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CHAPTER – 1

INTRODUCTION

Chapter 1: Introduction

1.1. Background

Infrastructure development often has adverse impact on Environment. Environmental attributes such as air, water, soil, noise, hydrology, land-use pattern, demography and socio economy of the area prone to be affected. Identification and characterization of critical environmental impacts helps the project proponents to adopt suitable measures for reducing these impacts and apply mitigating measures for the identified impacts.

Ministry of Environment, Forests & Climate Change (MoEF&CC) has taken several policy initiatives and enacted environmental protection and pollution control legislations to prevent indiscriminate exploitation of natural resources and to promote integration of environmental concerns in developmental projects. One such initiative is the notification on Environmental Impact Assessment (EIA) for developmental projects issued on 27.1.1994 under the provisions of Environment (Protection) Act, 1986. This was subsequently revised by Environmental Impact Assessment (EIA) Notification S.O.1533 (E) dt. 14th September 2006. The entire Environmental Clearance process was reengineered and also highlighted the need to introduce specific sectors / categories such as industry and infrastructure and also included new sector for certain criteria's of construction projects including new townships, settlement colonies, commercial complexes, hospitals and office complexes to obtain environmental clearance. This EIA study is conducted as per the requirement and guidelines of this notification and its amendments till 2018.

The purpose of this Environmental Impact Assessment Study is to present background environmental scenario, study the likely activities related to proposed construction and operation, identification of the probable environmental impacts due to those activities, review of the proposed environmental protection measures, recommendation for acceptable alternative where necessary and finally assessment of the impacts of the project on the environment.

This EIA report is prepared as per the guidance manual for Building, Construction, Township and Area Developmental Projects prepared by Administrative Staff College of India, Hyderabad dated February 2010 and EIA Notification 2016.

1.2. Project Description

M/s. Total Environment Constructions Pvt. Ltd., has obtained environmental clearance for the Residential Development Project at Survey No. 56(P), 55(P), 54/1, 54/2, 54/3, 54/4, 54/5(P), 54/6, 54/7, 54/8, 54/9, 54/10, 54/11, 68, 69/1, 69/2(P), 74/3(P), 76(P), 86/2(P), at Bileshivale Village, Bidarahalli Hobli, Bangalore East Taluk, Bengaluru vide the letter ref. no. SEIAA 142 CON 2015 dated 18-12-2015. The copy of the EC issued by SEIAA- Karnataka is attached as **Annexure No. 1** of this report. This project was developed on a plot of land measuring 14.738 acres (59,642.6 m^2) and having total built up area of 1,44,822 m^2.

In an effort to fulfil the increasing demand for quality living spaces they have Proposed Expansion of Residential project to Mixed Use Developmental project by expanding the plot area to 63.13 acres (2,55,495.55m2) with Built-up Area 7,84,570.10 m^2. The expansion is proposed in land 41p, 40/1, 40/2, 39/3, 39/2, 36, 38/1, 38/2, 38/3, 38/4, 38/5, 37, 32/15, 32/16, 32/17, 32/18, 31/22, 31/23, 31/24, 31/25, 30/9, 30/10, 30/11, 30/13, 30/14, 30/15, 61/1, 61/2, 61/3, 61/6, 61/7, 60/1, 60/2, 60/3, 63/2, 63/3, 63/4, 63/5, 63/6, 64/1, 64/3, 64/4, 64/5, 62, 61/5, 61/4, 64/2, 64/6, 64/7, 64/8, 64/5, 64/9, 65, 70, 72, 69/2, 74/3, 68, 69/1, 76/1, 86/2, 54/3, 54/2, 54/1, 54/7, 54/8, 54/4, 54/6, 76/1, 54/3, 54/9, 54/10, 54/11, 55, 59/4, 59/3, 59/2, 56, 59/1, 59/5, 58, 57, 56, 66/1, 66/2, 66/3, 67 Bileshivale village, Bidarahalli Hobli, Bangalore East Taluk, Bengaluru. The land documents are attached as **Annexure No. 2.**

As per the item No, 8, of the schedule attached to the EIA notification, 2006, Building / construction projects / area development projects & Township projects are categorised as B and the proposed Expansion project falls under category B1 (Built up area ≥1,50,000 Sqm). Accordingly application was submitted before SEIAA for issue of ToR and permission for detailed Environmental Impact Assessment Study. The same was issued on 21.01.2019 by SEIAA, Karnataka, through its order No. SEIAA 151 CON 2018. The copy of the ToR is attached as **Annexure No. 3**

1.3. Project Proponents

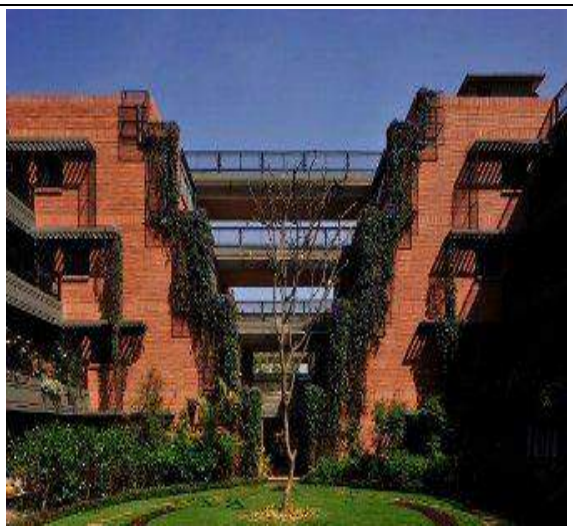
M/s. Total Environment Constructions Private Limited is an architect-led real estate firm, building completely furnished & customized homes with a focus on good design and detailing. They have built more than one million square feet of custom designed residential space in the last two decades - winning many national & international awards for design and quantity of workmanship, every year. Concepts like terrace gardens and water-bodies with every apartment, earth sheltered villas, smart- homes and the use of natural materials are some of the firsts we have brought to the market.

Established in 1996, Total Environment group is a fast-growing real-estate development firm based in Bangalore, the city dubbed as India's Silicon Valley because it hosts the largest number of technology companies in the country. With 52 projects to date that range from residential apartment blocks to corporate campuses, Total Environment's vision is to cater to the increasing number of Indian expatriates as well as foreign nationals who are arriving in Bangalore to work and stay, most of whom are exposed to the highest international standards of home and office environments.

The Figure 1.1 given below shows some of the recognitions that the project proponent grabbed during this period.

Windmills of Your Mind

Best Luxury Residential Project-South DSK Artists in Concrete Awards 2011
Best Luxury Residential Project-South Zee Business-RICS Real Estate Awards 2011
Sustainable Architecture Durian and Society Interiors Design Awards (2010)
Best Residential Architecture Asia Pacific Region International Property Awards CNBC Arabia2009

	## Orange Blossom Special 2011 Outstanding Concrete Structure - Pune ICIPC - BIRLA Super Award
	## Raindrops Keep Falling on My Head Best Ornamental Gardens 1st (Winners)(2009) The Mysore Horticultural Society, Lalbagh
	## Shine on - Block 2 Style Icon for Excellence in Architecture Runner up Kansai Nerolac - (2007)

	## Time Habitat Award for Apartment Planning Architecture+Design Spectrum Foundation - 1st (Winners) (2005)
	## The Good Earth Habitat Award for Apartment Planning 1st Winner (2003) Architecture + Design Spectrum Foundation Best Group Housing Project (Winners) 2002 - JK Cements – Architect of the Year
	## Reach for the Sky Habitat Award for Apartment Planning (2002) – 2nd Commendation Trophy Architecture + Design Foundation

	Bougainvillea Habitat Award for Apartment Planning – 3rd Special Mention (2002) Architecture + Design Spectrum Foundation
	Webb India Limited Institutional Architecture Award (2002) 2nd (Commendation Trophy) - Architecture+ Design Spectrum Foundation

Figure 1.1 Awards obtained for the projects by the Proponent

1.4. Justification for the Proposal

Bangalore has been one of the fastest-growing cities of India in recent days. IT and ITES has been the major growth driver and is responsible for aggressive real estate development in the city. Being the IT hub of India, Bangalore has a multi-cultural population with good social infrastructure, excellent educational institutes and constantly upgrading physical infrastructure.

Currently, the most promising residential micro-markets are Outer Ring Road (ORR), Sarjapur Road, Whitefield and North Bangalore. Bangalore is the third-largest hub for High Net worth Individuals (HNIs). It is estimated to be home to over 10,000 individual dollar millionaires. Bangalore has a large base of expatriates who live and work in the city. The residents are well travelled, cultured and have sophisticated tastes.

There has been increased demand for high-end residential apartments & commercial office space in the city, particularly in the Central Business District (CBD), Secondary Business District (SBD), Whitefield, North Bangalore and Outer Ring Road sub-markets.

1.4.1 The Proposal

In an effort to fulfil the increasing demand for quality living spaces the existing Residential project is proposed for Mixed Use Developmental Project. The existing plot area is 14.738 acres (59,642.6 m^2) with a Built up area of 1,44,822 m^2. The proposed expansion consists of, plot area of 63.13 acres (2,55,495.55 m^2) with Built-up Area 7,84,570.10 m^2. The existing project already has environmental clearance as per SEIAA 142 CON 2015 dt. 18.12.2015 and this is attached as Annexure No. 1

The project location is in Bileshivale Village, Bidarahalli Hobli, Bangalore East, which is near to Hennur Main Road. Hennur Main Road, which directly connects the Bangalore International Airport in the northern extremes of the city, is growing as a real estate investment destination.

1.4.2 Litigation Pending against the Proposed Expansion Project

There are no litigations, directions or orders passed by any court of law for the proposed expansion project.

1.5 Applicable Rules and Regulations

Rules, regulations and notifications that may directly concern the project components during their design, construction and operation phase have been addressed in the following sessions.

Environment (Protection) Act, 1986

The Environmental (Protection) Act, 1986 is the umbrella legislation providing protection of environment in the country. This act provided for the Environment (Protection) Rules, which were formulated in 1986, the Environmental Impact Assessment Notification, 2006 and the Amendments thereto (up to July 2018), and various other subsequent notifications.

EIA Notification 2006 and amendments till 2018

The EIA notification dated 14th September 2006, imposes certain restrictions and prohibitions on new projects or activities, or on the expansion or modernization of existing projects or activities based on their potential environmental impacts as indicated in the schedule to the notification, being undertaken in any part of India, unless prior environmental clearance has been accorded in accordance with the objectives of National Environment Policy as approved by the Union Cabinet on 18th May 2006 and the procedure specified in the notification, by the Central Government or the State or Union territory Level Environment Impact Assessment Authority (SEIAA).

As the townships and area development projects are listed as item no 8 in the schedule, in the above notification, this project comes under the scope of this notification and hence requires environmental clearance.

Water (Prevention and Control of Pollution) Act, 1974 as amended till 1988

This act provided for the prevention and control of water pollution and the maintaining and restoring of the wholesomeness of water resources. This Act resulted in the establishment of the Central and State level Pollution Control Boards whose responsibilities include managing water quality and effluent standards, as well as monitoring water quality, prosecuting offenders and issuing licenses for construction and operation of certain facilities.

As the project is proposing waste water treatment facility, the project proponent has to obtain Consent To Establish and Consent To Operate, from the Karnataka State Pollution Control Board as per the Water (Prevention and Control of Pollution) Act of 1974.

Air (Prevention and Control of Pollution) Act, 1981 as amended in 1987

This act provides for prevention, control and abatement of air pollution. 'Air Pollution' defined as the presence of any 'air pollutant' which means any solid, liquid or gaseous substance (including noise) present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment. The SPCB is empowered to set air quality standards and monitor and prosecute offenders under The Air (Prevention and Control of Pollution) Act, 1981.

The project proponent has to obtain Consent For Establish and Consent For Operate, from the Karnataka State Pollution Control Board as per the Air (Prevention and Control of Pollution) Act of 198 as the proposal involved operation of Diesel Generators and other machinery.

Hazardous and Other Wastes (Management and Trans boundary Movement) Rules, 2016

According to this act, the occupier (person in possession of hazardous and other wastes) shall follow the following steps viz: prevention, minimization, reuse, recycling, recovery and safe disposals. Occupier shall also be responsible for the safe and environmentally sound management of hazardous and other wastes and shall sell them only to authorized actual user or shall be disposed in an authorized disposal facility.

The occupier and operator of the disposal facility shall be liable for all damages caused to environment or third party due to improper handling and management of the hazardous and other waste.

These rules are applicable to this project, as it handles the hazardous materials like oil, lubricants, lead, paint etc.

Solid Waste Management Rules, 2016

According to this rule, every waste generator should segregate and store the waste generated by them in three separate streams namely bio-degradable, non-bio degradable, and domestic hazardous wastes in suitable bins and handover segregated wastes to authorized waste pickers or waste collectors as per the direction or notification by the local authorities from time to time.

Since the project activities during construction and operation will generate solid wastes of different kinds, this project comes under the scope of this rules.

E-Waste (Management) Rules, 2016

This rules sets up regulations for handling the e- wastes, responsibility of the producers, dealers, recyclers, users. This project involves commercial complexes and residential buildings, and hence likely produce e-wastes. Hence conditions of these rules are applicable to this project.

The Noise Pollution (Regulation and Control) Rules, 2000

The ambient air quality standards in respect of noise for different areas / zones are specified in the schedule of these rules. The State Government may categorize the areas into industrial, commercial, residential or silence areas / zones for the purpose of implementation of noise standards for different areas.

The noise levels in any area / zone shall not exceed the ambient air quality standards in respect of noise as specified in the Schedule. The proposed project in its construction phases may attract the provisions of these rules if the noise level from the construction machinery and the vehicles are above the standards.

The Plastic Waste Management Rules 2016

This rule stipulates the minimum quality criteria for plastic products, defines the responsibilities of producers and generators, promotes reuse of plastic in various industries etc. The conditions of these rules are applicable to this project as the residential and commercial complexes are likely to use and dispose various types of plastic materials.

Construction and Demolition Waste Management Rules, 2016

According to this act, every waste generator shall prima-facie responsible for collection, segregation of concrete, soil and others and storage of construction and demolition waste generated, as directed or notified by the concerned local authority in consonance with these rules.

Further the service provider (the authority who providing the service like road, water, sewerage, electricity etc) and the contractor shall prepare a comprehensive waste management plan covering segregation, storage, collection, reuse, recycling, transportation and disposal of construction and demolition waste generated. Also, the service provider shall remove all construction and demolition waste and clean the area every day, if possible, or depending upon the duration of work, the quantity and type of waste generated, appropriate storage and collection, a reasonable time frame shall be worked out in consultation with the concerned local authority.

Minimum Wages Act 1948

This act ensures minimum wages for different employments, estimating the wage rate and other conditions. The provisions of this act should be ensured during the construction time.

Inter-State Migrant Workmen (Regulation of Employment & Conditions of Services) Act 1979

The Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979 is enacted to regulate the condition of service of inter-state labourers. The Act's purpose is to protect the interest of workers whose services are requisitioned outside their native states in India. Whenever an employer faces shortage of skills among the locally available workers, the act creates provision to employ better skilled workers available outside the state. This act specifies the rights of the workers, the role of the contractor and the employer etc. The conditions of this act should be complied, if migrant labourers are employed for construction activities.

The Building and other construction workers (Regulation and Employment of Service) Act, 1996

This act regulate the employment & condition of service of buildings and other construction workers and to provide for their safety, health and welfare measures including wage, health and safety measures, accommodation etc. The provisions of this act should be ensured during the construction time.

1.6 Environmental Clearance

The procedure for Environmental Clearance, as set in EIA Notification, 2006 is summarized below:

1.6.1. Application for Prior Environmental Clearance

An application seeking prior Environmental Clearance (EC) for building / construction projects / area development projects and towns ships shall be made in the prescribed Form 1 and Supplementary Form 1A, after the identification of prospective site(s) for the project and/or activities to which the application relates, before commencing any construction activity, or preparation of land, at the site by the applicant. A pre-feasibility report and conceptual plan also should be submitted along with these forms.

1.6.2. Stages in the Environmental Clearance Process

The environmental clearance process for construction projects will comprise of a maximum of three stages as per the scope of the project, all of which may not apply to particular cases as set forth below in this notification. These three stages in sequential order are:

- Stage (1) Screening
- Stage (2) Scoping
- Stage (3) Appraisal

1.6.2.1. Stage 1- Screening

This stage will entail the scrutiny by the concerned State level Expert Appraisal Committee (SEAC), of an application, seeking prior environmental clearance made in Form 1 for determining whether or not the project or activity requires further environmental studies, for preparation of an Environmental Impact Assessment (EIA), for its appraisal prior to the grant of environmental clearance depending up on the nature and location specificity of the project . The projects requiring an Environmental Impact Assessment report shall be termed Category 'B1' and remaining projects shall be termed Category 'B2' and will not require an Environment Impact Assessment report. For categorization of projects into B1 or B2, except item 8 (b), the Ministry of Environment and Forests shall issue appropriate guidelines from time to time.

1.6.2.2. Stage 2- Scoping

(i) "Scoping" refers to the process by which the Expert Appraisal Committee (EAC) in the case of Category 'A' projects or activities, and State level Expert Appraisal Committee (SEAC) in the case of Category 'B1' projects or activities, determine detailed and comprehensive Terms of Reference (ToR) addressing all relevant environmental concerns for the preparation of an Environment Impact Assessment (EIA) Report in respect of the project or activity for which prior environmental clearance is sought. The EAC or SEAC concerned shall determine the ToR on the basis of the information furnished in the prescribed application Form1/Form 1A including Terms of Reference proposed by the applicant.

(ii) The ToR shall be conveyed to the applicant by the EAC or SEAC as concerned within sixty days of the receipt of Form 1. The approved Terms of Reference shall be displayed on

the website of the Ministry of Environment, Forests and Climate change and the concerned State Level Environment Impact Assessment Authority.

(iii) Applications for prior environmental clearance may be rejected by the regulatory authority concerned on the recommendation of the EAC or SEAC concerned at this stage itself. In case of such rejection, the decision together with reasons for the same shall be communicated to the applicant in writing within sixty days of the receipt of the application.

1.6.2.3. Stage 3-Appraisal

(i) Appraisal means the detailed scrutiny by the EAC or SEAC of the application and other documents like the final EIA report and others submitted by the applicant to the regulatory authority concerned for grant of environmental clearance. On conclusion of this proceeding, the EAC or SEAC concerned shall make categorical recommendations to the regulatory authority concerned either for grant of prior environmental clearance on stipulated terms and conditions, or rejection of the application for prior environmental clearance, together with reasons for the same.

(ii) The appraisal of all projects or activities which are not required to undergo public consultation, or submit an Environment Impact Assessment report, shall be carried out on the basis of the prescribed application Form 1 and Form 1A as applicable, any other relevant validated information available and the site visit wherever the same is considered as necessary by the EAC or SEAC concerned.

1.7. Scope, Methodology and Purpose of EIA study

M/s. Total Environment Constructions Pvt. Ltd. Bangalore, the project proponent has appointed M/s. METAMORPHOSIS[SM] Project Consultants Pvt. Ltd. (MPCPL) for preparation of EIA Report for proposed project in order to seek environmental clearance. MPCPL is one of the leading and professionally managed multi-disciplinary consultants in Environment, Geology, and Mine Planning for various Industrial, Infrastructural and Developmental projects, having its registered office at Bengaluru, Karnataka. They are "A" Category Accredited EIA consultant Organisation from Quality Council of India (QCI) /National Accreditation Board for Training & Education (NABET) as per office memorandum issued by

Ministry of Environment & Forests (MoEF), on 02/12/2009. The NABET certificate No. NABET/EIA/1518/ SA 0017 and valid upto November 30, 2018 and subsequent letter of extension No. QCI/NABET/ EIA/ACO/18/0803 dated 30 November 2018 valid upto 29 May 2019 has been enclosed as **Annexure No – 4.**

1.7.1. The scope and objective of the study includes following issues:

- Understanding of the basic project activities and make a detailed review of policy and regulations;
- To study and analyze the anticipated impacts due to the proposed project on overall baseline environmental and socio economic conditions in its surrounding study area;
- To identify environmental sensitive features within the study area and places of architectural and cultural importance, if any, and its safe guarding;
- To recommend project specific appropriate preventive and mitigation measures to minimize pollution, environmental and social disturbances during entire life-cycle period of the project.
- To adopt suitable environmental action plans and management systems, so as to implement and monitor the appropriate mitigation measures;

1.7.2. Methodology

Meetings were arranged with the technical people of the project proponent and the consultant to understand the scope, technology and timeline of implementation of the project.

The Functional Area Experts and EIA Co-ordinator have visited the project site and made a detailed note of the ground situation, including environmental and social sensitive features in the area. They also identified the locations for environmental monitoring.

Environmental monitoring was conducted to study the baseline environmental conditions. Air, Water, Noise and Soil samples were collected from the identified location. The monitoring continued for three months in Winter 2018-19 period (Dec 2018, Jan 2019 and Feb 2019). The location identification, sample collection and analysis were in accordance

with the guidelines of MoEF&CC. Other relevant details were taken from secondary sources like government gazetteer, census data, published reports and manuals etc.

1.7.3. Structure of the report

The structure of this Environmental Impact Assessment Report shall be as follows,

Chapter 1: Introduction

Chapter 2: Project Description

Chapter 3: Description of the Environment

Chapter 4: Anticipated Environmental Impacts & Mitigation measures

Chapter 5: Analysis of alternatives (Technology & Site)

Chapter 6: Environmental Monitoring Programme

Chapter 7: Additional Studies

Chapter 8: Project Benefits

Chapter 9: Environmental Management plan

Chapter 10: Summary & Conclusion

Chapter 11: Disclosure of consultants

Chapter 12: Corporate Environmental Responsibility

1.7.4. Terms of Reference issued by SEIAA, Karnataka

This Environmental Impact Assessment Report has been prepared as per Approved Terms of Reference (ToR) and Additional Terms of Reference, issued by the Honourable SEIAA Karnataka vide letter no. SEIAA 151 CON 2018 dated: 21 January 2019.

CHAPTER – 2

PROJECT DESCRIPTION

Chapter 2: Project Description

2.1 Goal & Objective of the Project

Bengaluru is one of the fast growing cities in South India and one of the most sought after cities in India by people, corporate and tourists. Bangalore is growing as IT capital of India and a major business hub. These results in influx of population, especially the upper class people who tend to settle in the city. Bangalore is the third-largest hub for High Net worth Individuals (HNIs). It is estimated to be home to over 10,000 individual dollar millionaires. Bangalore has a large base of expatriates who live and work in the city. This results in increased places for both residential and commercial with advanced and world class facilities. Currently, the most promising developments with respect to residential and office facilities are on Outer Ring Road (ORR), Sarjapur Road, Whitefield and North Bangalore. The residents are well travelled, cultured and have sophisticated tastes.

The primary objective of the proposed project is to provide world class facilities in terms of residential units and corporate business offices which will have a significant impact on the local developmental activities by providing further impetus to the infrastructural activities of Bangalore.

In response to the ever growing demand for quality real estate and housing, M/s. Total Environment Private Ltd, is coming up with expansion of high end luxury Residential and, Commercial units of their "In That Quiet Earth" Project, to meet the demand by,

- Providing a broad spectrum of integrated solutions.
- Meeting and exceeding customer needs and expectations.
- Adopting the latest technologies to deliver state-of-the-art developments with great care and detailing.
- Ensuring conservation and development of eco-friendly projects.

- Making continuous improvement in all areas of activity based on customer inputs in order to improve customer satisfaction.
- Contributing to the welfare of society.

M/s. Total Environment Construction Pvt. Ltd. is an architect led design company who is pioneering in creating luxury apartments and villas for sale in different parts of India. Their design innovations include:

- Introduced the concept of cantilevered terrace gardens with every apartment. The gardens include features like water bodies and wood decks - bringing the outdoors in and taking the indoors out.
- Their projects are also noted for their creeper-covered pergolas and landscaping.
- Use of natural construction materials like wire-cut bricks and exposed form finished concrete

2.2. Location

The property sits off Hennur Main Road, in the fast developing North Bangalore area which has not only emerged as an economic hub but also as a front-runner among self-contained suburbs that are great places to live and work. The survey numbers of the proposed site are 41p, 40/1, 40/2, 39/3, 39/2, 36, 38/1, 38/2, 38/3, 38/4, 38/5, 37, 32/15, 32/16, 32/17, 32/18, 31/22, 31/23, 31/24, 31/25, 30/9, 30/10, 30/11, 30/13, 30/14, 30/15, 61/1, 61/2, 61/3, 61/6, 61/7, 60/1, 60/2, 60/3, 63/2, 63/3, 63/4, 63/5, 63/6, 64/1, 64/3, 64/4, 64/5, 62, 61/5, 61/4, 64/2, 64/6, 64/7, 64/8, 64/5, 64/9, 65, 70, 72, 69/2, 74/3, 68, 69/1, 76/1, 86/2, 54/3, 54/2, 54/1, 54/7, 54/8, 54/4, 54/6, 76/1, 54/3, 54/9, 54/10, 54/11, 55, 59/4, 59/3, 59/2, 56, 59/1, 59/5, 58,57, 56, 66/1, 66/2, 66/3, 67 of Bileshivale Village, Bidarahalli Hobli, Bengaluru East Taluk. The location map of the site is given as Figure 2.1, the Google earth image is given as Figure 2.2. The table 2.1 below gives the coordinates of the project site. The project location on Village map and CDP map are shown in **Drawing No. 1** and **Drawing No.2** attached to this report.

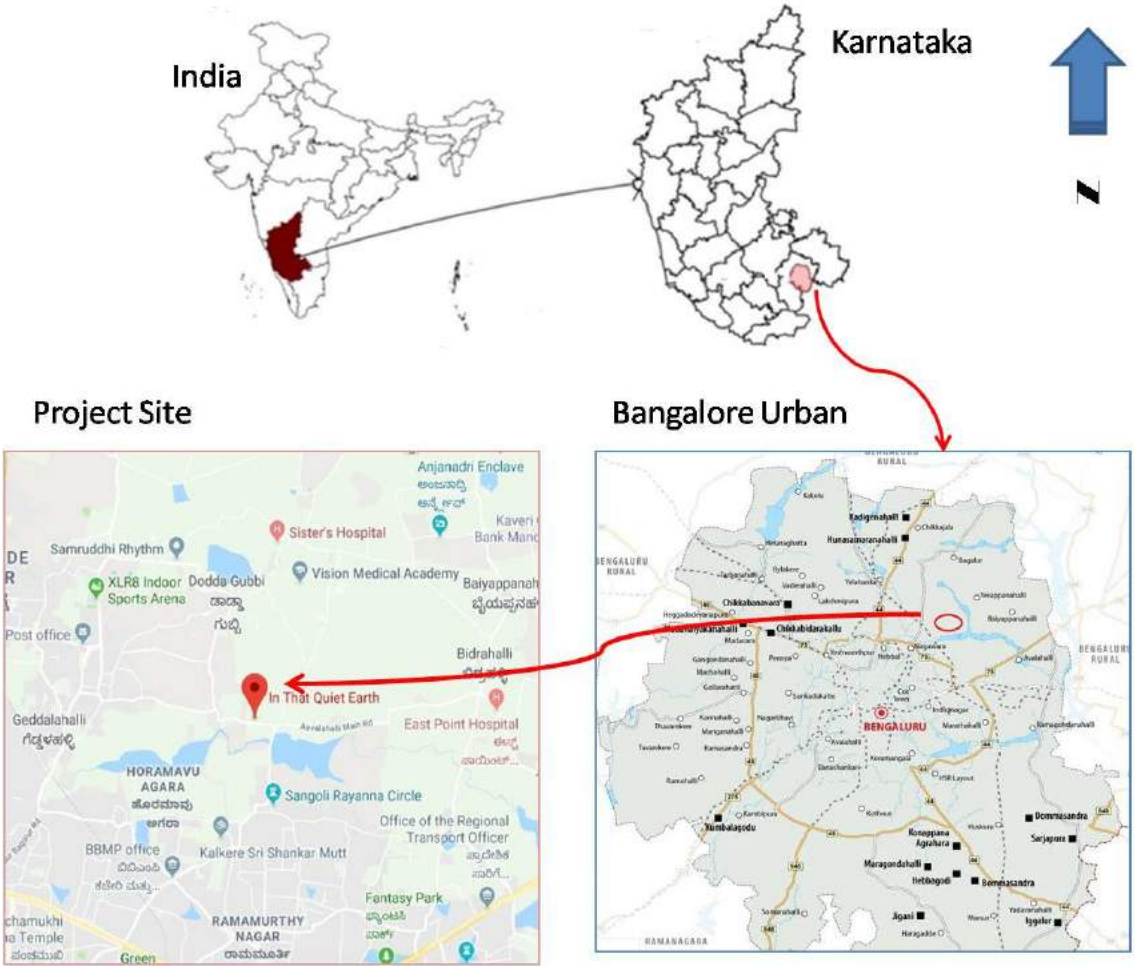


Figure 2.1. Geographical position of the project site

Figure 2.2 Project Location on Google earth

Table 2.1. Coordinates of project site

Sl No	Latitude (N)	Longitude (E)
1	13°03'31.04"	77°40'43.29"
2	13°03'29.92"	77°40'36.46"
3	13°03'31.35"	77°40'29.45"
4	13°03'23.29"	77°40'28.42"
5	13°03'23.47"	77°40'32.27"
6	13°03'12.36"	77°40'29.96"
7	13°03'10.27"	77°40'32.14"
8	13°03'09.97"	77°40'34.82"
9	13°03'11.67"	77°40'35.31"
10	13°03'11.34"	77°40'38.39"
11	13°03'09.45"	77°40'38.03"
12	13°03'09.21"	77°40'42.34"
13	13°03'15.43"	77°40'43.93"
14	13°03'17.78"	77°40'46.21"
15	13°03'22.45"	77°40'43.42"

2.3. Project Description

In an effort to fulfil the increasing demand for quality living spaces, M/s. Total Environment Construction Pvt. Ltd., is coming up with the proposed Building and Construction Project which is an expansion of existing residential complex into a mixed-use development comprising of residential, retail, commercial offices and schools. This development will offer its residents, occupants, tenants, owners and visitors state of the art infrastructure, professional facility management, high and ready connectivity, uninterrupted power supply and advanced telecommunications along with a host of value added services. The salient features of the project are given in Table 2.2 below. The Conceptual Plan is attached as **Drawing No. 3.**

Table 2.2 Salient Features of the Project

Sl. No.	Item	Details
1	Name of the project	In That Quiet Earth
2	Location	Bileshivale Village, Bidarahalli Hobli, Bengaluru East Taluk
3	Plot/Survey/ Khatha No.	At Survey Nos. 41p, 40/1, 40/2, 39/3, 39/2, 36, 38/1, 38/2, 38/3, 38/4, 38/5, 37, 32/15, 32/16, 32/17, 32/18, 31/22, 31/23, 31/24, 31/25, 30/9, 30/10, 30/11, 30/13, 30/14, 30/15, 61/1, 61/2, 61/3, 61/6, 61/7, 60/1, 60/2, 60/3, 63/2, 63/3, 63/4, 63/5, 63/6, 64/1, 64/3, 64/4, 64/5, 62, 61/5, 61/4, 64/2, 64/6, 64/7, 64/8, 64/5, 64/9, 65, 70, 72, 69/2, 74/3, 68, 69/1, 76/1, 86/2, 4/3, 54/2, 54/1,

Sl. No.	Item	Details
		54/7, 54/8, 54/4, 54/6, 76/1, 54/3, 54/9, 54/10, 54/11, 55, 59/4, 59/3, 59/2, 56, 59/1, 59/5, 58, 57, 56, 66/1, 66/2, 66/3, 67 of Bileshivale Village, Bidarahalli Hobli, Bengaluru East Taluk.
4	Proposed Area and structure	Plot area: 63.13 acres (255495.55 m^2) Total Built-up Area: 7,84,570.10 m^2
5	Structure Details	Residential Block 1 & 11: 2 B+ G+ 36 UF ; Residential Block 2: 3 B+ G+ 32 UF Residential Block 3 & 4 : 2 B+ G+ 29 UF Residential Block 5, 6, 8, 9 & 10 : G + 1 UF Residential Block 7 : 3 B + G + 23 UF Commercial Block: G+23 UF School: G +3 UF Club House = G + 1 UF
6	Height of the building	126.83 m
7	Expansion or New project	Expansion - Proposed Expansion from residential construction project to Mixed Use Development
8	Existing Area etc.	Plot area: 14.738 acres (59,642.6 m^2) With Built-up Area: 1,44,822 m^2
9	Name of the applicant	M/s. Total Environment Constructions Pvt. Ltd.,
10	Registered Address	M/s. Total Environment Constructions Pvt. Ltd., "Imagine" # 78, EPIP zone, ITPL main road, White fields, Bengaluru - 560 066
11	Address for correspondence :	M/s. Total Environment Constructions Pvt. Ltd., "Imagine" # 78, EPIP zone, ITPL main road, White fields, Bengaluru - 560 066
12	Name and designation of Owner / Partner / CEO	Mr. Suresh Bhandari Director M/s. Total Environment Constructions Pvt. Ltd
13	Address	M/s. Total Environment Constructions Pvt. Ltd., "Imagine" # 78, EPIP zone, ITPL main road, White field, Bengaluru
14	Pin Code	560 066
15	E-mail	suresh.bhandari@total-environment.com
16	Telephone No.	080 – 42453802/9711002644
17	Fax No.	080 - 28416624
18	Expected cost of the project	Land cost: Rs. 315 Crores Civil Construction cost: Rs. 2068 Crores Plant & Machinery cost: Rs. 153 Crores Total cost = 2536 Crores

2.3.1. Land Requirement

The project proponent is already having a residential complex consisting of 4 towers, spread over a land area of 59642.6 m^2, measuring total built up area of 1,44,822 m^2. This proposal is for expansion of the existing facilities adding three more residential blocks, two commercial blocks, one row house, one club house, school and auditorium. The land requirement for the expanded project will be 63.13 acres (255495.55 m^2) to have additional built up area of 7,84,570.10 m^2.

2.3.2 Water Requirement

The water requirement during the construction period is estimated at 18 KLD, which will be met through the BWSSB / Water Tankers / Treated water from STP.

The total water requirement during the operational phase is 2281 KLD. In which domestic water requirement will be 1489 KLD and flushing will be 793 KLD. Freshwater requirement will be met through BWSSB supply and water tankers. Flushing and part of the gardening will be met through the treated water from STP. The block wise split up of these requirement and waste water capacity is given in Figures 2.3a to 2.3h below and is summarized in Figure 2.3i and Table 2.3 below.

2.3.3 Sewage Treatment

Sewage Treatment Plants (STP) are proposed for treatment of waste water. Waste water from flushes and domestic drains will be collected and diverted to the proposed STPs. For better operational efficiency and design convenience, separate STPs are proposed for each block. Thus a total of ten STPs with total capacity 2235 KLD is proposed. The total waste water to the STP will be 2141 KLD (~ 95 % of total water requirement) and treated water from STP will be 2012 KLD(~90 % of the total waste water to STP), out of this 792 KLD will be using for flushing and 1220 KLD will be using for gardening. The details of capacity of plant, amount of waste water receiving and treated water delivering are given in Figures 2.3a to 2.3k and summarized in Table 2.3 above. The feasibility study was conducted for these STPs and is attached as **Annexure No. 5** of this report. The Rain Water Harvesting and Storm Water Management plans are given in **Drawing No. 4**.

Table 2.3. Total Water Requirement of the Project during the operational phase

Sl. No	Description	Total Water Demand (cum)										
		RB-1	RB-2	RB 3,4	RB-7	RB 5, 6, 8, 9,10	RB-11	Cl. Hse	Com. Blk	Schl	Audi	Total
1	Total Water Requirement per day	511	267	167	61	79	511	41	503	95	47	2281
2	Domestic Water Requirement per day	340	178	111	41	53	340	31	316	53	26	1489
3	Flushing Water Requirement per day	171	89	56	20	26	171	10	187	42	21	792
4	Sewage Load	485	253	158	58	74	485	21	478	90	45	2147
5	Shock load	15	7	2	2	6	15	4	22	10	5	88
6	STP Capacity in KLD	500	260	160	60	80	500	25	500	100	50	2235
R.B = Residential Block; Cl.H = Club House; Row. H = Row House; Com.Blk = Commercial Block, Sch=School, Audi= Auditorium												

Water Balance Chart –Residential Block-01

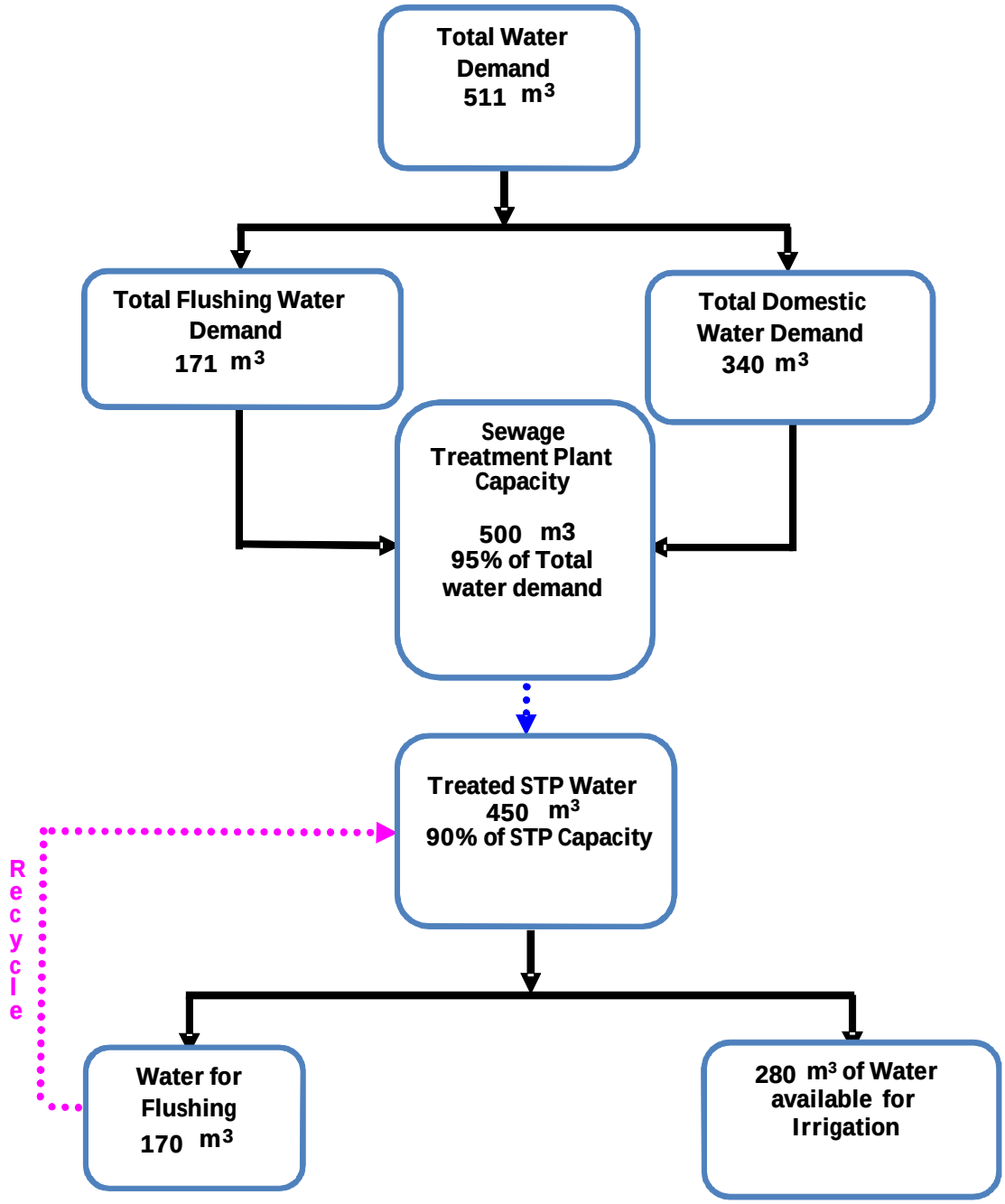


Figure 2.3a. Water Balance – Residential Block 1

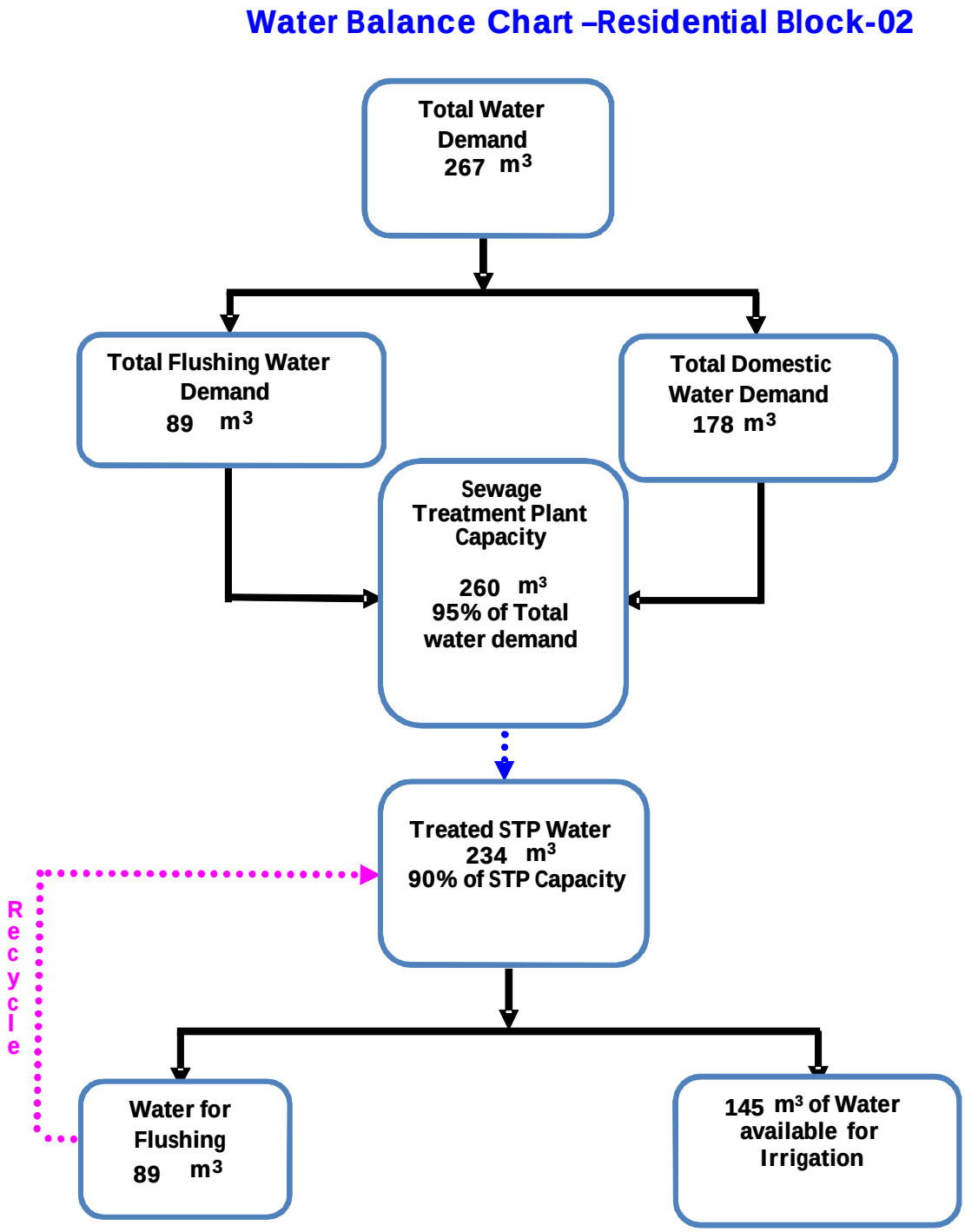


Figure 2.3b. Water Balance - Residential Block 2

Water Balance Chart –Residential Block 3, 4

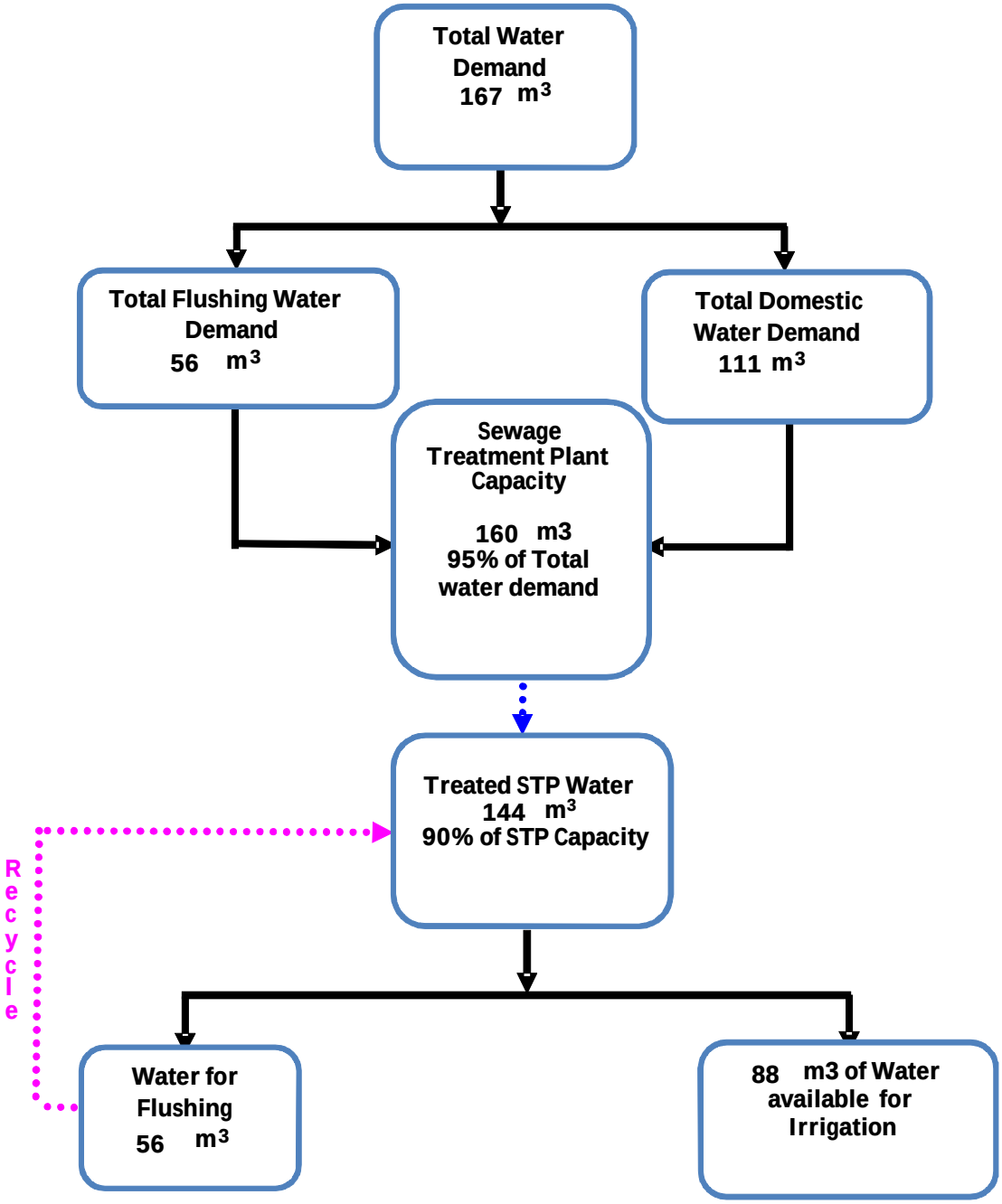


Figure 2.3c. Water Balance – Residential Block 3,4

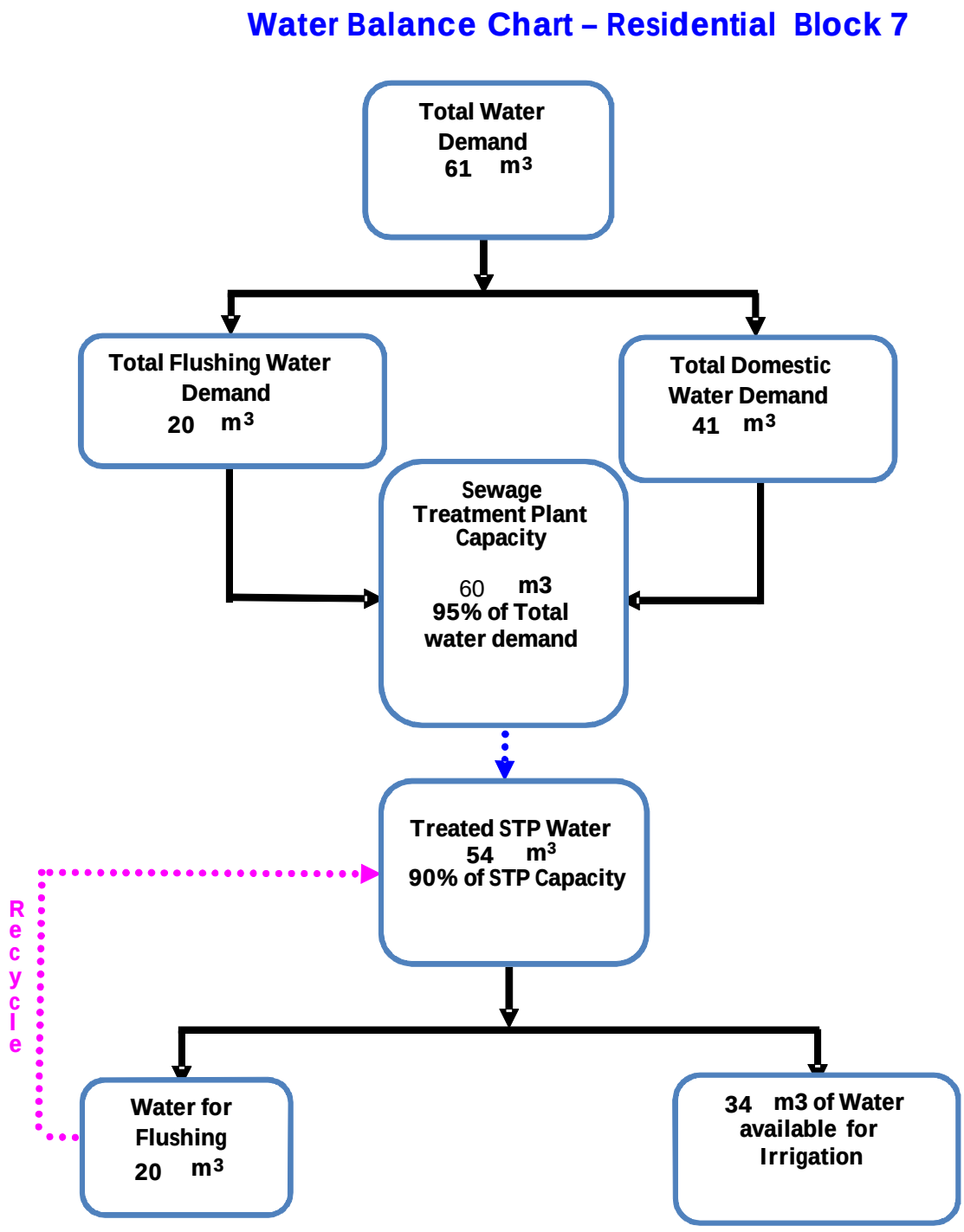


Figure 2.3d. Water Balance – Residential Block 7

Water Balance Chart – Residential Block 5,6,8,9 & 10

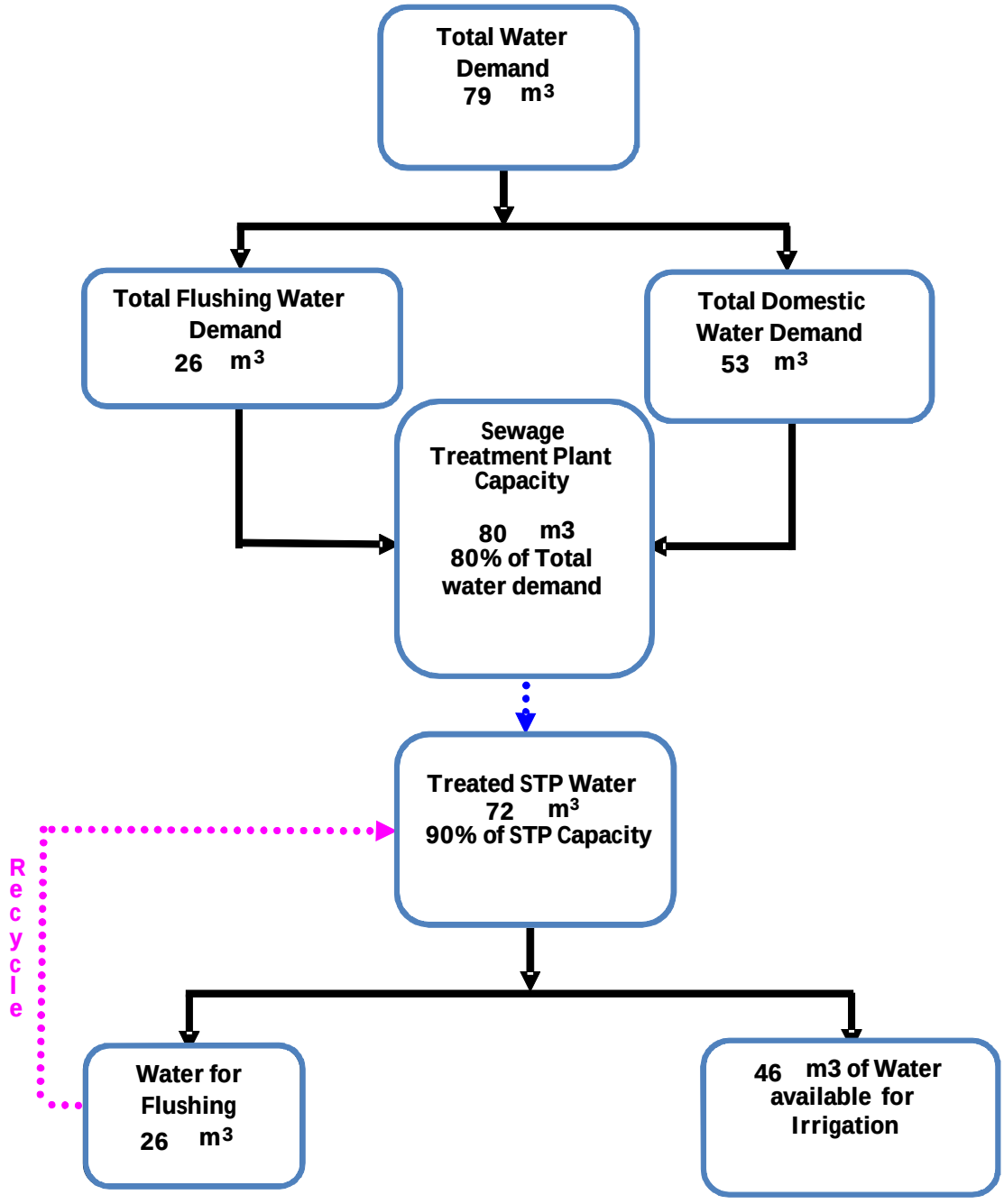


Figure2.3e . Water Balance – Residential Block 5,6,8,9 & 10

Water Balance Chart –Residential Block -11

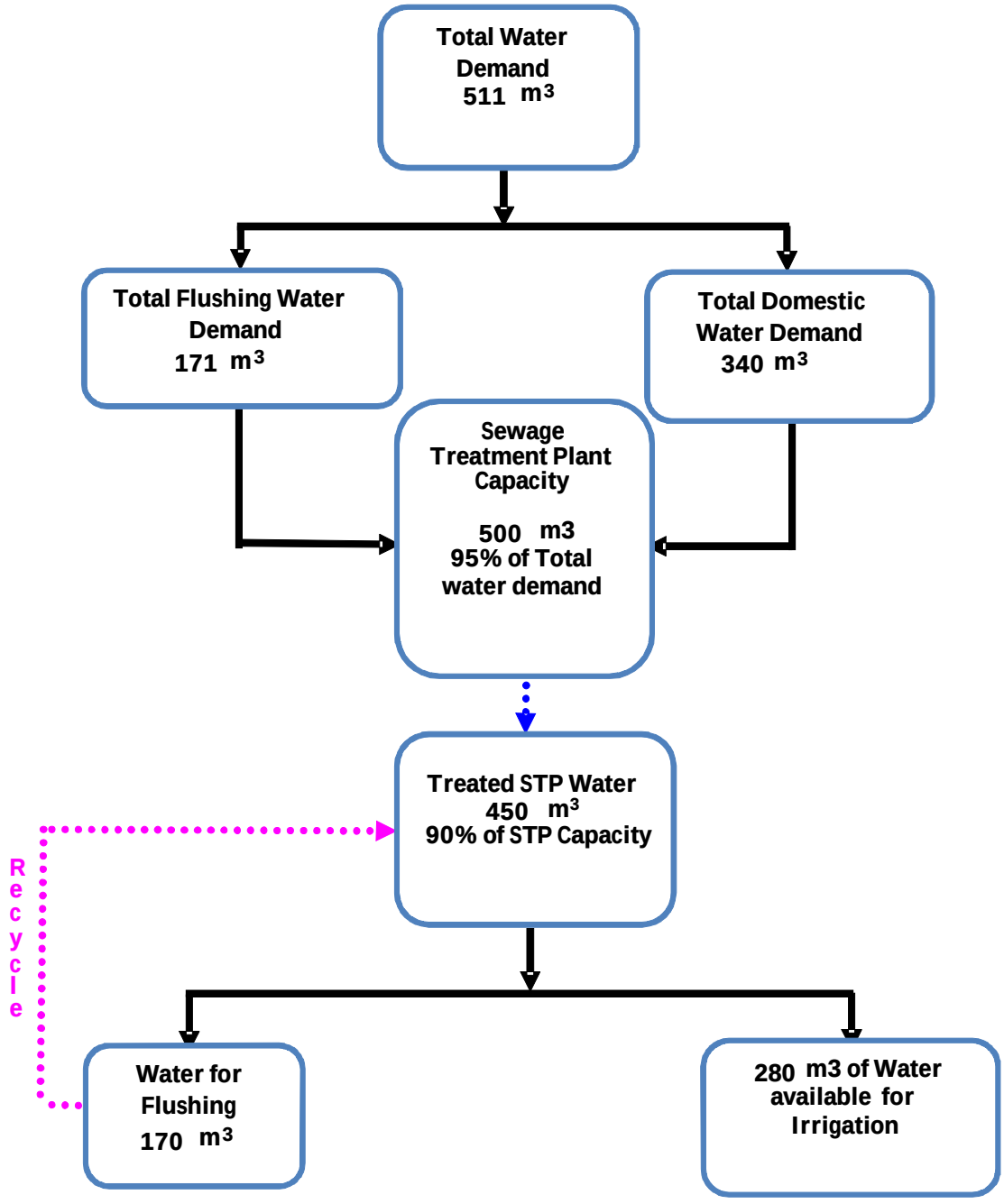


Figure 2.3f. Water Balance - Residential Block -11

Water Balance Chart –Club House

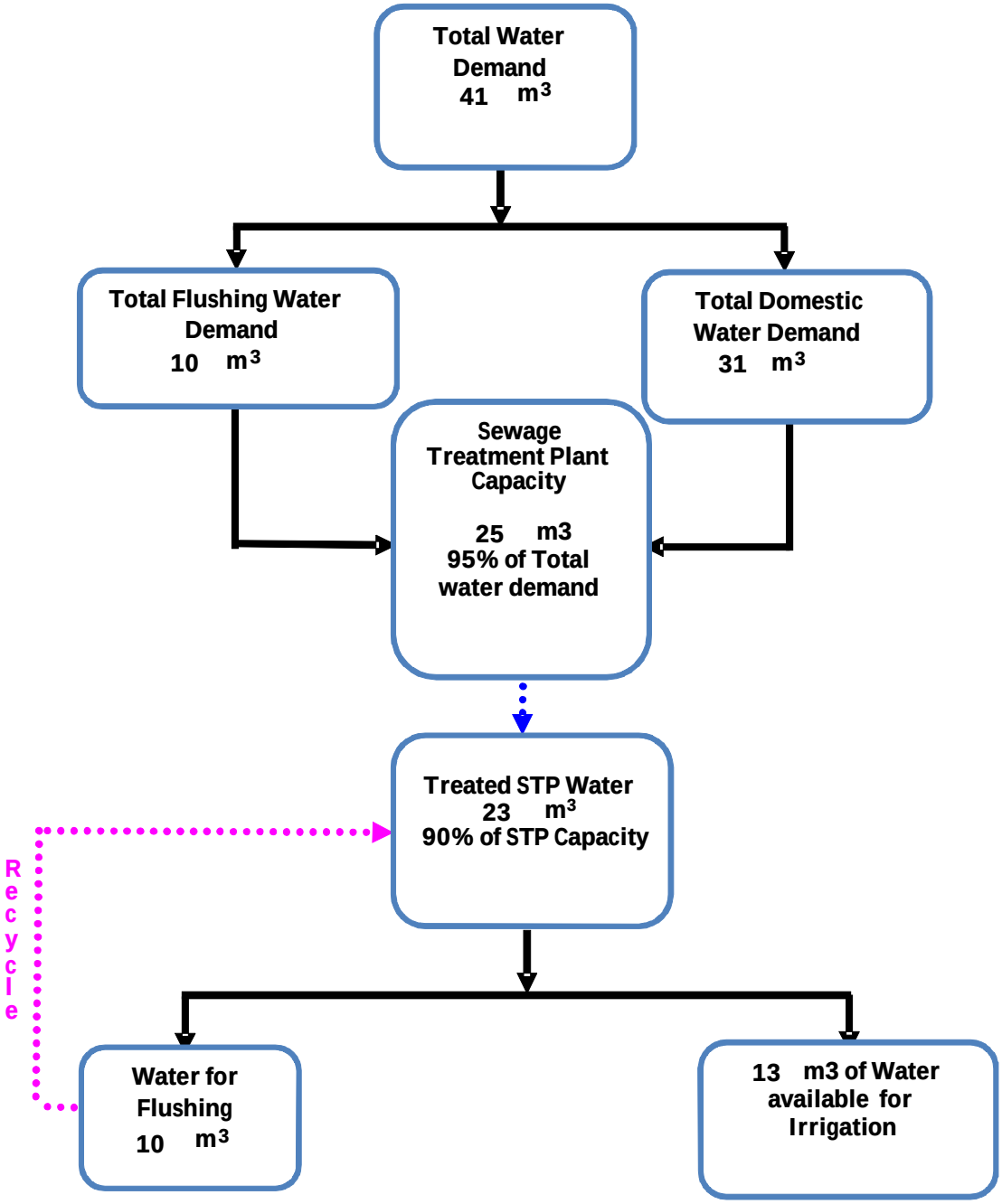


Figure 2.3g. Water Balance – Club House

Water Balance Chart –Commercial Block

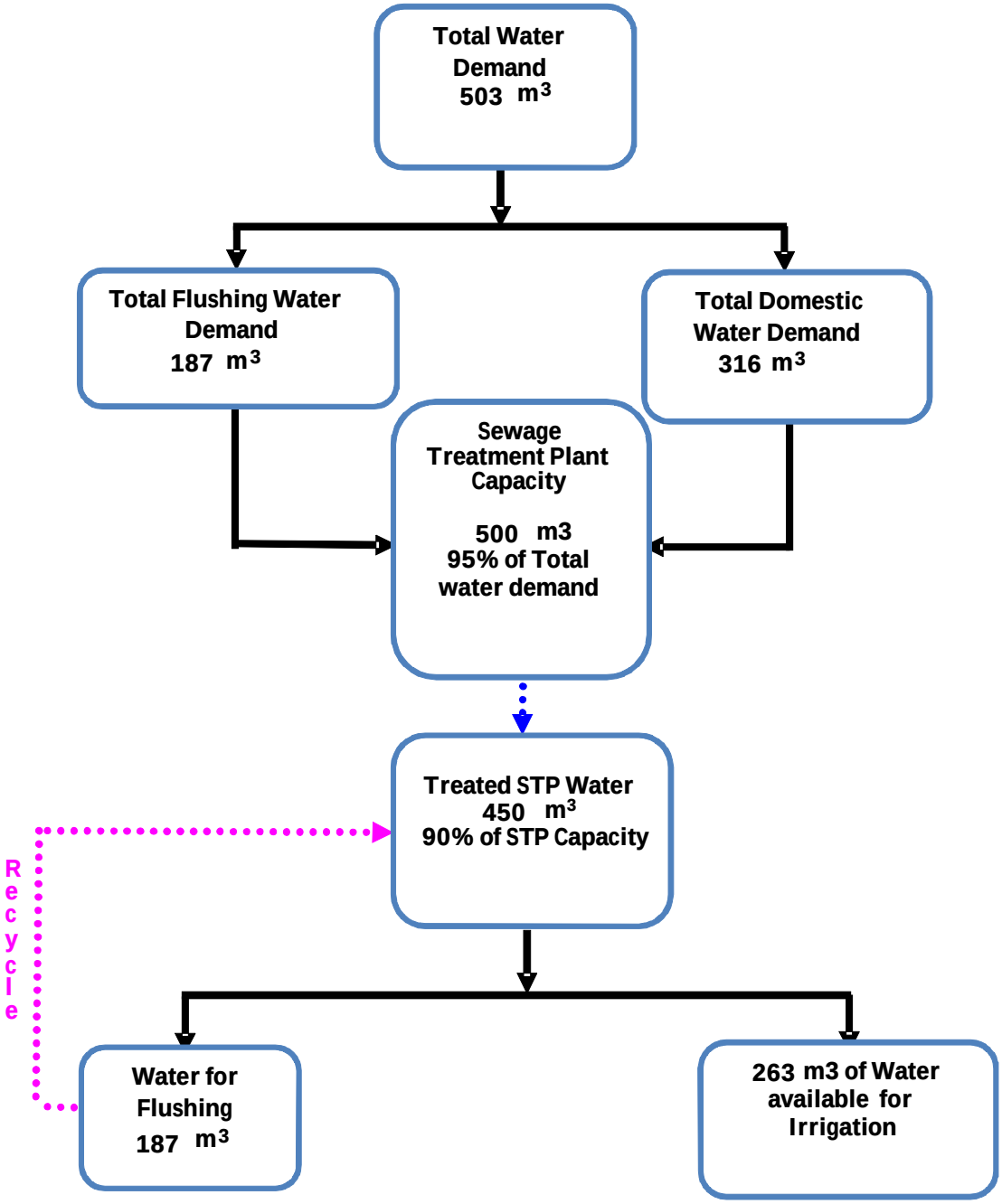


Figure2.3h. Water Balance – Commercial Block

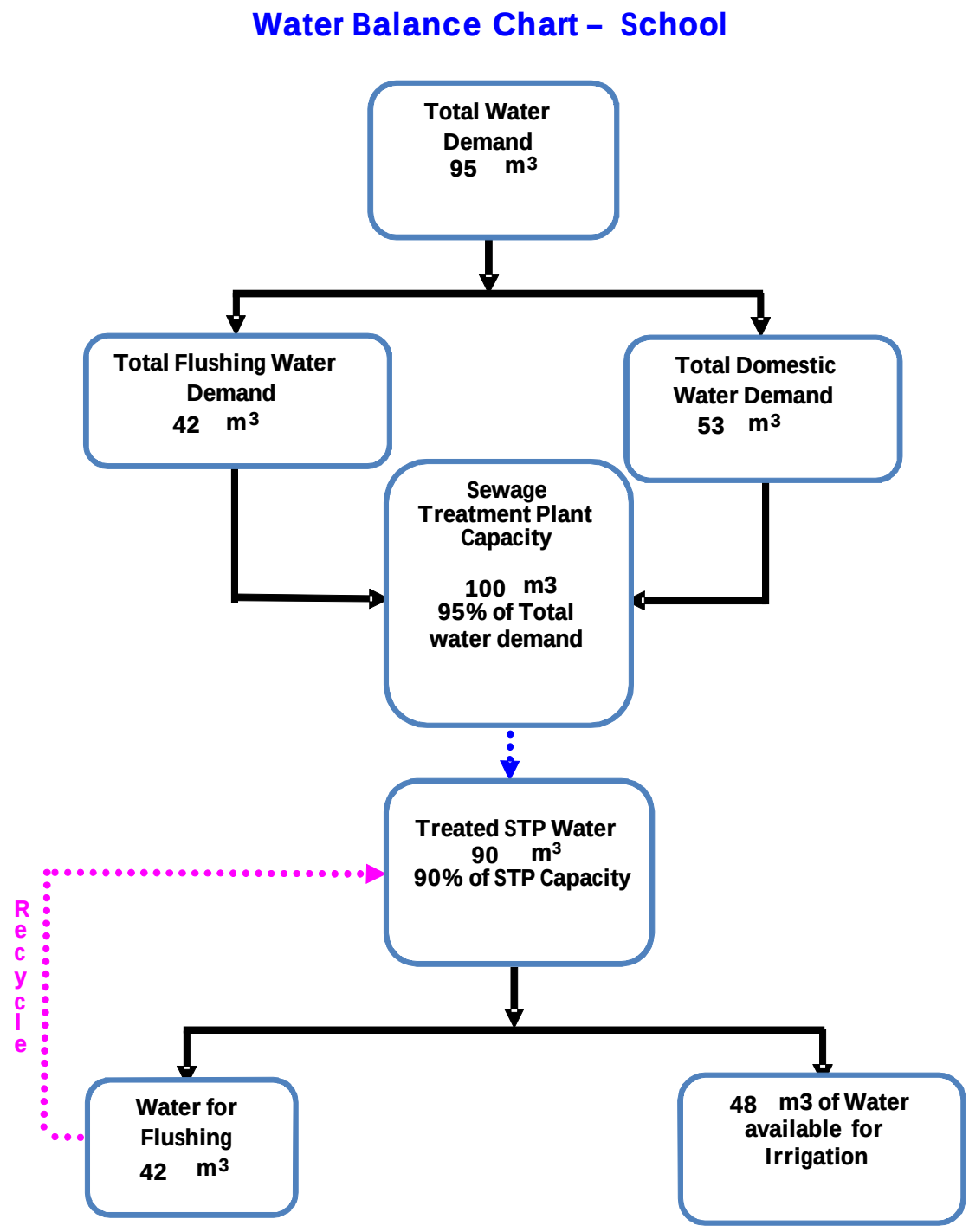


Figure2.3i. Water Balance – School

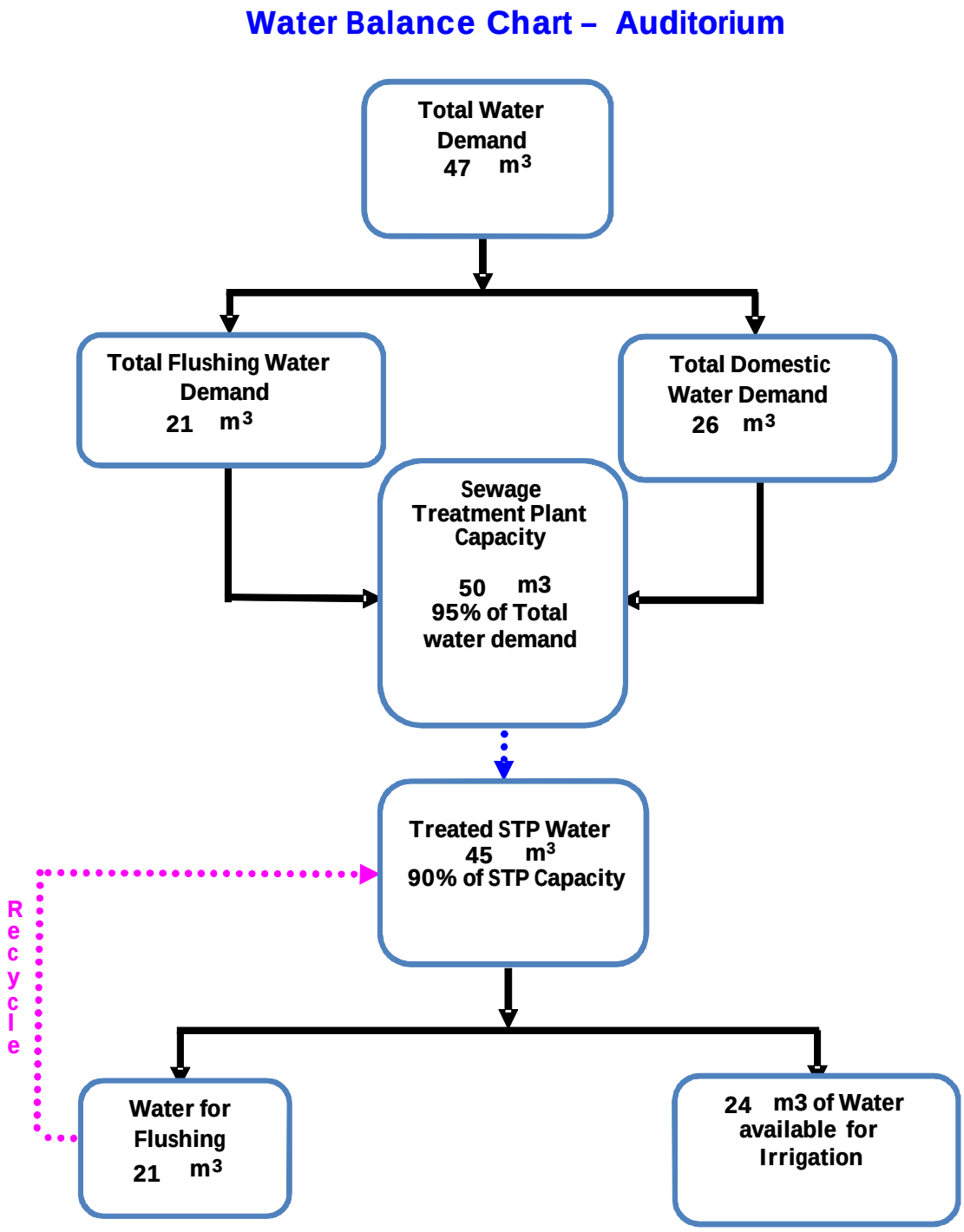


Figure2.3j. Water Balance – Auditorium

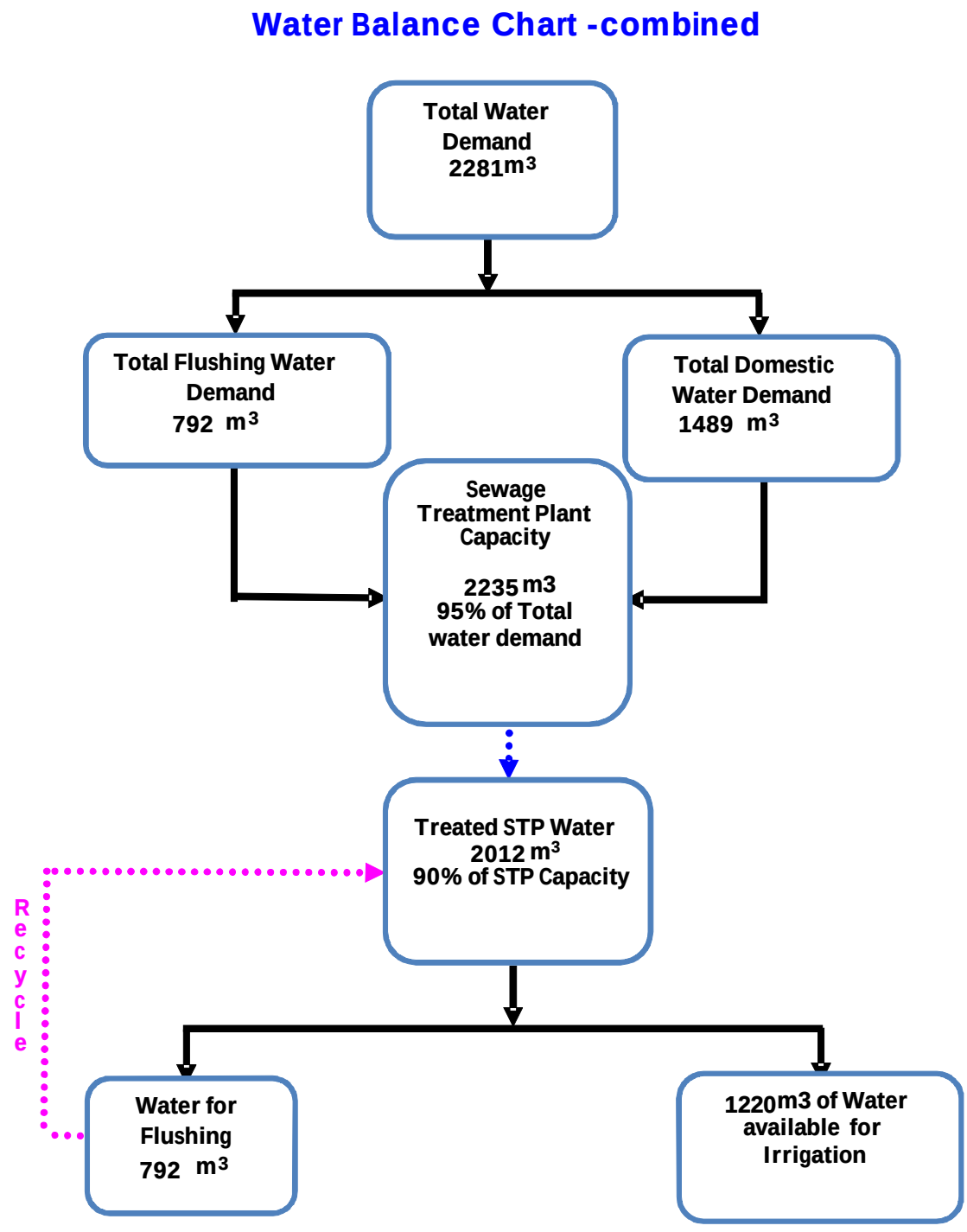


Figure2.3k. Overall water balance for the project

2.3.4 Power Requirement

The source of power during the operational phase will be BESCOM. Total power requirement estimated is 20650 KVA. Diesel Generators (DG) will be installed as a backup source of power during the power failures. The total capacities of backup generators are 21890 KVA. The details of DGs deployed are given below in Table 2.4. The installation plan of these Diesel Generators is given in **Drawing No. 5.**

Table 2.4. Details of backup generators

Sl. No	Building	Power Requirement (KVA)	DG Back up		
			Capacity (KVA)	Numbers	Power (KVA)
1	Residential Block	14925	750	11	8250
			500	3	1500
			380	6	2280
2	Commercial	5175	750	8+1(stand by)	6000
3	School	550	380	2	760
	Total	**20650**		**31**	**18790**

2.3.5 Waste Management

As there is no labour camps proposed, there will be only minimal domestic waste during the construction time. Construction and Demolition wastes will be disposed off at sites proposed by the BBMP or handover to BBMP waste collectors. Excavated earth will be utilized within the project site itself.

During the operational phase the total organic waste is estimated at 4.2 tonnes /day, dry waste is 3.7 tonnes /day. The STP sludge generated will be 111.76 m^3/day. The Construction waste will be 12,50,000 m^3 for the entire construction period.

The organic waste will be used for the gardening and landscaping. The dry waste will be disposed to authorised recyclers. The construction waste will be either handed over to BBMP waste collectors or will be disposed as per the direction of BBMP. The details of expected waste generation in each building are given as **Annexure No. 6** of this report.

2.3.6 Manpower Requirement

The average number of workers (skilled and semi skilled) to be employed during the construction period is estimated at 400, which can go upto 600 per day during the peak times. These labourers will be arranged from surrounding localities as far as possible.

Further during operational phase of the project, there will be requirement of more than 500 people, to work in office, shopping malls and apartments. This is in addition to the professionals required at these offices, schools and shops.

2.3.7 Material Requirement

The total quantity of construction material required for the completion of this project is given below:

Steel – 64412 MT

Glass – 140624 Sqm

Ready Mix Concrete – 426458 m^3

M Sand – 391835 m^3

2.3.8 Car Parking

Car parking requirement is 5270 however a provision is made for total 5797 cars.

2.3.9 Project Cost

The total cost of the project will be Rs. 2536 Crores, in which Rs. 315 Crores is the land cost, Rs. 2068 Crores will be for civil construction and Rs. 153 Crores will be for the plants and machinery.

CHAPTER – 3

DESCRIPTION OF THE ENVIRONMENT

Chapter 3: Description of the Environment

3.1. Environmental Screening

An environmental screening was conducted as part of the Environmental Impact Assessment Study. The environmental screening study identified the important environmental and social significant features present at the project site (core zone) and in the Project Impact Zone (Buffer zone).

3.1.1. Purpose

The environmental screening was conducted mainly to assess the direct and induced impacts due to the project in various phases on the environment. The main objectives of the Environmental Screening were as below:

- To document the baseline environmental and social profile of the Project Impact Zone (PIZ) based on primary and secondary data. An area of 5.0 km radius is selected as PIZ (buffer zone).
- To identify and evaluate the impacts on the baseline environmental and social profile of the PIZ due to the proposed project activities during construction and operation phases.
- To identify the requirements of various environmental regulations applicable to the project.

3.1.2. Methodology Adopted

The environmental consultants collected the primary data within the PIZ, through site visits and interaction with the local people. Secondary sources were referred for additional details. Toposheet, Google Earth etc were also used to identify and understand the characteristics and features of the area. Climate data were obtained from secondary sources. Ground water profile and geology were taken from the district hand book published by Central Ground Water Board and the demographical data were taken from Census data 2011.

3.2. Environmental Monitoring

The baseline environmental studies help in assessing the existing environmental conditions of the study area and identifying the critical environmental attributes. An environmental monitoring was conducted to establish the baseline environmental status. This would facilitate the comparison of the resultant environmental conditions in the project operational phase with the present day conditions and would help in preserving the environment without any sensible, irreversible deterioration and safeguarding the interests of the area.

Environmental monitoring was conducted during December 2018, January 2019 and February 2019. Air, Noise, Surface Water, Ground Water and Soil samples were taken from pre-identified sources which are within 5.0 km from the project site. The salient features of the Baseline Environment Studies Table 3.1.

Table 3.1. Salient Features of Baseline Environmental Studies

Attribute	Parameter	Remarks
Micro - meteorological Studies	Wind Details like speed, direction, Temperature, Relative Humidity and Rainfall.	3 months data has been collected to assess air pollution impacts on the surrounding environment.
Ambient Air Quality	PM_{10}, $PM_{2.5}$ Sulphur Dioxide (SO_2) Oxides of Nitrogen (NOx)	3 months data has been collected to assess baseline Air Quality status of the area.
Noise Quality Data	Noise levels	3 months data has been collected to identify noise producing areas.
Water Quality, Soil Quality Data and Land Use pattern.	Physical & Chemical parameters along with land use parameters.	To establish baseline Water Quality, Soil Quality for future reference and Land Use Pattern in the area.
Socio-Economic & Demographic Studies	Socio-Economic parameters	To know the present Socio-Economic status of the study area.

3.3. Baseline Environmental Conditions

. The baseline environmental status presented below comprises the following.

- Natural Environment
- Biological Environment

- Physical and Socio-economic Environment

3.3.1. Natural Environment

3.3.1.1 Regional Settings

Bangalore district is located in South Eastern part of Karnataka, located at Located at 12° 39' to 13° 18' North Latitude 77° 22' to 77° 52' East Longitude. The proposed project site is situated at survey Nos. 41p, 40/1, 40/2, 39/3, 39/2, 36, 38/1, 38/2, 38/3, 38/4, 38/5, 37, 32/15, 32/16, 32/17, 32/18, 31/22, 31/23, 31/24, 31/25, 30/9, 30/10, 30/11, 30/13, 30/14, 30/15, 61/1, 61/2, 61/3, 61/6, 61/7, 60/1, 60/2, 60/3, 63/2, 63/3, 63/4, 63/5, 63/6, 64/1, 64/3, 64/4, 64/5, 62, 61/5, 61/4, 64/2, 64/6, 64/7, 64/8, 64/5, 64/9, 65, 70, 72, 69/2, 74/3, 68, 69/1, 76/1, 86/2, 54/3, 54/2, 54/1, 54/7, 54/8, 54/4, 54/6, 76/1, 54/3, 54/9, 54/10, 54/11, 55, 59/4, 59/3, 59/2, 56, 59/1, 59/5, 58,57, 56, 66/1, 66/2, 66/3, 67 of Bileshivale Village, Bidarahalli Hobli, Bengaluru East Taluk, Bangalore Urban District in Karnataka state. The Figure 3.1 below shows the location of the project site in the toposheet (Toposheet Nos D43R12 (57G/12) and D43X9 (57H/9)).

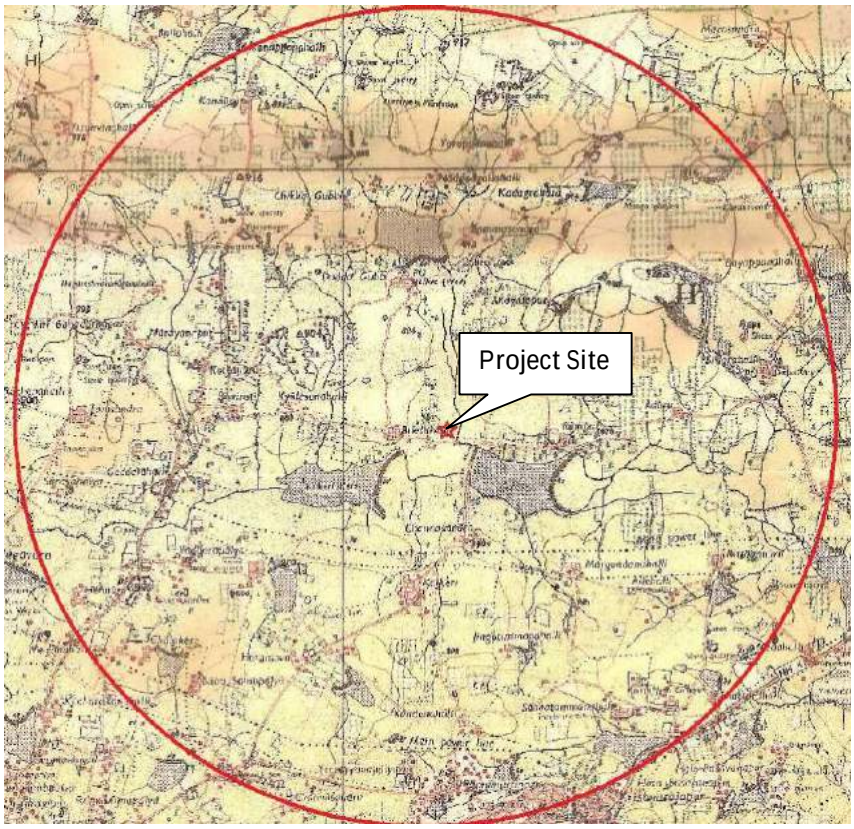


Figure 3.1. Project location and project Impact zone on toposheet.

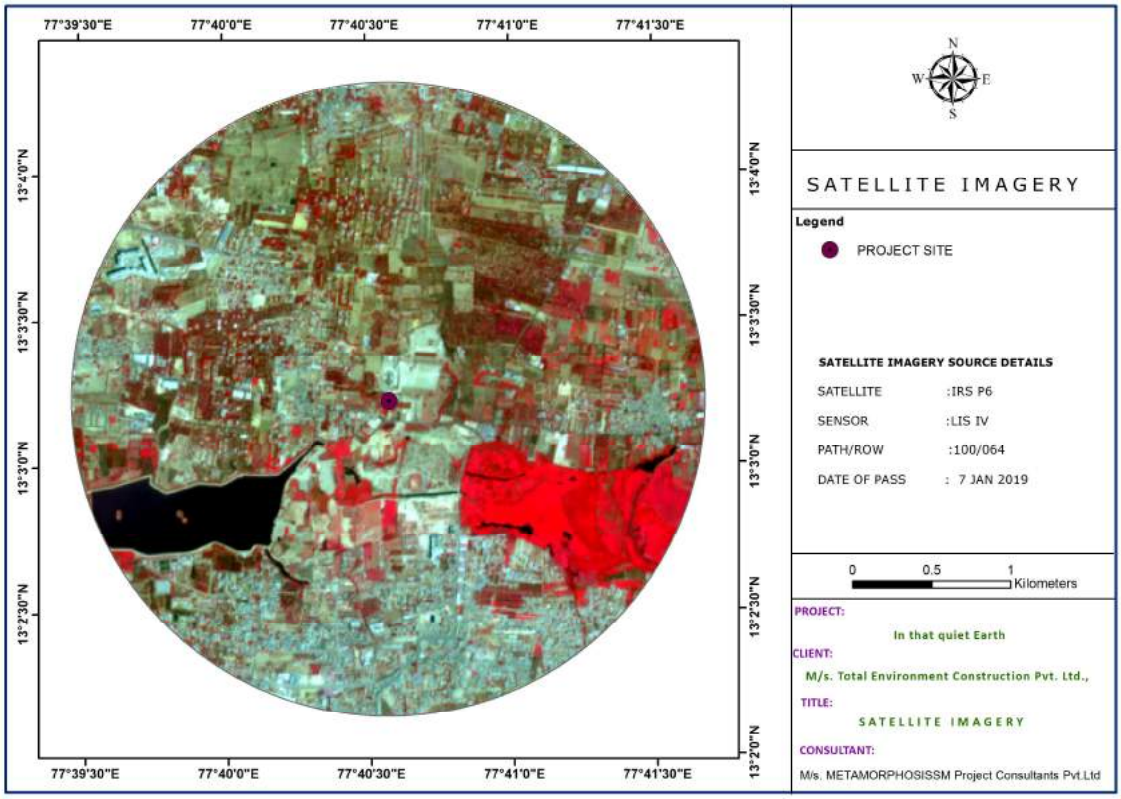


Figure 3.2. Satellite imagery of the Project Impact zone

3.3.1.1.1. Geography and Topography

As per the Ground Water Information Booklet, published by Central Ground Water Board, (December 2008), the Bangalore Urban district can be physiographically divided into rocky upland, plateau & flat topped hills at an general elevation of about 900m AMSL with its major part sloping towards south and south east forming pediplains interspersed with hills all along the western part. The pediplains of the district underlain by granites and gneisses with the highest elevation of 850 to 950 m. AMSL and constitute low relief area having matured dissected rolling topography with erosional land slope covered by a layer of red loamy soil of varied thickness. Major part of the pediplains is dissected by streamlets flowing in southern direction.

The project site is comparatively flat land with minor slope of 1-2 mts from North-West to South East direction. The highest elevation is 886 AMSL in the North – West part and the lowest elevation 875 at North-East part of the project site. The figure 3.3 below gives the geographical map. Figure 3.4 shows the Digital Elevation Model (DEM) of the project Impact Zone

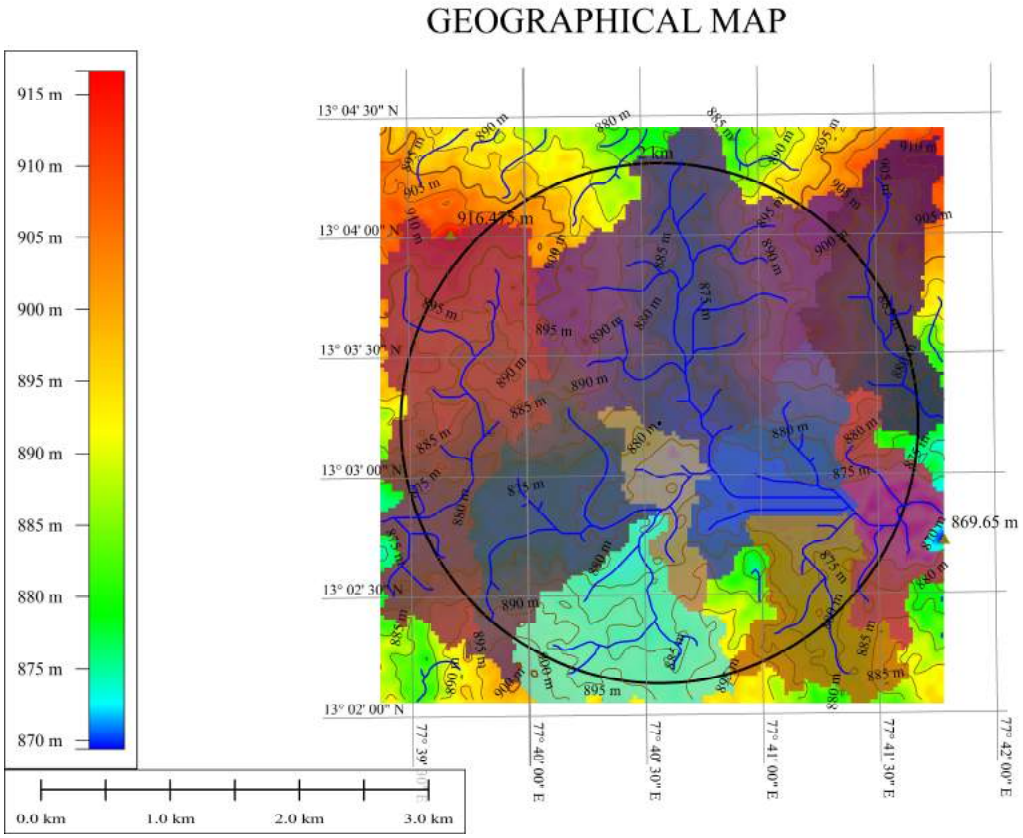


Figure 3.3. Geographical map of the Project Impact Zone

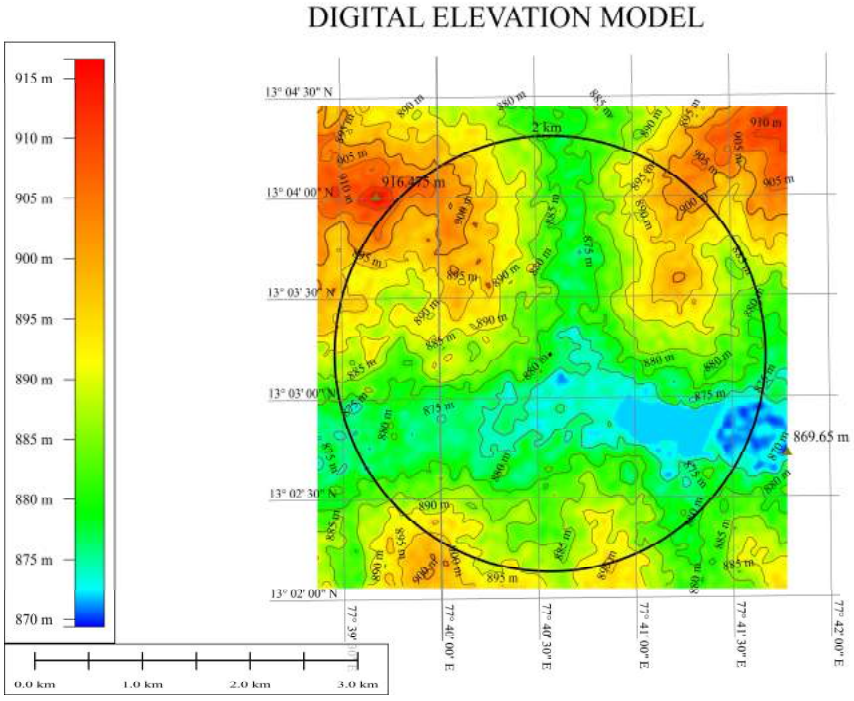


Figure 3.4. DEM of the Project Impact Zone

3.3.1.1.2. Land use

The major part of the project impact zone is agriculture land and followed by built up areas. The land use map of the Project Impact Zone is given in Figure 3.5 and its summary is given in Table 3.2 below.

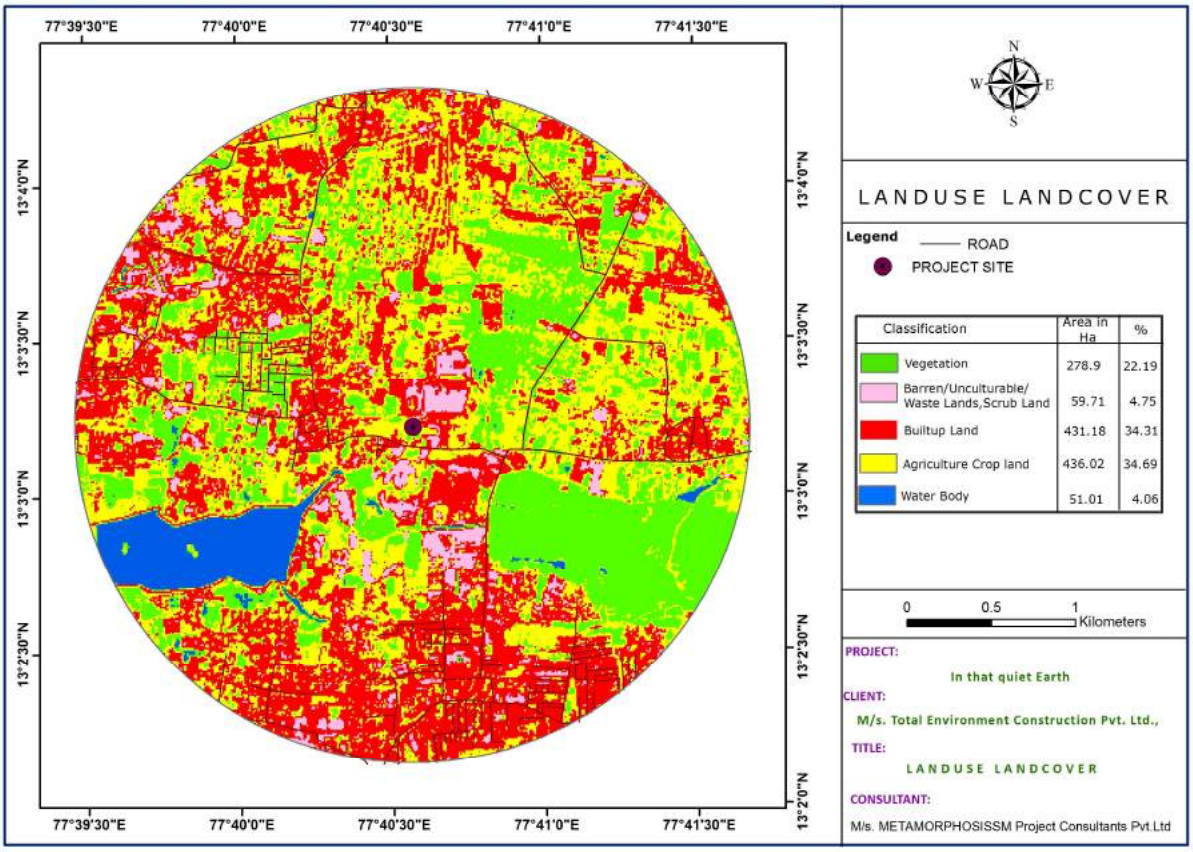


Figure 3.5. Land use map of the Project Impact Zone

Table 3.2. Land use classes

Sl. No	Land Use	Area (ha)	%
1	Vegetation	278.90	22.19
2	Barren Scrub land	59.71	4.75
3	Built up land	431.18	34.31
4	Agriculture Land	436.02	34.69
5	Water Body	51.01	4.06
	Total	**1256.82**	**100.00**

3.3.1.1.3. Climate

Historically, Bangalore is considered to be climatically a well-favored district. The climate of the district can generally be classified into four. The dry season with clear bright weather is

from December to February with summer from March to May, followed by the southwest monsoon season from June to September. October and November constitute the post-monsoon or retreating monsoon season. The two rainy seasons, June to September and October to November, come one after the other but with opposite wind regimes, corresponding to the southwest and northeast monsoons. The climate of the district is Dry tropical savanna with four seasons. They are given in table 3. 3 below

Table 3.3. Climate Seasons of Bangalore

Dry	Characterized with bright weather from Dec to Feb
Summer	Characterized by high temperatures, from March - May
Monsoon	South-West monsoon, Jun - Sept
Post-monsoon	Oct - Nov

Secondary data was analysed to understand the climate trend of Bangalore. The climatic variables for the last 10 years (2009-2018) were collected and analysed to understand the long term trend of climate variables in Bangalore. They are discussed in the following sessions.

Rainfall

The annual rainfall of Bangalore varies between as low as 400 mm to 800 mm. August, September and October are the months receiving maximum rainfall where as Dec- Apr are the driest months. In terms of number of rainy days Jun-October has maximum rainy days where as December – March are the lean months. The monthly rainfall for the last 10 years is given in Table 3.4 and the monthly rainfall days are given in Table 3.5 below. These two data are consolidated in Figure 3.6 below.

Table 3.4 Monthly Rainfall of Bangalore during 2009-2018

	Rainfall (mm)												
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Total**
2009	2.8	0.0	22.8	13.3	53.6	100.2	25.0	88.8	144.9	76.9	116.9	68.3	**713.6**
2010	27.5	1.7	3.6	25.0	30.5	117.0	82.4	108.2	115.4	176.5	98.9	18.7	**805.3**
2011	1.9	9.7	2.3	46.9	81.6	40.7	60.4	99.4	32.8	95.5	29.8	5.9	**506.9**
2012	0.6	0.0	6.1	31.9	45.8	45.8	42.2	50.8	70.9	39.8	32.3	3.2	**369.3**
2013	0.0	15.6	4.9	17.3	38.6	51.3	34.7	58.9	78.7	75.1	16.0	5.4	**396.4**
2014	0.4	1.4	14.7	5.6	32.9	54.2	49.3	73.6	72.2	80.9	4.6	13.0	**402.9**
2015	1.1	3.1	26.8	24.8	55.7	44.4	59.4	99.0	95.0	41.2	85.6	11.6	**547.6**
2016	7.4	0.1	2.1	6.2	71.7	100.6	75.6	58.1	63.2	38.0	2.8	30.3	**455.9**
2017	3.0	0.0	17.5	6.1	112.6	81.5	28.0	124.7	144.4	128.8	32.6	3.0	**682.1**

2018	0.3	10.5	39.2	12.6	138.2	94.6	61.0	101.4	95.6	243.2	63.2	23.1	**882.8**
Avg	**4.5**	**4.2**	**14.0**	**19.0**	**66.1**	**73.0**	**51.8**	**86.3**	**91.3**	**99.6**	**48.3**	**18.2**	**576.3**

Table 3.5. Monthly Rainy day of Bangalore during 2009-2018

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2009	3	0	12	9	22	24	18	22	24	18	25	21	198
2010	9	1	3	11	16	25	26	25	21	28	22	14	201
2011	1	6	5	13	20	17	21	22	19	27	12	6	169
2012	2	0	2	8	20	18	18	21	18	18	14	5	144
2013	0	5	3	13	15	19	25	22	24	27	10	3	166
2014	1	4	10	3	21	13	22	27	24	21	4	7	157
2015	1	1	14	13	17	20	17	22	24	13	26	12	180
2016	6	1	4	11	21	29	22	19	24	11	7	7	162
2017	2	1	11	5	20	25	19	29	22	22	15	4	175
2018	1	4	9	15	21	22	20	26	24	20	15	16	193
Avg.	**2.6**	**2.3**	**7.3**	**10.1**	**19.3**	**21.2**	**20.8**	**23.5**	**22.4**	**20.5**	**15.0**	**9.5**	**174.5**

Source: WorldWeatherOnline.com

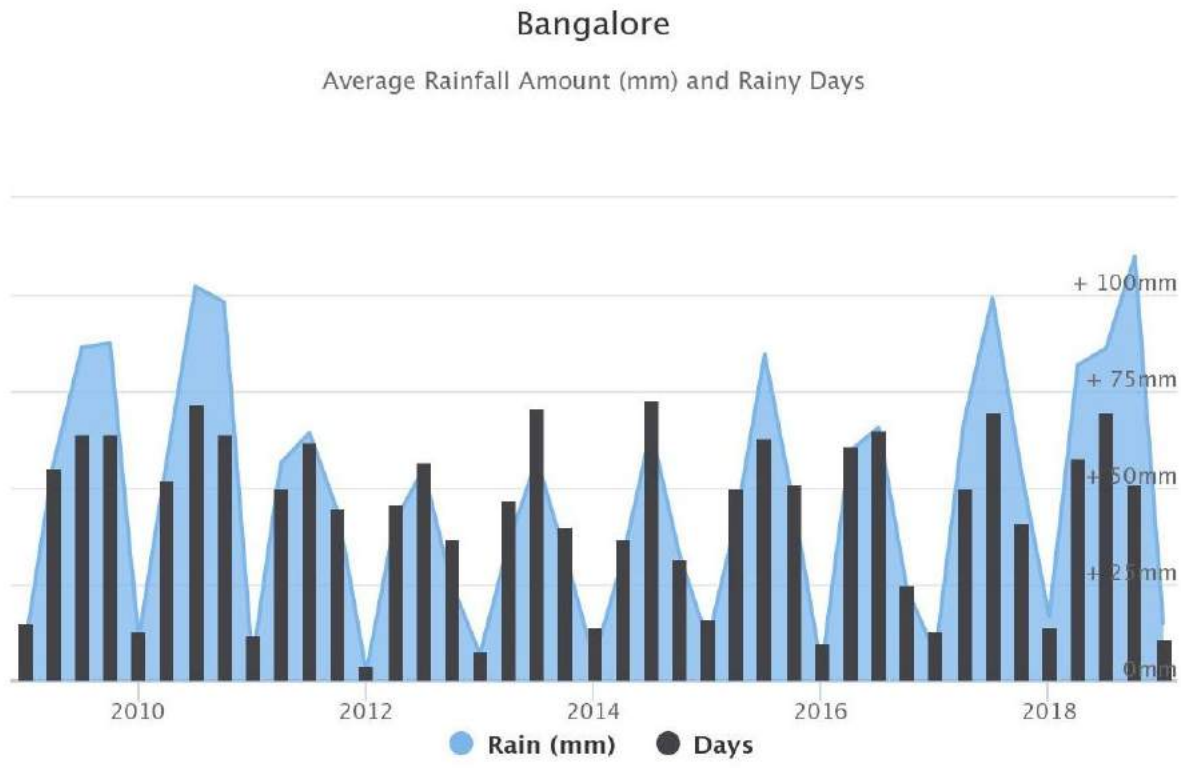


Figure 3.6. Monthly rainfall pattern of Bangalore

Wind speed

The surface winds in Bangalore have seasonal character with the Easterly components predominating during one period followed by the Westerly in the other. The high wind

speed averages 17-18 kmph during the westerly winds in the months of June to August and a minimum of 8-10 kmph during the months of April and October. The long term average of monthly wind speed data is given in Table 3.6 below.

Table 3.6. Monthly Average Wind Speed for the period 2009-2018

	Average Monthly wind speed (KMPH)											
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
2009	10.0	9.7	7.8	7.3	9.4	13.8	19.1	12.2	10.5	9.4	8.7	8.9
2010	8.8	10.0	9.4	7.6	9.3	12.5	12.3	11.7	9.5	7.5	7.9	8.6
2011	10.2	9.7	8.8	6.6	8.4	18.3	18.2	15.7	13.6	7.7	11.5	11.8
2012	10.5	12.6	10.4	8.1	11.5	18.5	17.7	16.3	12.6	10.5	10.2	12.7
2013	11.8	12.4	11.3	8.7	10.9	19.3	20.0	15.2	12.2	10.6	10.4	12.5
2014	13.7	11.6	12.2	8.8	9.6	16.2	19.7	14.7	12.5	8.7	10.9	10.7
2015	11.2	12.5	11.6	8.9	11.1	19.4	19.7	15.8	11.6	10.2	12.5	11.8
2016	10.5	11.6	10.0	9.1	9.9	17.1	19.8	17.4	14.1	8.4	9.9	11.0
2017	11.1	11.6	9.6	8.7	10.5	17.1	18.8	15.8	11.5	9.5	12.1	11.4
2018	10.9	12.9	11.9	9.5	9.7	19.5	22.8	20.8	10.1	11.5	13.5	12.0
Avg	**10.9**	**11.5**	**10.3**	**8.3**	**10.0**	**17.2**	**18.8**	**15.6**	**11.8**	**9.4**	**10.8**	**11.1**

Temperature

The main features of the climate of Bangalore are the agreeable range of temperatures, from the highest maximum of 33^{o} C in April to the lowest minimum of 14^{o}C in January. The Table 3.7 to Table 3.9 below gives the average monthly maximum, average and minimum temperatures for the region for the period 2009-2018.

Table 3.7. Monthly Average Maximum Temperature for the period 2009-2018

	Average Monthly Maximum Temp (^{o}C)											
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
2009	28	32	32	36	33	29	27	28	26	27	25	24
2010	26	31	35	37	35	29	26	28	28	27	26	26
2011	29	31	35	35	34	29	29	28	28	28	27	26
2012	28	31	34	34	33	31	29	29	29	28	27	28
2013	29	30	33	35	34	29	28	28	28	28	27	27
2014	28	30	32	36	34	32	29	29	29	28	27	27
2015	28	30	32	33	33	30	30	29	28	29	25	26
2016	28	32	35	36	33	29	28	28	27	28	28	27
2017	28	31	33	35	34	29	29	28	28	28	27	27
2018	28	30	32	34	32	29	28	27	29	28	27	27
Avg	**28**	**31**	**33**	**35**	**34**	**30**	**28**	**28**	**28**	**28**	**27**	**27**

Table 3.8. Monthly Mean Temperature for the period 2009-2018

	Average Monthly Mean Temp (°C)											
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
2009	21	24	25	28	27	24	24	23	23	22	21	20
2010	20	24	27	29	28	24	22	23	23	22	21	20
2011	21	22	26	27	27	24	24	23	23	23	21	20
2012	21	23	27	28	27	25	24	24	24	22	21	21
2013	22	23	27	29	28	24	23	23	23	22	21	20
2014	21	23	25	29	28	26	24	24	23	23	21	21
2015	21	22	25	28	27	25	25	24	23	23	21	21
2016	21	24	27	29	28	24	24	23	23	22	21	20
2017	21	23	26	29	27	24	25	24	25	23	22	21
2018	22	24	27	29	28	25	24	24	25	25	24	23
Avg	**21**	**23**	**26**	**29**	**28**	**25**	**24**	**24**	**24**	**23**	**21**	**21**

Table 3.9. Monthly Average Minimum Temperature for the period 2009-2018

	Average Monthly Minimum Temp (°C)											
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
2009	15	16	19	21	22	20	21	20	20	19	18	17
2010	16	17	19	22	23	21	20	20	19	19	18	16
2011	14	15	18	20	22	20	20	20	19	19	16	15
2012	15	17	20	23	22	20	20	20	19	18	16	16
2013	16	17	21	24	23	20	20	19	19	19	17	15
2014	15	17	19	23	23	22	20	20	19	19	16	16
2015	16	15	19	22	23	21	21	20	20	19	18	17
2016	16	18	20	23	23	20	20	19	19	18	16	15
2017	15	15	20	22	22	20	21	21	21	20	19	17
2018	17	18	21	24	24	22	21	20	21	21	19	19
Avg	**16**	**17**	**20**	**22**	**23**	**21**	**20**	**20**	**20**	**19**	**17**	**16**

November to February is the coldest months with average minimum temperature varying between 16-17 °C, the hottest months of the year are March to April and the average temperature for this period is 34-35 °C, in general, the average temperature of the city varies between 20-30 °C. The monthly temperature trend is shown in Figure 3.7 below.

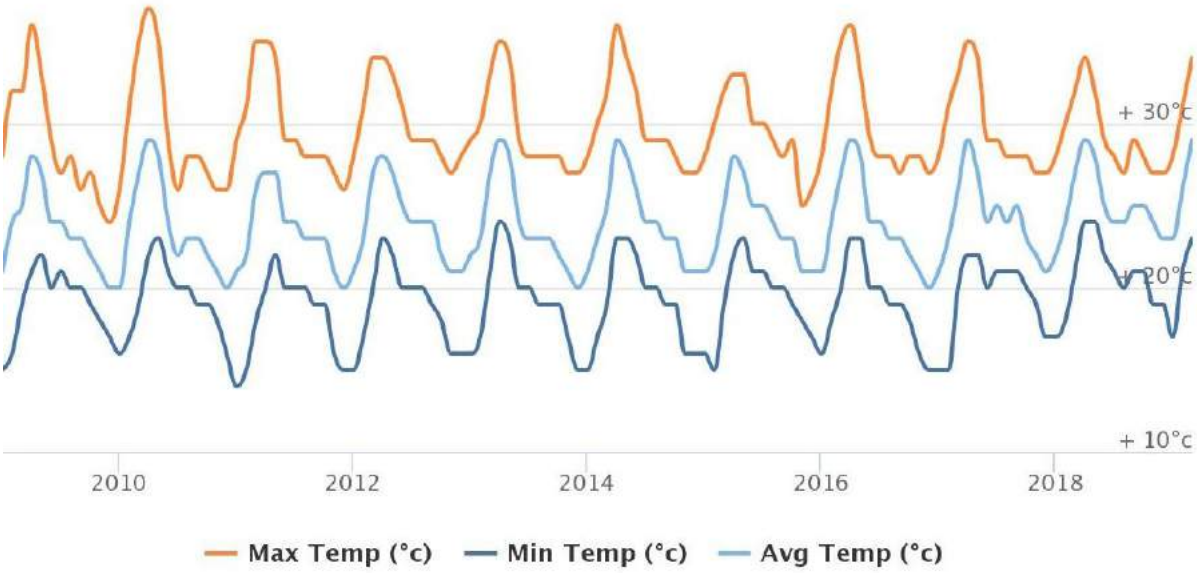


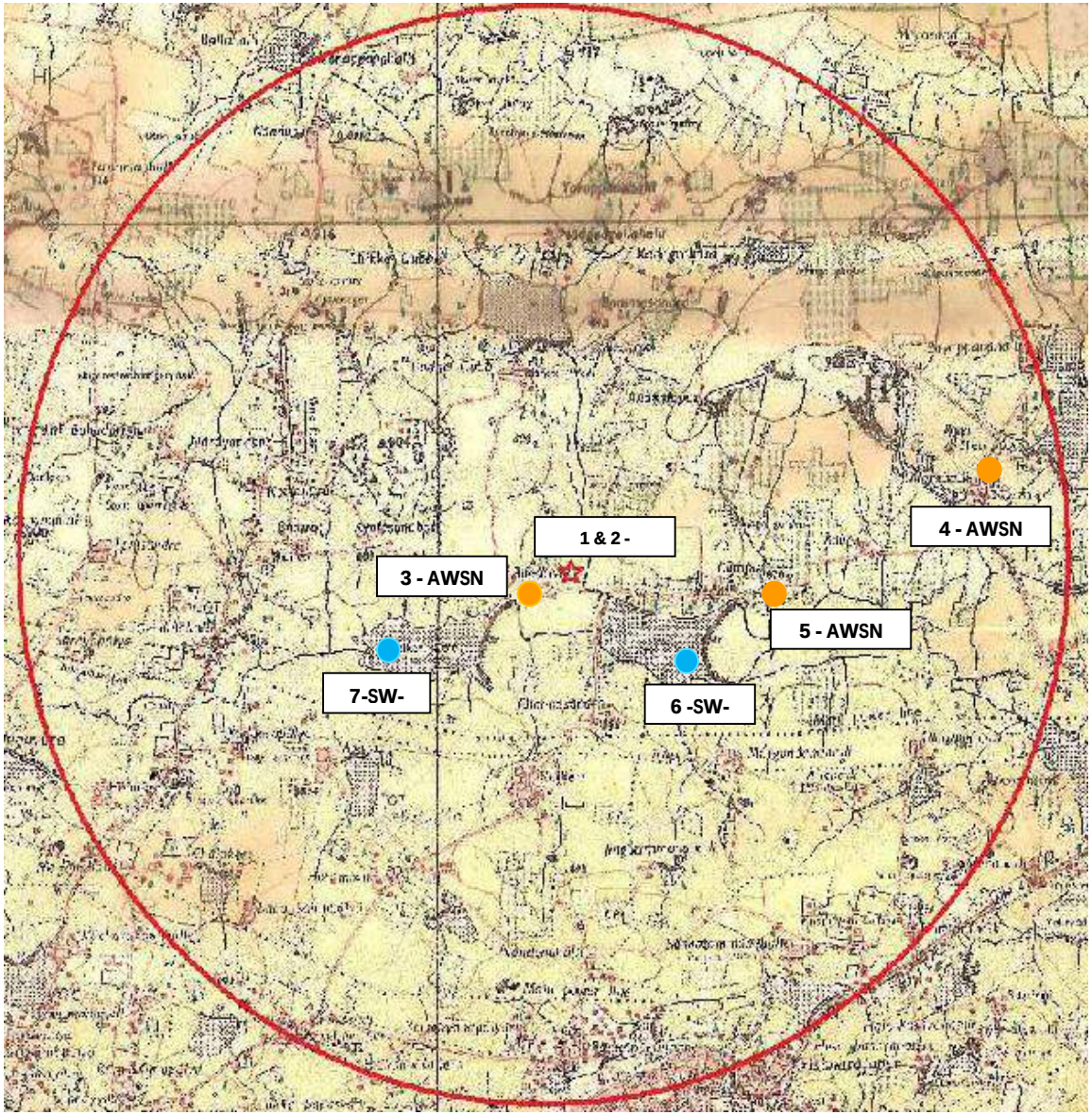
Figure 3.7. Long Term Temperature analysis for Bangalore

3.3.2. Baseline Environment

The baseline environmental quality was monitored at six locations. The monitoring period was December 2018 to February 2019. The location details are given Table 3.10 below and shown in Topomap in Figure 3.8.

Table 3.10. Sampling Locations

No.	Location	Air	Soil	Noise	Water
1	Project Site 1	✓	✓	✓	✓
2	Project Site 2	✓	✓	✓	
3	Bileshivale Village	✓	✓	✓	✓
4	Bidarahalli Village	✓	✓	✓	✓
5	Rampura Village	✓	✓	✓	✓
6	Rampura Lake – SW 1	--	--	--	✓
7	Kalkere Lake – SW 2	--	--	--	✓


1 & 2 -
3 - AWSN
4 - AWSN
5 - AWSN
7-SW-
6 -SW-

3.3.2.1. Air Environment

The air environment of the project site is comparatively clean. The results of air quality monitoring are discussed below. The results are given as **Annexure No. 7.**

The air samples were analysed for parameters like PM_{10}, $PM_{2.5}$, SO_2 and NO_2 and compared against the National Ambient Air Quality Standards. All the values are found to be within the permissible limits. The summary of the results are given in the table 3.11 and Figure 3.9 below.

Table 3.11. Air Sample Analysis Results

Parameter	Sampling Locations and Average results (µ g/m^3)					
	P. Site 1	P. Site 2	Bidarahalli	Rampura	Bileshivale	NAAQ
PM_{10}	57.1	65.0	65.5	59.2	60.5	100.0
$PM_{2.5}$	32.3	32.6	30.6	25.7	26.6	60.0
NO_2	28.1	35.5	27.1	31.2	23.3	80.0
SO_2	17.6	21.9	17.3	21.4	16.4	80.0

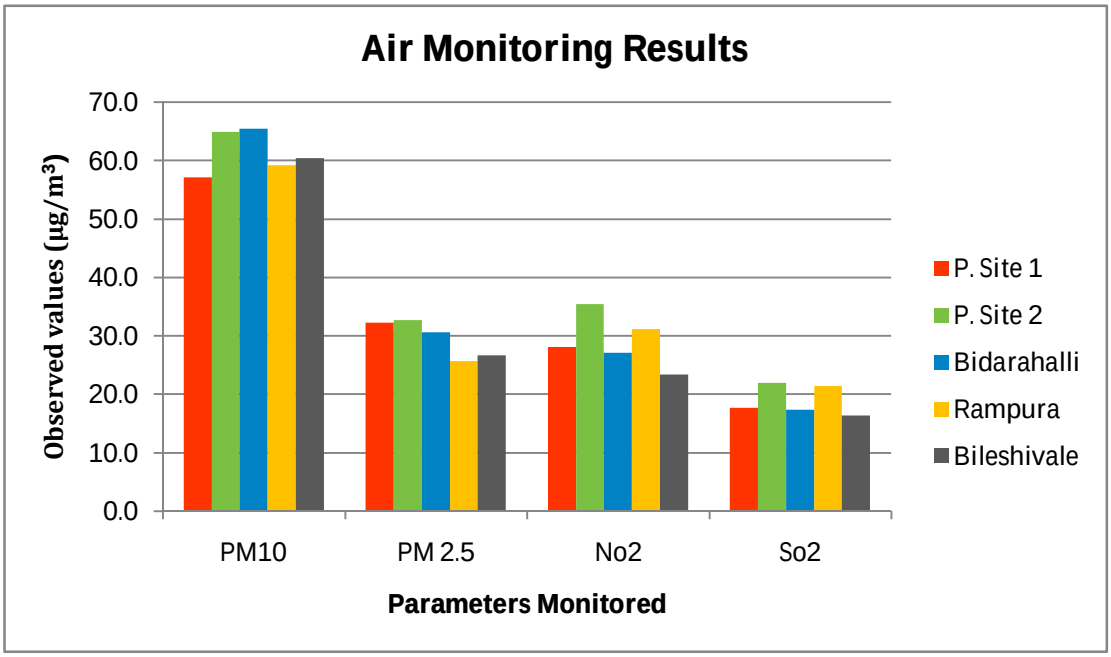


Figure 3.9. Comparison of Baseline Air Monitoring Results

3.3.2.2. Water Environment

Ground Water Samples were collected from four sources and surface water samples were drawn from two sources. The results of water quality monitoring are discussed below and

the results are given as **Annexure No. 8.** The results of the water sample analysis were compared against the standards recommended by IS: 10500; 2012

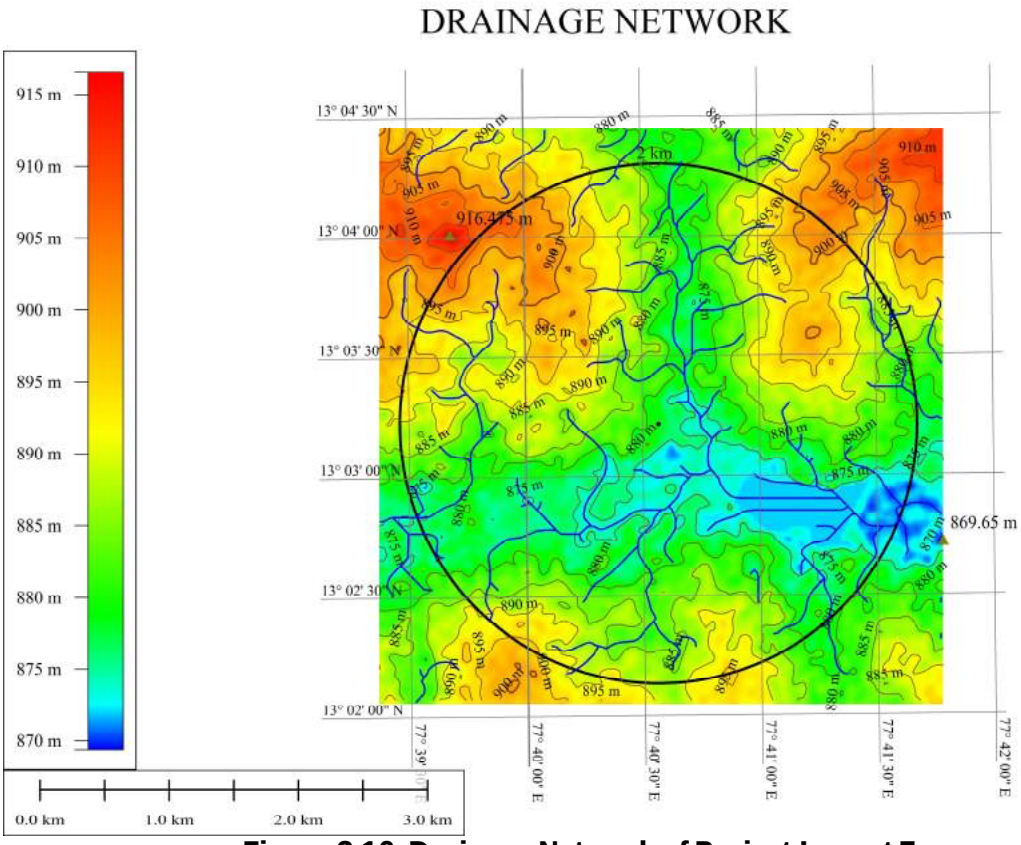


Figure 3.10. Drainage Network of Project Impact Zone

The comparison of the results shows that the water in the region is hard water and there is presence of calcium and magnesium above the acceptable limit. But all the parameters are within the permissible limit. The water is lightly alkaline character. Dissolved solid content is also above the acceptable limits. The summary of Surface Water Analysis is given as Table 3.12 and Ground Water Analysis is given as Table 3.13 below.

Table 3.12. Surface Water Analysis results

No	Parameter	Unit	Limit		Result – SW	
			Acceptable	Permissible	Kalkere	Rampura
A	**Physical Parameters**					
1	pH @ 25°C	--	6.5 to 8.5	No Relaxation	7.8	7.0
2	Turbidity	NTU	1	5	12.3	7.5
B	**Chemical Parameters**					
3	Conductivity	uS/cm	Not Specified	Not Specified	1194.3	1412.2
4	Total Dissolved Solids	mg/l	500	2000	806.7	990.3

No	Parameter	Unit	Limit		Result – SW	
			Acceptable	Permissible	Kalkere	Rampura
5	Total Hardness as CaCO3	mg/l	200	600	206.8	302.1
6	Calcium as Ca	mg/l	75	200	53.8	81.0
7	Magnesium as Mg	mg/l	30	100	18.2	25.1
8	Total Alkalinity as CaCO3	mg/l	200	600	242.3	425.0
9	Flourides as F	mg/l	1	1.5	1.3	0.9
10	Chlorides as Cl	mg/l	250	1000	151.8	136.3
11	Sulphate as SO4	mg/l	200	400	67.4	31.7
12	Nitrate as NO3	mg/l	45	No Relaxation	1.1	1.2
13	Dissolved Oxygen	mg/l	Not Specified	Not Specified	3.3	0.4
14	BioChemical Oxygen Demand	mg/l	Not Specified	Not Specified	30.0	59.1
15	Iron as Fe	mg/l	0.3	No Relaxation	BDL	0.7

Table 3.13. Ground Water Analysis results

Sl. No	Parameter	Unit	Limit		Result – Ground Water			
			Acceptable	Permissible	Project Site	Rampura	Bileshvale	Bidrahali
A	**Physical Parameters**							
1	pH @ 25oC	--	6.5 to 8.5	No Relaxation	5.8	7.4	7.4	7.2
2	Turbidity	NTU	1	5	BDL	BDL	BDL	BDL
B	**Chemical Parameters**							
3	Conductivity	uS/cm	Not Specified	Not Specified	1662.0	1729.0	1183.2	1451.0
4	Total Dissolved Solids	mg/l	500	2000	1153.0	1228.7	785.0	1000.8
5	Total Hardness as CaCO3	mg/l	200	600	417.9	414.2	327.5	460.9
6	Calcium as Ca	mg/l	75	200	125.1	63.7	117.6	139.7
7	Magnesium as Mg	mg/l	30	100	25.3	60.2	7.6	35.4
8	Total Alkalinity	mg/l	200	600	98.0	207.3	209.8	272.2

Sl. No	Parameter	Unit	Limit		Result – Ground Water			
			Acceptable	Permissible	Project Site	Rampura	Bileshvale	Bidrahali
	as CaCO3							
9	Flourides as F	mg/l	1	1.5	0.9	0.9	0.9	0.7
10	Chlorides as Cl	mg/l	250	1000	303.0	240.4	143.4	167.3
11	Sulphate as SO4	mg/l	200	400	19.4	53.5	30.3	17.9
12	Nitrate as NO3	mg/l	45	No Relaxation	5.1	4.5	0.4	4.4
13	Dissolved Oxygen	mg/l	Not Specified	Not Specified	--	--	--	--
14	BioChemical Oxygen Demand	mg/l	Not Specified	Not Specified	BDL	BDL	BDL	BDL
15	Iron as Fe	mg/l	0.3	No Relaxation	BDL	BDL	BDL	BDL

3.3.2.3. Soil Environment

The soils of the districts can be broadly grouped into red loamy soil and lateritic soil. Red loamy and sandy soils generally occur on hilly to undulating land slope on granite and gneissic terrain. The soils are light textured and are highly leached in nature with good infiltration rate. It is mainly seen in the eastern and southern parts of Bangalore north and south taluks. Laterite soils occur on undulating terrain forming plain to gently sloping topography of peninsular gneissic region. It is mainly covered in Anekal taluk and western parts of Bangalore North and south taluks.

The texture of the soil of the project site is found to be Red Sandy Loam.

The results of the soil quality monitoring are discussed below and the Soil Quality Monitoring Report is given as **Annexure No. 9.** The summary of Soil Analysis results from various sampling locations are given in following Table 3.14.

Table 3.14. Soil Sample Analysis Results

No	Parameter	Unit	Site 1	Site 2	Bidarahalli	Rampura	Bileshivale
1	pH @ 25°C	..	7.6	8.0	7.8	7.8	7.2

No	Parameter	Unit	Site 1	Site 2	Bidarahalli	Rampura	Bileshivale
2	Conductivity @ 25°C		310.0	121.5	191.2	191.2	103.4
3	Total Organic Matter	%	BDL	BDL	BDL	BDL	BDL
4	Moisture	%	2.7	2.1	3.8	3.8	7.0
5	Available Nitrogen as N	%	5.0	7.3	4.8	4.8	8.3
6	Available Potassium as K	Kg/ha	81.7	101.9	80.5	80.5	116.8
7	Available Phosphorous as PO_4	Kg/ha	62.5	113.9	81.4	81.4	120.1
8	Sand	%	11.0	12.3	23.3	23.3	3.8
9	Silt	%	67.0	67.7	65.0	65.0	79.2
10	Clay	%	19.7	19.7	7.2	7.2	16.8
11	Soil Type	..	Silt Loam	Silt Loam	Silt Loam	Silt Loam	Silt Loam

3.3.2.4. Noise Environment

The result of the noise monitoring is discussed below and the monitoring results are given as **Annexure No. 10.** The noise level is found to be slightly higher than the permissible limit. This is due to the vehicular traffic in the road adjacent to the monitoring point. The results are given in Table 3.15 and Figure 3.11 below.

Table 3.15. Noise Level Monitoring Results

Parameter	P. Site 1	P. Site 2	Bidarahalli	Rampura	Bileshivale
L min	66.7	70.3	70.0	70.3	71.2
L max	73.9	82.2	77.9	81.8	79.3
L eq	69.7	75.2	73.5	74.3	71.3

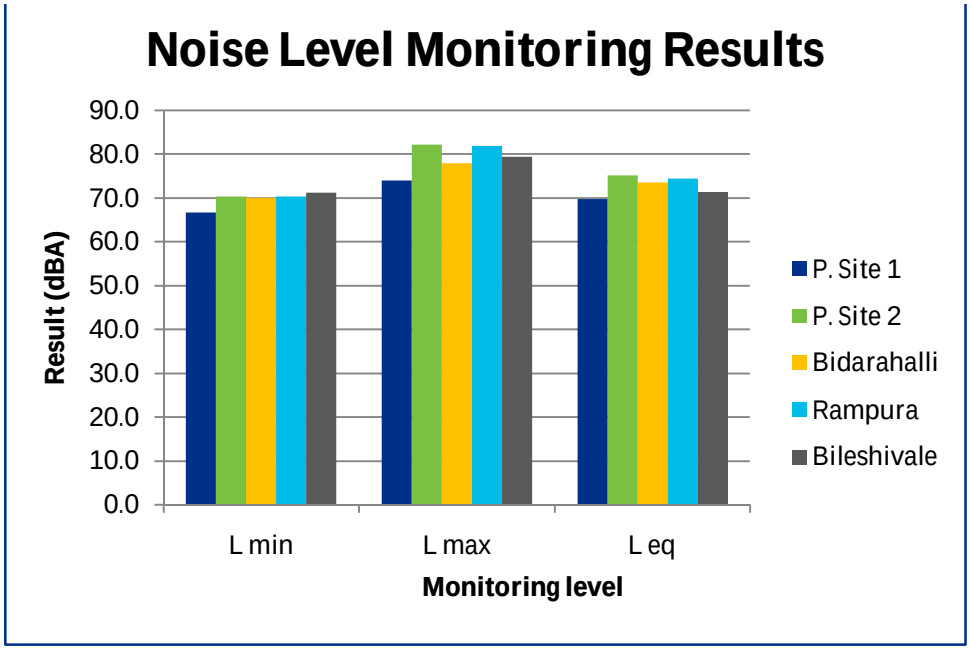


Figure 3.11. Comparison of Baseline Noise Level Monitoring Results

3.3.2.5. Biological Environment

Natural ecosystem is a structural and functional unit of nature. Its components exist in harmony and survive by inter-dependence. Ecosystems have self-sustaining ability and control the number of organisms at any level by cybernetic rules. The effects are such that an ecosystem does not become imbalanced. The middle of the 18th century saw birth of industrialization, which increased during 19th & 20th century and exploded in 21st century. The resources produced over and sustained for thousands of years were exploited and squandered for the luxuries of few humans. An unsustainable exploitation of resources has exploded pollution, so was the inevitable result. Thus, a chain of events of exploitation consumption- pollution-depletion and further exploitation started responding the imbalance and determination of ecological system.

Objectives

Following are the objectives of the study:

- To generate baseline data from field observations;
- To compare the data so generated with authentic past records to understand changes;
- To characterize the environmental components like land, water, flora and fauna;
- To understand the present biodiversity;

- To identify susceptible sensitive and critical areas (environmental hotspots);
- To understand impact of industrial activities on the flora and fauna;
- To predict changes as a result of impact in the composition and functioning of components of the ecosystem.

3.3.2.5.1 Approach and Methodology

Approach

A participatory and consultative approach was followed for executing the assignment on Biodiversity assessment of the project site and adjacent region in consultation with, front line officials of the Forest Department on existing biodiversity of the region and the forest management aspects. Literature survey included review of forest working plan and other published records related to biodiversity and ecology of the region.

Vegetation types were closely observed and recorded on the ground and then were cross checked with regional territorial forest Working plan and Champion & Seth Forest classification of India. We have gone around the core area and a one kilo meter of buffer zone around the project site and recorded the flora and fauna. We went around all the Direction of the project site and recorded the biodiversity falling in and around the project site; we have identified the species and recorded their life farm. Besides recording the plant species, other biodiversity aspects in the form of endemic status, conservation status and life form have been collected from the literature. The list of species in the study area is given in Table 3.16 and 3.17.

Baseline Status

Table – 3.16: List of Flora species identified in study area

Sl. No.	Scientific name	Common Name
BIG TREES		
1	*Mangifera indica*	Mango
2	*Azadirachta indiaca*	Neem
3	*Psidium guajava*	Guava
4	*Artocarpus heterophyllus*	Jack Fruit
5	*Tectona grandis*	Teak
6	*Cocos nucifera*	Coconut
7	*Bambusa vulgaris*	Bamboo
8	*Phoenix sylvestris*	Wild Date Palm
9	*Manilkara zapota*	Chikoo
10	*Eucalyptus tereticornis*	Forest Red Gum

Sl. No.	Scientific name	Common Name
11	*Grevillea robusta*	Silver Oak

Table 3.17: List of the Fauna in the Study Area

Scientific Name	English/Local name
Mammals	
Funabuluspalmarum	Squirrel
Rattusnorvegicus	Field Mouse
Rousettus leschenaultia	Fruit bat
Musmusculaus	Common Mouse
Reptiles	
Calotes Versicolor	Garden Lizard
Chamelonzeylanicus	Indian chameleon
Pantherophis obsoletus	Rat Snake
Ophiophagus hannah	King Cobra
Bungarus caeruleus	Common Krait
Amphibians	
Rana hexadactyla	Frog
Bufomelanosticus	Toad
Birds	
Corvussplendens	House crow
Acridotherestristicus	Common myna
Tylo alba	Barn owl
Bublus ibis	Cattle Egret
Milvus migrans	Pariah Kite
Cyanocittacristata	Blue Jay
Centropussinensis	Crow Pheasant
Orthotomussutorius	Tailor bird
Ardeagrayiigrayii	Paddy Bird
Ploceus Philippines	Weaver bird
Cuculusmicropterus	Indian cuckoo
Pycnonotuscafer	Red vented bulbul
Discurusmacrocerus	Black drongo
Alcedoatthis	Common king fisher
Psittacidae	Parrot
Trochilidae	Humming bird
Haliaeetus leucocephalus	Bald Eagle
Insects/Flies	
Rhopalocera	Butterflies

Scientific Name	English/Local name
Anisoptera	Dragon flies
Apis	Honey bees
Zygoptera	Damsel fly
Acridomorpha	Grass hopper
Formicidae	Ants
Gryllidae	Crickets
Lepidoptera	Moths

3.3.2.5 Socio Economic Environment

Bengaluru, the capital city of Karnataka, has a history of ever four hundred years, having been founded by Magadi Kempegowda in the year 1537 AD. Since then the city has throughout retained its importance as could be seen by the great desire of every chieftain or rulers not only in the South but even the Moghul Kings of Delhi to acquire possession of this city. Bangalore, with its strategic location as well as congenial climate, fertile land and adequate rainfall has grown steadily in its area and population. Its growth accelerated with the establishment of a cantonment by the British. In 1809, very close to the old city of Bangalore. With the establishment of the cantonment, the prospects of trade, employment and other means of livelihood increased and people started setting on the fringes of the cantonment area and various localities now known as Tasker Town, Maciever Town, Richmond Town, Frazer Town etc., started springing up. By 1890 the population of the cantonment area had crossed a Lakh mark while that of the old city, which also had a prosperous period of trade and commerce, had increased to over 80,000. The cantonment and the civil areas around it were, however, directly administered by the British Government and the city administration was with the State Government of Mysore. It was only in the middle of 1947 the Civil areas were conceded to the state and in the year 1949, the city and civil areas of Bangalore were brought under one Authority, the Corporation of the City of Bangalore, with a population of over seven Lakhs. Perhaps the most spectacular growth of the City Started after the independence of the country, with the establishment of Central Sector Industries like the Hindustan Machine Tools (H.M.T), Indian Telephone Industries (I.T.I.) etc. The re-organisation of states on linguistic basis in 1956 gave further impetus to the growth of Bangalore when it become the capital of a larger state of Mysore with the addition of vast Kannada speaking areas of the former Bombay, Hyderabad, Madras states and Kodagu. Bangalore Developed not only as a headquarters of administration and an educational centre of Karnataka but also had a tremendous growth as an Industrial Centre. Described by its older residents as Garden City, Air-conditioned City

etc., Bangalore attracted the people not only from Karnataka and surrounding areas but people from other states also on account of its salubrious climate, natural beauty and the abounding greenery. Within a decade and a half after the re-organisation of states in 1956 Bangalore became the Seventh Largest City in the Country by 1971, its population exceeding 16 Lakhs. Its population growth in the decade between 1971 and 1981 has been beyond any expectation and reached nearly 3 million marks raising its place to 5th among Indian Metropolitan Cities.

3.3.2.5.1 Demographic Profile of Study Area

A primary data collection by doing sample survey of the villages under buffer zone was conducted. The first hand information regarding number of population, occupation, literacy level etc., were obtained from the latest census data 2011. There are no inhabited villages within the project area. Hence, this Socio-economic study was conducted in the buffer-zone only. The socio economic condition is summarized below in **Table 3.18.** The detailed list with villages surveyed in the 5 Km buffer zone of study area is enclosed as **Annexure No. 19.**

Table 3.18: Socio Economic Status of Study Area

Total Population	Total Literate Population	Total illiterate Population	Working Population	Non working population
33715	24049	11749	14786	18929

Source: Census of India 2011

3.3.2.5.2 Population Details

The population break-up of all the villages/wards coming within the buffer-zone, as per 2011 census data is given in **Table 3.19** and graphically shown in **Fig 3.12.** The ST Male and Female population is nearly two percent compared to total population of the village.

Table 3.19: Population Details

Population	No of House Holds	Population			SC		ST	
		Total	M	F	M	F	M	F
2011 Census	7681	33715	17512	16203	4640	4507	387	324

Source: Census of India 2011

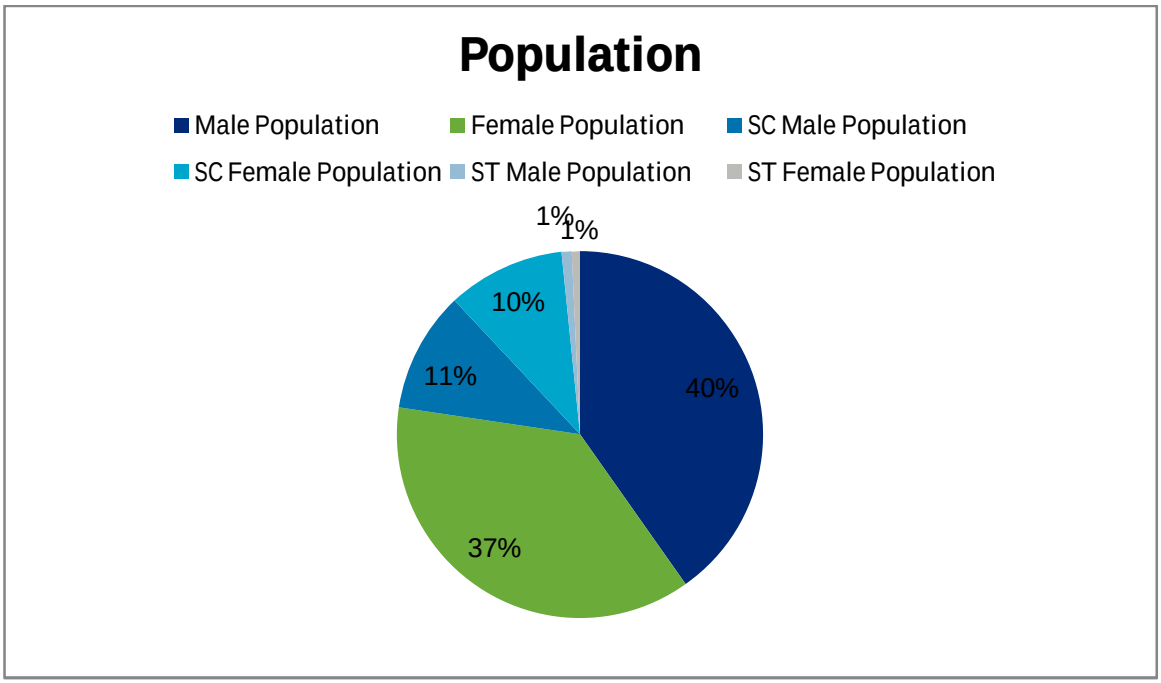


Fig 3.12: Population Break-up details in Buffer Zone

CHAPTER – 4

ANTICIATED ENVIRONMENTAL IMPACTS AND ITS MITIGATION MEASURES

Chapter 4: Anticipated Environmental Impacts & Its Mitigation Measures

4.1. Introduction

One of the major objectives of conducting Environmental Impact Assessment exercise is to identify the potential impacts due to the proposed construction activities on different environmental attributes during the pre-construction, construction and post construction phases of the project. This exercise also involves analysis of alternative methodologies and materials to avoid or mitigate the identified impacts and recommends mitigation measures for those impacts which cannot be avoided.

Environmental Management Plan (EMP), which is a part of the EIA report, identifies the mitigation measures to be adopted to keep the impacts to the minimum and to improve the

Total Environmental quality of the surroundings. The EMP also recommends the period and frequency of monitoring various attributes during the operational phase to evaluate any detrimental impacts to various environmental attributes of the project site and its surroundings. Chapter 9 of this report, discusses the EMP recommended for this project during its construction and operational phases.

The environmental impacts can be categorized as either primary or secondary. Primary impacts are attributed directly to project activities whereas secondary impacts are indirectly induced and typically include the associated investment and changed patterns of social and economic activities due to the proposed project activities. These impacts are assessed with respect to the regional environmental conditions. Based on the findings of such a study, mitigation measures are proposed in order to minimize adverse impacts and improve favourable impacts.

The potential impacts are identified for different phases of the project execution viz, pre construction, construction and operational phases. Impacts with respect to different environmental attributes during different activities of the project implementation are identified in the following sessions.

The major activities identified during the pre-construction and construction phases are:

a) Ground clearing and land levelling
b) Clearing of vegetation
c) Transportation of construction materials
d) Earth excavation, piling, drilling etc.
e) Construction of buildings

The major activities identified during the operational phases are:

a) Operation of generators and STPs
b) Regulation of the traffic
c) Treatment of water
d) Collection, segregation and disposal of solid wastes.

The impacts are assessed for the following environments:

i) Land Environment

ii) Water Environment

iii) Air Environment

iv) Ecological Environment

v) Noise Environment

vi) Socio-Economic Environment

In addition, considering the peculiar character of this project, the management of various types of wastes are also discussed in this chapter.

4.2 Impacts on Land Environment

4.2.1. Pre Construction and Construction Phase

4.2.1.1. Anticipated Impacts

The major impacts on land environment from construction projects are change in land use and loss of topsoil. There are also chances for induced soil erosion, soil contamination etc. From this construction project, the following impacts are anticipated on land environment, during the construction phase.

i) Change in land use pattern.

ii) Change in topography due to the cutting, filling and levelling of the land.

iii) Loss of productive topsoil

iv) Loss of the scenery and visual aesthetics due to construction of buildings and complexes.

v) Soil contamination from solid waste from construction sites, dumping of construction material and wastes, accidental spillage of oil and lubricants etc.

vi) Compaction of existing landscape, ground or other open areas due to the movement of vehicles carrying the construction materials and labourers, operation of the machinery or the dumping of the construction materials.

4.2.1.2. Mitigation Measures

As the proposed project site is nearly level, there won't be any major cutting and filling required. Further, no construction camps are proposed for this project and hence the solid waste generation during the construction phase will be very minimal. However, the

following measures are recommended to minimize and mitigate any impact on the land environment.

i) Conservation of the topsoil and reuse for the green belt development to avoid the loss of productive topsoil.

ii) Developing green belt and landscape along the project boundary.

iii) Earmark separate areas for storage of construction materials and isolated place for storage of hazardous material like oil, lubricants etc.

iv) Separate bins, clearly labelled to collect the organic, inorganic waste from the construction site. All the solid and inorganic waste should be handed over to approved vendors or recyclers authorized by BBMP.

v) Provision of storm water drains within the project site, to collect any erosion or surface runoff and divert to the recharge pits.

vi) Reusing of the excavated earth entirely for backfilling, levelling and construction activities within the project site itself.

vii) Hazardous waste shall be handed over to authorized common hazardous waste disposal and treatment facility (TSDF) for further treatment and disposal.

viii) In the project site, if there is no existing road for the transportation of materials and labourers, temporary roads will be provided. Dumping of construction materials will be allowed only on pre-identified area within the project site. No construction activity, storing or material or transportation will be allowed on existing developed landscapes.

ix) Guidelines of Solid Waste Management Rule 2016, Construction & Demolition Waste Management Rules 2016 and Plastic Waste Management Rules 2016, will be strictly followed.

4.2.2. Operational Phase

4.2.2.1. Anticipated Impacts

As this is a construction project consisting of only residential and commercial units, there won't be any impact on the land environment during the operational phase. Those impacts, that could happen will be from carelessness and negligence of the occupants. The potential impacts that could be expected during the operational phase are:

i) Soil contamination due to indiscriminate disposal of solid waste.

ii) Soil contamination due to contamination from oil and diesel from the Diesel Generators.

iii) Soil contamination from waste water draining from the buildings.

4.2.2.2. Mitigation Measures

i) Develop and implement Solid Waste Management Plan

ii) Creating awareness for waste segregation and providing separate collection bins for organic, inorganic and e-wastes.

iii) Proper maintenance and cleaning of storm water and waste water drains.

iv) Dual plumbing to divert waste water to STPs and maintenance of the network.

v) Scientific disposal of oil and lubricants from the Diesel Generators.

vi) Arrangements for collection of E-waste and hand over to authorised vendors.

vii) The dried sludge from the STP will be used as manure in landscaping only.

viii) Under no situation, the solid waste should be disposed as landfill.

4.3 Impacts on Water Environment

4.3.1. Pre Construction and Construction Phase

4.3.1.1. Anticipated Impacts

There are two lakes (Rampura lake and Kalkere lake) close to the project site (within 300 m distance) and the two water course (nallah) is passing through the project site. The potential impacts to water environment are from two fronts. First is from extraction of water and second contamination of water sources. From this construction project, the following impacts are anticipated on water environment, during the construction phase.

i) Extraction of water from nearby sources for construction activities and there by affecting the other stakeholders.

ii) Extraction of ground water for construction activities may affect the ground water table and the water resources in surroundings.

iii) The waste water from the construction site could contaminate the surrounding water bodies or the nallah.

iv) The contamination from oil, lubricants from generators and other machineries.

v) The contamination by indiscriminate disposal of construction materials, other solid waste etc.

vi) Contamination by surface runoff and sedimentation.

vii) Changes in flow path and / or contour of natural drainages or the nallah.

4.3.1.2. Mitigation Measures

The impacts discussed in the above section can be avoided or mitigated by implementing proper management plans and awareness creation. The following mitigation measures are recommended:

i) Drains will be provided to collect the surface runoff water into the recharge pits.

ii) Water requirement during construction time will be met through tanker lorries, hence leaves no impact on local water resources. Secondary water will be used for concrete mixing, dust suppression and cooling etc.

iii) No ground water / surface water extraction during the construction phase.

iv) Mobile STPs will be provided to treat the waste water.

v) Designated areas should be provided for collection and storage of segregated waste materials. Waste materials should not be disposed around the construction site unscientifically.

vi) Solid Waste Management plan should be prepared and adhered strictly.

vii) Guidelines of Water (Prevention and Control of Pollution) Rules 1974 and Amendment Rules until 2011 will be followed. The conditions of Consent for Establishment from the Karnataka State Pollution Control Board will be strictly complied.

4.3.2. Operational Phase

4.3.2.1. Anticipated Impacts

The potential major impact to water environment during the operational phase is from the disposal of waste water from buildings. This section discusses the potential impacts to water environment during the operational phase.

i) Extraction of ground water for the use in buildings

ii) Contamination of the two lakes and the two nallah, by the storm water runoff.

iii) Contamination of the nallah by the oil and diesel from the Diesel Generators.

iv) Waste water from buildings, toilets, bathrooms, vehicle washing area etc.

v) Indiscriminate dumping of the waste into the water bodies or nallah.

4.3.2.2. Mitigation Measures

The recommended measures for mitigating the impacts to water environment are given below:

i) Install STPs of sufficient capacity to collect the waste water generated and treat them for secondary and tertiary use.

ii) Install dual plumbing system separating domestic water and treated water.

iii) Water requirement to be met through BWSSB / tanker lorries and treated water from STPs. Water should not be extracted from the lakes or the nallah.

iv) Install water efficient appliance to reduce the total water requirement.

v) Develop and implement storm water management plan. Collect the storm water into drains and divert to recharge pits.

vi) Implement Rainwater Harvesting System and ground water recharge pits.

vii) No waste should be allowed to dump in the water course or water bodies

4.4 Impacts on Air Environment

4.4.1. Pre Construction and Construction Phase

4.4.1.1. Anticipated Impacts

Construction activities are likely to bring significant impact to the air environment. The transportation of construction materials and laborers, construction activities, operation of vehicles and machineries are the major sources impacts on air environment. The potential impacts on air environment during the construction phase are listed below:

i. Dust during the clearing and levelling of ground.

ii. Dust particles during the transportation of the construction materials.

iii. Dust particles during the earth work, drilling, piling etc.

iv. Smoke emission from the vehicles coming to and going out from the construction site.

v. Smoke and dust due to operation of various construction machinery

vi. Fugitive emission from the Diesel Generators

4.4.1.2. Mitigation Measures

The project site is not situated in any habitat area, hence it is unlikely that any impact from the project site will affect the general public outside. Further, the access road to the project site is in good condition, so the impact due to vehicular emission will be minimum and within permissible limit. Nevertheless, the following mitigation measures are recommended to control and minimise the impacts to the air environment.

i. High barricades should be erected around the project site boundary before starting any ground work / earth work, so that dust emissions won't reach to the general public outside the site boundary.

ii. Proper Personal Protection Equipments (PPE) like masks and face covers will be provided to all those who are exposed or working near to operations generating dust and smoke.

iii. All vehicles using for transportation of materials and person should have a valid 'Pollution Under Control' Certificate.

iv. While transporting loose particles like sand, cement, earth etc, the top should be covered with a tarpaulin or similar sheets.

v. Water should be sprinkled at frequent interval to suppress the dust nuisance.

vi. Use only DGs that are as per KSPCB conditions and approval.

vii. Ensuring proper cleaning and maintenance of DGs, Vehicles and other machinery.

4.4.2. Operational Phase

4.4.2.1. Anticipated Impacts

As the proposed project consists of only commercial and residential buildings, no major impacts to the air environment are anticipated during the operational phase. The anticipated impacts during the operational phase are:

i. Emission from the vehicles to the buildings.

ii. Fugitive emission from the Diesel Generators.

iii. Nuisance during the handling of solid waste.

4.4.2.2. Mitigation Measures

These are comparatively minor impacts and are of short duration only. The roads within the project site will ensure smooth operation of the vehicles coming and going without any

stoppage, hence there is less likely any major emission from the vehicles. Similarly, DG sets will be placed in special enclosed chambers and will be operational only when there is a power failure. However, the following mitigation measures are recommended.

i. Good condition roads and trained person to ensure smooth vehicular flow within the project site.

ii. Implementation of Traffic Management Plan.

iii. Special enclosed chambers for the Diesel Generators. Maintain stack height as per the guidelines.

iv. Provisions of Air (Prevention and Control of Pollution) Rules, 1982 and conditions of Consent for Operation from SPCB will be strictly followed.

4.5 Impacts on Ecological Environment

4.5.1. Pre Construction and Construction Phase

4.5.1.1. Anticipated Impacts

The major impacts expected on ecological environment during the construction phase is from the clearing of the trees on the ground. No labour / workers camps are envisaged for this project, hence there will not be any requirement of any clearance of land for labour camps. Careless activities in the construction phase may result in affecting the aquatic life in the water bodies negatively. The anticipated impacts on the ecological environment from this project are listed below:

i. Clearing of vegetation on ground for the construction purpose.

ii. Impact on the existing landscape in the project area due to careless dumping of construction materials, unauthorized parking of vehicles or movement of vehicles.

iii. Loss of habitat for the fauna in the project site.

iv. The contaminated water from the project site during the construction time could affect the aquatic fauna in the lakes and water course.

v. Green belt development, along the project boundary is part of the project design. An area of 164640 Sqm which is 35.56 % of the total plot area of the project will be used for green belt development. The green belt plan is attached as **Drawing No. 6.**

4.5.1.2. Mitigation Measures

The proposed site is barren land with no major trees and mostly with bushes and grass only. Therefore, the impact of the clearing of vegetation is very minimal. The project proposes developing individual landscapes and garden in addition to common landscape area. This will mitigate any impact and also will enhance the general environmental health of the area. The mitigation measures recommended are:

i. Limit the felling of trees to the minimum required.

ii. Restrict the transport through the roads and parking at the identified locations only.

iii. Waste materials, discarded objects, construction waste etc should not be dumped in or near the water bodies or water courses.

4.5.2. Operational Phase

4.5.2.1. Anticipated Impacts

As this is construction project, consisting of residential and commercial complexes, no impacts are anticipating on the ecology during the operational phase, unless due to some careless or casual activities. The anticipated impacts are:

i. Due to unauthorized vehicle parking at landscapes or lawns.

ii. Disturbance to the birds or other fauna due to the disturbance from the occupants in these buildings.

4.5.2.2. Mitigation Measures

The recommended mitigation measures are:

i. Restrict the vehicular movements and parking at the designated places only.

ii. Development of the garden, landscape and green belt, which will leave positive impact on the ecological environment.

4.6 Impacts on Noise Environment

4.6.1. Pre Construction and Construction Phase

4.6.1.1. Anticipated Impacts

The construction activities, vehicular movement etc are likely to produce some impacts to the noise environment of the project site. The following are the anticipated noise impacts due to the proposed construction activities.

i. During the operation of machinery, generators and other construction activities.

ii. During the loading and unloading of construction equipments and materials.

iii. Due to vehicular movement for transportation of materials and person.

4.6.1.2. Mitigation Measures

These are short term impact and lasts for short duration only, nevertheless the following mitigation measures are recommended.

i. Providing adequate Personal Protection Equipments like ear plug, ear muffs and helmets.

ii. Erecting tall barricades to reduce the nuisance to people in surrounding areas.

iii. Regulate the transportation of construction materials to non-peak hours.

iv. Regulate the high noise generating construction activities only during the day time.

v. Regulate the construction activities in such a way that, high noise generating operations will operate in a staggered schedule so that cumulative impact will be distributed.

vi. The machinery should be selected in such a way that they are with modern technology and produce less noise

4.6.2. Operational Phase

4.6.2.1. Anticipated Impacts

The two potential noise impacts that are anticipated in operational phase are:

i. Due to the operation of Diesel Generators.

ii. Due to the increased vehicular traffic to the residential, commercial and school complexes.

4.6.2.2. Mitigation Measures

The operation of the generators is required only during the time of power failure, therefore, it can consider as minor impacts. Similarly, a comprehensive traffic plan is prepared and will be implemented during the operational phase, this include separate entry and exit to the complexes, dedicated persons to regulate the traffic, sufficient parking space etc. With these measures the traffic flow is expecting to be smooth.

i. Dedicated spaces, with acoustic enclosures should be provided to the generators with noise proof enclosures.

ii. CPCB guidelines for the noise standards and conditions of Consent to Operate, issued by the KSPCB should be followed.

iii. Traffic plan should be implemented.

4.7 Impacts on Socio-Economic Environment

4.7.1. Pre Construction and Construction Phase

4.7.1.1. Anticipated Impacts

As there is no land acquisition, resettlement or rehabilitation, no negative impacts are anticipating during the pre-construction or construction phases. On the other hand, this project is expected to require 400-600 workers, who will be mostly from the surrounding areas. This will have positive impact by the way of job creation and other supportive services.

The anticipated impacts during the construction phase are:

i. Conflict with the local people on use of resources like surface and ground water.

ii. Minor inconvenience to the local public due to the increased vehicular traffic.

iii. Positive impact by the way job creation for skilled and semi skilled labourers for construction works.

iv. Positive impact on the local economy by the way of providing supportive services like shops, transportation, construction materials etc.

4.7.1.2. Mitigation Measures

The suggested measures to mitigate the potential impact to the socio-economic environment are as follows:

i. Procuring the construction materials from local market only, as far as possible.

ii. Mobilizing the workers from surrounding places, as far as available.

iii. No groundwater or surface water will be extracted for construction works. Water supply will be arranged through tankers.

iv. No construction camps are setting during the construction phase, hence there will be minimal demand for the domestic and drinking water.

4.7.2. Operational Phase

4.7.2.1. Anticipated Impacts

No major impacts are anticipating on socio-economic environment during the operational phase. But this project is expected to generate employment for nearly 300-500 people in the residential apartment, offices and schools. This will leave a major positive impact to the local economy. The anticipated impacts are:

i. Conflict with the local people if the surface or ground water diverted for the use in project buildings.

ii. Positive impacts by the way of employment to the local people in the residents, office and other supporting services.

iii. Positive impacts on the local economy by the way of improving the infrastructure like schools, transportation facilities, shops etc.

4.7.2.2. Mitigation Measures

The suggested measures to mitigate the potential impact to the socio-economic environment are as follows:

i) There will be no diversion water from any of the surrounding sources. The primary source of water will be BWSSB and secondary source will be treated water from the STPs. If there is any shortage in water supply, tanker lorry service will be used.

4.8 Occupational Health and Safety

The safety and health of the workers, visitors and occupants are of at most importance and will take all necessary precautions to ensure it. The following are some of the measures proposed to follow during the construction and operational phase.

4.8.1. Construction Phase

The following are the measures implemented to ensure the safety of the workers, employees, visitors and the local public.

i. Warning signs, cautionary boards should be placed, at appropriate places and proper size to be noticed easily.

ii. Tall barricades should be erected around the project boundaries.

iii. Personal Protection Equipments should be provided to the workers, visitors and employees. These includes hard hats, goggles, safety shoes, face masks, ear plugs, ear muffs, hand gloves etc.

iv. Site safety measures like barricading around deep excavation, scaffold safety, electrical safety should be provided.

v. Water sprinkling should be done at frequent interval to reduce the dust problems.

vi. High noise generating machinery should be operated in a staggered manner in order reduce the noise impacts.

vii. Tool box talks to be conducted regularly.

4.8.2. Operational Phase

The major safety concern during the operational phase is during the operation of STP, Diesel Generators, traffic etc. The following are the precautions recommended for the operational phase.

i. Persons operating the diesel generators and the STP should be trained properly, especially about the electrical hazards and standard operating procedures.

ii. Traffic management plan should be in place and there should be trained person to regulate the traffic.

4.9 Waste Management Plans

All efforts will be taken to minimize the wastes and principle of "Reduce, Reuse, Recycle" will be strictly applied throughout the construction and operational phases. Awareness creation will be provided to the workers as well as the occupants.

4.9.1. Construction Waste

Construction wastes are part of any construction activities, but its volume can be reduced to greater extend by proper planning and good workmanship. The major types of construction wastes are excavated earth, bricks, gravel, unused and excess concrete mixes, boulders etc. It is expected during the construction of this project 10,000 m^3 of construction waste will be produced.

Further it is expected that the total volume of excavated earth will be 12,50,000m3. The entire quantity of the excavated earth will be utilized in the construction site itself. The utilization plan for the excavated earth is given as table 4.1 below.

Table 4.1 Management Plan for Excavated Earth Generated Within the Site

Excavation Management		Total Environment – In That Quiet Earth	
Sl. No	***Particulars***	***Quantity in m^3***	***In %***
1	**Total Excavated Earth**	**12,50,000**	**100%**
a.	Back Filling in foundation	2,62,500	21%
b.	For landscaping	1,87,500	15%
c.	For Roads and walkways	2,75,000	22%
d.	For site formation	5,25,000	42%

4.9.2. Waste Water

During the construction phase, the waste water mainly comes from the construction activities, toilets and other operations. Mobile STPs will be provided during the construction phase. The treated water from these STPs and waste water from construction activities will be used for dust suppression, concrete mixing, landscaping etc.

During the operational phase, the waste water is mainly from the domestic waste water from the buildings, vehicle cleaning area etc. The waste water from the buildings will be

diverted to the STP. The storm water and other surface runoff, will be diverted to the recharge pits. The treated water will be using for flushing, gardening, cooling etc.

Guidelines of the Water (Prevention and Control of Pollution) Rules, 1974 and its amendment rules until 2011 will be followed. The conditions of Consent to Establish and Consent to Operate by the Karnataka State Pollution Control Board will be strictly complied.

4.9.3. Solid Waste

Solid wastes are expected to generate during the construction and operational phases. The solid waste during the construction phase will be the excavated earth during the construction activities and will be used for levelling, back filling etc. During the operational phase waste are expected from the residential and commercial buildings.

It is expected that total organic waste produced will be 4.2 t/day and dry waste produced will be 3.7 t/day during the operational phase of the project. The dry sludge from the STP will be 111.76 m^3/day.

i. The excavated earth will be using at the construction site itself for leveling, backfilling etc.

ii. Other waste will be segregated and separate bins / containers will be provided.

iii. The organic waste will be sent to the organic waste convertor.

iv. The solid wastes, scraps and other waste will be disposed to the authorized vendors.

v. Hazardous waste and E- waste will be sent to authorized recyclers.

vi. Plastic waste will be handed over to authorized recyclers.

vii. Dried sludge from the STP will be used as manure.

viii. Landfill will not be allowed either at construction phase or operational phase.

Guidelines of Solid Waste Management Rules, 2016, Plastic Waste Management Rules 2016, Construction and Demolition Waste Management Rules 2016 and other applicable regulations will be followed. The conditions of Consent to Establish and Consent to Operate by the Karnataka State Pollution Control Board will be strictly complied.

4.9.4. Hazardous Waste

The hazardous waste expected during the construction time are the spillage of oils and lubricants, paints and varnishes, disposal of used oil, grease, lubricants etc. There should be designated storage spaces keeping these hazardous materials and they should be clearly labeled with cautionary signs. The used materials should be handed over only to vendors authorized by KSPCB or any other concerned authorities. In case of any spillage, concerned authorities should be informed immediately and their guidelines should be followed.

During the operational phase, the hazardous waste expected is from the diesel generator. Generators will be placed in designated places only and only authorized persons will operate them. Used oils and lubricants will be handover to authorized recyclers or vendors as per the guidelines in Consent to Operate or other guidelines of KSPCB.

Conditions and guidelines of Hazardous and Other Wastes (Management and Trans boundary Movement) Rules 2016, will be strictly followed.

4.9.5. E- Waste

Various types of electrical and electronic wastes are generated in the construction project, which includes computers, CDs, flash drives, etc., will be stored in earmarked designated areas, segregated and shall be transported to the authorized recyclers approved by the KSPCB. There shall also be provision for storage of these wastes in the building before transportation.

4.10 Summary of Impacts and Mitigation Measures

The summary of the above discussion on potential impacts and mitigation measures proposed are summarized in the Table No. 4.2 and Table 4.3 below.

Table 4. 2 Summary of Potential Impacts and Mitigation Measures for the proposed Project during the construction and pre-construction phase

Sl. No	Anticipated Impact	Mitigation Measures	Type of the Impact
A. Land Environment			
1	Loss of productive topsoil	Topsoil will be used for green belt development	Negative, Major, long term
2	Contamination from waste from the construction camp	Proper system for storing and segregation of waste, reuse of excavated earth in the project site itself. Hazardous waste will be labelled and handover for further treatment.	Negative, Medium, short term
3	Compaction of landscape, ground and other open areas due to movement of machinery and operation of machinery	Temporary roads will be provided. Parking restricts to designated areas only.	Negative, Medium, short term
4	Green belt development	Improving the scenery and visual effect of the project site, improving the micro climate, arresting the storm water out of the project site	Positive, Major, long term
B. Water Environment			
1	Extraction of water for construction purpose	No water should be extracted for construction purpose from nearby sources	Negative, Major, short term
2	Contamination of the water bodies by the surface runoff of waste water, oil, lubricants and indiscriminate dumping of solid waste	Storm water drains should be in place, solid and hazardous waste management plan should be implemented	Negative, Medium, short term
C. Air Environment			
1	Dust during the levelling of the ground, transportation of materials, various construction activities.	High barricades should be erected to control dust nuisance to outside the project boundary. Water should be sprinkled periodically. Proper PPEs should be provided.	Negative, Medium, short term
2	Smoke emission from the vehicles	The access roads and temporary roads should be in good condition and compacted. All vehicles should have Pollution Under Control certificate	Negative, Minor, short term
3	Fugitive emission from the Diesel Generators	Use only PCB approved generator sets and ensure proper	Negative, Minor,

Sl. No	Anticipated Impact	Mitigation Measures	Type of the Impact
		maintenance. Provide proper place with enclosures.	Short term
	D. Ecological Environment		
1	Clearing the vegetation on ground and loss of fauna	Limit the felling of trees to the minimum	Negative, Minor, Short term
2	Damage to the existing landscape by indiscriminate dumping of wastes, movement and parking of vehicles	Restrict the movement of vehicles through temporary roads and parking in designated areas only	Negative, Minor, Short term
3	Developing the green belt	Improving the greenery and landscape of the locality	Positive, major, long term
	E. Noise Environment		
1	Noise impacts during the operation of machinery, generators and other construction activities	Providing adequate Personal Protection Equipments like ear plug, ear muffs and helmets. Erecting tall barricades to reduce the nuisance to people in surrounding areas. Regulate the high noise generating construction activities only during the day time and in staggered manner.	Negative, Medium, Short term
2	Noise impact due to vehicular movement for transportation of materials and person	Regulate the transportation of construction materials to non-peak hours.	Negative, Minor, Short term
	F. Socio – Economic Environment		
1	Conflict with local people over the use of resources like water.	Water and other resources should not be extracted from the surrounding sources.	Negative, Major, Short term
2	Inconvenience to local people due to increased vehicular traffic.	Transportation of construction materials limited to non-peak hours only	Negative, minor, short term
3	Employment to local people in construction activities	Improving the living status of the local people	Positive, medium, short term
4	Improving local economy by the way of purchase of construction materials, hotel, shops and transportation	Improving the economy and living status of the local people	Positive, medium, short term

Table 4. 3 Summary of Potential Impacts and Mitigation Measures for the proposed Project during the Operational phase

Sl. No	Anticipated Impact	Mitigation Measures	Type of the Impact
	A. Land Environment		
1	Soil contamination by indiscriminate disposal of solid waste	Implement Solid waste Management plan	Negative, Medium, short term
2	Soil Contamination from accidental spillage of oil and lubricants	Implement Solid waste Management plan	Negative, Medium, short term
3	Soil Contamination from waste water from buildings	Proper plumbing system to divert the waste water to STPS	Negative, Medium, short term
	B. Water Environment		
1	Extraction of water from nearby sources for domestic or other purpose	No extraction allowed from any of the nearby sources	Negative, Major, short term
2	Contamination of water course and lakes by the storm water from the building	Implement storm water management plan. Ensure proper maintenance of the storm water drains	Negative, Medium, short term
	C. Air Environment		
1	Emission from vehicles	Implement traffic management plan. Ensure good condition of roads	Negative, Minor, short term
2	Emission from DGs	Provide special storage and proper enclosures, maintain stack height.	Negative, Minor, short term
	D. Ecological Environment		
1	Damage to landscape due to unauthorized parking or driving away from tacks	Implement traffic management plans	Negative, Medium, Short term
	E. Noise Environment		
1	Operation of DGs	Provide special space with acoustic enclosures	Negative, Minor, Short term
2	Increased vehicular movement	Implement Traffic Management Plan	Negative, Minor, Short term
	F. Socio – Economic Environment		

Sl. No	Anticipated Impact	Mitigation Measures	Type of the Impact
1	Conflict over use of water sources nearby	No extraction of water from nearby sources	Negative, Major, Short term
2	Improving local economy and providing jobs to local people		Positive, minor, short term

CHAPTER – 5

ANALYSIS OF ALTERNATIVES

Chapter 5: Analysis of Alternatives

5.1. Introduction

Consideration of alternative site, technologies, materials, in order to reduce the potential impact to the environment, optimize the resource requirement and to achieve energy saving are discussed in this chapter.

5.2 Alternatives Considered

5.2.1 Site Alternative

Alternative sites are not considered because of the following reason:

1. This is an expansion project, from existing residential project to mixed use development. Therefore, this site is having advantage that facilities like accessibility, connectivity already exist.
2. The project site is located at a location which have good connectivity to highway, railway station etc.
3. The project site is not having any major species of flora and fauna and only minimal number of tree cutting will be required as this is expansion project.
4. The proposed project expansion will not affect any natural drainage.

5.2.2 Building Materials

The following material will replace the conventional building material in order to ensure the project being environmental friendly, consuming minimum natural resources and reducing the environmental foot print.

1. Bricks and blocks made of 30% recycled contents.
2. Vitrified and terracotta tiles made of 7% recycled contents.
3. Cement made of 32% recycled content.
4. Concrete made of 14% recycled content.
5. Steel made of 15% recycled content.
6. Glass made of 30% recycled content.

Thus, the percentage of cost of material with recycled content v/s. overall material cost(for the project) is 35%. Details of eco-friendly construction materials chosen are given as **Annexure No. 11**.

5.2.3 Technology

Technology - The Proposed expansion comes with a host of technological features that have been introduced to truly enhance the quality of life of people who live in them. From the quality of finish to RCC work, to the state-of –the art home automation systems that make interaction with home seamless and a pleasurable experience, technology is helping to deliver advanced homes of high quality, long life and efficiency. Some of the technological initiatives adopted for this project are.

Finishes - Customize the selection of colours, textures and materials for floors, walls and work-tops. Once the flooring material is chosen, the software presents coordinated options for skirting, wall paints, veneers etc.

Cabinetry - The layouts and finishes of various furniture elements can be customized for that elusive blend of form and function. The finishes come in a range of themes which can be selected keeping in mind the desired look of the space. Options: Wardrobes, walk-in closets, dresser units, and Study units.

Plumbing - Proponent offer a range of sanitary and plumbing fittings for bathrooms, kitchen, and utility spaces; these are available in well coordinated sets that satisfy varied tastes, budgets and functional requirements.

Home Automation System - State-of-the-art home automation system makes the interaction with home a seamless and pleasurable experience. Options: Curtain controls, additional sub phones, bathroom phones, mood lighting, and extra cameras.

Electrical - Home owners can even customize the electrical layouts in each space for easy access and convenience. Options: Add or remove points for lights, outlets, phones, Internet and two-way controls.

Interiors - Proponent provides the opportunity to customize the interior layout of your home to adapt to your family's lifestyle and needs. Options: Number of rooms, room sizes, layouts, furniture layouts, positions of doors etc.

Landscaping - The Garden can be customized in myriad ways like Soft or hard landscaping, simple or elaborate detailing, bird-baths, lily ponds and exotic flora.

Considering the above, the technology involved includes most modern techniques and amenities.

CHAPTER – 6

ENVIRONMENTAL MONITORING PROGRAM

Chapter 6: Environmental Monitoring Programme

6.1. Introduction

Setting the baseline is an important step in Environmental Impact Assessment process. It helps to understand the environmental health of the project site with respect to different attributes and thereby, helps to assess where the proposed project affect the environment in negative manner. Baseline study also helps to identify the critical / endangered sectors of the environment and thus to incorporate corrective measures in the Environmental Management Plan.

Environmental Monitoring is the primary tool in setting the baseline environment. The attributes to be monitored are Air, Noise, Soil and Water. These attributes will be monitored at selected sites within the project impact zone. Later, during the operational phase this exercise will be repeated at regular interval at these same locations, thereby to know the impact due to the project development.

6.2. Environmental Monitoring Plan

The following Table 6.1 shows the monitoring plan and frequency of various environmental attributes.

Table 6.1 Environmental Monitoring Plan

Attribute	Attribute	Parameters	Frequency of monitoring
Air	Impact Zone	PM_{10}, $PM_{2.5}$, SO_2, NO_X	24 hourly samples twice a week 8 hourly for SO_2 & NO_X.
	Core Zone	PM_{10}, $PM_{2.5}$, SO_2, NO_X	8 hourly samples twice a week for entire season
Water	Both core zone and impact zone	Physical, Chemicals and Biological parameters. As per IS 10500	As per the Guidelines/ Norms.
Noise	Both core zone and impact zone	Noise levels in dB(A)	As per the guideline.
Soil	Both core zone and impact zone	Physical and chemical properties of soil	As per the guideline.

6.3. Air Sampling

The air samples will be analysed for ambient air quality with respect to PM_{10}, $PM_{2.5}$, SO_2 and NOx at 5 locations and frequency of monitoring shall be as per Terms of Reference (TOR) Guidelines and the results shall be compared with the CPCB norms (NAAQ).

6.3.1. Sampling Location

The following locations are identified for Air Sample Collection.

Table 6.2 Air Sampling Locations

Sample Code	Location
A1	Project Location 1
A2	Project Location 2
A3	Bidarahalli Village
A4	Bileshivale Village
A5	Rampura Village

6.3.2. Instrument

The Combined dust samplers APM-451 will be used for monitoring the ambient air pollutants like PM_{10}, $PM_{2.5}$, gaseous pollutants etc.

6.3.3. Methodology

The methods of testing the particulate matter (PM_{10} and $PM_{2.5}$) are given in Table 6.3 below:

Table 6.3. Method of Testing PM_{10} / $PM_{2.5}$

Name of Pollutant	PM_{10}/$PM_{2.5}$
Medium	Air
Instrument	Respirable Dust Sampler (RDS)
Duration	Every 8/24 hours
Mode	Continuous
Unit	µg/m^3
Method	Gravimetric

The method of testing SO_2 and NO_X is given in Table 6.4 below:

Table 6.4. Method of Testing SO_2 and NO_X

Name of Pollutants	Sulphur Dioxide	Oxides of Nitrogen
Method	Modified West & Geake Method	Modified Jacob & Hochheiser Modified (N µg/m^3a-Arsenite) Method.
Frequency	8/4 hours	
Mode	Continuous	
Unit	µg/m^3	
Procedure	As per IS 5182 (Part II)	As per IS 5182 (Part IV),1975

6.4. Water Sampling

The water samples will be all the physical, chemical and biological parameters as per the standards / norms. The sampling and analysis methods will be followed as per IS 10500:2012 standards.

6.4.1. Sampling Location

The following locations are identified for Water Samples Collection.

Table 6.5 Water Sampling Locations

Sample Code	Source	Location
GW1	Borewell Water	Project Location 1
GW2		Project Location 2
GW3	Borewell Water	Bidarahalli Village
GW4	Borewell Water	Bileshivale Village
GW5	Borewell Water	Rampura Village
SW - 1	Lake Water	Rampura Lake
SW - 2	Lake Water	Kalkere Lake

6.5. Noise Level Monitoring

The noise level monitoring will be carried within project site and in the impact zone to record the ambient noise level in the project area. The following locations are identified for the noise level monitoring.

Table 6.6 Noise Sampling Locations

Sample Code	Location
N1	Project Location 1
N2	Project Location 2
N3	Bidarahalli Village
N4	Bileshivale Village
N5	Rampura Village

6.6. Soil Sampling

The soil samples will be analysed for their physical and chemical properties. The locations identified for soil sampling given in following table 6.7.

Table 6.7 Noise Sampling Locations

Sample Code	Location
S1	Project Location 1
S2	Project Location 2
S3	Bidarahalli Village
S4	Bileshivale Village
S5	Rampura Village

The sampling locations are shown in the top sheet Figure 3.6 in chapter 3.

CHAPTER – 7

ADDITIONAL STUDIES

Chapter 7: Additional Studies

7.1. Introduction

This chapter discusses the additional studies conducted for this project.

7.2. Traffic Study

The summary of the traffic study is discussed in this section. The detailed report is attached as **Annexure 12.** The summary of the study is given below:

7.2.1. Major Objectives of the study:

Before Construction:

- Road Geometrics
- Road Connectivity
- Speed
- Traffic Volume V/C; and LoS

During Constructions

- Additional truck movement
- Requirement for operation
- Impact in V/C and LoS

After Construction:

- Parking requirement
- Traffic Flow Logistics
- Modified Scenario of V/C and LoS
- Traffic Management Measures

Major Findings of the study

- Existing surface condition is good
- Streetlights and drainage not available at present
- The highest peak observed is **839 PCU's/hr** during **8:00 am to 9:00 am.**
- The existing V/C scenario is 0.38, which is 'very good'.

7.3. Energy Conservation

7.3.1 Solar Energy

Solar energy is radiant light and heat from the sun, that is harnessed using a range of ever-evolving technologies such as solar heating, photovoltaic, solar thermal energy, solar architecture, molten salt power plants and artificial photosynthesis. The potential solar energy that could be used by humans differs because of the factors such as geography, time variation, cloud cover, and the land available etc. Solar panels convert the sun's light in to usable solar energy using N-type and P-type semiconductor material. This process of converting light (photons) to electricity (voltage) is called the photovoltaic (PV) effect. Currently solar panels convert most of the visible light spectrum and about half of the ultraviolet and infrared light spectrum to usable solar energy. Solar power in India is a fast developing industry. The country's solar installed capacity reached 25.21 GW as of 31st December 2018

In the proposed project, Solar energy will be utilized in the following manners:

- Part of street lighting is proposed on solar backed up with EB power
- Part of common area lighting is proposed on solar backed up with EB power
- Occupancy sensors are proposed for service rooms and photo sensors are proposed for external lighting
- Part of internal common area lighting system is proposed to have either high efficiency lamps (CFL/LED). This gives a LPD less than 3W/m2but still achieving the required 200 LUX for ambient lighting.

Design Considerations

The buildings plans are provided with considering daylight factors, to permit maximum daylight to interiors and thus to optimize the overall energy consumption. In designing the site layout, the following factors are considered.

- The design of the apartment tower and villa units are such that the Fenestration on East and West is self-shaded by the built units itself. The shadow analysis report for Equinox and Solstice is attached as **Annexure No.13.**
- Choosing the layout to minimize cable runs and associated electrical losses.

- Pergolas that will be covered with creepers – provided above the Fenestration at the courtyard- will provide shading at all times and by evapotranspiration further provide thermal comfort in a natural way.
- Choosing a tilt angle that optimizes the annual energy yield according to the latitude of the site and the annual distribution of solar resource.
- Orientating the modules to face a direction that yields the maximum annual revenue from power production. In the northern hemisphere, this will usually be true south.
- The Green roof at the terrace of each villa not only brings down the effective u-value of the roof of the building envelope but also provide for Solar reflectance and Emissivity.
- All of the above will not only reduce the cooling / heating loads but bring down the 'Heat Island Effect' drastically.

7.3.2 Radiation

The glass parts like wall, windows, screen will be selected in such a way that plain glass with shades shall be used. This will be achieved without compromising the safety and desired transparency level. It will result in controlling the temperature inside the building and energy saving. The detailed characteristics and specification of glass are given below Table 7.1. The ECBC compliance study report for residential and commercial buildings is attached as **Annexure 14 and 15** of this report.

Table.7.1: Structural Glazing Characteristics of the glass

GLASS TYPE-1:CLEAR TEMPERED GLASS OF 10/12 MM THICK	
Day light transmittance in %	**46**
Day light reflectance external in %	**32**
Solar energy transmittance in %	**49**
Solar energy reflectance in %	**26**
Solar energy U-V transmittance in %	**18**
Solar Heat gain Co-efficient	**5.7**
Shading co-efficient	**0.64**
Summer "U.S" value in watts/ Smt Kelvin	**1.04**
GLASS TYPE-2:REFLECTIVE HEAT STRENGTHEND GLASS OF 6MM THICK	
Day light transmittance in %	**47**

Day light reflectance external in %	**32**
Solar energy transmittance in %	**52**
Solar energy reflectance in %	**26**
Solar energy U-V transmittance in %	**20**
Solar Heat gain Co-efficient	**5.7**
Shading co-efficient	**0.67**
Summer "U.S" value in watts/ smt. Kelvin	**6**
GLASS TYPE-3: COOL LITE ST 450 LIGHT BLUE GREEN REFLECTIVE HEAT STRENGTHENED GLASS OF 6MM THICK	
Day light transmittance in %	**37**
Day light reflectance external in %	**15**
Solar energy transmittance in %	
Solar energy reflectance in %	**21**
Solar energy U-V transmittance in %	**2.8**
Solar Heat gain Co-efficient	**2.58**
Shading co-efficient	**0.35**
Summer "U.S" value in watts/ smt. Kelvin	**5**

While selecting the materials, the ECBC recommendations on Visible Light Transmittance (VLT) will be ensured. The Thermal resistance value (U) for common finishes are given in Table 7.2.

Table 7.2 Building Envelope and their U-values

Sl. No	Building Envelope Component	Building Envelope Material	U-Value (in W/M2.K)
1	External Walls	Porotherm block with 20mm plaster on inside and 25mm plaster on outside	1.06
		Composite Masonry with wire-cut brick on the outside and Porotherm block on the inside	0.99
2	Roof	Green Roof with native grass and shrubs	0.0588
3	Fenestration	Glass	5.7

This project design includes tapping solar energy to the maximum potential. The diagram showing solar panel installation is given as **Drawing No. 7a, 7b and 7c**. The amount of energy saving by solar panel installation is expected as 0.2% of the total power consumption of the project.

7.4. Carbon Foot Print

All the care has taken to reduce the carbon foot print due to construction of this project. This has reflected in material selection, procurement, design and other aspects. The estimated carbon foot print during construction is 81,30,11,053 kg and that during the operational phase is 2,45,99,180 kg/year. The details of carbon credit saving is given as **Annexure No. 16** to this report

7.5. Environmental Risk Management

Environmental Risk Assessment (ERA), is a process that evaluates the likelihood or probability that adverse effect may occur to environmental values, as a result of human activities and therefore, it is a formal procedure for identifying and estimating the risk of environmental damage. ERA is a support tool for policy evaluation, land use planning and resource management decision making. In a construction project, ERA identifies all aspects of construction that could have an environmental impact and assesses the potential risk and impact of the activities on the environment.

The ERA process involves, identifying the risks, ranking them and developing management plans. The identified risks are ranked according to their severity (Insignificant, Minor, Moderate, Major, Catastrophic), Frequency (Minimal, short term, Significant, major Short term, major long term) and likelihood (Unlikely, moderate, possible, likely always).

An Environmental Risk Assessment was carried out for this proposed project and is given below in Table 7.3.

Table 7.3. Environmental Risk Assessment

Impact	Risk	Source	Severity	Frequency	Likelihood
Impact of Natural Resources	Land and water Pollution	Construction Materials	Moderate	Major Short Term	Possible
	Energy Consumption	Construction Activities	Minor	Short Term	Likely
	Water Scarcity	Extraction of Water and other resources	Moderate	Short Term	Moderate
Environment	Noise Pollution	Operation of Machinery and DG	Moderate	Short Term	Unlikely

	Dust Generation	DG and vehicle movement	Moderate	Short Term	Likely
	Land Contamination	Overspill of oil and lubricants, waste disposal	Moderate	Minimal	Unlikely
	Air pollution	DG and vehicle	Moderate	Short Term	Moderate
	Water Pollution	Runoff of waste water, Dumping of Waste	Minor	Minimal	Unlikely
	Waste Generation	Improper Waste Management	Moderate	Major Short term	Moderate
Social Impact	Public Health	Improper Waste Management, Dust and smoke from construction site	Insignificant	Minimal	Unlikely
	Disturbance to public	Movement of construction vehicles	Minor	Minimal	Possible

7.6. Disaster Management Plan

Disaster is a sudden, calamitous event bringing great damage, loss, and destruction and devastation to life and property. The damage caused by disasters is immeasurable and varies with the geographical location, climate and the type of the earth surface/degree of vulnerability. This influences the mental, socio-economic, political and cultural state of the affected area. The types of disasters are described in the Fig.7.1 below

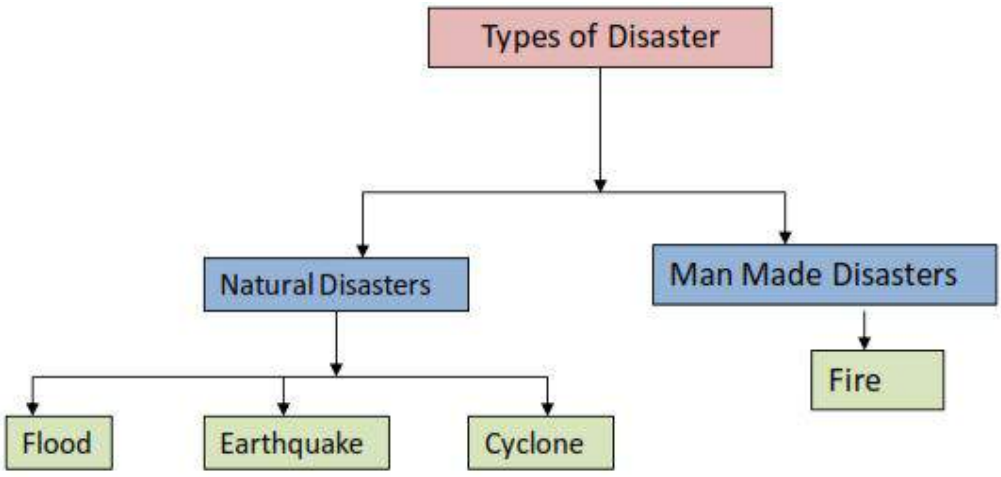


Figure 7.1 Classification of Disasters

7.6.1. Objectives of Disaster Management Plan

- Ensure the safety of all employees, residents and visitors at the site/facility during the time of disaster.
- Secure, residential buildings business sites and facilities.
- Safeguard and make available vital materials, supplies and equipment to ensure the safety and recovery of records from predictable disasters.
- Reduce the risk of disasters caused by human error, deliberate destruction, and building or equipment failures.
- Be better prepared to recover from a major natural catastrophe.
- Ensure the ability to continue operating after a disaster.
- Recover lost or damaged records or information after a disaster.

7.6.1.1. Preparation of Disaster Management Plan

The process of preparation of Disaster Management Plan (DMP) involves the following steps:

a) Hazard identification / assessment
b) Identifying resources available
c) Defining communication systems and individual responsibilities
d) Developing system for administration / implementation of the plan
e) Developing Emergency Response Procedure
f) Developing system for communication and execution of the procedures
g) Debriefing and post-traumatic stress procedure

a. Hazard Identification and Assessment

The process of hazard identification and assessment involves but not limited to, the following points:

- transportation, materials handling, hoisting, equipment or product installation, temporary structures, material storage, start-up, and commissioning activities

- environmental pollution
- potential hazards when working in or adjacent to operating facilities
- storage of hazardous materials
- proximity to traffic and public ways.

b. Resources Available

It is important to identify and list which resources are available and have contingency plans in place to make up for any deficiencies. The most common resources will be contact number of the health and safety officer, nearest medical facility, ambulance, fire and rescue team etc.

Answering the following questions also includes in the process of identifying resources:

Is a high-reach rescue team available?

What is the response time?

What must site personnel do in the meantime?

Other on-site resources such as fire extinguishers, spills containment equipment, and first aid kits must be maintained and clearly identified.

c. Defining communication systems and individual responsibilities

An important key to effective emergency response is a communications system that can relay accurate information quickly. To do this, reliable communications equipment must be used, procedures developed, and personnel trained. It is a good idea to have a backup system in place, in case the system is rendered useless by the emergency. It is equally important to know whom to contact and what are their roles and responsibilities. The emergency response plan posted in a conspicuous place on the project must identify the designated equipment and the people to operate it.

d. Administration and implementation of the Plan

The task of administering and organizing the plan is vital to its effectiveness. The person who has this task will normally be the person in charge of the emergency response operation. It is their task to ensure

- that everyone clearly understands their roles and responsibilities within the emergency response plan (a chart may be helpful in this regard)
- that emergency resources, whether people or equipment, are kept at adequate levels in step with the progress of the project.

It is very important to review the emergency plan on a regular basis and especially after an emergency has occurred. Changes may be necessary where deficiencies became apparent as the plan went into operation.

e. Emergency Response Procedure

An emergency can be reported from any source—a worker on site, an outside agency, or the public. Remember that circumstances may change during the course of an emergency. Any procedures you develop must be able to respond to the ongoing situation. The following list covers basic actions to take in an emergency. These steps apply to almost any emergency and should be followed in sequence.

- Stay calm.
- Assess the situation.
- Take command.
- Provide protection.
- Aid and manage.
- Maintain contacts.
- Guide emergency services.

f. Communication and execution of the procedures

To be effective, an Emergency Response Procedure / Disaster Management plan must be clearly communicated to all site personnel. Therefore, everyone working in the site, irrespective of their designation or roles should be provided with training of Disaster Management Procedures. Further, the Disaster Management Plan should be posted at

multiple locations, easily visible and printed in more than one language in which the staff and labourers are comfortable.

g. Debriefing and Post-Traumatic Stress Procedure

The recovery process, or what happens after the emergency response has been completed, is a critical step in the plan. Many emergency tasks may be handled by people who are not accustomed to dealing with emergencies. Some of the people involved may need assistance in order to recover. In some cases professional counseling may be needed.

Debriefing is necessary to review how well the plan worked in the emergency and to correct any deficiencies that were identified. Debriefing is critical to the success of future emergency response planning.

7.6.2. Standard Operating Procedures

A. Cyclones and Floods

- Community awareness and mass education programme would be arranged to manage the challenges during and after floods and cyclones.
- Employees and residents would be made aware to switch off electrical mains at emergency situation.
- Employees and residents would be educated about Do's and Don'ts during cyclone and floods.
- The proposed project will have the precautions to avoid the floods during rainy season eg: rainwater harvesting and recharge pits, storm water drains, green belt.
- Proper maintenance of storm water channel and sewer lines.
- The proposed building with all the measures to withstand high wind velocity.
- Nearby medical care details (phone no, address, route) will be made available to employees
- Awareness would be spread about the hazards of stored water. Communicable diseases like malaria, dengue, etc. could spread if water is stored for longer time.
- To avoid the leakages in building, there will be time to time check done by the maintenance staff.

B. Earthquake

- There will be provision of faster communications to residents and employee - Provide series of information on locating hazards
- Provide tips for earthquake drills.
- There will be proper maintenance team to assist concerned authority in repair and strengthening tips for exterior features, such as porches, front and back decks, sliding glass doors, canopies, carports, and garage doors.
- Would prepare a disaster emergency kit which would be maintained at office.
- The design team would follow seismic building standards and land use codes that regulate land use along fault lines, in areas of steep topography, and along shorelines.

C. Fire

- List of nearby fire stations and hospitals would be displayed at lobbies and office room.
- The road map of nearby fire stations would be displayed at lobbies, office room etc.
- Dedicated fire vehicle track incorporated in the design.
- All residents and employee would be given booklet for Do's and Don't for fire hazard.
- Would follow the appropriate building codes for construction of proposed building.
- Would follow appropriate norms for electrical wiring system to minimize the fire hazards.
- Evacuation plan would be shared with all the staff members, employees and the same would be displayed at each floor lobbies and office.
- Would be installing fire hoses/ fire extinguisher and first aid kit box.
- Sprinkler systems, fire and smoke alarm would be installed by developer. Locations for the same would be chalked out after completion of project. They would be regularly monitored for their efficient functioning.
- An underground water storage tank of would be provided for firefighting measures.
- Electric supply to these pumps would be on independent circuit.
- Walls enclosing lift shaft would have fire resistant capacity.
- The building would be provided with manual fire alarm system with main control panel at ground and pill boxes and hooters at each floor level. The layout of fire alarm would be in accordance to relevant I.S. Specification.

7.7. Natural Resource Conservation

The construction projects utilizes large amount natural resources both directly and indirectly. This starts from the site selection, design of the layouts, orientation of the buildings, finalization of the building materials and their procurement, the labour camps etc upto finishing the buildings.

This proposed project is envisaged and designed with sustainability as a prime concern and it reflects in the design of the structures, choice of building materials, market identification etc.

The raw materials for construction are chosen in such a way that, emphasis is given for the materials made out of recycled products and thereby attained 37% saving in raw materials. The list of the raw materials and procurement plan are given as **Annexure No. 17.** Most of these materials will be procured within 25-100 km distance and only 10% materials is procuring from outside the state.

Further conservation of materials and resources will be achieved through the following:

- Reduction in generation of Waste
- Reuse of waste
- Use of Rapidly Renewable Material for construction

Table 7.4 Reduce, Reuse and Recycling Plan

No.	Title	Aim	Compliance
1	**REDUCE**		
1.1	Storage & Collection of Recyclables	• Segregation & dedicated space for recycling (Post occupancy) • Facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills	Dedicated place for Recycling, Segregation Quantification Identification sources for recycling, Awareness programs for building occupants
1.2	Reducing construction waste	Reducing at least 10% of the construction waste through better construction management	Shall be Complied
2	**REUSE**		

2.1	Resource Reuse	Reuse building materials and products in order to reduce demand for virgin materials and to reduce waste, thereby reducing impacts associated with the extraction and processing of virgin resources	Recycled steel and construction materials shall be used.
2.2	Reusing Construction Waste	Utilize the construction waste	The construction waste will be utilized in the project site itself as back filling, leveling, construction of roads and pathways
2.3		Redirect reusable materials to appropriate sites	Plaster avoided Unless functionally where it is required like wet area to some extent within allowable limit according to specifications
3	**RE CYCLING**		
3.1	Using recycled material	Increase utilization of building products that incorporate recycled content materials, therefore reducing impacts resulting from extraction and processing of new virgin materials	Recycled material will be used in the form of reinforcement, cement, metal and aluminium.
3.2	Post consumer recycled content	Collection of recyclable materials separately, in turn reducing the consumption of virgin natural resources	Shall be complied with
4	**USING REGIONAL MATERIALS**		
4.1	Using regional material	Increase utilization of materials that are extracted and manufactured within the region, thus supporting the regional economy and reducing the environmental impacts resulting from transportation.	Material used in the building construction will be chosen on the basis of its manufacturing place. Most of the materials will be procured within 100 km and maximum procurement distance is 350 km
5	**RAPIDLY RENEWABLE MATERIAL**		
5.1	Rapidly Renewable Material	Reduce the use and depletion of finite raw materials and long-cycle renewable materials by	The usage of wood shall be minimal in the project.

		replacing them with rapidly renewable material like Bamboo products, MDF (eucalyptus, cotton, straw), Composite wood	

Table: 7.5: Natural Resource Conservation Measures

Sl. No.	Natural Resource	Plan of Action for Natural Resource Conservation
1	Water	2012 KLD of Water will be conserved using recycling of waste water by adopting Sewage treatment plant. The recycled water will be reused for flushing, gardening and other miscellaneous purposes.
2	Energy/Power	Solar roof top system has been proposed to generate solar energy from the available terrace space and will be stored and used for the 10% of common are lightings; the measure is towards achieving self sustaining energy concept. • Approximately 20% of total energy will be conserved using various energy saving concepts such as using solar energy, HF ballast, copper wound transformers, using LED lighting fixtures, etc. • Energy efficient electrical appliances will be used to reduce the power consumption. • All lifts are proposed with VVFD drive which results in 30% saving in consumption. • Energy Efficiency class 1 or 2 motors for common utility services. • Low loss star rated copper winding transformers as per ECBC. • Properly sized power cables to voltage drop upto 5% • Energy efficient 3/5 star rated AC mechanical system are proposed. • All common area lights (parking, staircase & lift lobby) are provided with LED lights, which results in substantial savings in power consumption. • Environment friendly R410A refrigerant gas used for air conditioning system, • chillers not proposed for this project The **Annexure No. 18** gives the energy saving achieved through various means.
3	Soil	Excavated top soil will be stored separately within the

		project site and will be used for landscaping purposes. Demolition debris will be used for land filling and road construction.
4	Solid waste	The organic waste resource generated from the proposed project will be converted to manure and used within the project at landscaped areas.
5	Tress/Vegetation	The existing trees will be retained to maximum extent possible and those are healthy will be transplanted.
6	Timber	Planned to use maximum extent of non timber doors and frames in the building to reduce the usage of timber products and conserve natural resources.
7	Temperature Control	• The design is such that, Fenestration on East and West is self shaded by the built unit itself. • Pergolas that will be covered with creepers – provided above fenestration at the courtyard – will provide shading at all times and by evaporation further provide thermal comfort in a natural way. • The green roof at the terrace of each villa not only brings down U- value of the roof of the building envelope but also provide Solar Reflectance and Emissivity.

7.8. R & R plan

Rehabilitation and Resettlement (R&R) plan is not required for this proposed project as it is an expansion project and there is no displacement of any population and also there is no person / property affected by the proposed expansion plan.

CHAPTER – 8

PROJECT BENEFITS

Chapter 8: Project Benefits

8.1 Introduction

This chapter includes benefits accruing to the locality, neighborhood, region and nation as a whole. It brings out details of benefits by way of:

8.2 Project Benefits

- The proposed expansion project by M/s. Total Environment Constructions Pvt Ltd will open a scope for residential areas attached to large commercial offices and schools with modern facilities, which will be unique in the locality.
- Bangalore, popularly known as Silicon Valley of India is already having presence of major world brands in all sectors and most of them are on expansion plan. This is in addition to upcoming new brands and corporate companies. The present infrastructure of the city will not be adequate to house all these emerging demands, hence more infrastructure development with modern amenities and luxury is essential for the growth of the city.
- This project consists of Residential, Commercial Offices, and Schools along with other amenities and infrastructure facilities, which will have a positive impact on the nearby locality by the way growth of associated business like transportation, housing, recreation, education etc.
- The project will shift the focus to North Bangalore as the new Commercial Offices construction destination, which will lead further development of the Northern Bangalore.
- The project is located on the Peripheral Ring Road (PRR) and provides seamless connectivity to major IT hubs and residential areas including Electronic City, Sarjapur, Varthur, Whitefield, Hosakote and Kempegowda International Airport.
- This will also help to reduce the traffic congestion in the city as it is mixed use development consisting of residential building, commercial offices and schools. The occupants will feel relieved from the daily hectic traffic as home, office and school are within one campus.
- Employment during the construction as well as during the operational phase is the biggest positive side of the project. The project will provide positive impact on the economic development of the region in terms of employment opportunities.

8.2.1 Benefits during Construction Phase

The major benefit due to the proposed project activities will be in the field of generating temporary employment for the nearby locality of the region. The local people will be given priority during the construction activities as laborers. Thus the proposed activities will generate and direct and indirect employment opportunities in the study area.

8.2.2 Benefits during Operational Phase

The significant positive impact on employment and occupation is envisaged on account of

- Better Economic status of the community due to better earnings
- Around 500 Nos. of Permanent Employees will required, when the Proposed Project comes to operational phase like maintenance staff, , drivers etc...
- Higher input towards infrastructural facilities due to the proposed construction activities of the establishment, plant activities and colony
- Community infrastructure and services will be improved under Corporate Environmental Responsibility (CER).

CHAPTER – 9

ENVIRONMENTAL MANAGEMENT PLAN

Chapter 9: Environmental Management Plan

9.1 Introduction

Much of the environmental degradation that happens during the construction stage of a building project can be controlled or mitigated, if there is an appropriate system in place. Hence, the Environmental Management Plan (EMP) has been specifically designed to capture all the impacts that take place during the entire life cycle of a project from design to operation stage. Accordingly, a thorough analysis was carried out to understand the impacts upon various environmental parameters such as land, water, air, noise, flora and fauna. Also socio-economic impact upon people and solid waste generation was also considered as separate impacts. The methodology is described in Figure 9.1 below.

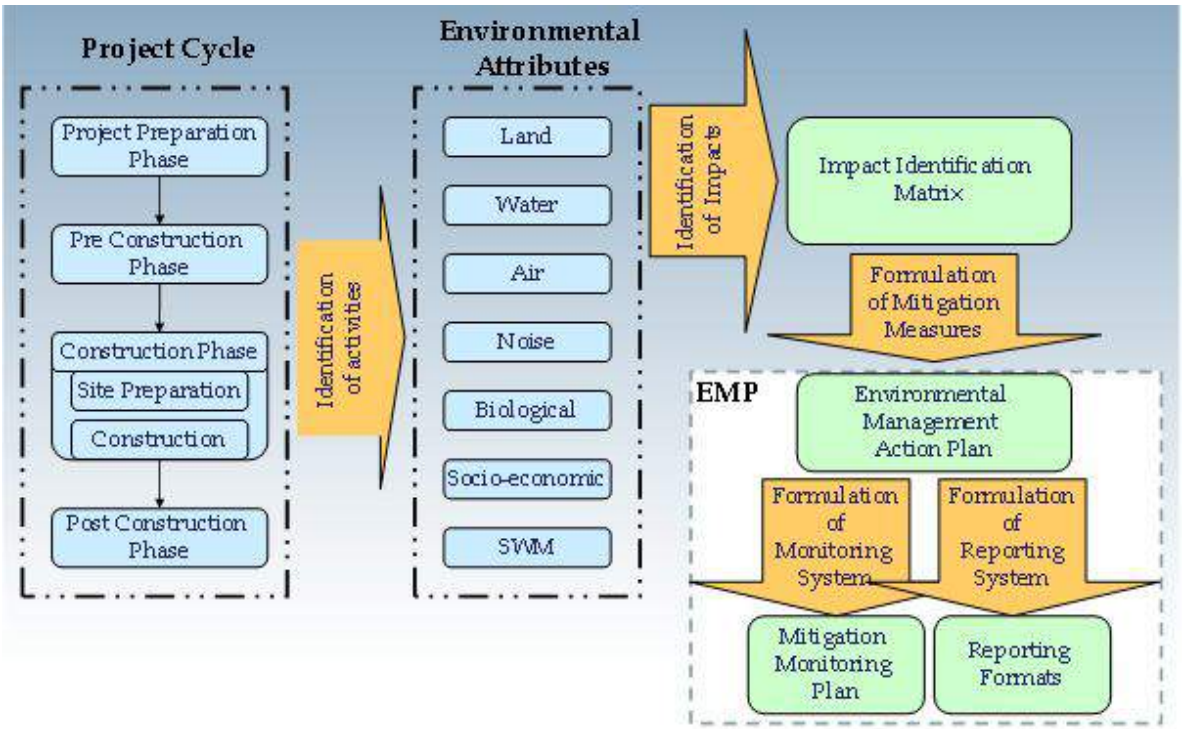


Figure 9.1: Environmental Impact Assessment Process

Based on this exercise, an EMP has been prepared suggesting various mitigation measures to avoid or minimize the impacts of the project on the environment during the pre-construction, construction and operation phases.

The potential environmental impacts and proposed mitigation measures have discussed in chapter 4.The primary objective of this proposed Environmental Management Plan (EMP) is to control environmental impacts to levels within acceptable limits and to minimize possible impact on the community and the workforce of foreseeable risks during the construction and subsequent operation phases of the project.

The EMP mainly consists of integrating potential impacts, environmental mitigation measures, implementation schedule and monitoring plans. The suggested management plan when implemented with good management practices, will not only yield desirable conditions but will also lead to enhancement of positive impacts from the project.

9.2 Pre -Construction Phase

The mitigation measures to be during the pre-construction (design stage) are the follows:

- The project should not affect any environmental sensitive features (forest, mangrove, water bodies) or social sensitive features (worship places or settlements).
- There should be plan for storm water drain, rainwater harvesting, waste management, top soil conservation and occupational health and safety.
- Design should be such that, natural topography should not be altered as far as possible and natural water courses should not be affected in any way.
- Slope stabilization and erosion control measures like compaction of earth, pitching, turfing, and landscaping with adequate drainage system such as slope drains and storm water drains are included in the engineering design.
- Green Belt development should be part of the design

9.3 Construction Phase

9.3.1. Mitigation measures for impacts on Land and soil

- The top soil removed for construction purpose should be re-used for landscaping / green belt development.
- Green belt should be developed along the project boundary
- Excavated earth should be used in the project site itself for back filling, landscaping and land leveling.

- Soil quality monitoring should be conducted as per the environmental monitoring plan.

9.3.2. Mitigation Measures for impacts on Water

- Waters should be from tanker lorries / BWSSB only. Water should not be extracted from nearby lakes, water course or ground water.
- Concrete flooring with catch drain should be constructed and vehicle washing and fuel handling should be at designated places only.
- Proper maintenance of vehicles and machineries should be carried out to minimize the spillage of oil. Provision should be made for storage of used oil.
- Wastes should not be dumped in lakes or water course.
- Water Quality Monitoring should be conducted periodically as per the Environmental Monitoring Plan

9.3.3. Mitigation Measures for impacts on Air and Noise

- Arrangements should be made for regular sprinkling of water for dust suppression in construction camp, stone crushing units, access roads and borrow areas to control the air pollution due to dust.
- All dust producing units should be housed in a building with suitable wall, roofing and flooring. Dust extraction units with a collection system should be provided in the crusher unit and all transfer points.
- Stack height and emission level of diesel generator in construction camp and crusher should meet the SPCB guidelines to reduce air pollution.
- Water should be sprinkled to suppress dust during any dust generating activity.
- Machinery and vehicles should be well-maintained to keep their noise to a minimum.
- Noise level of machinery used for construction activities should meet the noise standards set by Central Pollution Control Board
- Emission levels of all vehicles, plants and machineries should be well within the prescribed limits. All the vehicles should have Pollution Under Control certificate. PUC certificates of all vehicles and machineries should be renewed at required intervals.
- Mixing equipment should be well sealed, and be equipped with a dust-removal device.

- Dust covers/ tarpaulins should be provided to cover construction material loaded on trucks.
- High barricades should be erected to reduce to the dust and noise nuisance to the public.
- Idling of delivery trucks or other equipment shall not be permitted during periods of unloading or when they are not active.
- Ensuring proper cleaning and maintenance of DGs, Vehicles and other machinery.
- Air and Noise Quality Monitoring should be conducted as per the Environmental Monitoring Plan.

9.3.4. Mitigation Measures for impacts on Ecology

- Limit the felling of trees to the minimum required.
- Restrict the transport through the roads and parking at the identified locations only.
- Development of the garden, landscape and green belt, which will leave positive impact on the ecological environment.

9.3.5. Mitigation Measures for Socio Economic Impacts

- Compliance to the statutory regulations like Dock Workers (Safety, Health and Welfare) Act 1986.
- Construction materials and other purchase to the labour camps should be made from the local shops
- Labourers / Workers should be hired from local places if available in required number and with skill.

9.3.6. Occupational Health and Safety

- The building and other construction workers (Regulation of Employment and condition of service) Act 1996 and other applicable regulations should be complied.
- Safe drinking water and sanitation facilities comprising toilets, sewage collection system and mobile STPs should be made available to the construction workers in all sites.
- Personal protective equipment such as ear plugs, helmets, goggles, gloves etc. should be made available to the workers in construction camp, quarry areas, stone crusher unit and borrow areas.
- Firefighting equipment like fire extinguishers shall be provided in the camp as per fire safety standards.

- Vehicles used for construction activities should be maintained well, so as to ensure that the noise levels continues to be within the noise standards set by Central Pollution Control Board (maximum 80 dB(A)).
- Workers shall not be exposed to sound of more than 85 dB for more than eight hours a day and shall be provided with ear plugs.
- Warning signs, cautionary boards should be placed, at appropriate places and proper size to be noticed easily.
- Tall barricades should be erected around the project boundaries.
- Personal Protection Equipments should be provided to the workers, visitors and employees. These includes hard hats, goggles, safety shoes, face masks, ear plugs, ear muffs, hand gloves etc.
- Site safety measures like barricading around deep excavation, scaffold safety, electrical safety should be provided.
- Water sprinkling should be done at frequent interval to reduce the dust problems.
- High noise generating machinery should be operated in a staggered manner in order reduce the noise impacts.
- Tool box talks to be conducted regularly.

9.4 Operational Phase

- Solid Waste Management Plan should be implemented to ensure segregation of solid waste into organic, inorganic, plastic, hazardous and e-waste. Organic waste should be send to the Organic Waste Convertor and other waste to respective authorized recyclers.
- Waste water should be send to STP for treatment and only treated water should be used for gardening, cooling and flushing. Dual plumbing system should be installed for this purpose
- DGs should be operated as per the manufacturer's instructions only. Sufficient stack height should be maintained and should be placed in separate place with acoustic enclosures.
- Greenbelt should be maintained properly.
- Storm Water Management Plan should be developed and implemented.
- Rain Water Harvesting Plan should be developed and implemented
- Traffic Management Plan should be developed and implemented.

- Periodic monitoring of air, water, soil and noise quality should be continued.

9.5 Waste Management

- Comprehensive waste management plan to be prepared
- There should be provision of adequate space for segregated waste collection and waste handling.
- There should be provision of separate waste bins for bio-degradable, non-degradable and domestic hazardous waste in the camps / sites.

9.5.1. Waste Water

The waste water from different buildings and complex will be diverted to the respective STPs and will be treated. The capacity of individual STPs are given in section 4.3. The total capacity of all STPs together is 2235 KLD and they will produce 2012 KLD of treated water. From the treated water 792 KLD will be used for flushing and 1220 KLD will be used for gardening / irrigation. The individual water balance chart is given as Figure 2.3a to 2.3j, and the comprehensive water balance chart is given below as Fig 2.3k.

Storm Water Management

The terrain of the project site is more or less flat with mild slope from North West to South East . The highest elevation point is 888 m ASL and lowest elevation point 876 m ASL. The total storm water runoff is expected as 1358.54 m^3/day.

Table 9.1 Estimation of Storm Water Volume

Sl. no.	Area	Post development Runoff coefficient	Storm Catchment (Area in sq m)	Impervious (Area in sq m)	Average Intensity of rainfall (m/ day)	Discharge (Q)cum/day
1	Terrace	0.9	22,541	20286.90	0.014	284.017
2	Roads	0.8	26,588	21270.40	0.014	297.786
3	Podium Landscape	0.35	40,917	14320.95	0.014	200.493
4	Landscape area	0.25	164,640	41160.00	0.014	576.240
		Total area	254686	97038.25		1358.536

Storm water disposal system – From Terrace Area: Rainwater vertical pipes from the terrace areas are taken into the shafts provided for the purpose. These rainwater pipes are

then dropped down to the ground level to connect the catch basins and Hume pipe network. The final collected storm water from terrace area will be collected in rain water sump. The rain water is proposed to be treated by providing filtration unit and then reused for the domestic flushing purposes.

Storm water disposal system –From the Podium Area: From the podium area the storm water is effectively drained out by providing a number of rain water pipes provided with grating on top. These rain water pipes are in turn connected to the rain water pipes of higher diameters which are ceiling suspended at the ground floor. These pipes are run in slope and supported by brackets till they reach the peripheral storm water drain provided along the periphery of the building.

Storm water disposal system – From ramp Area: The water from the ramp areas is made to collect in the cattle drains provided with CI/MS/ Plastic Grating on top. The water then reaches the storm water collection sumps from where it is pumped to the external storm water drain.

9.5.2. Solid Waste Management

Comprehensive Solid Waste Management Plan will be developed and implemented. Designated areas and bins will be provided for different categories of waste. Under any situation, wastes will not be send for landfill. The total waste generation during the operation phase is estimated in Table 9.2 below.

Table 9.2 Total solid waste estimation

Sl. No	Type of Waste	Quantity	unit
1	Organic waste	4.2	tonnes/day
2	Dry Waste	3.7	tonnes/day
3	Sludge	111.76	m^3/day
4	Construction Waste	12,60,000	m^3

Organic Waste

Organic waste will be collected and send to Organic Waste Convertor and to produce compost for the landscaping.

Inorganic Waste

All other types of inorganic wastes will be collected separately and handed over to recyclers.

Plastic Waste

Plastic wastes will be collected and stored separately and will send to recycling, incineration as per the provisions of Plastic Waste Management Rules, 2016.

Hazardous Waste

Hazardous wastes like oil, lubricants, etc will be collected in special containers and stored in isolated areas and will be handed over to authorized vendors as per the provisions of Hazardous and Other wastes (Management and Trans boundary Movement) Rules 2016.

E- Waste

E- waste will be collected separately and will send for recycling as per the provisions of E-Waste Management rules 2016.

Excavated Earth

The construction waste including the excavated earth will be utilized in the construction site itself for back filling, leveling, roads and pavements and landscaping.

Greenbelt Development plan

The organic waste resource generated fom the prposed project will be converted to manure and used within the project at landscaped areas. The project proponent has allotted 164640 Sqm. i.e. 35.56 % of the total plot area for Greenbelt development.

CHAPTER – 10

SUMMARY & CONCLUSIONS

Chapter 10: Summary and Conclusions

10.1 Project Details

This project, called "In That Quiet Earth" by M/s. Total Environment Constructions Pvt Ltd, proposes expansion of existing residential project to mixed use development project consisting of Residential buildings, Commercial Complexes, School, Club House and Auditorium. The project is situated at survey nos. 41p, 40/1, 40/2, 39/3, 39/2, 36, 38/1, 38/2, 38/3, 38/4, 38/5, 37, 32/15, 32/16, 32/17, 32/18, 31/22, 31/23, 31/24, 31/25, 30/9, 30/10, 30/11, 30/13, 30/14, 30/15, 61/1, 61/2, 61/3, 61/6, 61/7, 60/1, 60/2, 60/3, 63/2, 63/3, 63/4, 63/5, 63/6, 64/1, 64/3, 64/4, 64/5, 62, 61/5, 61/4, 64/2, 64/6, 64/7, 64/8, 64/5, 64/9, 65, 70, 72, 69/2, 74/3, 68, 69/1, 76/1, 86/2, 54/3, 54/2, 54/1, 54/7, 54/8, 54/4, 54/6, 76/1, 54/3, 54/9, 54/10, 54/11, 55, 59/4, 59/3, 59/2, 56, 59/1, 59/5, 58,57, 56, 66/1, 66/2, 66/3, 67 of Bileshivale Village, Bidarahalli Hobli, Bengaluru East Taluk.

The existing project is spread over a plot area of 59642.6 m^2 (14.738 acres) and having a total built up area of 1,44,822 m^2 and the expanded project will have a total plot area of 2,55,495.55 m^2 (63.13 acres) and total built up area of 7,97,126.18 m^2.

As per the schedule attached to Environmental Impact Assessment Notification, 2006, this project comes under item 8(a) Township and Area Development and Category B1

The Hon'ble SEIAA, Karnataka after the presentation of Proposed TORs issued the Terms of Reference and Additional ToR for the preparation of EIA report on 21.01.2019 (SEIAA 151 CON 2018). Based on the approved TORs the present EIA report has been prepared by carrying out Baseline Environmental Monitoring during December 2018-February 2017, excluding monsoon season.

10.2 Salient Features of the Project

10.2.1. Building plan

The proposed plan consists of eleven residential blocks, Commercial blocks, school and club house. The building plan is given as Table 10.1 below. Total car parking area for the project is 5620.

Table 10.1 Building plan

Sl. No	Building	Plan
1	Residential 1,11	2B + G + 36 UF
2	Residential 2	3B + G + 32 UF
3	Residential 3,4	2B + G + 29 UF
4	Residential 5,6,8,9,10	G + B
5	Residential 7	3B + G + 23 UF
6	Commercial Block	G + 23 UF
7	School	G + 3 UF
8	Club House	G + 1 UF

10.2.2. Water Management

The total water requirement for the project will be 18 KLD during the construction phase and 2193 KLD during the operational , the building wise details are given in Table 2.3 in Chapter 2. The primary source of water will be BWSSB and secondary source will be tanker supply during the operational phase. Total ten STPs are proposed in this project to treat 2235 KLD of treated water from all the buildings.

10.2.3. Power Requirement

The power requirement during the operational phase is 20650 KVA will be availed from BESCOM. (The commercial buildings required 5175 KVA, residential buildings 14925 KVA and school and auditorium 550 KVA.). Total 31 Diesel generators having total capacity of 18790kVA (750kVA on Standby). (School 2x 380 KVA , Residential 11x750 KVA+ 3x500 KVA + 6x380 KVA, Commercial (8+1)x750 KVA)

10.2.4. Waste Management

Total solid waste generation during the operational stage is expected to 7.93 t/day. Organic waste will be sent to organic waste convertor. Hazardous wastes will be handed over to authorized vendors. Plastic waste will be send for recycling though approved dealers.

10.3 Baseline Environment

The baseline environmental status were studies selecting an Project Impact zone of 10 km radius. The baseline monitoring was conducted during the winter 2018-19 (December 2018, January 2019 and February 2019) months. The results are discussed below.

10.3.1. Summary of Environmental Monitoring Analysis

Air Environment

The air samples were analysed for parameters like PM_{10}, $PM_{2.5}$, SO_2 and NO_2 and compared against the National Ambient Air Quality Standards. All the values are found to be within the permissible limits.

Water Environment

The water sample results show that the water in the region is hard water and there is presence of calcium and magnesium above the acceptable limit. But all the parameters are within the permissible limit. The water is lightly alkaline character. Dissolved solid content is also above the acceptable limits for few samples

Soil Environment

The soils are found to be slightly alakaline in nature. They have very little organic matter and moisture content. The soil type is Silt loam.

Noise Environment

The noise level is found to be slightly higher than the permissible limit. This is due to the vehicular traffic in the road adjacent to the monitoring point.

10.4 Energy Conservation Plans

10.4.1. Recycled Product

Most of the construction materials are selected in such a way that they are produced from the recycled products and thereby achieved 35 % of cost of material with recycled content v/s. overall material cost(for the project). The procurement also done from the local / nearby sources / market to reduce the energy and resource requirement. Details are given materials procuring from local market and the distances are given in **Annexure No. 17** and the details of the recycled product using in the construction are given as **Annexure No. 18.**

10.5 Additional studies

10.5.1. Traffic Study

The results of traffic study shows the present geometry is very good and the road is capable of take the present vehicle population and projected population.

10.5.2. Carbon Footprint Study

The estimated carbon foot print during construction is 81,30,11,053 kg and that during the operational phase is 24,599,180 kg/year. The details of carbon credit saving is given as **Annexure No. 16** to this report

10.6 Environmental Management Plan

This project is unlikely to produce any major impact to the environment. The anticipated impacts are general impacts associated with any construction activities, and can be mitigated with standard mitigation measures. An Environmental Management Plan was developed for this project for mitigating those impacts and improving the environment. This plan is discussed in detail in chapter 9. A summary of that is given here.

Land Environment

The anticipated impacts to land environment during the construction period is due to the loss of productive topsoil for the construction, indiscriminate disposal of waste materials, and accidental spillage of oil and lubricants.

During the operational no major impact on land environment is anticipated except in mishandling of solid waste or unauthorized parking of vehicles.

The topsoil should be conserved and used for green belt development. Wastes should be segregated and disposed appropriately as prescribed in the waste management plan. Traffic Management plan should be implemented.

Water Environment

The Rampura and Kalkere lakes and the water course linking them are very close to the project site. Two nallah are passing through the project site. Therefore, care should be taken not to pollute the water bodies in any manner. The anticipated impacts to the water environment are due to extraction water for construction or domestic purpose, dumping

the wastes in the water bodies, contamination by the storm water runoff and spillage of oil and lubricants.

The major impact during the operation phase will be from poor maintenance of the sewer line / waste water pipes.

Water should not be extracted from the nearby water sources. Storm water drains should be provided to drain the storm water and not to let it drain to the water bodies. Wastes should be disposed off as per the waste management plan only. All the pipe networks should be maintained properly.

Air Environment

During the construction time the construction activities like digging, excavation, concrete etc likely to produce impact on the air environment. The movement of vehicles, operation of DGs and machinery can cause fugitive emission and smoke.

During the operation phase the impacts on air environment will be due to the vehicular traffic and operation of DGs.

Frequent sprinkling is recommended for dust suppression, the trucks should be covered at top while transporting construction materials. Low pollution level machinery should be selected. Stack height should be maintained as per CPCB norms. High barricades should be erected to control the dust nuisance to outside the project boundary.

DGs will be operational only during the power failures and they will be placed in separate isolated places. Traffic Management plan should be implemented to smooth traffic flow.

Noise Environment

The construction machinery, movement of vehicles and operation of DGs are the main sources of noise pollution during the construction period.

High noise machinery should be operated in staged manner. Acoustic enclosures should be provided for the DGs.

During the operational phase the impact on noise environment will be mainly from the increased traffic which can be mitigated by proper traffic management.

Socio-Economic Environment

There is no major impact expected to the socio economic environment during the construction and operational phases. Minor impacts are the inconvenience due to the increased frequency of vehicles at construction and operational phases.

But this project will give employment to the local people at construction and operational phases. Also the local economy will benefit from associated services like taxi, shops, infrastructure development. These are positive impacts due to this project.

Occupational Health and Safety

All standard health and safety precautions should be taken during construction and operational phases. The workers should be provided with adequate and appropriate Personal Protection Equipment at work place. These include, safety shoes, hard hats, ear muffs, goggles, aprons etc. Additionally other precautionary measures like scaffolding, safety belt, shoring and shielding should be provided.

10.7 Conclusion

Based on the discussions in the previous chapters, and from the result of various study it is found that this project is unlikely to produce any major impacts to environment. Those impacts that are anticipated are associated with any construction activity and can be mitigated by standard engineering practices. Environmental Management plan with mitigation measures are part of this report.

This project will bring many positive impacts to the environment by the way of ground water recharge, employment to local population, improving local economy etc. Also, this project has incorporated various energy / resource saving measures like identifying construction materials made up of recycled products, procuring materials from local market, waste water treatment, solar energy panels, organic waste convertor etc.

Therefore, it is concluded that there is only very minimal negative impact due to this project and that can be mitigated with recommended environmental management plan. And this project is going to leave positive impact on the environment on long run.

CHAPTER – 11

DETAILS OF CONSULTANTS

Chapter 11: Details of Consultants

Disclosure of Consultants Engaged

Name of Consultant: **METAMORPHOSIS[SM], Project Consultants Pvt. Ltd. BENGALURU.** ***"Accredited EIA Consultant Organization" from Quality Council of India (QCI)/National Accreditation Board for Education & Training (NABET).***

The details of the EIA Co-coordinators and Functional Area Experts involved in the project are given in **Table 11.1.**

EIA Coordinator

Name: Mrs Sreelekha K.S

Baseline Data Collection: Pre-monsoon 2017

Contact Information: "PRAKRUTI BHAVAN"
#200, 1st & 2nd Floor, 1st Cross, 40th Main,
Behind Central Silk Board, BTM Layout II Stage,
Bengaluru-560 068, Karnataka, INDIA.

Signature & Date: **Date: --------**

Table 11.1: Details of Functional Area Experts and EIA Team Members

Sr. No.	In-House Functional Area Experts	
1.	Dr. Shanth A. Thimmaiah	• Air Pollution Monitoring, Prevention and Control • Meteorology, Air Quality Modeling and

		Prediction • Water Pollution Monitoring, Prevention and Control. • Socio-Economics
2.	Mr. Kantharaj. K.	• Hydrology, Ground Water & Water conservation • Geology
3.	Mrs. Sreelekha K.S	• Land Use
4.	Mr. Sreekantan Nair	• Ecology & Bio-diversity ✓ Solid and Hazardous Waste management • Risks and Hazardous Management
5.	Ms. M.J Rekha	• Meteorology, Air Quality Modeling and Prediction
Empanelled Functional Area Experts		
1.	Dr. Nagaraj B.C	• Soil Conservation • Ecology & Bio-diversity.
2.	Dr. Venkat Reddy	• Geology • Hydrology, Ground Water & Water conservation
3.	Dr. Harsha Vardhan	• Noise and Vibration • Risks and Hazardous Management ✓ Solid and Hazardous Waste management (Industrial Solid Waste.)

CHAPTER – 12

CORPORATE ENVIRONMENTAL RESPONSIBILITY

Chapter 12: Corporate Environmental Responsibility

12.1: Company Principles

Principle 1: Businesses should conduct and govern themselves with Ethics, Transparency and Accountability

Total Environment is committed to achieving its business goals solely through means that are, and are seen to be, ethical, transparent and with total accountability. This in an inflexible principle that has historically shaped the character of Total Environment. Ethics, transparency and accountability as well as a number of allied attributes are part of the codified vision statement of the Company, and its policies on Corporate Social Responsibility (CSR), Corporate Human Resource and Corporate Environment, Health and Safety (EHS). These policies and practices extend to and encompass the operations of subsidiary and associate companies. Sound systems and policies are in place (e.g. Whistle Blower Policy) to promote the Company's principles of ethics and fair practices across all the group companies.

Total Environment's product and project spectrum underpins infrastructure and core sector industries. In distinct ways, the Company's offerings facilitate the efficient utilization and distribution of resources that contribute to public good, and set in motion the chain that enhances the quality of life.

Principle 2: Businesses should provide goods and services that are safe and contribute to sustainability throughout their life cycle

The Company recognises carbon footprint as a

significant measure of sustainable value. This is reflected in raw material selection and increasing focus on Energy-efficient processes. The Company undertakes a comprehensive review of health and safety impact of products, projects and services.

Signage systems are installed at all project sites. The Company has a growing portfolio of green products and services. They assist customers by conserving natural resources, and reduce energy consumption and associated GHG emissions. The Company has developed proven expertise, and is widely recognized as an industry leader in multiple projects that contribute to sustainability. These include the construction of green buildings. Green buildings constructed by the Company's Construction business help customers reduce energy and water consumption, utilize recycled material and locally sourced construction material.

13.2: Sustainability Practices in Value Chain

Total Environment recognizes that - no matter how well intentioned - the individual initiatives of an organization to enhance sustainability would not achieve the overall impact of collective effort. The Company therefore actively propagates environment-friendly, safe and socially responsible business practices across the value chain. Total Environment has formulated an Environment & Social Code of Conduct which many of its suppliers are committed to practice. The Company conducts capacity building programmes for vendors, sub-contractors and provides training & technical expertise towards business efficiency improvement. Local sourcing improves logistics as well as helps to develop the local economy. Around 51% of the Company's requirements are met by local suppliers. Material recycling and use of alternate materials is also being explored. However, as the Company's products are 'engineered to order' based on customer's requirement, the scope for direct material recycling is limited. Alternate materials such as fly ash in place of cement, crushed sand instead of natural sand, blast furnace slag in road construction in place of natural aggregate etc. help to conserve precious natural resources. Other examples include recycling of steel scrap and zinc waste, wherever feasible.

Total Environment is widely acknowledged as a professional organisation. Importantly the Company also recognises the person behind the professional, and has institutionalised systems that encourage personal growth in tandem with professional development. It provides an array of opportunities for new

Principle 3: Business should promote well-being of employees

learning's, expand skills sets, opportunity to develop their skills and secure a happy and fulfilling life. The Company's Corporate Human Resource Policy codifies its commitment to a culture of excellence while inspiring innovation and creativity. No discrimination is countenanced on the basis of caste, religion, gender or handicap. This is in line with the Company's endeavor to foster a culture of diversity and equal opportunity in employment. Employment of children and forced or compulsory labour is prohibited within the Company, its subsidiary and associate companies. The contract documents also include Human Rights clauses which are strictly adhered to within its premises.

Safety cannot be prioritised; it is an intrinsic part of the Company's operations across all its businesses. Enhancing safety standards is one of the thrust areas for the Company. The Corporate Environment, Health & Safety (EHS) Policy encapsulates the Company's commitment to providing a safe and healthy workplace to all employees and stakeholders. Female employees are covered under the policy on 'Protection of Women's Rights at Workplace'. Safety performance is being reviewed at regular intervals at all levels. The Board also reviews safety performance on quarterly basis. Regular safety trainings, mock drills and other safety interventions are undertaken to build a safe work culture within the organization. Further, a wide range of technical responsible business practices are propagated across the value chain. To cascade sustainability across the supply chain, Total Environment has developed an environment & social 'Code of Conduct' for our suppliers. Many suppliers are signatories to this code and have committed themselves to practicing it in letter and spirit. Essential environment-friendly and socially-responsible business practices propagated by the code include energy efficiency, water conservation, waste reduction, occupational health & safety, prevention of corruption and respect for human rights.

Principle 6: Business should respect, protect, and make efforts to restore the environment

Environmental health is critical to business sustainability. Total Environment endeavours to reduce the impact of operations by protecting the environment, conservation of resources and mitigating climate change. Over the years, the Company has formulated and executed green strategies which yield both environmental benefits and business growth. The underlying philosophy is to continuously enhance the efficiency of processes and augment the Company's green portfolio. Systems are in place to identify and assess potential

environmental risks and opportunities in its operations. The environment preservation policy and initiatives are propagated within and its key suppliers are also encouraged to follow such practices.

The Company remains committed to the eight missions of the National Action Plan on Climate Change (NAPCC) instituted by the Government of India. The Company has been increasingly investing in products and processes that assist sustainable economic growth – enhancing energy security, developing low-carbon technologies for building infrastructure, spreading sustainability knowledge and greening the nation's landscape. The Company has undertaken numerous initiatives for energy and Greenhouse gas (GHG) emission intensity reduction, increased use of renewable energy, promotion of green building construction, and enhancement of green cover, provision of solar & renewable energy solutions to customers and building of capacity for environmental management.

Pollution standards set by the regulatory bodies like central and state pollution control boards are adhered to, and the Company seeks environmental regulatory approvals prior to the commencement of operations at project sites. Regular checks are conducted by internal and independent agencies, to ensure compliance with relevant pollution control regulations. Compliance reports are submitted to Central Pollution Control Board (CPCB) / State Pollution Control Boards (SPCB). During the financial year, there are no pending or unresolved show cause/legal notices from CPCB/SPCB.

13.3: Water and Wastewater Management

The Company's water consumption and waste water discharge have declined steadily over the years. Various water management initiatives like water auditing, rainwater harvesting and waste water treatment & reuse are in place across the Company's locations.

CSR Initiatives from Total Environment Ltd

The CSR policy of Total Environment reflects the commitment and vision of the organisation. It demonstrates that business growth can go hand in hand with underlying commitment to the environment and society.

Total Environment participates in building a healthy community through continuing initiatives areas of education with a focus on childcare. Total Environment has been

organizing various activities to bridge the gap between poverty and well-being and to lay the foundation of a healthy future. One such is in association with Azim Premji Foundation, offering children of construction labourers of Total Environment project an opportunity to move into mainstream education.

Total Environment has engagement with communities to help the underprivileged through multi-pronged initiatives such as,

- ✓ Setting up of school for their construction workers at the project Wind Mills of Your Mind.
- ✓ Design and Design development for Redevelopment of Sankey Tank Park, Malleswaram.
- ✓ Maintenance of Sankey Tank Park, Malleswaram.
- ✓ Design and Design development for Redevelopment for Rejuvenation works at Hoodi Giddanakere lake.

In an effort to show its commitment towards Environmental Protection the company has allocated a maximum of 0.25% of the project cost towards Corporate Environmental Responsibility and has planned to use it during the period of project construction.

Snapshots of Activities by Total Environment in Association with Azim Premji Foundation