area and sties within 1 km of the project area

Table 6.2: Summary of Environmental Monitoring Programmed for Implementation during Project Operation Phase

S.N.	Aspects	Parameters to be Monitored	Frequency of Monitoring	Location
1	**Industrial Effluent**			
	Physico-chemical Parameters	Flow rate, pH, COD, Total Dissolved Solids (TDS), Suspended Solids (SS), Oil & Grease, BOD, Phenolic compounds, Total Kjeldahl Nitrogen, Ammoniacal Nitrogen (as N), Cyanide (as N), Total Residue Chlorine, Chromium hexavalent (as Cr^{+6}), Chromium (total) (as Cr), Copper (as Cu), Lead (as Pb), Nickel (as Ni), Zinc (as Zn), Arsenic (as As), Mercury (as Hg), Cadmium (as Cd), Fluoride (as Fe), Boron (as B)	Daily	Member industries and at inlet and outlet of CETP
2	**Surface and Ground Water**			
	Physico-chemical Parameters	pH, Salinity, Conductivity, TDS, Turbidity, D.O., BOD, Phosphates, Nitrates,	Once in a season	3 to 4 sites

S.N.	Aspects	Parameters to be Monitored	Frequency of Monitoring	Location
		Sulphates, Chlorides		
	Biological & Microbiological	Phytoplanktons (No. of species and their density), Zooplanktons (No. of species and their density), Total Coliforms (TC), *E. coli*	Once in a season	3 to 4 sites
3	**Ambient Air Quality**	PM_{10}, SO_2,NO_2	Summer, post – monsoon & winter season Twice a week for four consecutive weeks per season	Three sites
4	**Noise**	Equivalent Noise levels	Once per month	Project area and sites within 1 km of the project area
5	**Green belt development**	Rate of survival and growth of various species	Once per month	Around the plant site

6.8 COST ESTIMATE

The cost required for implementation of Environmental Monitoring Programme during construction Phase is 17.00 lakhs (**Table 6.3**).

Table. 6.3: The Cost Required for Implementation of Environmental Monitoring Programme during Project Construction Phase

S.N.	Parameter	Annual Cost (Rs. In Lakhs)
1	Surface and Ground water	13.00
3	Ambient air quality including noise	3.00
4	Green Belt Development	1.00
	Total	**17.00**

The cost required for implementation of Environmental Monitoring Programme during operation phase is Rs. 31.50 lakhs per year (**Table 6.4**).

Fig. 6.4: The Cost Required for Implementation of Environmental Monitoring Programme during Project Operation Phase

S.N.	Parameter	Annual Cost (Rs. In Lakhs)
1	Effluent (inlet & outlet at CETP)	15.00
2	Surface and Ground water	13.00
4	Ambient air quality including noise	3.00
5	Green belt	0.50
	Total	**31.50**

CHAPTER 7

ADDITIONAL STUDIES

7.1 PUBLIC CONSULTATION

The public consultation report will be added to this section after the Public Consultation will be completed, while preparing the Final EIA/EMP Report.

7.2 RISK ASSESSMENT

Identification, analysis and assessment of risk & hazard are very useful in providing information to risk management. It provides basis for planning safety measures during emergent situation.

The proposed project activity is a common effluent treatment plant (CETP) which does not involve major hazardous chemicals except hydrochloric acid during operation phase. The chemicals which will be used in CETP are coagulants (alum & polyelectrolyte), bleaching powder and hydrochloric acid (for decolonization), lime and urea/DAP (**Table 7.1**) etc.

Table 7.1: Chemicals Required for Operation of CETP and their Storage in CETP Premises

S.N.	Chemical	Daily Use	Storage
1.	Lime	7.5 tons/day	approx. 112 MT for 15 day stock
2.	Polyelectrolyte	25 kg/day	approx. 0.375 MT for 15 day stock
3.	Alum	approx.6 to 7 MT/day	approx. 100 MT for 15 day stock
4.	Urea/DAP	1000 kg/day	approx.15 MT for 15 days stock
5.	Bleaching Powder	approx. 1000 kg/day	approx. 15 MT for 15 day stock
6.	Hydrochloric Acid	500 L/day	Stock for 15 days

7.3 SAFETY PRECAUTIONS DURING STORAGE OF CHEMICALS

Following safety precautions will be taken during storage of chemicals.

- Storage tanks located and marked in designated area
- Selection of tanks of proper MOC
- Uniformly tagging of all tanks

- Provision of industrial type electric fittings
- Provision of adequate fire fighting equipments
- Anti corrosive paint will be used for the tanks
- Display of Safety Instruction Board
- Provision of proper earthing
- Provision of lightening arrester

7.4 POWER FAILURE / LOAD SHEDDING

Operational difficulties may be experienced at CETP plant when there will be power failure. Since, there is a provision made for DG sets for running plant during power failure, there will not be significant effect on the treatment efficiency of the CETP.

Three standby generators of total capacity of 1600 KVA ,one DG set of 1000 KVA and one DG set of 550 KVA for CETP operation and one DG set of 50 KVA for street light, office building and for staff quarters will be provided during power failure or load shedding period, which would reduce the chances of inadequate treatment of the effluent.

Training programme for plant operation and maintenance activities have been included as part of the project's technical assistance programme.

7.5 HEALTH & SAFETY MEASURES

During the operation of CETP and during handling chemicals, a practice of preventive and protective maintenance will be adopted to take care of employee's health. The various safety equipments like breathing apparatus, gum boots, goggles and helmate will be provided to the workers/operators. Besides, all the first aid, fire fighting devices will also be inspected, tested and maintained all the time in ready to use condition.

Health of all the employees in plant area will be regularly monitored by the physician. If any abnormality is found, necessary treatment will be given from time to time. Necessary history cards, records will be maintained which will be up-dated from time to time.

Some of the safety measures proposed to be carried out to ensure prevention of occupational hazards are delineated below.

- Safety equipmentsand fittings for handling of chemicals.
- Housekeeping of the plant as per prescribed norms. Floors, platforms, staircases, passages will be kept free of any obstruction.

- All operations will be explained to the workers. They will be periodically trained on the processes.
- Only authorized persons will be allowed inside the plant.
- All instruments and safety devices will be checked and calibrated during installation and at frequent intervals.
- All electrical equipments will be installed as per prescribed standards.
- All the equipments of the plant will be periodically tested as per standard and results will be documented. All equipments will undergo preventive maintenance schedule.
- D.G. sets will be provided to supply power in case of grid power failure.
- Number of fire extinguishers will be installed at different locations within premises.
- Adequate ventilation arrangement will be provided for safe and better working in the plant as per the standard.
- Sufficient access for firefighting will be provided in the plant.
- Protection against lightning will be taken care in the plant.

7.6 FIRE FIGHTING SYSTEM

The fire protection system with sand buckets, water pump etc. will be provided during plant commissioning and operation stage to avoid any outbreak of fire.

7.7 DISASTER MANAGEMENT PLAN

Disaster is an undesirable happening of such magnitude and nature that can adversely affect man, material and environment. Different components of DMP are described below.

7.7.1 Disaster Management Cell

For proper implementation of Disaster Management Plan, Disaster Management Cell (DMC) consisting of Sr. Manager, Asst. Manager, Sr. Officer, Shift Environmental Officer/Chemists, Trainees/Operators will be formed in CETP. Their responsibility is to make the employees aware about the risks and accidents in CETP and the planning to deal the emergency conditions and the responsibilities of the DMC and the staff during the emergency. The salient points of disaster management plan to mitigate the probable hazards are discussed in the following sections.

7.7.2 Occupational Health

During construction and maintenance of CETP, workers may be affected by drowning, trench collapses, falls, and confined spaces. The workers will be provided with personal protective equipments (PPE) to protect them from the impacts of such incidents and to avoid their contact with the effluent and sewage. Proper care should be taken and training will be given to the employees for safe working methods.

7.7.3 Components of CETP System

The every key components of the wastewater-treatment plant play an important role in the treatment process. The equalization tanks, aeration tanks, primary, secondary & tertiary clarifiers, reaction tank, effluent pumping etc. all must be in proper working order. Damage to any one of these components could result in inadequately treated wastewater.

Regular check up and maintenance of the components of CETP system will be carried out along with proper security of the project site.

7.7.4 Fire

In the case of fire, the buildings must have fire-protection infrastructure. The main control room in the operations building with all the electrical equipment that controls the effluent treatment operations will be provided with smoke detectors, which will be checked periodically.

7.7.5 Safe Working Conditions

The workers have to follow a safety protocol during the operation of CETP to avoid any impact, injury or accident. For this purpose, proper guidelines will be prepared for the employees to operate safely in CETP treatment area which will be implemented through training and display of instructions.

7.7.6 Emergency Preparedness Plan

An unexpected emergency incident at CETP facility is likely to involve preventive and mitigative action on the part of workers, officers and their proper coordination with outside agencies like Fire Department, Police Station, Hospitals and Doctors. The workers will be given training about their duties and actions including immediate first aid measures during emergency. The contact numbers of the officers, and outside agencies mentioned above will be displayed at various places in CETP.

7.7.7 Documentation & Training

Information gathered from above incidents will be documented and will be shared among those likely to be involved through training and information dissemination measures.

7.7.8 Protecting the Worker

For work around effluent or sewage, proper work practices and use of personal protective equipment (PPE) are the best ways to protect workers from exposures to chemical effluent and diseases.

The Baddi Infrastructure will ensure to give the worker:

- Training and education about the protective and preventive measures in CETP
- A place in CETP with clean water for washing the hands
- A place to wash and clean up after work
- The right PPE, such as gloves, goggles, a face shield, water-resistant suit, or respirator - depending on the job will be provided to the workers
- Clean areas will be set aside for eating and taking rest
- Cleaning facilities or services for clothing and equipment

7.8 WORKERS CAN TAKE FOOLLOWING PREVENTIVE MEASURES:

- Wash hands well with clean water and soap before eating and after work.
- Do not touch nose, mouth, eyes, or ears with hands, unless they are washed.
- Keep the finger nails short; use a stiff soapy brush to clean undersurface of the nails.
- Wear waterproof gloves during cleaning pumps or screens or during handling effluent, sewage, sludge, or grit.
- Always wear gloves when the hands are chapped or burned or have a rash or a cut.
- Take shower and change work clothes before leaving CETP
- Do not keep soiled work clothes with other clothes.
- Report any injury or illness got from work right away for proper treatment

CHAPTER 8

PROJECT BENEFITS

The rapid growth of industries over the last two decades in Baddi-Barotiwala area has been both a benediction in economic prosperity and a bane due to increase in pollution load in alarming proportion. This is reflected in the Comprehensive Environmental Pollution Index (CEPI) reaching its extreme danger level of 69.8%. The load of nearly one thousand wet processing units in this Himalayan belt has made a severe impact on its serene ecology. This needs an imperative action on the conservation of natural resources to protect the flora and fauna.

There was the development of fresh industries especially small scale industries without providing any infrastructure like CSTP, CETP and MSWP. On 20th August, 2010, Baddi Infrastructure Ltd. of BBN industrial Association proposes to establish Common Effluent Treatment Plant (CETP) on the site in Village Kainduwal, Distt. Solan, H.P., which falls in the notified Industrial Area as per the Master Development Plan of the area.

The advantage of CETP is mostly sought due to following benefits:

- The design advantages of the CETP are:
    - Modular concept
    - Extra provision to upgrade upto 40%
    - Water reclamation and recycling
    - Low treatment cost, sector-wise
    - Encouragement to utilize the existing facility if intended
- The immediate effect will be reduction in the discharge of industrial effluents in the adjoining river and this will be helpful to restore the normal flora and fauna in the river.

- The reduction in pollution load to river on installation of CETP is given below:

Pollution Reduction = Existing pollution load w.r.t. present standards –Pollution load on CETP installation to meet stricter standards

Pollutant Parameter	Pollution Load generation (tonnes/d)	Pollution Load w.r.t. existing standards (tonnes/d)	Pollution Load on CETP installation (tonnes/d)	Reduction in Load (tonnes/d)
BOD	18	0.75	0.25	0.50
COD	52	6.25	2.50	3.75
TDS	63	63	15	48

- This facility will also treat the domestic sewage produced in these Baddi-Barotiwala industrial areas
- The effluent discharge will comply with the guidelines given by HPPCB, CPCB and MoEF and will not be harmful to the ecology of the receiving river.
- This will also be helpful in decreasing the odour problem from the river. As a result local environmental problems will be reduced and it will be beneficial to local population and local fishery production. This will also ensure good water source for wild life around the river.
- There will be reduction in nutrient load to the surrounding water bodies thus reducing eutrophication of water bodies. The majority of the ammonia-N will be converted into nitrate-N and the toxicity of ammonia to the aquatic organisms will be reduced.
- Reduction in eutrophication of the river will make them suitable as the habitat for the fish population, microorganisms, planktons, and other aquatic food web organisms thus developing a sustainable ecosystem.
- The green belt of diverse plants and the clean river wetlands would provide suitable habitat for the birds in the area.
- The organic matter and nutrients removed in the form of biological sludge will act as resource and will be used as manure for the plantation and green belt in the industrial area and in agricultural fields in the surrounding area.

- Aesthetic appearance and quality of the river will be improved which will be useful for the local people.
- Bathing water quality and river water quality for domestic use will be improved.
- There is no ecologically sensitive area within a 10 km radial distance of the project site. No wildlife sanctuary or national park is present within the study area.
- A peripheral greenbelt/plantation, garden and lawn will be provided which will improve the aesthetics of the area.
- As the proposed site is the industrial area away from residential area and all the required care will be taken to control the pollution levels to minimum as discussed in the relevant sections of this report, no adverse impacts are anticipated due to construction of CETP during construction and operation phase.
- The unskilled and skilled manpower requirement during the construction and operation phases for the CETP will generate permanent jobs and secondary jobs for the operation and maintenance of plant. This will increase direct/indirect employment opportunities and ancillary business development to some extent for the local people. The employment opportunities as described above will create beneficial impact on the local socio-economic environment.
- Temporary hutment for the construction workers will be provided with basic amenities like low cost sanitation facilities, first aid, safe drinking water supply and personal protective equipments etc. The workers will be provided the medical assistance whenever required.
- Adequate mitigation measures will be ensured to reduce odor emissions and disease vectors from proposed site to eliminate the nuisance of ETP.
- Epidemic potential of the river will be minimized due to construction of CETP by not allowing the wastewater to the river which promotes the disease organisms in the river system which is utilized by the local people.
- Fly and mosquito breeding in the polishing ponds and drying lagoons will be controlled by chemical addition for ex. calcium hypochloride or chloride).
- Hence the status of sanitation and community will be maintained in good condition at the project site.

It is concluded that the present project is essential to reduce the pollution level in the area from aesthetic point of view as well as from public health point of view. This will be helpful to maintain the indigenous aquatic and terrestrial ecology. The expected reduction in pollution levels would help in further level of industrialization and improvement in the socio-economic status of the local people.

CHAPTER 9

ENVIRONMENTAL MANAGEMENT PLAN

9.1 INTRODUCTION

Based on the impact assessment and baseline environmental conditions, a comprehensive Environmental management plan (EMP) has been prepared to minimize the predicted environmental impacts due to project activity, to minimize the emission of pollutants, to improve the environmental quality and aesthetic environment and to improve the socio-economic status of the area. The different components of the environmental management plant have been discussed below.

9.2 OBJECTIVES OF ENVIRONMENTAL MANAGEMENT PLAN

The main objectives in formulating the environment management plan are:

- To treat the effluent from the 990 industrial units in Baddi-Barotiwala industrial area having registered with M/s Baddi Infrastructure to a level so that the effluent can be recycled & reused in the industrial units/safely discharged in the Sirsa River
- To minimize the air emission, noise and hazardous waste with appropriate technology
- To comply with all the regulations stipulated by MoEF/Central/State Pollution Control Boards related to liquid effluents inlet discharge and air emission as per Air & water pollution control laws.
- To encourage the member industries to carry out primary treatment of their effluent by imposing the treatment charges based on pollution levels in the effluent sent to CETP
- To handle hazardous waste as per Hazardous Waste (Management, Handling and Transboundary Movement) Amendment Rules, 2008 of Environment Protection Act, 1986.
- To improve the overall environmental status and to improve methods of environment management.
- To establish green belt/plantation/garden/lawn around the project area to improve the aesthetics of the area
- To crate good occupational environment for the benefit of the employees to improve

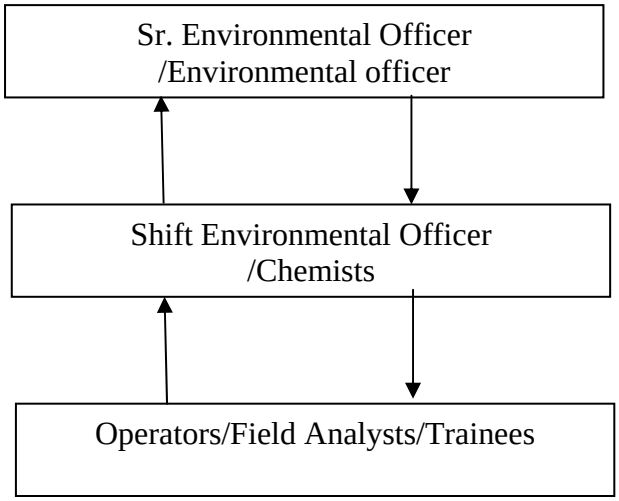
their work efficiency

- To take effective measures to curb the fire and accidental hazards on the project site
- To arrange regular medical health check-up of the employees and to provide the medical aid to them
- To conduct the skill up-gradation training programmes for the employees and for conduct training about preventive measures and conduct during on-site and off-site emergency conditions
- To allocate the required funds for the effective environmental management
- Dissemination of technological solutions on commercial basis to interested parties
- Continuous development and search for innovative technologies for better environment
- To adopt cleaner technology

9.3 ENVIRONMENTAL MANAGEMENT CELL

To implement and supervise the environmental management plan effectively, a permanent organizational set up is proposed by M/s Baddi Infrastructure. This set up consists of an Environmental Management Cell (EMC) consisting of officers from various disciplines having assigned responsibilities to co-ordinate the activities concerned with the management and implementation of environmental control measures. The organization structure is shown in **Fig. 9.1**.

Fig. 9.1: Organization Set-Up of Environmental Cell



9.4 RESPONSIBILTITY OF ENVIRONMENTAL MANAGEMENT CELL

The EMC has the primary responsibility of effective implementation of the mitigation measures delineated in Chapter 4 to minimize the anticipated impacts due to CETP during Construction Phase and Operation Phase. In addition, the EMC has the responsibility to undertake the monitoring of environmental pollution by monitoring the effluent quantity and quality, air quality, water quality, noise level, plantations either departmentally or by appointing external agency whenever necessary. CETP facility at Kainduwal will have its own Quality Control Laboratory facility equipped with different essential equipments i.e. Analytical balance, pH meter, COD heating apparatus, hot plate, oven, incubator, magnetic stirrer, and necessary glass-wares in addition to sophisticated instruments which will be available for analysis of environment parameters.

Regular environmental monitoring will be carried out to ensure that pollution is limited below prescribed limits and to take corrective action by either optimizing the treatment process or providing new equipment or improving the performance of existing pollution control equipment. In case the monitored results of environment pollution will indicate parameters exceeding the prescribed limits, remedial actions will be taken through the concerned plant authorities. The actual operation and maintenance of pollution control equipments of each department will be under respective department heads.

The Environmental, Occupational health and Safety department will also look after for preparation of environment statement, carrying out environment audit, preparation of Water Cess Return and various consent applications and renewal under water (Prevention and Control of Pollution) Act, 1974 and Air (Prevention and Control of Pollution) Act, 1981 as well as application for authorization and its renewal under Hazardous Waste (Management, Handling and Transboundary Movement) Amendment Rules, 2009 under Environment Protection Act, 1986.

Apart from above, EMC has to look after the following aspects also.

9.4.1 Management and Maintenance of Conveyance System

Environmental friendly and cost effective system of effluent conveyance has been planned to bring the effluent from heterogeneous industries from Baddi-Barotiwala industrial area. In the proposed scheme, there is a conveying system of effluent from the respective units (particularly covering large and medium units and small units in clusters) to the CETP site for each category of effluent by using 3 parallel piping network with the help of intermediate

Boosting Pumping stations, with an equivalent piping length of 60 km which can withstand adverse pH, chemicals and harsh thermal environment as shown in the piping network diagram (**Fig. 2.4 in Chapter 2**).

In addition to that, there will be conveyance through tanker system for the pick-up of small quantum of effluent from the nits which are scattered and are far away from the ambit of conduit system.

Following are the special provisions made in conveyance system to protect the environment from any malfunction and for smooth conductance.

- The conduit pipes will have manholes of adequate dimension at an interval of 200 m centre both at the header and branch lines for diagnostic purpose in case of trouble shooting.
- All the pipes will be sealed in the concrete 30cm below the ground and would run parallel to the road on the side.
- All the pipes will be fitted with pressure gauge etc. which will be used in the assessment of flow rate and will help the maintenance staff for trouble shooting. The booster stations will ensure the desired flow with or without clogging.
- A number of rubber lined tankers will be used for conveying the concentrated dye effluents and other small discharges
- The material of construction of pipe will be FRP with a pressure rating 10 to 12 kg/cm^2. Much above the operating pressure taking care of thermal expansion safety factor.
- The effluent is expected to contain suspended solids which may upset the design pressure otherwise the low friction factor will eliminate this problem, keeping the low pressure drop over the entire length.
- FRP has temperature tolerance. Hence, discharge of 60^0C is not going to affect the transportation process.
- At the manhole flange joint is being provided for easy maintenance and to prevent leakage.
- Pipeline network will provide with adequate size with screen.
- Adequate pipeline capacity will be provided.

- Proper Inspection will be carried out.
- Cleaning of pipeline will be carried out as per requirement.
- The routine monitoring of entire pipeline shall be carried out.

9.4.2 Management of Water Environment at CETP

The industrial effluents from heterogeneous industries will be classified into 5 streams from treatment point of view. After treatment, the hazardous sludge produced will be sent to designated hazardous waste dumping site while the innocuous bio-sludge after dewatering and drying will be used as manure.

Proper maintenance of rainwater harvesting will be carried out for recharge of groundwater table.

The recovered water will be recycled and reused in the specific member industries, thus conserving the freshwater, utilization of effluent as resource and to avoid pollution due to discharge in the environment. Only minimum quantity of freshwater requirement will be fulfilled by Public health Department water supply system. This will not put any stress upon the ground water bodies.

Recycle and reuse of treated effluent from CETP will be implemented as given below.

- Pharmaceutical effluent will yield the nano permeate of less than 10 COD and TDS<1500 mg/l. This effluent will be reused in any industry barring Food and Pharma Sector. Extent of recovery is envisaged to be 2200 KLD.
- Textile dye effluent will yield high saline water with TDS 40,000 – 50,000 mg/l. This effluent will be reused in the textile cotton dyeing process. This will be 2000 KLD.
- The major part of water will be reclaimed through textile, food, paper and sewage contributing to 20 MLD under full capacity utilization. This could be reused in the Paper and Textile Sector other than Food and Pharmaceutical.
- However in the beginning 20% treated effluent say 2000 KLD could be recycled.

9.4.3 **Annual Environmental Audit** from recognized environmental auditor will be conducted.

9.4.4 **Adequate Spares** for effluent collection, handling, treatment and transfer will be maintained.

9.4.5 Monitoring of Member Industrial Units for their Responsibilities

- To record the quantity of the influent daily
- To record the stipulated quality parameters of the influent and treated effluent daily

The daily record of the quality and quantity of the influent and treated effluent will be maintained by each member industry and is submitted on daily basis to CETP authorities. This will facilitate the smooth functioning of the treatment plants at CETP and to calculate the share of charge of individual member industries on pollution loads basis.

The details of effluent quality of the various industries (influent to CETP) are given in the Chapter 6 (Environmental Monitoring Programme).

9.4.6 Green Belt Development

Tree plantation is one of the effective remedial measures to control the Air pollution and noise pollution. It also causes aesthetics and climatologically improvement of area as well as sustains and supports the biosphere. It is an established fact that trees and vegetation acts as a vast natural sink for the gaseous as well as particulate air pollutants due to enormous surface area of leaves. It also helps to attenuate the ambient noise level. Plantation around the pollution sources control the air pollution by filtering the air particulate and interacting with gaseous pollutant before it reaches to the ground. Tree plantation also acts as buffer and absorber against accidental release of pollutants.

In Green belt area about 1000 trees (large, medium and small trees/shrubs) per acre of land is recommended to give a thick green cover around the CETP. M/s Baddi Infrastructure has kept 25 acres land of proposed site for development of plantation/green belt around the CETP **(Fig. 2.9 in Chapter 2**).

The selection of tree species suitable for plantation at the CETP shall be governed by guiding factors as stated below

- The trees should be tolerant to air pollutants present in the area
- The trees should be able to grow and thrive on soil of the area, be evergreen, inhabitant, having minimum of leaf fall. Local species will be preferred.
- The trees should be tall in peripheral curtain plantation and with large and spreading canopy in primary and secondary attenuation zone.
- The trees should possess extensive foliar area to provide maximum impinging surface

for continued efficient adsorption and absorption of pollutants.

- The trees should be fast growing and indigenous and should maintain ecological, land and hydrological balance of the region.
- It is also recommended to plant few trees, which are sensitive to air pollution, as air pollution indicator.
- It is also recommended to carry out extensive plantation within premises.

The list of suitable tree species for green belt development is given in **Table 9.1.**

Table 9.1: List of Trees and Shrubs for the Green Belt Development around the CETP

S.N.	Scientific Name	Common Name
	TREES	
1.	*Aegle marmelos*	Bel
2.	*Aesculas indica*	Pangar
3.	*Albizzia lebbek*	Siris
4.	*Bauhinia variegata*	Kachnar
5.	*Butea monosperma*	Dhak
6.	*Cassia fistula*	Amaltas
7.	*Cedrela toona*	Toon
8.	*Celtis australis*	Kharak
9.	*Cinnamomum tamala*	Dalchini
10.	*Cupressus torulosa*	Leuri
11.	*Dalbergia sissoo*	Shisham
12.	*Emblica officinalis*	Amla
13.	*Grewia oppositifolia*	Biul
14.	*Erythrina suberosa*	Chamror
15.	*Melia azadirach*	Denk
16.	*Mangifera indica*	Aam

17.	*Mirtragyna parviflora*	Phaldu
18.	*Pinus roxburghii*	Chil
19.	*Bombax ceiba*	Semul
20.	*Citrus spp.*	Malta
21.	*Sapindus mukurossi*	Ritha
22.	*Quercus incana*	Ban
23.	*Terminalia belerica*	Bahera
	SHRUBS	
1.	*Agave americana*	Rambans
2.	*Adhatoda vasica*	Basuti, Arusa
3.	*Carrisa spinarum*	Karaunda
4.	*Euphorbia royleana*	Shuru
5.	*Opuntia dilleni*	Nagphani
6.	*Jasminum humile*	Shunjai
7.	*Lagerstromia parviflora*	Dhauri
8.	*Rosa brunonii*	Jangli Gulab
9.	*Zizyphus mauritiana*	Kathber

9.4.7 ODOR MANAGEMENT PLAN

Following control measure will be implemented to avoid the odor problem;

- All the aspects of odour control have been adopted during the designing of the treatment plants
- Aerobic condition will be maintained.
- The odorous compounds will be oxidized or precipitated by using oxidizing agent as per requirement.
- Avoiding the overloading in process.
- Minimize turbulence in effluent flow.
- Avoiding the solids inventory and sludge backlog.
- Controlling the release of aerosols.
- Continuous disposal of sludge.
- Proper operating condition will be maintained.
- Proper housekeeping will be done.
- Green belt will be developed.

9.4.8 CORPORATE SOCIAL RESPONSIBILITY

Social Welfare Activities

M/s Baddi Infrastructure will carry out following socio economic activities in nearby area.

- **"Free Medical Check-up Camp"** for the benefit of employees and people of surrounding villages.
- Free of cost note book distribution programme in the schools of surrounding villages for Poor/backward students.
- CFL lamp (Energy Saver) distributed in nearby villages to increase the awareness for energy conservation and energy saving.
- For **"GREEN ENVIRONMENT"**, Mass Tree plantation campaign in industrial area and near by villages.

Occupational Environment

- **Provision of First Aid at Site**

  The proposed project may cause health problem to workers handling toxic effluent discharged by various industrial units. To meet any emergency during, provision for First Aid should be made by the project proponent. Before the affected person is removed to a doctor or health institution for necessary medical aid, the worker should be provided with First Aid.

- **Tie up with the Nearest PHC for Medical Help**

  To meet the medical needs of the workers it is suggested that tie-ups with nearest hospital or Primary Health Center (PHC) may be made. Few beds may be exclusively reserved for the CETP workers in the above health institutions. This will ensure timely medical aid to the affected persons.

- **Supply of Mask, Gloves and Helmets**

  The workers are subject to various diseases, including skin diseases. For protection from toxic material it may be made compulsory for all workers in the plant to wear masks and gloves while working in the CETP.

- **Regular Health Checkups**

  The plant workers may be encouraged to undergo health checkups at regular intervals in order to protect themselves from various diseases. The Health Department of Himachal Pradesh Government should organize Health Camps at regular intervals to make people health conscious. Further, free medical facilities may be made available to the workers and their family members.

- **Special Group Insurance Scheme**

  All the CETP workers may be covered under a Group Insurance Scheme of LIC or any other Insurance company, if not so far.

9.5 COST OF IMPLEMENTATION OF ENVIRONMENTAL MANAGEMENT PLAN

The cost of implementation of environmental management plan is around 44.26 lakhs per year. The details are given in **Table 9.2**.

Table 9.2: Cost of Implementation of Environmental Management Plan

S.N.	Item	Annual Cost (Rs. In Lakh)
1.	Environmental Monitoring	31.50
2.	Sludge management	00.20
3.	Green belt	01,00
4.	Water spraying/washing	00.36
5.	Noise protection gadgets	01.00
6.	Rainwater harvesting	00.20
7.	Social welfare measures	10.00
	TOTAL	**44.26**

9.6 POST CLEARANCE MONITORING PROTOCOL

This is being a Category A project, M/s Baddi Infrastructure will make public the environmental clearance granted for their project along with the environmental conditions and safeguards by advertising it at least in two local newspapers of the Solan district or Himachal Pradesh State. This shall also be displayed in the M/s Baddi Infrastructure's website permanently.

The MoEF shall also place the environmental clearance in the public domain on Government Portal.

Copies of the environmental clearance shall be submitted by M/s Baddi Infrastructure to the Heads of the local bodies, Panchayats and Municipal bodies in addition to the relevant offices of the Government who in turn have to display the same for 30 days from the date of receipt.

M/s Baddi Infrastructure shall submit half-yearly compliance reports in respect of the stipulated prior environmental clearance terms and conditions in hard and soft copies to MoEF, on 1st June and 1st December of each calendar year.

All such compliance reports submitted by M/s Baddi Infrastructure shall be public documents. Copies of the same shall be given to any person on application to the concerned regulatory authority i.e. MoEF.

The latest such compliance report shall also be displayed on the website of the MoEF.

The HPSPCB shall incorporate EIA clearance conditions into consent conditions and in parallel monitor and enforce the same.

9.7 CONCLUSION

The operation of CETP will result in decreasing the pollution levels in this highly polluted area and thereby in protection and restoration of the ecology of the region.

The setting up of CETP will give a sigh of relief to the workers in the adjoining industrial units from various killer diseases that have been threatening to their lives for long.

The project is expected to accelerate employment opportunities to local people and open a new vista for development of trade and industry. Since the setting up of the CETP is a step towards reducing environmental pollution in the area more and more industrial units including ancillary units will strive to set up their units in this industrial area. This will give further impetus to growth process resulting to greater employment opportunities to the local people. At present 39 percent of the population depends on agriculture. With the implementation of the proposed project the occupational pattern of the people in the area will change making more people engaged in industrial and business activities ensuring further shifting of population from agriculture to industry.

The social welfare activity of the M/s Baddi Infrastructure will improve the infrastructural facilities in the surrounding villages especially with respect to education and medical field.

CHAPTER 10

SUMMARY AND CONCLUSION

10.1 INTRODUCTION

M/s Baddi Infrastructure Ltd, a Special Purpose Vehicle (SPV), formed by Baddi Barotiwala Nalagarh Industrial Association (BBNIA), Baddi, Disrtrict Solan, Himachal Pradesh proposes to develop Common Effluent Treatment Plant (CETP) to serve the 990 wet industries present in 9 industrial areas in Baddi-Barotiwala industrial corridor. As per the M/s Baddi Infrastructure Ltd., all the industries are to join the CETP. Govt. of HP has issued notification to this effect. The proposed site of CETP is present near the industrial area at village Kainduwal in Solan District. The total cost of the project is around Rs. 56.80 Crores.

10.2 NEED OF THE PROJECT

The rapid growth of industry over the last two decades in Baddi and Barotiwala has been both a benediction in economic prosperity and a bane due to increase in pollution load in alarming proportion. This is reflected in the Comprehensive Environmental Pollution Index (CEPI) reaching its extreme danger level just below 70. The load of nearly one thousand wert processing units in this Himalayan belt has made a severe impact on its serene ecology. This needs an imperative action on the conservation of natural resources to protect the flora and fauna. The Common Effluent Treatment Plant is a recent approach to treat the industrial effluent coming from small and medium scale industries which do not have capability to treat the same to comply with the stipulated standards.

10.3 CATEGORY OF THE PROJECT

All the CETP units are listed at Serial no. 7(h) of the Schedule of EIA Notification of 14-09-2006 and categorized under Category 'B'. However, this plant is located within critically polluted Baddi area as per CEPI (CPCB, Comprehensive Assessment of Industrial Clusters, Ecological Impact Assessment Series EIAS/5/2009-10, December 2009) and is present at 7 km distance from inter-State boundary with Punjab and Himachal Pradesh, thus attract two general conditions to be categorized as **Category 'A'** Project under EIA Notification, 2006.

10.4 CLIMATE AND RAINFALL

The climate of the region is sub-tropical in the lower reaches of the district and moist temperate in the upper reaches. Generally, the rainy season commences from the first week of July and continues upto the first half of September. Average yearly rainfall in the Baddi-Nalagarh area is about 105 cm with occasional foggy weather. Winter rains generally commence from last week of December and continue upto the end of February. October, November, and March to May are relatively dry months. Due to significant variations in altitudes in the district, the temperature also varies considerably. Minimum temperature goes down below 0^0C in higher reaches during winter and minimum temperature exceeds 40^0C in lower reaches during summer season.

10.5 TOPOGRAPHY

The project site lies in the Doon Nalagarh valley in Solan District of Himachal Pradesh. The Solan District is located in the Shiwalik and lower Himalayan zone. The area is essentially rural except the industrial town of Baddi-Barotiwala. The topography of the area is represented by moderate hills and plain valley. The average country slope is 0.9% to 10 %.

The Baddi & Borotiwala area is located on a flat terrain which is surrounded by Dharampur Range, Surajpur-Haripur-Mandhala Range and Shivalik Range. Geological formation consists of sand, gravels and clay. The topography of the area is represented by moderate hills and plain valley. The altitude of 10 km radial area around the project site varies from 150 m to 900m MSL.

The Project area is criss-crossed by seasonal streams and drained by River Sirsa which has very lean flow due to effluents discharged in it, otherwise it remains dry throughout the year. The Sirsa River is flowing in the downstream of twin industrial complex, receives the industrial and domestic effluents from this twin industrial complex in addition to the various non point pollution loads from domestic and agricultural sectors. This river with a mainstream channel length of 41 Kms originates in the Panchkula District of Haryana and after flowing in Northwest direction it confluences with River Sutlej near Ropar. The River Sirsa flows to the north of the proposed project.

10.6 NATURE AND SIZE OF THE PROJECT

S. No	Particulars	Details
1.	Name of the Project	Common Effluent Treatment Plant and Recovery Facility (25 MLD capacity)
2.	Total Plot area for CETP	25 acre
3.	Green belt area	8 acre
4.	Location A. Village	 Kainduwal
5.	B. District C. State	Solan Himachal Pradesh
6.	National Highway	NH-21
7.	Nearest town/city	Baddi
8.	Reserve Forest/Protected Forest/ Wildlife Sanctuary	None
9.	Nearest water body	River Sirsa along the boundary of the project site
10.	Seismic Zone	Zone IV
11.	Total Project cost	Rs 56.80 Crores
12.	Power requirement	4000 KW (Installed load) 2750 KW (Running load)
13.	Source of Power	Himachal Pradesh State Electricity Board
14.	Water requirement	50 KLD which will be provided by Public Health Department
15.	Number of working Days	360
16.	Hazard Management	Provision of fire facility, fie extinguishers, yard hydrants, hose reels, exit sign boards, alternate source of electric supply, fire alarm system, water storage tank for fire fighting

The project site has been allotted by HP State Government and satisfies the MoEF guidelines for site selection. The site is present near Baddi Barotiwala Industrial area. .

In case of Baddi CETP, the norms being aimed at by the proponent for the CETP outlet treated effluent are much more stringent i.e. BOD <10mg/l and COD <100 mg/l as a

requirement to take care of refractory chemicals and also the management of TDS and to reclaim the ecology of the Sirsa River. Till now, In case of member industrial units, they have to meet the relaxed existing discharge statutory norms of 30 mg/l for BOD and 250 mg/l for COD which has resulted in the severe pollution of the Sirsa River. It is anticipated that the quality of the river will improve with the installation of CETP and discharge of highly purified effluent into the river.

The various types of industries existing are textile, pulp and paper, food and beverages, engineering and metal, footwear, plastics, pharma, soap and detergents, electrical and electronics, automobile, packaging and others. The facility will be treating 12989 KLD effluent from the Textile industries, 2432 KLD effluent from Food and Beverage units, 2050 KLD effluent from Paper Units, 1917 KLD effluent from the Detergents units, 2217 KLD effluent from Pharma units, 42 KLD effluent from Electroplating units and 193 KLD effluent from Miscellaneous units.

For effective treatment, on the basis of comprehensive survey, effluent analysis and treatability studies, the effluents have been segregated into 5 streams as per their compatibility and five treatment processes have been designed using recent technology. The factory sewage will also be treated with industrial effluent.

The plant has been designed by absorbing the new technology like micro and nano filtration technology, MBBR, Ozonation etc and conventional Activated Sludge Process to deal with tricky recalcitrant pollutants to make a solid foundation for a techno-economic viability for investment and recurring expenditure. Simultaneously attempt has been made to do sludge minimization through proper scheme selection.

The treatment plants will consist of physical, chemical and biological treatment, sludge processing and other required infrastructure. Recycle and reuse of the treated effluent in suitable industrial units is also included in the project. The bio sludge (6 tonnes/day) produced during the biological treatment will be dried and used as manure after complying to physicochemical quality while the hazardous sludge (24 tonnes/day) produced during treatment will be sent to Shivalik Solid Waste Treatment Facility. Non-complying bio=-sludge will also be sent to Shivalik Solid Waste Treatment Facility.

10.6.1 Manpower Requirement

The number of working people will be approximately 100. Preference will be given to local people during the engagement of the construction labourers, contractors and workers during construction and operation phase.

10.6.2 Effluent Treatment Charges

Every member industry has to pay for the treatment of effluent based on their pollution load. This will encourage them to give primary treatment to the wastewater before sending the effluent to the CETP for treatment.

10.7 EFFLUENT TRANSPORTATION

Environmental friendly and economical transportation have been planned to transport the effluent from different industries to the CETP site.

Textile effluent excluding concentrated dye part, food effluent and paper industry wastewater, being in large volume, will be transported through pipe from the industry to the CETP site. The Pharma units are located in a centered zone; therefore their effluent will also be transported through a separate piping conduit to the CETP. Effluent from large Soap and Detergent units will be transported through pipeline, while tankers will be used to collect effluent from large number of scattered units. The concentrated dye effluents and other small discharge will be lifted through tankers and transported to CETP site. A number of rubber lined tankers will be used for this purpose.

10.8 MAJOR ASPECTS OF MITIGATION MEASURES INCORPORATED INTO THE PROJECT

The major issues in common effluent treatment plant are to meet the prescribed standards of inlet and outlet effluent and to minimize the effluent discharge (ZLD).

To achieve above objectives following mitigation measures will be implemented:

- For proper management of the CETP, M/s Baddi Infrastructure Ltd. acts as Special Purpose Vehicle (SPV)
- The individual industries were made to get equipped with their own waste treatment devices, so that the inlet effluent quality to CETP will meet the prescribed standards.
- Every member industry will daily monitor the specified parameters of effluent and its flow and the data will be submitted to CETP operator on regular basis. A Memorandum of Association (MoA) has been executed between M/s Baddi Infrastructure Ltd and the member industries to this effect.
- Economical and environmental friendly method of effluent collection system at member units level

- A legal agreement (MoU) between the M/s Baddi Infrastructure Ltd and its member units has been executed and cost recovery formula has been developed.
- Member industries of CETP shall regularly pay their shares towards meeting the treatment cost and operation and maintenance of CETP
- Adequate linkages with treatment, storage and disposal facility (TSDF) for disposal of hazardous waste generated from the facility will be ensured.
- Inlet and outlet effluent standards of the CETP will be complied with irrespective of the degree of treatment i.e. primary, secondary or tertiary. Continuous flow meters will be installed at the outlet of the CETP to monitor the same.
- Adequate measures will be taken to control air pollution, noise levels, water pollution, apart from having proper land-scaping and green belt & plantation development.
- Social welfare measures will be undertaken
- Occupational Health and Safety Plan will be formulated and implemented

10.9 BASELINE STATUS OF THE ENVIRONMENT

Summary of baseline environmental quality monitored during October to December 2011 is given below:

10.9.1 Ambient Air Quality

The dominant wind direction is from North-West to South-East, and the dominant wind speed is 2.1 to 3.6 m/s.

Ambient air quality monitoring was carried out at five stations including project site.

The seasonal maximum, minimum and average values of PM2.5 observed at the project site were 44.9 µg/m^3, 39.2 µg/m^3 and 41.1 µg/m^3 respectively. The 98th percentile values of PM2.5 varied at different stations from 43.8 µg/m^3 (AQ1), 48.6 µg/m^3 (AQ2), 46.8 µg/m^3 (AQ3), 44.2 µg/m^3 (AQ4) and 47.6 µg/m^3 (AQ5). All these values are below the stipulated standard of 60 µg/m^3.

The seasonal maximum, minimum and average values of PM_{10} observed at the project site were 83.5 µg/m^3, 65.5 µg/m^3 and 71.7 µg/m^3 respectively. The 98th percentile values of PM10 varied at different stations from 82.6 µg/m^3 (AQ1), 91.5 µg/m^3 (AQ2), 88.2 µg/m^3 (AQ3), 79.3 µg/m^3 (AQ4) and 89.4 µg/m^3 (AQ5). All these values are below the stipulated standard of 100 µg/m^3.

The seasonal maximum, minimum and average values of SO_2 observed at the project

site were 10.8 µg/m^3, 6.1 µg/m^3 and 7.8 µg/m^3 respectively. The 98th percentile values of SO2 varied at different stations from 10.2 µg/m^3 (AQ1), 12.7 µg/m^3 (AQ2), 11.1 µg/m^3 (AQ3), 9.4 µg/m^3 (AQ4) and 12.2 µg/m^3 (AQ5). All these values are below the stipulated standard of 80 µg/m^3.

The seasonal maximum, minimum and average values of NO_x observed at the project site were 21.6 µg/m^3, 15.8 µg/m^3 and 17.2 µg/m^3 respectively. The 98th percentile values of NOx varied at different stations from 20.9 µg/m^3 (AQ1), 25.3 µg/m^3 (AQ2), 23.4 µg/m^3 (AQ3), 19.5 µg/m^3 (AQ4) and 24.3 µg/m^3 (AQ5). All these values are below the stipulated standard of 80 µg/m^3.

The seasonal maximum, minimum and average values of CO observed at the project site were 1160 µg/m^3, 730 µg/m^3 and 890 µg/m^3 respectively. The 98th percentile values of CO varied at different stations from 1150.8 µg/m^3 (AQ1), 1227.8 µg/m^3 (AQ2), 1087.7 µg/m^3 (AQ3), 1046.2 µg/m^3 (AQ4) and 1207.0 µg/m^3 (AQ5). All these values are below the stipulated standard of 4000 µg/m^3.

10.9.2 Noise Environment

Noise levels were monitored at 5 stations including project site. It is observed that the night time Leq (Ln) varies from 39.1 to 51.8 (A) and the daytime Leq (Ld) varies from 48.6 to 63.4 (A) within the study area. The noise levels are higher at industrial zone and commercial zone than those recorded at project site, residential zone and silence zone which is due to lesser human activity in these areas. The status of noise quality within the 10 km zone of the study area is, therefore, within the CPCB standards.

10.9.3 Water Environment

Five groundwater samples and four surface water samples were analysed for physico-chemical, biological and microbiological parameters Ground water quality was discussed by comparing with Drinking Water Standards (IS:10500) and surface water bodies were classified as per Surface Water Quality Criteria (CPCB) based on designated best use.

The salient physico-chemical and microbiological characteristics of groundwater samples are given below.

The groundwater showed the Physicochemical characteristics as Total Dissolved Solids (570 to 621 mg/l), Total Hardness as CaCO3 (252 to 278 mg/l), Calcium (46 to 62 mg/l), Magnesium (30 to 33 mg/l), Chlorides (120 to 136 mg/l), Sulphate (57 to 62 mg/l), Nitrate (3 to 4

mg/l), Zinc (0.14 to 0.17 mg/l), Cyanide (<0.01 mg/l). Total Coliform count is around MPN 10/100 ml and *E. Coli* is absent in water samples

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

The surface water samples from the Sirsa River (upstream and downstream of discharge of Balad Nadi) , Balad Nadi and Ratta Nadi showed polluted water quality due to discharge of industrial effluent and sewage in them. The Sirsa River was observed to be more polluted at the downstream of the confluence of the Balad nadi with it. The Balad nadi and Ratta nadi are comparatively less polluted than Sirsa River. The salient physico-chemical and microbiological characteristics of these river waters are given below.

The river water quality showed physicochemical quality as Total Dissolved Solids (274 to 450 mg/l), Total Hardness as CaCO3 (148 to 24 mg/l), Magnesium (36 to 60 mg/l), Chloride (42 to 82 mg/l), Sulphate (10 to 20 mg/l), Nitrate (4 to 8 mg/l), Zinc (of 0.04 to 0.13 mg/l) and Cyanide (<0.01 mg/l).

Comparing the values of pH, DO, BOD and Total Coliforms with use based classification of surface waters' published by Central Pollution Control Board; it can be seen that the analyzed surface waters are highly polluted and classified as "Below Class 'E'" and can not be used for any designated use of water. Bacteriological examination of surface water indicates the presence of higher count of total coliforms and E.coli, which may be due to presence of human activities in the area and organic industrial waste.

10.9.4 Land Environment

The landuse / landcover pattern of the 10 km radial study area around the project site is mainly dominated by the types – forest cover (44.64%), agricultural land (34.72%) and Scrub land (16.04%). Other land uses are water bodies (4.37%) and settlements (0.21%).

Five soil samples collected from project site and buffer zone were analysed for the physic-chemical characteristics of soil samples. It was observed that most of the soil samples are loam in nature, in which, clay & sand percentage is predominant. The salient characteristics are given below.

- Electrical conductivity of the soil measured is 155 to 231 µmhos/ cm
- The value of sodium was in the range 67-144 mg/kg.
- The value of magnesium was in the range of 876-2548.03 mg/kg.

- The value of calcium was in the range 1667-7153.62mg/kg.
- The soil shows a pH range of 7.62-7.85, which is basic probably due to presence of oxides and hydroxides of the basic metals in moderate amount.

The results show that the soils in the study area are fertile in nature

10.9.5 Biological Environment

The Baddi Barotiwala area is located on a flat terrain which is surrounded by Dharampur Range, Surajpur-Hamirpur-Mandhala Range and Shivalik Hills. The 10km radial study area has an elevation ranging from 150m to 900 m above m.s.l. The average elevation of Baddi Barotiwala area is 372 m above msl. The project site is a vacant plot without any vegetation. Only some herbs and grasses are present in the project site.

The Flora and Fauna in the buffer zone of study area is classified as belonging to Lower Montane Zone (up to 1,000metres above MSL) of Himachal Pradesh.

Faunal and Flora Species in Study Area

The project site is an open land with few grasses on the bank of Sirsa River with no trees. No wild life species or breeding or roosting place has been recorded from or near project site.

In general for the State as a whole the forests of the State have been classified on an ecological basis as laid down by Champion and Seth, and can be broadly classified into broad-leaved Forests. The vegetation varies from Dry Scrub Forests at lower altitudes to Mixed Deciduous Forests at higher altitude. The broadleaves bushes and trees include *Adhatoda, Azadirachta, Bombax, Butea, Dalbergia, Albizzia, Ficus*, etc.. A large number of herbs form part of the ground flora. Thorny bushes and trees include *Capparis, Ziziphus, Acacia, Mimosa, Lantana* etc. There are a large variety of orchids, bamboo and creepers. . The trees like Bamboo, Chil, and Kail, are found. Pine forests are found in the steep dry slopes of the Shivalik Hills.

Common Maina, Kingfisher, Spotted dove are some dominant bird species present in the study area. There is no information regarding migratory movement of birds in the study area. The major bird species in the study area are white rumped vulchur (*Gyps bengalensis*), rock pigeon *(Columba livia*), spotted Dove (*Streptopelia chinensis*), Indian Robin (*Saxicoloides fulicata*), black drongo (*Dicrurus macrocercus*), Indian cukoo (*Cuculus micropterus*), green bee-eater (*Merops orientalis*), common myna (*Acridotheres tristis*), and Jungle Bush Quail (*Perdicula*

asiatica). The wild life consists of Indian hare, Indian fox, monkeys, jackal and Indian porcupine. As far as the reptile community was concerned, rat snake, python, krait, and house lizard are reported from the study area.

There are no endemic or endangered species observed in the Study area around the CETP at Baddi.

10.9.6 Socio-economic Environment

Large Scale Industrial development has taken place in the Project Area Nalagarh Doon Valley with in the Nagar Panchayat of Baddi and Gram Panchayats of Barotiwala, Gulurawala, Sandholi, Thana, Bhood, located in between Ratta Nadi and Maranawala nalla. The socio-economics profile has been studied through random sample primary surveys and secondary data.

Total population of Baddi-Barotiwala-Nalagarh (BBN) planning area is 1.5 lakhs. With a decadal growth rate of 46.91% in 1981-91 and 45.99% in 1991-01, share of urban population has increased in 2001 bringing down share of rural population in the area. The urban population has scaled up from 7.5% in 1991 to 22.15% in 2001 in Baddi-Barotiwala-Nalagarh area. Due to industrialization after 2003, concession policy, large population has migrated to Baddi from outside this region and state.

10.10 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Anticipated environmental impacts and mitigation measures during construction phase and operation phase are given in **Table 10.1** and **10.2** respectively.

10.10.1CONSTRUCTION PHASE

The major impacts during construction phase are exposure of trespassers to hazards of construction, dust pollution, noise pollution, sewage disposal from temporary labour colony, excavated overburden, noise due to construction activity etc. The mitigation measures will be fencing of the project site, low cost sanitation and safe water to the labour colony and ear muffs for labours working near high noise equipments, use of overburden in construction and for land filling, and construction of embankment towards river side.

10.10.2 OPERATION PHASE

Air Environment

There will be small amount of dust emission due to vehicular movement and negligible emission of air pollutants due to DG sets which will be used only during emergency of power failure. Traces of odour may be produced.

The mitigation measures will include:

- Reduction of vehicular movement due to pipeline conveyance of 90% of effluent and Vehicles will be maintained in good conditions with PUC
- Good housekeeping will be maintained
- Roads will be maintained in good condition;
- Generators with proper height of stack as per guidelines and will be used during emergency only
- Equalization tanks with air sparging system to reduce odour
- Aerobic sludge after decanter will be disposed off through tankers immediately
- If biosludge is mixed with primary sludge, its alkalinity and aerobic nature will reduce smell to a great extent
- Peripheral green belt will minimize odour further

Noise Environment

Some increase in noise will be from machinery, pumps, generators and tankers. Noise will be minimized by regular maintenance of all the units and installation of all noise generating units in acoustic chambers/rooms. Roads will be maintained in good conditions to reduce noise by vehicles. The workers working in noise zones will be provided with ear mufflers.

Water environment

Disposal of excess treated effluent, complying to the stringent norms aimed at and with that of MoEF, in water bodies will not produce pollution / eutrophication but will reclaim and clean the river ecosystem. The mitigation measures included in the Planning and design of CETP are given below:

- Stoppage of discharge of partially treated/untreated effluent in Sirsa river
- Recycle and reuse of treated effluent to maximum extent
- Domestic sewage from CETP facility and from industrial areas will be treated In the same facility

- Treatment of five streams of effluent as per their compatibility to reduce TDS, colour, BOD & COD
- CETP will be constructed with strong foundation and water proof RCC work to avoid any seepage
- Rainwater harvesting will be done for groundwater recharge

Land Environment

There will not be any impact on the land due to proper management of chemical hazardous sludge and biosludge produced during the effluent treatment process.

Hazardous sludge, after decanters, will be disposed off in authorized Shivalik Solid Waste Management Facility. The bio-sludge will be monitored regularly for physico-chemical characteristics and if suitable will be used as manure in the agricultural fields. Otherwise it will be sent to Shivalik HWMF. Used oil will be sold to registered dealers. Discarded containers will be decontaminated and will be given to state authorized vendors. .

Ecological Environment

There will be no impact on the local ecology due to insignificant emission through air from CETP. CETP will have beneficial effect on the environment and will reduce the CEPI gradually. Immediate effect of CETP will be reduction in the discharge of pollution load to the Sirsa River and reduction in the eutrophication of river boosting up aquatic life and DO content and necessary nutrients. The discharge of excess treated effluent remaining after recycle and reuse will not only meet the discharge standards and it will not be harmful to the river ecology. Green belt/ plantation will be developed around the CETP

Socio-economic Environment

Socioeconomic environment will not be affected due to no influx of outside people as the number of workers will be only 100 and local people will be selected for most of the posts. In addition, large number of secondary job opportunities will be created due to installation of CETP. Socioeconomic conditions of the local people will be improved. There will be improvement in the infrastructural facilities. Aesthetic and hygienic environment will be created which will be helpful in maintaining good public health with reduction in water borne diseases in the surrounding environment.

Other benefits will be further growth in industrial development, and improvement in occupational health & skills and improvement in sanitation. The analysis by matrix representation indicates that the overall impact is beneficial.

10.11 RISK ASSESSMENT AND DISASTER MANAGEMENT CELL: The RADM Cell will be formed to undertake suitable action during any emergency in the CETP premises. All the workers will be given training to conduct their duty and responsibility to take preventive action and to minimize the impact of hazardous incident and to protect the lives and the property from such incidents.

10.12 ENVIRONMENTAL MANAGEMENT PLAN

For proper implementation of EMP, an Environmental Management Cell (EMC) consisting of Sr. Environ. Officer/Sr. Officer, Shift Environ. Officer/Chemists, Trainees/Operators. The EMC will be having responsibility to monitor the environment as per schedule given in Environmental Monitoring Plan in Chapter 6 of this EIA report. Any environmental problem will be detected and will be taken care off by the EMC.

The objective of EMP will be:

- To treat the effluent from the heterogeneous industrial units in Baddi-Barotiwala industrial area having registered with Baddi Infrastructure to a level so that the effluent can be recycled & reused in the industrial units/safely discharged in the Sirsa River
- To minimize the air emission, noise and hazardous waste with appropriate technology and to comply with all the regulations stipulated by MoEF/Central/State Pollution Control Boards related to liquid effluents discharge and air emission as per Air & water pollution control laws.
- To handle hazardous waste as per Hazardous Waste (Management, Handling and Transboundary Movement) Amendment Rules, 2008 of Environment Protection Act, 1986.
- To improve the overall environmental status and to improve methods of environment management.
- To establish green belt/plantation/garden/lawn around the project area to improve the aesthetics of the area
- To crate good occupational environment for the benefit of the employees to improve

their work efficiency by regular medical health check-up, skill up-gradation programme, and training on preventive measures and conduct and duty during emergency conditions.

- To take effective measures to curb the fire and accidental hazards on the project site
- To allocate the required funds for the effective environmental management
- Dissemination of technological solutions on commercial basis to interested parties
- Continuous development and search for innovative technologies for better environment
- To adopt cleaner technology

An Environmental Management Cell will be formed in the CETP for effective implementation of the mitigation measures detailed in the **Chapter 4** as well as in **Tables 10.1** and **10.2** in this Chapter to reduce the anticipated impacts due to CETP on the environment and socioeconomic status during Construction Phase and Operation Phase.

Regular environmental monitoring will be carried out to ensure that pollution is limited below prescribed limits and to take corrective action by either optimizing the treatment process or providing new equipment or improving the performance of existing pollution control equipment. In case the monitored results of environment pollution will indicate parameters exceeding the prescribed limits, remedial actions will be taken through the concerned plant authorities. The actual operation and maintenance of pollution control equipments of each department will be under respective department heads.

The Environmental, Occupational health and Safety department will also look after for preparation of environment statement, carrying out environment audit, preparation of Water Cess Return and various consent applications and renewal under water (Prevention and Control of Pollution) Act, 1974 and Air (Prevention and Control of Pollution) Act, 1981 as well as application for authorization and its renewal under Hazardous Waste (Management, Handling and Transboundary Movement) Amendment Rules, 2008 under Environment Protection Act, 1986.

EMC will also take care of following issues during the operation of the CETP.

- Management and maintenance of conveyance system.
- Management of water environment at CETP site

- To carry out Annual environmental Audit from recognized environmental auditor
- To make available adequate spares for effluent collection, handling, treatment and transfer
- Monitoring of member industries for their responsibilities
- Green Belt development and maintenance
- To implement odour management plan
- To carry out social welfare activities for occupational environment and for public in nearby villages

10.13 COST OF IMPLEMENTATION OF ENVIRONMENTAL MANAGEMENT PLAN:

Rs. 44.26 lakhs per annum

10.14 POST CLEARANCE MONITORING PROTOCOL

- M/s Baddi Infrastructure will make public the environmental clearance granted by MoEF and to the head of local bodies, relevant offices of Government and HPPCB
- M/s Baddi infrastructure shall submit half-yearly compliance reports to MoEF which will be public documents

10.15 CONCLUSION

The development and operation of CETP is highly needed in this highly polluted zone to save the environment and the ecology of the region. The construction and operation of CETP will have immense benefits to reduce the environmental pollution and will be helpful to reduce the pollution status of this region as per Comprehensive Environmental Pollution Index (CEPI). Other benefits will be development of primary and secondary employment opportunities, development of infrastructural development, improvement of public health conditions, improvement of socio-economic status and healthy atmosphere which is essential for sustainable development of the area.

The setting up of CETP will give a sigh of relief to the people and workers in the adjoining industrial units from various killer diseases that have been threatening to their lives for long. The project is expected to accelerate employment opportunities to local people and open a new vista for development of trade and industry.

Since the setting up of the CETP is a step towards reducing environmental pollution in the area more and more industrial units including ancillary units will strive to set up their units in this industrial area. This will give further impetus to growth process resulting to greater employment opportunities to the local people. At present 39 percent of the population depends on agriculture. With the implementation of the proposed project the occupational pattern of the people in the area will change making more people engaged in industrial and business activities ensuring further shifting of population from agriculture to industry.

The social welfare activity of the M/s Baddi Infrastructure will improve the infrastructural facilities in the surrounding villages especially with respect to education and medical field.

Table 10.1: Potential Impacts and Mitigation Measures during Construction Phase

Environ-mental Compo-nent	Sources of Impacts	Potential Impacts	Mitigation Measures	Remarks
Air Quality	• Land preparation and construction activity • Vehicular traffic	• Dust emission • Stacking of construction material may block roads	• Water spraying on haul roads in project site • Regular maintenance of vehicles • Vehicles with PUC	• No remarkable increase in dust emission and other air pollutants • The construction activity will be completed in shortest possible period
Noise	HEMM, heavy machineries and truck movement	• Workers exposed to increased noise near machineries	• Construction work during day time only • Ear plugs to workers • Regular maintenance of machineries and trucks	• Noise will be below stipulated standard of 90 dB(A) for occupational area
Water Quality	• Wastewater produced from labour colony • Excavated material	• Public health concern due to wastewater • Storm water with sediments from excavated material	• Modular Septic tank for wastewater treatment • Secured storage and reuse of excavated material in construction and land filling • Embankment towards river side	Labour colony will be temporary for construction period only.
Land Quality	Land preparation and construction activity	• Change in land use pattern, • Overburden & construction waste may pollute soil	• Project site is open land allotted for CETP so no change in land use pattern, • Reuse of O.B. & construction waste in construction and for land fill during	• Quantum of excavated O.B. & construction waste will be small

Environ-mental Compo-nent	Sources of Impacts	Potential Impacts	Mitigation Measures	Remarks
			land-scaping	
Ecology (terrestrial and aquatic)	Land preparation for construction of CETP	Production of noise	Construction work during day time lonely and vehicles will be maintained in good condition	Increase in noise will be very small
Socio-Economic	Construction of CETP	No adverse impact	Direct and indirect employment opportunities	Improvement in socioeconomic status of local people
Infrastructure & Services	Construction activity require many products from other industries	Development of industries in the area	Commercial and economic development	
Environmental Hazards	Construction of CETP	No environmental hazard		Construction of CETP will not involve blasting activity
Public Health	Labour colony	Insanitary conditions & public health problems	• Low cost sanitation and safe water will be provided • First aid and medical help will be provided • Personal protective equipments will be provided	
Transpor-tation and Communi-cation	Construction of CETP	The project site is well connected with roads and communication means, so no impact on these aspects	--	

Table 10.2: Potential Impacts and Mitigation Measures during Operation Phase

Environmental Component	Sources of Impacts	Potential Impacts	Mitigation Measures	Remarks
Air quality	• Small amount of vehicular movement • Operation of DG generators during emergency only • CETP operation	• Small amount of dust emission due to vehicular movement • Negligible emission of air pollutants due to DG sets • Traces of odour may be produced	• Vehicular movement is reduced due to pipeline conveyance of 90% of effluent • Good housekeeping will be maintained • Vehicles will be maintained in good conditions with PUC; • Roads will be maintained in good condition; • Generators with proper height of stack as per guidelines and will be used during emergency only • Equalization tanks with air sparging system to reduce odour • Aerobic sludge after decanter will be disposed off through tankers immediately • If biosludge is mixed with primary sludge, its alkalinity and aerobic nature will reduce smell to a great extent • Peripheral green belt will minimize odour further	Generators will be used only during load shedding period The CETP is almost odour free due to its design
Noise	Waste treatment pumps, fans, generator and vehicles	Some amount of increase in noise levels	• Noise from generator sets will be within stipulated standards due to acoustic enclosures	Increase in noise levels will be within limits

Environmental Component	Sources of Impacts	Potential Impacts	Mitigation Measures	Remarks
			• Machineries within acoustic enclosures / rooms • Ear plugs to workers • Roads will be maintained in good condition to reduce noise due to traffic	
Water Quality	Disposal of excess treated effluent, complying to the stringent norms aimed at and with that of MoEF, in water bodies	No impact like eutrophication will be there in the River Overall quality of Sirsa River will be improved due to controlled single point discharge of treated effluent complying to the stringent norms aimed at	• Stoppage of discharge of partially treated/untreated effluent in Sirsa river • Recycle and reuse of treated effluent to maximum extent • Domestic sewage from CETP facility and from industrial areas will be treated In the same facility • Treatment of five streams of effluent as per their compatibility to reduce TDS, colour, BOD & COD • CETP will be constructed with strong foundation and water proof RCC work to avoid any seepage • Rainwater harvesting will be done for groundwater recharge	• The polluted Sirsa River will be reclaimed as clean river and will be hygienically safe • The partially treated and untreated industrial effluent and sewage will be mandatorily passed through CETP • Moreover, toxic effluents likely to be generated from electroplating industries are being stored within an acid proof tank with retention time for 2 days before it gets into CETP inlet. • Installations of CETP will avert the

Environmental Component	Sources of Impacts	Potential Impacts	Mitigation Measures	Remarks
				present problem of colour and turbidity in Sirsa River making it absolutely clean
Land Quality	Production of hazardous chemical sludge	No impact due to proper management	• Chemical sludge after reduction in quantity by segregation from biosludge and by decantation will be sent to authorized Shivalik Solid Waste Management Facility • Only biosludge will be used as manure after chemical testing to improve the soil quality, otherwise it will be disposed off to Shivalik SWMF	Record of sludge disposal shall be kept as per Hazardous Waste (Management, Handling and Transboundary) Rules, 2008
Ecology (terrestrial and aquatic)	Operation of CETP	No impact due to insignificant emission through air	• CETP will have beneficial effect on the environment and will reduce the CEPI gradually • Immediate effect will be reduction in the discharge of pollution load to the Sirsa River • Installation of CETP will reduce the eutrophication of Sirsa River boosting up aquatic life and DO content and necessary nutrients • The discharge of	• No biologically sensitive area is present within 10 km radial area

Environmental Component	Sources of Impacts	Potential Impacts	Mitigation Measures	Remarks
			excess treated effluent remaining after recycle and reuse will not only meet the discharge standards and it will not be harmful to the river ecology •Green belt/ plantation will be developed around the CETP	
Socio-Economic	Operation of CETP: Construction Phase and Operation Phase	• Negligible influx of outside people as workers • Beneficial impacts with respect to employment and other socioeconomic aspects	•Local people will be given preference in employment or contract jobs •Generation of primary & secondary employment to local people	Other benefits: • Industrial development • Improvement in aesthetic and hygienic environment • Benefits to women labourers • Public health will be improved • Family income will be improved • Consumption pattern will be enhanced
Infrastructure & Services	Operation of CETP	Infrastructural and industrial development will take place	Commercial and economic development will be possible	Basic utilities like supply of water, electricity, gas etc. will be improved
Transportation and Communication	Pressure on transportation and communica-tion	No impact on transportation & communication as all the facilities are already well developed in the area	--	--
Historical, Archeological and Architectural	CETP operation	No historical, archeological and architectural sites are present in the	--	--

Environmental Component	Sources of Impacts	Potential Impacts	Mitigation Measures	Remarks
Sites		study area		
Law and Order	CETP – construction and operation phase	As local people will be employed with other benefits, no law and order problem will be there.	However to avoid any untoward incident, one police post may be set up close to the project area.	--

CHAPTER-11

DISCLOSURE OF CONSULTANTS ENGAGED

11.1 LIST OF EXPERT: PREPARATION OF EIA/EMP REPORT

- **Project Leaders:**
  - Mr. Samir Choksi, Coordinator (CETP), Ramans Enviro Services Private Limited
  - Dr. P.R. Chaudhari, GRC India
  - Mr. K.D. Choudhary, GRC India
- **Functional Area Experts**
  - Dr. P.R. Chaudhari (GRC India) WP, EB
  - Mr. K.D. Chaudhari (GRC India), AP, NV
  - Mr. S.B. Sinha (Empanelled) (GRC India), AQ
  - Mr. P. Radhakrishnamurthy (GRC India), LU
  - Mr. K.N. Dutta (GRC India), SE
  - Mr. Tapan Mujumdar (Empanelled) (GRC India), HG, GS
  - Mr. S.R. Malay (Empanelled) (GRC India), GS
  - Dr. Ravindra Kode(Empanelled) (GRC India), RH
  - Mrs. Anasua Nag (GRC India), SWH

11.2 RAMANS ENVIRO SERVICES (P) LTD., AHMADABAD

11.2.1 Name of Consultant

Company Name:	Ramans Enviro Services Private Limited
Contact Person:	Mr. Samir Choksi

Telephone:	+(91)-(79)-40063330
Fax No:	+(91)-(79)-40064440
Address:	23,24 - Second Floor, Camps Corner, Nr. Auda Garden, Opp. Flavors Restaurant, Anand Nagar Road, Prahlad Nagar, Ahmedabad, Gujarat - 380051 (India)

11.2.2 Accreditation/ from Quality Council of India (QCI)

Mr. Samir Choksi has got accreditation for CETP sector

National Accreditation Board for Education & Training

Quality Council of India

CERTIFICATE OF ACCREDITATION

(CONDITIONAL)

M/s Ramans Enviro Services Pvt. Ltd.

SF 23 & 24, Camps Corner, Nr. Auda Garden, Prahladnagar, Ahmedabad - 380015

are hereby accorded conditional accreditation under the QCI-NABET Scheme for Accreditation of EIA Consultant Organizations (Rev. 06, 2010) for the following scope/s:

Sl.No.	Name of the Sector*	Category
1.	Thermal Power Plants	B
2.	Synthetic organic chemicals industry	A
3.	Common Effluent Treatment Plants (CETPs)	B

**Details are given in Annexure IA*

Accreditation to the above Sectors is subject to the EIA reports being prepared by the experts (EIA Coordinators & Functional Area Experts) mentioned in Annexure IB and compliance to the Terms and Conditions mentioned in Annexure IC.

Final Certificate of Accreditation shall be issued on fulfilment of the following conditions:

1. *Arranging in-house/ empanelled experts for LU, Vibration and GS.*

The Accreditation is subject to the compliance to Terms & Conditions mentioned in the QCI-NABET letter.

Certificate No: NABET/ EIA/ 1013/ 050 ***Valid up to: December 09, 2013#***

December 10, 2010
New Delhi

NABET

Director

 # Subject to
- **Continual compliance to NABET Scheme and meeting the norms during yearly surveillance assessment.**
- **Updated status of accreditation should be verified from QCI website (www@qcin.org).**

Annexure 1A

National Accreditation Board for Education & Training

Quality Council of India

QCI- NABET Scheme for Accreditation of EIA Consultant Organization

For Certificate No: NABET/EIA/1013/050 Valid up to: December 09,2013

Scope of Accreditation

M/s Ramans Enviro Services Pvt. Ltd.

SF 23 & 24, Camps Corner, Nr. Auda Garden, Prahladnagar, Ahmedabad - 380015

are accredited for the following Sectors:

S.No.	Name of the Sector	Category
1.	Thermal Power Plants	B
2.	Synthetic organic chemicals industry (dyes & dye intermediates; bulk drugs and intermediates excluding drug formulations; synthetic rubbers; basic organic chemicals, other synthetic organic chemicals and chemical intermediates)	A
3.	Common Effluent Treatment Plants (CETPs)	B

December 10, 2010
New Delhi

Director

NABET

Annexure 1B

National Accreditation Board for Education & Training

Quality Council of India

QCI- NABET Scheme for Accreditation of EIA Consultant Organization

For Certificate No: NABET/ EIA/ 1013/ 050 Valid up to: December 09, 2013#

List of Experts

Accreditation given to

Ramans Enviro Services Pvt. Ltd.

SF 23 & 24, Camps Corner, Nr. Auda Garden, Prahladnagar, Ahmedabad - 380015

for the Sectors mentioned in Annexure 1A, subject to EIAs being prepared by the experts as mentioned below:

EIA Coordinators

S. No.	Name of Expert	Sector No.	Sectors Approved	Category*
1.	Samir Chandravadan Choksi	4	Thermal Power Plants	B
		21	Synthetic organic chemicals industry (dyes & dye intermediates; bulk drugs and intermediates excluding drug formulations; synthetic rubbers; basic organic chemicals, other synthetic organic chemicals and chemical intermediates)	A
		36	Common Effluent Treatment Plants (CETPs)	B

* Experts approved for Category A, may take up Category B projects also

December 10, 2010
New Delhi

Director

NABET

Subject to
- Continual compliance to NABET Scheme and meeting the norms during yearly surveillance assessment

Page 1 of 2

11.2.3 Vision and Mission

VISSION

To establish a strong technical foothold in the area of environmental pollution control

MISSION

We ensure to deliver best available optimal solutions / technology to our clients for the control of environmental pollution.

11.2.4 Nature of Consultancy

We deal with the issues related to environment pollution control and waste minimization. We aim to provide effective and optimum environment management systems for treatment & control of gaseous emissions, water, wastewater and hazardous waste. We have a sufficing infrastructure of technical as well as field staff along with a fully equipped laboratory.

- Environmental Audit Services
- Sewage Treatment Plant Design Services
- Water Treatment Plant Design Services

Other Products & Services We Offer

Air Pollution Control Equipments	Cleaner production Services	Environmental Impact Assessments Service
Environmental Statement Services	Noise Pollution Survey & Control Services	Operation & Maintenance of Treatment Plants
Secured Landfill Design Services	Supply & Design of ETP Equipments	Waste Minimization Services
	Waste Water Treatment Plant Design Services	

11.3 GRASS ROOTS RESEARCH & CREATION INDIA (P) LTD., NOIDA

11.3.1 Name of the Consultant with Resume and Nature of Consultancy

Name of the Consultant : Dr.Dhiraj Kr.Singh

Address for Correspondence : Grass Roots Research and Creation India (P) Ltd.,
F-374-375,
Sector-63
Tel: 0120 4044630, 120 4323120
Fax: 0120 2406519
Website: www.grc-india.com

11.3.2 ACCREDITION/ FROM QUALITY COUNCIL OF INDIA, QCI, AND LIST OF COORDINATORS.

GR&C India Pvt. Ltd. has got accredition from QCI as per MoEF, GoI requirements. The certificates from QCI-NABET are given on next pages.

11.3.3 NATURE OF CONSULTANCY

Grass Roots Research and Creation India Pvt Ltd. (GR&C) is an environmental consultancy registered under the Companies Registration Act, 1956 (No. 1 of 1956) and ISO 9001:2008 Certified.


Technical Services, Research & Training
ISO Certification
Soil & Material Testing
Turnkey Project
Save Globe
TM
Advisory Services
EIA Study, RA Study, Environmental Appraisal & Audits
Clean Development Mechanism
Environmental Survey, Sampling, Analysis & Data Generation

Annexure 1A

National Accreditation Board for Education & Training

Quality Council of India

QCI- NABET Scheme for Accreditation of EIA Consultant Organization

For Certificate No: NABET/EIA/1013/052 Valid up to: December 02, 2013#

Scope of Accreditation

M/s Grass Roots Research and Creation India (P) Ltd.

F – 375, Sector – 63, Noida - 201301

are accredited for the following Sectors:

S.No.	Name of the Sector	Category
1.	Mining of minerals (Opencast only)	A
2.	Thermal Power Plants	A
3.	Metallurgical industries (ferrous & non ferrous) – both primary and secondary	A
4.	Industrial estates/parks/ complexes/ area, export processing Zones(EPZs), Special Economic Zones(SEZs), Biotech Parks, Leather Complexes	B
5.	Highways, railways, transport terminals, mass rapid transport systems	A
6.	Common Municipal Solid Waste management Facility (CMSWMF)	B
7.	Building and large construction projects including shopping malls, multiplexes, commercial complexes, housing estates, hospitals, institutions	B
8.	Townships and Area development projects	B

December 03, 2010
New Delhi

Director

Subject to
- Continual compliance to NABET Scheme and meeting the norms during yearly surveillance assessment.
- Updated status of accreditation should be verified from QCI website (www.qcin.org)

Annexure 1B

National Accreditation Board for Education & Training

Quality Council of India

QCI- NABET Scheme for Accreditation of EIA Consultant Organization

For Certificate No: NABET/EIA/1013/052 Valid up to: December 02, 2013#

List of Experts

Accreditation given to

Grass Roots Research and Creation India (P) Ltd.

F – 375, Sector – 63, Noida - 201301

for the Sectors mentioned in Annexure 1A, subject to EIAs being prepared by the experts as mentioned below:

EIA Coordinators

S. No.	Name of Expert	Sector No.	Sectors Approved	Category#
1.	Kalidas Choudhury	1	Mining of minerals (Open cast only)	A
		8	Metallurgical industries (ferrous & non ferrous) – both primary and secondary	A
		37	Common Municipal Solid Waste management Facility (CMSWMF)	B
		38	Building and large construction projects including shopping malls, multiplexes, commercial complexes, housing estates, hospitals, institutions	B
		39	Townships and Area development projects	B
2.	Anasua Nag	31	Industrial estates/parks/ complexes/ area, export processing Zones(EPZs), Special Economic Zones(SEZs), Biotech Parks, Leather Complexes	B
		34	Highways, railways, transport terminals, mass rapid transport systems	A
		38	Building and large construction projects including shopping malls, multiplexes, commercial complexes, housing estates, hospitals, institutions	B
		39	Townships and Area development projects	B
3*	Amiya Kumar Sahu	37	Common Municipal Solid Waste management Facility (CMSWMF)	B
4.	Pramod Ramakrishna Chaudhari	1	Mining of minerals (Open cast only)	A
		4	Thermal Power Plants	A
		38	Building and large construction projects including shopping malls, multiplexes, commercial complexes, housing estates, hospitals, institutions	B
5.	Navin Handa	4	Thermal Power Plants	B
		38	Building and large construction projects including shopping malls, multiplexes, commercial complexes, housing estates, hospitals, institutions	B
		39	Townships and Area development projects	B

*Empanelled Experts
* Experts approved for Category A, may take up Category B projects also

December 03, 2010
New Delhi

Director

Subject to
- Continual compliance to NABET Scheme and meeting the norms during yearly surveillance assessment.
- Updated status of accreditation should be verified from QCI website (www.qcin.org)

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Annexure 1B

Functional Area Experts

S. No.	Name of Expert	Functional Area Code	Functional Area Approved	Category#
1.	Anasua Nag	EB	Ecology and Biodiversity	A
		SW	Solid Waste and Hazardous Waste Management	A
2.	Kalidas Choudhury	NV	Noise/ Vibration	A
		AP	Air Pollution Prevention, Monitoring & Control	A
3.	Kashi Nath Dutta	SE	Socio-Economics	B
4.	Manoj Kumar Dwivedi	GS	Soil only	A
5*.	Tapan Majumdar	HG	Hydrology, Ground Water & Water Conservation	A
		GS	Geology only	A
6*.	Amiya Kumar Sahu	SW	Solid Waste only	A
7*.	Shanta Ram Maley	GS	Soil only	A
8*.	Periyasama Radhakrishnamoorthy	LU	Land Use	B
		HG	Hydrology, Ground Water & Water Conservation	B
9*.	Jai Prakash Vaidya	HG	Hydrology, Ground Water & Water Conservation	A
10*.	Ramesh Kumar Sharma	SE	Socio-Economics	B
11*.	V N Sivasankara Pillai	AP	Air Pollution Prevention, Monitoring & Control	B
12*.	Shamsher Bahadur Singh	HG	Hydrology, Ground Water & Water Conservation	B
13.	Jeeniva Mahapatra	LU	Land Use	B
14.	Sekhar Upadhyay	LU	Land Use	B
		SE	Socio-Economics	B
15.	Shashi Bhusan Sinha	AP	Air Pollution Prevention, Monitoring & Control	A
		AQ	Meteorology, Air Quality Modeling & Prediction	A
16*.	Pramod Ramakrishna Chaudhari	EB	Ecology and Biodiversity	A
		WP	Water Pollution Prevention, Control & Prediction of Impacts	A
17.	Navin Handa	AP	Air Pollution Prevention, Monitoring & Control	A
		AQ	Meteorology, Air Quality Modeling & Prediction	A
		WP	Water Pollution Prevention, Control & Prediction of Impacts	A
		NV	Noise only	B
18*.	Amit Ranjan Chakraborthy	SW	Solid Waste and Hazardous Waste Management	A

*Empanelled Experts
* Experts approved for Category A, may take up Category B projects also

December 03, 2010
New Delhi

Director

Subject to
- Continual compliance to NABET Scheme and meeting the norms during yearly surveillance assessment.
- Updated status of accreditation should be verified from QCI website [illegible]

Page 2 of 2

DISCLOSURE OF CONSULTANTS ENGAGED

Name and address of the Consultant	**GRC, India (P) Ltd. F-374,375, Sector: 63, Noida, India**	**ISO 9000-2008 certified, MoEF, New Delhi Accredited Laboratory, NABET, QCI, India Accredited.**
Nature of Consultancy	Environment consultant Dr. Dhiraj Singh (MD)	GRC, India (P) Ltd.
EIA Coordinator	Mr. K.D. Choudhary	
FAE-WP	Mr. P.R. Choudhary	
FAE-AP	Mr. K.D. Choudhary	
FAE-AQ	Mr. S.B. Sinha (Empanelled)	
FAE-LU	Mr. P. Radhakrishnamoorthy (Empanelled)	
FAE-EB	Mr. P.R. Choudhary	
FAE-NV	Mr. K.D. Choudhary	
FAE-SE	Mr. K.N. Dutta	
FAE-HG	Mr. Tapan Majumdar (Empanelled)	
FAE-GS	Mr. Tapan Majumdar (Empanelled) Mr. S.R. Maley (Empanelled)	
FAE-RH	Dr. Ravindra Kode (Empanelled)	
FAE-SWH	Mrs. Anasua Nag	
Base line data	GRC, India Training and Analytical Laboratory Sector: 63, F- 374, 375, Noida, India	

11.3.4 LIST OF CLIENTELE

- U.P. Jal Nigam
- Agra Development Authority
- Greater Noida Institute of Technology (GNIT)
- Deepak Gupta Education Trust
- ATS infrastructure
- Ashiana Group
- Supertech Ltd.
- Shipra Estates Pvt. Ltd.
- ERA Landmark
- Rajiv Gandhi National University of Law
- Hindustan Mittal Energy Limited
- Ansal Properties and Infrastructures Ltd.
- Tata Housing Development Co.
- Ritesh Properties & Industries Ltd.
- Indian Institute of Technology
- Delhi Development Authority
- ESIC Hospital
- Max Hospital
- Purearth Infrastructure Ltd.
- The Grand Hotel
- HUDA
- Footwear Design and Development Institute
- Engineers India Limited
- Rockland Hospitals Ltd.
- Ansal Buildwell Ltd.
- Indiabulls Real Estate
- Chintels India Ltd.
- Unitech Group
- Eros Group
- Crown Group
- Madhya Pradesh State Electronics Development Corp.
- Airport Authority of India, Indore
- Moser Baer Power & Infrastructure Ltd.
- Tricone Projects India Pvt Ltd.
- Amrapali Group
- Aarone Group
- Sobha Developers
- Adani Infrastructure and Developers Pvt. Ltd.
- Backwater Hotels and Resorts Pvt. Ltd.
- Mather Projects (P) Ltd.
- Choice Constructions
- Amrapali Group
- Gujarat State Petroleum Corporation
- Secon Pvt Ltd.
- Goel Ganga Group
- Kate Builders
- K. Raheja Group
- New Front Developers
- Nandan Developers
- Ramnath Realty Pvt. Ltd.
- RNA Group
- Cement Corporation of India
- Meenakshi Energy Pvt. Ltd.
- Gharonda Builders
- Hyderabad Sky Scrapers

11.4 GRC INDIA TRAINING AND ANALYTICAL LABORATORY

11.4.1 ADDRESS

GRC INDIA TRAINING AND ANALYTICAL LABORATORY

F-374-375, Sector 63,

Noida 201301

11.4.2 BACKGROUND INFORMATION

GRC India Training and Analytical Laboratory , a unit of Grass Roots Research and Creation India (P) Ltd., was established in 2008 as a dedicated environmental laboratory committed to high quality testing, exceptional client services and a passionate interest in data and its interpretation. Our staff comprises of well qualified and experienced scientists, chemists and technicians from various govt. Organization and MNCs.

We also offer training facilities for capacity building of young technicians.

Our main objectives is to provide reliable and efficient data analysis generation and interpretation of environmental components such as air, water, soil, sludge, solid waste, meteorological, chemical and microbiological studies.

11.4.3 VISION

- Diversification in the field of laboratory testing by performing all tests with excels and wins the trust of its customer.
- Continual up-gradation of technology
- Quick redressal of complaints from customers.

11.4.4 FACILITIES

The laboratory has state-of–the art lab facilities for carrying out the environmental monitoring with quality policy, with an aim for comprehensive coverage of environmental assessment and analysis. Our testing infrastructures has wide range of instruments for testing parameters of water and soil samples, air monitoring and meteorological monitoring etc.

11.4.5 Accreditation by Different Management Systems

GRC India Training and Analytical Laboratory is accredited by various managements systems, which helps it to meet the quality requirements of its activities. It is also recognized by Ministry of Environment and Forests (MoEF), Govt. of India under the Environment Protection Act-1986 for conducting environmental monitoring and testing.

Details of all accreditations granted are listed in the following tables:

Certification	Certificate no.	Date of issue	Valid until
OHSAS 18001:2007	I/OSC-062	07 JUNE,2011	06 JUNE,2014
ISO 9001:2008	I/QSC-2649	12 OCTOBER,2010	11 OCTOBER,2012
ISO 14001:2004	I/ESC-196	07 JUNE,2011	06 JUNE,2014
MoEF UNDER EPA 1986 REG. NO. DC-33004/99 05 APRIL,2011 04 APRIL,2016,S.0.1174(E)			

The copy of Gazette of India No.5771 dated April 5, 2011 showing the accreditation of GRC India Training and Analytical Laboratory by MoEF under the Environmental (Protection) Act 1986 is given on the next page..

रजिस्ट्री सं० डी० एल०-33004/99 REGD. NO. D. L.-33004/99

भारत का राजपत्र
The Gazette of India

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पर्यावरण और वन मंत्रालय

अधिसूचना

नई दिल्ली, 5 अप्रैल, 2011

का.आ. 692(अ).—केन्द्रीय सरकार, पर्यावरण (संरक्षण) नियम, 1986 के नियम 10 के साथ पठित पर्यावरण (संरक्षण) अधिनियम, 1986 (1986 का 29) की धारा 12 की उप-धारा (1) के खंड (ख) और धारा 13 द्वारा प्रदत्त शक्तियों का प्रयोग करते हुए, भारत सरकार के पर्यावरण और वन मंत्रालय की अधिसूचना संख्यांक का.आ. 1174(अ), तारीख 18 जुलाई, 2007 में निम्नलिखित और संशोधन करती है, अर्थात् :—

2. उक्त अधिसूचना की सारणी में,—(i) क्रम संख्यांक 16 और उससे संबंधित प्रविष्टियों के स्थान पर निम्नलिखित क्रम संख्यांक और प्रविष्टियां रखी जाएंगी, अर्थात् :—

सारणी

क्रम सं.	प्रयोगशाला का नाम	सरकारी विश्लेषणकर्ता का नाम	लागू और कब तक मान्य
(1)	(2)	(3)	(4)
"16	मैसर्स पिटकोन कंसल्टेंसी एंड इंजीनियरिंग सर्विसेज लिमिटेड (पर्यावरण प्रबंधन एवं इंजीनियरिंग प्रभाग) प्रथम तल, कृषि कालेज परिसर, डी.आई.सी. ऑफिस के आगे, शिवाजी नगर, पुणे-411005 (महाराष्ट्र)	(1) श्री संजय रामभाऊ शेलार (2) श्री उमाकांत पांडुरंग पैथनी (3) श्रीमती उज्ज्वला राजेश चिटनिस	05-04-2011 से 04-04-2016";

(ii) क्रम संख्या 89 और उससे संबंधित प्रविष्टियों के पश्चात् निम्नलिखित क्रम संख्या और प्रविष्टियां अंतःस्थापित की जाएंगी, अर्थात् :—

(1)	(2)	(3)	(4)
"90	मैसर्स श्री.आर.सी. इंडिया ट्रेनिंग एंड ऐनालीटिकल लेबोरेट्री (ग्रास रूट्स रिसर्च एण्ड क्रिएशन इंडिया (प्रा.) लिमिटेड की इकाई), एफ. 375, सेक्टर-63, नोएडा-201301 (उ. प्र.)	(1) डॉ. धीरज कुमार सिंह (2) डॉ. कन्हैया लाल सक्सेना (3) श्री के. डी. चौधरी	05-04-2011 से 04-04-2016";
(1)	(2)	(3)	(4)