

**Environmental Impact Assessment Report
for
Proposed Common Bio – Medical Waste Treatment Facility (CBWTF)
at Plot No. C-6, SIPCOT Industrial Park, Seikalathur Village,
Manamadurai Taluk, Sivagangai District, Tamil Nadu by
M/s Medicare Environmental Management Private Limited (MWML)**

Activity: 7(da) Bio-medical Waste Treatment Facilities, Category B

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(Draft Report for Public Hearing)



Project Proponent

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FOREWORD

M/s Medicare Environmental Management Private Limited (MEMPL) proposes to establish a Common Bio-Medical Waste Treatment Facility (CBWTF) at Plot No.C-6, SIPCOT Industrial park, Seikalathur Village, Manamadurai Taluk, Sivagangai District, Tamil Nadu in an area of 3.60 ac (1.45 ha). The proposed CBWTF project has been designed to treat up to 5.5 TPD of BMW with 2 X 250 kg/hr incinerators, Autoclave – 1275 litres/batch, Shredder – 250 kg/hr, Effluent Treatment Plant (ETP) – 8 KLD.

Total water requirement is estimated to be 35 KLD, which will be sourced from SIPCOT/ water tankers. The total power required for the facility is estimated to be around 150 kVA, which will be sourced from SIPCOT and 1 X 150 kVA DG set will be used for power backup. The capital cost for the proposed project is estimated to be around Rs.4.96 Crores.

With a view to assess the potential environmental impacts due to the proposed facility, M/s. Medicare Environmental Management Private Limited, retained Re Sustainability Solutions Private Limited (RSSPL), Hyderabad, to conduct Rapid Environmental Impact Assessment (REIA) study of the proposed project as a prerequisite to preparation of appropriate Environmental Management Plan (EMP).

The REIA report presents details of baseline data covering summer season - June 2023 to August 2023 monitoring for air, noise, water, soil, land, ecology and socio-economic components of environment with a view to identify, predict and evaluate the potential impacts due to the proposed project. A detailed EMP has also been delineated to mitigate the adverse impacts.

The co-operation and assistance rendered by the officials of MEMPL and site officials, in preparation of this report are greatly acknowledged.



Dr.B.Chakradhar

Head of the Division

Re Sustainability Solutions Private Limited (RSSPL)

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Lists of Abbreviations

Ac	Acre
AAQ	Ambient Air Quality
AERMOD	American Meteorological Society-Environmental Protection Agency Regulatory Model
ALOHA	Areal Locations of Hazardous Atmospheres
AMSL	Above Mean Sea Level
APCD	Air Pollution Control Devices
APHA	American Public Health Association
APIIC	Andhra Pradesh Industrial Infrastructure Corporation
AQI	Air Quality Index
BDL	Below Detection Limit
BMW	Bio-medical Waste
BOD	Biochemical Oxygen Demand
BP	Boiling Point
C & D	Construction and Demolition
CBWTF	Common Bio Medical Waste Treatment Facility
CC & A	Consolidated Consents & Authorization
CE	Combustion Efficiency
CER	Corporate Environmental Responsibility
CETP	Common Effluent treatment Plant
CFE	Consent for Establishment
CGWB	Central Ground Water Board
CO	Carbon monoxide
CO ₂	Carbon Dioxide
COD	Chemical Oxygen Demand
CPCB	Central Pollution Control Board
CSR	Corporate Social Responsibility
CW	Crosswind
°C	Degree Celsius
dB	Decibels
DFO	District Forest Officer
DG set	Diesel Generator set
DMP	Disaster Management Plan
DPR	Detailed Project Report
DW	Downwind
E. Coli	Escherichia coli
EAC	Expert Appraisal Committee
EB	Ecology & Diversity
EC	Environmental Clearance
EC	Electrical Conductivity
ECC	Emergency Control Centers
EIA	Environmental Impact Assessment
ELCB	Earth Leakage Circuit Breaker
EMP	Environmental Management Plan
EMS	Environmental Management System

EPA	Environmental Protection Agency
EPCO	Environmental planning & Coordination Organization
EPP	Emergency Preparedness Plan
ERT	Emergency Response/Rescue Team
ETP	Effluent Treatment Plant
FAE	Functional Area Expert
FCC	False Colour Composite
FFT	Fire Fighting Team
FP	Flash Point
GCP	Ground Control Points
GIS	Geographic Information System
GLC	Ground Level Concentration
GOI	Government of India
GW	Ground Water
Ha	Hectare
HAZWAMS	Hazardous waste treatment Series
HBV	Hepatitis-B Virus
HC	Hydrocarbon
HCE	Health Care Establishments
HCF	Health Care Facilities
HCl	Hydrogen Chloride
HDPE	High-Density Polyethylene
Hg	Mercury
HIV	Human Immuno-Deficiency Virus
HPCL	Hindustan Petroleum Corporation Limited
HSD	High-Speed Diesel
HWMP	Hyderabad Waste Management Project
IMD	Indian Meteorological Department
ISO	International Organization for Standardization
IUCN	International Union for Conservation of Nature
IWPA	Indian Wildlife Protection Act
KLD	Kilo Liters per day
km	Kilo Meter
LC	Lethal Concentrations
LD	Lethal Dose
LED	Light Emitting Diode
LEL	Lower Explosive Limit
LISS	Linear Imaging and Self Scanning Sensor
LOS	Level of Service
LULC	Land Use Land Cover
MAH	Major Accident Hazards
MBGL	metres below ground level
MCA	Maximum Credible Accident Analysis
MEMPL	Medicare Environmental Management Private Limited
MHI	Major Hazard Installation
MHz	Megahertz
MMI	Man-Machine Interface

MoEF&CC	Ministry of Environment, Forest and Climate Change
MP	Melting Point
MSIHCR	Manufacture, Storage and Import of Hazardous Chemical Rules
MSL	Mean Sea Level
N	North
NAAQ	National Ambient Air Quality Standards
NABET	National Accreditation Board for Education and Training Scheme
NABL	National Accreditation Board for Testing and Calibration Laboratories
NE	North East
NFPA	National Fire Protection Association
NGO	Non-Governmental Organization
NH	National Highway
No.	Number
NOC	Non Objection Certificate
NO _x	Nitrogen oxides
NOX	Nitrogen Oxide
NRSC	National Remote Sensing Centre
NTPC	National Thermal Power Corporation
NW	North West
O ₂	Oxygen
OCEMS	Online Stack Monitoring - Online Continuous Emission Monitoring Stations
OHC	Occupational Health Center
OHSAS	Occupational Health and Safety Assessment Series
OM	Office Memorandum
OSM	Open Series Map
OSPCB	Odisha State Pollution Control Board
PCC	Pollution Control Committee
PCU	Passenger Car Unit
PFR	Pre-Feasibility Report
PH	Public Hearing
PM	Particulate matter
PM ₁₀	Particulate matter 10
PM _{2.5}	Particulate matter 2.5
PP	Polypropylene
PPE	Personal Protective Equipment
psi	Pound-force per square inch
QCI	Quality Council of India
QMS	Quality Management System
RCC	Reinforced Cement Concrete
RCCB	Residual Current Circuit Breaker
REET species	Rare, Endangered, Endemic and Threatened species
RF	Reserved Forest
Rs.	Rupees
RSSPL	Re Sustainability Solutions Private Limited

RT	Rescue Team
RTO	Regional Transport Office or Road Transport Office
SC	Scheduled Castes
SCBA	Self-Contained Breathing Apparatus
SE	Socio-economics
SEAC	State Expert Appraisal Committee
SEIAA	State Environment Impact Assessment Authority
SIPCOT	State Industries Promotion Corporation of Tamil Nadu Limited
Sl.No.	Serial Number
SMF	Stack Monitoring Facility
SO ₂	Sulfur Dioxide
SOI	Survey of India
SOP	Standard Operating Procedure
SPCB	State Pollution Control Board
SQ	Soil Quality
Sq. m	Square Meter
ST	Scheduled Tribes
STP	Sewage Treatment Plant
SW	Surface Water
SW	South West
SWOT	Strengths, Weaknesses, Opportunities and Threats
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total Dissolved Solids
TLV	Threshold Limit Value
TNPCB	Tamil Nadu Pollution Control Board
ToR	Terms of Reference
TREM	Transport Emergency
TSDF	Treatment, Storage, and Disposal Facility
TSIIC	Telangana State Industrial Infrastructure Corporation
TSPCB	Telangana State Pollution Control Board
TSS	Total Suspended Solids
TT	Technical Team
UEL	Upper Explosive Limit
UP	Upwind
UTM	Universal Transverse Mercator
WGS	World Geodetic System
WHO	World Health Organization
WMC	Works Main Controller
WQ	Water Quality
WRIS	Water Resources Information System.

**QCI – NABET ACCREDITATION
CERTIFICATE OF CONSULTANT**



National Accreditation Board for Education and Training



Certificate of Accreditation

Re Sustainability Solutions Private Limited (formerly Ramky Enviro Services Pvt Ltd)

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The organization is accredited as **Category-A** under the QCI-NABET Scheme for Accreditation of EIA Consultant Organization, Version 3: for preparing EIA-EMP reports in the following Sectors –

S.No	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1	Mining of minerals including Open cast/ Underground mining	1	1 (a) (i)	A
2	Onshore Oil and gas exploration, development & production	2	1 (b)	A
3	River Valley projects	3	1 (c)	B
4	Thermal power plants	4	1 (d)	A
5	Petrochemical based processing	20	5 (e)	A
6	Synthetic organic chemicals industry	21	5 (f)	A
7	Industrial estates/ parks/ complexes/ Areas, export processing zones(EPZs), Special economic zones (SEZs), Biotech parks, Leather complexes	31	7 (c)	A
8	Common hazardous waste treatment, storage and disposal facilities (TSDFs)	32	7 (d)	A
9	Bio-medical waste treatment facilities	32A	7 (da)	B
10	Common effluent treatment plants (CETPs)	36	7 (h)	B
11	Common municipal solid waste management facility (CMSWMF)	37	7 (i)	B
12	Building and construction projects	38	8 (a)	B
13	Townships and Area Development projects	39	8 (b)	B

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in RAAC minutes dated Jan 17, 2023 and posted on QCI-NABET website.

The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in QCI-NABET's letter of accreditation bearing no QCI/NABET/ENV/ACO/23/2721 dated March 31, 2023. The accreditation needs to be renewed before the expiry date by Re Sustainability Solutions Private Limited, Hyderabad following due process of assessment.

Sr. Director, NABET
Dated: March 31, 2023

Certificate No.
NABET/EIA/2225/RA 0278

Valid up to
Sept 26, 2025

ACCREDITATION CERTIFICATE OF
LABORATORY



National Accreditation Board for
Testing and Calibration Laboratories

CERTIFICATE OF ACCREDITATION

**HYDERABAD WASTE MANAGEMENT PROJECT(RE
SUSTAINABILITY LIMITED) LABORATORY**

has been assessed and accredited in accordance with the standard

ISO/IEC 17025:2017

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

for its facilities at

TSDF AT 684/1, DUNDIGAL VILLAGE, DUNDIGAL GANDIMAISAMMA MANDAL, MEDCHAL
MALKAJGIRI, HYDERABAD, TELANGANA, INDIA

in the field of

TESTING

Certificate Number: TC-12024

Issue Date: 31/07/2023

Valid Until:

28/07/2024

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

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

Name of Legal Identity : RE SUSTAINABILITY LIMITED

Signed for and on behalf of NABL



N. Venkateswaran
Chief Executive Officer



F.No. LB/99/7/2021-INST LAB-HO-CPCB-HO/Pvt./ 1590

Dated: 06th June 2023

Recognition Letter

To,

Head of Laboratory,
M/s Hyderabad Waste Management Project Laboratory
(A Division of Re Sustainability Limited (Formerly known as
Ramky Enviro Engineers Limited), Survey No. 684/1, Dundigal Village, Dundigal
Gandimaisamma Mandal, Medchal -500043 Telangana.

Subject: Recognition of M/s Hyderabad Waste Management Project Laboratory (A Division of Re Sustainability Limited (Formerly known as Ramky Enviro Engineers Limited), Survey No. 684/1, Dundigal Village, Dundigal Gandimaisamma Mandal Medchal -500043, Telangana as Environmental laboratory under the Environmental (Protection) Act- 1986.

Sir,

I am directed to refer the online application, dated 07/11/2022 for the recognition of your laboratory under Environmental (Protection) Act, 1986. Based on the recommendations of the concerned Division, approval of Competent Authority for recognition of Environmental laboratories and your acceptance of the revised terms and conditions at Annexure-III & IV of the guidelines for recognition of environmental laboratories, CPCB approves the renewal of recognition M/s Hyderabad Waste Management Project Laboratory (A Division of Re Sustainability Limited (Formerly known as Ramky Enviro Engineers Limited), Survey No. 684/1, Dundigal Village, Dundigal Gandimaisamma Mandal Medchal -500043 Telangana and shall be notified in the Gazette of India. Considering the current requirement of mandatory accreditation/ certifications of the laboratory, this recognition shall be valid up to 28/07/2024.

2. As sought in the aforementioned application, M/s Hyderabad Waste Management Project Laboratory (A Division of Re Sustainability Limited (Formerly known as Ramky Enviro Engineers Limited), Survey No. 684/1, Dundigal Village, Dundigal Gandimaisamma Mandal Medchal -500043 Telangana may undertake the following tests:

- Physical Tests**-Conductivity, Colour, pH, Fixed & Volatile Solids, Total Solids, Total Dissolved Solids, Total Suspended Solids, Turbidity, Temperature, Velocity & Discharge Measurement of Industrial Effluent Stream, Flocculation Test (Jar Test), Odour, Salinity, Settleable Solids and Sludge Volume Index.
- Inorganic (General and Non-metallic):** Acidity, Alkalinity, Ammonical Nitrogen, Chloride, Chlorine Residual, Dissolved Oxygen, Fluoride, Total Hardness, Total Kjeldahl Nitrogen (TKN), Nitrite Nitrogen, Nitrate Nitrogen, Phosphate, Sulphate, Bromide, Carbon Dioxide, Chlorine Demand, Iodine, Sulphite, Silica, Cyanide and Sulphide.
- Inorganic (Trace Metals):** Boron, Cadmium, Calcium, Total Chromium, Chromium Hexavalent, Copper, Iron, Lead, Magnesium, Mercury, Nickel, Potassium, Sodium, Sodium Absorption Ratio, Zinc, Arsenic, Aluminium, Beryllium, Barium, Lithium Manganese, Selenium, Silver, Strontium, Tin, Antimony, Cobalt and Vanadium.
- Organics (General) and Trace Organics:** Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Oil and Grease, Phenolic Compounds, Pesticides (each) (Organo-Chlorine and Organo Nitrogen-Phosphorus), Total Organic Carbon, Surfactants, Tanin & Lignin, Poly-Chlorinated Biphenyl (PCB's), Polynuclear Aromatic Hydrocarbon Each, Organic Carbon (In Solid) and Carbon/Nitrogen Ratio.

Contd.

‘परिवेश भवन’ पर्वी अर्जुन नगर, दिल्ली-110032

Parivesh Bhawan, East Arjun Nagar, Delhi-110032

दूरभाष/Tel : 43102030, 22305792, वेबसाइट/Website : www.cpcb.nic.in

- v. **Microbiological Test:** Total Coliform, Faecal Coliform, *E. coli*, *Faecal Streptococci* and Total Plate Count .
- vi. **Toxicological Tests:** *Bioassay Method for Evaluation of Toxicity using Fish, Measurement of Toxicity Factor Using Zebra fish (Dimensionless Toxicity Test).*
- vii. **Characterization of Hazardous Waste:** Preparation of Leachate (TCLP extract/Water Extract), Corrosivity, Ignibility (Flash Point), Toxicity and Measurement of Heavy Metals/Pesticides in the Waste/Leachate.
- viii. **Soil/Sludge/Sediment and Solid Waste:** Boron, Cation Exchange Capacity (CEC), Electrical Conductivity, Nitrogen (Available), Organic Carbon/Matter (Chemical Method), pH, Phosphorous (Available), Phosphate (Ortho), Phosphate (Total), Potassium, SAR in Soil Extract, Sodium, Soil moisture, TKN, Calorific Value, Ammonia, Bicarbonate, Calcium, Calcium Carbonate, Chloride, Colour, Exchangeable Sodium Percentage (ESP), Gypsum Requirement, H. Acid, Heavy Metals, Magnesium, Mechanical Soil Analysis, Nitrate, Nitrite, PAH, Pesticide, Potash (Available), Sulphate, Sulphur and TOC.
- ix. **Ambient Air/ Fugitive Emissions:** Nitrogen Dioxide (NO₂), Sulphur Dioxide (SO₂), Total Suspended Particulate Matter, Respirable Suspended Particulate Matter PM₁₀, Ammonia, Carbon Monoxide, Chlorine, Fluoride, Non-Methane Hydrocarbon, Lead, Methane, Ozone, Benzene Toluene Xylene (BTX), Polycyclic Aromatic Hydrocarbon (PAH), Benzo-a-Pyrene & others PM_{2.5} and Volatile Organics Carbon.
- x. **Stack Gases/ Source Emission:** Particulate Matter, Sulphur Dioxide, Velocity & Flow, Carbon Dioxide, Carbon Monoxide, Temperature, Oxygen, Oxides of Nitrogen, Acid Mist, Ammonia, Chlorine, Fluoride (Particulate), Fluoride (Gaseous), Hydrochloric acid, Total Hydrocarbons, Hydrogen sulphide, Carbon Disulphide and Mercapton.
- xi. **Noise Level:** Noise Level Measurement (20-140 dBA) and Ambient Noise and Source Specific Noise.
- xii. **Meteorological:** Ambient Temperature, Wind Direction, Wind Speed, Relative Humidity, Solar Radiation and Rain Fall.

3. Further, the following analysts have been approved as Government Analysts.

- i. Sh. Ravi Kumar Kadari
- ii. Ms. Swathi Yannam
- iii. Ms. A.Neeraja

4. The laboratory shall compulsorily participate in the Analytical Quality Exercise conducted by the Central Pollution Control Board (CPCB) to ascertain the capability of the laboratory and analysis carried out and shall submit quarterly progress report to CPCB.
5. The surprise inspection/periodic surveillance of the recognized environment laboratory will be undertaken by CPCB to assess its proper functioning systematic operation and reliability of data generated at the laboratory.
6. It is also mandatory for the laboratory to have requisite accreditations of the ISO: 17025 and ISO:45001 and its renewal as per accreditation rules. This recognition is subject to such accreditations and renewals as applicable. The laboratory is required to apply online for further renewal of recognition through CPCB web portal after renewal of the mandatory accreditations / certifications concerned.
7. The laboratory should compulsorily follow the accepted terms and conditions. In case of serious non-compliance of any of the terms and conditions, the laboratory may be black listed for a minimum period of two years and civil/criminal proceedings, as applicable, may be initiated for performing functions on behalf of the Government in an unauthorized manner.

Yours faithfully,

डॉ. के. रंगनाथन / Dr. K. Ranganathan
 वैज्ञानिक 'ई' सरकारी विश्लेषक / Scientist 'E' Govt. Analyst
 केंद्रीय प्रदूषण नियंत्रण बोर्ड
 Central Pollution Control Board
 पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, भारत सरकार
 (Mo Environment, Forest & Climate Change, Govt. of India)
 परिवेश भवन, पूर्वी अर्जुन नगर, दिल्ली-110032
 Parvesh Bhawan, East Arjun Nagar, Delhi-110032

K. R. J. 6/6/23
 (Dr. K. Ranganathan)
 Scientist-E & Divisional Head
 Instrumentation laboratory

UNDERTAKING BY CONSULTANT



Sustainability

UNDERTAKING BY CONSULTANT

We, Re Sustainability Solutions Private Limited is an accredited EIA Consultants involved in the preparation of EIA/ EMP report after accreditation with QCI/NABET (Certificate No. NABET/EIA/2225/RA 0278), hereby declare that, we have prepared the EIA/EMP report based on Terms of Reference (ToR) issued by SEIAA, Tamil Nadu Letter No. SEIAA-TN/F.No.10145/7(d)(a)/ToR-1527/2021 Dt.07.08.2023 (Proposal No. SIA/TN/INFRA2/429635/2023 Dt. 29.05.2023) for the Proposed Common Bio – Medical Waste Treatment Facility (CBWTF) at Plot No. C-6, SIPCOT Industrial Park, Seikalathur Village, Manamadurai Taluk, Sivagangai District, Tamil Nadu by M/s Medicare Environmental Management Private Limited (MEMPL). In this regard, we hereby certify that EIA/ EMP report prepared by us and data provided by laboratory including our status of approvals presented in the report is factually correct. The laboratory used for analysis of sample is approved by NABL, MoEF&CC and under EPA 1986 and rules made there under.




Dr. B. Chakradhar

Head of the Division

Re Sustainability Solutions Private Limited

Re Sustainability Solutions Private Limited
(Formerly known as Ramky Enviro Services Private Limited)

Registered Office:

Level 11B, Aurobindo Galaxy,
Hyderabad Knowledge City,
HITECH City Road, Hyderabad-500 081, India,
CIN No. U90001TG2010PTC071974

T: 040 2301 5000
E: info@resustainability.com
resustainability.com

UNDERTAKING BY PROPONENT

UNDERTAKING BY PROJECT PROPONENT

As per MoEF&CC Office Memorandum No. J-11013/41/2006-IA.II(I) dated October 05, 2011, We, M/s. Medicare Environmental Management Private Limited, Project Proponent of Proposed Common Bio – Medical Waste Treatment Facility (CBWTF) at Plot No. C-6, SIPCOT Industrial Park, Seikalathur Village, Manamadurai Taluk, Sivagangai District, Tamil Nadu, hereby declare that we have engaged Re Sustainability Solutions Private Limited, accredited by QCI/NABET (Certificate No. NABET/EIA/2225/RA 0278), as EIA Consultant for preparation of EIA Report. The EIA Report has been prepared in compliance with the Terms of Reference (Letter No. SEIAA-TN/F.No.10145/7(d)(a)/ToR-1527/2021 Dt.07.08.2023). We hereby certify that the data/information presented in the report is factually correct and that we own the contents (information and data) of the EIA Report.

For M/s Medicare Environmental Management Private Limited

Authorized Signatory



Medicare Environmental Management Private Limited
(A Subsidiary of Re Sustainability Limited)

CIN No. U24117TG1997PTG026555

Registered Office:

Level IIB, Aurobindo Galaxy,
Hyderabad Knowledge City, Hitech City Road,
Hyderabad - 500081,
Telangana.

T: +91 40244 48000
E: info@resustainability.com

Certificate of Plagiarism Check

Title of EIA Report	Proposed Common Bio – Medical Waste Treatment Facility (CBWTF) at Plot No. C-6, SIPCOT Industrial Park, Seikalathur Village, Manamadurai Taluk, Sivagangai District, Tamil Nadu
Name of Accredited Organization	Re Sustainability Solutions Private Limited <i>(formerly known as Ramky Enviro Services Private Limited)</i>
Unique Identification Number	RSSPL/BMW Manamadurai/32A & B1/2023-D
Name of EIA Co-ordinator (EC)	Dr. B. Chakradhar
Name of the Software	Plagiarism Checker X
Date of Check	11.10.2023
Time of Check	15:07

Declaration by the Head of the Accredited Consultant Organization (ACO)

I hereby certify that this EIA report has been evaluated using online/in-house software i.e. PlagiarismXchecker. The report produced has been analysed by the system and based on it, I certify that the EIA report produced is in accordance with good scientific practice.

Date and sign of EIA Coordinator/Head of ACO



Name: Dr. B. Chakradhar

Designation: Head of the Division

Re Sustainability Solutions Private Limited

(formerly known as Ramky Enviro Services Private Limited)

NABET Certificate No. & Issue Date: NABET/EIA/2225/RA 0278 & March 31, 2023

DECLARATION OF EXPERTS

DECLARATION BY EXPERTS CONTRIBUTING TO THE EIA – “Proposed Common Bio - Medical Waste Treatment Facility (CBWTF) at Plot No.C-6, SIPCOT Industrial Park, Seikalathur (V), Manamadurai (T), Sivagangai (D) Tamil Nadu (S) by M/s Medicare Environmental Management Private Limited”

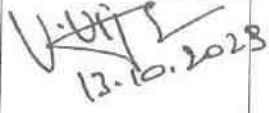

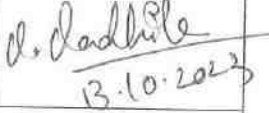


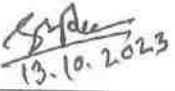
I, hereby, certify that I was a part of the EIA team in the following capacity that developed this EIA report.


EIA Coordinator:

Name : Dr. B. Chakradhar
 Sign & Date : 13.10.2023

Period of involvement: **May, 2023 – Till date**
 Contact information : drchakradhar@resustainability.com

Functional Area Experts:


S. No	Functional Area	Name of the Expert	Involvement		Sign & Date
			Period	Task	
1	AP	Mr. V. Vijay Kumar	May, 2023 – Till date	Provided the required inputs for AP during project period	 13.10.2023
2	WP	Mr. Manikandan Nachiappan	May, 2023 – Till date	Provided the required inputs for WP during project period	 13/10/2023
3	SHW	Mrs. R. Radhika	May, 2023 – Till date	Provided the required inputs for SHW during project period	 13.10.2023
4	SE	Mr. K. Anjaneyulu	May, 2023 – Till date	Provided the required inputs for SE during project period	
5	EB	Mr. Pawan Kumar Verma	May, 2023 – Till date	Provided the required inputs for EB during project period	 13/10/2023
6	HG	Mr. G. Seshagiri Rao	May, 2023 – Till date	Provided the required inputs for HG during project period	 13.10.2023

7	GEO	Mr. G. Seshagiri Rao	May, 2023 – Till date	Provided the required inputs for GEO during project period	 13.10.2023
8	SC	Mr. Pawan Kumar Verma	May, 2023 – Till date	Provided the required inputs for SC during project period	 13/10/2023
9	AQ	Mr. M. Vishnu Vardhan Reddy	May, 2023 – Till date	Provided the required inputs for AQ during project period	 13-10-2023
10	NV	Mr. Bhasker Boge	May, 2023 – Till date	Provided the required inputs for NV during project period	 13/10/2023
11	LU	Mr. G. Seshagiri Rao	May, 2023 – Till date	Provided the required inputs for LU during project period	 13.10.2023
12	RH	Dr. B. Chakradhar	May, 2023 – Till date	Provided the required inputs for RH during project period	 13.10.2023

Declaration by the Head of the Accredited Consultant Organization/ authorized person;

I, **Dr. B. Chakradhar**, hereby, confirm that the above mentioned experts prepared the EIA "**Proposed Common Bio - Medical Waste Treatment Facility (CBWTF) at Plot No.C-6, SIPCOT Industrial Park, Seikalathur (V), Manamadurai (T), Sivagangai (D) Tamil Nadu (S) by M/s Medicare Environmental Management Private Limited**"

I also confirm that the consultant organization shall be fully accountable for any mis-leading information mentioned in this statement.

Signature : 
Name : Dr. B. Chakradhar 13.10.2023
Designation : Head of the Division
Name of the EIA Consultant Organization : Re Sustainability Solutions Private Limited
(formerly known as Ramky Enviro Services Private Limited)
NABET Certificate No. & Issue Date : NABET/EIA/2225/ RA 0278 & March 31, 2023

Annexure – IE

Format for information on Team Member

(only for in-house employees)

Name of project: **“Proposed Common Bio - Medical Waste Treatment facility (CBWTF) at Plot No C-6, SIPCOT Industrial Park, Seikalathur (V), Manamadurai (T), Sivagangai (D) Tamil Nadu (S) by M/s Medicare Environmental Management Private Limited”**

1. Name and address of EIA consultant organization

M/s. Re Sustainability Solutions Private Limited
(formerly known as Ramky Enviro Services Private Limited)
**Level 11 B Aurobindo Galaxy, Hyderabad Knowledge City,
Hitech City Road, Gachibowli,
Hyderabad- 500081**

a. Head Office : ✓

b. Branch Office/s:

2. Name of the head of the organization with designation

Dr. B. Chakradhar
Head of the Division

3. Contact details with name of the contact person

a. Name of Contact person **Dr. B. Chakradhar**
Address **M/s. Re Sustainability Solutions Private Limited**
(formerly known as Ramky Enviro Services Private Limited)
**Level 11 B Aurobindo Galaxy, Hyderabad Knowledge
City, Hitech City Road, Gachibowli,
Hyderabad- 500081**

b. Tel. No. **040 24446000** Mob.: **+91-9000604455**

c. Email: **drchakradhar@resustainability.com**

Alt. Email: **vvijaykumar@resustainability.com**

d. Website: **resustainability.com**

4. Team Members proposed

Sl. No.	Name	Qualification [#]	EC/ FAE	Sector/ FA	Approved Sr. Expert	Jobs to be assigned
With EIA Coordinator						
1	Mrs. R.Radhika	<ul style="list-style-type: none"> M.Sc. in Environmental Science and Technology (Year of Passing 2011) from Jawaharlal Technological University, Hyderabad 	EC	32A: Bio-medical Waste treatment, storage and disposal Facilities (BMW) – 7(da)	Dr.B.Chakradhar	Involved in: Coordinated in obtaining information for preparing Pre-Feasibility report from project proponent. Supported Co-ordinator in selecting team to be finalizing in EIA. Assisted in preparing draft compliance to the Terms of reference. Identifying the Baseline Locations and crosschecking collected baseline data. Assisted in preparing Executive Summary of the project.
2	Mrs. A.Neeraja	<ul style="list-style-type: none"> M.Sc. in Environmental Science and Technology (Year of Passing 2011) from Jawaharlal Technological University, Hyderabad 				
With Functional Area Expert						
1.	Mrs. Arpita Podder Paka	<ul style="list-style-type: none"> M.Sc. Geography (Year of passing 2011) (University of Calcutta) M. Plan (Urban and Regional planning, Public policy) (Year of passing 2014) (Center for Environmental Planning and Technology) 	FAE	SE	Mr. Anjaneyulu K.	Involved in: 1. Assisting in identifying the project area and demarcate the study area based on the anticipated impact of the upcoming project on google earth. 2. Resource mapping in and around the project site on Google earth, for preliminary understanding before starting secondary analysis which includes no. of habitats, no. of hospitals,

Sl. No.	Name	Qualification [#]	EC/ FAE	Sector/ FA	Approved Sr. Expert	Jobs to be assigned
						<p>no. of educational institutes, no. of Administrative units, Road accessibilities etc.</p> <ol style="list-style-type: none"> 3. Detailed data analysis from Secondary source (Census of India)- includes Demographic profile analysis, social Character analysis, Physical Infrastructure analysis (Educational centers, Medical Units etc.) along with validation of data from other peer published documents. 4. Preparing an illustrated inference from the secondary source to derive into the existing situation in relation to the project. 5. Preparation for upcoming field visit, like documentation of questionnaires for Village level survey, door to door survey, FGD format, if required PRA format. 6. Once data is collected, organizing the raw data into excel format for further detailed analysis. Various techniques would be the part of data analysis. 7. An illustrated inference would be drawn from the analyzed data and would be incorporated in the EIA report based on the impact analysis gather from the environmental dynamics.

Sl. No.	Name	Qualification [#]	EC/ FAE	Sector/ FA	Approved Sr. Expert	Jobs to be assigned
			FAE	LU	Mr. Uttam Kumar Bhunia	<ol style="list-style-type: none"> 1. Assisting in identifying toposheet, satellite imagery for the project site and the study area 2. Helping in land use and land cover verification during field visit 3. Preparing KML of the project site according to project layout 4. Assisting in data interpretation and digitization.
2.	Mr. Athul S	<ul style="list-style-type: none"> • B.Tech. Civil Engineering (Year of Passing 2017) from Cochin University of Science and Technology (CUSAT) 	FAE	SC	Mr. V. Vijay Kumar	<p>Involved in:</p> <ol style="list-style-type: none"> 1. Identifying the soil sampling locations and do a comparative study of soil quality for the study area. 2. Assessment of fertility/ productivity of soil, nutrient availability of soil 3. Assessment of impact of gaseous, liquid and solid pollutants on soil 4. Management of soil salinity, Remediation of soil pollution/contaminated soils 5. Suggesting controlling measures for degradation of soil 6. Preparation of EIA Report
			FAE	NV	Mr. Bhasker Boge	<p>Involved in:</p> <ol style="list-style-type: none"> 1. Monitoring of noise/vibration levels using specific instruments, processing and analysis of data 2. Prediction of noise/vibration isopleths using relevant models in residential,

Sl. No.	Name	Qualification [#]	EC/ FAE	Sector/ FA	Approved Sr. Expert	Jobs to be assigned
						sensitive, commercial and industrial area 3. Assessing Probable impacts of noise on communities due to project activities 4. Assessing impacts of noise and vibration on fauna from projects in ecologically sensitive areas 5. Suggesting mitigation measures 6. Involved in EIA report preparation.
			FAE	HG	Mr.G.Seshagiri Rao	Involved in: 1. Analysis of surface hydrological data pertaining to flow fluctuation, estimation of flows 2. setting up and interpretation of gauging station readings, designing of ground water table measurement and monitoring network, computation of ground water recharge, flow rate and direction 3. Plotting of ground water contours 4. Analysis and description of aquifer characteristics e.g. permeability, transmissivity, storage coefficient etc., estimation of groundwater potential and recharge phenomenon, determination of impact of withdrawal of groundwater 5. Preparation of water budget for an area 6. Involved in EIA Report preparation

Sl. No.	Name	Qualification [#]	EC/ FAE	Sector/ FA	Approved Sr. Expert	Jobs to be assigned
3	Mr. G. Venkata Santosh Kumar	<ul style="list-style-type: none"> M. Tech (Chemical Engineering) Specialization in Industrial Pollution Control Engineering. (Year of Passing 2020) from Andhra University 	FAE	RH	Dr.B.Chakradhar	Involved in: <ol style="list-style-type: none"> Risks and consequences analysis using latest software such as Phast Micro, SAFETI, ALOHA or other relevant software Identification and assessment of risk associated to the project during various phase of project Preparation of on-site Emergency Preparedness Plan Preparation of off-site Disaster Management Plan Suggesting general occupational health and safety measures Involved in preparation of EIA/EMP report
				AP	Mr. V. Vijay Kumar	<ol style="list-style-type: none"> Measurement of Meteorological information i.e. Wind speed, Wind direction, relative humidity, wet and dry bulb temperature, rainfall etc. Involve in Air quality monitoring – selecting locations of sampling stations, monitoring/ supervision of monitoring of suspended and respirable particulate matter (PM_{2.5} and PM₁₀), SO₂, NO_x, CO and other relevant parameters as per NAAQ standards, including handling of relevant equipment, collection and

Sl. No.	Name	Qualification#	EC/ FAE	Sector/ FA	Approved Sr. Expert	Jobs to be assigned
						preservation of the samples
4	Dr. P. Kiran Kumar	<ul style="list-style-type: none"> • Ph. D in Environmental Science and Technology from JNTU, Hyderabad (2016 2022). • M. Sc. (Environmental Biotechnology) from JNTU, Hyderabad (2011 - 2013). • PG Diploma (Chem. Informatics) from Nizam college Hyderabad, Osmania University in 2011. • PG Diploma (Bio. Informatics) from Nizam college Hyderabad, Osmania University in 2010. • B.Sc. (Biotechnology, Chemistry and Computer Applications) from Kakatiya University, Warangal (2006 2009). 	FAE	EB	Mr.Pawan Kuma Verma	Involved in: <ol style="list-style-type: none"> 1. Desk Based Survey involves review of existing literature, databases and site-specific information for the study area 2. Listing of potentially threatened flora and fauna species, along with land cover/vegetation map. Securing secondary information from Forest & Wildlife department. 3. Visit to project site and study area for collecting flora and fauna species. 4. Identification of Ecological sensitive area including identification of flora and fauna species. 5. Assessing the impact on the ecology and biodiversity due to project activities.
			FAE	WP	Mr.Manikandan Nachiappan	Involved in: <ol style="list-style-type: none"> 1. Designing sampling network for water and waste water 2. Visiting to site and involved in Water sample collection, preservation and transportation 3. Assessing water analysis results 4. Identification, characterization and segregation of effluent streams 5. Suggesting suitable treatment technology for Effluent and domestic wastewater

Sl. No.	Name	Qualification [#]	EC/ FAE	Sector/ FA	Approved Sr. Expert	Jobs to be assigned
						6. Preparing water balance, water budgeting and developing water conservation and water pollution controlling measures 7. Contribution in EIA report preparation
			FAE	AP	Mr. V. Vijay Kumar	Involved in: 3. Measurement of Meteorological information i.e. Wind speed, Wind direction, relative humidity, wet and dry bulb temperature, rainfall etc. 4. Involve in Air quality monitoring – selecting locations of sampling stations, monitoring/ supervision of monitoring of suspended and respirable particulate matter (PM _{2.5} and PM ₁₀), SO ₂ , NO _x , CO and other relevant parameters as per NAAQ standards, including handling of relevant equipment, collection and preservation of the samples 5. Stack monitoring - particulate matter, SO ₂ , NO _x , and other relevant parameters 6. Identification of probable impacts of the different air emissions from the plants/facilities proposed 7. Identifying the most suitable control device e.g. condensers, chillers, spray systems, scrubbers, cyclones, ESPs, bag filters etc.

Sl. No.	Name	Qualification [#]	EC/ FAE	Sector/ FA	Approved Sr. Expert	Jobs to be assigned
						8. Suggesting Air Pollution controlling measures 9. Involved in EIA report preparation
5	Mr. P. Ramalu	<ul style="list-style-type: none"> • M.Sc. (Environmental Science) (Year of Passing: 2011) from Osmania University, Hyderabad, Telangana • B.Sc.(IMBZC) (Industrial Microbiology, Zoology, Chemistry) (Year of Passing: 2009) from Kakatiya University Hanumakonda, Warangal. 	FAE	AP	Mr. V. Vijay Kumar	Involved in: <ol style="list-style-type: none"> 1. Measurement of Meteorological information i.e. Wind speed, Wind direction, relative humidity, wet and dry bulb temperature, rainfall etc. 2. Involve in Air quality monitoring – selecting locations of sampling stations, monitoring/ supervision of monitoring of suspended and respirable particulate matter (PM_{2.5} and PM₁₀), SO₂, NO_x, CO and other relevant parameters as per NAAQ standards, including handling of relevant equipment, collection and preservation of the samples 3. Stack monitoring - particulate matter, SO₂, NO_x, and other relevant parameters 4. Identification of probable impacts of the different air emissions from the plants/facilities proposed 5. Identifying the most suitable control device e.g. condensers, chillers, spray systems, scrubbers, cyclones, ESPs, bag filters etc. 6. Suggesting Air Pollution controlling measures

Sl. No.	Name	Qualification#	EC/ FAE	Sector/ FA	Approved Sr. Expert	Jobs to be assigned
						7. Involved in EIA report preparation
			FAE	EB	Mr.Pawan Kumar Verma	Involved in: 1. Desk Based Survey involves review of existing literature, databases and site-specific information for the study area 2. Listing of potentially threatened flora and fauna species, along with land cover/vegetation map. Securing secondary information from Forest & Wildlife department. 3. Visit to project site and study area for collecting flora and fauna species. 4. Identification of Ecological sensitive area including identification of flora and fauna species. 5. Assessing the impact on the ecology and biodiversity due to project activities.
			FAE	WP	Mr.Mani kandan Nachiappan	Involved in: 1. Designing sampling network for water and waste water 2. Visiting to site and involved in Water sample collection, preservation and transportation 3. Assessing water analysis results 4. Identification, characterization and segregation of effluent streams 5. Suggesting suitable treatment technology

Sl. No.	Name	Qualification [#]	EC/ FAE	Sector/ FA	Approved Sr. Expert	Jobs to be assigned
						for Effluent and domestic wastewater 6. Preparing water balance, water budgeting and developing water conservation and water pollution controlling measures 7. Contribution in EIA report preparation
6	Mr. V. Venkata Raju	<ul style="list-style-type: none"> Perusing Ph.D. in Environmental Science at Acharya Nagarjuna University Guntur, Andhra Pradesh. M.Sc. in Geology (5 year Integrated) from Andhra University, Visakhapatnam in the year 2016. B.Sc. in Geology from Andhra University, Visakhapatnam in the year 2014 	FAE	HG	Mr. G. Seshagiri Rao	Involved in: <ol style="list-style-type: none"> Analysis of surface hydrological data pertaining to flow fluctuation, estimation of flows setting up and interpretation of gauging station readings, designing of ground water table measurement and monitoring network, computation of ground water recharge, flow rate and direction Plotting of ground water contours Analysis and description of aquifer characteristics e.g. permeability, transmissivity, storage coefficient etc., estimation of groundwater potential and recharge phenomenon, determination of impact of withdrawal of groundwater Preparation of water budget for an area Involved in EIA Report preparation
				Geo	Mr. G.Seshagiri Rao	Involved in: <ol style="list-style-type: none"> Analysis of Geological and Geo morphological features of site

Sl. No.	Name	Qualification [#]	EC/ FAE	Sector/ FA	Approved Sr. Expert	Jobs to be assigned
						2. Identification of Stratigraphy/ Lithology of site 3. Developing geological maps 4. Assessing impact on geology due to various stages of project 5. Suggesting mitigation measures 6. Involved in EIA report preparation
7	Mrs. A.Neeraja Arugonda	<ul style="list-style-type: none"> M.Sc. in Environmental Science and Tech. JNTU Hyderabad. Year of Passing 2011. B.Sc. in Microbiology. Chemistry. Bio-Technology (MB.C.BT) from Prathibha Degree Collage affiliated to Osmania University, Hyderabad in the year of 2008. 	FAE	WP	Mr. Manikandan Nachiappan	Involved in: <ol style="list-style-type: none"> Designing sampling network for water and waste water Visiting to site and involved in Water sample collection, preservation and transportation Assessing water analysis results Identification, characterization and segregation of effluent streams Suggesting suitable treatment technology for Effluent and domestic wastewater Preparing water balance, water budgeting and developing water conservation and water pollution controlling measures Contribution in EIA report preparation

Sl. No.	Name	Qualification [#]	EC/ FAE	Sector/ FA	Approved Sr. Expert	Jobs to be assigned
			FAE	AP	Mr. V. Vijay Kumar	Involved in: <ol style="list-style-type: none"> 1. Measurement of Meteorological information i.e. Wind speed, Wind direction, relative humidity, wet and dry bulb temperature, rainfall etc. 2. Involve in Air quality monitoring – selecting locations of sampling stations, monitoring/ supervision of monitoring of suspended and respirable particulate matter (PM_{2.5} and PM₁₀), SO₂, NO_x, CO and other relevant parameters as per NAAQ standards, including handling of relevant equipment, collection and preservation of the samples 3. Stack monitoring - particulate matter, SO₂, NO_x, and other relevant parameters 4. Identification of probable impacts of the different air emissions from the plants/facilities proposed 5. Identifying the most suitable control device e.g. condensers, chillers, spray systems, scrubbers, cyclones, ESPs, bag filters etc. 6. Suggesting Air Pollution controlling measures 7. Involved in EIA report preparation

Sl. No.	Name	Qualification [#]	EC/ FAE	Sector/ FA	Approved Sr. Expert	Jobs to be assigned
			FAE	NV	Mr.Bhasker Boge	Involved in: <ol style="list-style-type: none"> 1. Monitoring of noise/vibration levels using specific instruments, processing and analysis of data 2. Prediction of noise/vibration isopleths using relevant models in residential, sensitive, commercial and industrial area 3. Assessing Probable impacts of noise on communities due to project activities 4. Assessing impacts of noise and vibration on fauna from projects in ecologically sensitive areas 5. Suggesting mitigation measures 6. Involved in EIA report preparation.

[#] Qualification – Bachelor degree in Technical subjects and Master’s degree in Science, Humanities and other subjects, year of passing and name of university

Declaration by the employer

We have carefully read the provisions in respect of 'Team Members' in the NABET's Scheme for accreditation of EIA Consultants organizations and commit to abide by the same. The conformity of eligibility of the candidates proposed as Team Member in respect of qualification and other aspects has been verified by us at our end. We confirm that the information provided in the application is correct to the best of our knowledge and belief.

We understand that in case the information provided is found wrong/mis-leading, it may result in cancellation of accreditation granted to the organization.

Signature



Name (authorized signatory)

Dr. B. Chakradhar

Designation

Head of the Division

Organization

M/s. Re Sustainability Solutions Private Limited
(formerly known as Ramky Enviro Services Private Limited)

Date

13/10/2023

TERMS OF REFERENCE



THIRU.DEEPAK S. BILGI, I.F.S.
MEMBER SECRETARY

STATE LEVEL ENVIRONMENT IMPACT
ASSESSMENT AUTHORITY-TAMILNADU
3rd Floor, Panagal Maaligai,
No.1, Jeenis Road, Saidapet,
Chennai - 600 015.
Phone No. 044-24359973
Fax No. 044-24359975

TERMS OF REFERENCE (ToR)

Letter No.SEIAA-TN/F.No.10145/7(d)(a)/ToR-1527/2021 Dated:07.08.2023

To

M/s. Medicare Environmental Management Private Limited;
Level-11B; Aurobindo Galaxy;
Knowledge City Road;
HITECH City,
Hyderabad-500081

Sir,

Sub: SEIAA, TN – Proposed Common Bio - Medical Waste Treatment Facility (CBWTF) by M/s.Medicare Environmental Management Private Limited at Plot No. C-6 SIPCOT Industrial Park, Seikalathur Village. Manamadurai Taluk, Sivagangai District, Tamil Nadu – Category ‘BI’ & Schedule Item No. 7(d)(a) – “Common hazardous waste treatment, storage and disposal facilities (TSDFs)” of EIA Notification, 2006 – Issue of Terms of References (ToR) with Public Hearing – Regarding

Ref: 1. Online Proposal No. SIA/TN/INFRA2/429635/2023 dated 29.05.2023.
2. Your application for Terms of Reference dated: 22.06.2023.
3. Minutes of the 394th SEAC meeting held on 21.07.2023.
4. Minutes of the 644th SEIAA meeting held on 07.08.2023.

XXXXXX

The proponent of Medicare Environmental Management Private Limited have


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submitted application for Terms of References (ToR) on 22.06.2023, in Form-I, Pre- Feasibility report and draft ToR for the Proposed Common Bio - Medical Waste Treatment Facility (CBWTF) at Plot No. C-6 SIPCOT Industrial Park, Seikalathur Village. Manamadurai Taluk, Sivagangai District, Tamil Nadu.

Discussion by SEAC and Remarks:

Proposed Common Bio - Medical Waste Treatment Facility (CBWTF) at Plot No. C-6 SIPCOT Industrial Park, Seikalathur Village. Manamadurai Taluk, Sivagangai District, Tamil Nadu by M/s. Medicare Environmental Management Private Limited – For Terms of Reference. (SIA/TN/INFRA2/429635/2023 dated 29.05.2023.)

The proposal is placed for appraisal in this 394th meeting of SEAC held on 21.07.2023. The Project Proponent made a detailed presentation on the proposed project. The details of the project furnished by the proponent are given in the website (parivesh.nic.in).

The SEAC noted the following:

1. The Project Proponent, M/s. Medicare Environmental Management Private Limited has applied seeking Terms of Reference for EIA study the Common Bio - Medical Waste Treatment facility proposed at Plot No. C-6 SIPCOT Industrial Park, Seikalathur Village. Manamadurai Taluk, Sivagangai District, Tamil Nadu.
2. The project/activity is covered under Category “B1” of Item 7d(a) “Common Bio Medical Treatment Facilities (CBWTF)” of the Schedule to the EIA Notification, 2006 as amended.

Based on the presentation made by the proponent, SEAC recommended to grant of **Terms of Reference (TOR) with Public Hearing** for the EIA study subject to the following ToRs in addition to the standard ToR for EIA study for Common Bio Medical Treatment Facilities (CBWTF) and details issued by the MOEF & CC to be included in EIA/EMP Report:

1. **The Project Proponent shall consult the District Pollution Control Board regarding the suitability of the project site for establishing Common Bio - Medical Waste Treatment Facility and furnish the details.**
2. **A gap analysis shall be carried out on the quantity of the Bio Medical Waste generated and availability of the treatment and disposal facilities in the district and furnish report.**
3. **Every industry located in the SIPCOT shall be served individual notice on the**


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place, date and time of public hearing.

4. A detailed note on the technology proposed to be adopted for treatment and disposal of Bio medical waste and the advanced technology currently in practice world-wide shall be furnished.
5. Establishment of the facility as per Bio Medial Waste Management Rules 2016 as amended.
6. Land requirement for the facility including its break up for various purposes, its availability and optimization.
7. Details of proposed layout clearly demarcating various activities such as security.
8. Details on collection and transportation of Bio Medical Waste from health care establishments, No. of vehicles and feature of vehicles, etc.
9. Details of the incineration system – a statement on the compliance to the CPCB guidelines for common bio medical waste incinerators in respect of waste feed cutoffs, operating parameters of combustion chambers, flue gas cleaning, ash handling, etc.
10. Details on fuel requirement for incineration.
11. Details on flue gas emissions discharge through stack analysis of toxic pollutants and proposed pollution control technologies.
12. Details on residue/ash generation and management.
13. Details on area storage of BMW, in case of maintenance flow of waste of detail action plan shall be part at EIA study.
14. Details of the proposed overall safety and health protection measures.
15. Details of the existing access road(s)/walkways to the designed operations in the site and its layout.
16. Land use map based on satellite imagery including location specific sensitivities such as national parks / wildlife sanctuary, villages, industries, etc.
17. Surface water quality of nearby water bodies.
18. Details on proposed groundwater monitoring wells, locations, frequency of monitoring, parameters, etc.
19. Action plan for the greenbelt development in accordance with CPCB published guidelines.
20. Details on pollution control technologies and online monitoring equipments.


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21. Details of the emergency preparedness plan and on-site & off-site disaster management plan.
22. The proponent shall explore the possibility for use of green technology like plasma technology, etc.,
23. The proponent shall conduct Socio-economic and health survey.
24. A detailed incinerator design needs to be submitted on the likelihood of emission, possible types of gases coming out of the process and its measures and mitigation.
25. The proponent shall furnish SOP for the process.
26. The proponent shall conduct a detailed study on water, land and Air quality.
27. Proponent shall furnish the letter received from DFO concerned stating the proximity details of Reserve Forests, Protected Areas, Sanctuaries, Tiger reserve etc., up to a radius of 25 km from the proposed site.
28. The Proponent shall carry out Bio diversity study through reputed Institution and the same shall be included in EIA Report.
29. The Project Proponent shall conduct the hydro-geological study considering the contour map of the water table detailing the number of ground water pumping & open wells, and surface water bodies such as rivers, tanks, canals, ponds etc. within 1 km (radius) along with the collected water level data for both monsoon and non-monsoon seasons from the PWD / TWAD so as to assess the impacts on the wells due to proposed activity. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided.
30. The Proponent shall furnish the baseline data for the environmental and ecological parameters with regard to surface water/ground water quality, air quality, soil quality & flora/fauna including traffic/vehicular movement study.
31. The Proponent shall carry out the Cumulative impact study due to project activity specifically with reference to the specific environment in terms of soil health, biodiversity, air pollution, water pollution, climate change and flood control & health impacts. Accordingly, the Environment Management plan should be prepared keeping the proposed site and the surrounding habitations in the mind.
32. Rain water harvesting management with recharging details along with water balance


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- (both monsoon & non-monsoon) be submitted.
33. Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.
 34. Proximity to Areas declared as 'Critically Polluted' (or) the Project areas which attracts the court restrictions for proposed operations, should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the TNPCB should be secured and furnished to the effect that the proposed project activities could be considered.
 35. Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.
 36. Impact on local transport infrastructure due to the Project should be indicated.
 37. A tree survey study shall be carried out (nos., name of the species, age, diameter etc..) at the project site.
 38. Public Hearing points raised and commitments of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project and to be submitted to SEIAA/SEAC with regard to the Office Memorandum of MoEF& CC accordingly.
 39. The Public hearing advertisement shall be published in one major National daily and one most circulated vernacular daily.
 40. The Proponent shall produce/display the EIA report, Executive summary and other related information with respect to public hearing in Tamil Language also.
 41. As a part of the study of flora and fauna around the vicinity of the proposed site, the EIA coordinator shall strive to educate the local students on the importance of preserving local flora and fauna by involving them in the study, wherever possible.


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42. The purpose of Greenbelt around the project is to capture the fugitive emissions, carbon sequestration and to attenuate the noise generated, in addition to improving the aesthetics. A wide range of indigenous plant species should be planted as given in the **Appendix-I** in consultation with the DFO, & Tamil Nadu Agriculture University. The plant species with dense/moderate canopy of native origin should be chosen. Species of small/medium/tall trees alternating with shrubs should be planted in a mixed manner.
43. Taller/one year old Saplings raised in appropriate size of bags, preferably eco-friendly bags should be planted as per the advice of local forest authorities/botanist/Horticulturist with regard to site specific choices. The proponent shall earmark the greenbelt area with GPS coordinates all along the boundary of the project site with at least 3 meters wide and in between blocks in an organized manner.
44. A Disaster management Plan and Risk Assessment and management Plan shall be prepared and included in the EIA/EMP Report.
45. Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the project site area may be detailed.
46. Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.
47. The Socio-economic studies should be carried out within a 5 km buffer zone from the project site. Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.
48. Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.
49. Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment


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potential, etc.

50. The Proponent shall prepare the EMP for the entire life of project and also furnish the sworn affidavit stating to abide the EMP for the entire life of project.
51. Concealing any factual information or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this Terms of Conditions besides attracting penal provisions in the Environment (Protection) Act, 1986.

STANDARD TERMS OF REFERENCE FOR CONDUCTING ENVIRONMENT IMPACT ASSESSMENT STUDY FOR BIO-MEDICAL WASTE TREATMENT FACILITIES AND INFORMATION TO BE INCLUDED IN EIA/EMP REPORT.

I. Project Details

- i. Importance and benefits of the project.
- ii. Reasons for selecting the site with details of alternate sites examined/rejected/selected on merit with comparative statement and reason/basis for selection. The examination should justify site suitability in terms of environmental damages, resources sustainability associated with selected site as compared to rejected sites. The analysis should include parameters considered along with weightage criteria for short-listing selected site.
- iii. The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.
- iv. Details of various waste management units with capacities for the proposed project. Details of utilities indicating size and capacity to be provided.
- v. List of waste to be handled and their characteristics. Details of temporary storage facility for storage of Bio-medical waste at project site.
- vi. Other chemicals and materials required with quantities and storage capacities.
- vii. Detailed design of pre-treatment and waste stabilization facility of Bio-


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medical waste.

- viii. Project proponents would also submit a write up on how their project proposal conform to the stipulations made in the " Bio-Medical Waste Management Rules, 2016 ", notified by the MoEF&CC on 28th March, 2016.
 - ix. Process description along with major equipment and machineries, process flow sheet (quantitative) from *Bio-Medical waste* material to disposal to be provided.
 - x. Details of man-power requirement (regular and contract).
 - xi. A detailed layout of the project site indicating all the project components.
- II. Road and Traffic**
- xii. Submit the details of the road/rail connectivity along with the likely impacts and mitigative measures
 - xiii. Examine the details of transportation of Bio-Medical wastes, and its safety in handling.
- III. Land Environment**
- xiv. Detailed soil analysis of the site including its permeability, waterholding capacity be included.
 - xv. Submit the present land use and permission required for any conversion such as forest, agriculture etc.
 - xvi. Specify the land area and space allotted for each activity proposed within the facility. The area requirements for each activity shall be calculated as per the CPCB guidelines for the specified activity.
 - xvii. Status of the land purchases in terms of land acquisition Act. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land.
 - xviii. The EIA would address to the conformity of site to the stipulations as made in the Bio-Medical Waste Management Rules, 2016 and Hazardous and Other Wastes (Management and Trans-boundary Movement) Rules, 2016 and will have a complete chapter indicating


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conformity to the said rules. NOC shall be obtained from State Pollution Control Board/Committee (SPCB/SPCC) regarding site suitability for establishment of Bio-Medical Waste Treatment Facilities.

xix. Post project reclamation management program with financial allocation.

IV. Environmental Monitoring and Management

xx. Examine and submit the details of on-line pollutant monitoring.

xxi. Project proponent must ensure Good Combustion Practice (GCP) to reduce the possibilities of formation of 'Total dioxins and furans'. In addition, GCP must be coupled with appropriate End-of-the-pipe treatment at low temperature to reduce the emission of 'Total dioxins and furans' below the standards. Further, the project proponent must provide detailed Standard operating procedure (SOPs) for sampling and monitoring of 'Total dioxins and furans'.

xxii. Environmental Management Plan should be accompanied with Environmental Monitoring Plan and environmental cost and benefit assessment. Regular monitoring shall be carried out for odour control

xxiii. Water quality around the landfill site shall be monitored regularly to examine the impact on the ground water.

xxiv. A detailed draft EIA/EMP report should be prepared in accordance with the above additional TOR and should be submitted to the Ministry in accordance with the Notification.

xxv. Air Quality Index shall be calculated for base level air quality.

xxvi. Baseline data on Ground water quality is required.

xxvii. Possible carbon footprint contribution from each activities and mitigation measures proposed shall be included as part of Environment Management Plan.

V. Waste Management

xxviii. Examine and submit details of the proposed odour control measures.

xxix. The storage and handling of Bio-Medical wastes shall be as per the Bio-Medical Waste Management Rules, 2016.


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xxx. Details of storage and disposal of pre-processing and post-processing rejects/inerts and products. List of proposed end receivers for the rejects/inerts/products should be provided. MoUs to be submitted in this regard.

xxxi. Details of hazardous/solid waste generation and their management.

VI. Water Environment

xxxii. Detailed hydro-geological studies and possible impact if any accidental contamination occurs shall be included.

xxxiii. Examine and submit details of monitoring of water quality around the landfill site.

xxxiv. Examine and submit details of impact on water body and mitigative measures during rainy season.

xxxv. Details of Drainage of the project up to 5 km radius of study area. If the site is within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on

peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided.

VII. Water Management

xxxvi. Details of effluent treatment and recycling process.

xxxvii. A certificate from the local body supplying water, specifying the total annual water availability with the local authority, the quantity of water already committed, the quantity of water allotted to the project under consideration and the balance water available. This should be specified separately for ground water and surface water sources, ensuring that there is no impact on other users.

VIII. Energy Management

xxxviii. A certificate of adequacy of available power from the agency supplying power to the project along with the load allowed for the project.


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IX. Disaster Management Plan

xxxix. Submit details of a comprehensive Disaster Management Plan including emergency evacuation during natural and man-made disaster.

xl. Hazard identification and proposed mitigation measures.

X. Green Belt

xli. A detailed Plan for green belt development.

XI. Socioeconomic Environment

xlii. Public hearing to be conducted for the project in accordance with provisions of Environmental Impact Assessment Notification, 2006 and the issues raised by the public should be addressed in the Environmental Management Plan. The Public Hearing should be conducted based on the ToR letter issued by the Ministry and not on the basis of Minutes of the Meeting available on the web-site.

xliii. The project proponents shall satisfactorily address all the complaints/suggestions that have been received against the project till the date of submission of proposals for Appraisal.

XII. Court Cases

xliv. Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.

XIII. Miscellaneous

xlv. Any further clarification on carrying out the above studies including anticipated impacts due to the project and mitigative measure, project proponent can refer to the model ToR available on Ministry website <http://moef.nic.in/Manual/Incinerator>



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Appendix -I
List of Native Trees Suggested for Planting

No	Scientific Name	Tamil Name	Tamil Name
1	<i>Aegle marmelos</i>	Vilvam	வில்வம்
2	<i>Adenanthera pavonina</i>	Manjadi	மஞ்சாடி, ஆனைக்குன்றுமணி
3	<i>Albizia lebbek</i>	Vaagai	வாகை
4	<i>Albizia amara</i>	Usil	உசில்
5	<i>Bauhinia purpurea</i>	Mandharai	மந்தாரை
6	<i>Bauhinia racemosa</i>	Aathu	ஆத்தி
7	<i>Bauhinia tomentosa</i>	Iruvathu	இருவாத்தி
8	<i>Buchanania axillaris</i>	Nattuma	காட்டுமா
9	<i>Borassus flabellifer</i>	Panai	பனை
10	<i>Butea monosperma</i>	Murukkamaram	முருக்கமரம்
11	<i>Bobax ceiba</i>	Ilavu, Sevvilavu	இலவு
12	<i>Calophyllum inophyllum</i>	Punnai	புள்ளை
13	<i>Cassia fistula</i>	Sarakondrai	சரக்கொன்றை
14	<i>Cassia roxburghii</i>	Sengondrai	செங்கொன்றை
15	<i>Chloroxylon swietenia</i>	Purasamaram	பரசு மரம்
16	<i>Cochlospermum religiosum</i>	Kongu, Manjallavu	கோங்கு, மஞ்சள் இலவு
17	<i>Cordia dichotoma</i>	Naruvuli	நருவளி
18	<i>Creteva adansonii</i>	Mavalingum	மாவிலங்கம்
19	<i>Dillenia indica</i>	Uva, Uzha	உசா
20	<i>Dillenia pentagyna</i>	SiruUva, Sitruzha	சிறு உசா
21	<i>Diospyro sebenum</i>	Karungali	கருங்காலி
22	<i>Diospyro schloroxylon</i>	Vaganai	வாகனை
23	<i>Ficus amplissima</i>	Kalltchi	கல் இச்சி
24	<i>Hibiscus tiliaceus</i>	Aatrupoovarasu	ஆற்றுப்புலரசு
25	<i>Hardwickia binata</i>	Aacha	ஆச்சா
26	<i>Holoptelia integrifolia</i>	Aavili	ஆயா மரம், ஆயில்
27	<i>Lanea coronandolica</i>	Odhiam	ஓதியம்
28	<i>Lagerstroemia speciosa</i>	Poo Marudlu	பூ மருது
29	<i>Lepisanthus tetraphylla</i>	Neikottaimaram	நெய் கொட்டை மரம்
30	<i>Linonia acidissima</i>	Vila maram	வில்லா மரம்
31	<i>Litsea glutinos</i>	Pisinpattai	பின்பட்டை
32	<i>Madhuca longifolia</i>	Iluppai	இலுப்பை
33	<i>Manilkara hexandra</i>	UlakkaiPaalai	உலக்கை பாலை
34	<i>Mimusops elengi</i>	Magizhamaram	மகிழ்மரம்
35	<i>Mitragyna parvifolia</i>	Kadambu	கடம்பு
36	<i>Morinda pubescens</i>	Nuna	நுணா
37	<i>Morinda citrifolia</i>	Vellai Nuna	வெள்ளை நுணா
38	<i>Phoenix sylvestre</i>	Eachai	ரச்சமரம்
39	<i>Pongamia pinnat</i>	Pungam	புங்கம்

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40	<i>Premna mollissima</i>	Munna	முன்னை
41	<i>Premna serratifolia</i>	Narumunna	நறு முன்னை
42	<i>Premna tomentosa</i>	Malapoovarasu	மலை பூவரசு
43	<i>Prosopis cinerea</i>	Vanri maram	வள்ளி மரம்
44	<i>Pterocarpus marsipium</i>	Vengai	வேங்கை
45	<i>Pterospermum canescens</i>	Vennangu, Tada	வெண்ணாங்கு
46	<i>Pterospermum xylocarpum</i>	Polavu	புலவு
47	<i>Putranjiva roxburghii</i>	Karipala	கறிபாலா
48	<i>Salvadora persica</i>	Ugaa Maram	உகா மரம்
49	<i>Sapindus emarginatus</i>	Manipungan, Soapukai	மணிப்புங்கன் சோப்புக்காய்
50	<i>Saraca asoca</i>	Asoca	அசோகா
51	<i>Streblus asper</i>	Piray maram	பிராய் மரம்
52	<i>Strychnos nuxvomica</i>	Yetti	எட்டி
53	<i>Strychnos potatorum</i>	Therthang Kottai	தேத்தான் கொட்டை
54	<i>Syzygium cumini</i>	Naval	நாவல்
55	<i>Terminalia bellerica</i>	Thandri	தான்றி
56	<i>Terminalia arjuna</i>	Ven marudhu	வெண் மருது
57	<i>Toona ciliata</i>	Sandhana venbu	சந்தன வேம்பு
58	<i>Thespesia populnea</i>	Puvarasu	பூவரசு
59	<i>Walsuratrifoliata</i>	valsura	வால்கரா
60	<i>Wrightia tinctoria</i>	Veppalai	வெப்பாலை
61	<i>Pithecellobium dulce</i>	Kodukkapuli	கொடுக்காப்புளி

Discussion by SEIAA and Remarks:

Proposed Common Bio - Medical Waste Treatment Facility (CBWTF) at Plot No. C-6 SIPCOT Industrial Park, Seikalathur Village, Manamadurai Taluk, Sivagangai District, Tamil Nadu by M/s. Medicare Environmental Management Private Limited – For Terms of Reference

The subject was placed in this 644th meeting of Authority held on 07 .08.2023. The Authority noted that the subject was placed in the 394th meeting of SEAC held on 21.07.2023 and the SEAC has furnished its recommendation for the grant of **Terms of Reference (ToR) with Public Hearing** for the EIA study subject to the conditions stated therein.

After detailed discussions, the Authority taking into account the recommendations of SEAC and also the safety aspects and to ensure sustainable, scientific and systematic mining, decided

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to grant Terms of Reference along with public hearing subject to the standard ToR prescribed by MoEF & CC for Common Bio Medical Waste Treatment Facilities(CBMWTF) along with the following additional ToR:

1. The pp shall furnish impact of biomedical waste on contamination of water, surface water, storage details, safety of rodents, stray animals, rack pickers etc.
2. The pp shall furnish impact of biomedical waste storage, packaging & labelling.
3. The pp shall furnish impact of biomedical waste pollution from radioactive particles, needle shots, plastic waste, chemical waste, volatile, solvent, Aesthetic waste, pathological waste & hazardous Waste.
4. The pp shall furnish impact of biomedical waste treatment facility on the nearby Local communities nearby and staffs.
5. The pp shall furnish precautionary measures for the nearby local community in regard to deep burial, auto calving, recycling, & Inceniration.
6. New technologies available for reuse and recycling/ disposal of Biomedical wastes.

STANDARD TERMS OF REFERENCE (ToR) FOR EIA/EMP REPORT FOR PROJECTS/ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

7(d): STANDARD TERMS OF REFERENCE FOR CONDUCTING ENVIRONMENT IMPACT ASSESSMENT STUDY

- 1) Reasons for selecting the site with details of alternate sites examined/rejected/selected on merit with comparative statement and reason/basis for selection. The examination should justify site suitability in terms of environmental damages, resources sustainability associated with selected site as compared to rejected sites. The analysis should include parameters considered along with weightage criteria for short-listing selected site.
- 2) Submit the details of the road/rail connectivity along with the likely impacts and mitigative measures
- 3) Submit the present land use and permission required for any conversion such as forest, agriculture etc
- 4) Examine the details of transportation of Hazardous wastes, and its safety in handling.
- 5) Examine and submit the details of on line pollutant monitoring.
- 6) Examine the details of monitoring of Dioxin and Furon.


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- 7) MoU for disposal of ash through the TSDF.
- 8) MoU for disposal of scrubbing waste water through CETP.
- 9) Examine and submit details of monitoring of water quality around the landfill site.
- 10) Examine and submit details of the odour control measures.
- 11) Examine and submit details of impact on water body and mitigative measures during rainy season.
- 12) Environmental Management Plan should be accompanied with Environmental Monitoring Plan and environmental cost and benefit assessment. Regular monitoring shall be carried out for odour control.
- 13) Water quality around the landfill site shall be monitored regularly to examine the impact on the ground water.
- 14) The storage and handling of hazardous wastes shall be as per the Hazardous Waste Management Rules.
- 15) Submit details of a comprehensive Disaster Management Plan including emergency evacuation during natural and man-made disaster.
- 16) Public hearing to be conducted for the project in accordance with provisions of Environmental Impact Assessment Notification, 2006 and the issues raised by the public should be addressed in the Environmental Management Plan. The Public Hearing should be conducted based on the ToR letter issued by the Ministry and not on the basis of Minutes of the Meeting available on the web-site.
- 17) A detailed draft EIA/EMP report should be prepared in accordance with the above additional TOR and should be submitted to the Ministry in accordance with the Notification.
- 18) Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.
- 19) The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.
- 20) Any further clarification on carrying out the above studies including anticipated impacts due to the project and mitigative measure, project proponent can refer to the model ToR available on Ministry website "<http://moef.nic.in/Manual/Incinerator>"


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The Executive summary of the EIA/EMP report in about 8-10 pages should be prepared incorporating the information on following points:

1. Project name and location (Village, District, State, and industrial Estate (If applicable).
2. Products and capacities. If expansion proposal then existing products with capacities and reference to earlier EC.
3. Requirement of land, raw material, water, power, fuel, with source of supply(Quantitative)
4. Process description in brief specifically indicating the gaseous emission, liquid effluent and solid and hazardous wastes.
5. Measures for mitigating the impact on the environment and mode of discharge or disposal.
6. Capital cost of the project, estimated time of completion.
7. Site selected for the project- Nature of land-Agricultural(Single/double crop), barren, Govt/Private land, status of its acquisition, nearby (in 2-3 km), water body,, population, with in 10km other industries, forest, eco-sensitive zones, accessibility,(note-I case of industrial estate this information may not be necessary)
8. Baseline environmental data-air quality, surface and ground water quality, soil characteristic, flora and fauna, socio-economic condition of the nearby population
9. Identification of hazards in handling, processing and storage of hazardous material and safety system provided to mitigate the risk.
10. Likely impact of the project, on air, water, land, flora-fanua and nearby population
11. Emergency preparedness plan in case of natural or in plant emergencies.
12. Issues raised during public hearing (If applicable) and response given
13. CSR plan with proposed expenditure.
14. Occupational Health Measures.
15. Post project monitoring plan.

Besides the above, the below mentioned general points should also be followed:

1. The EIA document shall be printed on both sides, as for as possible.
2. All documents should be properly indexed, page numbered.
3. Period/date of data collection should be clearly indicated.

4. Authenticated English translation of all material provided in Regional languages.
5. The letter/application for EC should quote the MoEF & CC File No. and also attach a copy of the letter prescribing the ToR.
6. The copy of the letter received from the Ministry on the ToR prescribed for the project should be attached as an annexure to the final EIA-EMP Report.
7. The final EIA-EMP report submitted to the Ministry must incorporate the issues mentioned in ToR. The index of the final EIA-EMP report, must indicate the specific chapter and page no. of the EIA-EMP Report where the specific ToR prescribed by the Ministry have been incorporated. Questionnaire related to the project (posted on MoEF&CC website) with all sections duly filled in shall also be submitted at the time of applying for EC.
8. Grant of ToR does not mean grant of EC.
9. The status of accreditation of the EIA consultant with NABET/QCI shall be specifically mentioned. The consultant shall certify that his accreditation is for the sector for which this EIA is prepared.
10. On the front page of EIA/EMP reports, the name of the consultant/consultancy firm along with their complete details including their accreditation, if any shall be indicated. The consultant while submitting the EIA/EMP report shall give an undertaking to the effect that the prescribed ToRs (ToR proposed by the project proponent and additional ToR given by the MoEF & CC) have been complied with and the data submitted is factually correct (Refer MoEF & CC Office memorandum dated 4th August, 2009).
11. While submitting the EIA/EMP reports, the name of the experts associated with/involved in the preparation of these reports and the laboratories through which the samples have been got analysed should be stated in the report. It shall clearly be indicated whether these laboratories are approved under the Environment (Protection) Act, 1986 and the rules made there under (Please refer MoEF&CC Office Memorandum dated 4th August, 2009). The project leader of the EIA study shall also be mentioned.
12. All the ToR points as presented before the State Expert Appraisal Committee (SEAC) shall be covered.


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13. The project proponent shall submit the detailed final EIA/EMP prepared as per ToR to the Ministry for considering the proposal for environmental clearance within 3 years as per the MoEF & CC O.M. No.J-11013/41/2006-IA-11(1) (P) dated 08.10.2014.
14. The consultants involved in preparation of EIA/EMP report after accreditation with Quality Council of India/National Accreditation Board of Education and Training (QCI/NABET) would need to include a certificate in this regard in the EIA/EMP reports prepared by them and data provided by other Organization(s)/ Laboratories including their status of approvals etc. vide Notification of the MoEF & CC dated 19.07.2013.
15. The prescribed ToR would be valid for a period of three years for submission of the EIA/EMP Reports.
16. A note confirming compliance of the ToR, with cross referencing of the relevant section/ pages of the EIA report should be provided.
17. All documents may be properly referenced with index, page numbers and continuous page numbering.
18. Copy of permission related to Port facility, Desalination plant, wind mill/solar power plant from competent Authority.
19. Where data are presented in the report especially in tables, the period in which the data were collected and the sources should be indicated.
20. While preparing the EIA report, the instructions for the proponents and instructions for the consultants issued by MoEF & CC vide O.M. J-11013/41/2006-IA-II(I) dated 4th August, 2009, which are available on the website of the Ministry should also be followed.
21. The consultants involved in the preparation of EIA/EMP report after accreditations with quality Council of India (QCI)/National Accreditation Board of Education and Training (NABET) would need to include a certificate in this regard in the EIA/EMP reports prepared by them and data provided by other organization/Laboratories including heir status of approvals etc. In this regard circular no. F.No. J-11013/77/2004-IA-II(I) dated 2nd December, 2009, 18th March 2010, 28th May 2010, 28th June 2010, 31st December 2010 & 30th September 2011 posted on the Ministry's website <http://www.moef.nic.in/> may be referred


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After preparing the EIA (As per the generic structure prescribed in Appendix-III of the EIA Notification, 2006) covering the above mentioned points, the proponent will take further necessary action for obtaining environmental clearance in accordance with the procedure prescribed under the EIA Notification, 2006.

The final EIA report shall be submitted to the SEIAA, Tamil Nadu for obtaining Environmental Clearance.

The TORs prescribed shall be **valid for a period of three years** from the date of issue, for submission of the EIA/EMP report as per O.M. No. J-11013/41/2006-IA-II (I)(part) dated 29th August, 2017.

The receipt of this letter may be acknowledged.


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Copy to:

1. The Additional Chief Secretary to Government, Environment & Forests Dept,
Govt. of Tamil Nadu, Fort St. George, Chennai - 9.
2. The Principal Secretary to Government, Industrial Department,
Govt. of Tamil Nadu, Fort St. George, Chennai - 9.
3. The Chairman, Central Pollution Control Board, Parivesh Bhavan,
CBD Cum-Office Complex, East Arjun Nagar, New Delhi - 110 032.
4. The Member Secretary, Tamil Nadu Pollution Control Board,
76, Mount Salai, Guindy, Chennai - 600 032.
5. The CCF, Regional Office, Ministry of Environment & Forest (SZ),
34, HEPC Building, 1st & 2nd Floor, Cathedral Garden Road, Nungambakkam, Chennai - 34.
6. Monitoring Cell, I A Division, Ministry of Environment & Forests,
Paryavaran Bhavan, CGO Complex, New Delhi - 110 003.
7. The District Collector, Sivagangai District.
8. Stock File.

TERMS OF REFERENCE COMPLIANCE

Terms of Reference (ToR) Compliance

Sl.No.	ToR Points	ToR Compliance
Standard ToR		
I. Project Details		
i	Importance and benefits of the project	(i) Better Effective administration and management of Bio-medical waste covering around 7000 beds within Manamadurai Taluk (ii) Reduction of pollution load on environment, (iii) Reduced environmental liability for health care establishments, (iv) Employment opportunities for Indirect and direct employment during construction and operation will be around 50 persons.
ii	Reasons for selecting the site with details of alternate sites examined/rejected/selected on merit with comparative statement and reason/basis for selection. The examination should justify site suitability in terms of environmental damages, resources sustainability associated with selected site as compared to rejected sites. The analysis should include parameters considered along with weightage criteria for short-listing selected site	The proposed site is located within SIPCOT Industrial Park. As per site selection criteria, the proposed site is suitable for establishment of the facility. However, according to the above location criteria as per revised guidelines of CBWTF, 2016 the proposed CBWTF is 500 m far from all sensitive areas and hence no alternative site were examined or considered. Hence the site is considered for setting up the proposed project. The detailed site analysis are given in Chapter 5 Table 5.1.
iii	The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.	The capital cost for the proposed project is estimated to be around Rs.4.96 Crores. The capital cost allocated for EMP is around Rs.49.6 Lakhs with a recurring cost of Rs.4.96 Lakhs per annum.
iv	Details of various waste management units with capacities for the proposed project. Details of utilities indicating size and capacity to be provided.	<ul style="list-style-type: none"> ● Incinerator – 2 X 250 kg/hr ● Autoclave - 1275 liters/batch ● Shredder - 250 kg/hr ● ETP – 8 KLD ● DG set – 1 X 150 kVA
v	List of waste to be handled and their characteristics. Detail of temporary	The proposed facility facilitate the treatment of all BMW categories as per

	storage facility for Storage of Bio-medical waste at project site.	BMW management rules, 2016 covering from HCEs/HCFs in and around Sivagangai district. The characteristics of the BMW include infectious, sharp objects, anatomical waste, contaminated body fluids etc., as per BMW management rules, 2016. The BMW waste at the project site is stored temporarily in waste storage area of 189.93 Sq.m.
Vi	Other chemicals and materials required with quantities and storage capacities.	The other chemicals used in the project are mainly for ETP treatment. The chemicals used are lime, polyelectrolytes, alum etc. The diesel fuel is used for initial startup of incinerator.
Vii	Detailed design of pre-treatment and waste stabilization facility of Bio- medical waste	The pre treatment of all plastic waste such as are autoclaved for total disinfection and destruction of bacterial contamination and sent to shredder for recycling the same. Similarly all glass medicine vials and ampoules except those contaminated with cytotoxic wastes will sent for autoclaving and recycling end use. <ul style="list-style-type: none"> • Autoclave - 1275 liters/batch • Shredder - 250 kg/hr
viii	Project proponents would also submit a write up on how their project proposal conform to the stipulations made in the “Bio-Medical Waste Management Rules, 2016” notified by the MoEF&CC on 28 th March 2016.	The compliance on applicable rules and guidelines for CBWTF as per “Bio-Medical Waste Management Rules, 2016” notified by the MoEF&CC on 28 th March 2016 and Revised guidelines for CBWTF by CPCB on 21 st Dec 2016 is given in Table 2.13 .
Ix	Process description along with major equipment and machineries, process flow sheet (quantitative) from Bio-Medical waste material to disposal to be provided.	The detailed process description of major equipment and machineries used in the process of treating BMW and disposal is given in Chapter 2 - Section 2.7 .
X	Details of man-power requirement (regular and contract).	Indirect and direct employment during construction and operation will be around 50 (Administrative – 8, Skilled-5, Unskilled – 20, other categories - 17). The

		detailed breakup of manpower Table 2.7.
xi	A detailed layout of the Project site indicating all the project components.	The BMW project is executed in an area of 14569 sq.m, out of which the BMW processing is carried out in 450 sq.m and majority of 4800 sq.m is allocated for greenbelt area. In the rest of area waste storage shed, vehicle parking, ETP and workers washrooms etc are provided. The site layout plan with detailed breakup of land area is given Table 2.3 & Figure 2.5.
II. Road and Traffic		
xii	Submit the details of the road/rail connectivity along with the likely impacts and mitigative measures	The proposed site is well connected to major roads around the project. NH-36 is situated 1.31 km (E) from the project site. The traffic study was examined near site and details of traffic study are given in Chapter 3 - Table 3.18. The existing traffic scenario of site connecting road is given in Chapter 3 - Table 3.19.
xiii	Examine the details of transportation of Bio-Medical wastes and its safety in handling.	The BMW will be transported to the facility in a fully covered dedicated vehicles for transportation of BMW only. Vehicles used for collection of BMW from member HCFs units should will be registered under Motor vehicle Act with respective RTO/Transport department and SPCB/PCC. Depending upon the volume of the waste to be transported the vehicle may be a two or three-wheeler, light motor vehicle or heavy duty vehicle. The detailed description of transportation of BMW is given in Chapter 2 - Section 2.7.2 (5)
III. Land Environment		
xiv	Detailed soil analysis of the site including its permeability, water holding capacity be included.	The soil analysis of the site is given in Chapter 3 Table 3.21. The permeability of the soil is 2.5 cm/hour and water holding capacity of the soil 1 inch/foot.

Xv	Submit the present land use and Permission required for conversion such as forest, agriculture etc.	The proposed site is located within SIPCOT Industrial Park, Seikalathur (V), Manamadurai (T), Sivagangai (D), Tamil Nadu. The present land is allotted by SIPCOT for setting up of industrial unit for Bio Medical Waste Treatment Facility vide P-III/SIP-MNM/Medicare/2022 dt. 23.12.2022.
xvi	Specify the land area and space allotted for each activity proposed within the facility. The area requirements for each activity shall be calculated as per the CPCB guidelines for the specified activity.	It is proposed to setup the CBWTF in 14569.00 Sq.m (3.60 ac) at Plot No.C-6, SIPCOT Industrial Park. The details of area requirements for each activity is provided in Chapter 2 - Table 2.3.
Xvii	Status of the land purchase in terms of land acquisition Act. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land.	The land is allotted to M/s. Medicare Environmental Management Private Limited vide P-III/SIP-MNM/Medicare/2022 dt. 23.12.2022 by SIPCOT for establishing the BMW facility.
Xviii	The EIA would address to the conformity of site to the stipulations as made in the Bio-Medical Waste Management Rules, 2016 and Hazardous and Other Wastes (Management and Trans-boundary Movement) Rules, 2016 and will have a complete chapter indicating conformity to the said rules. NOC shall be obtained from State pollution Control Board/Committee (SPCB/SPCC) regarding site suitability for establishment of Bio-Medical waste Treatment Facilities.	<p>The proposed BMW project is to be established in a notified SIPCOT industrial park which is in operation since 1971. The project area of 3.6 acres is identified within the SIPCOT industrial park and approved by SIPCOT Industrial Park to establish the same. The land is allotted to M/s. Medicare Environmental Management Private Limited vide P-III/SIP-MNM/Medicare/2022 dt. 23.12.2022</p> <p>The details regarding location criteria as per the stipulated rules is given in detail in Chapter 5 – Section 5.2.</p> <p>To obtain NOC from SPCB, correspondence request is already initiated. NOC from State pollution Control Board/Committee (SPCB/SPCC) regarding site suitability for establishment of Bio-Medical waste</p>

		Treatment Facility will also be provided.
Xix	Post project reclamation management program with financial allocation.	No land fill is proposed within the site, as post project reclamation is not envisaged.
IV. Environmental Monitoring and Management		
xx.	Examine and submit the details of on-line pollutant monitoring.	On-line monitoring system/flue gas analyzer will be fitted with the incinerator for flue gas analysis. Parameters to be monitored online include CO ₂ , O ₂ , CO and the data shall be transmitted real time to the servers at respective SPCB/PCC. All necessary air pollution control devices shall be put in place to ensure compliance of emission standards as prescribed in Bio-Medical Waste Management Rules, 2016 and its subsequent amendments.
Xxi	Project proponent must ensure Good Combustion practice (GCP) to reduce the possibilities of formation of Total dioxin, and furans. In addition, GCP must be coupled with appropriate End-of-the-pipe treatment at low temperature to reduce the emission of 'Total dioxins and furans' below the standards. Further, the project proponent must provide detailed Standard operating procedure (SOPs) for sampling and monitoring of 'Total dioxin and furans'.	As per Bio-Medical Waste Management Rules 2016 and its subsequent amendments, HCEs are required to phase out use of chlorinated plastic bags, gloves and blood bags. The proposed facility utilizes non-chlorinated plastic colored bags only. For obtaining GCP a proper air -to- fuel ratio of around 1 to 1.5 will be maintained for complete combustion to avoid CO emission levels. To avoid formation of dioxins and furans the flue gas temperature must be reduced from 500 °C to 200°C by gas cooler gas neutralization methodology. The flue gas is also further treated in dry scrubbing to remove all the harmful gaseous pollutants. The incinerator shall comply with the standards of dioxins and furans as per the rules and shall ensure good combustion practice to reduce the possibilities of formation of Total dioxin and furans. Waste to be incinerated shall not be chemically treated with any chlorinated

		disinfectants. As per Bio-Medical Waste Management Rules 2016 and subsequent amendments, monitoring of dioxins and furans shall be done once in a year through a professional third party (in the presence of PCB officials, if required).
Xxii	Environmental Management Plan should be accompanied with Environmental Monitoring plan and environmental cost and benefit assessment. Regular monitoring shall be carried out for odour control	Environmental Management Plan (EMP) has been prepared to mitigate the adverse impacts on environment. Details of item-wise cost for implementation of EMP (including capital cost and annual recurring cost) is presented in Chapter 6 - Table 6.3 . Details of Environmental monitoring plan is presented in Chapter 6 - Table 6.2
xxiii	Water quality around the landfill site shall be monitored regularly to examine the impact on the ground water.	No landfill is proposed for the facility as it is a CBWTF. Ground and surface water samples were collected around the proposed site within 10km radius. All samples were analysed for physical and chemical characteristics. Chapter 3 -Table 3.13 presents analysis results of ground water samples and Table 3.14 presents analysis results of surface water samples. The ground water samples in the nearby villages will be monitored regularly as per CFE conditions
Xxiv	A detailed draft EIA/EMP report should be prepared in accordance with the above additional ToR and should be submitted to the Ministry in accordance with the Notification.	Noted and Complied. EIA report has been prepared in accordance with Generic structure of EIA notification, standard ToR and ToR issued and shall be submitted to SEIAA, Tamil Nadu
Xxv	Air Quality Index shall be calculated for base level air quality.	Air Quality Index (AQI) is ranging from 40 – 54 of the study area and is falling under good to satisfactory category as per MoEF&CC - 'The National Air Quality Index' (AQI). The details of the same is given in Chapter 3 - Table 3.11
Xxvi	Baseline data on Ground water quality is required.	To assess ground water quality during the study period 10 GW samples were collected from different sources within

		the study area. The analytical results of the ground water samples were compared with IS: 10500-2012 drinking water standards. The results were are within the permissible limits. The details of the ground water results are given in Chapter 3 – Section 3.6.1 & Table 3.13
Xxvii	Possible carbon footprint contribution from each activities and mitigation measures proposed shall be included at Part of Environment Management Plan.	The expected annual carbon emission of proposed CBWTF is around 24763 kg.The brief details are given in Chapter 9 – Section 9.6
V. Waste Management		
xxviii	Examine and submit details of the proposed odour control measures,	It shall be ensured that the total time taken from generation of bio-medical waste to its treatment, which also includes collection and transportation time, shall not exceed 48 hours. During transportation, the containers shall be covered in order to prevent exposure of public to odors and contamination. Good housekeeping practices shall be adopted. Dilution of odor concentration by spraying ecosorb (organic and biodegradable chemical) around odor generation areas at regular intervals. Plantation of trees to reduce the odor and to carry out the process in closed room for controlling/minimizing odor. Details are presented in Chapter 9 - Section 9.4.1
xxix.	The storage and handling of Bio-Medical wastes shall be as per the Bio-Medical Waste Management Rules, 2016.	All necessary steps will be taken to ensure that all the operations of collection, transportation, handling, storing, treatment, and disposal will carried out without adverse effect on environment and in accordance with Bio-Medical Waste Management rules, 2016 and its subsequent amendments.
Xxx	Details of storage and disposal of pre-processing and post processing	Since it is a CBWTF, only BMW shall be collected and disposed in line with the

	rejects/inerts and products. List of proposed end receivers for the rejects/inerts/products should be provided. MoUs to be submitted in this regard.	provisions of Common Bio-medical Waste Management Facility. The ash generated during the incineration of BMW shall be sent to an authorised Common Hazardous Waste Treatment,Storage and Disposal Facility for disposal in the secured landfill. Hence no pre-processing and post processing rejects/inerts shall be generated at the above facility.
Xxxi	Details of hazardous/solid waste generation and their management.	Ash generated from the incinerator of around 170 kg/day and sludge from ETP of 1 kg/day will be sent to authorized CHWTSDF, waste oil from DG set of 2LPD will be sent to oil recovery facility and MSW of 1 kg/day shall be sent to the nearest municipal bin. The details of the same are enclosed in Chapter 2 – Section 2.5.3
VI. Water Environment		
xxxii	Detailed hydro-geological studies and Possible impact if any accidental contamination occurs shall be included.	The detailed study of hydrogeology along with the possible impacts if any accidental contamination are given in Chapter 7 – Section 7.12
Xxxiii	Examine and submit details of monitoring of water quality around the landfill site.	No landfill proposed for the facility. Ground and surface water samples were collected around the proposed site within 10km radius. All samples were analysed for physical and chemical characteristics. Chapter 3 -Table 3.13 presents analysis results of ground water samples and Table 3.14 presents analysis results of surface water samples.
Xxxiv	Examine and submit details of impact on water body and mitigative measures during rainy season.	There are no water bodies in the site and its immediate surroundings within 1 km. The entire wastewater generated from process and domestic activities will be treated and reused within the project, no treated wastewater will be discharged outside the project. Rainwater from built-

		up areas will be collected during a rainy day, and channeled to storage tank for reuse. And rainwater from road and parking, greenbelt, small built-up and other areas, will be collected separately and channeled to storm water drains to ETP for treatment (in-house effluent treatment plant), the treated water is stored and reused, as a fresh water conservation measure. If any excess will be discharged into common storm water drain outside after meeting the discharge standards.
Xxxv	Details of Drainage of the project up to 5 km radius of study area. If the site is within 1 km radius of any major river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided.	The drainage map of the project site covering 5 km radius study area is given as Figure 7.7. No major river is present within 1 km radius of the project site, the nearest minor river Vaigai is around 3.30 km (southwest). Vaigai river peak and lean discharges are 36 and 28 m ³ /sec. River high flood level is 41.475m amsl (Source: Paramakudi Base station, Central Water Commission of India dated 20.11.1979). The site elevation is at 88 m amsl and the flood occurrence frequency would be 30-years. The peak rainfall is 190 mm (Madurai station of IMD India – 25.11.1970). Hence there is no river flood risk anticipated to the project site.
VII. Water Management		
xxxvi	Details of effluent treatment and recycling process.	The wastewater of 6 KLD generated from the proposed facility will be treated in 8 KLD ETP and the treated wastewater shall be reused within the proposed facility for vehicle wash, floor wash etc.,
Xxxvii	A certificate from the local body supplying water, specifying the total annual water availability with the local authority, the quantity of water already committed the quantity of	The water for the proposed facility will be sourced from SIPCOT/water tankers. The permission for water quantity 50KL has been obtained from SIPCOT vide P-III/SIP-MNM/Medicare/ 2022 dt. 23.12.2022.

	water allotted to the project under consideration and the balance water available. This should be specified separately for ground water and surface water sources, ensuring that there is no impact on other users	
VII. Energy Management		
xxxviii	A certificate of adequacy of available power from the agency supplying power to the project along with the load allowed for the project.	The power requirement of around 150 kVA will be sourced from SIPCOT Industrial Park. For emergency backup DG set is maintained with optional usage with a capacity 150 kVA.
IX. Disaster Management Plan		
xxxix	Submit details of a comprehensive Disaster Management plan including emergency evacuation during natural and man-made disaster.	Comprehensive Disaster Management plan presented including emergency evacuation during natural and man-made disaster is given in Chapter 7
xl.	Hazard identification and proposed mitigation measures.	Identification of hazards at the CBWTF is considered the primary significance of the analysis. The quantification of risk indicates the characteristics of wastes that pose potential damages and create emergencies. Thus, all the components in the CBWTF need to be examined thoroughly at regular intervals in order to avoid their potential for initiating or propagating any unplanned events an emergency preparedness plan is prepared to mitigate the consequences. The detailed hazard identification assessment, evaluation, DMP is provided in Chapter 7 .
X. Green Belt		
xli.	A detailed Plan for green belt development.	Detailed green belt development Plan is given in Chapter 9 – Section 9.4.8 .
XI. Socioeconomic Environment		
xlii.	Public hearing to be conducted for the project in accordance with provisions of Environmental Impact Assessment Notification, 2006 and the issues raised	Public Hearing will be conducted after submission of the Draft EIA Report to Regional office of State Pollution Control Board. All the concerns raised during the

	by the public should be addressed in the Environmental Management Plan. The public Hearing should be conducted based on the ToR letter issued by the Ministry and not on the basis of Minutes of the Meeting available on the web-site.	Public Hearing shall be addressed and action plans will be incorporated in the Final EIA Report.
xliii.	The project proponents shall satisfactorily address all the complaints/suggestions that have been received against the project till the date of submission of proposals for Appraisal.	The project proponent shall comply and address all the complaints/ suggestions that have been received against the project till the date of submission of proposals for Appraisal.
XII. Court Cases		
xliv.	Details of litigation pending against the project, if any, with direction /order passed by any Court of law against the Project should be given.	There are no litigations pending against the project, in any Court of law.
XIII. Miscellaneous		
xlv.	Any further clarification on carrying out the above studies including anticipated impacts due to the Project and mitigative measure, project proponent can refer to the model ToR available on Ministry website http://moef.nic.in/Manual/Incinerator	Noted
Additional ToR - SEAC		
1.	The Project Proponent shall consult the District Pollution Control Board regarding the suitability of the Project site for establishing Common Bio – Medical Waste Treatment Facility and furnish the details.	Communciation has been intiated to District Pollution Control Board regarding the site suitability of the project site for establishing common BMW waste treatment facility. The same will be provided during EC meeting.
2.	A gap analysis shall be carried out on the quantity of the Bio Medical Waste generated and availability of the treatment and disposal facilities in the district and furnish report.	Noted and accordingly a request has been made to TNPCB in this regard. Once the reply /details of the gap analysis request is received from TNPCB, the same shall be shared during the EC meeting.
3.	Every industry located in the SIPCOT shall be served individual notice on the place, date and time of public hearing.	Noted and Complied

4.	A detailed note on the technology proposed to be adopted for treatment and disposal of Bio medical waste and the advanced technology currently in practice world-wide shall be furnished.	A detailed description on the technology proposed and adopted for treatment is given in Chapter 2 – Section 2.7
5.	Establishment of the facility as per Bio Medical Waste Management Rules 2016 as amended.	The proposed facility is established by following existing Bio Medical Waste Management Rules 2016 and its subsequent amendments.
6.	Land requirement for the facility including its break up for various purposes. Its availability and optimization.	It is proposed to setup the CBWTF in 14569.00 Sq.m (3.60 ac) and the breakup of various purposes is given in Chapter 2 Table 2.3
7.	Details of proposed layout clearly demarcating various activities such as security.	The site layout plan with detailed breakup land area is given Figure 2.5.
8.	Details on collection and transportation of Bio Medical Waste from health care establishments, No. of vehicles and feature of vehicles. etc	Adequate number of specially designed vehicles in compliance with the provisions laid down by CPCB and Ministry of Road Transport and Highways (MoRTH) shall be provided for collection and transportation of Bio-medical waste from health care establishment to the proposed CBWTF in a safe manner. The vehicles shall be spill proof, with the name of the project printed on it, label mentioning that the vehicle is for “Transportation of Bio-medical Waste”, contact details in case of emergency etc .
9.	Details of the incineration system – a statement on the compliance to the CPCB guidelines for common bio medical waste incinerators in respect of waste feed cutoffs, operating parameters of combustion chambers, flue gas cleaning, ash handling, etc.	Details of the incineration system – a statement on the compliance to the CPCB guidelines for common bio medical waste incinerator is given in Chapter 2 - Table 2.12
10.	Details on fuel requirement for incineration.	Fuel requirement for incinerator is 15 liter/hr will be HSD (High speed diesel) details are given in Chapter 2 – Section 2.5.4

11.	Details on flue gas emission discharge through stack analysis of toxic pollutants and proposed pollution control technologies.	The major sources of air pollution in proposed project are from incinerator and DG set. Pollution control devices will be installed for incinerator comprising of dry scrubbing system to scrub the flue gases and to comply with prescribed standards as indicated in Table 2.12 for Particulate matter, HCl, NO _x (NO and NO ₂ expressed as NO ₂), Dioxins/Furans, Hg and its compounds as given in Chapter 2 .
12.	Details on residue/ash generation and management.	Ash generated from incinerator of around 170 kg/day will be sent to authorized CHWTSDF. Details of same are given in Chapter 2- Section 2.5.3
13.	Details on area storage of BMW, in case of maintenance flow of waste of detail action plan shall be part at EIA study.	The details of the storage of BMW is described in Chapter 2 - Section 2.7.2 (7) .
14.	Details of the proposed overall safety and health protection measures.	Details of the occupational health and other safety approaches at the site are given in Chapter 7 - Table 7.16 .
15.	Details of the existing access road(s)/walkways to the designed operations in the site and its layout.	The proposed site is well connected to major roads around the project. NH-36 is situated 1.31 km (E) from the project site. The traffic study was examined near site and details of traffic study are given in Chapter 3 - Table 3.18 . The existing traffic scenario of site connecting road is given in Chapter 3 - Table 3.19 .
16.	Land use map based on satellite imagery including location specific sensitivities, such as national parks / wildlife sanctuary, villages, Industries, etc	Land use map based on satellite imagery is given in Chapter 3 – Figure 3.8
17.	Surface water quality of nearby water bodies.	The surface water samples were collected from Mel Konnakulam pond and Vaigai river. The pH of the surface water samples were found to be in the range of 7.46 & 8.10 and dissolved solids were in the range of 545 mg/l & 709 mg/l . The detailed surface water sample analysis

		results are given in Chapter 3 - Table 3.14.
18.	Details on proposed groundwater monitoring well, locations, frequency of monitoring, parameters, etc.	The groundwater samples in the existing wells of nearby villages (downstream and upstream) will be analyzed as per consent conditions (or quarterly once) for major and minor ions such as Electrical conductance, pH, Total dissolved solids, Calcium, Magnesium, Sodium, Potassium, Chlorides, Sulphates, Nitrates, Fluorides, etc. No new groundwater monitoring wells are proposed.
19.	Action plan for the greenbelt development in accordance with CPCB published guidelines.	Detailed green belt development Plan is given in Chapter 9 – Section 9.4.8.
20.	Details on pollution control technologies and online monitoring equipments.	Monitoring provision for continuous monitoring of the incinerator stack emission will be installed by the CBWTF and adhere to the guidelines issued by SPCB/CPCB. This provision will monitor flue gas parameters such as CO ₂ , O ₂ and CO as well as primary and secondary chamber temperatures and records maintained. The real-time continuous stack emission data must be transmitted to the servers of the respective SPCB/PCC and CPCB.
21.	Details of the emergency preparedness plan and on-site & off-site disaster management Plan.	All the components in the CBWTF need to be examined thoroughly at regular intervals in order to avoid their potential for initiating or propagating any unplanned events an emergency preparedness plan is prepared to mitigate the consequences. The detailed hazard identification assessment, evaluation, DMP is provided in Chapter 7.
22.	The proponent shall explore the possibility for use of green technology like plasma technology, etc.	The incineration technology has been identified for the proposed bio-medical waste treatment facility.
23.	The proponent shall conduct socio-economic and health survey.	Socio-economic study was carried out in the study area. Detailed impact

		assessment survey and proposed mitigation measures along with demography and the prevailing socio-economic conditions are given in Chapter 3 - Section 3.12.
24.	A detailed incinerator design needs to be submitted on the likelihood of emission, possible types of gases coming out of the process and its measures and mitigation.	The design details of the proposed incinerator system is given in Chapter 2 - Table 2.11
25.	The proponent shall furnish SOP for the process.	A detailed SOP is in place based on the guidelines provided in BMW management rules, 2016 and CPCB for treatment of BMW.
26.	The proponent shall conduct a detailed study on water, land and Air quality.	The detailed study of water, land and air quality are given in Chapter 3
27.	Proponent shall furnish the letter received from DFO concerned stating the proximity details of Reserve Forests, Protected Areas, Sanctuaries, Tiger reserve etc., up to a radius of 25 km from the proposed site.	Communciation has been intiated to DFO for obtaining necessary information related to Reserve Forests, Protected Areas, Sanctuaries, Tiger reserve etc., up to a radius of 25 km from the proposed site.
28.	The Proponent shall carry out Bio diversity study through reputed institution and the same shall be included in EIA Report.	The communication have been initiated and the expert instiutions will be identified to undertake the biodiversity study.
29.	The Project Proponent shall conduct the hydro- geological study considering the contour map of the water table detailing the number of ground water pumping & open wells. And surface water bodies such as rivers, tanks, canals, ponds etc. within 1 km (radius) along with the collected water level data for both monsoon and non-monsoon seasons from the PWD / TWAD so as to assess the impacts on the wells due to proposed activity. Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data	Details of the groundwater condition surrounding the site are provided in Table 3.13 , and the groundwater contour map in Figure 7.9 . Natural drainage comprises mostly with ponds and lakes. As per monitored (field-collected) data, the working (construction at site) will not intersect groundwater since the groundwater level depth and is varying between 5 to 6 m below ground level.

	and documentation in this regard may be provided.	
30.	The Proponent shall furnish the baseline data for the environmental and ecological parameters with regard to surface water/ground water quality, air quality, soil quality &. Flora/fauna including traffic/vehicular movement study.	The baseline data study has been carried during the period of June, 2023 to August, 2023 (Summer season) for the environmental and ecological parameters with regard to surface water/ground water quality, air quality, soil quality &. Flora/fauna including traffic/vehicular movement study.
31.	The Proponent shall carry out the Cumulative impact study due to project activity specifically with reference to the specific environment in terms of soil health, biodiversity, air pollution, water Pollution, climate change and flood control & health impacts. Accordingly, the Environment Management plan should be prepared keeping the proposed site and the surrounding habitations in the mind.	Cumulative impact study due to proposed project activity specifically with reference to soil health, biodiversity, air pollution, water Pollution and flood control & health impacts are given in the EIA Report.
32.	Rain water harvesting management with recharging details along with water balance (both monsoon & non-monsoon) be submitted.	Rainwater from built-up areas will be collected during a rainy day, and channeled to storage tank for reuse. And, from road, parking, greenbelt, small built-up and other areas, will be collected separately and channeled to stormwater drains for treatment (in-house effluent treatment plant), then is stored and reused: a fresh water conservation measure
33.	Land use of the study area delineating forest area, agricultural land. Grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational	Detailed Land use report of the study area i.e 10km radius from the project site is given in Chapter 3 – Section 3.11

	phases and submitted. Impact, if any, of change of land use should be given	
34.	Proximity to Areas declared as 'Critically Polluted' (or) the project areas which attracts the court restrictions for proposed operations, should also be indicated and where so required. Clearance certifications from the prescribed Authorities, such as the TNPCB should be secured and furnished to the effect that the proposed project activities could be considered.	Not Applicable as the site is located within the SIPCOT Industrial Park.
35.	Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project. If any, should be provided.	Rainwater from built-up areas will be collected during a rainy day, and channeled to storage tank for reuse. And, from road, parking, greenbelt, small built-up and other areas, will be collected separately and channeled to stormwater drains for treatment (in-house effluent treatment plant), then is stored and reused: a fresh water conservation measure
36.	Impact on local transport infrastructure due to the Project should be indicated.	It is observed that the existing level of service (LOS) as per IRC:106-1990 the site access road is falling under 'C' and will not impact the performance of the existing road due to the proposed project. The proposed site is well connected to major roads around the project. NH-36 is situated 1.31 km (E) from the project site. The details of traffic study was examined near site and details of traffic study are given in Chapter 3 - Table 3.18 & Table 3.19.
37.	A tree survey study shall be carried out (nos., name of the species, age, diameter etc.,) at the project site.	Primary data has been collected using standard procedure from core zone and buffer zone detailed tree survey has been conducted and described in Chapter 3 - Table 3.22

38.	Public Hearing points raised and commitments of the project proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the project and to be submitted to SEIAA/SEAC with regard to the Office Memorandum of MoEF& CC accordingly.	Noted and Compiled
39.	The Public hearing advertisement shall be published in one major National daily and one more circulated vernacular daily.	Noted and Complied
40.	The Proponent shall produce/display the EIA report, Executive Summary and other related information with respect to public hearing in Tamil Language also.	Noted and Complied
41.	As a part of the study of flora and fauna around the vicinity of the proposed site, the EIA coordinator shall strive to educate the local students on the importance of preserving local flora and fauna by involving them in the study, wherever possible.	During the baseline studies for Ecology study the local educated persons were consulted and involved in identifying the flora, fauna as well as other related ecological aspects as much as possible.
42.	The purpose of Greenbelt around the project is to capture the fugitive emissions, carbon sequestration and to attenuate the noise generated, in addition to improving the aesthetics. A wide range of indigenous plant species should be planted in given in the Appendix – I in consultation with the DFO, & Tamil Nadu Agriculture University. The Plant species with dense/moderate canopy of native origin should be chosen. Species of small/medium/tall trees alternating	Detailed action plan for green belt development is given in Chapter 9 – Section 9.4.8 . The plant species proposed for the facility in accordance with Appendix – I is provided in Chapter 9. Total 960 trees and small plants will be planted under green belt development.

	with shrubs should be planted in a mixed manner.	
43.	Taller/one year old Saplings raised in appropriate size of bags, preferably eco – friendly bags should be planted at Per the advice of local forest authorities/ botanist/Horticulturist with regard to site specific choices. The proponent shall earmark the greenbelt area with GPS coordinates all along the boundary of the project site with at least 3 meters wide and in between blocks in an organized manner.	Taller/one year old Saplings raised in appropriate size of bags, preferably eco – friendly bags will be planted as per the of local forest authorities / botanist / Horticulturist with regard to site specific choices. The greenbelt with at least 3 meters wide has been earmarked all along the boundary of the project site in an organized manner.
44.	A Disaster management Plan and Risk Assessment and management Plan.	Detailed Disaster Management plan along with risk assessment is presented in Chapter 7
45.	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and Periodical medical examination schedules should be incorporated in the EMP. The Project specific occupational health mitigation measures with required facilities, proposed in the Project site area may be detailed.	Details of the occupational health impacts due to the project and preventive measures are given in Chapter 7 - Table 7.16.
46.	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.	The budget allotted towards public health check up along with timeframes of implementation is given in Chapter 6 – Table 6.4
47.	The Socio-economic studies should be carried out within a 5 km buffer zone from the project site, Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far	The Socio-economic studies has been carried out within a 10 km buffer zone from the project site. The detailed report is given in Chapter 3. The timeframes of implementation is given in Chapter 6 – Table 6.4

	as possible, quantitative dimensions may be given with time frames for implementation.	
48.	Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.	As per information received from project proponent Medicare Environmental Private Limited (MEMPL), no litigations is against the project.
49.	Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic. Employment potential. Etc.	Details of project benefits are given in Chapter 8 of the EIA Report.
50.	The Proponent shall prepare the EMP for the entire life of project and also furnish the sworn affidavit stating to abide the EMP for the entire life of project.	A dedicated EMP comprising various treatment facilities for air, water, noise, HW, BMW, solar, GB with a 49 lakhs investment will be prepared for entire life of the project. To operate & maintain all the above treatment systems an amount of 4.9 lakhs per annum will be spent along with dedicated manpower to supervise and monitor throughout the life of the proejct.
51.	Concealing any factual information or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this Terms of Conditions besides attracting penal provisions in the Environment (Protection) Act, 1986.	An undertaking by Project Proponent certifying that the data/information presented in the report is factually correct and that we own the contents (information and data) of the EIA Report is given in EIA report.
Additional ToR – SEIAA		
1	The pp shall furnish impact of biomedical waste on contamination of water, surface water, storage details, safety of rodents, stray animals, rack pickers etc.	The proposed BMW treatment facility adopting a zero-discharge system for 8 KLD of wastewater. The treated water suitable for cleaning / washing and for greenbelt developments totally reused and will not be discharged from the plant premises. Thus the impact of BMW facility on surrounding waterbodies will be negligible. The BMW facility will be provided with rodent safety system,

		rodent proofing, environmental sanitation, proper food storage etc.
2	The pp shall furnish impact of biomedical waste storage, packaging & labelling.	As per BMW treatment guidelines and BMW rules 2016, all the BMW collected from various hospitals will be transported to the BMW facility and treated within 48 hrs as per the guidelines. There will not be any intermediate storage of BMW waste at project site and all four categories of BMW waste labelled and packed in designated non-chlorinated bags will be incinerated, autoclaved and shredded for reuse, recycle & plastic, glass and metal correspondents.
3	The pp shall furnish impact of biomedical waste pollution from radioactive particles, needle shots, plastic waste & hazardous waste	As per BMW treatment guidelines and BMW rules 2016, all the BMW collected from various hospitals will be transported to the BMW facility and treated within 48 hrs as per the guidelines. There will not be any intermediate storage of BMW waste at project site and all four categories of BMW waste labelled and packed in designated non-chlorinated bags will be incinerated, autoclaved and shredded for reuse, recycle & plastic, glass and metal correspondents.
4	The pp shall furnish impact of biomedical waste treatment facility on the nearby Local communities nearby and staffs.	The proposed BMW facility is to be established in a SIPCOT industrial park and there were no any habitations near the plant. However all the corporate / social responsibility activities will be undertaken based on the suggestions from the local village communities with responsible officials of the study region.
5	The pp shall furnish precautionary measures for the nearby local community in regard to deep burial, autoclaving, recycling & Incineration.	The proposed BMW facility does not have any deep burial activity, thus there will not be any land contamination within the plant area. The facility mainly has incinerator with dual chambers and with all necessary transportation and residence time condition. The plastic and

		<p>glass waste collected from various hospitals will be autoclaved with steam for disinfection and will be sent to shredder for making the recyclable materials and sold to authorised recyclers. All these treatment methods will be as per the BMW rules 2016 and CPCB guidelines.</p>
6	<p>New technologies available for reuse and recycling/disposal of Biomedical wastes.</p>	<p>New technologies like plasma pyrolysis waste sharps dry heat sterilization and encapsulation sharp blasters (Needle blaster) are recently developed for BMW treatment and for present project the incineration, autoclaving and shredder system are adopted. The APCD provided for dust removal and scrubbing system for gaseous pollutants are part of the project to meet the regulatory standards and compliance PCB conditions.</p>

EXECUTIVE SUMMARY

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1. Introduction

Medicare Environmental Management Private Limited (MEMPL), currently operating around 24 CBWTFs in all over India, proposed to establish a Common Bio-Medical Waste Treatment Facility (CBWTF) at Plot No.C-6, SIPCOT Industrial park, Seikalatur Village, Manamadurai Taluk, Sivagangai District, Tamil Nadu All the Health Care Establishments (HCEs) are required by law to put in place the mechanisms for proper segregation and scientific disposal of Bio-Medical Waste (BMW) to minimize adverse impacts on health care workers and on the environment. However, installation of individual treatment facilities by HCEs requires significant capital investment and trained manpower for proper operation and maintenance of treatment systems.

Common Bio-Medical Waste Treatment Facilities (CBWTFs) offer huge advantage to health care establishments through more efficient treatment and disposal of bio medical waste and through 'Economies of Scale' (significant decrease in cost of treatment per kilogram).

Ministry of Environment, Forest & Climate Change (MoEF&CC) has notified an amendment to the EIA Notification 2006 published vide S.O. 1142 (E) dated 17th April, 2015. According to this notification, the BMW Treatment facility is categorized under the Item 7 (da) – Category B1 in the schedule, requiring 'Environmental clearance' from the State Environment Impact Assessment Authority (SEIAA)/ State Expert Appraisal Committee (SEAC).

2. Project details

The proposed facility will be developed in an area of 14569.00 Sq. m (3.60 ac) with all associated auxiliary units. Geographical location of project site is Latitude 09°43'9.20"N, Longitude 78°28'29.05"E. The proposed CBWTF has been designed to treat up to 5.5 TPD of BMW with 2 X 250 kg/hr incinerators, Autoclave – 1275 litres/batch, Shredder – 250 kg/hr, ETP – 8 KLD.

The site is situated in notified SIPCOT Industrial Park, Seikalathur (V), Manamadurai (T), Sivagangai (D), Tamil Nadu and is well connected by village & industrial roads. National Highway NH-36 is located 1.31 km (E) from the site. Seikalathur village is located 1.0 km (SW) from the site. The nearest town is Manamadurai town 2.0 km (SW). The nearest railway

station is Manamadurai railway station at a distance of 3.2 km (SW). The nearest airport is Madurai Airport 42.5 - km (NW) from the site.

Total water requirement is estimated to be 35 KLD, which will be sourced from SIPCOT/ water tankers. The wastewater generated will be treated in the proposed ETP and the treated wastewater shall be reused within the proposed facility. The total power required for the facility is estimated to be around 150 kVA, which will be sourced from SIPCOT and 1 X 150 kVA DG set will be used for power backup.

In proposed project, the solid / hazardous waste generated will be from incineration of biomedical waste. The ash from incinerator is around 170 kg/day will be sent to CHWTSDF. The municipal solid waste will be daily disposed to nearest municipal bins. The waste oil from DG set of 2LPD will be sent to oil recovery facility.

The proposed facility will have an employment of around 50 no's. The direct and indirect employment is envisaged for both skilled and unskilled.

3. Baseline Environmental Status

The baseline data study has been carried out during the period of June, 2023 to August, 2023 (summer season). The baseline information on ambient air quality, water quality, noise levels, soil quality, ecology & biodiversity and socio-economic are given below.

Air Quality

Ambient Air quality was monitored at 10 locations within the study area of the project site. The locations were identified in downwind, cross wind and up wind directions. The air pollutants monitored are Particulate Matter (PM), Sulphur dioxide (SO₂), Oxides of nitrogen (NO_x), Carbon monoxide (CO) and Ozone (O₃) as per the standard MoEF&CC guidelines and results were compared with stipulated standards of CPCB.

The minimum and maximum levels of PM_{2.5} are recorded in the range of 22.6 µg/m³ to 33.8 µg/m³, whereas the PM₁₀ are in the range of 39.8 µg/m³ to 54.1 µg/m³.

The sulphur dioxide concentrations within the study are observed are in the range of 8.8 µg/m³ to 15.3 µg/m³ and the oxides of nitrogen observed are in the range of 15.4 to 25.3 µg/m³. The observed pollutant levels were compared with CPCB Standards for PM_{2.5} (60

$\mu\text{g}/\text{m}^3$), PM_{10} ($100 \mu\text{g}/\text{m}^3$) and SO_2 & NO_x ($80 \mu\text{g}/\text{m}^3$) and found to be well within the limits indicating that the baseline environmental status in terms of air pollution is better with as all pollutants are within the limits. The CO recorded within the study area was in the range of BDL to $580 \mu\text{g}/\text{m}^3$ and O_3 concentrations were also monitored in the study area and are found to be Below Detection Limit (BDL).

Water quality monitoring

The ground and surface water samples were collected from different sources within the study area and analyzed for all important physico-chemical and biological parameters to establish quality of water prevailing in the project surroundings. Around 10 ground water and 2 surface water samples were collected. The ground water is mainly from bore wells used by the villages for domestic purposes. The surface water were collected from Mel Konnakulam Pond and Vaigai River. The pH of ground water observed is from 6.68 to 7.63 and in surface water it is from 7.46 & 8.10, the TDS level of GW is from 267 to 1170 mg/l, whereas in surface water the levels are 545 & 709 mg/l. The chloride concentrations in GW is between 58 to 420 mg/l. The hardness observed in ground water is 144 to 600 mg/l, Fluoride concentrations observed in GW is in the range of 0.39 to 0.85 mg/l. All the sample analysis of ground and surface waters found to be fit for human use purpose.

Noise Levels

Noise was monitored at 10 locations within the study area of project site. The locations were identified based on existing noise level status, keeping in view of land use pattern, residential areas in villages, schools, bus stands etc. Day levels of noise are monitored during 6 AM to 10 PM and in night during 10 PM to 6 AM. The noise levels during the day are ranging between 50.0 dB (A) to 54.3 dB (A), whereas in night noise levels are ranging between 40.1 dB (A) to 44.4 dB (A). The noise levels were monitored as per ambient noise standards and are observed to be within the standards. The National Highway NH-36 is located 1.31 km (E) from the site. The traffic survey was carried out near site. It was found that the highest peak (worst case) was observed 630 PCU/hr during 10 to 11 am near site road. It is observed that the existing level of service of site access road is good as per the IRC; 106-1990 (PCU's per hour) and implies that traffic will not have a major impact due to the proposed project.

Soil quality

Soil quality was monitored at 10 locations within the study area of project site. Locations were selected to assess existing soil conditions representing various land use and geological features. The important physical, chemical parameters concentrations were determined from all samples. The pH values in the study area are varying from 6.27 to 7.42, electrical conductivity is observed to be in the range of 234 to 461 $\mu\text{Mhos/cm}$, organic carbon is varying from 0.5 to 1.1 %, available Nitrogen is varying from 43 to 89 kg/ha, available phosphorus is varying from 71 to 90 kg/ha, and available potassium is varying between 296 to 355 kg/ha.

Ecological Environment

A detailed study was done within 10 km radius area of the project site. Primary data has been collected using standard procedure from core as well buffer zone. Primary data has been verified and crossed checked from secondary data available. The species has been classified in to tree, shrubs, herbs (in case of Flora species) and Fishes Reptile, Amphibians, Birds and Mammals species (In case of Fauna species). Conservation status has been verified using with IUCN Red Data List and IWPA, 1972 Schedule. Being located within the Notified Industrial area the plot (core zone) is having some seasonal ground flora, bushes and few trees. None of the species is falling in any conservation category. Most of the species are widely distributed in the area and locally available. There is no species falling within the Endangered category as per IUCN. No Schedule-I species as per IWPA, 1972 found or reported at the area. No National Park, Wildlife Sanctuary, Tiger Reserve, Biosphere Reserve present within 10 km radius study area. Katturani RF present in NW direction and Sattarasankottai RF present in NE direction from the project site.

Socio-Economic Environment

The socio-economic study covers villages within 10 km radius from the periphery of the proposed project site. The primary data was collected through a range of research techniques and tools, like a transactional walk, a structured questionnaire, focus group discussions, observations, and key stakeholder interactions. Secondary data was collected from district census statistics for 2011. The socio-economic study observed that 20% of people belong to scheduled category, in which 19.9% belongs to Scheduled Castes (SC) and 0.1% belongs to Scheduled Tribes (ST). Males and females constitute 50.02% and 49.98%, respectively, and

the number of females per 1000 males is 999. According to Census data of 2011, the study area had an average family size of 4 persons per household. This represents moderately high family size and also in similarity with other parts of the district. The literacy levels in selected villages of study area, reveals that the male literacy comprises of 55.5%, whereas literacy rate among women, which is an important indicator for social change, is estimated to be 44.5%. As per 2011 census, there are a total of 29% main workers in the study area. The marginal workers and non-workers constitute to 17% and 55% of the total population respectively. Therefore, non-workers are predominant in that of workers by occupation.

4. Anticipated environmental impacts and mitigation measures

The proposed project may cause impact on the environment in two phases:

- a. During Construction phase
- b. During Operation phase

a. Impacts during construction phase:

Construction phase works include site clearance, site formation, building works, infrastructure provision and any other infrastructure activities. The impacts due to construction activities are short term and are limited to the construction phase.

b. Impacts during operation phase:

Impact on Air Quality

The potential dust sources associated with operation activities are loading and unloading of the materials, travel over unpaved roads and wind erosion etc. The construction works associated with the proposed development are given below.

- The main air pollutant expected from line sources are dust generation from the movement incoming & outgoing vehicle.
- Point source emissions from Incinerator, DG set
- Dust generation due to the movement of vehicles on unpaved roads
- Unloading of raw materials and removal of unwanted waste material

The anticipated air emissions from incinerator, DG set and Stacks are estimated and emission rates were calculated based on the outlet emission standards provided for PM, SO₂ and NO_x (50 mg/m³ , 200 mg/Nm³ and 400 mg/ Nm³ respectively) The AIRMOD 7.6.1 model results

shows very negligible incremental rise in all these air quality parameters with an overall air quality scenario in worst case for PM ($54.15 \mu\text{g}/\text{m}^3$), SO_2 ($15.5 \mu\text{g}/\text{m}^3$) and NO_x ($25.7 \mu\text{g}/\text{m}^3$) respectively.

Mitigation Measures - Air Quality

- To minimize the impact from line source, black carpeted road will be maintained properly to reduce the dust generation.
- Regular water sprinkling on main haul roads in the project area, this activity will be carried out at least twice a day.
- Greenbelt will be provided along the boundary and along the road and DG set will be used only during power failure for emergency requirements.
- The duration of stockpiling will be as short as possible as most of the material will be used as backfill material for the open cut trenches for road development.
- Temporary tin sheets of sufficient height (3m) will be erected around the site of dust generation or all around the project site as barrier for dust control.

Impact on Water quality

The water quality impacts mainly arises from site formation, which may produce large quantities of run-off with high-suspended solids, and the wastewater generated during the bio medical waste treatment operations. The 35 KLD of water is required for industrial purposes, floor wash & vehicle washes, domestic and for green belt purposes. The total wastewater of 6 KLD is treated in Effluent treatment plant of capacity 8 KLD and the treated water of 5 KLD is reused in the process and other uses whereas around 1 kg of sludge generated is sent to nearest TSDF, thus the impacts arising from water and wastewater is negligible.

Mitigations Measures - Water quality

During site development necessary precautions will be taken, so that the runoff water from the site gets collected to working pit and if any over flow is, will be diverted to nearby greenbelt/ plantation area. Wastewater including vehicle and container washing, floor washing, domestic water shall be treated in ETP for safe guard of water environment. The treated waste water shall be reused for greenbelt, floor/vehicle washing etc.

Impact on Noise Levels

The major source of noise in proposed project will be from unloading of bio-medical waste and use of Incinerator, DG set, pumps, motors etc.

Mitigation measures – Noise Levels

- Providing suitable enclosures (adequate insulation) to minimize the impact of high noise generating sources.
- Employees will be provided with PPE like earplugs, helmets, safety shoes, etc.
- Development of greenbelt all along the boundary and along the roads within the project

5. Environmental management plan

The Environmental Management Plan (EMP) is required to ensure sustainable development of the plant area and the surroundings. The EMP aims to control pollution at the source level to the possible extent with the available and affordable technology followed by the standard treatments before getting discharged. The capital cost for the proposed project is estimated to be around Rs.4.96 Crores. The capital cost allocated for EMP is around Rs.49.6 Lakhs with a recurring cost of Rs.4.96 Lakhs per annum.

The proposed incinerators shall be equipped with all necessary Air Pollution Control Devices (APCDs) to comply with prescribed emission norms. Necessary precautions shall be taken to minimize odour and noise. Wastewater generated from the from floor washing/vehicle and container washing shall be treated in Effluent Treatment Plant (ETP). Treated wastewater shall be reused for floor/vehicle washing, greenbelt etc. Ash generated from the incineration and sludge generated from the ETP shall be stored temporarily with proper lining and impervious flooring and eventually will be sent to CHWTSDF.

6. Environmental monitoring program

Environmental monitoring program describes the processes and activities that need to take place to characterize and monitor the quality of environment. Different activities involved in proposed project and their impact on various environmental attributes have been taken into account while designing a detailed environmental monitoring program. Environmental

monitoring program has been prepared for the proposed project for assessing the efficiency of implementation of Environment Management Plan and to take corrective measures in case of any degradation in the surrounding environment. Results of monitoring will be reviewed, analyzed statistically and submitted to concerned authorities.

Environmental Monitoring Program includes: (i) continuous online monitoring of the incinerators stack emission for flue gas parameters, (ii) incinerators stack emission monitoring to ensure compliance with emission standards, (iii) ambient air quality monitoring, (iv) analysis of treated wastewater, especially in case of discharge, (v) periodic monitoring of incineration ash and ETP sludge, (vi) other parameters as prescribed in Consent for Operation (CFO) etc.

7. Risk analysis

Risk assessment was carried out to identify and quantify major hazards and risk associated with various operations of proposed project that may lead to an emergency situation which affect public safety and health. A systematic analysis of chemicals and their quantities of storage have been carried out to determine threshold quantities as notified in MSIHC Rules, 1989 and amended in 2000.

All necessary measures to minimize the risk due to the proposed project will be taken during design stage and operation period viz., fire and safety control measures, emergency preparedness plan, disaster management plan etc.

8. Project Benefits

The contribution of proposed facility to health care establishments in their BMW Management is expected to be significant. Expected project benefits include: (i) better management of bio-medical waste, (ii) reduction of pollution load on environment, (iii) ensure compliance with applicable rules (Bio-Medical Waste Management Rules, 2016), (iv) reduced environmental liability for health care establishments, (v) employment opportunities etc.

9. Conclusion

Baseline data was collected for various environmental components and an overall assessment was made on the potential environmental impacts likely to arise from the CBWTF. Necessary pollution control measures (along with monitoring plan) were proposed to ensure minimal

impact on the environment. The facility offers huge advantage to HCEs through efficient treatment and disposal of BMW at a lower cost and minimizes adverse impacts on environment.

The CBWTF also reduces the stress of individual HCEs to have their captive treatment facilities to comply with regulatory norms. The facility also improves prevailing environmental conditions of all HCEs avoiding any kind of long-term storage of BMW within their premises as the scope of common facility includes daily waste collection mechanism to avoid unwanted storage and reduce its effects on the human population as well as surrounding environment.

CHAPTER 1 - INTRODUCTION

Chapter 1

Introduction

1.1 Introduction

M/s. Medicare Environmental Management Private Limited (MEMPL), proposes to establish a Common Bio-Medical Waste Treatment Facility (CBWTF) at Plot No.C-6, State Industries Promotion Corporation of Tamil Nadu Limited (SIPCOT) Industrial Park, Seikalathur (V), Manamadurai (T), Sivagangai (D), Tamil Nadu (S) in an area of 3.60 ac (1.45 ha). The proposed facility will cater approximately 600 Health Care Facilities (HCFs) / Health Care Establishments (HCEs) in and around Sivagangai district, Manamadurai.

As per Ministry of Environment, Forest and Climate Change (MoEF&CC) notification dated 17th April 2015, the proposed facility falls under item 7 (da) Bio-medical waste treatment facilities, Category B1. Therefore, it is required to conduct EIA studies and prepare a report as per EIA Notification dated 14th September 2006. To obtain Environmental Clearance (EC) for the same from State Expert Appraisal Committee (SEAC)/ State Environment Impact Assessment Authority (SEIAA) of Tamil Nadu, Environmental Impact Assessment (EIA) report is prepared.

The total land area in the above project is as follows:

- Total land area : 3.60 ac (1.45 ha)
- Greenbelt area : 4800.00 Sq. m (33%)
- Project cost : Rs.4.96 Crores

Bio-medical Waste (BMW) means **“any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or research activities pertaining thereto or in the production or testing of biological or in health camps”** as per Bio-Medical Waste Management Rules, 2016.

1.2 Identification of the project and project proponent

1.2.1 Identification of project proponent

MEMPL, is one of India's premier, registered company under the Companies Act, with the primary objective of being the BMW management service provider. The vision has always been to be a conscious & effective contributor in the field of waste management and has envisioned the concept of CBWTF as early as 1995, which was the first company to envision the same.

MEMPL, has about 24 operating BMW facilities all over India, present at Ahmedabad, Bengaluru, Agartala, Durgapur, Ghaziabad, Howrah, Hyderabad, Kalyani, Lohardaga, Ludhiana, Muzaffarpur, Nellore, Adityapur, Mumbai, West Bengal, Madurai, Gummidipoondi, Bargur, Mangalore, Salem, Kagaz Maddur, Chandigarh and Kanpur. Medicare, has a client base of more than 51,125 HCFs/HCEs and serving more than 4,30,067 beds. It employs more than 1400 people & has a fleet of more than 300 vehicles to collect & transport the waste.

Being a pioneer in the industry in India, we have introduced best of the technologies/practices and have carried operations & maintenance as per the policies and framework laid down under the various Environmental Acts. All the plants have got ISO certifications viz. ISO 9001: 2015 QMS, ISO 14001:2015 EMS, OHSAS 45001:2018, Integrated Management System etc.

1.2.2 Identification of proposed project

The proposed project has been designed to treat up to 5.5 Tons Per Day (TPD) of BMW with 2 X 250 kg/hr capacity Incinerators, Autoclave - 1275 liters/batch, Shredder - 250 kg/hr, Effluent Treatment Plant (ETP) - 8 KLD at Plot No.C-6, SIPCOT Industrial Park, Seikalathur (V), Manamadurai (T), Sivagangai (D), Tamil Nadu (S) in an area of 3.60 ac (1.45 ha). The proposed facility provides BMW treatment and disposal to the HCEs of Manamadurai (T) and surrounding districts.

It shall cover around about 600 numbers of HCEs / HCFs (including Govt. & Private Hospitals), and total bed strength will be around 7,000 numbers. The quantum of BMW generated is about 1750 kg/day and is likely to increase day by day.

1.3 Brief description of nature, size, location of the project and its importance to the country/region

The proposed treatment facility includes incinerators, autoclave, shredder and ETP. The primary purpose of incineration is to burn the waste to ashes through combustion process. The unit will be composed of dual chambered incinerator. The purpose of autoclave is to sterilize / disinfect the waste with steam. Microorganisms, which contribute to infection, do not survive beyond 80°C. However, as a precaution, MoEF&CC has stipulated a temperature of 121°C and pressure of 15 pounds per square inch (psi) for an autoclave residence time of not less than 60 minutes pressure to ensure distribution of temperature. **Table 1.1** depicts the site features of the project area.

Table 1.1 Site features

Land Coordinates	09°43'9.20"N 78°28'29.05"E
Location	Plot No.C-6, SIPCOT Industrial Park, Seikalathur (V), Manamadurai (T), Sivagangai (D), Tamil Nadu (S)
Project Schedule	7(da) - Category B1, Sector 32A Bio-Medical Waste Treatment Facilities
Land Area	3.60 acres
Project Cost	Rs.4.96 Crores
Elevation	Approx. 88 - 90 meters above MSL
Nearest Railway Station	Manamadurai Railway station - 3.2 km (SW)
Nearest Airport	Madurai Airport - 42.5 km (NW)
Nearest City	Madurai - approx. 40.0 km (NW)
Nearest Habitation	Manamadurai is approx. 2.0 km (SW)
Nearby Water bodies	Mel Konnakulam Lake - approx. 0.6 km (N)

1.3.1 Importance to country/region

Nearly 80 - 85 % of the waste generated by healthcare activities consists of general waste. The remaining approximately 15 - 20 % of waste is considered hazardous that may be infectious or toxic. Healthcare waste becomes infectious and hazardous when hazardous and non-hazardous wastes are not properly segregated at source itself and are mixed together. Thus, increasing the volume of waste and making it difficult to manage. Improper management or exposure to infectious BMW can result in disease

or injury.

BMW may contain infectious agents, toxic or hazardous chemicals or pharmaceuticals, radioactive wastes and waste sharps. The infectious wastes may contain any of the wide variety of pathogenic microorganisms. Pathogens in infectious wastes may enter the human body through a number of routes like a puncture or cut in the skin, mucous membranes, by inhalation or ingestion. Sharps may not only cause cuts and punctures but also infect the wounds if they are contaminated with pathogens. Because of this dual risk - of injury and disease transmission - sharps are considered as a hazardous waste class.

A CBWTF project comprehensively takes care of the above possible challenges that may be posed to human health and environment by BMW. The industries dependent on recyclable materials can not only generate employment and income for the people engaged in the industry but also save huge foreign exchange, which the country spends on import of raw materials required for making such products. Bio-medical wastes are collected in colour - coded non - chlorinated HDPE bags and regular requirement of huge quantity of such bags generate employment and income for the people engaged in such industries.

1.4 Justification of the project

To enable effective management and handling of BMW, the Ministry of Environment, Forest and Climate Change (MoEF&CC), New Delhi has issued formulated rules known as the BMW Rules, 2016 and subsequent amendments, under The Environment (Protection) Act, 1986 and its amendments.

It may not be possible for small nursing homes, dispensaries, clinical laboratories, and other small organizations or individual medical professionals to carry out treatment and disposal of BMW generated as per the methods prescribed in the rules on their own. It is not economical for even bigger hospitals to have their own treatment facilities.

A CBWTF is an ideal and perhaps only solution to all such problems considered as a very hazardous waste class. Other potential infectious risks may include the spread of drug resistant microorganisms from healthcare establishments into the environment.

1.5 Objective and scope of EIA study

1.5.1 Objective of the study

As per the BMW Rules, 2016 it is the duty of every occupier (a person having control over an institution or premises) of an institution generating bio-medical waste including a hospital, nursing home, clinic, dispensary, veterinary institution, animal house, pathological laboratory, blood bank to take all steps to ensure that such waste is handled without any adverse effects to human health and environment.

The rules to be followed are as given below:

- Bio-medical waste shall not be mixed with other waste.
- Bio-medical waste shall be segregated into container/ bags at the point of generation as per their respective categories.
- Every occupier shall make an application to the prescribed authority for grant of authorization.
- Every occupier shall maintain records related to generation, collection, reception, storage, transportation, treatment and disposal of BMW.

1.5.2 Scope of environmental impact assessment

Environmental Impact Assessment (EIA) is the process of evaluating likely environmental impacts, both positive and negative, of a project by taking into account natural, social and economic aspects. It also comprises of suggesting possible mitigation measures, for the negative impacts, before implementation of the project. The EIA study encompasses 10 km radius area with the proposed project as its center. The scope of the study includes detailed characterization of existing status of environment in the study area including various environmental components viz. air, noise, water, land, biological, and socio-economic components and other parameters of interest. The envisaged scope of EIA is as follows:

- To assess the present status of air, noise, water, land, biological and socio-economic components of environment
- Identification and quantification of significant impacts from proposed project operations on various components of environment
- Evaluation of proposed pollution control facilities
- Preparation of an EMP outlining additional control technologies to be adopted for mitigation of adverse impacts

CHAPTER 2 – PROJECT DESCRIPTION

Chapter 2

Project Description

2.1 Type of project

The proposed project is to establish a CBWTF at Plot No.C-6, SIPCOT Industrial Park, Seikalathur (V), Manamadurai (T), Sivagangai (D), Tamil Nadu (S).

According to MoEF&CC Notification of S.O. 1142 (E) dated April 17, 2015 the Bio-medical waste treatment facility is categorized under the Item 7 (da) in the schedule, requiring 'environmental clearance' from the State Level Environment Impact Assessment Authority (SEIAA) / State Expert Appraisal Committee (SEAC). The SEAC has given ToR vide its Letter No.SEIAA-TN/F.No.10145/7(d)(a)ToR-1527/2021, dt. 07.08.2023. The salient features of the project are given in **Table 2.1**.

Table 2.1 Salient features of the project

Sl.No	Parameters	Description
1	Plot no./Survey no./ Khasra No.	C-6
2	Area	3.60 ac
3	Proposed capacity of plant & equipments	The proposed project has been designed to treat upto 5.5 TPD of BMW Incinerator - 5.5 TPD (2 X 250 kg/hr) Autoclave - 1275 litres/batch Shredder - 250 kg/hr
4	Coordinates	Latitude: 09°43'9.20" N Longitude: 78°28'29.05"E
5	Water requirement & Source	Net water requirement is 35 KLD Source : SIPCOT & Water tankers
6	Power & Source	150 kVA power will be supplied by SIPCOT Industrial park 1x150 kVA DG set will be used for power backup and emergency
7	Coverage Area	Sivagangai, Manamadurai, Ilayangudi, Thirupuvanam, Kalaiyarkoli, Karaikudi, Devakottari, Thiruppathur, Singampunari
8	Total Project Cost	Rs. 4.96 Crores

Sl.No	Parameters	Description
9	Nearest Highway	National Highway 36 is 1.31 km E
10	Nearest Railway Station	Manamadurai Railway station -3.2 km SW
11	Nearest Airport	Madurai, 42.5 km NW
12	Nearest Town/City	Manamadurai Town 2.0 km SW
13	National Parks	None in study area
14	Wildlife Sanctuary	None in study area
15	Major water bodies/Rivers	Mel Konnakulam Lake 0.6 km N, Vaigai River 3.3 km SW

2.2 Need for project

In recent years, healthcare units have grown with a record of 400%. The reason for drastic increase in medical waste includes educational institutes having first aid centers, industries with clinics, medical waste generated from domestic front, infectious waste segregated from solid waste. In addition, government has included BMW generated from veterinary hospitals. Hence, establishment of additional BMW treatment facility is necessary. Currently Tamil Nadu state has 10 operating CBWTFs. The details of the 10 CBWTFs under operation in Tamil Nadu are listed in **Table 2.2**, the detailed annual report of Tamil Nadu Pollution Control Board (TNPCB) & Central Pollution Control Board (CPCB) is enclosed as **Annexure I & Annexure II**. To strengthen this TNPCB had invited entrepreneurs for developing district wise medical waste treatment facility to meet future requirements. In view of shortage in CBWTFs, MEMPL has proposed to establish CBWTF at Plot No.C-6, SIPCOT Industrial Park, Seikalathur (V), Manamadurai (T), Sivagangai (D), Tamil Nadu (S).

At present according to TNPCB annual report, Sivagangai district does not have BMW treatment facility and currently, BMW generated from the Sivagangai district is being treated at a facility which is located at a distance of 120 km from the proposed site. Therefore, the challenges faced for treatment of BMW are as follows:

- Transportation of BMW to a very far distance
- Leakage / spillage while transportation
- Environmental contamination and hazards
- Delay in treatment and disposal of BMW

In addition to this, following are the problems faced by healthcare institutions in handling and management of BMW.

- Space constraint for constructing the facility
- Money/ Funds onstraint

In order to manage the BMW generated in the state, few CBWTF service providers are operating with variable efficacies. It is recommended to establish minimum of one CBWTF within each district to facilitate the efficient disposal of BMW. This recommendation takes into account the anticipated growth in healthcare infrastructure (as indicated by an increase in bed capacity), the potential cost savings associated with reduced transportation of BMW, the need to manage BMW effectively.

Table 2.2 Details of CBWTFs under operation in Tamil Nadu

Sl.No	Name and address of the CBWTFs	Present status (tons/day)		Areas covered
		Incinerator	Autoclave	
1	M/s. G. J. Multiclave (India) Pvt Ltd, Thenmelpakkam, Chengalpattu Taluk, Chengalpattu District	9.9	5.42	Part of Chennai & Chengalpattu, Kancheepuram Districts
2	M/s. Tamilnadu Waste Management Ltd., Kinnar village, Maduranthakam Taluk,Chengalpattu District.	4.4	3.24	Cuddalore, Chennai (North) Part of Kancheepuram, Thiruvallur Districts
3	M/s.Medicare Enviro Systems, Sengipatti, Thanjavur Taluk, Thanjavur District.	3.3	2.0	Thanjavur, Thiruvarur, Trichy, Nagapattinam, Pudukottai, & Sivagangai Districts
4	M/s. Ken Bio Links Private Ltd,Kandipedu, Katpadi Taluk, Vellore District.	5.5	3.6	Ranipet, Vellore, Thirupathur & Tiruvannamalai Districts

Sl.No	Name and address of the CBWTFs	Present status (tons/day)		Areas covered
		Incinerator	Autoclave	
5	M/s.Ramky Energy and Environment Ltd, Thangayur, Salem District.	3.3	2.6	Salem, Namakkal, Erode, Dharmapuri, Krishnagiri & Karur Districts
6	M/s.Teknotherm Industries, Orattukuppai, Coimbatore District.	5.5	4.0	Coimbatore Nilgris & Tiruppur Districts
7	M/s. Aseptic System Bio Medical Waste Management Co,Pappankulam,Tirunelveli District.	4.4	2.4	Tirunelveli, Thoothukudi, Tenkasi & Kanyakumari Districts
8	M/s.Ramky Energy and Environment Ltd,Undurmikidakulam,Virudhunagar District.	3.3	1.6	Madurai, Virudhunagar, Dindigul, Theni & Ramanathapuram Districts
9	M/s.Kovai Biowaste Management(P) Ltd, No.402, 4th Floor, Ramani's fraser square, Goods Shed Road, Coimbatore-1.	5.5	2.4	Coimbatore, Tiruppur & Nilgris Districts
10	M/s.Pondicherry Solid Waste Management Company private limited, S.F.No.275/2, T.Pudaiyur Village, Virudhachalam Taluk, Cuddalore District.	11	2.56	Cuddalore,Villupuram,Perambalur, Ariyalur,Kallakurichi Districts

Source : TNPCB Annual Report 2022

2.3 Location

2.3.1 General location of the site

It is proposed to setup a CBWTF in 3.60 ac, at Plot No.C-6, SIPCOT Industrial Park, Seikalathur (V), Manamadurai (T), Sivagangai (D), Tamil Nadu (S). The location of project site shown in **Figure 2.1**.

2.3.2 Specific location of the site with project boundary

Geographical location of project site is Latitude 09°43'09.20"N, Longitude 78°28'29.05"E. The base elevation of the project site is at approximately 88m - 90m above mean sea level (amsl). The study area is mostly vacant land with few trees, shrubs, grasslands. The geographical location of project site is shown in **Figure 2.2**. The 10 km radius topographical map shown in **Figure 2.3**. Site photographs are represented in **Figure 2.4**.

Figure 2.1 Location of project site

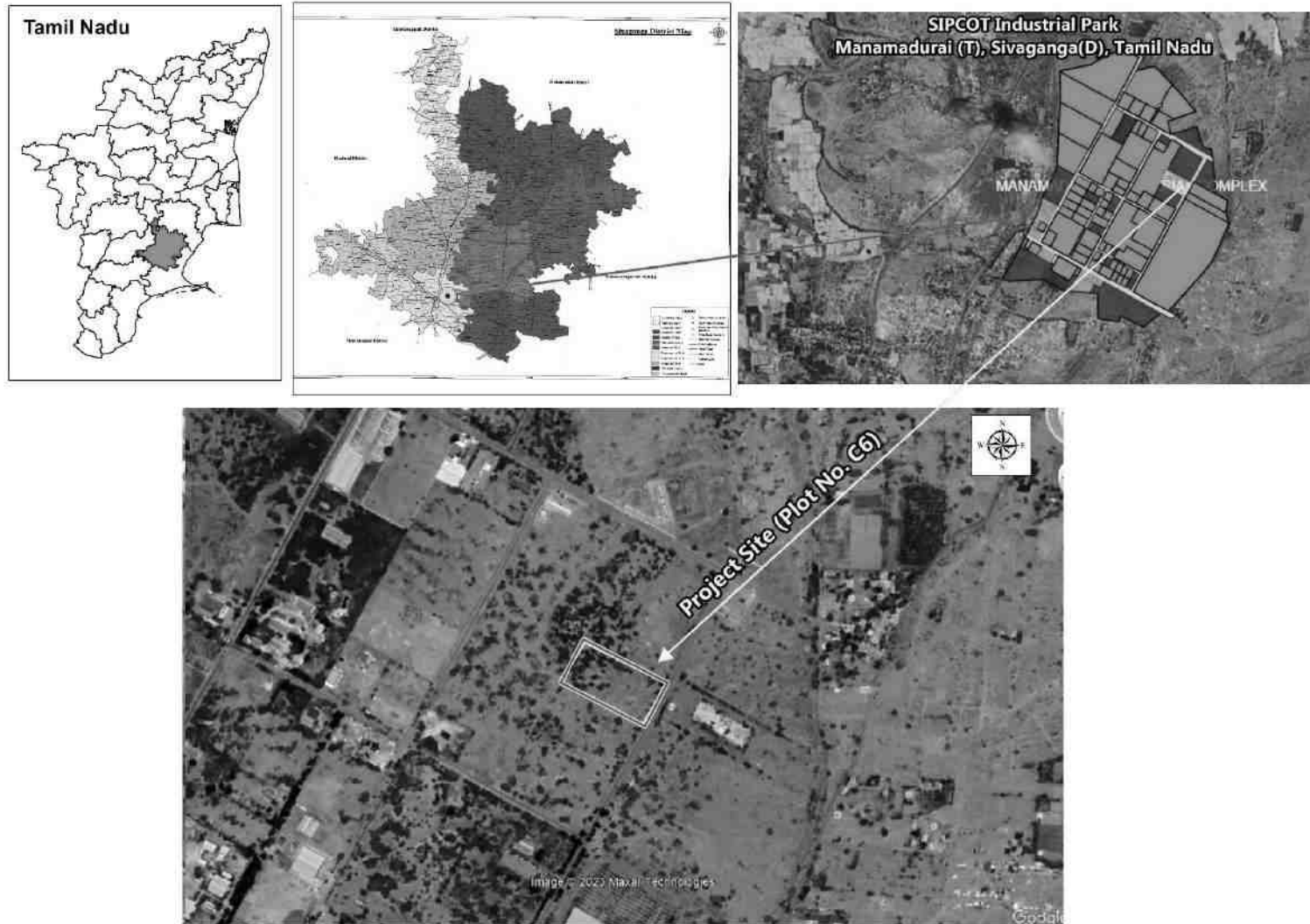


Figure 2.2 Geographical location of project site

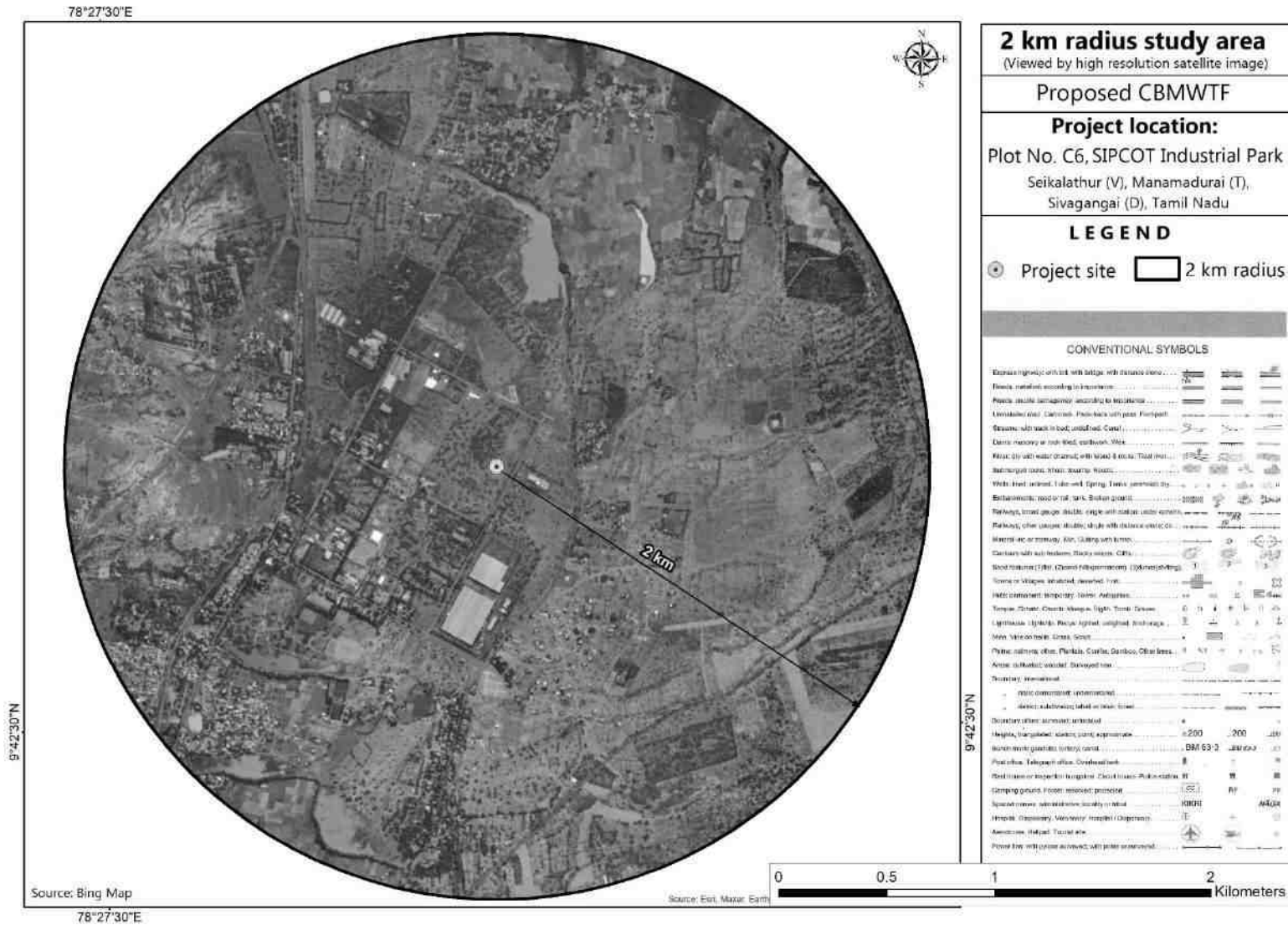


Figure 2.3 Topographical map (10 km radius)

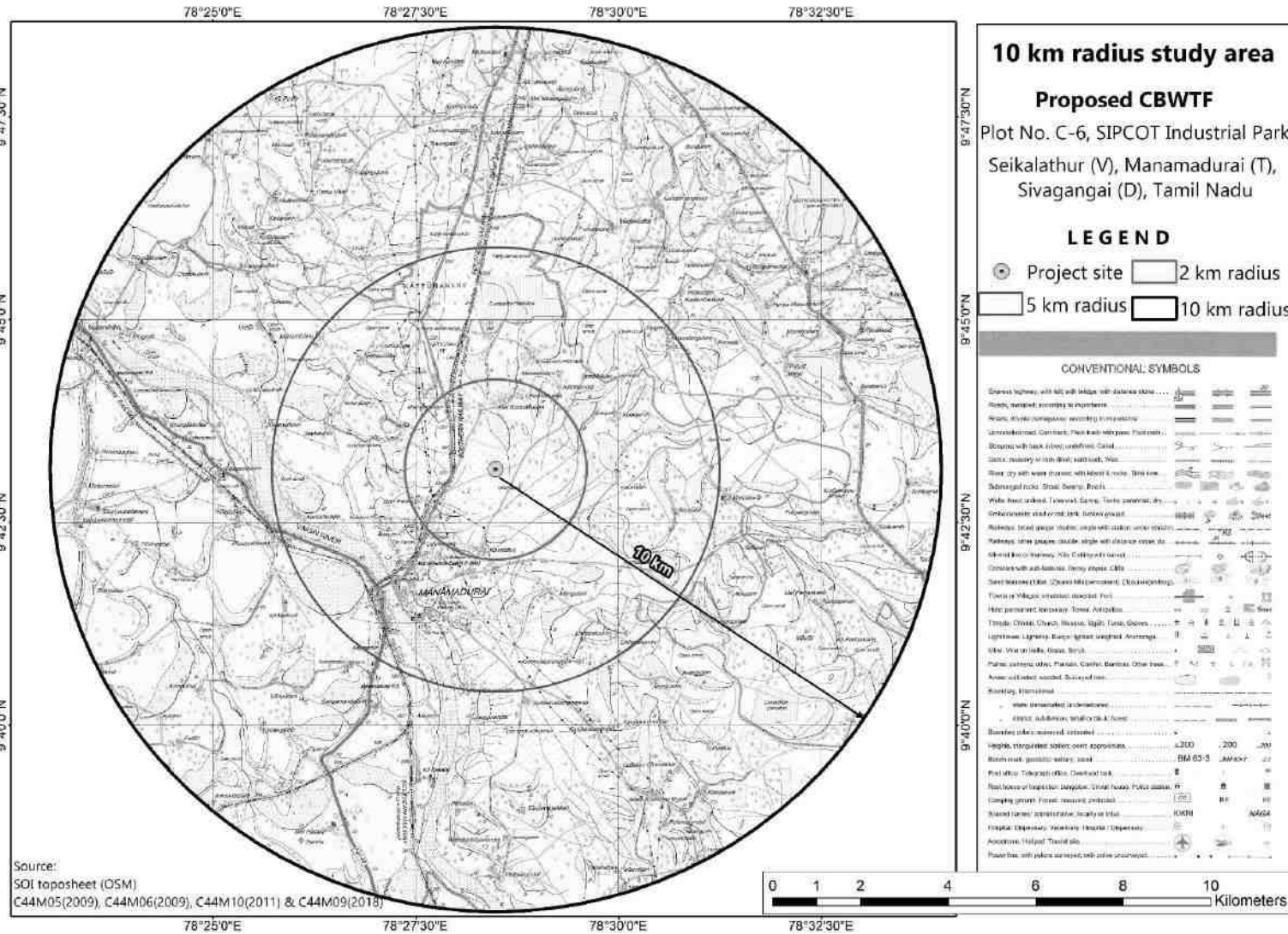


Figure 2.4 Site photographs



2.4 Size or magnitude of operation

The proposed CBWTF project shall be developed for the effective treatment of the BMW from the hospitals and nursing homes from the surrounding area of Sivagangai district. The proposed CBWTF will be of 5.5 TPD capacity. All the components are designed to comply BMW Management Rules, 2016. The components of the CBWTF are given below:

- Incinerator – 2 X 250 kg/hr
- Autoclave - 1275 liters/batch
- Shredder - 250 kg/hr

2.5 Project requirements

2.5.1 Land

Proposed facility shall be set up in an area of 3.60 ac. Site layout plan of the project is represented in **Figure 2.5**. Details of land breakup are provided in **Table 2.3**.

Figure 2.5 Site layout plan

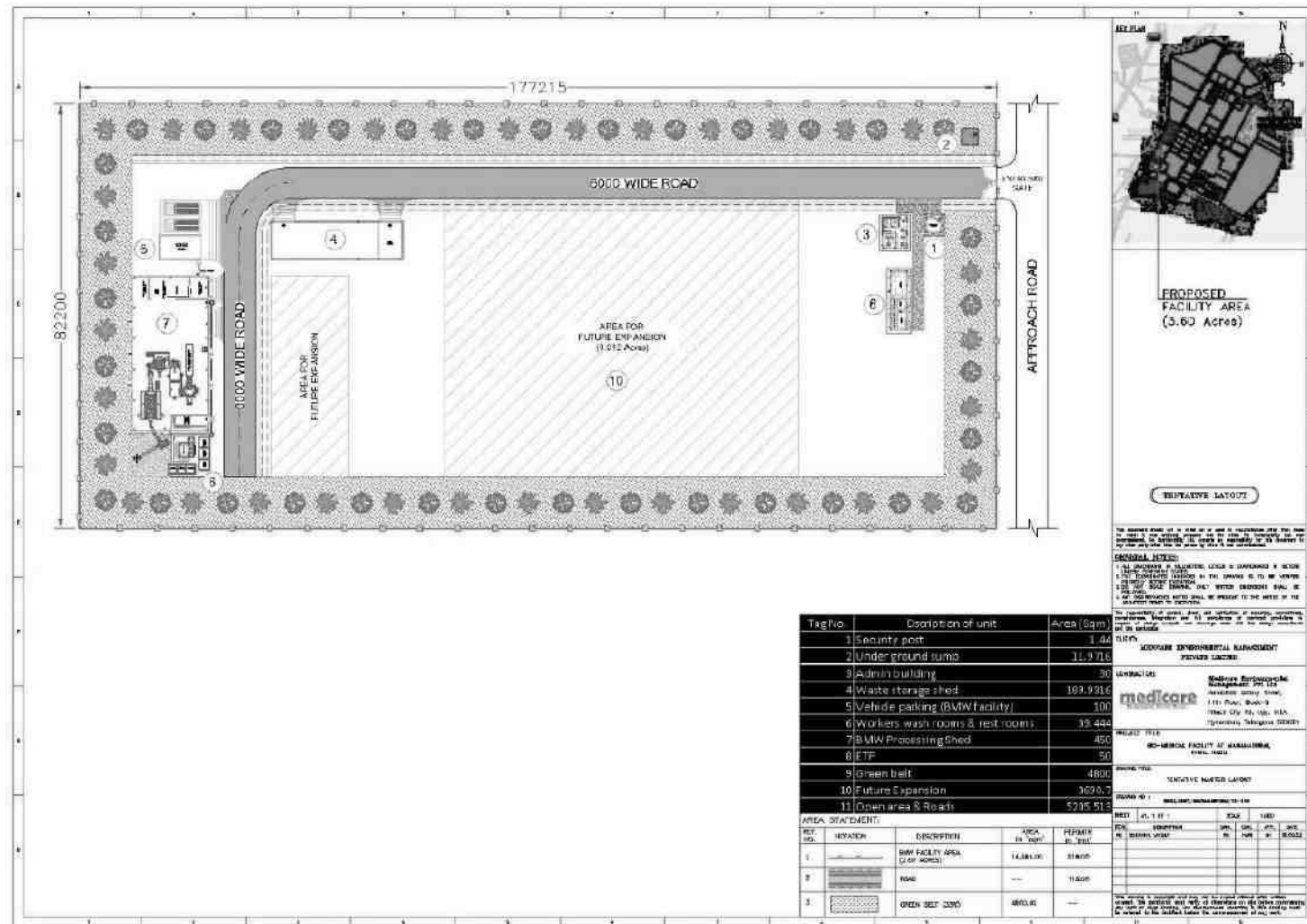


Table 2.3 Land breakup details

Sl.No	Description	Area (in Sq.m.)	Percentage (%)
1	Security post	1.44	0.01
2	Underground sump	11.97	0.08
3	Admin building	30.00	0.21
4	Waste storage shed	189.93	1.30
5	Vehicle parking (BMW facility)	100.00	0.69
6	Workers wash rooms & rest rooms	39.44	0.27
7	BMW processing shed	450.00	3.09
8	Effluent Treatment Plant (ETP)	50.00	0.34
9	Green belt	4800.00	32.95
10	Future expansion	3690.70	25.33
11	Open area & roads	5205.51	35.73
Total		14569.00	100.00

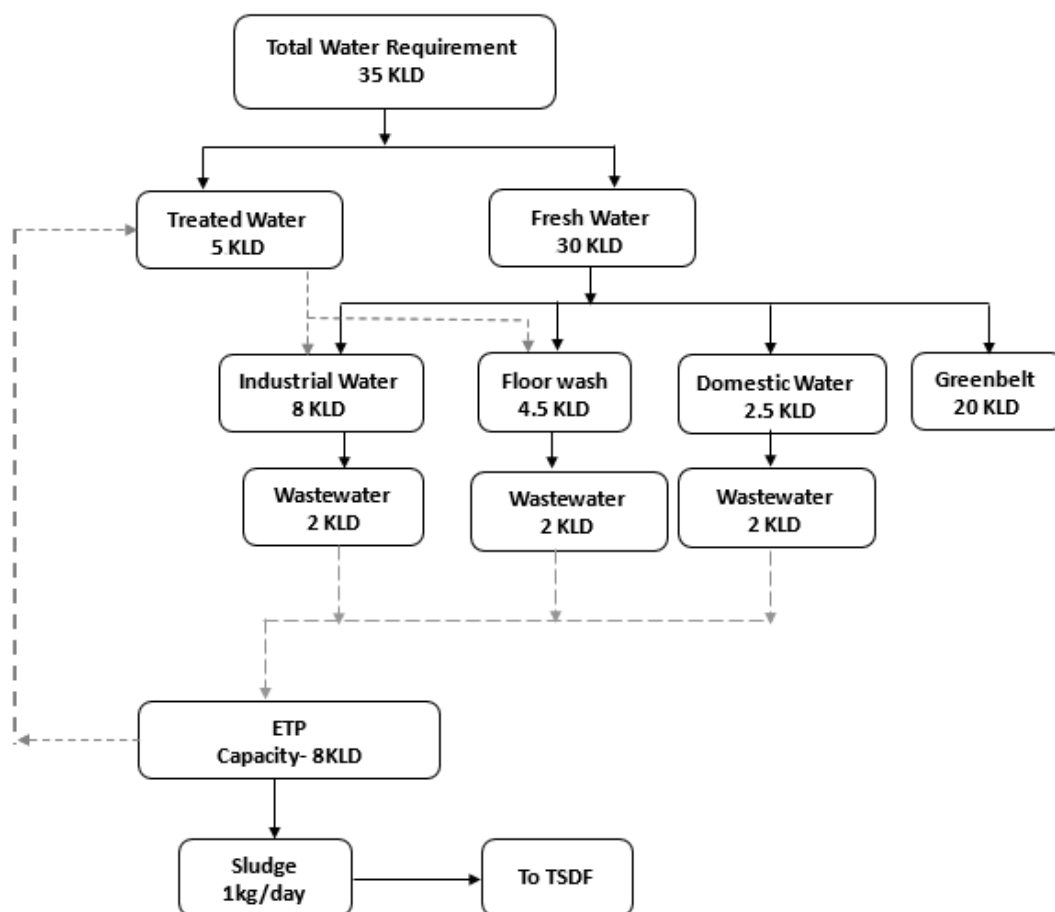
2.5.2 Water requirement

Total water requirement is estimated to be 35 KLD which will be sourced from SIPCOT/ water tankers (permission for water quantity of 50 KL has been obtained from SIPCOT considering future expansion). The wastewater generated will be treated in the proposed ETP and the treated wastewater shall be reused within the proposed facility. The details of the water requirement, water balance is given in **Table 2.4 & Figure 2.6** respectively. An ETP with a capacity of 8 KLD will be established to treat wastewater generated.

Table 2.4 Water requirement (KLD)

Utility	Fresh Water	Treated Water	Total Water	Wastewater	Remarks
Industrial Water	5.0	3.0	8.0	2.0	Gas cooling system based Incinerator is proposed
Floor Washing, Vehicle Washing	2.5	2.0	4.5	2.0	
Domestic Water	2.5	-	2.5	2.0	
Greenbelt	20.0	-	20.0	-	
Total	30.0	5.0	35.0	6.0	
Allotment order P-III/SIP-MNM/Medicare/2022 Dt. 23.12.2022 - 50 KL of water quantity is allotted for the proposed facility (Keeping in view of future expansion).					

Figure 2.6 Schematic representation of water balance



2.5.3 Solid waste

In the proposed project, the solid waste/Hazardous waste generated is incineration ash which would be generated from incineration biomedical waste. The details of solid waste/hazardous waste generated and disposal methods are proposed is given in **Table 2.5.**

Table 2.5: Details of solid waste generated

Sl. No.	Description	Quantity	Remarks
1	Ash from incinerator	170 kg/day	Sent to authorized Common Hazardous Waste Treatment, Storage and Disposal Facility
2	Sludge from ETP	1 kg/day	
3	Waste oil from DG set	2 LPD	Sent to the used oil recovery facility
4	Municipal solid waste	1 kg/day	Sent to nearest municipal bin

2.5.4 Power and fuel requirement

Total power requirement for the project is 150 kVA, which will be sourced from SIPCOT Industrial Park. For emergency backup DG set is maintained with optional usage with a capacity 150 kVA. The details of the power required for the operation of the facility and fuel required for running of DG sets for emergency use during power failure are given in **Table 2.6**.

Table 2.6 Power and fuel requirement

Sl.No.	Details	kVA	Remarks
1	Power required	150	Sourced from SIPCOT industrial park
2.	DG set	1x 150	Used as emergency power backup, fuel will be procured from local dealers
3.	HSD Fuel for DG set & Incinerator	28 liters /hr	Purchased from local dealers

2.5.5 Manpower requirement

The details of skilled and unskilled manpower for the proposed project during construction and operational phase is given below in **Table 2.7**.

Table 2.7 Manpower details

Sl.No.	Description	Direct	Remarks
1	Administrative	8	Indirect and direct employment during construction and operation will be around 50.
2	Skilled manpower	5	
3	Unskilled manpower	20	
4	Other categories	17	
Total		50	

2.6 Proposed schedule for approval and implementation

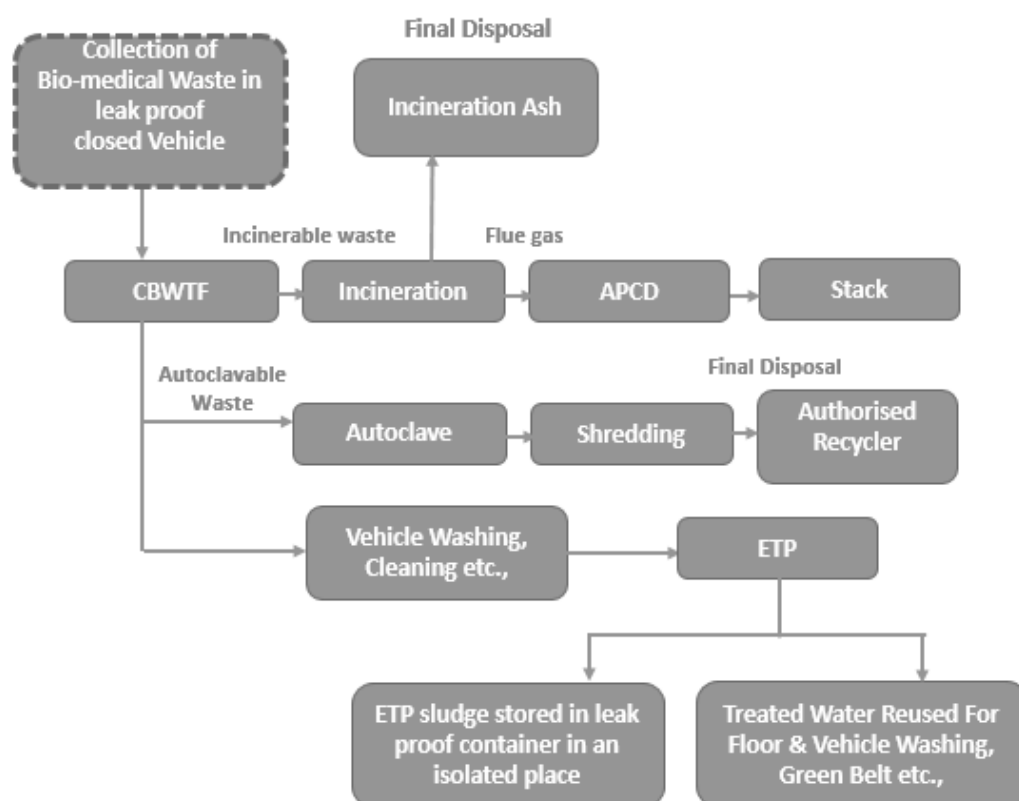
As soon as the EC is accorded, the industry will obtain Consent for Establishment (CFE) from TNSPCB and take up construction work. The probable date of commissioning of project is one year after obtaining necessary clearances.

2.7 Technology and process description

"Bio-medical waste treatment and disposal facility" means any facility wherein treatment, disposal of BMW or processes incidental to such treatment and disposal is carried out, and includes CBWTFs (BMW Management Rules, 2016).

The proposed CBWTF will be following the scientific guidelines for treatment and disposal of BMW as per the guidelines issued by CPCB during 2016 and strictly in accordance with the BMW Management Rules, 2016 published by Ministry of Environment and Forest & Climate Change (MoEF&CC). The schematic representation of process at CBWTF is represented in **Figure 2.7**.

Figure 2.7 Schematic representation of process at CBWTF



2.7.1 Operational methodology of CBWTF

As described hospital waste once generated need to be segregated, collected, transported and safely treated and disposed of without causing damage to the human health and environment. To reduce this problem and provide the HCEs with a cost-

effective solution to the waste disposal, MEMPL proposes for the development of CBWTF.

The raw material required for treatment facility is given in **Table 2.8** and the categories of BMW categories and their segregation, collection, treatment, processing and disposal options as per BMW Management Rules, 2016 are defined in **Table 2.9**. Waste collection bags for BMW shall be made up of non-chlorinated plastics which shall not be incinerated.

Table 2.8 Material requirement

Sl.No.	Particulars	Source	Quantity
1	Color Coded Trolley	Locally	Based on requirement
2	Non-chlorinated color-coded bags	Locally	
3	Diesel	Petrol bunk dealers	
4	Chemicals	Locally	
5	Personal Protective Equipment (PPE's)	Locally	

Table 2.9 BMW categories
(Segregation, Collection, Treatment, Processing and Disposal options)

Category	Type of waste	Type of bag or container to be used	Treatment and disposal options
(1)	(2)	(3)	(4)
Yellow	<p>(a) Human Anatomical Waste: Human tissues, organs, body parts and fetus below the viability period (as per the Medical Termination of Pregnancy Act 1971, amended from time to time</p> <p>(b) Animal Anatomical Waste: Experimental animal carcasses, body parts, organs,</p>	Yellow coloured non-chlorinated plastic bags	Incineration or Plasma Pyrolysis or deep burial*

Category	Type of waste	Type of bag or container to be used	Treatment and disposal options
(1)	(2)	(3)	(4)
	<p>tissues, including the waste generated from animals used in experiments or testing in veterinary hospitals or colleges or animal houses.</p> <p>(c) Soiled Waste: Items contaminated with blood, body fluids like dressings, plaster casts, cotton swabs and bags containing residual or discarded blood and blood components.</p>		<p>Incineration or Plasma Pyrolysis or deep burial* In absence of above facilities, autoclaving or micro-waving/hydroclaving followed by shredding or mutilation or combination of sterilization and shredding. Treated waste to be sent for energy recovery.</p>
	<p>(d) Expired or Discarded Medicines: Pharmaceutical waste like antibiotics, cytotoxic drugs including all items contaminated with cytotoxic drugs along with glass or plastic ampoules, vials etc.</p>	<p>Yellow coloured non-chlorinated plastic bags or containers</p>	<p>Expired cytotoxic drugs and items contaminated with cytotoxic drugs to be returned back to the manufacturer or supplier for incineration at temperature >1200 °C or to common bio-medical waste treatment facility or hazardous waste treatment, storage and disposal facility for incineration at >1200 °C Or Encapsulation or Plasma Pyrolysis at >1200°C. All other discarded medicines</p>

Category	Type of waste	Type of bag or container to be used	Treatment and disposal options
(1)	(2)	(3)	(4)
			shall be either sent back to manufacturer or disposed by incineration
	(e) Chemical Waste: Chemicals used in production of biological and used or discarded disinfectants.	Yellow coloured containers or non-chlorinated plastic bags	Disposed of by incineration or Plasma Pyrolysis or Encapsulation in hazardous waste treatment, storage and disposal facility.
	(f) Chemical Liquid Waste: Liquid waste generated due to use of chemicals in production of biological and used or discarded disinfectants, silver X-ray film developing liquid, discarded Formalin, infected secretions, aspirated body fluids, liquid from laboratories and floor washings, cleaning, house-keeping and disinfecting activities etc.	Separate collection system leading to effluent treatment system	After resource recovery, the chemical liquid waste shall be pre-treated before mixing with other wastewater. The combined discharge shall conform to the discharge norms given in Schedule- III
	(g) Discarded linen, mattresses, beddings contaminated with blood or body fluid.	Non-chlorinated yellow plastic bags or suitable packing material	Non-chlorinated chemical disinfection followed by incineration or Plasma Pyrolysis or for energy recovery. In absence of above facilities, shredding or mutilation or

Category	Type of waste	Type of bag or container to be used	Treatment and disposal options
(1)	(2)	(3)	(4)
			combination of sterilization and shredding. Treated waste to be sent for energy recovery or incineration or Plasma Pyrolysis.
	<p>(h)Microbiology, Biotechnology and other clinical laboratory waste: Blood bags, Laboratory cultures, stocks or specimens of microorganisms, live or attenuated vaccines, human and animal cell cultures used in research, industrial laboratories, production of biological, residual toxins, dishes and devices used for cultures.</p>	Autoclave safe plastic bags or containers	Pre-treat to sterilize with non - chlorinated chemicals on-site as per National AIDS Control Organisation or World Health Organisation guidelines thereafter for Incineration.
Red	<p>Contaminated Waste (Recyclable) (a) Wastes generated from disposable items such as tubing, bottles, intravenous tubes and sets, catheters, urine bags, syringes (without needles and fixed needle syringes) and</p>	Red coloured non-chlorinated plastic bags or containers	Autoclaving or micro-waving/ hydroclaving followed by shredding or mutilation or combination of sterilization and shredding. Treated waste to be sent to registered or authorized recyclers or for energy recovery or plastics to

Category	Type of waste	Type of bag or container to be used	Treatment and disposal options
(1)	(2)	(3)	(4)
	vaccutainers with their needles cut) and gloves.		diesel or fuel oil or for road making, whichever is possible. Plastic waste should not be sent to landfill sites.
White (Translucent)	Waste sharps including metals: Needles, syringes with fixed needles, needles from needle tip cutter or burner, scalpels, blades, or any other contaminated sharp object that may cause puncture and cuts. This includes both used, discarded and contaminated metal sharps	Puncture proof, leak proof, tamper proof containers	Autoclaving or Dry Heat Sterilization followed by shredding or mutilation or encapsulation in metal container or cement concrete; combination of shredding cum autoclaving; and sent for final disposal to iron foundries (having consent to operate from the State Pollution Control Boards or Pollution Control Committees) or sanitary landfill or designated concrete waste sharp pit.
Blue	(a) Glassware: Broken or discarded and contaminated glass including medicine vials and ampoules except those contaminated with cytotoxic wastes.	Cardboard boxes with blue colored marking	Disinfection (by soaking the washed glass waste after cleaning with detergent and sodium hypochlorite treatment) or through autoclaving or microwaving or

Category	Type of waste	Type of bag or container to be used	Treatment and disposal options
(1)	(2)	(3)	(4)
	(b) Metallic body implants		hydroclaving and then sent for recycling.
Source: BMW Management Rules, 2016			

2.7.2 Segregation, collection, packaging, transportation and storage

1. Segregation and collection

The waste shall be segregated at source as per the provisions of BMW Management Rules, 2016 as amended as well as compatible with treatment facilities at CBWTF and occupier / generator is responsible for providing segregated waste to the operator. HCFs are primarily responsible for management of healthcare waste generated within the facilities. They shall be responsible for segregation, collection, in-house transportation, pre-treatment of waste and storage of waste before such waste is sent to CBWTF operator. Dedicated temporary storage at healthcare unit shall be designated. The waste generated from the healthcare facility can be classified as BMW, general waste & other waste.

The coloured bags handed over by the healthcare units shall be collected in similar coloured containers with proper cover. Each bag shall be labeled as per Schedule IV, as well as with bar coding system (to be complied by the occupier or operator of a CBWTF as per BMW Management Rules) so that at any time, the healthcare units can be traced back that are not segregating the bio-medical wastes as per BMW Management Rules. The coloured containers should be strong enough to withstand any possible damage that may occur during loading, transportation or unloading of such containers. These containers shall also be labeled as per Schedule IV of the Rules. Sharps shall be collected in puncture resistant container.

The person responsible for collection of BMW shall also carry a register with him to maintain the records such as name of the healthcare unit, the type and quantity of waste received, time at which waste collected from the member HCF, signature of the authorized person from the healthcare unit etc. During transportation, the containers

should be covered in order to prevent exposure of public to odours and contamination. The segregation, collection, treatment, processing and disposal will be done as per **Table 2.10**.

It shall be ensured that the total time taken from generation of BMW to its treatment, which also includes collection, and transportation time, shall not exceed 48 hours.

2. Packaging

BMW bags / containers are required to be provided with bar code labels in accordance with CPCB guidelines for “Guidelines for barcode System for Effective Management of Biomedical Waste” April, 2018.

- BMW bags should not be filled more than three quarters full. Once this level is reached, the BMW bag should be sealed ready for collection.
- Plastic bags should be tied sealed with a plastic tag or tie and never be stapled
- Immediate replacement bags or containers should be available at each waste collection location
- The bar coded stickers must be pasted on each bag as per the guidelines issued by CPCB.

3. Labeling

All the bags/ containers/ bins used for collection and storage of BMW, shall be labelled with the symbol of Bio Hazard or Cytotoxic Hazard as the case may be as per the type of waste in accordance with BMW Management Rules, 2016. The details like date of generation, type of waste category, waste quantity in kg, name and address of the hospital, contact person name and phone number, contact details in case of any emergency, receivers contact details etc., should be labelled on all the bags and containers apart from bar coding label before transported to CBWTF.



Bio-Hazard Label



Cyto-Toxic Label

4. Bar coded label

Bar coding system is required to be adopted in compliance to the BMW Management Rules, 2016 by the occupier as well as the operator of a common facility.

The benefits of the bar-coding system are summarized below:

- Tracking of BMW from source to disposal and quantification of BMW generated
- Daily check on the occupier, transporter who are involved in transportation of BMW within HCF and from HCF to the CBWTF premises and operator of a CBWTF
- Preventing spillage of BMW at HCFs as well as during transportation of waste from HCF to the CBWTF
- Keeping record of visits made by CBWTF to the member HCFs for collection of waste
- Identification of source of generation of BMW in case waste is disposed of improperly
- Creates real time online monitoring of waste generation, collection, transportation, treatment and disposal
- Colour coding-wise waste handed over to CBWTF operator by the Occupier and waste collected daily by the Operator of a CBWTF from the member HCFs for further treatment and disposal.
- The guidelines published by CPCB on use of bar code system for BMW Management should be followed.

5. Transportation of BMW from HCFs to common bio medical waste

The BMW collected in coloured containers will be transported to the facility in a fully covered dedicated vehicle for transportation of BMW only. Vehicles used for collection of BMW from member HCFs units should be registered under Motor vehicle Act with respective RTO/Transport department and SPCB/PCC. Depending upon the volume of the waste to be transported the vehicle may be a two or three-wheeler, light motor vehicle or heavy duty vehicle.

Regardless of the scenario, the vehicle must have the following:

- Separate cabins for driver/staff and the BMW containers
- Base of the waste cabin will be leak proof to avoid spillage of liquid during transportation
- Waste cabin may be designed for storing waste containers in tiers
- The waste cabin shall be so designed that it is easy to wash and disinfect
- The inner surface of the waste cabin will be maintained as a smooth surface to minimize water retention
- The waste cabin shall have provisions for sufficient openings in the rear and/or sides so that waste containers can be easily loaded and unloaded
- The vehicle shall be labelled as per the Schedule IV of BMW rules and should display the name, address and telephone number of the CBWTF
- BMW transportation vehicle shall be fitted with GPS for tracking the movement of the vehicle
- The vehicles are provided with the first aid kit to handle emergency situations
- The CBWTF biomedical waste shall be responsible for transportation and the risks and liabilities associated with transportation
- A spill kit containing absorbent material, a disinfectant, a leak proof waste disposal container and heavy-duty reusable glove will be used by the Personnel handling the waste during the transport will be kept in the transport vehicle
- All the vehicles used for collection of BMW from the health care facilities will have the symbol of BMW and the label displayed as prescribed in the BMW rules
- Two designated vehicles with GPS system satisfying the above conditions are used for transportation of BMW in the facility

6. Disinfection and destruction

Upon receipt of BMW at the facility, waste containers shall be unloaded. Wastes based on their colour codes shall be separated and properly treated and disposed of as per MoEF&CC rules. The incinerable waste shall be loaded into the incinerator while autoclavable shall be loaded into the autoclave for disinfection. Residual ash from incinerator unit shall be sent to nearest TSDF and waste from autoclave shall be sent to authorized recyclers.

7. Storage of BMW

a. Treatment equipment room

A separate housing shall be provided for each treatment equipment such as incinerator room, autoclave room, etc. Each room shall have well-designed roof and walls. Such room shall be well ventilated and easy to wash. The floor and interior finishing of the room shall be such that chances of sticking / harbouring of microorganisms are minimized and can be attained by providing smooth & fine floor and wall surfaces (to a height of 2 meter from floor) preferably of tiles. The number of joints in such surfaces shall be minimal. The equipment room shall also have a separate cabin, to supervise the operation of the equipment and to record the waste handling and equipment operational data attached to each equipment room. There shall be two waste storage rooms, one for storage of untreated wastes and another for treated wastes and may be located at a distance from each other. The storage room shall have provisions similar to that of equipment room being well-ventilated with easy to wash floors & walls, smooth and fine surfaces etc. All the treatment equipment rooms and waste storage rooms should be provided with 'fly catcher/killing device'. The room has to be washed and cleaned with a suitable disinfectant every day.

b. Main Storage space

Storage of BMW collected from HCFs /HCEs and bought in by the vehicles to the facility is stored in a designated storage area in the facility. The storage area is as per the BMW Rules consisting of the following:

- A roofed storage shed with impervious flooring to prevent seepage of liquid waste into the soil and ground water
- The shed is well ventilated to control odour
- Storage area is designed to withstand the load of waste stocked and ensuring no probable impact from BMW spillage
- In case of spills / leak from the stored waste, cotton will be used to mop the leachate from the floor and incinerated

- Smoking is prohibited in and around the storage area
- Proper housekeeping and maintenance of the storage area
- Only person authorized and trained will have access to the BMW storage area

c. Treated waste storage room

- Separate space should be provided to store the wastes treated in different treatment units.
- Other provisions in the room shall be similar to main storage room.
- Waste such as incineration ash/vitrified ash generated in the process of incineration/plasma pyrolysis respectively shall be stored safely in a separate area under the shed so as to avoid entry of rain water during the monsoon and for easy collection.
- In case, incineration ash/ vitrified ash is found to be hazardous in nature same should be disposed through any authorized TSDF operator located nearby following the manifest as per Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016.

d. Administrative room

This room shall be utilized for general administration, record keeping, billing etc.

e. Generator set

CBWTF shall have a generator set of adequate capacity as standby arrangement for power, with sufficient capacity to run the treatment equipment during the failure of power supply. The generator set shall comply with the necessary requirement as per DG Set norms notified under the Environment (Protection) Act, 1986.

f. Continuous emission monitoring system (CEMS)

Monitoring provision for continuous monitoring of the incinerator/plasma pyrolysis stack emission shall be installed by CBWTF operators for the parameters as stipulated by respective SPCB/PCC as per the authorisation granted under BMW Management Rules, 2016. Otherwise, at present, all the existing CBWTF operators are required to

carry out stack emission monitored using continuous emission monitoring system for the flue gas parameters such as CO₂, O₂, CO and SPM as well as primary & secondary chamber temperatures, and records maintained. The continuous emission monitoring system for stack emission should be installed as per the guidelines issued by SPCB/PCC/CPCB. Real time continuous stack emission monitoring data is also required to be transmitted to the servers of the respective SPCB/PCC as well as CPCB, by all existing CBWTF operators.

g. Vehicle Parking

Provision for parking shall be made within the confines of site, for parking required number of vehicles, loading and unloading of vehicles meant for transporting waste to and from the facility, etc. In case of a CBWTF with space constraints, multi-storey parking or a separate provision may be allowed only for parking of vehicles.

h. Display and sign board

An identification board (Display) of durable material and finish shall be displayed at the entrance of facility. This shall clearly display the name of the facility, owner name, address and telephone number of operator and the prescribed authority, no. of hours of operation & operational hours, telephone numbers of the personnel to be contacted in the event of an emergency, validity period of authorization as well as total daily waste treated and disposed.

Signboards should be provided with all salient points (untreated waste storage area, treatment equipment, treated waste storage area, ETP, firefighting equipment) within the facility.

i. Washing room

A washing room shall be provided for eye washing / hand washing / bathing etc. for the workers.

j. Site security

High walls, fencing and guarded gates shall be provided around the facility to prevent unauthorized access to the site by humans and livestock.

k. Fire safety

Fire safety equipment such as sand buckets and fire extinguishers should be placed at all the salient points of the CBWTF including at the diesel storage areas, diesel tanks connected with the incinerator etc. Fire alarm to be provided within the CBWTF to prompt the workers in the event of any fire hazard. Workers should also be trained in First Aid administration.

l. First aid box

First Aid Box with necessary provisions need to be provided at all the salient points within the facility.

m. Green belt

Adequate area will be allotted for greenbelt development and one row of plants will be planted all along the boundary & internal roads within the project site to minimize the environmental impacts of the site on its surroundings.

2.8 Treatment of BMW

The primary methods for treatment and disposal of BMW, which are proposed for the CBWTF are incineration, autoclaving and shredding. The brief description about the treatment process is given below:

2.8.1 Incineration

The primary purpose of incineration is to burn the waste to ashes through a combustion process. MEMPL intends to set up incinerator of optimum capacity at each of the locations. Proposed to install, Incinerators of capacity 2 X 250 kg/hr at the facility. The unit shall be a dual chambered fixed hearth incinerator.

Dual chambered incinerator with a capacity of 250 kg/hr, run on diesel and monoblock automatic burners. The temperature for primary chamber is 800°C and secondary

chamber is 1050°C +/- 50°C. The incinerator is facilitated with loading door, emergency vent and large opening to enable waste charge and to install air pollution control devices. The incinerator shall be made of mild steel plate of 5 mm thick and painted externally with heat resistant aluminum paint suitable to withstand high temperatures. The incinerator is designed on "controlled-air" incineration principle. The waste is fed into the incinerator in small batches at fixed intervals of time using auto-feeding mechanism.

Description of incinerator - dry scrubbing system

Incineration is a treatment process, applied to certain wastes that cannot be recycled, reused or safely deposited into a landfill. It is a high temperature, thermal destruction oxidation process in which BMW are converted in the presence of oxygen in air into gases and incombustible solid residue. The gases are vented into the atmosphere with cleaning as deemed necessary while the solid residue is sent to landfill for disposal. The proposed incinerator would facilitate treatment of Bio-medical wastes.

A dry scrubbing incinerator in BMW has the following components:

1. Primary combustion chamber

Operating temperature - 800 °C +/- 50 °C

Primary Chamber consists of the following:

- Waste feeding system (DFDV system/ Ramp pusher)
- Combustion fan (Forced draft fan)
- Automatic burners (O₂ Burners Lo-20 / Lo-30)

2. Secondary chamber

Operating temperature - 1050 +/- 50 °C

Secondary chamber consists of the following:

- Automatic burners (O₂ Burners Lo-40 Double stage / Lo-30)

3. Emergency chimney

4. Gas cooler

The flue gases from reactor will enter into the air-cooled gas cooler through refractory lined duct and cooled down to the filter operating temperature range.

Flue gas inlet temperature - 900°C to 1000 °C

Flue gas outlet temperature - 200°C to 250 °C

5. Air pollution control devices (dry scrubbing system)

- Gas neutralization system
- Filtration unit

The dry scrubbing system consists of dry injector for reagent injection followed by ceramic candles filter for collection of reaction products and particulate. Reagents used are lime/ sodium bicarbonate and activated carbon.

6. ID fan

The ID fan maintains the balance and draws out the clean gases into the atmosphere through a 30m high stack. The force duct fan is provided to supply air inside the primary and secondary chambers.

7. Emergency stack (automatic operated through Pneumatic system)

8. Fully automated PLC based control panel with SCADA.

9. Automatic operated air compressor and air dryer

Standards for incineration

All incinerators will meet the following operating and emission standards

A. Operating Standards

- 1) Combustion Efficiency (CE) shall be at least 99%.
- 2) The Combustion efficiency is computed as follows:

$$\text{C.E.} = \frac{\% \text{CO}_2}{(\% \text{CO}_2 + \% \text{CO})} \times 100$$

- 3) The temperature of the primary chamber shall be a minimum of 800 °C and the secondary chamber shall be minimum of 1050°C +/- 50°C

4) The secondary chamber gas residence time shall be at least two seconds

B. Emission Standards

Table 2.10 Emission standards

Sl. No	Parameter	Standards	
		Limiting concentration in mg/nm ³ unless stated	Sampling Duration in minutes, unless stated
1.	Particulate matter	50	30 or 1 nm ³ of sample volume, whichever is more
2.	Nitrogen Oxides- NO and NO ₂ expressed as NO ₂	400	30 for online sampling or grab sample
3.	HCl	50	30 or 1 nm ³ of sample volume, whichever is more
4.	Total Dioxins and Furans	0.1ngTEQ/ nm ³ (at 11% O ₂)	8 hours or 5 nm ³ of sample volume, whichever is more
5.	Hg and its compounds	0.05	2 hours or 1 nm ³ of sample volume, whichever is more

The design details of the proposed incinerator system is given in **Table 2.11** and statement on compliance with CPCB guidelines for CBWTF incinerator is given in **Table 2.12** and **Table 2.13** Compliance on applicable rules and guidelines for CBWTF.

Table 2.11 Design details of proposed incinerator

Design details of Incinerator	
Type of Waste to be Incinerated	Bio-Medical Waste
Model	BMW-250 kg/hr.
Thermal Combustion Efficiency	99 %
Primary Chamber	
MoC	Mild Steel, 5 mm thickness & painted externally with heat resistant aluminum paint suitable to withstand temperature of 250°C
Brick Lining	Minimum 115 mm thickness and shall conform to IS:8-1983 & IS:2042-1972 and suitable for temperature up to 1400°C
Volume of Primary Chamber	5 times the volume of one batch
Hearth Area	3.75 sq. m (0.75 sq. m/50 kg/hr)

Design details of Incinerator	
Operating Temperature	Minimum 800°C
Side & Top portion of Primary Chamber	Will have rounded corners from inside to avoid possibility of formation of black pockets/dead zones
Suction	The suction at primary combustion chambers will always be maintained at -5 mm WC and measuring device shall be provided for measurement of the same.
Manometer	Shall be provided
Manhole and ash discharge doors	Shall be provided
Raking System	Manual
Thermocouple Rod	TC rod K type shall be provided in primary chamber before admission of secondary air.
Skin Temperature	Less than 70°C
Automatic Waste Feeding System	
MoC	Mild Steel, Thickness 5 mm
Feeder	Hydraulic based waste feeding system equipped with power pack, cylinders and 2 doors shall be provided. This mechanism will protect from heat loss and flames coming out of the chamber. Material to be loaded through conveyor at the hopper of the hydraulic based waste feeding system. Waste feeding system is mechanized and interlocked with temperature. This shall be provided with conveyor, conveyor belt, support and hopper.
Oil Burner for Primary Chamber	
Quantity	2 Nos.
Fuel	HSD
Temperature Control	Automatic
Ignition	Automatic
Blower with Motor	Shall be provided
Flame View Port	Shall be provided
Filter	Shall be provided
Forced Draft Fan	
Quantity	1 No
Type	Centrifugal
MoC of Outer Body	Mild steel
Balancing	Dynamically and Statically
Air Flow Measuring Gauges	Shall be provided
Air Supply Regulation	30% - 80% and 170% - 120% of stoichiometric amount in primary & secondary chambers respectively. Primary air will be admitted near/at the hearth for better contact.

Design details of Incinerator	
Secondary Chamber	
MoC	Mild Steel, 5 mm thickness
Brick Lining	Minimum 115 mm thickness and shall confirm to IS:8-1994 & IS:2042-2006 and suitable for temperature up to 1400°C
Side & Top Portion of Secondary Chamber	Rounded corners from inside to avoid possibility of formation of black pockets/dead zones
Operating Temperature	1050°C ± 50°C
Minimum Flow of the Flue Gas in the Secondary Chamber	0.6 m ³ /sec at 1050°C, 2 second - temperature residence time and turbulence
Suction Pressure Measurement Device	Shall be provided
Manhole	Shall be provided
Skin Temperature	Less than 70 degree
Temperature Sensor	Shall be provided at the end of secondary chamber or before admission of dilution medium to cool the gas
Burner for Secondary Chamber	
Quantity	1 No.
Fuel	HSD
Temperature control	Automatic
Ignition	Automatic
Fuel pump	Shall be provided
Blower with motor	Shall be provided
Sequence controller	Shall be provided
Flame view port	Shall be provided
Interconnecting Ducts	
MoC	Mild steel
Thickness	6 mm & painted externally with heat resistant aluminum paint suitable to withstand temperature of 250°C
Refractory and Insulation	Refractory lining (minimum 45 mm thick) of the hot duct will be done with refractory castable (minimum 80 mm thick) & Insulating castable. Downstream side also shall be provided with thick castable. Asbestos blanket/ceramic wool will be used at hot duct flanges & expansion joints
Emergency Stack	
Quantity	1 No.
MoC	Mild steel, 6 mm thickness
Operation/Control	Through dampers, in case of power failure for emergency and will remain close during normal operating hours

Design details of Incinerator	
Refractory & Insulation	115 mm thick
Air cooler unit	
Quantity	1 set
MoC/Thickness	Mild steel/5 mm
Refractory and Insulation	80 mm & 45 mm Thick
Pipeline and Fittings	Gas distribution system
Gas neutralization unit	
Quantity	1 set
MoC	Mild steel/5 mm thick
Pipeline and Fitting	Shall be provided
Gas filtration unit	
Quantity	1 No.
Type	Hopper with screw conveyor – dust removal
MoC	MS Sheet 5 mm
Pipelines & Fitting	Shall be provided
Flanges	Shall be provided
Induced Draft Fan (id fan)	
Quantity	1 No.
Type	Centrifugal
Static Pressure	500 mm WC
MoC of Outer body	Mild Steel/ 5 mm
FRP coating	3 mm
MoC of Impeller	Stainless Steel 316 L
Balancing	Dynamically & Statically
Motor	Shall be provided
Drive	Belt driven
Fuel Tank	
Quantity	1 No.
MoC	Mild Steel 5mm
Label Indicator/ Pipeline & Fitting	Shall be provided
Control Panel	
Quantity	1 No.
MoC	CRCA (Cold Rolled Close Annealed) sheet
Tamper Proof Programmable Logic Controller (PLC)	Shall be provided
Temperature Indicator for Primary & Secondary Chamber	Shall be provided
Temperature Controller	Shall be provided
Flue Gas Temperature Indicator	Shall be provided
Hooters/Alarms	Audio-Video alarms shall be provided for any abnormal operation
Interlocking	Shall be provided for safe operation

Design details of Incinerator	
Auto Cut off ID Fan, FD Fan & Burners	Burners will be automatically operated as per the temperature guidelines mentioned in BMW Management Rules, 2016 and its amendments
Contractors, Overload Relays, MCB etc.	Shall be provided
Timer, Selector Switch, Volt Meter	Shall be provided
Chimney	
Structural Design	As per IS: 6533-1389
Height	30 m above ground
Concrete chimney will be provided for maintenance and extended life of the project.	

Table 2.12 Statement on compliance with guidelines of CPCB for CBWTF incinerator

Design Parameter	CPCB Guidelines	Proposed Incinerator
Air Pollution Control Devices	Compulsory	Complied. All necessary air pollution control devices (gas neutralization system, filtration unit etc.) are provided to meet the emission standards prescribed in Bio-Medical Waste Management Rules, 2016
Chambers	Only double chamber	Complied. Dual Chamber Incinerator is proposed
Volume of primary chamber	5 times the volume of one batch	Complied. Volume of primary chamber is proposed to be at least 5 times the volume of one batch of bio-medical waste
Size of opening	> size for waste bag to be fed	Complied. The size of opening shall be greater than size of the waste bags to be fed
Pressure gauge	Mandatory	Complied. Necessary pressure gauges will be provided
Double chamber incinerator design	Controlled air incinerator principle	Complied. Incinerator is designed on controlled air incineration principle
Overall design	Minimum 100% excess air	Complied. Incinerator is designed considering minimum 100% excess air
Air supply	Primary chamber: 30-80% of stoichiometric amount	Complied
Flow meters on primary and secondary ducting	Mandatory	Complied. Flow meters shall be provided as per guidelines

Design Parameter	CPCB Guidelines	Proposed Incinerator
Pressure in incinerator	Lower than ambient pressure in incinerator room	Complied. Incinerator designed accordingly
Draft height of WC column	Minimum 1.27 to 2.54 of water column	Complied. Incinerator designed accordingly
Water column pressure measurement by U-tube manometer	Mandatory	Complied. Incinerator designed accordingly
Residence time of waste in secondary chamber	Minimum 2 sec	Complied. Secondary chamber of the incinerator designed to maintain a minimum residence time of 2 seconds.
Temperature	Primary chamber: min of 800°C ± 50°C	Complied
	Secondary chamber: min of 1050 ± 50°C	Complied
Refractory bricks	Minimum thickness: 115 mm; IS: 8-1983 & IS:2042-1972	Provided
Incinerator shell thickness	Min 5 mm	Complied. Incinerator designed accordingly
Incinerator thickness with standing capacity	Min. 250°C and outside surface temp. < 20°C above ambient temperature	Complied. Incinerator designed accordingly
Refractory lining of hot ducts	Shall be done with refractory castable (min, 45 mm thickness) and insulating castable (min. 80 mm thickness)	Complied. Incinerator designed accordingly
Thermocouple location	Primary chamber- Before admission of secondary air	Complied. Incinerator designed accordingly
	Secondary chamber: at the end of secondary chamber or before the admission of dilution medium	Complied. Incinerator designed accordingly
Heat burning time prior to waste charge	Max. of 60 minutes	Complied. Incinerator designed accordingly
TOC content in slag and bottom ash	< 3%	Complied. Incinerator designed accordingly

Design Parameter	CPCB Guidelines	Proposed Incinerator
LOI	<5 % of dry weight	Complied. Incinerator designed accordingly
Automatic switch on/off for temperature control	Mandatory	Complied. Incinerator designed accordingly
Handling during charging of waste	No manual handling/ waste shall be charged in bags through automatic feeder system	Complied. Incinerator designed accordingly
PLC system	Mandatory	Complied. PLC system provided
Emergency vent	Mandatory	Complied. Emergency vent shall be provided
Graphic or computer recording devices	Mandatory	Complied. Incinerator designed accordingly
Continuous emission monitoring system	For CO, CO ₂ and O ₂	Complied. Continuous online monitoring system shall be installed
Structural design of chimney/stack	IS 65330-1989	Complied. Chimney designed accordingly
	Lining with min. 3mm thick natural hard rubber	
	IS: 4682 part I-1968 (for avoiding corrosion)	
Instruction plates at suitable places	Mandatory	Complied
Air Pollution Control Devices		
Acids	Acid gas scrubbers	Complied. Dry Scrubbers shall be provided
Oxides of nitrogen	Catalytic converter/ high temp reaction with ammonia	Complied. Will be provided, if necessary
Heavy metals	Adsorption on injected activated carbon powder	Complied. Will be provided, if necessary
Dioxins	Rapid quenching/ catalyst/adsorption by activated carbon	Complied. Sufficient capacity of gas cooler and gas neutralization unit shall be provided
Mist	Demister	Complied. Demister is proposed

Design Parameter	CPCB Guidelines	Proposed Incinerator
Oxygen correction	< Standard percentage oxygen concentration (11%)	Complied. Oxygen correction shall be as per guidelines
Stack height requirement	> or = 30 m above the ground, Bio medical Waste Management rules, 2016	Complied. Stack height of 30 meters proposed
Stack emission monitoring provision	As per Emission Regulations of CPCB, 2007	Complied. Stack emission monitoring provision shall be ensured to be as per guidelines
	Separate monitoring provision for dioxins and furans	
Particulate Matter, HCl, NOx, Hg & compounds and combustion	Frequency: Once in 3 months	Will be followed
Dioxins and furan	Frequency: Once in a year	Will be followed
Continuous emission monitoring system	Mandatory	Complied. Continuous emission monitoring system is considered in Incinerator design
Quench/ scrubber waste management	Wastewater shall be treated	Complied. Wastewater shall be treated in in-house Effluent Treatment Plant
Note: Expired cytotoxic drugs and items contaminated with cytotoxic drugs will be segregated from BMW waste and sent hazardous waste treatment, storage and disposal facility for disposing at >1200°C incinerator temperature.		

Table 2.13 Compliance on applicable rules and guidelines for CBWTF

Sl. No.	Criteria	Details	Remark
Bio-medical Waste Management Rules, 2016			
1	The selection of site for setting up of such facility shall be made in consultation with the prescribed authority, other stakeholders and in accordance with guidelines published by the MoEF&CC and CPCB	The land for the proposed BMW facility at Manamadurai is in a notified SIPCOT industrial area. The land is complying to the siting criteria specified by CPCB. Further as per the ToR condition, we (Medicare Environmental Management Limited) have requested TNPCB to confirm the suitability of the land for establishment of the CBWTF.	Noted and shall be Complied

Sl. No.	Criteria	Details	Remark
Revised Guidelines for CBWTF by CPCB on 21st Dec. 2016			
1	<p>A CBWTF shall preferably be developed in a notified industrial area without any requirement of buffer zone</p> <p>(or) CBWTF can be located at a place reasonably far away from notified residential and sensitive areas and should have a buffer distance of preferably 500 m so that it shall have minimal impact on these areas.</p>	<p>The project site is located within the notified industrial park of SIPCOT, Tamil Nadu</p>	<p>Noted and shall be Complied</p>
2	<p>Adoption of best available technologies (BAT) by the proponent of CBWTF</p>	<p>The proposal includes all advance treatment facility like dual fired chamber incinerator with Air Pollution Controlling Equipment and adequate height of Stack.</p> <p>Shredder, Autoclave has also provided for disinfection of not incinerable waste.</p> <p>ETP has been provided with 100% utilization of treated wastewater so that no wastewater will be discharged outside the facility.</p>	<p>Noted and shall be Complied</p>
3	<p>The CBWTF can also be developed as an integral part of the Hazardous Waste Treatment Storage and Disposal Facility (TSDF) subject to obtaining of necessary approvals from the authorities concerned including 'Environmental Clearance' as per Environmental Impact Assessment Notification 2006</p>	<p>The proposed CBWTF is a standalone facility to be constructed at 3.6 ac of the land allotted in notified industrial park of SIPCOT, Manamadurai. The facility shall be established after obtaining necessary Environmental Clearance, Consent to Establish and Consent to Operate from the respective authorities</p>	<p>Complied</p>

Sl. No.	Criteria	Details	Remark
4	<p>Preferably, a CBWTF shall be set up on a plot size of not less than one Acre in all the areas. However, a CBWTF can be developed in adjacent plots but cannot be set up in two or more different plots located in different areas. Separate plots can be permitted only for vehicle parking if located in the close vicinity of the proposed CBWTFs or the existing CBWTFs.</p> <p>In case of upcoming or new CBWTFs (both in municipal limits with population more than 25 lakhs or in rural areas), the land area requirement may be relaxed (but in any case, not less than 0.5 Acre) by the SPCB/PCC, with additional control measures such as ZLD, increase in stack height, stringent emission norms, odour control measures or any other measures felt necessary by the prescribed authority on case-to-case basis, only in consultation with CPCB</p>	<p>The CBWTF is proposed on 3.6 ac of notified industrial park of SIPCOT, Manamadurai, TN.</p> <p>Necessary steps such as ZLD, stack height, odor control measures etc., as shall be prescribed by the authorities shall be followed.</p>	<p>Shall be Complied</p>
5	<p>A CBWTF located within the respective State/UT shall be allowed to cater healthcare units situated at a radial distance of 75 km. However, in a coverage area where 10,000 beds are not available within a radial distance of 75 km, existing CBWTF in the locality</p>	<p>There is no CBWTF in Manamadurai at the present. Hence, the proposed facility once established shall cater to the requirement of BMW disposal requirement of the health care establishments in the Manamadurai.</p>	<p>Noted and Shall be Complied</p>

Sl. No.	Criteria	Details	Remark
	(located within the respective State/UT) may be allowed to cater the healthcare units situated up to 150 km radius w.r.t. its location provided the Bio-medical waste generated is collected, treated and disposed of within 48 hours as stipulated under the BMWM Rules 2016.		

2.8.2 Autoclave

The primary purpose of autoclave is to sterilize/disinfect the waste with steam. Microorganisms, which contribute to infection, do not survive beyond 80°C. However, as a precaution temperature of 121°C with 15 pounds per square inch (psi) pressure and 45 min duration to ensure distribution of temperature. At this temperature and pressure, microorganisms are completely destroyed and thus render the waste infection free. The disinfected waste shall then be segregated into HDPE, PP, rubber, latex, glass and metal. The segregated materials shall then be shredded completing the process of disinfection and ensuring non-recycling of the waste materials for medical / food grade purposes. All the process control conditions will be as per the applicable Bio-Medical rules.

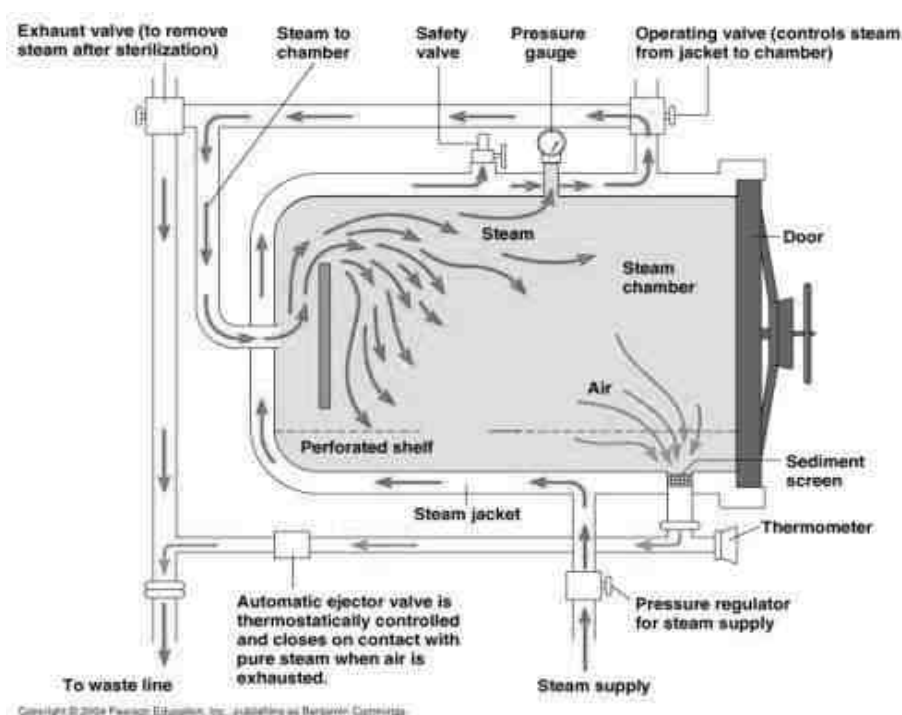
Autoclave features

A vacuum type (programmable) autoclave which can operate at all the specifications mentioned by MoEF&CC with a capacity to handle 1275 liters/batch is proposed. The autoclave shall have continuous and automatic recording of temperature, pressure, date, time and batch of loading. Every batch shall be monitored with a strip chart recorder and once in a month the spore validation test and/or spore monitoring shall be done. The key features of the proposed autoclave are given in **Table 2.14**. The typical autoclave is shown in **Figure 2.6**.

Table 2.14 Proposed features of autoclave

Type	Vacuum Type, automatic with documentation
Capacity	2 Ton per day
Temperature	121° C
Pressure	15 psi
Time	45 min
Automation	PLC with MMI (Man-Machine Interface)
Documentation/ Recording	Computerized recording

Figure 2.8 Sterilization process



2.8.3 Shredder

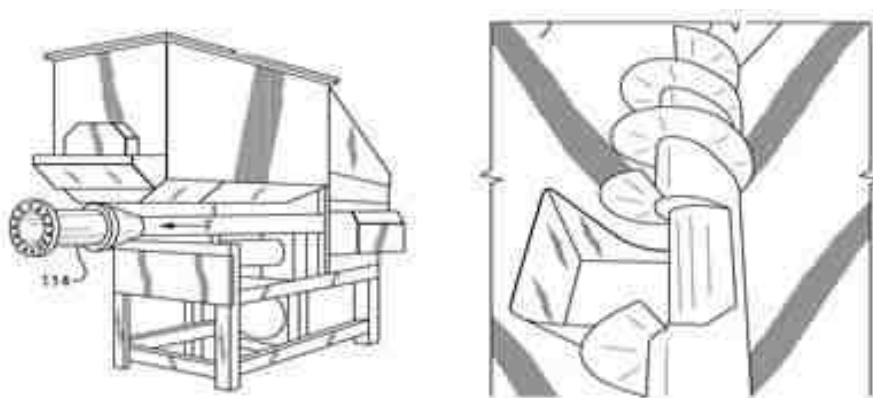
A mechanical shredder to make the waste unrecognizable as medical waste shall be installed with a required capacity of BMW. The shredder shall be properly designed and covered to avoid spillage and dust generation. The hopper and cutting chamber of shredder shall be designed to accommodate the waste bag full of bio-medical waste. The shredder blades are highly resistant and able to shred waste sharps, syringes, scalpels, glass vials, blades, plastics, catheters, broken ampoules,

intravenous sets/ bottles, blood bags, gloves, bandages etc. The shredder blades shall be of non-corrosive and hardened steel.

The shredder shall be so designed and mounted so as not to generate high noise & vibration. If hopper lid or door of collection box is opened, the shredders shall stop automatically for safety of operator. In case of shock-loading (non-shreddable material in the hopper), there shall be a mechanism to automatically stop the shredder to avoid any emergency/accident. In case of overload or jamming, the shredders shall have mechanism of reverse motion of shaft to avoid any emergency/accident.

The shredder shall have low rotational speed (maximum 50 rpm) to ensure better gripping and cutting of the BMW. The discharge height (from discharge point to ground level) shall be sufficient (minimum 3 feet) to accommodate the containers for collection of shredded material. This avoids spillage of shredded material.

Figure 2.9 Shredder

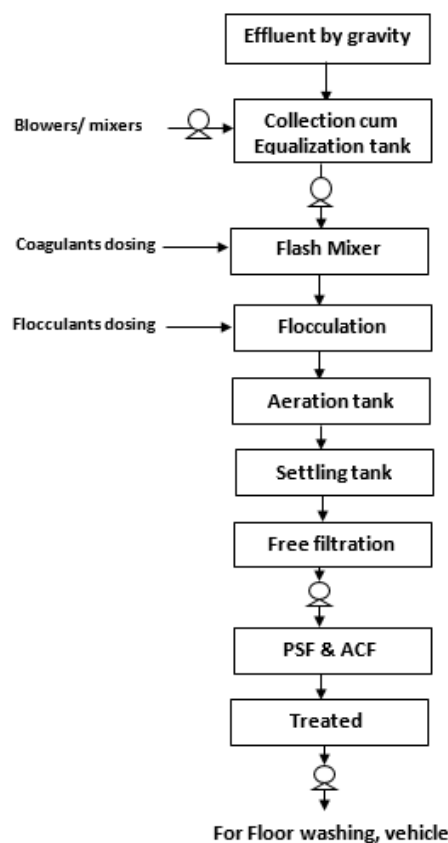


2.9 Effluent treatment plant

A suitable Effluent Treatment Plant (ETP) shall be installed to ensure that liquid effluent generated during the process of washing containers, vehicles, floors etc. is treated and reused after treatment. ETP should have required treatment unit operations comprising collection tank, chemical dosing, coagulation chamber, primary settling tank, biological treatment process, secondary settling tank, pressure filter and activated carbon filter so as to comply with the regulatory discharge

standards stipulated under the Bio-Medical Waste Management Rules, 2016. The effluent process flow chart is given in **Figure 2.10**.

Figure 2.10 Effluent Treatment Process Flow Chart



ETP shall be fitted with separate 'energy meter' so as to know total consumption of electricity for operation of the machinery attached with the ETP. ETP shall also be fitted with pH meter so as to know pH level of treated water, ETP also be fitted with 'magnetic flow meter' at the outlet to know the total wastewater treated for further end use or discharge in compliance to the BMW Rules. ETP should also be connected with a provision of 'press filter' or 'sludge drying bed' for drying the sludge generated from the ETP and after drying, same need to be disposed of in an environmentally sound manner depending upon the hazardous constituents present in it. Proper treatment of wastewater shall be ensured in case of zero discharge by recycling of treated wastewater for scrubbing.

The entire wastewater collected from autoclave, floor and reactor washings shall flow through the ETP and shall be re-circulated into the scrubber.

2.10 Ash storage area

Waste such as incineration ash generated in the process of incineration shall be stored in a separate area under the shed so as to avoid entry of rain water during the monsoon and for easy collection and in case, incineration ash is hazardous waste in nature same shall be disposed through any authorized TSDF operator located nearby.

2.11 Waste Audit

MEMPL shall undertake a waste audit to assess the waste quantities, current waste handling practices and subsequent treatment and disposal of the wastes. The audit shall include a survey of representative health care establishments and cover all aspects related to bio-medical wastes including occupational health and safety.

2.12 Training and Awareness

Medicare experience indicates that, the awareness levels of most health care establishments in respect to bio-medical waste management are very low. The health care workers are not completely aware of the impacts of the improper waste handling and management. Our first step towards our endeavor would be to create awareness among all the stakeholders involved in the subject. Subsequent to this MEMPL shall provide thorough training to all the members on all aspects of bio-medical waste management. This training shall include segregation of wastes into proper color-coded bags, identification of containers required for collecting the wastes, precautions to be taken in respect of handling wastes with special reference to sharps management. There shall be specific focus towards occupational safety of health care workers.

CHAPTER 3 – DESCRIPTION OF ENVIRONMENT

Chapter 3

Description of the Environment

3.1 Introduction

This chapter illustrates the description of the existing environmental status of the study area with reference to the major environmental attributes. The main aim of the baseline study is to identify the critical environmental attributes which will be affected and have adverse impacts on the surrounding systems due to the present scenario. The study is carried out during the project planning stage itself, so that the proposed facility can be implemented in a technically, financially and environmentally sustainable manner on a long-term basis. With the proposed project as the center, a radial distance of 10 km is considered as 'study area' for baseline data collection and environmental monitoring.

3.2 Study area, period and components

Studies of various environmental parameters have been done within 10 km radius (Core Zone and Buffer Zone) from project site at SIPCOT Industrial Park, Seikalathur (V), Manamadurai (T), Sivagangai (D), Tamil Nadu in accordance with the guidelines issued by the MoEF&CC, CPCB and SPCB. The baseline data study has been carried out during the period of June, 2023 to August, 2023 (summer season).

The study depends mainly on two factors. One is estimation of impact from proposed project on the environment and the second one is assessment of the baseline environmental condition. Both are key factors to arrive at the post project scenario. The estimated impact due to the proposal can be superimposed over the existing conditions to arrive at the post project scenario. The scope of the baseline studies includes detailed study of the following environmental components, which are most likely to be influenced by setting up the proposed common BMW treatment facility:

- Meteorological conditions
- Ambient Air Quality

- Water Quality (Ground & Surface water)
- Noise Levels
- Traffic study
- Soil Quality
- Biological Environment
- Land Environment and
- Socio- Economic Studies

3.3 Methodology adopted

The data was collected from both primary and secondary sources. The baseline information on micrometeorology, ambient air quality, water quality, noise levels, soil quality, ecology & biodiversity and socio-economic are given below.

3.3.1 Primary and Secondary data

The primary data collection is a pre-requisite for environment impact assessment study in order to provide a description of the status and trends of environmental factors against which the predicted changes can be compared and evaluated in terms of importance. Wherever possible, the primary data are interpreted with site conditions and validated with secondary data. For selection of stations, the entire 10 km study area has been considered.

Secondary data will be collected from reliable sources like local district administration, Government Organizations/Departments such as Survey of India, Department of Geology, Botanical Survey of India, Zoological Survey of India, State Forest department, concerned IMD, National Information Centre database, published census documents, MoEF&CC, CPCB, EIA publications etc. Efforts shall be made to collect updated and relevant data.

The methodology for collection of primary and secondary data is given in **Table 3.1**.

Table 3.1 Methodology for collection of primary and secondary data

Sl.No.	Area	Description	Method
1	Meteorology	The meteorological data was collected for ambient wind speed, wind direction, rain fall, cloud cover, relative humidity and temperature	Weather monitoring equipment installed at site at a height of above 10 m above ground level to record wind speed, wind direction, rainfall, cloud cover, relative humidity and temperature. The guidelines specified under IS:8829 was followed for setting up of monitoring station. Cloud cover was recorded by visual observation. All other parameters were recorded hourly for three months. (Procedure Ref: RSSPL/SOP/AP-02 & RSSPL/SOP/AQ-03).
2	Ambient Air Quality	Particulate Matter (PM ₁₀ & PM _{2.5}), Sulphur dioxide (SO ₂), Nitrogen dioxide (NO _x), Ozone (O ₃), Carbon monoxide (CO)	In order to assess the Ambient Air Quality (AAQ), 10 locations were identified within 10km radius from the boundary of proposed site covering upwind, downwind and crosswind at a height of minimum 3m from ground level. For sampling the parameters like PM ₁₀ , SO ₂ , NO _x , O ₃ etc., Respirable Dust Sampler (RDS) with gaseous sampling box attachment having different flow 0.2 to 3 lpm is used). For sampling the parameters PM _{2.5} fine Particulate Sampler is used. For sampling CO, grab sampling using polythene bags and quantified by GCMS detector method. The air samples will be analyzed as per the standards specified by CPCB, IS: 5182. (Procedure Ref: RSSPL/SOP/AP-02 & RSSPL/SOP/AQ-03).
3	Water Quality (Surface & Ground Water)	Water sampling is done to predict the baseline ground water (10) and surface water (2) quality at identified	Water samples collected in plastic/glass containers using grab sampling technique from ground water sources tap water and surface water bodies near to the proposed site within 10 km radius. The collected samples are stored/ preserved as per the procedure given in the IS: 3025 (Part 1)-1987 referred in RSSPL/SOP/BIS-01. The physical,

Sl.No.	Area	Description	Method
		locations within vicinity of 10km radius.	chemical & biological parameters of the water samples were tested as per the Bureau of Indian standards (BIS) & APHA methods. The ground water samples results compared with IS 10500-2012 drinking water standards and surface water samples with CPCB standards. (Procedure Ref: RSSPL/SOP/AP-02 & RSSPL/SOP/WP-05).
4	Noise Levels	The day equivalent (L_{eqday}) and night equivalent ($L_{eqnight}$) will be calculated as logarithmic average using the L_{eqday} hours from 6.00 am to 10.00 pm and $L_{eqnight}$ hours from 10.00 pm to 6.00 am.	<p>The monitoring carried out minimum 75% of the prescribed day time and night time. The exercise had to be carried out for 6 to 8 hrs in the said time frame of day & night.</p> <p>Noise measurements made with a Type I integrating sound level meter with free field microphone, which meets the accuracy of noise measurement as per IEC804 Grade I or ANSI Type I.</p> <p>Noise level measurements were done once at 10 locations in the study area at different intervals of time for 24 hours with the help of sound level meter to establish the baseline L_{day} and L_{night} noise pressure levels in the study area. The day & night equivalent will be compared with NAAQ standards in respect of Noise SO 123 (E) dt 14th Feb 2000/OSHA/WHO/any other relevant standards. (Procedure Ref: RSSPL/SOP/AP-02 & RSSPL/SOP/N-04).</p>
5	Soil Quality	Soils from the project core and buffer area within 10km analyzed for physico – chemical characteristics in order to identify the effects	Random soil samples collected by rooting depth (10-15 cm) using borer samplers or augers. The analysis data received from laboratory rechecked and compared with the secondary sources. The analytical results obtained compared with rating chart of the soil Test Data of Indian Council of Agricultural Research, New Delhi. (Procedure Ref: RSSPL/SOP/SC-06).

Sl.No.	Area	Description	Method
		of pollution on these properties.	
6	Ecology & Biodiversity	Ecological survey is to study the ecological profile of study area to facilitate the subsequent impact assessment and mitigation measures.	Flora and fauna inventory were prepared by site specific information of the study area and review of existing literature and databases. The flora and fauna species from core and buffer zone are studied. The primary data on terrestrial and aquatic biodiversity collected. Action plan to mitigate likely impacts on the biodiversity of the project area through green belt development (following local conditions and CPCB guidelines). (Procedure Ref: RSSPL/SOP/EB-08).
7	Socio-economic	The Socio-economic details required for the study collected through various sources to understand the living standards of people residing in a particular Village.	Socio-economic data collected from primary sources through Focused group discussions, questionnaire, Door to door surveys, village level surveys, and consultation. To analyse the prevailing conditions of the village primary and secondary data are used the data is collected within 2, 5 and 10 km radius of the project site. (Procedure Ref: RSSPL/SOP/SE-07)
<p>Note: Normally, the secondary data collected from the authentic sources such as various government departments, government published literature and report prepared by various universities/institutions. However if the collected secondary data is sourced from unauthorized sources, verification of the content shall be carried out. The secondary data sources for each environmental component are addressed in RSSPL/SOP/BL-15.</p>			

3.4 Micrometeorology

The study of meteorological conditions of a particular region is of utmost importance to understand the variations in ambient air quality status in that region. The prevailing micrometeorology at project site plays a crucial role in transport and dispersion of air pollutants released from the project site. The principal variables, which affect the micrometeorology, are horizontal transport and dispersion (average wind speed and directions), convective transport and vertical mixing (atmospheric stability) and also topography of the area towards local influences.

The summary of the secondary climatological data (IMD station Madurai) has been mentioned in **Table 3.2**. The monthly average weather data from 2011-2023 has been mentioned in **Table 3.3** sourced from world weather online. The maximum and minimum temperatures, relative humidity and predominant wind direction observed are given in **Table 3.4**.

Table 3.2 IMD data of Madurai (1981-2010)

IMD Station– Madurai, Lat. 09°50' & Lon. 78°05' above Mean Sea Level (MSL) 131 m, Distance from proposed site 45 km NW										
Month	Mean Temperature °C				Humidity %		Rainfall		Mean wind Speed m/s	Predominant direction
	Min	Max	Highest	Lowest	Min	Max	Monthly mm	No of rainy days		1 st
Jan	20.6	30.8	17.9	33.2	51	78	8.5	0.8	2.0	NE
Feb	21.5	33.3	18.5	35.8	41	76	11.0	1.1	1.9	NE
Mar	23.4	36.0	20.3	38.5	36	71	18.3	1.2	1.7	NE
Apr	25.6	37.2	22.5	39.8	43	68	60.1	3.3	1.6	SE
May	26.3	37.9	22.6	40.4	44	63	80.6	4.0	1.6	NW
Jun	26.2	37.2	23.8	39.7	44	58	34.3	2.2	1.8	W
Jul	25.9	36.5	22.8	39.3	46	59	56.9	2.9	1.9	W
Aug	25.5	36.2	22.4	38.7	48	61	93.9	4.6	1.9	W
Sep	24.6	35.1	22.4	37.9	54	66	121.5	6.6	1.5	NW
Oct	23.7	33.1	21.8	36.3	63	76	185.8	9.7	1.2	N
Nov	22.7	30.6	20.1	33.6	68	80	147.2	6.8	1.5	NE
Dec	21.3	30.0	18.1	32.3	62	78	51.3	3.4	1.9	NE

Source: GOI, Ministry of Earth Sciences, IMD, Climatological Tables - 1981-2010

Table 3.3 Monthly average weather data - Madurai (2011-2023)

Month	Avg. Temperature (°C)		Avg. Humidity	Avg. Rainfall	No. of rainy days
	Min	Max	(%)	mm	
Average meteorological data from 2011 to Jun 2022					
Jan	21	30	67	19.4	2
Feb	22	33	60	14.8	2
Mar	25	36	54	25.3	3
Apr	27	37	52	53.4	6
May	28	37	51	84.0	14
Jun	27	36	50	60.4	10
Jul	27	35	51	68.2	12
Aug	26	35	54	117.4	15
Sep	26	35	57	102.9	13
Oct	25	32	67	201.8	17
Nov	23	30	74	206.8	14
Dec	22	29	73	104.8	7
Average meteorological data from Jan to Jun 2023					
Jan	20	31	63	2.0	1
Feb	20	34	56	8.2	1
Mar	23	37	58	23.6	2
Apr	27	39	54	23.5	3
May	27	38	61	233.9	4
Jun	27	37	55	201.1	1
Source: https://www.worldweatheronline.com/madurai-weather-history/tamil-nadu/in.aspx					

Table 3.4 Observed meteorological data

Period	Temp (°C)		Relative Humidity (%)		Predominant wind Direction
	Min	Max	Min	Max	
Jun 2023	23.1	39.1	42	73	W
Jul 2023	22.3	38.3	45	76	W
Aug 2023	21.8	37.7	46	78	W

3.4.1 Wind Pattern – June to August 2023 (summer season)

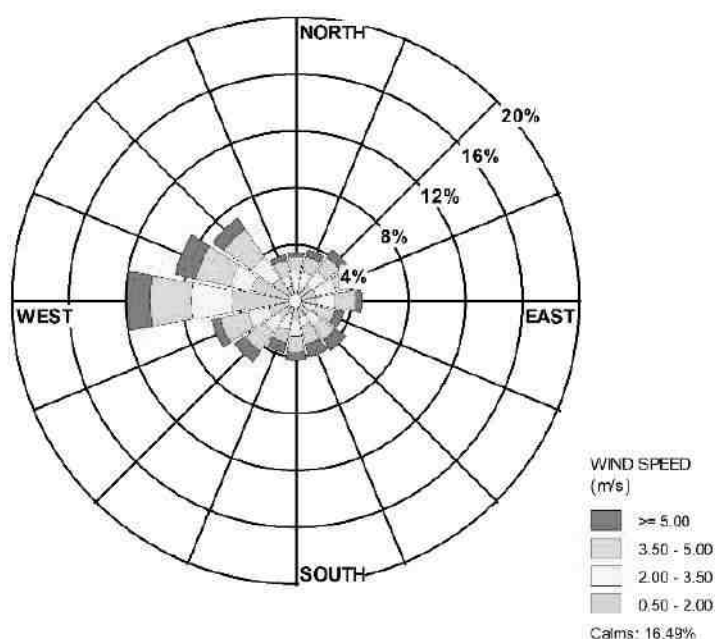
Dispersion of the different air pollutants released into the atmosphere has significant impacts on neighborhood air environment. The dispersion or dilution of air pollutants over the large area will result in considerable reduction of the concentration of a pollutant. During the baseline period i.e., June to August 2023, the winds were predominantly recorded from West to East. Calm conditions prevailed for 16.49% of the total time and the average wind speed for the post monsoon season is 2.54 m/s. The frequency distribution for summer season is given in **Table 3.5** and wind rose diagram for summer season is presented in **Figure 3.1**.

Table 3.5 Frequency distribution for summer season (June to Aug 2023)

Wind directions	Wind classes (m/s)				Total
	0.5 - 2.0	2.0 - 3.5	3.5 - 5.0	> 5.0	
N	0.72	1.49	0.91	0.32	3.44
NNE	1.04	1.09	1.13	0.50	3.76
NE	1.45	1.18	1.22	0.63	4.48
ENE	1.49	1.45	1.00	0.54	4.48
E	1.63	1.13	1.54	0.41	4.71
ESE	0.77	0.72	1.40	0.63	3.53
SE	1.22	1.00	1.22	0.91	4.35
SSE	1.22	0.68	1.31	0.91	4.12
S	1.45	1.09	1.13	0.59	4.26
SSW	1.00	1.18	0.91	0.72	3.80
SW	1.54	1.18	1.68	0.91	5.30
WSW	1.99	1.49	1.99	0.63	6.11
W	4.48	2.90	2.85	1.68	11.91
WNW	3.22	1.49	2.49	1.49	8.70
NW	1.99	1.81	2.40	0.95	7.16
NNW	1.13	0.72	1.13	0.41	3.40
Sub-Total	26.36	20.61	24.32	12.23	83.51
Calms (<0.5 m/s)					16.49
Total					100

Note: 1. Average Wind Speed is 2.54 m/s
2. All values are in percentages

Figure 3.1 Wind rose diagram – Summer season (June – August 2023)



3.5 Ambient Air Quality (AAQ)

The ambient air quality was monitored in the impact of the study area as per MoEF&CC guidelines. The prime objective of the baseline air quality study is to assess the existing ambient air quality of the area with reference to conventional air pollutants.

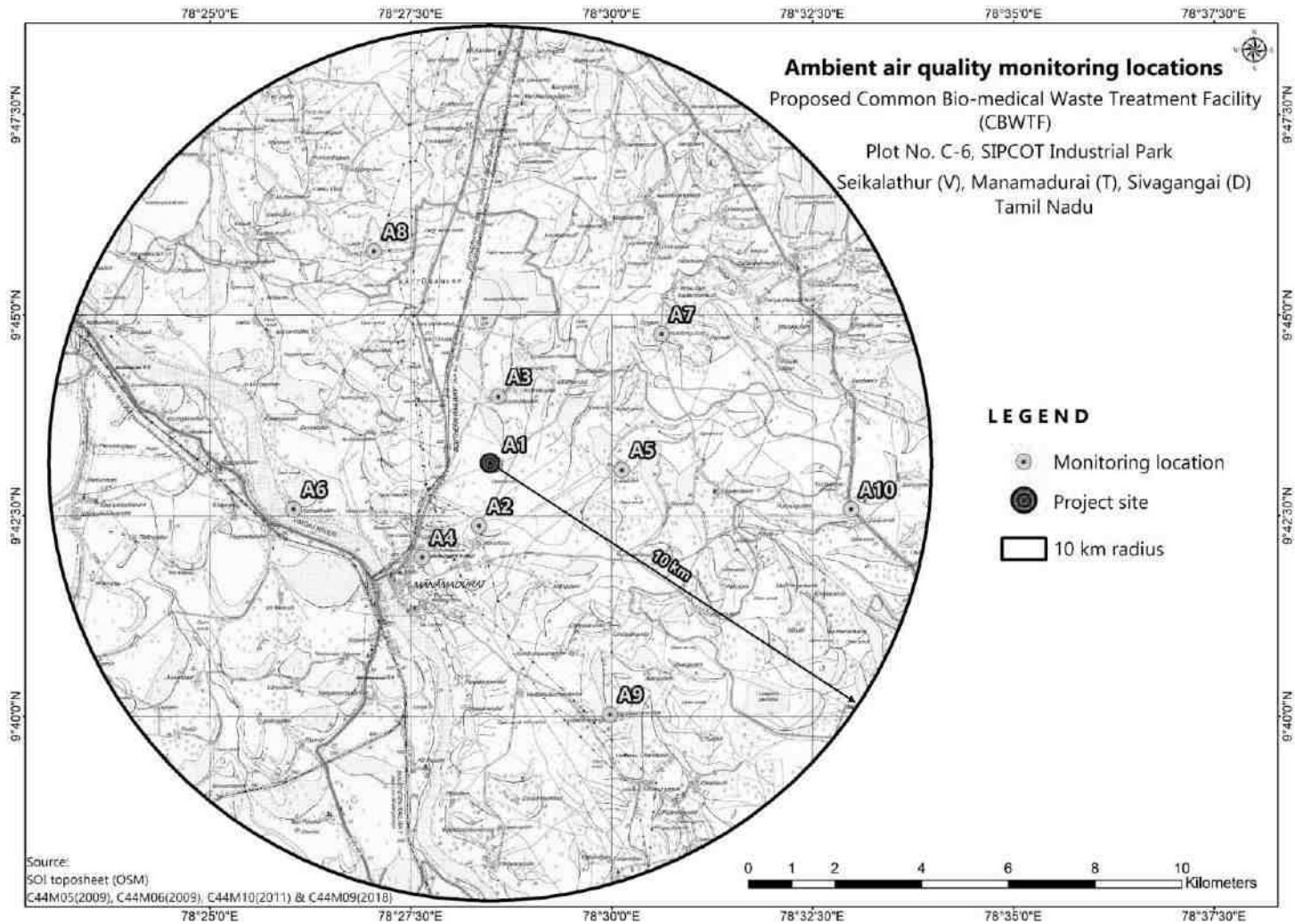
AAQ Monitoring stations were installed at 10 different locations with due consideration to the above mentioned points. AAQ locations were selected in downwind (DW), crosswind (CW) and upwind (UW) direction of the proposed project location. The details of the monitoring stations are given in **Table 3.6**. The AAQ sampling locations map is given in **Figure 3.2**.

The monitoring carried out twice per week for 12 weeks during study period. The common air pollutants namely Particulate Matter (PM_{<2.5µm}, PM_{<10µm}), Sulfur dioxide (SO₂) and Oxides of Nitrogen (NO_x) were sampled on 24 hourly basis. Carbon Monoxide (CO) and Ozone (O₃) were sampled on 8 hourly basis. The results were averaged to 24 hours to meet the requirements of the MoEF&CC and compared with the standards stipulated by CPCB.

Table 3.6: Ambient air quality monitoring locations

Code	Location	Wind type	W.R.T		Latitude (North)	Longitude (East)
			Direction	Distance (km)		
A1	Project site	--	E	0.01	09° 43' 08.3"	78° 28'32.5"
A2	Navattavu	CW	S	1.5	09° 42' 22.2"	78° 28'20.9"
A3	Mel Konnakulam	CW	N	1.8	09° 43' 58.8"	78° 28'35.5"
A4	Manamadurai	CW	SW	3.0	09° 41' 58.8"	78° 27'38.4"
A5	Padukkulam	DW	E	3.1	09° 43' 04.2"	78° 30'07.6"
A6	Karisalkulam	UW	W	4.5	09° 42' 34.9"	78° 26'02.4"
A7	Kurundangulam	CW	NE	5.0	09° 44' 45.6"	78° 30'37.1"
A8	Urulr	CW	NW	6.0	09° 45' 47.5"	78° 27'02.6"
A9	Kanjikkarenendal	DW	SE	6.5	09° 40' 01.2"	78° 29'58.7"
A10	Puliyangulam	DW	E	8.0	09° 42' 34.7"	78° 32'58.6"

Figure 3.2 Ambient air quality sampling locations map



The statistical parameters like minimum, maximum, average and 98th percentile values have been computed from the observed raw data for all sampling locations. The summary of baseline data values for PM₁₀, PM_{2.5}, SO₂, NO_x, O₃ and CO of AAQ in core zone and buffer zone are given in **Table 3.7 to 3.10**. These values compared with the National Ambient Air Quality Standards, 2009 issued by ministry.

Table 3.7 PM₁₀ & PM_{2.5} levels in the study area (µg/m³)

Code	Location	PM ₁₀			PM _{2.5}		
		Min	Max	98 th Percentile	Min	Max	98 th Percentile
A1	Project site	43.4	48.5	48.5	25.5	29.5	29.5
A2	Navattavu	45.6	50.7	50.7	26.4	30.2	30.2
A3	Mel Konnakulam	40.8	46.7	46.7	23.9	27.6	27.6
A4	Manamadurai	48.3	54.1	54.1	28.4	33.8	33.8
A5	Padukkulam	41.4	47.5	47.5	24.8	28.8	28.8
A6	Karisalkulam	44.8	50.6	50.6	25.6	29.4	29.4
A7	Kurundangulam	45.6	51.2	51.2	26.4	30.8	30.8
A8	Urulr	35.4	42.2	42.2	21.7	25.6	25.6
A9	Kanjikkarenendal	33.9	39.8	39.8	19.9	22.6	22.6
A10	Puliyangulam	46.5	52.3	52.3	27.3	31.2	31.2
98th Percentile		39.8 to 54.1			22.6 to 33.8		
NAAQ Standards 2009 (24 hr)		100			60		

Table 3.8 SO₂ and NO_x levels in the study area (µg/m³)

Code	Location	SO ₂			NO _x		
		Min	Max	98 th Percentile	Min	Max	98 th Percentile
A1	Project site	9.5	13.4	13.4	17.7	21.6	21.6
A2	Navattavu	8.7	12.3	12.3	16.7	20.6	20.6
A3	Mel Konnakulam	7.9	11.7	11.7	15.8	19.9	19.9
A4	Manamadurai	11.9	15.3	15.3	21.4	25.3	25.3
A5	Padukkulam	7.5	10.7	10.7	14.6	17.5	17.5
A6	Karisalkulam	9.4	13.8	13.8	18.4	21.4	21.4
A7	Kurundangulam	9.8	12.6	12.6	17.3	20.8	20.8
A8	Urulr	7.3	9.7	9.7	13.7	16.6	16.6
A9	Kanjikkarenendal	6.2	8.8	8.8	12.4	15.4	15.4
A10	Puliyangulam	10.1	13.9	13.9	18.2	22.5	22.5
98th Percentile		8.8 to 15.3			15.4 to 25.3		
NAAQ Standards 2009 (24 hr)		80			80		

Table 3.9 O₃ and CO levels in the study area (µg/m³)

Code	Location	O ₃			CO		
		Min	Max	98 th Percentile	Min	Max	98 th Percentile
A1	Project site	BDL	BDL	BDL	130	165	165
A2	Navattavu	BDL	BDL	BDL	120	155	155
A3	Mel Konnakulam	BDL	BDL	BDL	115	145	145
A4	Manamadurai	BDL	BDL	BDL	420	580	580
A5	Padukkulam	BDL	BDL	BDL	BDL	BDL	BDL
A6	Karisalkulam	BDL	BDL	BDL	125	160	160
A7	Kurundangulam	BDL	BDL	BDL	140	172	172
A8	Urulur	BDL	BDL	BDL	BDL	BDL	BDL
A9	Kanjikkarenendal	BDL	BDL	BDL	BDL	BDL	BDL
A10	Puliyangulam	BDL	BDL	BDL	145	180	180
98th Percentile		BDL to BDL			BDL to 580		
NAAQ Standards 2009 (8hr)		100			2000		
Note: Ozone -BDL value is less than 20 µg/m ³ CO - BDL value is less then 115 µg/m ³							

Table 3.10 Summary of AAQ (µg/m³)

Parameter	Core Zone (µg/m ³)			Buffer Zone (µg/m ³)		
	Min	Max	Avg	Min	Max	Avg
PM ₁₀	43.4	48.5	46.5	33.9	54.1	48.3
PM _{2.5}	25.5	29.5	27.1	19.9	33.8	28.9
SO ₂	9.5	13.4	11.3	6.2	15.3	12.1
NO _x	17.7	21.6	19.1	12.4	25.3	20.0

The categories of the air quality index (AQI) is decided based on ambient concentration values of air pollutants and their likely health impacts. There AQI of the study area is given in **Table 3.11**.

Table 3.11 Air Quality Index (AQI)

Location	AQI
Project site	49
Navattavu	51
Mel Konnakulam	47
Manamadurai	54

Location	AQI
Pudukkulam	48
Karisalkulam	51
Kurundangulam	51
Urulr	42
Kanjikkaranendal	40
Puliyangulam	52
Range of AQI	40 to 54
AQI range is 40 to 54 fall under good to satisfactory category as per MoEF&CC - The National Air Quality Index	
Good (0-50)	Minimal Impact
Satisfactory (51-100)	Minor breathing discomfort to sensitive people
Moderate (101-200)	Breathing discomfort to the people with lung, heart disease, children and older adults
Poor (201-300)	Breathing discomfort to people on prolonged exposure
Very Poor (301-400)	Respiratory illness to the people on prolonged exposure
Severe >400	Respiratory effects even on healthy people

3.5.1 Air quality scenario in the study area

a) Particulate Matter <2.5µm &<10µm

Particulate Matter (PM) is a mixture of solid particles and liquid droplets suspended in the atmosphere, arising from diverse sources such as power plants, industrial operations, and diesel trucks. They are formed in the atmosphere by transformation of gaseous emissions. Their chemical and physical compositions depend on location and seasonal factors. Particulate matter composed of both coarse and fine particles.

Coarse particles (PM₁₀) have an aerodynamic diameter between 2.5µm and 10µm. They are formed by mechanical disruption (e.g. crushing, grinding, and abrasion of surfaces) evaporation of sprays, and suspension of dust. PM₁₀ is composed of alumina silicate and other oxides of crustal elements, and major sources including fugitive dust from roads, industry, agriculture, construction and demolition, and fly ash from fossil fuel combustion. The lifetime of PM₁₀ is from minutes to hours and its travel distance varies from <1 km to 10 km.

Fine particles have an aerodynamic diameter less than 2.5µm (PM_{2.5}). They differ from PM₁₀ in origin and chemistry. These particles are formed from gas and condensation of high temperature vapors during combustion.

The 98th percentile of Particulate Matter <10 µm recorded within the study area were in the range of **39.8 µg/m³ to 54.1 µg/m³**

The 98th percentile of Particulate Matter <2.5 µm recorded within the study area were in the range of **22.6 µg/m³ to 33.8 µg/m³**.

The 24 hourly average values of Particulate Matter <2.5µm & Particulate Matter <10µm were compared with the National ambient air quality standards and found that all sampling locations recorded values within the applicable limits of residential and rural area limits for all locations in study area.

b) Sulfur Dioxide (SO₂)

Sulfur dioxide gas is an inorganic gaseous pollutant. SO₂ emissions are expected to be emitted wherever combustion of any fuel containing sulfur takes place. The sulfur in the fuel will combine with oxygen to form sulfur dioxide. Sulfur trioxide and sulfuric acid mist are the other important pollutants in the sulfur group. In general, some of the important sources of sulfur dioxide are Power stations, sulfuric acid plants, oil refining, boilers in utilities in any industry and domestic use of coal. The following sources of Sulfur dioxide in the study area are identified:

- Emissions from domestic fuel (coal, diesel, etc.)
- Emissions from DG sets used by industries and local residents

In atmosphere, it is significant because of its toxicity and capable of producing illness and lung injury. Further, it can combine with water in the air to form toxic acid. Aerosols can corrode metal surfaces, fabrics and the leaves of plants. Sulfur dioxide is irritating to the eyes and respiratory system. Excessive exposure to sulfur dioxide causes bronchial asthma and other breathing related diseases as it affects the lungs.

The 98th percentile of SO₂ recorded within the study area was in the range of **8.8 µg/m³ to 15.3 µg/m³**.

The 24 - hourly average values of SO₂ were compared with the National ambient air quality standards and it was found that all sampling locations recorded values much lower than the applicable limit of 80 µg/m³ for residential and rural areas.

c) Oxides of Nitrogen (NO_x)

Oxides of Nitrogen are also an inorganic gaseous pollutant like SO₂. Oxides of Nitrogen emissions are expected to be emitted wherever combustion at high temperatures takes place. Nitrous oxide and Nitric Acid Mist are the other important pollutants in inorganic nitrogen group. In general, some of the important sources of oxides of Nitrogen are Boilers (utilities) in any industry and auto exhaust. In the study area NO_x levels are predominantly due to automobile emissions. The following sources of oxides of nitrogen in the study area are identified:

1. Emissions from industries and domestic burning of coal
2. Emissions from automobiles

Oxides of nitrogen have far greater significance in photochemical smog reaction than any of the other inorganic gaseous contaminants. NO_x in the presence of sunlight will undergo reactions with a number of organic compounds to produce all the effects associated with photochemical smog. NO_x has inherent ability to produce deleterious effects by themselves like toxicity. It acts as an asphyxiate when in concentrations great enough to reduce the normal oxygen supply from the air.

The 98th percentile of NO_x recorded within the study area was in the range of **15.4 µg/m³ to 25.3 µg/m³**.

The 24 - hourly average values of NO_x were compared with the national ambient air quality standards and it was found that all the sampling locations recorded values much lower than the applicable limit of 80 µg/m³ for residential and rural areas.

d) Ozone (O₃)

Ozone (O₃) or Trioxygen, is a triatomic molecule, consisting of three oxygen atoms. It is an allotrope of oxygen that is much less stable than the diatomic allotrope (O₂). Ozone in the lower atmosphere is an air pollutant having harmful effects on the respiratory systems of animals and will burn sensitive plants; however, the ozone layer in the upper atmosphere is beneficial, preventing potentially damaging ultraviolet light from reaching the earth's surface. It is present in low concentrations throughout the earth's atmosphere.

The 98th percentile of O₃ within the study area was found to be in **Below Detection Limit (BDL)**. The 8 - hour average values of ozone were compared with the national ambient air quality standards and found that the recorded values were within the applicable limits of residential and rural area limits for all the locations in study area.

e) Carbon Monoxide (CO)

It is a colorless, odorless, and tasteless gas that is slightly less dense than air. It is toxic to humans and animals when encountered in higher concentrations, although it is produced in normal animal metabolism in low quantities, and is thought to have some normal biological functions. In the atmosphere, it is spatially variable and short-lived, having a role in the formation of ground-level ozone. Along with aldehydes it is part of series of reactions that form photochemical smog.

Carbon monoxide is present in small amounts in the atmosphere, chiefly as a product of volcanic activity but also from natural and manmade fires (such as forest and bush fires, burning of crop residues etc).

Carbon monoxide is a temporary atmospheric pollutant in some urban areas, mainly from the exhaust of internal combustion engines (including vehicles, portable and back-up generators, lawn mowers, power washers, etc.), but also from incomplete combustion of various other fuels (including wood, coal, charcoal, oil, paraffin, propane, natural gas, and trash).

The 8 hourly average values of CO were compared with the national ambient air quality standards and it was found that all the sampling stations recorded values much lower than the applicable limit of 2000 µg/m³ for residential and rural areas.

The 98th percentile of CO recorded within the study area was in the range of **BDL to 580 µg/m³**.

3.6 Water quality – Ground Water (GW) & Surface Water (SW)

The ground and surface water samples were collected from different sources within 10kms of study area and some important physical & chemical parameters including heavy metals were considered for depicting the baseline status of study area. To

assess water quality during the study period 10 GW samples and 2 SW samples were collected from different sources within the study area. The details of water sampling locations are given in **Table 3.12** and ground & surface water sampling locations map are given in **Figure 3.3**.

The analytical results of the ground water samples were compared with IS: 10500-2012 drinking water standards and the results are shown in **Table 3.13**. The results are within the permissible limits. The analytical results of the surface water samples were compared with CPCB water quality criteria as updated on 11th October, 2019 standards and the results are shown in **Table 3.14**.

Table 3.12 Water sampling locations

Code	Location	Source	W.R.T. Site		Latitude (North)	Longitude (East)
			Direction	Distance (km)		
Ground water						
GW1	SIPCOT office	Bore well	SW	1.0	09° 42' 58.2"	78° 27'54.8"
GW2	Mel Konnakulam	Bore well	N	1.8	09° 43' 59.7"	78° 28'35.3"
GW3	Navattavu	Bore well	S	1.8	09° 42' 22.2"	78° 28'20.9"
GW4	Pudukkulam	Bore well	E	3.1	09° 43' 05.4"	78° 30'05.8"
GW5	Manamadurai	Bore well	SW	3.5	09° 41' 58.8"	78° 27'38.4"
GW6	Nattapurakki	Bore well	NW	4.0	09° 44' 39.5"	78° 26'58.9"
GW7	Karisalkulam	Bore well	W	4.5	09° 42' 38.7"	78° 26'00.7"
GW8	Kurundangulam	Bore well	NE	5.0	09° 44' 46.1"	78° 30'37.2"
GW9	Velangulam	Bore well	SE	6.2	09° 41' 22.7"	78° 31'02.3"
GW10	Kil Pasalai	Bore well	S	8.0	09° 38' 42.4"	78° 28'37.8"
Surface water						
SW1	Mel Konnakulam	Pond	N	1.8	09° 44' 05.2"	78° 28'44.1"
SW2	Vaigai river	River	SW	3.5	09° 41' 39.5"	78° 27'09.2"

Figure 3.3 Ground water & Surface water sampling locations map

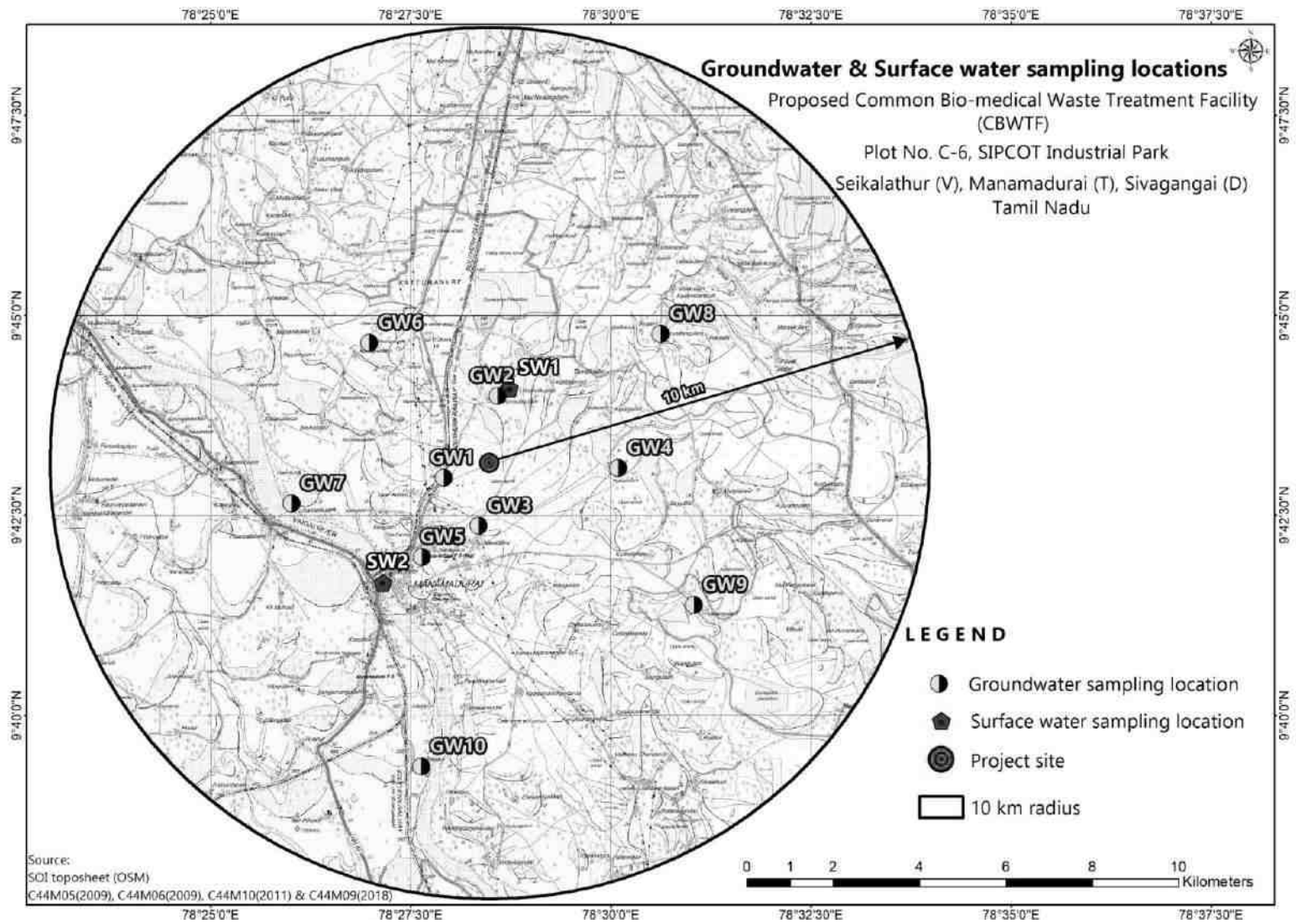


Table 3.13 Groundwater sample analysis results

Parameter	Unit	Analysis Results										Standard as per IS -10500:2012	
		GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8	GW9	GW10	Acceptable Limit	Permissible Limit
pH	--	6.89	7.02	6.85	7.26	6.68	7.36	7.57	7.60	7.63	6.92	6.5-8.5	No Relaxation
Odour	--	Agreeable										Agreeable	Agreeable
Electrical Conductivity (EC)	µMho/cm	901	1656	446	1750	1850	1759	875	1937	1281	654	--	--
Dissolved Solids	mg/l	523	943	267	1050	1170	1002	516	1104	743	386	500	2000
Alkalinity (as CaCO ₃)	mg/l	200	365	116	200	355	350	175	380	248	116	200	600
Chloride (as Cl)	mg/l	121	223	66	420	255	277	129	335	170	58	250	1000
Sulphate (as SO ₄)	mg/l	12	24	6	13	52	31	21	33	28	9	200	400
Nitrate (as NO ₃ -N)	mg/l	20	42	5	19	42	36	14	28	31	30	45	No Relaxation
Total Hardness as CaCO ₃	mg/l	277	441	144	233	600	495	257	510	357	214	200	600
Calcium as Ca	mg/l	79	155	38	46	170	119	58	115	85	65	75	200
Magnesium as Mg	mg/l	19	13	11	29	65	48	28	54	35	13	30	100
Sodium as Na	mg/l	63	116	32	285	97	160	58	193	98	37	--	--
Potassium as K	mg/l	20	101	9	15	14	21	25	26	32	7	--	--
Fluoride as F	mg/l	0.61	0.64	0.45	0.85	0.44	0.85	0.39	0.84	0.59	0.53	1	1.5
Iron (as Fe)	mg/l	0.25	0.28	0.69	0.43	0.22	0.11	0.13	0.12	0.13	0.16	0.3	No Relaxation

Table 3.14 Surface water sample analysis results

Parameter	Units	SW1	SW2	CPCB water quality criteria as updated on 11 th Oct, 2019				
				A	B	C	D	E
pH	---	8.10	7.46	6.5-8.5	6.5-8.5	6.0-9.0	6.5- 8.5	6.0- 8.5
Electrical Conductivity	µMho/cm	940	1181	-	-	-	-	2250
Total Dissolved Solids	mg/L	545	709	-	-	-	-	-
Total Suspended Solids	mg/L	<1.0	<1.0	-	-	-	-	-
Turbidity	NTU	10.8	5.7	-	-	-	-	-
Alkalinity as CaCO ₃	mg/L	175	190	-	-	-	-	-
Chloride as Cl	mg/L	155	228	-	-	-	-	-
Sulphate as SO ₄	mg/L	52	43	-	-	-	-	-
Nitrates as NO ₃	mg/L	6	9	-	-	-	-	-
Phosphate as P	mg/L	0.63	0.59	-	-	-	-	-
Total Hardness as CaCO ₃	mg/L	134	228	-	-	-	-	-
Calcium as Ca	mg/L	22	28	-	-	-	-	-
Magnesium as Mg	mg/L	19	39	-	-	-	-	-
Sodium as Na	mg/L	99	121	-	-	-	-	-
Potassium as K	mg/L	82	61	-	-	-	-	-
Fluoride as F	mg/L	0.50	0.39	-	-	-	-	-
Iron as Fe	mg/L	0.11	0.13	-	-	-	-	-
Dissolved Oxygen as DO	mg/L	7.2	3.6	6	5	4	4	-
Chemical Oxygen Demand as COD	mg/L	10.1	60.5	-	-	-	-	-
Biological Oxygen Demand as BOD (3 Days at 27°c)	mg/L	<4	12	-	-	-	-	-
Total Coliform	MPN/100ml	<1.8	31	-	500	5000	-	-
E.coli	MPN/100ml	<1.8	13	-	-	-	-	-
A – Drinking water without conventional treatment but after disinfection B – Outdoor bathing (organized) C – Drinking water source with conventional treatment followed by disinfection D – Propagation of wild life, fisheries E – Irrigation, industrial, cooling, controlled waste disposal								

3.6.1 Regional Scenario

a) Groundwater

- The pH limit fixed for drinking water samples as per IS: 10500-2012 standard is 6.5 to 8.5 beyond this range the water will affect the mucus membrane and or water supply system. In the study area, the pH was varying from **6.68 to 7.63** showing that they are within the acceptable range.
- The acceptable limit for total dissolved solids as per IS: 10500-2012 Standard is 500 mg/l whereas the permissible limits in absence of alternate source are 2000 mg/l, beyond this palatability decreases and may cause gastro intestinal irritation. In ground water samples collected from the study area, the total dissolved solids are varying from **267 mg/l to 1170 mg/l**. The TDS of two samples are below the acceptable limits but within the permissible limit, rest all samples are below the permissible limit.
- The acceptable limit for chloride is 250mg/l as per IS: 10500-2012 standards whereas the permissible limit of the same is 1000 mg/l beyond this limit taste, corrosion and palatability are affected. The Chloride levels in the ground water samples collected in the study area were ranging from **58 mg/l** to a maximum of **420 mg/l**. Six samples are found to be within the acceptable limit, rest six samples are below the permissible limits.
- The acceptable limit as per IS:10500-2012 Standards for Hardness as CaCO₃ is 200 mg/l whereas the permissible limit for the same is 600 mg/l beyond this limit encrustation in water supply structure and adverse effects on domestic use will be observed. In the ground water samples collected from the study area, the hardness is varying from **144 mg/l to 600 mg/l**. Hardness as CaCO₃ in one sample is found to be within the acceptable limit, rest nine samples are below the permissible limits.
- Fluoride is the other important parameter, which has the acceptable limit of 1 mg/l and permissible limit of 1.5 mg/l. However the optimum content of fluoride in the drinking water is <0.6 to 1.5 mg/l. If the fluoride content is less than 0.6 mg/l it causes dental carries, above 1.5 mg/l it causes staining of tooth enamel, higher

concentration in range of 3 - 10 mg/l causes fluorosis. In the ground water samples of study area, the fluoride value were in the range of **0.39 to 0.85 mg/l**. All samples are within the acceptable limit.

b) Surface Water

The pH of the surface water samples were found to be in the range of **7.46 & 8.10** and dissolved solids were in the range of **545 mg/l & 709 mg/l**. The detailed surface water sample analysis results are given in **Table 3.14**.

3.7 Noise environment

Noise can be defined any unwanted sound that is not desirable because it interferes with speech and hearing, is intense enough to damage hearing or is otherwise annoying. The definition noise as unwanted sound implies that it has an adverse effect on human beings and their environment including land, structures and domestic animals. Noise can also disturb natural wildlife and ecological systems.

Noise levels have been monitored at 10 locations within the study zone and was recorded continuous for 24 hours at an interval of 1 hour. The monitoring was carried out once during the study period. Random noise level measurement locations were identified for assessment of existing noise level status, keeping in view of the land use pattern, residential areas in villages, schools, bus stands, etc., the day levels of noise have been monitored during 6 AM to 10 PM and the night levels during 10 PM to 6 AM. The noise monitoring locations are shown in **Table 3.15** and **Figure 3.4**. The noise results are presented in **Table 3.16**. The summary of noise levels in the core and buffer zone are provided in **Table 3.17**.

Table 3.15 Noise monitoring locations

Code	Locations	W.R.T. Site		Zone	Latitude (North)	Longitude (East)
		Direction	Distance (km)			
N1	Entrance of the Project site	-	-	Industrial	09° 43' 07.8"	78° 28'31.2"
N2	Inside the Project Site	-	-	Industrial	09° 43' 08.9"	78° 28'28.5"
N3	SIPCOT office	SW	1.0	Commercial	09° 42' 57.0"	78° 27'54.6"
N4	Navattavu	S	1.5	Residential	09° 42' 22.1"	78° 28'21.1"
N5	Mel Konnnakulam	N	1.8	Residential	09° 43' 59.7"	78° 28'35.3"
N6	Kalkurich	WSW	3.0	Silence	09° 42' 32.6"	78° 27'0.6"
N7	Pudukkulam	E	3.1	Residential	09° 43' 04.2"	78° 30'07.6"
N8	Manamadurai	SW	3.2	Residential	09° 41' 58.6"	78° 27'39.2"
N9	Nattapurakki	NW	4.0	Residential	09° 44' 39.2"	78° 26'57.8"
N10	Velangulam	SE	5.5	Residential	09° 41' 20.7"	78° 31'15.2"

Figure 3.4 Noise sampling locations map

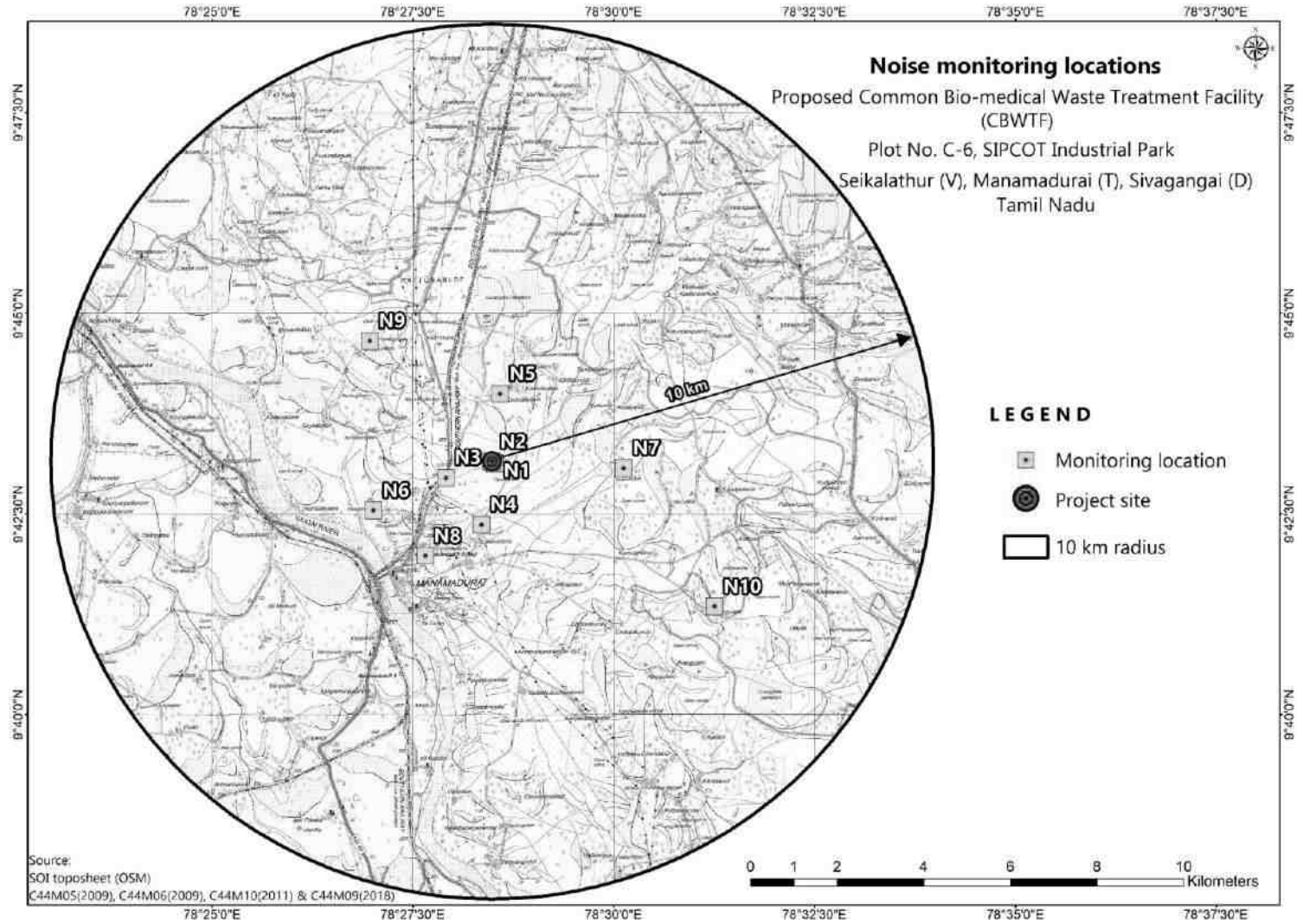


Table 3.16 Noise levels in the study area – dB (A)

Sl.No.	Location	Day		Night		Leq dB (A)	
		Min	Max	Min	Max	L _{day}	L _{night}
N1	Entrance of the Project site	47.3	57.5	42.3	48.2	53.9	43.9
N2	Inside the Project Site	47.2	57.2	41.9	47.2	53.7	43.8
N3	Sipcot office	48.5	58.8	42.5	47.8	54.3	44.4
N4	Navattavu	46.4	57.4	42.2	48.3	53.8	43.7
N5	Mel Konnnakulam	46.9	57.8	42.3	47.1	53.6	43.9
N6	Kalkurich	44.2	52.7	38.5	44.6	50.0	40.1
N7	Pudukkulam	47.5	56.9	43.1	47.1	53.6	43.8
N8	Manamadurai	48.1	58.1	43.1	48.1	53.9	44.3
N9	Nattapurakki	47.1	57.9	42.4	47.9	53.8	43.9
N10	Velangulam	46.3	56.8	42.6	46.8	53.3	43.8
Range						50.0 to 54.3	40.1 to 44.4

Table 3.17 Summary of noise levels in the core and buffer zone - dB (A)

Parameter	Noise levels results dB(A)			
	Core Zone		Buffer Zone	
	Min	Max	Min	Max
L _{day}	53.7	53.9	50.0	54.3
L _{night}	43.8	43.9	40.1	44.4

AAQ Standards in respect of Noise S.O 123 (E) dated 14.2.2000

Area Code	Category of Area/Zone	Limits in dB(A) Leq	
		Day Time	Night Time
A	Industrial Area	75	70
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Zone	50	40

Note: Day time is recorded in between 6 am and 10 pm
Night time is recorded in between 10 pm to 6 am

3.7.1 Regional Scenario

The values of noise observed in some of the rural areas are primarily owing to vehicular traffic and other anthropogenic activities. In rural areas wind blowing and chirping of birds would contribute to noise levels especially during the nights. The day equivalents during the study period are ranging between **50.0 dB (A) to 54.3 dB (A)**.

Whereas the night equivalents were in the range of **40.1 dB (A) to 44.4 dB (A)**. From the results it can be seen that the day equivalents and the night equivalents were within the ambient noise standards of residential.

3.8 Traffic study

Traffic studies are required to assess the traffic density pattern of the region and to assist proponent in planning vehicular movement during the project activity. The methodology adopted for carrying out the traffic study was to select the major roads around the project site and count the various categories of vehicles moving on these roads. The traffic survey was carried out near site and details are given in **Table 3.18** and traffic scenario for the site-connecting road is given in **Table 3.19**. It was found that the highest peak (worst case) was observed 630 PCU/hr during 10 am to 11 am at near site road. It is observed that the existing level of service as per IRC:106-1990 of site access road is falling under 'C' - good and nearest highway is 'B' - very good. This implies that the performance of the existing road due to the proposed project will not have a major impact.

Table 3.18 Traffic survey (Near site)

Hours	Two wheeler		Three Wheeler		Passenger cars & Pick-up Vans		Heavy commercial Vehicles (HCV)		Total vehicles	
	v/hr	PCU/hr	v/hr	PCU/hr	v/hr	PCU/hr	v/hr	PCU/hr	v/hr	PCU/hr
06-07 am	132	99	35	70	24	24	12	44	203	237
07-08 am	180	135	44	88	35	35	18	67	277	325
08-09 am	265	199	68	136	52	52	23	85	408	472
09-10 am	348	261	75	150	56	56	28	104	507	571
10-11 am	355	266	86	172	62	62	35	130	538	630
11-12 pm	324	243	82	164	58	58	32	118	496	583
12-01 pm	310	233	80	160	54	54	30	111	474	558
01-02 pm	304	228	78	156	48	48	28	104	458	536
02-03 pm	298	224	74	148	44	44	25	93	441	508
03-04 pm	282	212	65	130	42	42	22	81	411	465
04-05 pm	315	236	55	110	50	50	26	96	446	492
05-06 pm	312	234	60	120	53	53	31	115	456	522
06-07 pm	242	182	64	128	50	50	29	107	385	467
07-08 pm	165	124	42	84	42	42	24	89	273	339
08-09pm	122	92	30	60	33	33	18	67	203	251
09-10pm	85	64	22	44	20	20	14	52	141	180
10-11pm	45	34	12	24	16	16	8	30	81	103
The highest peak observed is 630 PUC/hr during 10 am to 11 am										
Road width in m (2 way/2 lane) - 1500 (PCU/h), Existing V/C Ratio 0.42										
Carrying capacity of the road (the road is 2 way 2 lane road)(with divider) As per IRC:106-1990										
LOS = Level of service (Existing)										

Table 3.19 Existing traffic scenario of site connecting road

Road	Towards	Volume (V) PCU's/hr (worst case)Existing	Capacity of road PCU's/hr	Existing (V/C)	Level of service (LOS)
Manamadurai main road	To & Fro	630	1500	0.42	"C"
Indicators for Level of service (LOS)					
V/C	LOS	Performance			
0.0 - 0.2	A	Excellent			
0.2—0.4	B	Very good			
0.4-0.60	C	Good			
0.6-0.80	D	Fair/Average			
0.8-1.00	E	Poor			
1.0 & above	F	Very poor			

3.9 Soil Quality

The present study on soil quality establishes the baseline characteristics in the study area surrounding the project site. To also determine the impact of industrialization / urbanization and impacts on soil characteristics. For studying the soil types and soil characteristics, ten sampling locations were selected within 10km radius of the project to assess the existing soil conditions representing various land use conditions and geological features. The details of the soil sampling location and map are given in **Table 3.20** and **Figure 3.5** respectively. The soil analysis results are represented in **Table 3.21**.

Table 3.20 Soil sampling locations

Code	Locations	Source	W.R.T. Site		Latitude (North)	Longitude (East)
			Direction	Distance (km)		
S1	Site	Barren land	Core	-	09° 43' 09.6"	78° 28'28.3"
S2	Mel konnakulam	Agriculture land	N	1.8	09° 44' 06.6"	78° 28'41.0"
S3	Navattavu	Barren land	S	1.8	09° 42' 06.4"	78° 28'28.6"
S4	Pudukkulam	Barren land	E	3.0	09° 43' 03.3"	78° 30'04.9"
S5	Manamadurai	Garden	SW	4.1	09° 42' 09.1"	78° 26'27.6"
S6	Nattapurakki	Barren land	NW	4.1	09° 44' 51.1"	78° 26'59.9"
S7	Karisalkulam	Agriculture land	W	4.2	09° 42' 28.0"	78° 26'18.9"
S8	Karundangulam	Agriculture land	NE	5.0	09° 44' 43.2"	78° 30'37.3"
S9	Vembankudi	Agriculture land	N	6.0	09° 46' 00.3"	78° 29'56.9"
S10	Kanjikkaranendal	Barren land	SE	6.6	09° 40' 04.7"	78° 29'40.9"

Figure 3.5 Soil sampling locations map

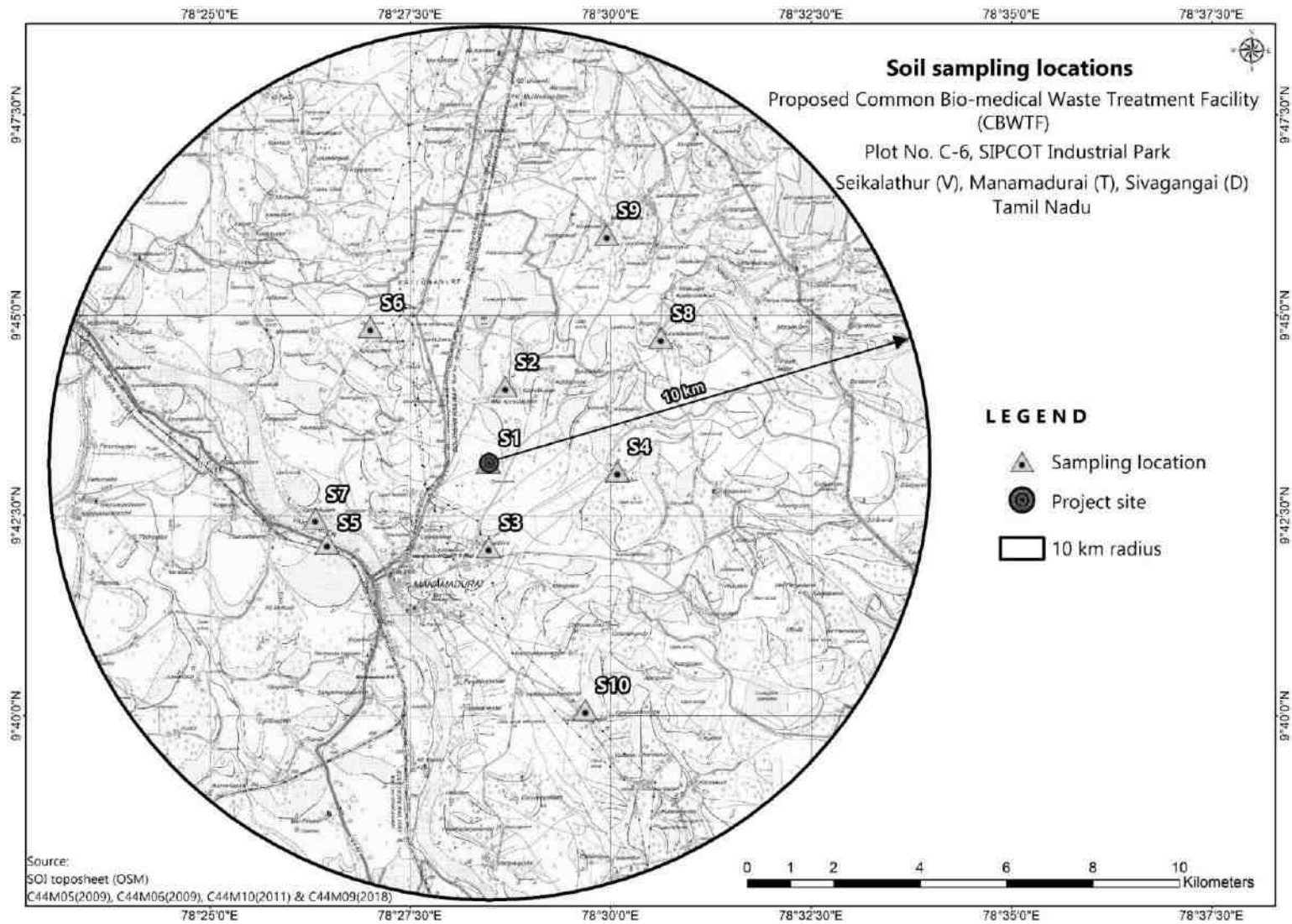


Table 3.21 Soil Analysis results

Parameter	Unit	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	Standard Soil Classification – Indian Council of Agricultural Research, New Delhi
Texture	--	Silty Loam										--
Color	--	Red	Brown	Red	Red	Brown	Brown	Brown	Brown	Brown	Brown	--
pH	--	6.54	6.81	7.09	7.42	6.35	7.23	6.69	6.46	6.27	7.12	<ul style="list-style-type: none"> • Acidic <6.0 • Normal to saline 6.0 – 8.5 • Tending to become alkaline 8.6-9.0 • Alkaline > 9.0
EC	μMho/cm	337	339	362	461	329	319	382	339	360	234	<ul style="list-style-type: none"> • Normal <1000 • Critical for germination 1000 – 2000 • Critical for growth 2000- 4000 • Injurious to most crops > 4000
organic Carbon	%	0.6	1.1	0.5	0.9	0.7	0.8	0.8	0.7	1.1	0.7	Low <0.5%, Medium 0.5-0.75%, High >0.75%
Bulk Density	gm/cc	0.92	0.81	1.12	1.06	1.53	0.79	0.01	1.42	0.95	0.89	
Calcium as Ca	mg/kg	474	355	631	712	1585	1207	1066	429	413	571	
Magnesium as Mg	mg/kg	96	48	167	168	505	156	658	130	84	60	
Available Potassium as K	Kg/ha	296	324	343	316	354	340	355	329	316	309	Low below 110; Medium 110 to 280; High above 280
Available Nitrogen as N	Kg/ha	43	58	89	63	57	66	66	55	87	77	Low below 280; Medium 280 to 560; High above 560
Available Phosphorus as P	Kg/ha	76	83	71	75	81	76	71	78	90	72	Low below 10; Medium 10 to 25; High above 25

3.9.1 Regional Scenario

The pH values in the study area are varying from 6.27 to 7.42 indicating that the soils are falling in normal to saline class.

Based on the electrical conductivity (EC), the soils are classified into 4 groups (normal, critical for germination, critical for growth of the sensitive crops, injurious to most crops). The EC in the study area is varying from **234 μ Mho/cm to 461 μ Mho /cm** indicating that soils falling under normal category.

The organic carbon in the study area is varying from **0.5 % to 1.1 %** indicating that five samples are in low range and five samples are in high range as per the standard.

Available Nitrogen as N in the study area is varying from 43 kg/ha to 89 kg/ha which indicates that all the samples are falling under low category.

Available Phosphorus as P in the study area is varying from **71 kg/ha – 90 kg/ha**, all samples are falling under high category.

Available Potassium in the study area is varying between **296 kg/ha to 355 kg/ha** which indicates that all the samples are falling under high category.

3.10 Biological Environment

The main aim of an ecological survey is to study the ecological profile of project area to facilitate the subsequent impact assessment and mitigation measures. A rapid ecology and biodiversity study have been conducted to assess the ecological conditions of the site in core area and buffer area (10 km radius) during baseline study period.

3.10.1 Objectives of Ecological and Biodiversity studies

The objective of baseline study of an ecological assessment is to collect adequate and accurate information of the site and its surroundings. The primary objectives of the study of biological environment are as follows:

- To record flora and fauna species from core zone (project site) and buffer zone (10 km radius) around project site.

- To locate/ demarcate and understand ecological setting of the project area in terms of national parks/ wildlife sanctuary / forests / tiger reserve / eco-sensitive attributes / wetlands / biosphere reserve/ tiger reserves etc. within 25 km. radius from project site.
- To identify schedule, Rare, Endangered, Endemic and Threatened species (REET species) within the project study area and prepare site specific and species-specific conservation plan.
- To verify the conservation status of species as per Indian Wild Life Protection Act, 1972 and species listed under International Union for Conservation of Nature (IUCN).
- To evaluate the likely impact of the proposed project activities and its aspects on surrounding habitats / flora and fauna of the project study area.
- To suggest/ prepare action plan to mitigate likely impacts on the biodiversity of the project area through green belt development.

3.10.2 Methodology adopted for the survey

Primary data was collected as per the requirement of ToR points issued to the project by SEIAA, TN. The terrestrial ecosystems of core zone and buffer has been surveyed separately by visiting various available habitats. All trees present in the core zone were counted and measured for their girth size using measuring tape. While in case of the buffer zone, inventory / listing of flora and fauna was carried out through actual field observations (visiting various identified habitats). Desk Based Survey involves the review of existing literature, databases and site-specific information for the study area.

3.10.3 Quality assurance/ validation of the data

Field data collected from the site were validated using authentic literature IUCN, March 2019 and IWPA, 1972 data and Schedules.

3.10.4 Collation, synthesis and Interpretation of Primary and Secondary data

Primary data has been collected using standard procedure from core as well buffer zone. Primary data has been verified and crossed checked from the secondary data

available. The species has been classified in to tree, shrubs, herbs (in case of Flora species) and Fishes Reptile, Amphibians, Birds and Mammals species (In case of Fauna species). Conservation status has been verified using with IUCN, March 2019 Red Data List and IWPA, 1972 Schedule.

3.10.5 Vegetation and flora of the core & buffer zone

Being located within the Notified Industrial area the plot (core zone) is having some seasonal ground flora, bushes and few trees as given in **Table 3.22**. The list of flora (buffer zone) of the study area is given in **Table 3.23** and List of shrubs and herbs are given in **Table 3.24 & Table 3.25**.

Table 3.22 List of Flora in the study area (core zone)

Sl. No.	Species name	Number	Common name	Family	Approx. Height	Approx. Diameter	Approx. Age
1	<i>Azadirachta indica</i>	2	Neem	Meliaceae	6-7 m	20-22 cm	4-5 years
2	<i>Adina cordifolia</i>	1	Sapodila	Rubiaceae	4-5 m	15-17 cm	3-4 years

Table 3.23 List of Flora in study area (buffer zone)

Sl. No.	Scientific name	Common name	Family	Use				
				A	B	C	D	E
1	<i>Acacia nilotica</i>	Gum arabic tree	Fabaceae					+
2	<i>Acacia catechu</i>	Catechu	Fabaceae			+		+
3	<i>Acacia auriculiformis</i>	Aakashmani	Fabaceae				+	
4	<i>Acacia mangium</i>	Black wattle	Fabaceae		+			+
5	<i>Adina cordifolia</i>	Sapodila	Rubiaceae				+	
6	<i>Ailanthus excelsa</i>	Tree of heaven	Simaroubaceae			+		
7	<i>Albizia lebbek</i>	Siris	Fabaceae		+			+
8	<i>Albizia amara</i>	Usil	Fabaceae			+		
9	<i>Aleurites moluceana</i>	Candleberry	Euphorbiaceae					+
10	<i>Annona squamosa</i>	Custard apple	Annonaceae	+				
11	<i>Azadirachta indica</i>	Neem	Meliaceae		+	+		+
12	<i>Bauhinia variegata</i>	Kachnaar	Fabaceae				+	+
13	<i>Bauhinia purpurea</i>	Kachnaar	Fabaceae				+	
14	<i>Bauhinia racemosa</i>	Kachnaar	Fabaceae				+	
15	<i>Bauhinia tomentosa</i>	Kachnaar	Fabaceae				+	
16	<i>Cassia fistula</i>	Golden shower tree	Fabaceae			+	+	
17	<i>Citrus limon</i>	Lemon	Rutaceae	+				+

Sl. No.	Scientific name	Common name	Family	Use				
				A	B	C	D	E
18	<i>Cocos nucifera</i>	Coconut tree	Arecaceae	+		+	+	+
19	<i>Dalbergia sissoo</i>	Sheesham	Fabaceae		+			+
20	<i>Delonix regia</i>	Flame tree / Gulmohar	Fabaceae				+	
21	<i>Dillenia indica</i>	Elephant Apple	Dilleniaceae					+
22	<i>Diospyros sesamum</i>	Coromandel ebony	Ebenaceae					+
23	<i>Eucalyptus tereticornis</i>	Eucalyptus	Myrtaceae		+			+
24	<i>Ficus benghalensis</i>	Banyan tree	Moraceae			+		+
25	<i>Ficus religiosa</i>	Peepal	Moraceae			+		+
26	<i>Haldina cordifolia</i>	Haldina	Rubiaceae			+		+
27	<i>Lagerstroemia speciosa</i>	Pride of India	Lythraceae				+	
28	<i>Madhuca longifolia</i>	Maduca/Mahua	Sapotaceae	+		+	+	+
29	<i>Mangifera indica</i>	Mango	Anacardiaceae	+			+	+
30	<i>Moringa pterygosperma</i>	Moringa	Moringaceae	+		+		
31	<i>Phoenix loureirii</i>	Vuyavuy palm	Arecaceae				+	
32	<i>Phyllanthus acidus</i>	Gooseberry	Phyllanthaceae	+		+		+
33	<i>Phyllanthus emblica</i>	Amla	Phyllanthaceae	+		+		
34	<i>Pongamia pinnata</i>	Karanj	Fabaceae			+		
35	<i>Psidium guajava</i>	Guava	Myrtaceae	+				
36	<i>Saraca asoca</i>	Ashoka tree	Fabaceae				+	
37	<i>Syzygium cumini</i>	Java Plum	Myrtaceae	+				+
38	<i>Tectona grandis</i>	Teak	Lamiaceae		+			+
39	<i>Terminalia Arjuna</i>	Arjun Tree	Combretaceae			+		
40	<i>Toona ciliata</i>	Red cedar	Meliaceae				+	
41	<i>Ziziphus mauritiana</i>	Indian jujube	Rhamnaceae	+				

Note - A: Fruiting species, B: Timber value species, C: Medicinal Value species, D: Ornamental Value species, E, Economic values

Table 3.24 List of shrubs in study area

Sl. No.	Species name	Common name	Family	Use			
				A	B	C	D
1	<i>Argemone mexicana</i>	Mexican poppy	Papaveraceae		+		
2	<i>Baccharis halimifolia</i>	Salt bush / Groundsel bush	Asteraceae			+	
3	<i>Bougainvillea spectabilis</i>	Paper flower	Nyctaginaceae			+	
4	<i>Caesalpinia pulcherrima</i>	Peacock flower	Fabaceae			+	
5	<i>Carica papaya</i>	Papaya	Caricaceae	+			
6	<i>Cassia alata</i>	Candle bush	Fabaceae		+		
7	<i>Cryptostegia grandiflora</i>	Rubber vine	Apocynaceae			+	
8	<i>Datura metel</i>	Datura	Solanaceae				+
9	<i>Gardenia resinifera</i>	white emetic nut	Rubiaceae			+	

10	<i>Gmelina asiatica</i>	Asiatic beechberry	Lamiaceae	+			
11	<i>Hibiscus rosa-sinensis</i>	China rose	Malvaceae			+	
12	<i>Indigofera longiracemosa</i>	Neelayamari	Fabaceae		+		
13	<i>Ipomoea aquatica</i>	Water spinach	Convolvulaceae			+	+
14	<i>Ipomoea hederifolia</i>	Cscarlet morning glory	Convolvulaceae			+	
15	<i>Ixora coccinea</i>	Jungle geranium	Rubiaceae			+	
16	<i>Jasminum auriculatum</i>	Jasmine	Oleaceae			+	+
17	<i>Jatropha gossypifolia</i>	Bellyache bush	Euphorbiaceae		+		+
18	<i>Lantana camara</i>	Common Lantana	Verbenaceae			+	+
19	<i>Nerium oleander</i>	Nerium	Apocyanaceae			+	
20	<i>Pavetta indica</i>	Indian Pavetta	Rubiaceae		+		
21	<i>Pithecellobium dulce</i>	Manila tamarind/Madras thorn	Fabaceae	+	+		
22	<i>Prosopis juliflora</i>	Long-thorn kiawe	Fabaceae	+			+
23	<i>Ricinus communis</i>	Castor oil plant	Euphorbiaceae		+		+
24	<i>Solanum torvum</i>	Devil's fig	Solanaceae	+	+		+
25	<i>Vachellia nilotica</i>	Babul thorn	Fabaceae	+			
26	<i>Ziziphus oenophilia</i>	Jackal jujube	Rhamnaceae	+			

Note- A: Fruiting/Fodder species, B: Medicinal Plant, C: Ornamental Plant, D: Economical Plant

Table 3.25 List of Herbs in Study Area

Sl. No.	Species name	Common name	Family	Use		
				A	B	C
1	<i>Abrus precatorius</i>	Rosary pea	Fabaceae			+
2	<i>Achyranthes aspera</i>	Chaff-flower	Amaranthaceae			+
3	<i>Aganosma cymosum</i>	Forest Aganosma	Apocynaceae	+		
4	<i>Agave sisalana</i>	Sisal	Asparagaceae		+	+
5	<i>Ageratum conyzoides</i>	billygoat-weed	Asteraceae			+
6	<i>Aloe vera</i>	Alovera	Asphodelaceae	+	+	
7	<i>Andropogon pumilus</i>	beard grass,	Poaceae			+
8	<i>Anisomeles indica</i>	Catmint	Lamiaceae	+		
9	<i>Aristida adscensionis</i>	Sixweeks threeawn	Poaceae			+
10	<i>Boerhavia diffusa</i>	Punarnava	Nyctaginaceae	+		
11	<i>Brachiaria ramosa</i>	Browntop millet	Poaceae			+
12	<i>Brassica juncea</i>	Brown mustard	Brassicaceae			+
13	<i>Chromolaena odorata</i>	Siam weed	Asteraceae	+		
14	<i>Chrysopogon aciculatus</i>	Lesser spear grass	Poaceae			+
15	<i>Cissus quadrangularis</i>	Hathjod	Vitaceae	+		
16	<i>Coccinia grandis</i>	Ivy gourd	Cucurbitaceae			+
17	<i>Corallocarpus epigaeus</i>	Red fruit creeper	Cucurbitaceae	+		
18	<i>Cynodon dactylon</i>	Bermuda grass	Poaceae	+	+	+

Sl. No.	Species name	Common name	Family	Use		
				A	B	C
19	<i>Cyperus compressus</i>	Mothi	Cyperaceae			+
20	<i>Cyperus difformis</i>	Small flower umbrella-sedge	Cyperaceae			+
21	<i>Diplocyclos palmatus</i>	Striped cucumber	Cucurbitaceae	+		
22	<i>Eclipta prostrata</i>	False daisy/Bhringraj	Asteraceae	+		+
23	<i>Emilia sonchifolia</i>	Lilac tasselflower	Asteraceae	+		
24	<i>Imperata cylindrica</i>	Cogongrass	Poaceae			+
25	<i>Musa acuminata</i>	Banana	Musaceae			+
26	<i>Ocimum africanum</i>	Lemon Tulsi	Lamiaceae	+		
27	<i>Oryza sativa</i>	Rice	Poaceae			+
28	<i>Piper betle</i>	Betel	Piperaceae	+		+
29	<i>Piper nigrum</i>	Black pepper	Piperaceae	+		+
30	<i>Raphanus sativus</i>	Radish	Brassicaceae			+
31	<i>Wedelia chinensis</i>	Chinese Wedelia	Asteraceae	+		
32	<i>Xanthium indicum</i>	Rough cocklebur	Asteraceae	+		
33	<i>Zea mays</i>	Maize	Poaceae			+

Note - A: Medicinal value, B: Ornamental value, C: Fodder/Economic/Other

Total 41 tree species 26 shrub species and 33 herbs species were identified in the study area. None of the species is falling in any conservation category. Most of the species are widely distributed in the area and locally available.

3.10.6 Terrestrial fauna of the Core area and the Buffer zone with conservation status

Fauna in Core Zone:

The proposed project is being located within Notified Industrial area no fauna species is sighted within the plot area (Core area).

Fauna in Buffer Zone:

Fauna survey was conducted through site visit and observation at the study area. Secondary data like published literatures, Forest working plan were also considered. Fauna was identified / reported in five major categories i.e. Fishes, Reptiles, Amphibians, Birds and Mammals. Fish species were identified by visiting to the local fish markets, local discussion with person involved in fishing activities etc. List of Fauna species and their conservation status are given in below **Table 3.26**.

Table 3.26 List of Fauna species and their conservation status

Sl. No	Scientific name	Common name	Family	IWPA, 1972	IUCN
Mammals					
1	<i>Lepus nigricollis</i>	Indian Hare	Leporidae	Schedule-IV	LC
2	<i>Bandicota bengalensis</i>	Bandicoot	Muridae	Schedule-IV	LC
3	<i>Bandicota indica</i>	Rat	Muridae	Schedule-IV	LC
4	<i>Funambulus Palmarum</i>	Squirrel	Sciuridae	Schedule-IV	LC
5	<i>Rattus rattus</i>	Black Rat	Muridae	Schedule-IV	LC
Reptiles					
1	<i>Hemidactylus sp.</i>	House Lizard	Gekkonidae	Schedule-IV	-
2	<i>Chameleon zeylanicus</i>	Indian chameleon	Chamaeleonidae	Schedule-IV	LC
3	<i>Naja naja</i>	Indian Cobra	Elapidae	Schedule-IV	-
Amphibians					
1	<i>Rana tigrina</i>	Common Frog	Ranidae	Schedule-IV	-
2	<i>Duttaphrynus melanostictus</i>	Toad	Bufoidea	Schedule-IV	LC
Birds					
1	<i>Perdica aslatica</i>	Jungle Bush Quail	Phasianidae	Schedule IV	LC
2	<i>Perdica argoondah</i>	Rock Bush Quail	Phasianidae	Schedule IV	LC
3	<i>Perdica erythrorhynchos</i>	Painted bush Quail	Phasianidae	Schedule IV	LC
4	<i>Gallinago spadicea</i>	Red Spurfowl	Phasianidae	Schedule IV	LC
5	<i>Gallinago lanulata</i>	Painted Spurfowl	Phasianidae	Schedule IV	LC
6	<i>Anas poecilorhynchos</i>	Indian Spot-billed Duck	Anatidae	Schedule IV	LC
7	<i>Tachybaptus ruficollis</i>	Little Grebe	Podicipedidae	Schedule IV	LC
8	<i>Ardeola grayii</i>	Indian Pond Heron	Ardeidae	Schedule IV	LC
9	<i>Ardea cinerea</i>	Grey Heron	Ardeidae	Schedule IV	LC
10	<i>Bubulcus ibis</i>	Cattle Egret	Ardeidae	Schedule IV	LC
11	<i>Casmerodius albus</i>	Great Egret	Ardeidae	Schedule IV	LC
12	<i>Egretta garzetta</i>	Little Egret	Ardeidae	Schedule IV	LC
13	<i>Phalacrocorax niger</i>	Little Cormorant	Phalacrocoracidae	Schedule IV	LC
14	<i>Phalacrocorax fuscicollis</i>	Indian Cormorant	Phalacrocoracidae	Schedule IV	LC
15	<i>Elanus caeruleus</i>	Black-winged Kite	Accipitridae	Schedule IV	LC

Sl. No	Scientific name	Common name	Family	IWPA, 1972	IUCN
16	<i>Milvus migrans</i>	Black kite	Accipitridae	Schedule IV	LC
17	<i>Hallastur indus</i>	Brahminy Kite	Accipitridae	Schedule IV	LC
18	<i>Vanellus indicus</i>	Red-wattled Lapwing	Charadriidae	Schedule IV	LC
19	<i>Charadrius dublus</i>	Little ringed plover	Charadriidae	Schedule IV	LC
20	<i>Columba livia</i>	Common Pigeon	Columbidae	Schedule IV	LC
21	<i>Stigmatopella chinensis</i>	Spotted Dove	Columbidae	Schedule IV	LC
22	<i>Chalcophaps indica</i>	Emerald dove	Columbidae	Schedule IV	LC
23	<i>Loriculus vernalis</i>	Vernal Hanging Parrot	Psittaculidae	Schedule IV	LC
24	<i>Psittacula krameri</i>	Rose-ringed Parakeet	Psittaculidae	Schedule IV	LC
25	<i>Psittacula cyanocephala</i>	Plum-headed Parakeet	Psittaculidae	Schedule IV	LC
26	<i>Eudynamys scolopaceus</i>	Asian Koel	Cuculidae	Schedule IV	LC
27	<i>Centropus(sinensis) parroti</i>	Southern Coucal Centropus	Cuculidae	Schedule IV	LC
28	<i>Glaucidium radiatum</i>	Jungle owlet	Strigidae	Schedule IV	LC
29	<i>Caprimulgus asiaticus</i>	Indian Nightjar	Caprimulgidae	Schedule IV	LC
30	<i>Apus affinis</i>	Little Swift	Apodidae	Schedule IV	LC
31	<i>Coracias benghalensis</i>	Indian Roller	Coraciidae	Schedule IV	LC
32	<i>Alcedo atthis</i>	Common Kingfisher	Alcedinidae	Schedule IV	LC
33	<i>Micropternus brachyurus</i>	Rufous Woodpecker	Picidae	Schedule IV	LC
34	<i>Picus xanthopygaeus</i>	Streak-throated Woodpecker	Picidae	Schedule IV	LC
35	<i>Dinoplum benghalense</i>	Lesser Goldenbeck	Picidae	Schedule IV	LC
36	<i>Chrysocolaptes festivus</i>	White-napped Woodpecker	Picidae	Schedule IV	LC
37	<i>Dicrurus paradiseus</i>	Greater Racket-talled Drongo	Dicruridae	Schedule IV	LC
38	<i>Dicrurus macrocerus</i>	Black Drongo	Dicruridae	Schedule IV	LC
39	<i>Corvus culminatus</i>	Indian Jungle Crow	Corvidae	Schedule IV	LC
40	<i>Corvus splendens</i>	House Crow	Corvidae	Schedule IV	LC
41	<i>Pycnonotus cafer</i>	Red-vented Bulbul	Pycnonotidae	Schedule IV	LC

Sl. No	Scientific name	Common name	Family	IWPA, 1972	IUCN
42	<i>orthotomus sutorious</i>	Common Tailorbird	Cisticolidae	Schedule IV	LC
43	<i>Acridotheres tristis</i>	Common Myna	Sturnidae	Schedule IV	LC
44	<i>Stumia pagadarum</i>	Brahminy Starling	Sturnidae	Schedule IV	LC
45	<i>Saxicoloides falicatus</i>	Indian Robbin	Muscicapidae	Schedule IV	LC
46	<i>Cyornis tickellae</i>	Tickells Blue Flycatcher	Muscicapidae	Schedule IV	LC
47	<i>Cinnyris asiaticus</i>	Purple Sunbird	Nectariniidae	Schedule IV	LC
48	<i>Lonchura striata</i>	White-rumped Munia	Estrildidae	Schedule IV	LC
49	<i>Lonchura punchulata</i>	Scaly-breasted Munia	Estrildidae	Schedule IV	LC
50	<i>Lonchura malacca</i>	black-headed munia	Estrildidae	Schedule IV	LC
51	<i>Lonchura atricapilla</i>	Chestnut Munia	Estrildidae	Schedule IV	LC
52	<i>Motacilla maderaspatensis</i>	Whitebrowed Wagtail	Motacillidae	Schedule IV	LC
Fishes					
1	<i>Catla catla</i>	Katla		Cyprinidae	LC
2	<i>Channa orientalis</i>	Ceylon snakehead		Channidae	VU
3	<i>Channa striata</i>	Common snakehead		Channidae	LC
4	<i>Cyprinus carpio carpio</i>	Common carp		Cyprinidae	-
5	<i>Etroplus maculatus</i>	Orange chromide		Cichlidae	LC
6	<i>Garra mullya</i>	Mullya garra or sucker fish		Cyprinidae	LC
7	<i>Labeo rohita</i>	Rohu		Cyprinidae	LC
8	<i>Mystus cavasius</i>	Catfish		Bagridae	LC
9	<i>Mystus vittatus</i>	Striped dwarf catfish		Bagridae	LC
10	<i>Puntius chola</i>	Chola barb		Cyprinidae	LC
11	<i>Puntius dorsalis</i>	Long-snouted barb		Cyprinidae	LC
12	<i>Puntius sophore</i>	Pool barb		Cyprinidae	LC
Note - LC: Least Concern, NT: Near Threatened, VU: Vulnerable					

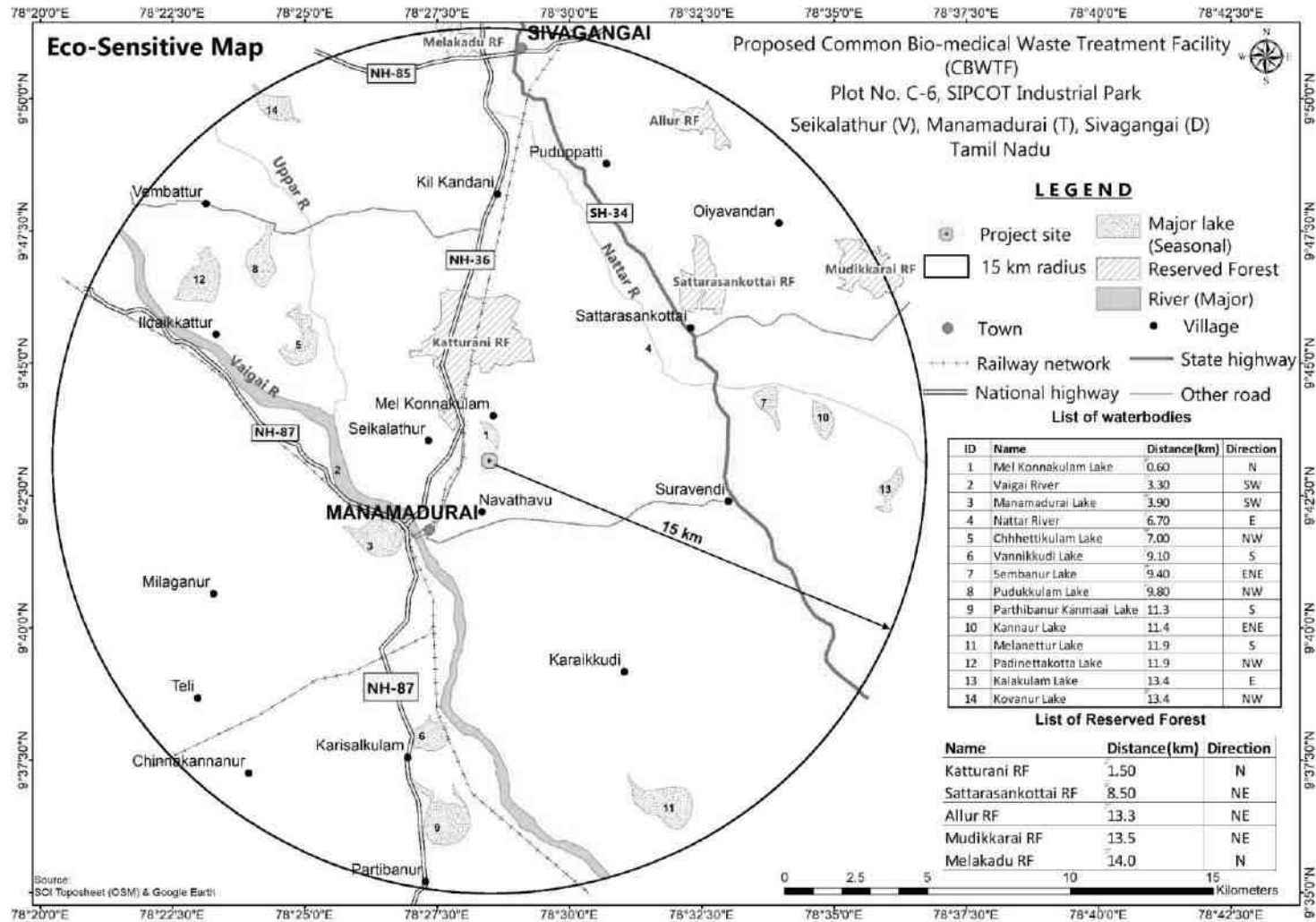
There is no species falling within the Endangered category as per IUCN, March 2019 Schedule-I species as per IWPA, 1972 found or reported at the area.

3.10.7 Wildlife Sanctuaries/ National Parks/ Biosphere Reserve/REET Species

The project site is located within Notified Industrial area. No National Park, Wildlife Sanctuary, Tiger Reserve, Biosphere Reserve present within 10 km radius study area.

Where clarification from DFO for presence of such Eco-sensitive area within 25 km area will be secured and will be submitted in the Final EIA Report. Katturani RF present in NW direction and Sattarasankottai RF present in NE direction from the project site. Few Eucalyptus plantation patches also seen in the Study area. The eco sensitive map is given in **Figure 3.6**.

Figure 3.6 Eco sensitive map



3.11 Land use/ land cover

Land cover data describes the types of land and water in a region. Land use data shows how people use the land. Understanding both is crucial for decision-making and planning in communities. Socio-economic surveys help understand the social and economic development of a society.

LULC maps are vital for planning and monitoring at all levels. They help shape policies for sustainable development. Accurate information about land use/land cover is essential. LULC maps help us study ecosystem changes and support EIA studies. They integrate GIS layers to assess natural features.

3.11.1 Methodology

The technological advances in remote sensing products and Digital Image Processing software are surely blessing to analyse the land status of the study area for further impact assessment. The Survey of India toposheet (OSM series) of 1:50,000 scale is used as the base map of the study area. Indian Remote Sensing Satellite Image, Multispectral Resourcesat-2, LISS-IV imagery of 5.8 m spatial resolution is obtained and Date of pass: 20-May-2023.

a. Data Used

This study involved primary data collection and secondary data collection. Resourcesat-2 Multispectral high resolution LISS-IV image were used for mapping land use feature classification up to level-2 standard to represent the map in 1:50000 scale with reference of SOI Toposheet were used as Secondary source for Geographic reference of the study area as well as to make one to one co-ordination between both the data and furthermore for superimposing the project on accurate location. The detail of satellite used for LULC thematic map is given below **Table 3.27**.

Table 3.27 Details of Satellite data

Satellite	Sensor	Path/Row	Resolution	Date of Pass
Resourcesat-2	LISS-IV	101/067	5.8m	23-May-2023

b. Data Processing

The satellite data obtained from NRSC data centre after successful selection of path/row of satellite data based on study area. It was corrected for radiometric and geometric errors. Indian Remote Sensing Satellite data geo-registered to UTM Zone 44 N projection and WGS84 datum were used. UTM projection was chosen due to its easy application and widespread usage throughout the world. More importantly, UTM projections are best suited for small areas that lie within a single zone.

The satellite data was then geometrically rectified following image-to-map registration with the aid of the dereferenced toposheet. It has been done by superimposing geometrically corrected satellite data over the toposheet in the digital domain. This process ensured the creation of correctly geo referenced database. The co-registration of spatial features and GCPs with that of toposheet has been verified using the Swipe tool available with the ARC GIS.

3.11.2 Delineation of the study site:

For preparation of LULC for the same area, the satellite image was clipped according to study area boundary, for further preparation LULC. FCC of the study area was also generated by changing band combination of red, green and blue. Further classification was carried out on this extracted scene to reduce space and time consumption. The satellite map of the study area (10 km radius of the project site) is provided in **Figure 3.7.**

Classification & Mapping

The visual image interpretation technique of classification was applied in the study. It is a process of identifying what we see on the images and communicates the information obtained from these images to others for evaluating their significance. Below visual interpretation methodology was used in the present study. This comprise of the following six major steps

- Selection and acquisition of data
- Pre-field interpretation
- Ground data collection and verification
- Post field interpretation and modification

- Computation LULC classes of area
- Final cartographic map preparation and reproduction.

Reconnaissance of the area under study is a prerequisite for any kind of attempt in mapping natural resources of the earth. The preliminary survey of the area assists in acquainting the worker with the various kinds of classes of LULC types present in the field and subsequently help in adopting a suitable classification scheme and interpretation key for the final map generation. Hence a general reconnaissance of the study area was carried out and different classes of LULC that could be demarcated on LISS IV satellite imagery were identified on the ground. A final interpretation key for the various classes was prepared using spectral characteristics of classes and field knowledge.

On-screen digitization was done in Arc Map 10.8. software. A polygon map was generated where each polygon represented a distinct class and area. The classes were then assigned their respective attributes. Ground truth verification was done by using a handheld GPS during field visit. GPS readings for the doubtful location due to radiometric error by atmospheric aerosol and other particles, were collected for further identification of the actual land use classes. The same record captured by GPS has been brought into GIS platform to create final LULC thematic map. It was found that points were very accurate in the satellite image. Finally, the area statistics of different categories of LULC and color-coded classified map of 10 km radius of the project site was generated.

3.11.3 LULC analysis result

In present EIA study 10 km radius of the project site were identified as study area of this project and LULC for the same area to get present LULC status around 10 km radius of the TSD facility. Classification has been performed through the training site selection with the help of visual interpretation of the satellite image by various image interpretation element for preparing the draft land use and same land use has been further verified with the ground trothing for LULC validation and to prepare final existing present LULC map which is shown in in **Figure 3.8** and area statistics has been generated as per final LULC map, given in **Table 3.28**.

According to LULC analysis, there are 10 categories of LULC were extracted in level-2 classification standard to represent map into 1:50000 scale level, which can be summarized into 5 broad level classifications system, called Level-1 classification as per NRSC standard LULC classification system. Majorly three types of Built-up, two types of Agricultural land, Forest land and water bodies, also one type of wasteland and other class is river sand.

As per the LULC map it is observed that the study area mostly dominated by agriculture land and scrub land which are together covering around 85% of the study area, followed by 5% of built-up area, 4% forest land and 6% covering by surface waterbodies.

Table 3.28 Land utilization pattern of the study area

Leve-1			Level-2		
Class	Area(ha)	% of area	Class	Area(ha)	% of area
Built-Up area	1573	5	Urban	495	1.5
			Rural	785	2.5
			Industrial area	293	1
Agricultural land	15685	49	Crop land	12205	38
			Fallow land	3480	11
Forest land	1261	4	Plantation	1261	4
Surface waterbodies	1905	6	River/stream	376	1
			Lake/pond/dam	1529	5
Wasteland & others	11647	36	River sand	56	0
			Scrub land	11591	36

Figure 3.7: Satellite image (R2 LISS-IV) of the study area

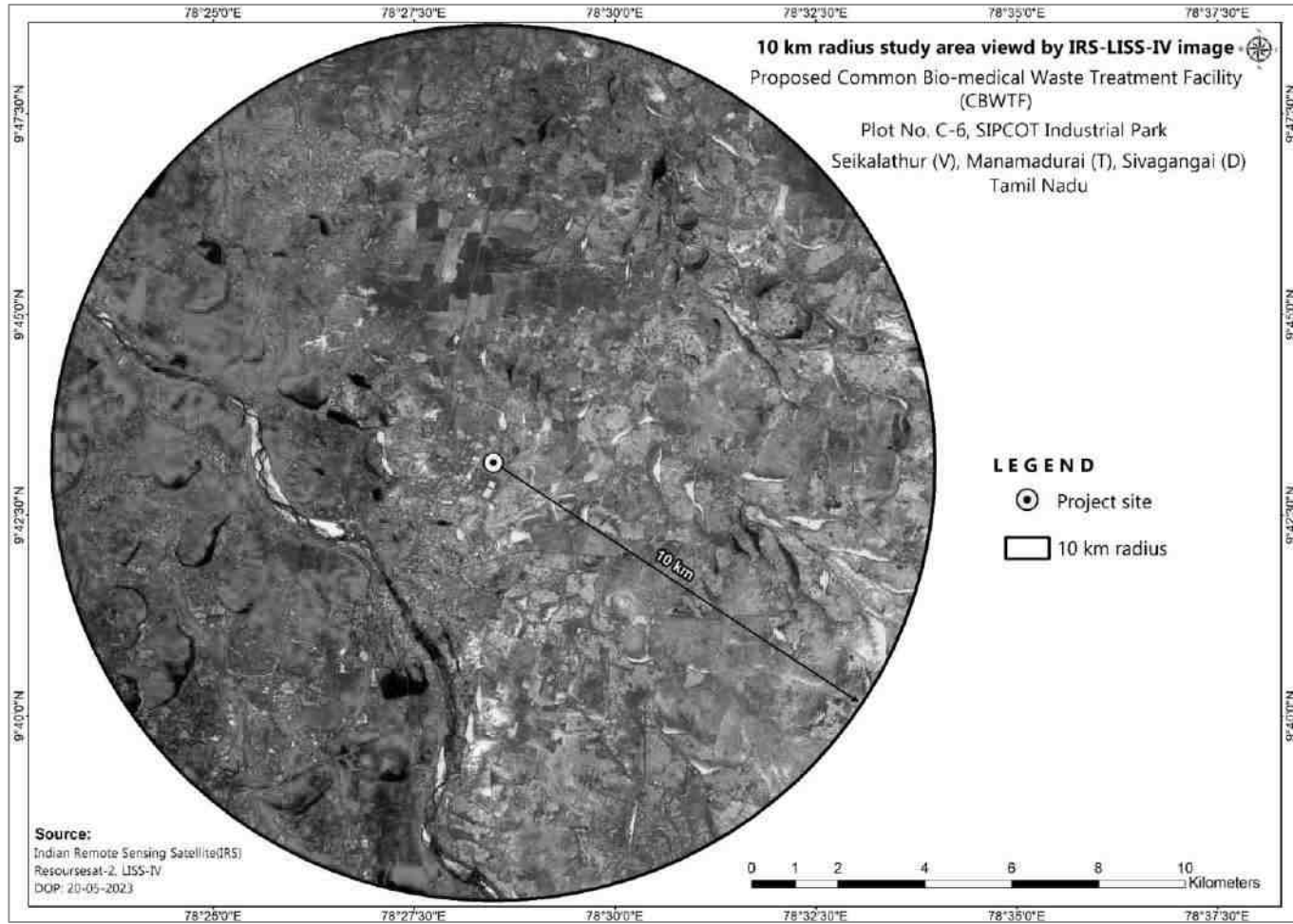
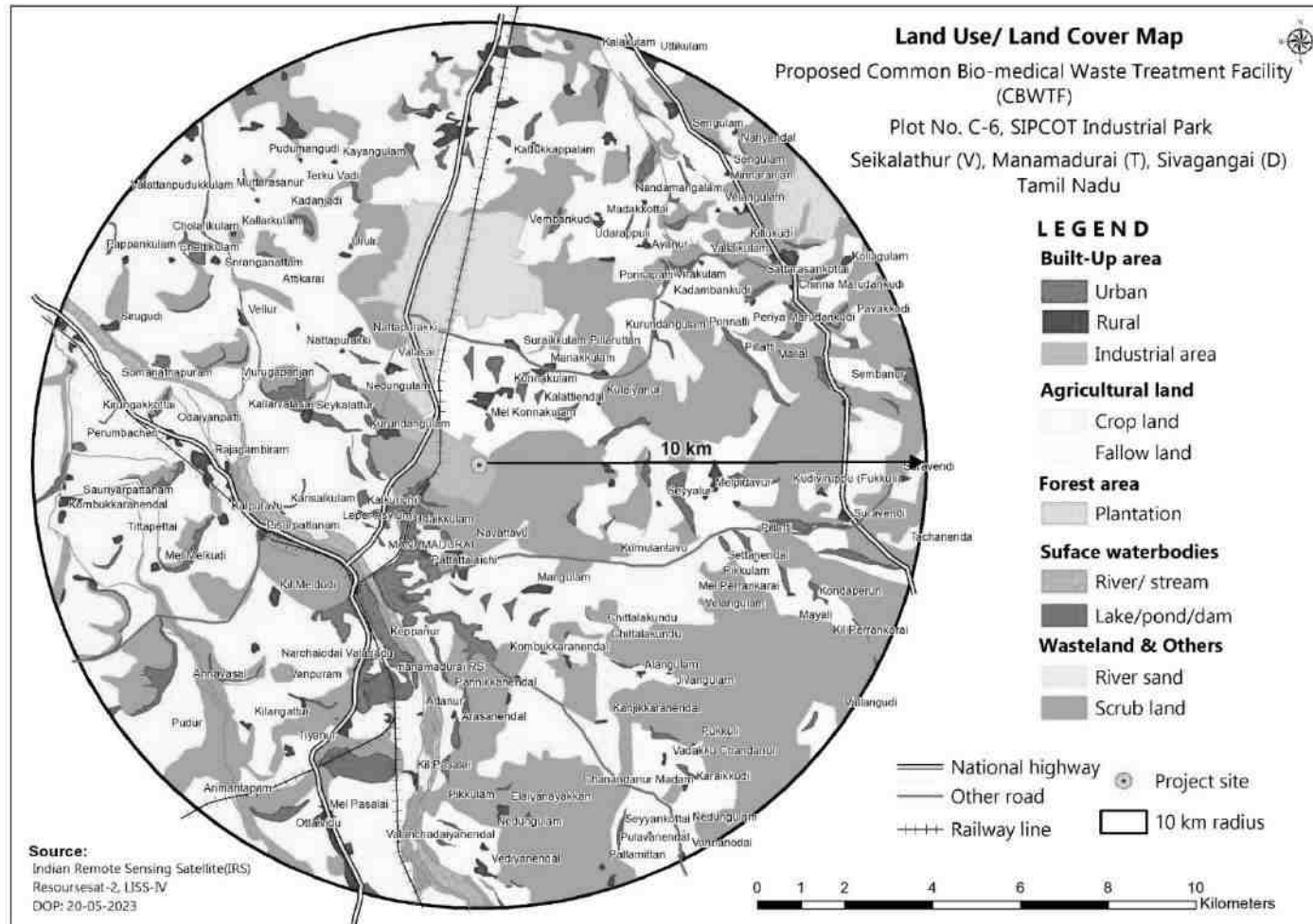


Figure 3.8 Land use/ Land Cover of the study area



3.12 Demography and socio-economics (secondary data description)

This section illustrates the prevailing socio-economic aspects of villages within a 10 km radius of the proposed CBWTF at SIPCOT Industrial Park, Seikalathur (V), Manamadurai (T), Sivagangai (D), Tamil Nadu. The following section comprehends the social phenomenon in order to represent the demographic, occupational, gender, and diversity within the proposed project area and its surroundings, thereby postulating impactful developmental interventions.

3.12.1 Methodology adopted for the study

As aforementioned, the socio-economic study covers villages within 10 km radius from the periphery of proposed project site at SIPCOT Industrial Park, Seikalathur (V), Manamadurai (T), Sivagangai (D), Tamil Nadu. The socio-economic study further categorises the villages into 3 zones, namely the Core Zone (0–2 km radius), the Buffer Zone (2–5 km), and other villages that are within 5–10 km from the proposed site.

The study also adopts a two-fold methodology for data collection, namely, a review of published secondary data and an analysis of primary data. Secondary data was collected from district census statistics for 2011, which include demography, occupational structure, literacy profile, social structure, etc.

Similarly, the primary data was collected through a range of research techniques and tools, like a transactional walk, a structured questionnaire, focus group discussions, observations, and key stakeholder interactions. The salient features of the demographic and socio-economic aspects in the Core and Buffer Zone (hereafter referred to as the study area) have been described in the following sections:

3.12.2 Socio-economic profile of the study area:

Demographic aspects

Distribution of population

As per 2011 census the study area consists of and the distribution of population in the study area is given in **Table 3.29**.

Table 3.29 Distribution of population in the study area

Particulars	0-2km	2-5km	5-10km	Total (0-10 km)
Number of households	1,324	3,287	8,793	13,404
Male population	2,696	6,617	17,342	26,655
Female population	2,611	6,823	17,198	26,632
Total population	5,307	13,440	34,540	53,287
SC population	1,816	2,539	6,239	10,594
ST population	0	0	28	28
Total population (0-6 years)	605	1,506	3,568	5,679
Average household size	4.01	4.09	3.93	3.98
% of males to the total population	50.80	49.23	50.21	50.02
% of females to the total population	49.20	50.77	49.79	49.98
Sex ratio (number of females per 1000 males)	968.47	1031.13	991.70	999.14
Source: District Primary Census statistics of Tamil Nadu 2011				

As illustrated in the above table, gender diversity, as a percentage of men and women, constitutes about 50.02% and 49.98% of the study area, respectively.

Average household size

According to the Census data of 2011, the study area had an average family size of 4 persons per household. This represents moderately high family size and also in similarity with other parts of the district.

Population projection

The details of the population projection is given below **Table 3.30**.

Table 3.30 Details of annual population projections

Percentage Decadal Variation in Manamadurai and surrounding villages (2001-11)	Year	Total Population	Male	Female
Total Decadal Percentage Growth Rate 14.27 Total Annual Percentage Growth Rate 1.4 Male Annual Percentage Growth Rate 1.5 Female Annual Percentage Growth Rate 1.3	2001	46,629	23,142	23,487
	2011	53,287	26,655	26,632
	2012	54,033	27,055	26,978
	2013	54,789	27,461	27,329
	2014	55,557	27,873	27,684
	2015	56,334	28,291	28,044
	2016	57,123	28,715	28,408
	2017	57,923	29,146	28,777
	2018	58,734	29,583	29,151
	2019	59,556	30,027	29,529
	2020	60,390	30,477	29,913
	2021	61,235	30,934	30,301
	2022	62,092	31,398	30,694
	2023	62,962	31,869	31,093
	2024	63,843	32,347	31,496
	2025	64,737	32,832	31,905
	2026	65,643	33,325	32,318
	2027	66,562	33,825	32,738
	2028	67,494	34,332	33,162
	2029	68,439	34,847	33,592
2030	69,397	35,370	34,027	
2031	70,369	35,900	34,468	

Source: District Primary Census statistics of Tamil Nadu -2011

Sex ratio

To reiterate, males and females constitute 50.02% and 49.98%, respectively, and the number of females per 1000 males is 999.

3.12.3 Social structure

The socio-economic study observed that 20% of people belong to scheduled category, in which 19.9% belongs to Scheduled Castes (SC) and 0.1% belongs to Scheduled Tribes (ST). The distribution of population in the study area by social structure is illustrated in **Table 3.31**.

Table 3.31 Distribution of population by social structure

Particulars	0-2km	2-5km	5-10km	Total (0-10 km)
SC population	1816	2539	6239	10594
ST population	0	0	28	28
% of SC to the total population	34.2	18.9	18.1	19.9
% of ST to the total population	0.0	0.0	0.1	0.1
Total SC & ST Population	1816	2539	6267	10622
Percentage to the total population	34.2	18.9	18.1	19.9
Total population	5307	13440	34540	53287
<i>Source: District Primary Census statistics of Tamil Nadu -2011</i>				

Literacy levels

The analysis of the literacy levels in selected villages of study area, reveals that the male literacy comprises of 55.5%, whereas literacy rate among women, which is an important indicator for social change, is estimated to be 44.5%. The distribution of literates and literacy rates in the study area is illustrated in **Table 3.32**.

Table 3.32 Distribution of literate and literacy rates

Particulars	0-2km	2-5km	5-10km	Total (0-10 km)
Male population	2,696	6,617	17,342	26,655
Female population	2,611	6,823	17,198	26,632
Total population	5,307	13,440	34,540	53,287
Male literates	1,997	4,935	13,863	20,795
Female literates	1,466	3,691	11,546	16,703
Total literates	3,463	8,626	25,409	37,498
% of males Literates	57.67	57.21	54.56	55.46
% of females Literates	42.33	42.79	45.44	44.54
% of Male literates to the Male population	74.07	74.58	79.94	78.02
% of Female literates to the Female population	56.15	54.10	67.14	62.72
Total literacy rate (%)	65.25	64.18	73.56	70.37

3.12.4 Occupational structure

The occupational structure of the project area is studied with reference to three categories: main workers, marginal workers, and non-workers. According to the Census Department of India, the main workers include four categories of workers: cultivators, agricultural labourers, those engaged in manufacturing, processing, and repairs in the household industry, and others, including those engaged in the

household industry, construction, trade and commerce, transport and communication, and all other services. The marginal workers are those workers engaged in some work for a period of less than six months during the reference year prior to the census survey. The non-workers include those engaged in unpaid household duties, students, retired persons, dependents, beggars, vagrants, etc.; institutional inmates; or all other non-workers who do not fall under the above categories.

As per 2011 census, there are a total of 29% main workers in the study area. The marginal workers and non-workers constitute to 17% and 55% of the total population respectively. Therefore, non-workers are predominant in that of workers by occupation. The occupational structure of the study area is given in **Table 3.33**.

Table 3.33 Occupational structure

Particulars	0-2km	2-5km	5-10km	Total (0-10 km)
Total population	5,307	13,440	34,540	53,287
Total workers	2,629	6,916	14,581	24,126
Work participation rate (%)	49.54	51.46	42.21	45.28
Main workers	1373	4008	9919	15,300
% of main workers to total population	25.87	29.82	28.72	28.71
Marginal workers	1256	2908	4662	8,826
% of marginal workers to total population	23.67	21.64	13.50	16.56
Non-workers	2678	6524	19959	29,161
% of non-workers to total population	50.46	48.54	57.79	54.72
Dependency ratio	1.02	0.94	1.37	1.21

Source: District Primary Census statistics of Tamil Nadu -2011

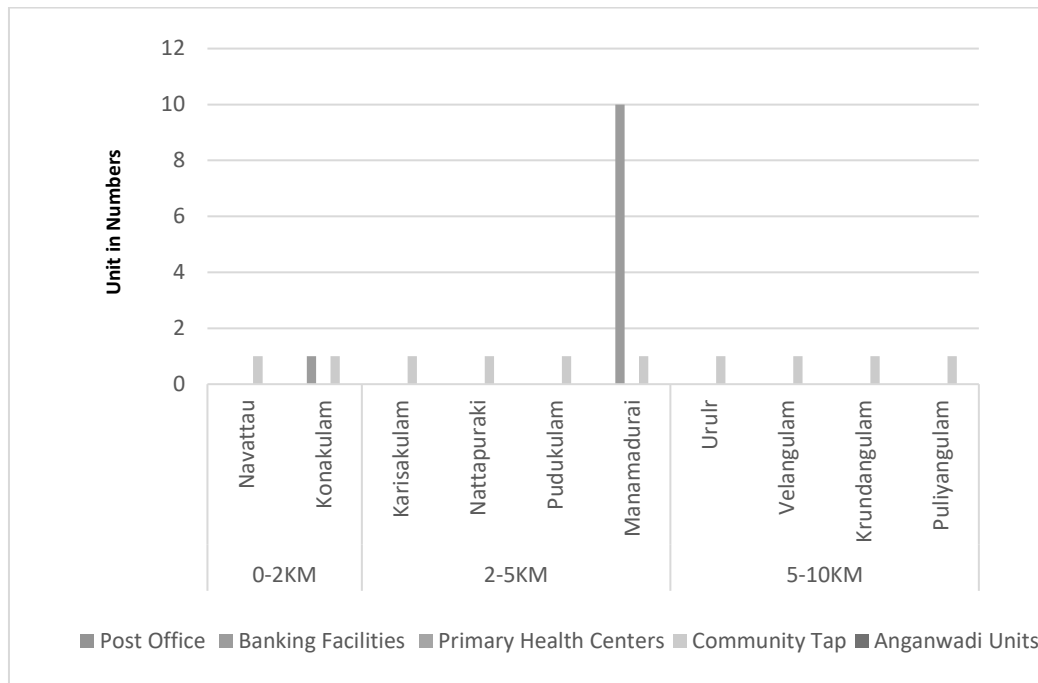
Dependency ratio

Based on the occupational structure of the study area, the dependency rate of non-workers on the worker category has been estimated at 1.2. The study also noted that the work participation rate is only 55% in the project area. It is observed that the majority of the educated youth are also part of the non-working population, as they have limited employment opportunities in the area. Similarly, the prevalence of low industrialization and subsistence agriculture has affected the employability of the local population; therefore, there is a need for income-generation activities to strengthen the livelihoods of the local population.

3.12.5 Primary observation aspect

A detailed primary observation has been documented to understand the empirical scenario of the study area, which covers a 10 km radius of the proposed project. A comprehensive study across 10 villages within the study area was carried out; primarily, six villages were selected from the direct and indirect impact areas (0–5 km). The surveys were conducted through a semi-structured and open-ended questionnaire about socio-economic aspects, including questions on the aspirations and requirements of the people for a better life. The village-level formats were filled in order to capture the overall condition of the village with respect to community land, availability of potential earning opportunities in the vicinity, community institutions (schools, anganwadi centres, health sub-centres, community centres, places of worship, etc.), availability of electricity, provision of drainage and toilet facilities, etc.

Figure 3.9 Details of the physical amenities in the study area

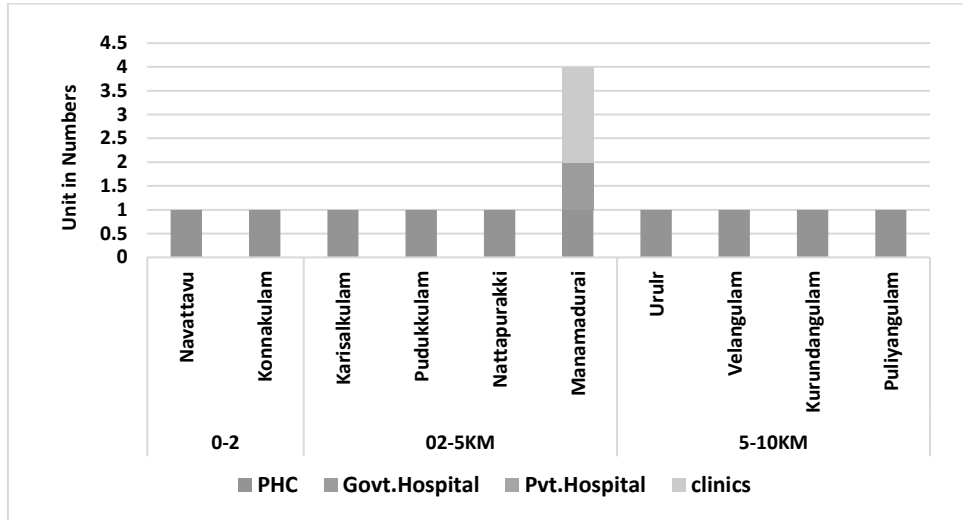


Health care facilities

Although the data reveal no prevalence of chronic diseases, elderly people do have chronic illnesses, including heart disease, diabetes, etc. However, most of the villages have anganwadi facilities to address the community's healthcare needs. Over the last

3 years, common illnesses like fevers, flues, colds, and coughs have been noticed among the locals.

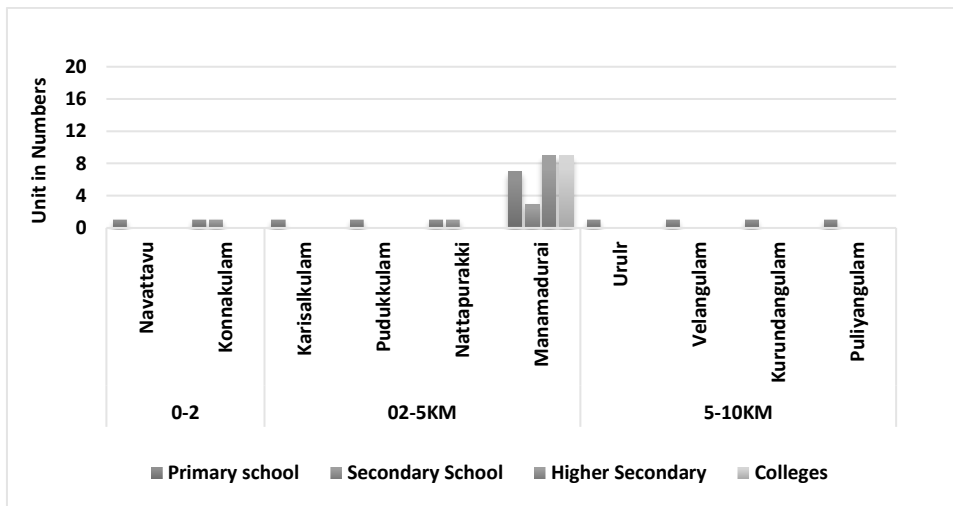
Figure 3.10 Details of Healthcare Facilities in the surveyed Villages, Manamadurai



Educational facilities

A detailed study of the educational units reveals that the majority of the villages in the study area have elementary schooling facilities along with an anganwadi service provider that caters to the nutritional needs of the youngest population among the locals. Moreover, major secondary and higher secondary schools were evident in Manamadurai town. Owing to the lack of basic infrastructure facilities in the local schools, several initiatives have been taken by the panchayat, state government, NGOs, and the CSR wings of the manufacturing units present in the region.

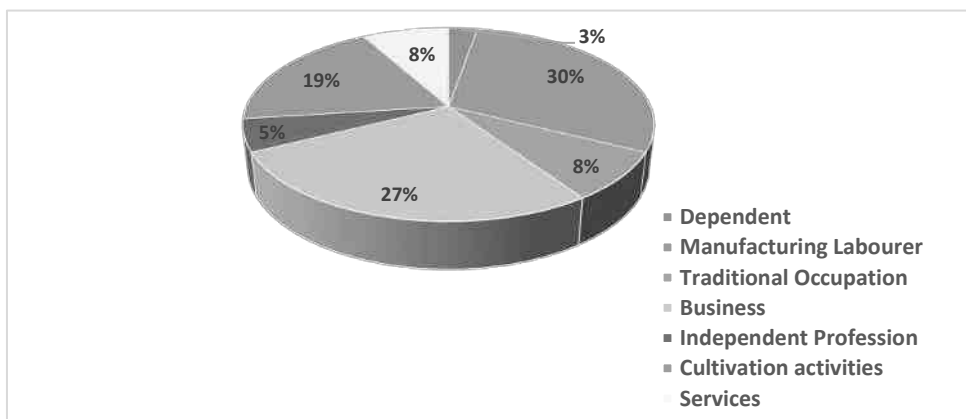
Figure 3.11 Details of educational facilities in the study area



Occupation Structure

A thorough survey in the study area shows that the majority of the population works primarily as daily wage earners, which includes manufacturing workers involved in small manufacturing units (like the ancillary steel industry, agro-based industries, chemical units, and the cottage/handicraft industry). In addition to this, a significant fraction of the population is actively involved in agriculture (one time per year).

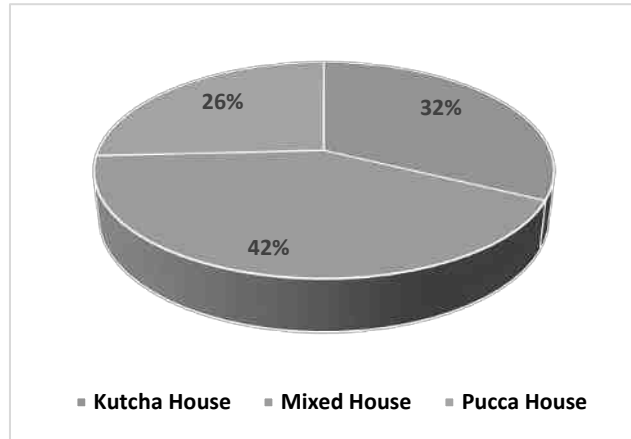
Figure 3.12 Details of the occupational structure of surveyed villages in Manamadurai



Due to the lack of industrial operations in SIPCOT, a small number of locals from nearby villages commute to other states for employment opportunities.

Based on a site inspection, most of the settlements within the study area have mixed housing facilities, except for a few villages like Karisalkulam, Velangulam, and Urulr, where kutcha housing was evident.

Figure 3.13 Details of Housing typology of surveyed villages in Manamadurai



In addition, the majority of the locals in the study area complain about the inadequate power facilities, mainly during normal days and the monsoon season, television, mobile phones, and cycles as common commodities used by the local inhabitants. Whereas a very small number of families with higher income levels own land and even have 2- and 4-wheel vehicles.

CHAPTER 4 – ANTICIPATED
ENVIRONMENTAL IMPACTS AND
MITIGATION MEASURES

Chapter 4

Anticipated Environmental Impacts and Mitigation Measures

4.1 Introduction

Environmental Impact can be defined as any alteration of environmental conditions. The purpose of the impact assessment study is to provide information on the nature and extent of environmental impacts arising from the proposed project during construction and operation periods.

4.2 Methodology

The potential impacts on environment from the proposed project are identified based on nature of the various activities associated not only with the project implementation and operation, but also on current status of the environmental quality at the project site.

4.3 Potential impacts

The potential significant environmental impacts associated with the project are described below:

Air environment

- Impacts on ambient air quality
- Impacts on ambient odor
- Impacts on ambient noise

Water environment

- Impacts on surface & ground water quality
- Impacts on aquatic life

Land environment

- Impacts on land use
- Impacts on agriculture/ soil fertility

Socio economics

- Impacts on infrastructure
- Impacts on employment

Indirect impacts

- Impacts on public health and safety
- Impacts on aesthetics

The impact assessment is carried out for the following phases

- Impacts during construction / development phase
- Impacts during operation phase

4.4 Construction phase - Impacts and Mitigations

Construction phase works include site clearance, site formation, building works, infrastructure provision and any other infrastructure activities. The impacts due to construction activities are short term and are limited to the construction phase. The impacts will be mainly on air quality, water quality, soil quality and socio-economics.

4.4.1 Air quality - Impacts and Mitigations

Air quality - Impacts

The principle potential source of air quality impact arising during construction period is fugitive dust generation. The dust, measurable as total suspended particulate matter and respirable suspended particulates would be generated as a result of construction activities. The construction program of the project shall commence immediately after obtaining statutory clearances.

The potential dust sources associated with construction activities are loading and unloading of the materials, top soil removal, travel over unpaved roads and wind erosion etc. The construction works associated with the proposed development are given below.

- Dust generation during leveling of earth
- Dust generation due to the movement of vehicles on unpaved roads

- Emission of pollutants from vehicular exhaust
- Unloading of raw materials and removal of unwanted waste material
- Accumulation of excavated earth material

Air quality - Mitigation measures

For the proposed project site levelling and grading will be carried out, where ever possible to maintain the natural elevations they will not be disturbed, only levelling activity will be carried out for providing roads, sewage network, storm water system, and places required for providing buildings for administrative, plant shed erection. Most of the excavated material (for providing basements) will be reused within the project boundary for leveling low lying areas or leveling the roads, if any excess will be disposed through local contractors. The movement of cut and fill material will be limited.

Dust will be generated from the movement of construction vehicles on unpaved roads. Unloading and removal of soil material shall also act as a potential source for dust nuisance. The control measures proposed to be taken up are given below.

1. The important dust suppression measures proposed will be regular water sprinkling on main haul roads in the project area, this activity will be carried out at least twice a day, if need arises frequency will be increased on windy days, in this way around 50% reduction on the dust contribution from the exposed surface will be achieved.
2. The duration of stockpiling will be as short as possible as most of the material will be used as backfill material for the open cut trenches for road development.
3. Temporary tin sheets of sufficient height (3m) will be erected around the site of dust generation or all around the project site as barrier for dust control.
4. Tree plantations around the project boundary will be initiated at the early stages by plantation of 2 to 3 years old saplings, regular watering will be done, so that the area will be moist for most part of the day.
5. To reduce the dust movement from civil construction site to the neighbourhood the external part of the building (administration, canteen, etc.) will be covered by plastic sheets.

4.4.2 Water quality - Impacts and mitigations

Water quality - Impacts

The proposed project will involve various construction activities. The following section summarizes the activities likely to be undertaken during the proposed development and describes the potential impacts on water quality from each activity. The site formation may produce large quantities of run-off with high suspended solids loading in the absence of appropriate mitigation measures. This potential problem may be aggravated during rainy season.

The used engine oil and lubricants, and their storage as waste materials as the potential to create impacts if spillage occurs. Waste oil may infiltrate into the surface soil layers, or runoff into local water courses, increasing hydrocarbon levels. Proper precautionary measures should be taken to prevent any spillage of the above materials and their subsequent runoff into the water bodies.

During construction, impacts from the workers include waste and wastewater generated from eating areas, and sewage from temporary sanitary facilities. Sewage is characterized by high levels of BOD, ammonia and E. Coli. Significant water quality impact will happen only if the sewage is discharged directly into the receiving waters without any prior treatment.

Water quality – Mitigations Measures

During site development necessary precautions will be taken, so that the runoff water from the site gets collected to working pit and if any over flow is, will be diverted to nearby greenbelt/ plantation area. During construction activity all the equipment washed water will be diverted to working pit to arrest the suspended solids if any and the settled water will be reused for construction purposes, and for sprinkling on roads to control the dust emission, etc.

The domestic waste water generated from temporary toilets used by the work force will be diverted to septic tank/mobile STP/ soak pit.

4.4.3 Noise levels - Impacts and mitigations

Noise - Impacts

The major activities, which produce periodic noise, during construction phase, are as follows:

- Foundation works
- Fabrication of structures
- Plant erection
- Operation of construction equipment
- Movement of vehicles etc.

Noise – Mitigation Measures

All noise generating equipment will be used during day time for brief period of its requirement. Proper enclosures will be used for reduction in noise levels, where ever possible the noise generating equipment will be kept away from the human habitation. Therefore, impact on noise environment due to proposed project would be insignificant. All vehicles entering into the project will be informed to maintain speed limits, and not blow horns unless it is required.

4.4.4 Solid waste - Impacts and Mitigation measures

Solid waste generation - Impacts

This category of waste generation in the proposed project is due to different types of raw materials being used during construction stage in general may comprise the following

- Cement concrete
- Bricks, tiles,
- Cement plaster
- Steel (RCC, door/ window frames, roofing support, railings of staircase etc.)
- Rubble, sand, stone (marble, granite, sand stone)
- Timber/wood
- Paints/varnishes

Besides above there are some major and minor components namely conduits, geo membrane, pipes, electrical fixtures, panels, etc. all the above items will be segregated and stored at the site and once the facility established the same will be used in respective treatment facilities within the site.

Solid waste - Mitigation measures

The solid waste generated during this period being predominantly inert in nature. Hence maximum effort would be made to reuse and recycle them. The most of the solid waste material can be used for filing/ levelling of low-laying areas within the site. All attempts should be made to stick to the following measures.

- All construction waste shall be stored within the site itself. A proper screen will be provided so that the waste does not get scattered.
- Attempts will be made to keep the waste segregated into different heaps as far as possible so that their further gradation and reuse is facilitated.
- Materials, which can be reused for purpose of construction, levelling, making roads/ pavement will also be kept in separate heaps from those which are to be sold.
- The local body or a private company may be arranged to provide appropriate number of skip containers/ trolleys on hire.

The use of the construction material basically depends on their separation and conditions of the separated material. A majority of these materials are durable and therefore, have a high potential for reuse. It would, however, be desirable to have quality standards for the recycled materials. Construction waste can be used in the following manner.

- Reuse of bricks, tiles, stone slabs, timber, piping railings etc., to the extent possible and depending upon their conditions.
- Sale/ auction of materials which cannot be used at the site due to design constraint
- Plastics, broken glass, scrap metal etc., will be stored and processed within the site premises.
- Rubble/ brick bats can be used for building activity, such as levelling, under

coat of lanes where the traffic does not constitute heavy moving loads.

- Larger unusable pieces can be sent for filling up low laying areas.
- Fine material such as sand, dust, etc can be used as cover material
- The unearthed soil can be used for levelling as well as for lawn development
- The broken pieces of the flooring material can be used for levelling in the building or can be disposed off
- The unused or remaining paints/varnishes/wood can either be reused or can be disposed off.

4.4.5 Impact and Mitigation Measures of Land Environment

Land Environment - Impacts

Change in land use pattern/ site clearing civil works such as earth moving and building of structures which might be impact on land erosion, loss of bio diversity, loss or change of soil quality and quantity which caused the changes in land use pattern.

Land environment - Mitigation measures

Following steps are proposed to take care of impact of construction activity on project land area:

- On completion of civil works, all debris etc. will be completely removed from site to avoid any incompatibility with future use.
- Other materials like paint, diesel etc. will be properly stored and handled to prevent any spillage on land.
- All the wastes will be stored at a designated site within the premises to prevent scattered discharge on land.
- Provision for topsoil storage and reuse, separate stacking of topsoil with adequate collection rain all around , topsoil storage heap should be covered with grasses and bushes to avoid erosion, removing vegetative cover only from the specific site on which construction has to take place.

4.4.6 Socio-economics - Impacts and mitigation measures

Socio-economics - Impacts

Overall socio – economic (SE) effect of construction phase will be positive due to direct and indirect employment opportunity. Skilled and unskilled people will be employed during construction and operation of the facility.

The impact of the proposed unit on demography and socio-economic conditions of the study area given in **Table 4.1**

Table 4.1 Impact of proposed project on demographic and SE conditions

Category	Potential impact/risk	Significance of impact
Pre-Construction Phase		
It is not anticipated that there are any potential environmental impacts/ risks resulting from the proposed Project during the pre-construction phase.		
Construction Phase		
Air quality and socio-economic	Dust and fine particulates affecting ambient air quality	Low
Major Hazard Installation (MHI) risks	Serious injury and or fatality	Low
Visual	Visual impact of construction activities	Moderate
Archaeological remains and Cultural Sites	Damage to and/or destruction of sub- surface heritage resources	Low
Socio-economic	Investment into the local economy through purchase of goods and services	Moderate
Socio-economic	Increased risk of accidents with pedestrians and/ or other vehicles, resulting in serious injury or death	Low
Soils, land capability and land use	Soil erosion	Low
Visual	Loss of open space	Moderate
Noise and socio-economic	Increase in baseline ambient noise levels at sensitive receptors	Low
Socio-economic	Creation of a number of local employment opportunities	Moderate
Socio-economic	Increased traffic volumes and congestion	Low
Socio-economic	Social tension, and possibly violence	Low

Socio-economics – Mitigation measures

- Involvement of locals by getting temporary employment opportunities during construction
- Prospect of improvement of standard of living
- Opportunities of investment in the local economy
- CSR activities during construction phase

4.4.7 Ecology – Impacts and Mitigation measures

Proposed facility will not involve any trees cutting exercise so, there will be no impact on ecology. However, minimum of 33% of total plot area is proposed for greenbelt development. The Likely Impacts and mitigation measures are given in **Table 4.2.**

Table 4.2 Impacts and mitigation measures of flora and fauna

Sl.No.	Likely Impact Description	Impact Justification and Mitigation Measures
Pre-construction Phase		
1	Loss of Floral diversity	<ul style="list-style-type: none"> - Common species of grass, herbs and shrubs (not trees) will be uprooted during the site clearing. - Core zone is not a critical/ unique habitat for any species - No developed tree will be removed and will be retained asities in under greenbelt.
2	Loss of habitat and associated faunal diversity	Considering above facts there will no loss of Flora, Fauna and habitat diversity in true sense. However, 33 % of the site area will be developed as a greenbelt. Greenbelt with the suitable species will compensate floral loss as well as provide habitat for local faunal species.
3	Disturbance to the Fauna/ Faunal movement	All recorded species are generalist and adapted to routine human activity so no specific mitigation is required.
4	Site specific impact (dust deposition) on the site Flora & disturbance Fauna	Proper measures like Water sprinkling will be done to suppress the dust during site preparation

Construction Phase/ Plant erection		
1	Site specific impact (dust deposition) on the site Flora & disturbance Fauna	No specific mitigation is required since all species are generalists and well adapted to routine human activities. However, regulatory norms will be followed.
2	Site specific impact on the site Flora & Fauna due to Generation of PM, SO ₂ and NOx from DG sets	Proper engineering controls will be required to meet the regulatory norms.
3	Site specific impact on the site Fauna due to generation of dust or odours due to Handling of materials including construction materials, sewage and waste	Proper engineering controls will be required to meet the regulatory norms. However, this will be a short-term impact. Plantation of fragrance species are recommended for greenbelt development.

4.5 Impacts during operation phase

During operation phase of the proposed project there would be impacts on the air environment, water environment, Land environment, socio-economic aspects and Biological environment.

4.5.1 Air quality - Impacts and Mitigations

Air quality - Impacts

Prediction of impacts from the proposed project on the ambient air quality was carried out using air quality simulation models. The main sources of air pollution are as follows.

1. Line source emissions from vehicular movement
2. Point source emissions from Incinerator, DG set.

The emissions from the DG sets are minimal since they will be operated only during power failures.

Atmospheric dispersion of stack emissions

In order to estimate the ground level concentrations due to the emissions from the proposed project, EPA approved American Meteorological Society/Environmental Protection Agency Regulatory Model - AERMOD 7.6.1 dispersion Model has been

used. AERMOD dispersion Model provides option to model emissions from a wide range of sources that are present at a typical industrial source complex. The model considers the sources and receptors in undulated terrain as well as plain terrain and the combination of both. The basis of the model is the straight-line steady state Gaussian Plume Equation.

$$C(x, y, z) = \frac{Q}{2\pi u \sigma_y \sigma_z} e^{-\frac{y^2}{2\sigma_y^2}} \left(e^{-\frac{(z+H)^2}{2\sigma_z^2}} + e^{-\frac{(z-H)^2}{2\sigma_z^2}} \right)$$

Where C = Plume contaminant concentration ($\mu\text{g}/\text{m}^3$)

Q = Pollutant emission rate (g/s)

u = Average wind speed (m/s)

σ_y = y direction plume standard deviation (m)

σ_z = z direction plume standard deviation (m)

y = y position (m)

z = z position (m)

H = Effective stack height (m)

AERMOD dispersion model with the following options has been used to predict the cumulative ground level concentrations due to the proposed emissions. Area being rural, rural dispersion parameters is considered

- Predictions have been carried out to estimate concentration values over radial distance of 10 km around the sources
- A combination of cartesian and polar receptor network has been considered
- Emission rates from the sources were considered as constant during the entire period
- The ground level concentrations computed were as is basis without any consideration of decay coefficient
- Calm winds recorded during the study period were also taken into consideration
- 24-hour mean meteorological data extracted from the meteorological data collected during the study period as per guidelines of IMD/CPCB has been

used to compute the mean ground level concentrations to study the impact on study area.

Pollution sources

The main air pollutant expected from line sources are dust generation from the movement incoming & outgoing vehicle. To minimize the impact from line source, black carpeted road will be maintained properly to reduce the dust generation.

All vehicles will be maintained properly to meet emission standards of respective vehicles. Greenbelt will be provided along the boundary and along the road.

The point source emissions considered for proposed project are Incinerator and DG set. The DG set will be used only during power failure for emergency requirements. Hence the impacts from DG set will be felt only during power failure. Inputs used to run the model are stack details, emissions details are given in **Table 4.3** and twenty- four hours mean meteorological data is given in **Table 4.4**.

The Predicted maximum ground level concentration of 24-hour average PM, SO₂ and NO_x concentrations considering 24-hour mean meteorological data of study season are superimposed on the maximum baseline concentrations obtained during the study period to estimate the post project scenario, which would prevail at the post operational phase. The overall scenario with predicted concentrations over the maximum baseline concentrations is shown in **Table 4.5** and isopleths are shown in the **Figure 4.1 to 4.3**.

Table 4.3 Details of stack emissions

Facility	Unit	Incinerator	DG set
Capacity	--	250 kg/hr	150 kVA
Stack details	--	Incinerator	DG set
Height of the stack	m	30	7
Internal diameter of stack	m	0.85	0.2
Temperature of flue gas	°C	95	430
Velocity of flue Gas	m/s	12	16
Volumetric flow rate	m ³ /s	6.81	0.50

Facility	Unit	Incinerator	DG set
Parameters	Emission rates		
PM emission	g/s	0.28	0.0007
SO ₂ emissions	g/s	1.10	0.0007
NO _x emissions	g/s	2.21	0.013
Parameters	Emission Standards		
PM emission	mg/Nm ³	50	0.02 g/kWh
SO ₂ emissions	mg/Nm ³	200	-
NO _x emissions	mg/Nm ³	400	0.4 g/kWh
Note: Incinerator: Based on outlet emission standards (worst case) BMW Management Rules, 2016 and its subsequent amendments / Common HW Incinerator Standards as per CPCB, 2017			
Source: Environmental Standards for Ambient Air, Automobiles, Fuels, Industries and Noise, Series: PCLS/4/2000-2001, CPCB July 2000			
Note: DG set Stack height			
(H) = h+0.2 √kVA			
H= Total height of the Stack, h= height of the building (m) where DG set is installed, kVA Generator capacity, height of the building assumed 3m			
Total Sulphur max 50 mg/Kg as per BS-IV HSD Standards (IS 1460: 2017)			
NO _x emission limit 0.40 g/kWh & PM emission limit 0.02 g/kWh (More than 56 kW up to 560 kW) as per Gazette of India G.S.R .804(E) Environment (Protection) Amended Rules dated 3 rd November 2022			
Note: As per United States Environmental Protection Agency (AP-42) incinerator emission factors are as given below:			
<ul style="list-style-type: none"> PM emission factor is 2.33 kg/ton of medical waste (0.16 g/s for a capacity of 250 kg/hr) SO₂ emission factor is 1.09 kg/ton of medical waste (0.08 g/s for a capacity of 250 kg/hr) NO_x emission factor is 1.78 kg/ton of medical waste (0.12 g/s for a capacity of 250 kg/hr) 			

Table 4.4 - 24 Hours mean meteorological data for Jun to Aug 2023 (summer season)

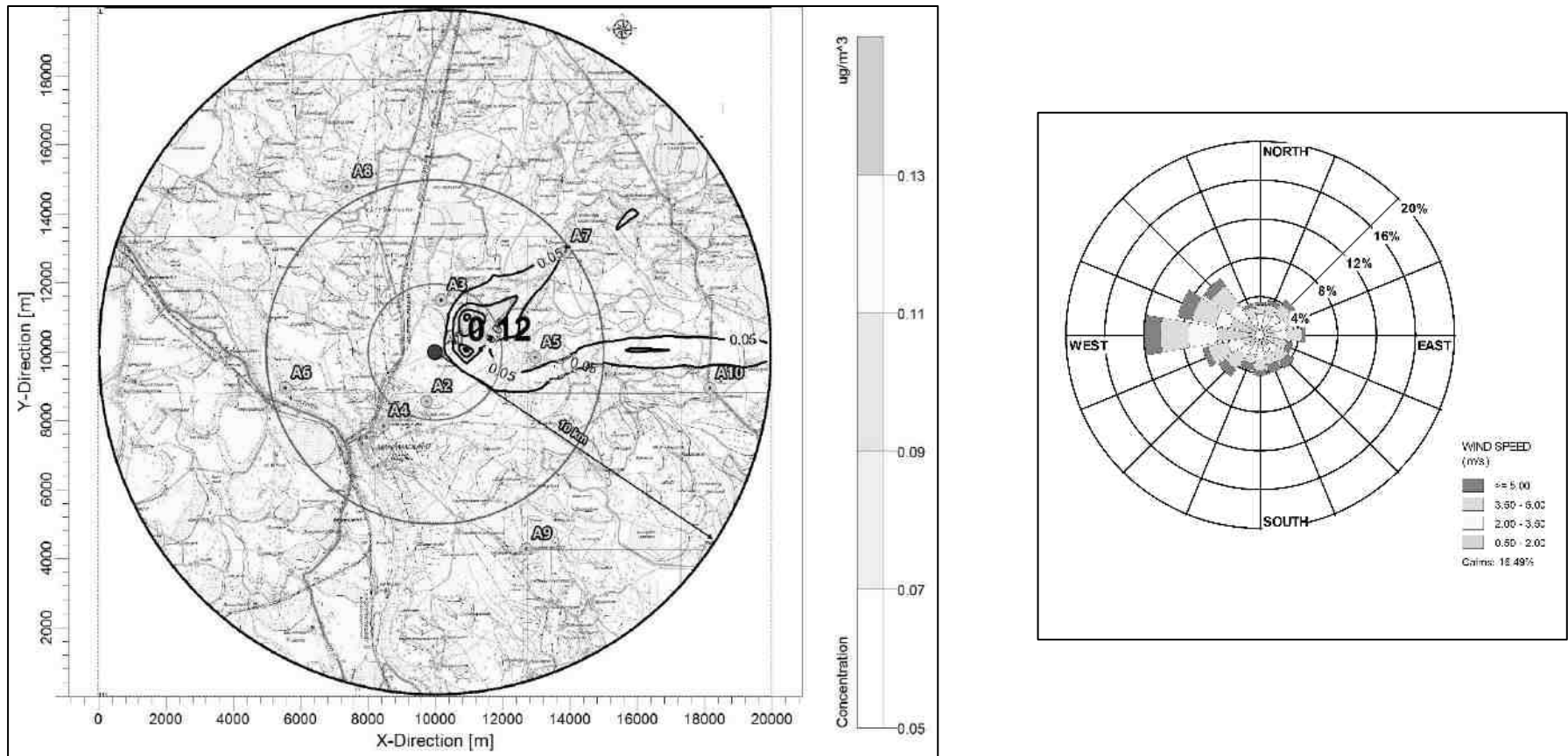
Hour	Temperature (°C)	Relative humidity (%)	Wind direction (Degrees)	Wind speed (m/s)	Stability class
1	24.4	70	270	1.56	6
2	23.8	72	315	1.63	6
3	23.3	74	240	1.75	6
4	22.8	76	290	1.87	6
5	22.5	77	270	1.32	6
6	23.8	75	270	1.23	6
7	26.7	72	315	2.26	5
8	28.8	68	270	2.75	4

Hour	Temperature (°C)	Relative humidity (%)	Wind direction (Degrees)	Wind speed (m/s)	Stability class
9	29.7	64	270	2.86	3
10	32.8	58	240	2.84	2
11	35.7	54	270	2.94	1
12	36.8	48	290	3.12	1
13	38.4	44	270	3.42	1
14	37.9	46	270	3.22	1
15	36.5	48	290	3.12	1
16	34.3	50	315	2.92	2
17	32.1	54	315	2.88	2
18	30.4	55	240	2.94	2
19	28.8	57	225	2.84	3
20	27.6	59	290	2.65	4
21	26.6	60	225	2.22	5
22	25.8	64	200	2.02	6
23	25.4	66	180	1.56	6
24	24.9	68	270	1.23	6

Table 4.5 Post project scenario – Units: µg/m³

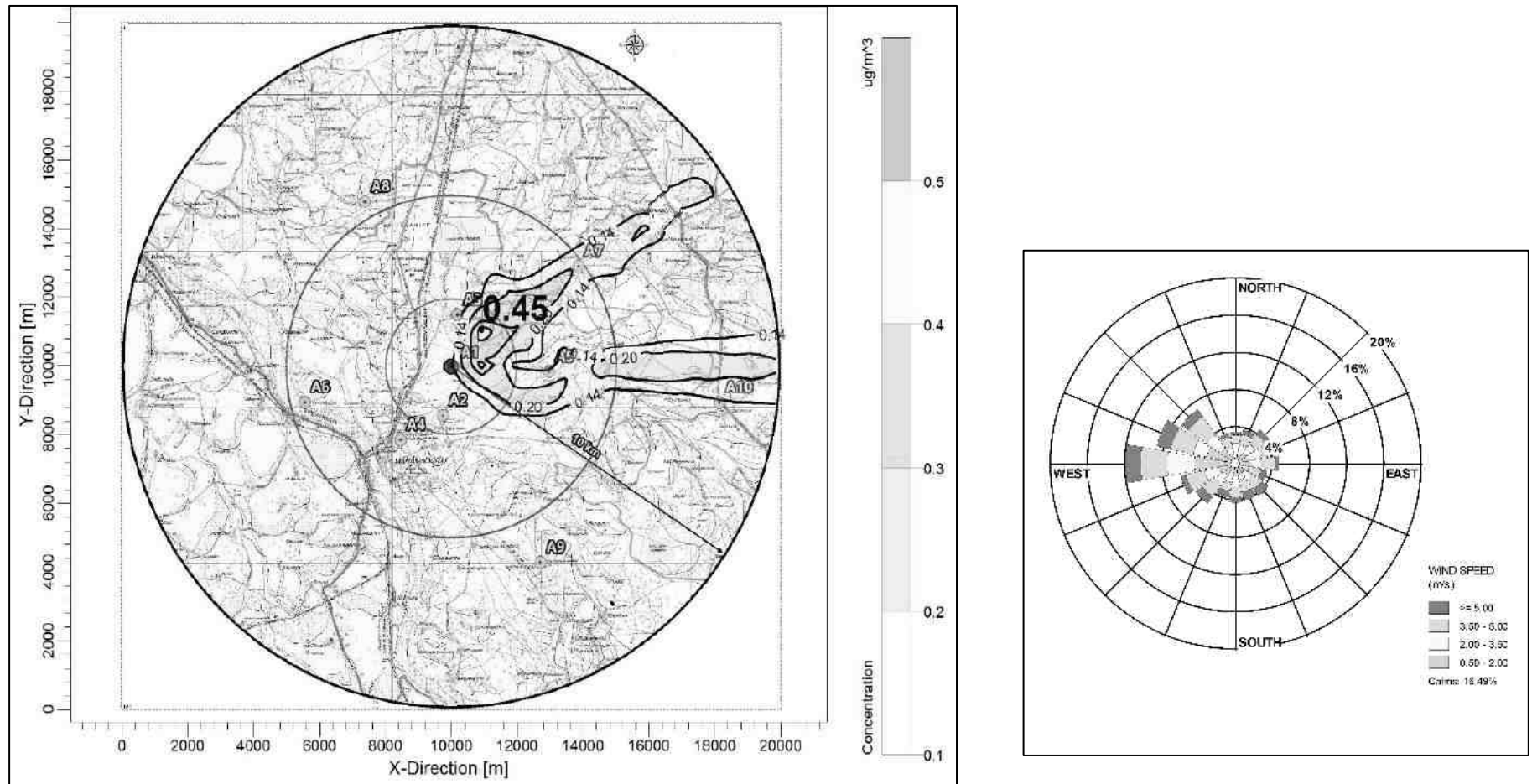
Particulars	Zone	Particulate Matter (PM ₁₀)	Particulate Matter (PM _{2.5})	Sulphur Dioxide (SO ₂)	Oxides of Nitrogen (NO _x)
Baseline Scenario (Max)	Core	48.5	33.8	13.4	21.6
Predicted GLC (Max)		0.05	0.03	0.2	0.4
Overall Scenario (Worst Case)		48.55	33.83	13.6	22.0
Baseline Scenario (Max)	Buffer	54.1	33.8	15.3	25.3
Predicted GLC (Max)		0.12	0.7	0.45	0.96
Overall Scenario (Worst Case)		54.22	34.5	15.75	26.26
NAAQ Standards 2009 (24hr)		100	60	80	80

Figure 4.1 Predicted GLCs of PM ($\mu\text{g}/\text{m}^3$)



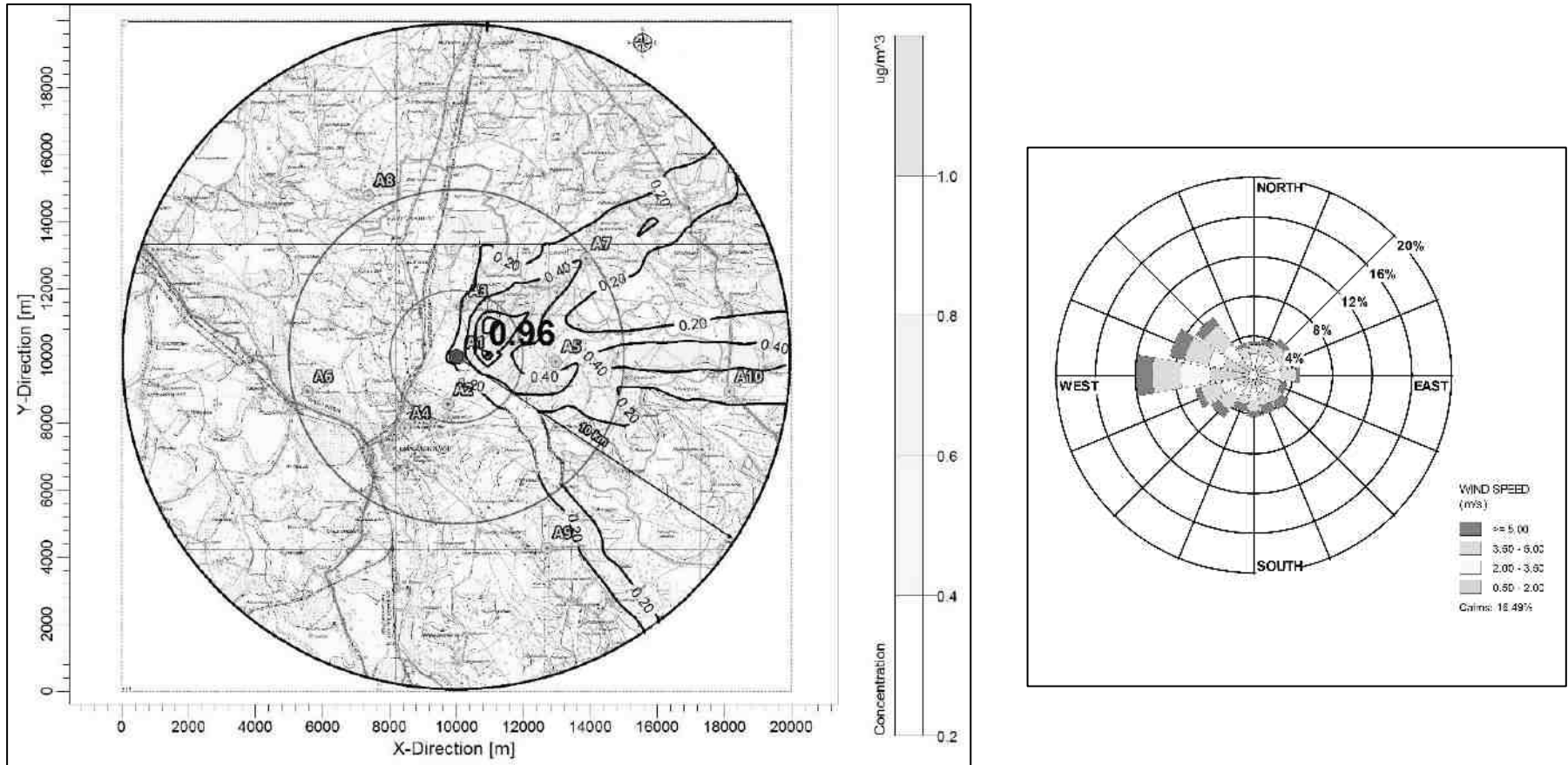
Max. Concentration of PM: $0.12 \mu\text{g}/\text{m}^3$ @ 600 m in E direction

Figure 4.2 Predicted GLCs of SO₂ (µg/m³)



Max. Concentration of SO₂: 0.45 µg/m³ @ 600 m in E direction

Figure 4.3 Predicted GLCs of NO_x (µg/m³)



Max. Concentration of NO_x: 0.96 µg/m³ @ 600 m in E direction

Table 4.6 Predicted Impact at AAQ (Baseline) monitoring locations

Locations	Wind	W.R.T. Site	Baseline value 98 th precentile (µg/m ³)			Predicted Increment (µg/m ³)			Post-Predicted(Final status) (µg/m ³)		
			PM	SO ₂	NO _x	PM	SO ₂	NO _x	PM	SO ₂	NO _x
Site	-	E	48.5	13.4	21.6	0.05	0.2	0.4	48.55	13.6	22.0
Navattavu	CW	S	50.7	12.3	20.6	0.0	0.0	0.0	50.7	12.3	20.6
Mel Konnakulam	CW	N	46.7	11.7	19.9	0.05	0.1	0.2	46.75	11.8	20.1
Manamadurai	CW	SW	54.1	15.3	25.3	0.12	0.45	0.96	54.22	15.75	26.26
Pudukkulam	DW	E	47.5	10.7	17.5	0.05	0.2	0.4	47.55	10.9	17.9
Karisalkulam	UW	W	50.6	13.8	21.4	0.0	0.0	0.0	50.6	13.8	21.4
Kurundangulam	CW	NE	51.2	12.6	20.8	0.05	0.2	0.4	51.25	12.8	21.2
Urulr	CW	NW	42.2	9.7	16.6	0.0	0.0	0.0	42.2	9.7	16.6
Kanjikkaranendal	DW	SE	39.8	8.8	15.4	0.0	0.0	0.0	39.8	8.8	15.4
Puliyangulam	DW	E	52.3	13.9	22.5	0.05	0.1	0.2	52.35	14.0	22.7
NAAQ Standards 2009 (24 hr)									100	80	80
Note: CW - Crosswind, UW - Upwind & DW - Downwind											

Air Pollution - Mitigation measures

The major air pollutants generated from the proposed project are given below:

- Dust particulates in flue gas
- Sulphur dioxide (SO₂) in flue gas
- Nitrogen oxides (NO_x) in flue gas

Air Pollution Control Devices (APCDs)

Air Cooled Gas Cooler

The flue gas to be filtered must be first conditioned to a temperature, cooled necessary for the cleaning within the filter system. For this reason, thermal energy (heat) must be removed from the flue gases. The flue gases from the reactor to enter the Air - cooled Gas cooler via refractory lined duct and cooled down to the filter operating temperature range of 250 to 350°C. The heat removed from the flue gases is transferred to air.

Collection unit

In the collection unit dust-laden air enters the cyclonical/conical body of the collection unit tangentially at the top and the flow assumes a vertex pattern as it travels helically downwards. Centrifugal force from the air's tangentially velocity cause the heavier dust particles to move radically out wards to the collection unit wall, when the particles reach the wall friction and gravity force them to descend to the discharge point into the rotary air lock valve. The clean air spirals upwards at the exits at the top of collection unit. The dry scrubbing system consists of dry injector for reagent injection followed by ceramic candles filter for collection of reaction products and particulate. The dry reagent (Sodium Bicarbonate and Activated carbon) are placed in the holding hopper which is closed and sealed for safe reagent transfer.

Filtration System (Ceramic Filter Candle)

After the sodium bicarbonate and activated carbon treatment, neutral flue gases are sent into filtration system. Wherein very fine dust particles are separated. Ceramic candles are the highest in quality product for dust particle collection in the world. Being ceramic the filter candles can withstand temperatures up to 900°C. Filtration system or dust collection filters called ceramic candle that efficiently trap fine particles of dust while allowing clean gases to move through. Ceramic filters are advantageous because they have high dust collection efficiencies even for very small particles.

4.5.2 Water quality – Impacts & Mitigation Measures

Water quality - Impacts

The water demand of the project will be met through SIPCOT/water tankers. To minimize the water consumption, water saving options will be planned.

- Site formation which may produce large quantities of run-off with high-suspended solids
- Wastewater generated during the BMW treatment operations
- Rain water holding sump
- Treatment and reuse of wastewater

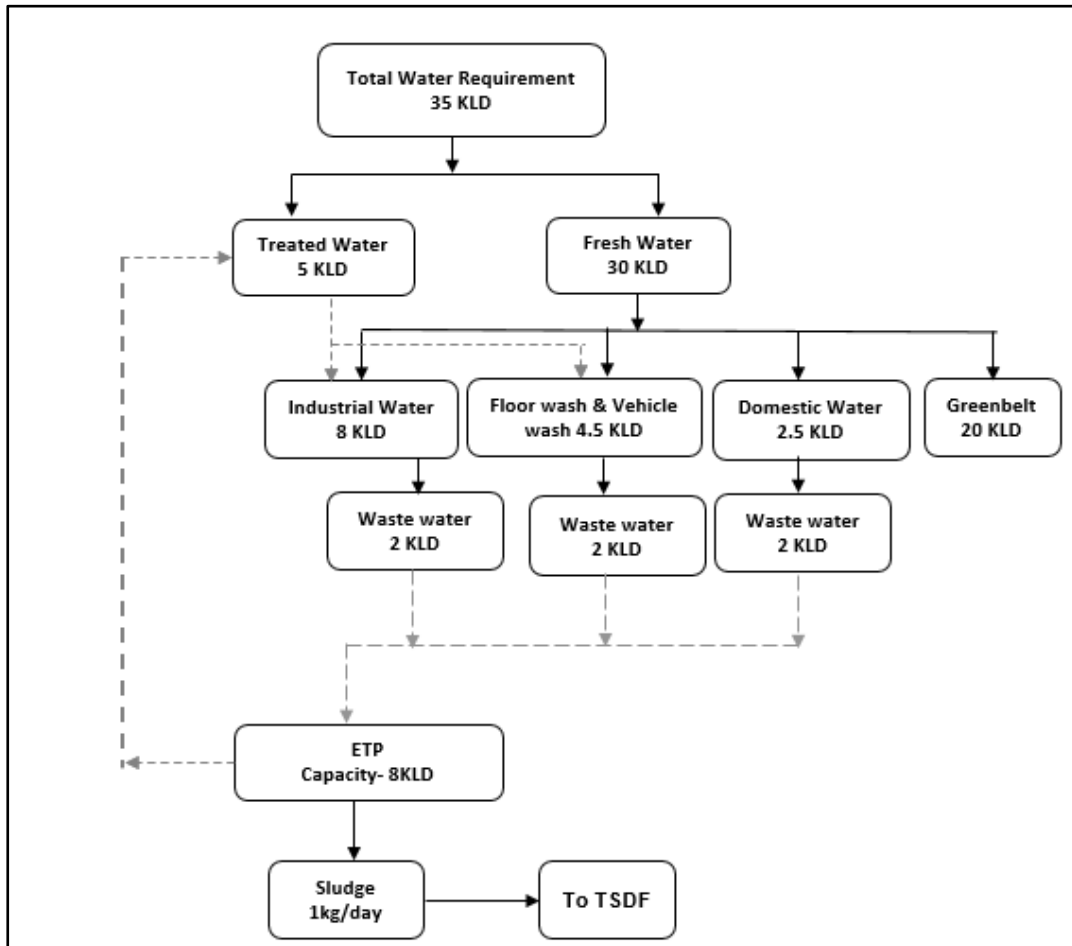
The details of wastewater generation from various activities are given in **Table 4.7**

Table 4.7 Wastewater generation details

Utility	Fresh Water	Treated Water	Total Water	Wastewater	Remarks
Industrial Water	5.0	3.0	8.0	2.0	Gas cooling system based
Floor Washing, Vehicle Washing	2.5	2.0	4.5	2.0	
Domestic Water	2.5	-	2.5	2.0	Incinerator is proposed
Greenbelt	20.0	-	20.0	-	
Total	30.0	5.0	35.0	6.0	

Allotment order P-III/SIP-MNM/Medicare/2022 Dt. 23.12.2022 - 50 KL of water quantity is allotted for the proposed facility.

Figure 4.4 Water balance



Water - Mitigation measures

Wastewater including vehicle and container washing, floor washing, domestic water shall be treated in ETP for safe guard of water environment. The treated waste water shall be reused for greenbelt, floor/vehicle washing etc.

Storm water drains shall be provided throughout the facility taking topography into consideration. The storm water drains are connected to rain water collection sump. The rain water thus collected shall be used for greenbelt, vehicle washing etc., after treatment, if necessary.

4.5.3 Noise environment – Impacts & Mitigation measures

The major source of noise in proposed project will be from unloading of BMW and use of Incinerator, DG set, pumps, motors etc.

Noise mitigation measures

Adequate measures for noise control, at the design stage shall be taken such as keeping high noise generating equipment's like pumps, motors, etc., on anti-vibration pads, closed rooms and regular maintenance as suggested by the manufacturer. Some of the mitigation measures proposed is as below

- Noise level specification of the various equipment's as per the Occupational Safety and Health Association (OSHA) standards.
- Providing suitable enclosures (adequate insulation) to minimize the impact of high noise generating sources.
- Employees will be provided with PPE like earplugs, helmets, safety shoes, etc.
- Development of greenbelt all along the boundary and along the roads within the project

4.5.4 Land environment – Impacts & Mitigation measures

Land Contamination: Improper disposal or handling of BMW can lead to soil and groundwater contamination, affecting the land's usability for other purposes.

Air Pollution: Incineration, one of the methods used to treat BMW, can release pollutants into the air, affecting air quality and potentially harming nearby ecosystems.

Aesthetic Impact: BMW facilities may not be aesthetically pleasing and can negatively impact the visual landscape of an area, potentially reducing property values nearby.

Land Use Conversion: Establishing a BMW management facility often requires converting land from its existing use to accommodate the facility. This can result in the loss of natural habitats, agricultural land, or other land uses.

Land environment mitigation measures

Site Selection: Site is falling under notified industrial area where all mitigation measure has been taken care during establishment of industrial area. Also, site is 500 m far from the sensitive areas like residential neighbourhoods, wetlands, and agricultural land.

Waste Segregation and Treatment: Proper segregation and treatment BMW on-site to minimize the risk of contamination.

Engineering Controls: Impermeable liners and secure waste storage will be proposed to prevent soil and groundwater contamination.

Landscaping: 33% greenbelt will be maintained to control odour and air pollution.

Monitoring and Reporting: Monitoring the facility's operations and baseline monitoring will be conducted to assess environmental baseline status & any further contamination.

4.5.5 Socio-economic – Impacts & Mitigation measures

The proposed facility is likely to provide direct and indirect employment and likely to increase the socio-economic status.

Public safety: A number of activities carried out in the facility might have significant impacts on the public safety. With the implementation of a strong EMP, the communities residing near the project site are unlikely to be exposed to any long-term hazards.

Aesthetics: The project site is located within notified industrial area and proper greenbelt will help to improve the aesthetic value of the area.

Risk to individuals or society from fire or explosion: Develop and implement an onsite Emergency Plan in consultation with relevant authorities. Undertake a detailed review for three months after commissioning of the facility to confirm that the operation meets all the required health, safety and environmental requirements. Strictly enforce permit system and compliance with the procedures and controls. Internal roads must be well maintained with clearly visible direction and signage board (i.e. speed limits).

4.5.6 Ecology – Impacts & Mitigation measures

There is no ecological and otherwise sensitive areas viz. wildlife sanctuary, national parks, within 10 km radius of the project site. There are no known rare, endangered or ecologically significant animal and plant species. Except for a few wild species of plants and grasses and a few animals that are very commonly spotted in any rural environment, the study area does not have any endangered or endemic species of animals. Due to the development of greenbelt at the project vicinity the impact on the ecology will be minimal.

Impact on surrounding vegetation including buffer zone and associated biodiversity due to emissions from incinerator, DG set : Considering the various habitats like agriculture area, plantation area and Reserved Forest area of the buffer zone, this impact is rated as a moderate sever. Greenbelt with the suitable species will be developed in the core zone/ site and in the surrounding areas including degraded forest area tom mitigate the likely impacts.

Site specific disturbance on the site Fauna due to generation of Noise due to operation of equipment: This will be site specific impact on the common generalist species and requires engineering control. Regulatory norms have to be followed. However, greenbelt will be developed as per norms. The detailed discussion on environment impacts and mitigation measures along with biological consequences scoring scheme is given in **Annexure III**.

CHAPTER 5 – ANALYSIS OF ALTERNATIVES

Chapter 5

Analysis of Alternatives

5.1 Introduction

MEMPL proposes to establish a CBWTF at Plot No.C-6, SIPCOT Industrial Park, Manamadurai (T), Tamil Nadu.

To maintain positive environmental impact, social benefits and to minimize the temporary adverse impact alternative sites should be critically examined. Various alternatives might exist for completing these processes and it is important to choose the option that causes the least or no negative impacts to the environment. Hence, a careful analysis is crucial to choose the right alternative.

5.2 Location Criteria

As per revised guidelines of BMW Management rules, 2016 a CBWTF shall preferably be developed in a notified industrial area without any requirement of the buffer zone or CBWTF can be located at a place reasonably far away from notified residential and sensitive areas and should have a buffer distance of preferably 500 m so that it shall have minimal impact on these areas.

The location criteria as per revised guidelines for CBWTF and Hazardous waste treatment facility HAZWAMS/25/2003-4 is given in **Table 5.1**.

The present site is falling under notified industrial area, hence site selection criteria shall not be applicable. However, according to the above location criteria as per BMW Management Rules, 2016 the proposed CBWTF is 500 m far from all sensitive areas and hence no alternative site were examined or considered. Hence the site is considered for setting up the proposed project.

Table 5.1 Location criteria

Sl.No	Parameter	Criteria	Observation
1	Lake or pond (Distance from SW body)	Should not be within 500 m	No - The nearest waterbody is Mel Konnakulam Lake is 600 m far from the site
2	River	Should not be within 500 m (<i>200 m for Hazardous Waste Management Facility</i>)	No - The nearest river is the Vaigai river located 3.3 km far from the site
3	Flood plain	Should not be within 100-year flood plain	No - Nearest major river is Vaigai river which is 3.3 km far from the site, there are no flood seen over the years, as per available satellite image history in google earth and the NRSC flood map
4	Highway - State or National	Should not be within 500 m	No - National Highway NH-36 is 1.3 km far from the site
5	Habitation - Notified habituated area	Should not be within 500 m	No - The nearest habitation is 1 km far from the site
6	Public Parks	Should not be within 500 m	No
7	Critical habitat area - area in which one or more endangered species live	Not within the zone	No
8	Reserved Forest area	Should not be within 500 m.	No - The nearest reserved forest is Katturani RF, 1.5 km away from the site
9	Wetlands	Should not be within 500 m	No
10	Airport	Should not be within zone around the airport(s)	No - Madurai airport is 42.5 km away from the proposed location

Sl.No	Parameter	Criteria	Observation
11	Water supply	No Water supply well within 500 m	No
12	Coastal Regulation Area	Not suitable	No - The coastal zone is 50 km far from the site
13	Ground Water Table Level	GW table should be >2m from the base of the landfill	Pre-monsoon water level – 16 mbgl, Post-monsoon water level - 11 mbgl (source: India WRIS)
14	Presence of monuments / religious structures	Should not be within 500 m	No - Not within 1 km radius
15	Close to National Parks, Monuments, and Forests with large No. of flora and fauna, historical, religious and other important cultural places.	Should not be within 500 m	No - The nearest forest is Katturani RF, which is 1.5 km far from the site.

5.3 Alternative Technologies

5.3.1 Incineration

Incineration is the process of burning waste materials in a controlled environment to reduce their volume and mass. It is a thermal treatment process that uses high temperatures (typically 800°C and 1050°C±50°C) to break down the waste materials into ash, gas and heat.

5.3.2 Plasma pyrolysis

Plasma pyrolysis is a non-thermal treatment process that uses a high-temperature plasma (ionized gas) to break down waste materials into their constituent elements. The plasma is created by passing an electric current through a gas, which causes the gas to become ionized and very hot (typically 5000°C - 10000°C).

Incineration process is preferred over plasma pyrolysis due to its established track record and lower initial investment costs, ensuring efficient disposal of medical waste

while maintaining cost-effectiveness. Additionally, incineration can effectively eliminate pathogens in biomedical waste, meeting stringent health and safety standards.

5.3.3 Autoclaving

Autoclaving is a traditional method of steam sterilization that uses a closed chamber to heat the waste materials to high temperature (typically 121°C -134°C) and pressure (typically 15-30 psi). The high temperature and pressure kill microorganisms, including bacteria, viruses, and fungi.

5.3.4 Microwaving

Microbial inactivation by microwaves is a thermal process that occurs due to absorption of electromagnetic radiation in 300 to 300,000 MHz frequency range. The radiation causes the water molecules in waste material to vibrate, which generates heat that kills the microorganisms.

5.3.5 Hydroclaving

Hydroclaving is a method of treating BMW by using pressurized steam to kill microorganisms. It is a type of autoclave, but it uses a higher pressure and temperature than traditional autoclaves.

Autoclaves have been used for decades to sterilize medical equipment and supplies, and they are considered to be a safe and effective method of disinfection. They are also relatively inexpensive to operate and maintain. In terms of overall performance, autoclaves are the most consistent and least expensive option for BMW treatment. They are a good choice for facilities that need to sterilize a large volume of waste on a regular basis.

5.3.6 Shredder

Shredding is the mechanical process of reducing size of waste material by cutting or tearing it into small pieces. In waste treatment, shredding is used to reduce volume of waste, make it easier to transport and dispose of, and to prevent spread of hazardous

materials. It also helps to prevent the reuse of BMW and can be used to indicate that the waste has been disinfected and is safe to dispose.

CHAPTER 6 – ENVIRONMENTAL
MONITORING PROGRAM

Chapter 6

Environmental Monitoring Program

6.1 Technical aspects of monitoring the effectiveness of mitigation measures

Environmental monitoring program includes the technical aspects of environmental parameters such as air, water, soil and noise. The monitoring programme includes sampling location and frequency of the components addressed above. Environmental monitoring is used to evaluate the performance and effectiveness of mitigation measures proposed in Environmental Management Plan (EMP) and suggest improvements, if required.

6.1.1 Objective of environmental monitoring

Environmental monitoring provides feedback about the actual environmental impacts of a project. They are used to ensure compliance with environmental standards, and to facilitate any needed project design or operational changes. Environmental monitoring is an essential program since it helps in providing the beneficial information and helps in:

- Encourage good environmental practices through proper planning, commitment and improvements.
- Complying with the regulatory standards prescribed by the state pollution control board and in line with environmental protection act rules.
- Defining the liabilities and provide feasible communication to the contractors, environmental monitors, and project proponents related to the environmental issues
- Identifying the monitoring parameters and defining the mechanism of the monitoring
- Evaluating the operational performance and effectiveness of proposed controlled measures in the EMP and proposes the necessary advancements in the management plan.

- Ensuring that the day to day activities are running in compliance with the regulatory requirements and based on the approvals by respective authorities.

6.2 Measurement methodology – Construction & Operation Phase

Ambient air, stack emissions, ambient noise, water & wastewater and soil are to be monitored on regular basis. All environmental samples will be monitored as per the guidelines provided by MoEF&CC/CPCB/SPCB. The method followed will be recommended or the standard method approved or recommended by MoEF&CC/CPCB. The standard procedures will be followed for the parameters, which are not covered, by MoEF&CC /CPCB.

The monitoring is required during the below phases:

- a. Construction phase
- b. Operation phase

a. Construction phase

The major construction activities involved participated in setting up the facility are construction of sheds for treatment units, stores, administrative blocks, canteen etc., major components in the industry are incinerator, autoclave, shredder, diesel generator, and other civil, mechanical and electrical equipment. The construction activities require mobilisation of construction material and equipment. The construction activities are expected to last for few months.

During construction stage of CBWTF facility, quality of construction will be monitored at every stage viz. base preparation, installation of equipment etc. The environmental monitoring that need to be undertaken during construction phase are given in the following **Table 6.1**.

Table: 6.1 Environmental monitoring during construction phase

Sl.No	Potential Impact	Detailed actions to be followed as per EMP	Parameters for Monitoring	Monitoring Frequency
1.	Air Emissions	All equipments are operated within specified design parameters.	Random checks of equipment logs/manuals	Periodic
		Vehicle trips to be minimized to the extent possible	Vehicle logs	Periodic during site clearance & construction activities
		Any dry, dusty materials stored in sealed containers or prevented from blowing.	Stockpiles or open containers of dusty materials.	Periodic during construction activities
		Compaction of soil during various construction activities	Construction logs	
		Maintenance of construction DG set emissions to meet stipulated standards	Gaseous emissions (SO ₂ , HC, CO, NO _x)	Periodic emission monitoring
		Ambient air quality within the premises & adjacent villages of the Study area to be monitored	PM ₁₀ PM _{2.5} , SO ₂ , NO _x , and CO	As per CPCB/SPCB requirements
2.	Noise	List of all noise generating machinery onsite along with age to be prepared	Equipment logs, noise reading	Regular during construction activities
		Minimize the work during night	Working hour records	Periodic during construction activities
		Generation of vehicular noise	Maintenance of records of vehicles	
		Implement good working practices (equipment selection and siting) to minimize noise and also reduce its impacts on human health (ear muffs, safe distances, and enclosures)	Site working practices records, noise reading	

Sl.No	Potential Impact	Detailed actions to be followed as per EMP	Parameters for Monitoring	Monitoring Frequency
		No machinery running when not required		
		Acoustic mufflers / enclosures to be provided in large engines	Mufflers / enclosures shall be in place	Prior to use of equipment
		Noise to be monitored in ambient air within the project premises	Instant Noise recording	As per CPCB/SPCB requirements
		The noise level will not exceed the permissible limit both during day and night times		
		All equipment are functioned within specified design parameters	Casual checks of equipment logs/manuals	Periodic during construction activities
		Vehicle trips to be reduced to the level possible	Vehicle logs	
3.	Wastewater Discharge	No direct discharge of wastewater into surface water, groundwater or soil	No discharge hoses shall be in vicinity of watercourses	Periodic during construction activities
		The discharge point would be selected properly and sampling and analysis would be undertaken prior to discharge.	Discharge norms for effluents as given in Permits	Periodic during construction activities
		Take care in disposal of wastewater generated such that soil and groundwater resources are protected	Discharge norms for effluents as given in permits	
4.	Soil Erosion	Minimize area extent of site clearance, by staying within the defined boundaries	Site boundaries not extended / breached as per plan document	Periodic during construction activities
		Protect topsoil stockpile	Effective cover in place	Periodic during construction activities

Sl.No	Potential Impact	Detailed actions to be followed as per EMP	Parameters for Monitoring	Monitoring Frequency
5.	Drainage and effluent Management	Ensure drainage system and specific design measures are working effectively. The design to incorporate existing drainage pattern and avoid disturbing the same.	Visual inspection of drainage and records thereof	Periodic during construction activities
6.	Waste Management	Implement waste management plan that identifies and characterizes every waste arising associated with proposed activities and which identifies the procedures for collection, handling & disposal of each waste arising.	Comprehensive Waste Management Plan should be in place and available for inspection onsite. Compliance with the guidelines of C&D Waste Management Rules, 2016, BMW Management Rules, 2016 its subsequent amendments under the aegis of the Environment Protection Act, 1986	Periodic check during construction activities
7.	Non-routine events and accidental releases	Plan will be drawn, considering likely emergencies and steps required to prevent / limit consequences.	Mock drills and records of the same	Periodic during construction activities
8.	Health	Employees and migrant labour health checkups	All relevant parameters including HIV	Regular checkups as per Factories Act

b. Operation phase

During operational phase, air emissions from incinerators, DG set and other process if any, wastewater characteristics, incineration ash generation etc. are monitored. The

following attributes which need to be regularly monitored based on the environmental setting and nature of project activities are listed below.

- Point Source emissions and ambient air quality
- Ground water quality
- Water & wastewater quality & quantity
- Solid waste characterisation (Ash, ETP sludge)
- Soil quality
- Noise levels (equipment and machinery noise levels, occupational exposures and ambient noise levels) and
- Ecological preservation and afforestation.

The environmental monitoring during operation phase is given in **Table 6.2**

Table 6.2 Environmental monitoring during operation phase

Sl.No	Environmental monitoring	Parameters for monitoring	Monitoring Frequency
1.	Air emissions		
	Emissions from Incinerator stacks	CO, CO ₂ , SO ₂ , NO _x , HCl and O ₂	Continuous monitoring
		Temperature, Particulate matter, NO _x , HCl, Hg and its compounds	Once in three months
		Dioxins & Furans	Once in a year (minimum)
	Stack emissions from DG sets	PM, SO ₂ , NO _x	Once in a month
AAQ within the project premises	PM, SO ₂ , NO _x	Quarterly once	
2	Autoclave	Validation test using biological indicator strips	Once in three months
		Routine test using chemical indicator strips	Each batch
		Spore testing using biological indicator	Once in every week
3.	Noise		
	Noise generated from DG set, motors etc.,	Day equivalent and night equivalent	Quarterly once
4.	Wastewater		
	Treated wastewater	pH, TDS, TSS, COD, BOD, Chloride, Oil & grease	Once in a month (to check ETP efficiency)

Sl.No	Environmental monitoring	Parameters for monitoring	Monitoring Frequency
5.	Hazardous waste		
	Incineration ash, ETP sludge etc.,	Quality & quantity monitoring	Periodically
6.	Greenbelt		
	Vegetation, greenbelt / green cover development	No. of trees, species and condition of greenbelt	Once a year
7.	Soil quality		
	Soil quality within site at multiple locations	Physico-chemical parameters and metals	Once a year
8.	Health		
	Employees and migrant labour health check ups	All relevant parameters (Blood Pressure, diabetes, chest x-ray, vision test, etc.)	Once a year/along with immunization
Reference: Biomedical Waste Management Rules - 2016, Schedule II			

6.3 Monitoring of autoclaves

Autoclave shall be operated, in compliance with the requirements stipulated in BMW Management Rules, 2016 (and its subsequent amendments). The following shall be part of monitoring the performance of autoclave, as per the Rules.

- 1) Validation test for autoclaves** In order to validate the efficacy of the autoclave, a validation test must be conducted using four biological indicator strips. One of these strips shall serve as a control and be left at room temperature, while the remaining three shall be placed in the approximate center of three containers containing the waste. Personal protective equipment, including gloves, facemasks, and coveralls, must be worn when opening the containers for placing the biological indicators. At least one of the containers with a biological indicator should be placed in most difficult location for steam to penetrate, typically the bottom center of the waste pile. The facility must conduct this test three consecutive times to define the minimum operating conditions. The temperature, pressure, and residence time at which all biological indicator vials or strips for three consecutive tests show complete inactivation of spores shall define the minimum operating conditions for the autoclave. Once the minimum temperature, pressure, and

residence time have been determined, the occupier or operator of a CBWTF must conduct this test once in every three months and maintain records in this regard.

- 2) Routine test:** A chemical indicator strip or tape that changes color upon reaching certain temperature can be used to verify that a specific temperature has been achieved. To ensure that the contents of the waste package have been sufficiently autoclaved, it may be necessary to utilize multiple strips at various locations. The facility is obligated to perform this examination for each batch during the autoclaving process, and documentation of the results shall be maintained.
- 3) Spore testing:** It is imperative that autoclave unit completely and consistently kill the approved biological indicator at the maximum design capacity of each autoclave unit. The biological indicator for autoclave shall be *Geobacillusstearothermophilus* spores using vials or spore strips, with at least 1×10^6 spores. The facility must perform this examination once in a week and maintain accurate records of the results.

6.4 Pollution monitoring facilities

The incinerator and DG set stacks must be equipped with a platform and a port hold to facilitate stack sampling in accordance with the standards prescribed by MoEF&CC, along with the necessary power outlet. Sampling and analysis of air, water etc., shall be given for third party monitoring (MoEF&CC accredited laboratories).

6.5 Online continuous monitoring

Monitoring provision for continuous monitoring of the incinerator stack emission will be installed by the CBWTF and adhere to the guidelines issued by SPCB/CPCB. This provision will monitor flue gas parameters such as CO₂, O₂, CO and SPM as well as primary and secondary chamber temperatures and records maintained. The real-time continuous stack emission data must be transmitted to the servers of the respective SPCB/PCC and CPCB. The online monitoring systems attached to the incinerators require periodic calibration and maintenance to ensure accurate and reliable data.

6.6 Reporting schedules of the monitoring data

The monitoring of environmental activities must comply with the provisions stipulated in the Environmental Clearance, Consent for Operation, and BMW rules and guidelines. Environmental audit reports will be prepared for the entire year of operations and will be submitted on a regular basis to the relevant regulatory bodies. Also, it is proposed that a voluntary reporting of environmental performance, with reference to the EMP, shall be carried out.

6.7 Budgetary provision for EMP

To implement the environmental protection measures as suggested in the above sections, the project management has made budgetary provision for environmental protection and safety measures. Cost towards environmental mitigation measures are given in **Table 6.3**.

- Environmental Monitoring Program
- Operation & Maintenance of environmental technologies / equipment
- Laboratory works for Environmental management activities
- Emergency purchase of necessary material, equipment, tools, services, PPEs

Table 6.3 Budget allotted for Environmental Management Plan

Sl.No	Particulars	Capital Cost (Rs.Lakhs)	Recurring Cost (Rs.Lakhs /Annum)
1	Air Pollution Control Devices (APCDs)	15	1.5
2	Online Stack Monitoring - Online Continuous Emission Monitoring Stations (OCEMS)	5	0.3
3	Effluent Treatment Plant (ETP)	3	0.2
4	Odor Control Systems - Automated Ecosorb Spraying etc.	4	0.3
5	Storm water Drains and Storage Tanks	3	0.3
6	Landscaping, Greenbelt Development	5	0.5
7	Temporary storage / Ash disposal / ETP Sludge	0	0.5
8	Ambient Air Quality Monitoring / Stack Monitoring	0	0.5
9	Solar lighting & Led lighting	5	0.3
10	Miscellaneous	9	0.5
Total		49	4.9

6.8 Corporate Environmental Responsibility (CER) activities and budget

In the past MoEF&CC has issued Office Memorandum on 1st May 2018, in order to have transparency and uniformity while recommending CER by EAC/ SEAC and issued the guidelines for both greenfield project and brownfield projects based on capital investment proposed. However, MoEF&CC in its recent Office Memorandum on 30th September 2020 and subsequently on 20th October 2020 suppressed the earlier OM on 1st May 2018. The new OM has empowered the Expert Appraisal Committee (EAC) or State Level Expert Appraisal Committees (SEAC) to deliberate on the commitments made by the project proponent to address concerns raised during the public consultation.

The proposed budget and activities are subjected to ratification by the concerns that would be expressed during Public Hearing. The budgetary outlay and activities proposed under the CER are given in **Table 6.4**

Table 6.4 Budgetary proposed for CER

Sl. No.	Activities	Details	Total Amount Rs. (in Lakhs)	Timelines
1	Health checkups	Health checkup for communities in the nearby villages and distribution of medicines to the needy	1.0	Once in a month in villages of core zone
2	Plantation Drives, Infrastructure development	Avenue Plantation and other Plantation drives would be conducted on World Environment Day in the nearby villages. Infrastructure development like street lighting facilities, drainage facilities etc.	1.5	Need based
3	Income generation and skill development Training programs for Women & Youth	For nearby villagers – women & youth empowerment initiative	1.5	Quarterly one batch
Grand Total			4.0	

CHAPTER 7 – ADDITIONAL STUDIES

Chapter 7

Additional Studies

7.1 Risk assessment

As a part of the proposed facility, it is important to identify and quantify associated safety hazards and carry out a basic risk assessment in and around the project site. CBWTF is associated with several potential hazards to both the employees and the public. Based on this, an emergency preparedness plan is prepared to mitigate the consequences. The approach involved hazard identification, assessment, evaluation and developing a Disaster Management Plan (DMP). Thus, risk analysis follows an extensive hazard analysis, which involves the identification and assessment of the risks neighbouring populations are exposed to.

Mechanical and electrical hazards pertaining to heavy lift equipment, electrical fires and shocks, trips and falls, and other standard hazards in different services constitute the overall hazard profile of the project. In spite of the safety measures, the possibility of accidents due to either human errors and/or equipment or system failure cannot be ruled out.

7.1.1 Hazard identification

Identification of hazards at the CBWTF is considered the primary significance of the analysis. The quantification of risk indicates the characteristics of wastes that pose potential damages and create emergencies. Thus, all the components in the CBWTF need to be examined thoroughly at regular intervals in order to avoid their potential for initiating or propagating any unplanned events, which can be termed an emergency. Thus, the following types of risks are presumed a potential emergency during the operation of a facility due to the handling of different wastes.

- a) Pathological Waste - Human anatomical waste, fluids, or blood bags.
- b) Genotoxic Waste – Toxic drugs and hazardous toxic waste.

- c) Sharps – Sharps objects like needles, blades, broken glass, and syringes with fixed needles.
- d) Plastic waste - which is recyclable.

7.1.2 Hazardous activities at the site

The following are the likely hazardous activities during the operational phase that can pose a threat and risk to humans and the surrounding environment.

- Tank storage of High-Speed Diesel (HSD)
- Waste movement and manual handling
- Chemical reactions

These activities may pose a serious threat to human health if the toxic medical waste managed and disposed of at the site releases constituents of concern into the air as vapour or particles due to wind erosion of the disposed contaminates groundwater through leaching. Bio-medical hazardous waste can be infectious and toxic in nature, and spillage, leakage or accidental release of such wastes creates localized effects within short distances inside the site in the form of thermal radiation or toxic fume release.

Types of hazards during construction and operation phases and based on the areas and unit operations involved in the CBWTF are identified and given in **Table 7.1**.

Table 7.1 Types of hazards and associated risk

Type of hazard	Line of activity	Type of associated risk
Natural	Construction and operation phase	Earthquakes, flooding, droughts, etc.
Electrical	Construction and operation phase	Electrical cables, machinery/ equipment, loose wiring, maintenance work etc.
Mechanical	Construction and operation phase	Associated with power-driven machines operated manually, hand-held tools, failure of slip falls and traps at the workplace, activities such as cutting, lifting, crushing etc.

Type of hazard	Line of activity	Type of associated risk
Physical	Construction and operation phase	Noise and vibrations are generated within the site and its surroundings.
Transportation	Construction and operation phase	Movement of heavy vehicles, transport of construction material & raw material for operations, vehicle collision etc.
Storage and handling of flammable materials	Operation phase	The proposed projects deal with infectious waste and Biomedical incinerable waste, which are generally contagious to human health. Bio-medical hazards in this case are associated with human health and accidental fire, explosion, or gas accumulation.
Ergonomic	Construction and operation phase	Repetitive strain injuries, awkward postures, repetitive & monotonous work, excessive workload.
Others	Construction	Civil construction works and other hot jobs are done at height.

7.2 Evaluating hazards

The need for sophisticated techniques for evaluating hazards depends on the result of Preliminary Hazard Analysis.

- Maximum Credible Accident (MCA) Analysis

Maximum credible accident analysis for High Speed Diesel (HSD) storage area

Identification of causes and types of hazards is the primary task for planning risk assessment. Hazard can happen because of the nature of the chemicals handled and the nature of the process involved. Identification of hazardous chemicals is done in accordance with the Manufacture, Storage and Import of Hazardous Chemical (MSIHC) Rules, 1989 and its subsequent amendments.

The following **Table 7.2** shows the HSD chemical which, has been identified as hazardous chemicals and which is to be considered as Major Accident Hazards (MAH) installations.

Table 7.2 Details of chemicals and applicability of MSIHC rules

Solvent	Storage Type	Listed in Scheduled	Threshold Quantity for Application of Rules (tons)	
			4,5,7-9,13-15	10-12
HSD	Vertical	Schedule 1 (part I)	5000	50000
Ref. As per the MSIHC Rules, 1989 and its subsequent amendments				

From the above table it can be inferred that there would be no Major Hazardous chemical stored (HSD) at the plant, which would attract the GOI rules 4,5,7-9 ,13-15 and 10-12 as the quantity likely to be stored at the site lies above the stipulated threshold quantities.

Schedule 1, of the Rule provides a list of the Toxic and Hazardous chemicals and the flammable chemicals. It defines the flammable chemicals based on the flash point and boiling point.

Identification of major hazard installations based on GOI Rules, 1989 and its subsequent amendments.

By Studying accidents that occurred in industries in India over a few decades, specific legislation covering major hazard activities has been enforced by the Government of India in 1989 in conjunction with the Environment Protection Act, of 1986. This is referred here as GOI rules 1989. For identifying major hazard installations, the rules employ certain criteria based on the toxic, flammable and explosive properties of chemicals.

- Group 1 - Toxic substances
- Group 2 - Highly reactive substances
- Group 3 - Explosive substance
- Group 4 - Flammable substances

Identification of toxic, flammable, explosive chemicals

Toxic Chemicals: Chemicals having the values of acute toxicity are given in **Table 7.3** and which owing to their physical and chemical properties are capable of producing major accidents.

Table 7.3 Details of Toxic Chemicals

Sl. No	Toxicity	Oral toxicity LD ₅₀ (mg/kg)	Dermal toxicity LD ₅₀ (mg/kg)	Inhalation toxicity LC ₅₀ (mg/l)
1	Extremely Toxic	>5	<40	<0.5
2	Highly Toxic	>5-50	>40-200	<0.5-2.0
3	Toxic	>50-200	>200-1000	>2-10

Flammable Chemicals: Flammable gases, which at 20°C and at a standard pressure of 101.3 KPa are:-

- Ignitable when in a mixture of 13 percent or less by volume with air, or Have a flammable range with air of at least 12 percentage points regardless of the lower flammable limits.
- Extremely flammable liquids: chemicals, which have flash point lower than or equal to 23 °C and boiling point less than 35°C
- Very highly flammable liquids: chemicals, which have flash point, lower than or equal to 23°C and initial boiling point higher than 35°C.
- Highly flammable liquids: chemicals, which have a flash point lower than or equal to 60°C but higher than 23°C.
- Flammable liquids: chemicals, which have a flash point higher than 60°C but lower than 90°C.

Explosives: Explosives means a solid or liquid or pyrotechnic substance (or a mixture of substances) or an article.

- Which is in itself capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage to the surroundings
- Which is designed to produce an effect by heat, light, sound, gas or smoke or a combination of these as a result of a non-detonative self-sustaining exothermic chemical reaction. The following **Table 7.4** shows the identification of Bio-medical hazardous areas in the proposed site.

Table 7.4 Identification of bio-medical hazardous area

Hazard	Area	Probable cause of the accident
Explosion	Boilers/ Transformers/ Receivers for the Air Compressors	Malfunctioning of the safety valve.
	Flammable Petroleum Product Storage Tank/ Drum Storage area	External Fire causes pressure to build up in the tanks/ barrels.
Fire	HSD/ FO storage areas	Flammable vapour/air mixture and source of ignition.
	Flammable petroleum product Storage Tank/ Drum storage Shed/ Production Area	Formation of pool in the dyke wall and source of ignition. External Fire → Built up of internal → pressure failure of the top cover tank on fire.
Spillage	Acid/ Alkali Storage area	Spillage of Acid/ Alkali due to rupture of the pipeline, collapse of the storage tank.

In order to be in a state of readiness to face the adverse effects of accidents, an Emergency Preparedness Plan (EPP) has to be prepared. Inter-alia, cover the possible Bio-medical hazardous situations in the locality and the causes, areas most likely to be affected, on-site and off-site plans, establishment of Emergency Control Centers (ECC), location of emergency services and duties of officers/staff during emergency.

The EPP document for accidents is to be designed to provide for measures to contain the incident and for minimization of effects due to fire, explosives, release or escape of toxic gas, and spillage of hazardous substances in storage, processing or during transportation.

Fire and Explosive Toxicity Index (F&ETI) for HSD Chemical

The application of F&ETI would help to make a quick assessment of the nature and quantification of the hazard in these areas. As per the National Fire Protection Association (NFPA) classification, The F&ETI values of HSD Chemical are given in

Table 7.5

Table 7.5 F&ETI of fuels used for the industrial Area

Chemicals	NFPA Classification				GPH	SPH	F&ETI*	F&ETI Category
	N _h	N _f	N _r	MF*				
High-Speed Diesel	1	2	0	10	1.8	2.83	50.89	Low
*F&ETI = MF *(1+GPH) * (1+SPH)								

The F&ETI values are ranked into the following categories **Table 7.6**.

Table 7.6 F&ETI Category

Sl. No.	F&ETI Value	F&ETI Category
1	1-60	Low
2	60-90	Medium
3	90 and above	Severe

7.2.1 Hazard from fuel storage

HSD is a flammable liquid having a flash point varying from 32°C to 96°C. However, its boiling point ranges between 215°C to 376°C. Major hazards from HSD storage can be fire, maximum credible accidents from HSD storage tanks. The following details of chemicals storage of HSD at the project site and Physical properties of HSD stored at the site are given in **Table 7.7** and **Table 7.8**.

Table 7.7 Chemicals storage at the project site

Chemicals	Use	Nature of Chemical (Schedule 1)	Type of Storage	Storage Quantity (tons)
HSD	Fuel for DG set / Incinerator	Flammable	Vertical	5.20 (tons) Average 10 days in a month

Table 7.8 Physical properties of HSD stored at the site

Chemicals	TLV (ppm)	BP	MP	FP	LEL	UEL
		($^{\circ}\text{C}$)			%	
High-Speed Diesel	800	215 - 376	18 - 46	32-96	0.5	6.0
TLV: Threshold Limit Value			BP: Boiling Point			
MP: Melting Point			FP: Flash Point			
UEL: Upper Explosive Limit			LEL: Lower Explosive Limit			

a. Tank fire

HSD is stored in a fixed floating roof tank; any leak in rim seal or spillage leads to accumulation of vapour, which can be a source of ignition and can cause tank fire.

b. Pool / dyke fire

If there is outflow from the tank due to any leakage from tank or any failure of connecting pipes or valves, HSD will flow outside and form a pool. When a dyke surrounds the tank, the pool of oil will be restricted within that dyke. After some time, the vapour from the pool can catch fire and can cause pool or dyke fire.

7.2.2 Safety Precautions for the Storage of Fuel

- Stored separately with proper enclosures within premises in closed shed.
- Proper ventilation to be provided
- Sufficient fire extinguishers and PPE to be provided

Thermal Effect

The level of damage caused by the thermal effect due to fire is a function of the duration of exposure and heat flux (i.e. radiation energy onto the object of concern) and it is true for the effect on buildings, plant equipment and also for the effect on personnel. The effect of heat radiation and fatality on variation in exposure time is given in **Table 7.9**.

Table 7.9 Heat radiation and fatality

Incident Radiation Intensity (kW/m ²)	Type of Damage
37.5	Sufficient to cause damage to process equipment.
25	Minimum energy required to ignite nearby wood at infinitely long exposure (non-piloted).
12.5	Minimum energy required for piloted ignition of wood, melting plastic tubing etc. 1 st degree burns for 10 seconds exposure.
8.0	Maximum thermal radiation intensity allowed on thermally unprotected adjoining equipment.
4.0	Sufficient to cause pain within 20 seconds. Blistering of skin 1 st degree burns are likely.
1.6	Will cause no discomfort to long exposure.
Source: Techniques for Assessing Industrial Hazards by World Bank, 2017	

For computing the damage distances, the Areal Locations of Hazardous Atmospheres (ALOHA) software is used. Full tank storage capacity has been considered in the calculations. The effect of heat radiation and subsequent damage distances from pool fires on HSD is given in **Table 7.10**.

Table 7.10 Effect of heat radiation due to storage tank (Pool fire) - HSD

Input data		Results of computation	
Spilled quantity	1 KL	Flame length	7 m
Circular opening diameter	2.5 cm	Max burn rate	20.6 kg/min
Wind speed	2.54 m/s	Total amount burned	1227 kg
Heat radiation at ground level kW/m ²		Damage distances (m)	
8		< 10	
4		11	
1.6		16	

The thermal radiation threat zone is shown in **Figure 7.1** and the risk contour on the site layout for HSD is shown in **Figure 7.2**

Figure 7.1 Thermal radiation threat zones

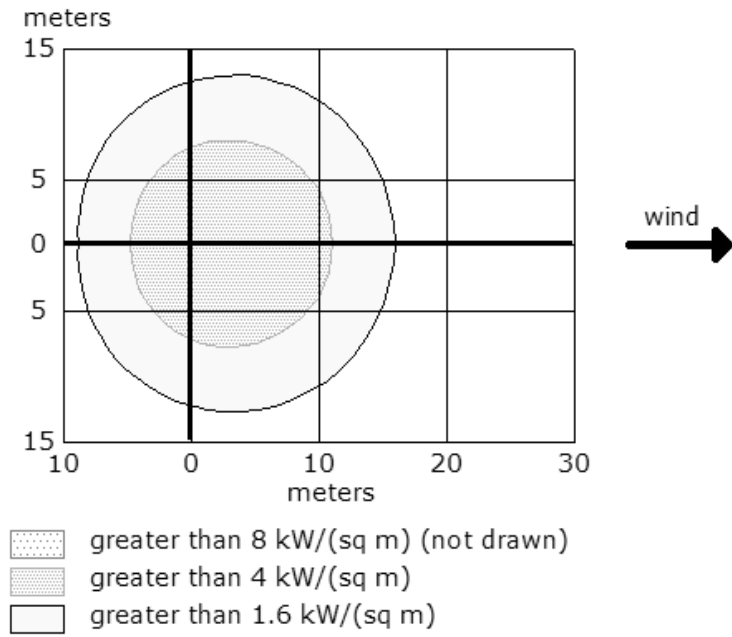


Figure 7.2 ALOHA source point on the layout – HSD



7.3 Hazards mitigation measures for proposed CBWTF

MEMPL will prepare detailed emergency control measures and give information about the quantity of bio-medical hazardous material storage, location of storage, approximate population living in vicinity and details of hazardous characteristics of the material to employees, concerned government departments, and the public living in the vicinity regularly. This will enable the government to prepare the on-site disaster management plan and educate employees, and public living in the vicinity on the safety measures required to be taken in the event of an accident-taking place. Certain risk mitigation measures for the proposed facility are given in **Table 7.11**.

Table 7.11 Certain risk mitigation measures for proposed facility

<p>Collection and Transportation of BMW</p>	<ul style="list-style-type: none"> ➤ The driver will carry the Transport Emergency (TREM) card at all times when BMW is transported. ➤ The drivers will be adequately trained in using the TREM Card and to use the details mentioned on the card when any unfortunate incident takes place while carrying BMW. ➤ All the drivers will have the ability to read and write in the English, Hindi and Regional languages. The drivers will also be provided with special training for handling and transporting waste. The drivers will be adequately trained in using emergency equipment such as fire extinguishers, gas masks, first aid kits, etc. ➤ A driver who transports BMW will be well acquainted with the procedure to be followed in case of an emergency during transit. ➤ A driver who delivers BMW to the designated facility will be instructed and trained about thorough cleaning, disinfection and washing of the vehicle before leaving the facility premises. ➤ All the drivers will be provided with mobile phones to communicate with the logistics team and if viable, they will be provided GPS tracking on each vehicle. ➤ All the drivers will be responsible for keeping the vehicles clean and disinfected every day. They will
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	<p>also be responsible for the maintenance of these vehicles to avoid any kind of mechanical breakdown while moving BMW into the zone.</p> <ul style="list-style-type: none"> ➤ Each vehicle will have a separate compartment to keep different colour-coded bags. The vehicles' floors and compartments will be tested for leaks. Each compartment will ease the loading and unloading of waste. The correct technical procedure will be used. There would be no retention of water or disinfectant during the washing process. ➤ The transportation routes of the vehicle will be designed for optimum travel distance and to cover the maximum number of healthcare units. As far as possible, transportation will be carried out during non-peak traffic hours through pre-decided routes only.
<p>Storage</p>	<p>Untreated waste storage:</p> <ul style="list-style-type: none"> ➤ All collected BMW will be stored in respective rooms and should be disposed of on the same day. ➤ The waste will be treated within 48 hours. BMW will not be stored for more than 48 hours at HCFs or CBWTF sites. ➤ The size of the room will be adequate to store all waste transported to the facility. ➤ A coding mechanism will be implemented to tag the bags so that a complete record of the quantity of waste generated by a particular generator will be maintained. This process will be computerized so that all logs can be maintained for future reference. ➤ All employees at the facility will be trained to handle waste in storage rooms and transfer any waste in cases of spillage etc. As a precautionary step. <p>Treated waste for storage</p> <ul style="list-style-type: none"> ➤ Separate storage facilities are provided for the storage of BMW treatment. ➤ Proper ventilation will be provided. ➤ Proper Entry-Exit will be provided. ➤ Proper flooring will be provided.

Storage Container	<ul style="list-style-type: none"> ➤ Designated colour coded bags as prescribed under the BMWM Rules, 2016 containing pre-printed bar-coded bags/containers or bar code labels which can be supplied by any vendor who used for storing. ➤ Prescribed bar code labels used at the source of generation by the occupier or operator of a facility for details of the storage items.
Spillage/ Leakage Control Measures	<ul style="list-style-type: none"> ➤ The storage areas should be inspected daily for detecting signs of leaks or deterioration, if any. ➤ Leaking or deteriorated containers should be removed. ➤ Instead of water, dry adsorbents/ cotton is used for cleaning spills/leaks ➤ Proper slope with collection pits is provided in the storage area to collect spills/ leakages. ➤ Storage areas are provided with an adequate number of spill kits at suitable locations. These spill kits are provided with compatible sorbent material in an adequate quantity.
Fire Protection system	<p>The following fire-fighting fire systems should be proposed in the proposed project:</p> <ul style="list-style-type: none"> ➤ Fire extinguishers of suitable types and capacities ➤ Fire hydrant system ➤ Heat detectors & fire alarms ➤ Automatic sprinkler systems ➤ Hydrant valves ➤ Water monitors ➤ Deluge valves ➤ Fire tenders
Miscellaneous	<ul style="list-style-type: none"> ➤ Smoking shall be prohibited in and around the storage areas ➤ Only those vehicles with spark proof should be allowed. ➤ Good housekeeping is maintained in the storage areas. ➤ Signboards showing precautionary measures to be taken in case of normal and emergency situations should be displayed at appropriate locations. ➤ To the extent possible, manual operations within the storage area are to be avoided.

	<ul style="list-style-type: none"> ➤ A system for inspection of storage areas to check the condition of containers, spillages, leakages, etc., should be established and proper records should be maintained. ➤ Storage sites should have adequate and prompt emergency response equipment systems for bio-medical hazardous waste stored on-site. This should include firefighting arrangements based on risk assessment, spill management, evacuation and first aid. ➤ Immediately on receipt of BMW, it should be analysed and depending upon its characteristics its storage should be finalized. ➤ Only authorized personnel trained in BMW handling procedures should have access to the storage site. ➤ Mock drills for on-site emergencies should be conducted regularly and records should be maintained.
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7.3.1 Firefighting System

Management to take into consideration fire prevention measures at the project planning and during the plant commissioning stage to avoid any outbreak of fire. However, looking at the operation, the chances of an outbreak of fire cannot be totally refuted. Hence, to avoid such a scenario, the following fighting equipment will be deployed. The list of proposed fire-fighting equipment for the facility are given in **Table 7.12**

Table 7.12 List of proposed fire-fighting equipment

Sl. No	Name of equipment	Proposed quantity (No's)
1	ABC type fire extinguisher 5 kg	3
2	ABC type fire extinguisher 2 kg	5
3	CO ₂ type fire extinguisher 4.5 kg	5
4	Dry chemical powder fire extinguisher 4.5 kg	5
5	10 liters Sand Bucket	5
6	Hose Reel	3
7	Trailer driven pump	1
8	Mechanical Foam - Trolley Mounted (50 Liters)	3

For the proposed facility, the details of the fire panel activities are given in **Table 7.13** and the fire-fighting equipment in the site area is shown in **Figure 7.3**

Table 7.13 Details of fire panel activities

Activity	Responsibility	Frequency
Development and approval	Project proponent	At the project proposal stage
Maintaining	Fire department	Maintaining copies at concerned dept.
Revision	Fire department	Two years
Updating	Fire department	Creating - Live page
Implementation	Fire department	Need basis
Review	Fire department	Review of SOP, and checklist yearly
Rehearsal/ Drill	Fire department	As per the Table 7.17

Figure 7.3: Fire-fighting Equipment's



High pressure water jet



Hydrant valve



Mechanical Foam - Trolley Mounted

7.4 Electrical accidents

Electrical hazards cause burns, shocks, and electrocution, which leads to serious injury and even death.

Prevention of electrical accidents

- Maintaining the proper condition of cables and connectors is essential to prevent short circuits. The use of worn, damaged or bare cables strictly prohibited
- Use of proper protective equipment like dry gloves, rubber-soled shoes, etc. to be worn before carrying out any electric equipment-related works and repairs.
- Flexible cords connected to appliances should be wired to conform to the international colour code.

- The appliance should preferably be tested and certified by a national or reputed standards testing authority.
- All electrical wiring, rewiring or extension work should be carried out by licensed electrical contractors. On completion, the contractors should test before the electricity supply is connected.
- The facility should be equipped with a current-operated Earth Leakage Circuit Breaker (ELCB) or Residual Current Circuit Breaker (RCCB) set to operate at a very small leakage current. If there is a dangerous electrical leak to the earth, the power should be cut off automatically.
- Grounding/ earthing all electrical equipment to an approved electrical ground.

7.5 Health Hazards from infectious BMW

Workers handling and disposing BMW are at potential risk of exposure to infection from sharps-related accidents or when containers of waste burst, open and leak, or spills of certain waste materials occur. Exposure to a needle or other sharp object contaminated with the blood of an infectious person presents the greatest potential risk for transmission of HBV, HIV, and other blood borne pathogens to the healthcare workers and waste handlers.

Mitigation Measures/Prevention of Health Hazards

- Project Proponent will take reasonable steps to reduce the risk of exposure to infection by establishing written policies and procedures based upon the most currently accepted clinical and occupational health and safety information in consultation with workers and operators in handling and disposing of BMW. These policies and procedures will be reviewed and updated regularly, with compliance to their requirements verified as necessary.
- Make sure that waste haulers and handlers will always be clothed properly and wear personal protective equipment so that harmful agents whether physical, chemical, or infectious are prevented from gaining access to open wounds, cuts, or by absorption through the skin. Personal protective equipment may include cut-proof gloves, gowns, safety glasses, footwear etc.

- A course of Hepatitis B (HBV) vaccine will be given to all employees dealing with, handling and disposing of BMW, who are at risk of exposure to human blood, blood products, or body secretions.
- Appropriate protective equipment, including dust masks, heavy gloves and safety shoes with puncture-proof toes and soles to avoid injury to staff responsible for loading and cleaning out incinerators.

Mitigation measures to minimize risk in case of spillage of infectious fluid are:

- Visible material will be first removed with disposable towels or other appropriate means that prevents direct contact with blood. If splashing is anticipated, both protective eyewear and clothing to be worn.
- The area will be decontaminated with an appropriate germicide.
- Hands will be washed after gloves are removed.
- Soiled cleaning equipment will be cleaned and decontaminated or placed in an appropriate container for disposal.
- Plastic waste-holding bags will be made available for removing contaminated items from the site of the spill.
- Shoes and boots can sometimes become contaminated with blood. If there is massive blood contamination on floors, the use of disposable, impervious shoe coverings will be considered.

7.6 On-site Operational systems during emergency communication system

There are different types of alarms to differentiate one type of emergency from another such as - fire or gas, normal fire siren, emergency/ evacuation and high-pitched wailing siren. Apart from these alarms, an adequate number of external and internal telephone connections are also installed for passing information effectively, which are given in **Table 7.14**.

Table 7.14 Details of the warning system and other related services

Siren code – for “DECLARING EMERGENCY”	Siren code – for “CLOSING EMERGENCY”
<ul style="list-style-type: none"> ➤ Sirens should be blown for 2.5 minutes. ➤ Each cycle of blowing for 20 seconds, pause for 10 seconds. ➤ There should be 5 cycles of blowing of the siren totaling 2.5 minutes. 	<ul style="list-style-type: none"> ➤ A long siren of 2 minutes should be blown once.
Warning system and control	
Control centers	The Control centres should be located in areas of minimum risk or vulnerability within the premises, taking into account the direction of the wind, the potential for fire/explosions and toxic releases, etc.
Emergency services	<ul style="list-style-type: none"> ➤ The facilities for firefighting, first aid, and rescue should all be described elaborately. ➤ Alternate power supply source for operating fire pumps and communication with local bodies, the fire brigade, etc. Should be indicated clearly ➤ Floor plans or workplace maps that clearly show emergency escape routes and safe areas should be included in the evacuation plan. ➤ All potential emergencies will be addressed with detailed procedures to be followed by those employees who must remain behind to care for essential plant operations until their evacuation becomes absolutely necessary. ➤ Monitoring of plant, power supplies, water supplies, and other essential services cannot be shut down for every emergency alarm.

7.6.1 Emergency response plan at the proposed site

The purpose of this procedure is to have a plan to contain and control incidents in the shortest possible time during emergency situations so that damage is minimised, to rescue victims and treat them suitably, to safeguard other assets, to safeguard other personnel and evacuate them to safer places, to prevent and mitigate the environmental impacts associated with accidents and emergency situations, and to ensure the preparedness and response process of the organisation. If an accident or

incident takes place within the facility and its effects are confined to the premises, involving only the persons working and the property inside, it is called an on-site disaster. The following are key members of emergency control.

7.6.2 Roles and responsibilities of emergency personnel

The emergency control center and the roles and responsibilities of the personnel are given in **Figure 7.4** and **Table 7.15** respectively.

Figure 7.4 Details of the emergency control center

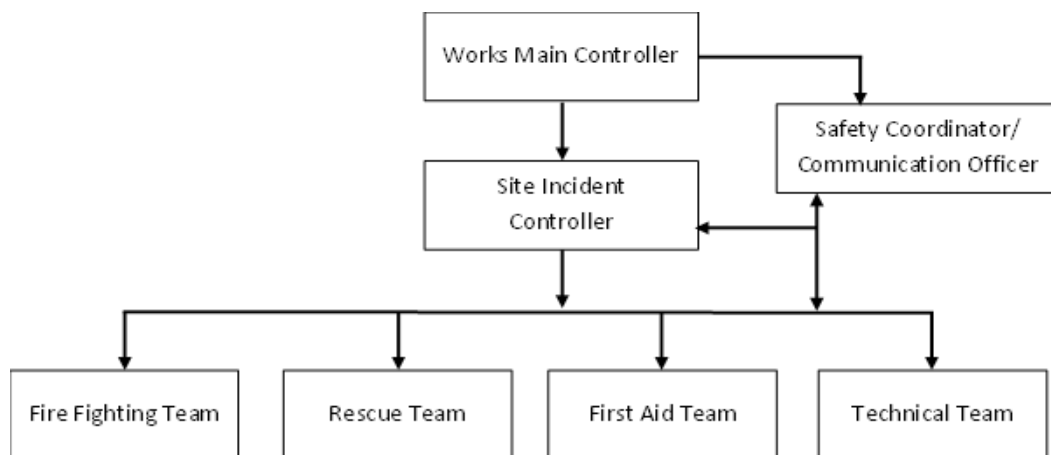


Table 7.15: Roles and responsibilities of emergency personnel

<p>Works main controller (WMC)</p>	<ul style="list-style-type: none"> ➤ On receiving any emergency calls from the site incident controller or others, provide direction to site incident controller to conduct or activate emergency response action suitably. ➤ Keep informed of the situation from the site incident controller. ➤ Ensure notification of appropriate local governmental/ municipal authorities of the emergency and request assistance where needed. ➤ Approve statements to the media. ➤ Prioritize repairs and salvage operations. ➤ Deactivate the ECC after termination of an emergency.
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<p>Site-Incident Controller (SIC)</p>	<ul style="list-style-type: none"> ➤ On hearing the emergency siren or call from security or any person, he will rush to the emergency control centre. ➤ Assess the situation and inform WMC about the emergency. ➤ Visit the emergency spot & assess the intensity of the situation. ➤ Deploy the ERT teams. ➤ If it is beyond control, inform the safety department and work with the main controller for external help. ➤ If needed, arrange the evacuation of all people from the emergency area & advise them to assemble at a safe assembly point. ➤ Coordinate with the site main controller for a final assessment of the situation & declare the emergency under control.
<p>Safety coordinator/ Communication officer (CO)</p>	<ul style="list-style-type: none"> ➤ Rush to the safe assembly point and coordinate with ECC. ➤ Based on the instructions from the Incident Controller and Site Main Controller, please proceed to inform and coordinate the necessary internal and external resources, including ambulances, and the fire department. ➤ Collect all roll call data for all safe assembly zones, including the counts of employees, visitors, and contractors. ➤ Review the roll call information with the security headcount data and find out if any personnel are missing and their last known location. ➤ Direct Rescue Team to search in the plant to find out missing personnel is trapped inside the plant and rescue.
<p>Fire-fighting team (FFT)</p>	<ul style="list-style-type: none"> ➤ On hearing emergency siren, find out the location of fire from Site Incident Controller or ECC and collect the information like; <ul style="list-style-type: none"> • Location • Type of material on fire (e.g. HSD) • Nature of fire • Wind direction • Availability of extinguisher (Quantity, type etc.) ➤ Wear the fire-fighting suits. ➤ Be prepared with the hydrant system as back up arrangement. ➤ If the fire is out of control, leave the spot and inform to Incident Controller and move combustibles away from the hot work site; ➤ Shield combustibles with fire blankets or welder's blankets; ➤ Protect stored items as soon as possible. ➤ Assist fire brigade

<p>Rescue team (RT)</p>	<ul style="list-style-type: none"> ➤ Rush to the assigned location and alert others inside the plant. ➤ Guide all employees, visitors, and contractors under site control or in the area to the nearest Safe Assembly Zone as per the Emergency Exit Plan. ➤ Check restrooms, meeting rooms, and toilets. ➤ Assist physically challenged individuals and children. ➤ At the safe assembly zone, conduct a roll call and record the count of employees, visitors, and contractors. ➤ Report the roll call information to the Communication Officer, including any missing personnel and their last known location. ➤ Provide feedback to the Incident Controller/Safety Engineer, indicating whether any problems were found during the evacuation to facilitate improvements.
<p>First Aid Team</p>	<ul style="list-style-type: none"> ➤ Provide standard first aid treatment for non-serious injuries, which may include cleaning the injured areas and applying antiseptic, salves, ointments, or bandages. ➤ Examine patients and administer treatment within the scope of training. Refer patients to the appropriate practitioner, clinic, or arrange for transport to a local hospital as necessary. ➤ Observe staff members with injuries or illnesses requiring further treatment. ➤ Maintain required records and documentation, including a log of injuries and occupational illnesses that required first aid treatment. ➤ Ensure an adequate inventory of first aid supplies is maintained and request additional supplies when needed.
<p>Technical team (TT)</p>	<ul style="list-style-type: none"> ➤ Upon hearing the siren or receiving a message, immediately proceed to the location and ensure that the affected person has been moved to the Occupational Health Center (OHC). ➤ Turn off the machine/electrical power supply/close the control valve. ➤ Alert others to evacuate the area. ➤ Offer technical assistance to the incident controller and Emergency Response Team (ERT) members. ➤ Provide feedback to the Incident Controller/Safety Engineer, indicating whether any issues were encountered during the evacuation to facilitate improvements. ➤ Participate in the incident investigation.

In addition, the following details of the occupational health and other safety approaches are given in **Table 7.16**.

Table 7.16 Details of occupational health and other safety approaches

Occupational health and safety approaches at the site	
Emergency control room	<ul style="list-style-type: none"> ➤ An emergency control room must be established as the central focal point in the event of an emergency. It will serve as the hub for directing and coordinating emergency response operations. ➤ Maintain detailed lists of essential telephone numbers, key personnel, and their addresses, as well as an overall facility map with emergency evacuation routes. ➤ Ensure that emergency equipment, such as Self-Contained Breathing Apparatus (SCBA), fire extinguishers, Personal Protective Equipment (PPE) like gloves, boots, face shields, torches, etc., is stored in proper working order and readily available for use.
Assembly points	<ul style="list-style-type: none"> ➤ Assembly points should be established at a distance farthest from the potential hazardous events' locations. These points will be where pre-designated individuals from the workforce, contractors, and visitors gather in case of an emergency. ➤ Ensure that an up-to-date list of pre-designated employees from various departments (organized by shifts) is available at the assembly points for roll call purposes. Pre-designated individuals will be responsible for managing this process.
Occupational health center (OHC)	<ul style="list-style-type: none"> ➤ To ensure immediate attention to injured personnel during emergencies, an Occupational Health Center (OHC) may be established on the project premises. ➤ The OHC should be well-equipped and regularly maintained with essential equipment, including oxygen cylinders, masks, observation beds, wheelchairs, first-aid kits, stretchers, bio-medical disposable bins, and have an ambulance on standby for transporting injured personnel to hospitals.

<p>Mock drill monitoring</p>	<p>Conducting mock drills at regular intervals enhances preparedness and assesses the viability of the environmental/disaster management plan.</p> <ul style="list-style-type: none"> ➤ Mock drills help in improving and enhancing the environmental/disaster management plan. ➤ They aim to change workers' attitudes toward safety and risk management. ➤ Mock drills evaluate the skills and readiness of trained officials for unforeseen events, ensuring that emergency equipment is well-maintained and ready for use. ➤ Local services such as the fire department, police, and hospitals will provide emergency support. ➤ Recording the drills is an essential component of better preparedness.
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Mock drill training are important for the following reasons:

- Helps in improving/enhancing environmental/disaster management plan
- To bring about change in the attitude of the workers towards safety and risk management
- To evaluate the skills and readiness of trained officials towards unforeseen events. Helps to check whether the emergency equipment is maintained and ready to use

The project proponent/EHS department/EMP cell shall conduct periodic on-site mock drills in case of occurrence of the following activities:

- Fire, natural calamities like earthquakes, cyclones etc.
- Power breakdown
- Bomb threats
- Accidents

Mock drills should also ensure that local services like fire departments, police, etc. are required to provide emergency support. Documentation of the outcome and recording of the drills is an important part as this helps in looking back and tweaking the current plan for better preparedness. In every safety program, the employment of the right personnel is of extreme importance. The following details of the mock drill

schedule for the site as given in **Table 7.17**.

Table 7.17 Details of mock drill schedule for the Site

Sl. No.	Activity	Frequency	Remarks
1	Fire Evacuation Exercise	Annually	Practice as per planned or false alarm
2	Mock Drill (Construction & Operating phase)	Quarterly	Testing of overall plan mobilization of an emergency control room, evacuation
3	Spill	Annually	Use of spill kit practical demo
4	Flammable Gas Release	Annually	Awareness program
5	Fire Extinguisher	Half Yearly	Practical demo
6	Fire Drill	Quarterly	Practical demo of Hydrant system preparedness

7.7 Post-emergency assessment plan

After ensuring that the emergency is under control and over, the incident controller along with other officials shall assess the overall performance in responding to the situation along with assessment of the damage occurred if any. In case of possible contamination of water / or land, suitable remedial measures in consultation with the experts, would be taken up. Any need for updating of the emergency plan will also be reviewed.

Infrastructure

- **Emergency Control Room:** The emergency control room is to be set up and marked on the site plan. The control room will be the focal point in case of an emergency from where the operation to handle the emergency is directed and coordinated. It will control site activities and should be furnished with external and internal telephone connections, a list of essential telephone numbers, and a list of key persons and their addresses.
- **Assembly Points:** Assembly points are to be set up farthest from the location of likely hazardous events, where pre-designated persons from the works, contractors and visitors would assemble in case of emergency. Up to date list

of pre designated employees of various departments must be available at these points so that roll call can be taken. Pre-designated persons would take charge of these points and mark presence as the people come into it.

7.7.1 Occupational health and safety program for the project

Some of the preventive safety measures to be taken to minimize the risk of accidents with respect to technical safety, organizational safety and personal safety are listed below:

- All building plans and installations are to be as per relevant acts and duly approved by competent government authorities.
- Treatment equipment to be designed by qualified and experienced professionals and fabricated to applicable national/international codes with stage-wise inspection.
- Entire processes to be operated by trained workers and to be looked after by qualified & experienced supervisors.
- Safety features such as fire extinguishers, fire hydrant system and suitable Personal Protective Equipment (PPE) to be provided. Regular operations and testing of fire extinguishers are to be carried out.
- BMW to be stored separately to confine any spillage and facilitate easy collection.
- Periodic inspection and testing of equipment, types of machinery and equipment to be done.
- Training of workers and staff to be given for handling waste, firefighting, first aid and integrating safety, in all activities.
- Periodic health checkups for employees as per factories act during joining and once in six months shall be done.
- Suitable notices/boards to be displayed at several locations indicating appropriate hazard warnings as well as DOs and DON'Ts for ensuring operational and personal Safety for information of workers/staff and visitors.

7.8 Off-site Disaster management plan

When the damage extends to the neighbouring areas, affecting the local population beyond plant boundaries, an off-site emergency plan is put into action in which quick response and services of many agencies are involved. The off-site emergency plan shall be prepared in consultation with the factory management and Govt. agencies. The plan contains up-to-date details of outside emergency services and resources such as fire services, hospitals, police etc. with telephone numbers. The district authorities are to be included in the plan are:

- Police department
- Revenue department
- Fire brigade
- Medical department
- Municipality
- Electricity department
- Pollution control department
- Press and Media

➤ **Functions of the state crisis group**

- Review all district off-site emergency plans in the State with a view to examine its adequacy in accordance with the MSIHC amendment rules.
- Assist the state government in the planning, preparedness and mitigation of major chemical accidents at a site in the State.
- Continuously monitor the post-accident situation and review the progress.

➤ **Functions of the district crisis group**

- Assist in the preparation of the district's off-site emergency plan.
- Review all the on-site emergency plans prepared by the occupier of major accident hazards installation for the preparation of the off-site emergency plan.

- Assist the district administration in the management of chemical accidents at a site lying within the district monitor every chemical accident and ensure the continuous information flow from the district to the state.
- Conduct a full-scale mock-drill of a chemical accident at a site each year and forward a report of the strengths and the weaknesses of the plan to the state crisis group.

➤ **Functions of the local crisis group**

- Prepare a local emergency plan for the industrial pocket.
- Ensure dovetailing of the local emergency plan with the district off-site emergency plan.
- Train personnel involved in chemical accident management.
- Educate the population likely to be affected in a chemical accident about the remedies and existing preparedness in the area.
- Conduct at least one full-scale mock drill of a chemical accident at a site every six months and forward a report to the district crisis group

7.9 Hydro-geological Studies

7.9.1 Introduction

Geological and hydrogeological aspects were studied in the study area for physiography and topographical conditions, existing natural drainage, soil and geology, ground water conditions in and around the project site.

7.9.2 Physiography and natural drainage

The study area of the project is a 10 km radius and it is situated in the plain lands region, also the proposed project site is on a gentle slope as plain land. The topographic elevation in the study area ranges from 55 to 105 m above msl (mean sea level) and the slope is mainly towards the south direction, it has been shown in a contour map of the study area and project site is shown in **Figure 7.5 & 7.6** the climate is tropical wet and dry with moderate hot and humid conditions.

The natural drainage of the study area is ephemeral type consists of ponds, lakes, streams and a river. The 5 km radius drainage map of the study area with major waterbody features is shown in **Figure 7.7**. The study area falls in the Vaigai river basin.

7.10 Geology

The rock formations underlying belong to the quaternary-recent and archaean age period. The alluvium consists mostly of fine clay, silt and sand with other loose and unconsolidated sediments. The thickness of the alluvium strata varies from place to place, continuous to discontinuous, narrow to broad width, and has spread and covered near major streams and rivers. Below the topsoil, the deeper stratum is granite and laterite, sandstone and gneissic rocks. The geological formation of the region is given below:

Age	Group/formation	Lithology
Quaternary	Alluvium	Alluvium of unconsolidated sand, silt and clay; top-soil
Archaean	Peninsular gneissic complex-I	Granite

The landform consists of hills, dissected by valleys that are also undissected, and a pediment-pediplain complex. The project area is situated on the plain which is covered with moderately weathered material with mostly red soil at the top layer. The hill and upland areas are acting as runoff zones, and the pediment area as a recharge zone, these are contributing to groundwater development.

The type of soil found in the study area is red soil which is resulted from surrounding rocks. And also found alluvial soil which is mostly along and adjoining the flowing major streams and rivers in the study area and these consist mostly of sand, silt and clay with other coarse material. It occurs mostly as narrow and limited aerial extents with thickness varying from place to place on the ground, it is approximately 0.5 to 3 metres and more near the river course. place to place on the ground, it is approximately 0.5 to 3 metres and more near the river course.

Figure 7.5 Contour map of the study area

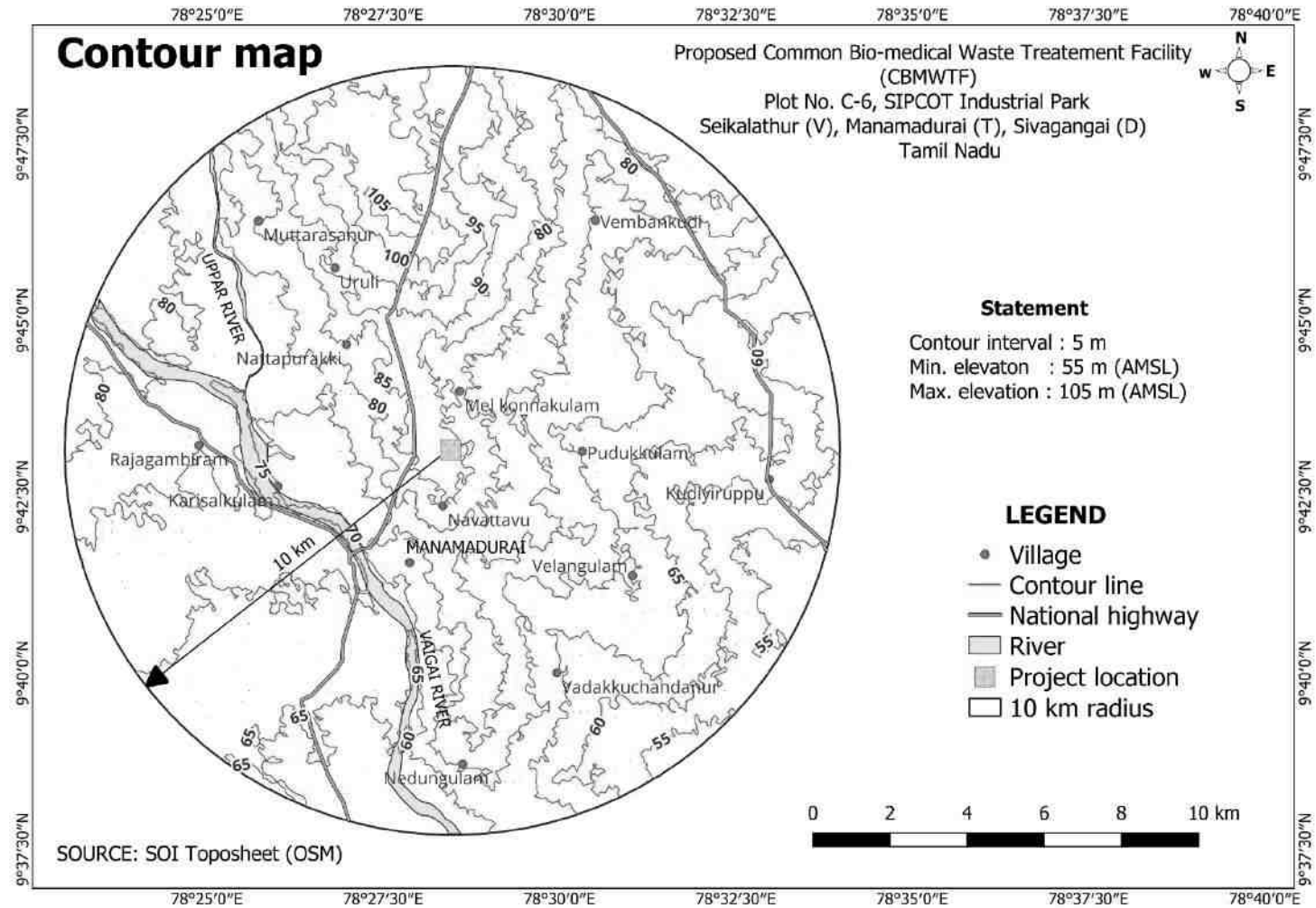


Figure 7.6 Contour map of project site

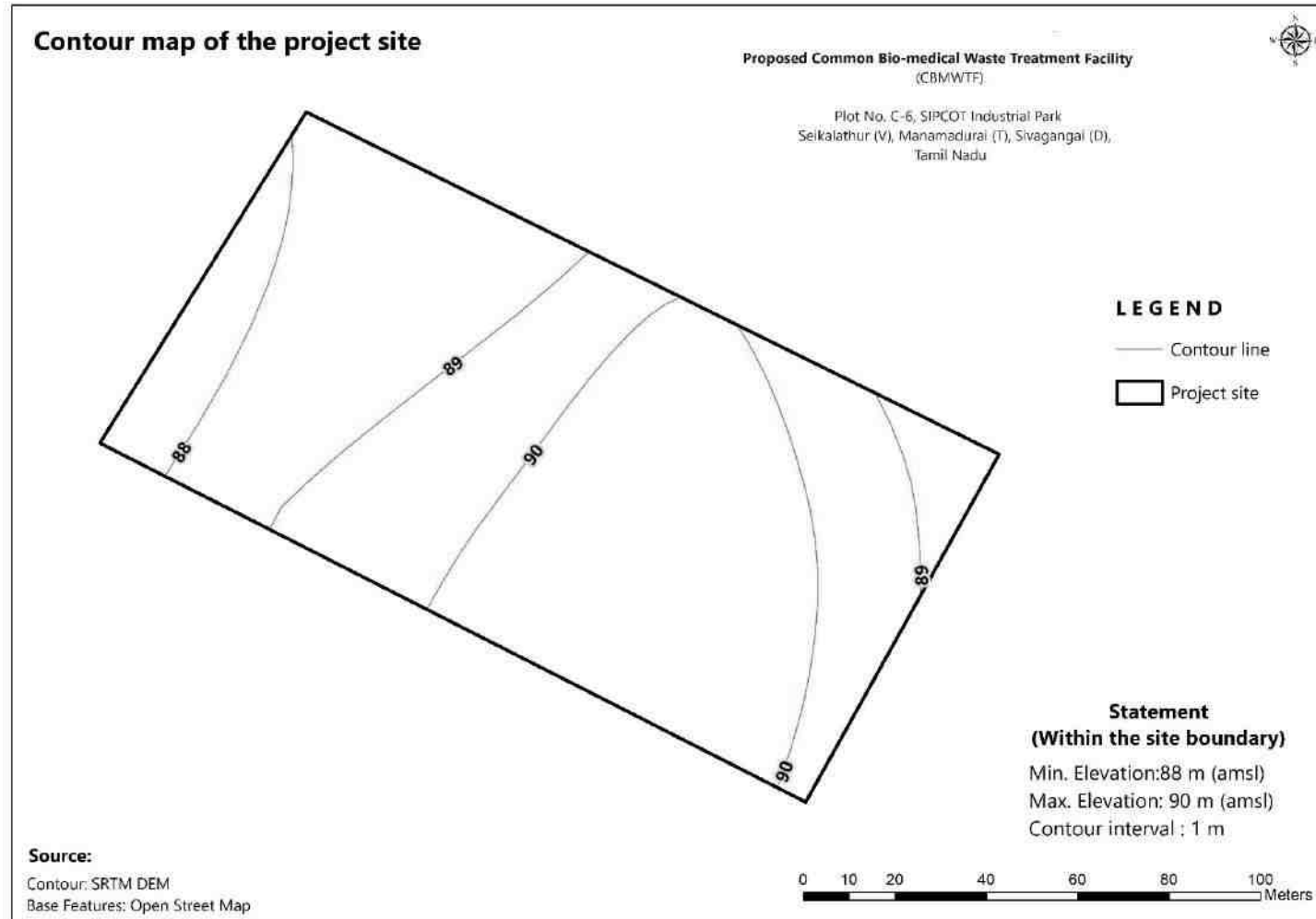
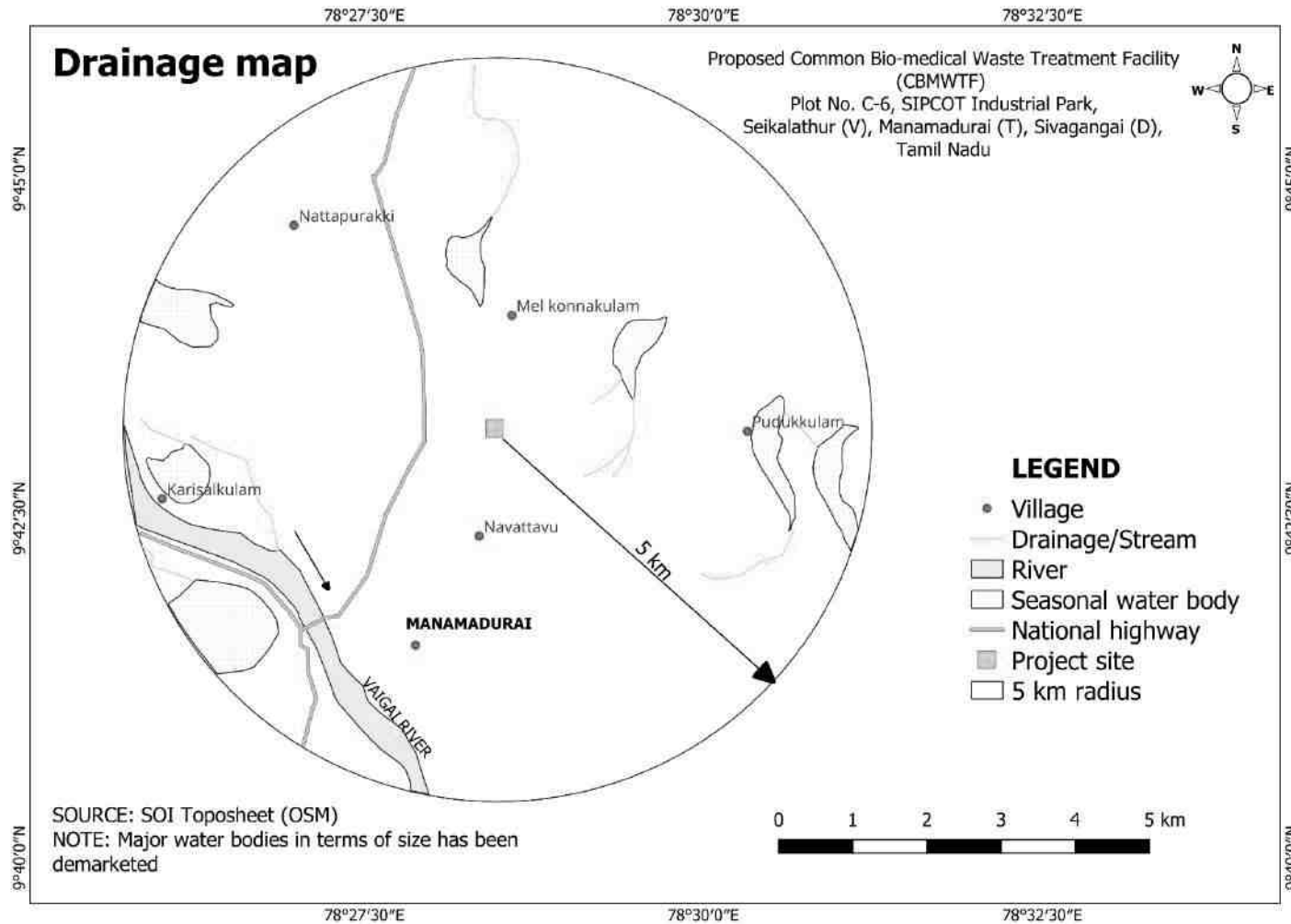


Figure 7.7 Drainage map of project site



The soil infiltration test was performed to estimate the rate at which the runoff will infiltrate into the native soil of the proposed project area. The test, measuring the drop in water level over a period of time (90 minutes elapsed time), was conducted at shallow depth, based on the double-ring infiltration method. The double-ring infiltration method was performed at the site, the infiltration rate estimated is 5.3 cm/hour and the test details are given in **Table 7.18**.

Table 7.18 Soil infiltration test result

Measured rate of infiltration	Location
5.3 cm/hour	9°43'9.08"N, 78°28'29.95"E (within site)
Note: Latitude and Longitude in degree minutes seconds (DMS), N is north, E is east.	

Based on the soil infiltration test result soil type is a sandy loam with gravel, which has spread and covered weathered material on the ground surface as an upper layer of the topsoil having movement of water with high infiltrability. The moderate water flow behaviour into the soil layer would be due to the deep and semi-assorted soil material in this area being very gentle slope and open plain with little scrubs, the subsurface soil-rock profile shown in **Figure 7.8**.

Figure 7.8 Lithological-log

Depth (m)	Litho-log	Lithological description
0 m		
0.5	1	Red sandy loam soil with fine gravels. (0 to 0.5 m)
2	2	Red colour, sandy loam soil and gravels of weathered material. (0.5 to 4 m)
3		
4		
5	3	Weathered and fractured rock, medium strength. (4 to 5 m)

Legend :

1	Sandy loam soil with fine gravels.
2	Sandy loam soil and gravels of weathered material.
3	Weathered and fractured rock, medium strength.

Note: Nature of stratum, as per open pit near the site and field observations; m is meter

7.11 Hydrogeology

The occurrence of groundwater is unconfined, semi-confined and confined aquifer conditions. The potential zones of the area would be mostly deeper depths. The depth to water level from the surface of the groundwater wells surrounding the project site varies between 4 and 14 m bgl (meters below ground level) collected during baseline survey. The depth of water level during post-monsoon as per CGWB varies from 5 to 15 m bgl. The water level depth of the study area is provided in **Table 7.19**.

As per the reported data, groundwater levels during pre and post-monsoon season vary between 6 and 7 m below ground level [data-source: India-WRIS website of the ministry of Jal Shakti of the GOI, district-level data of 2018]. The flow direction is mainly towards the south, and is known by the generalization of bore wells in hard rock areas, also by dug-wells, bore-wells in riverside areas. The groundwater contour map is shown in **Figure 7.9** the water yield of wells in hard rock areas would be

moderate. The quality of bore-well water is potable, it can be used for drinking and other purposes.

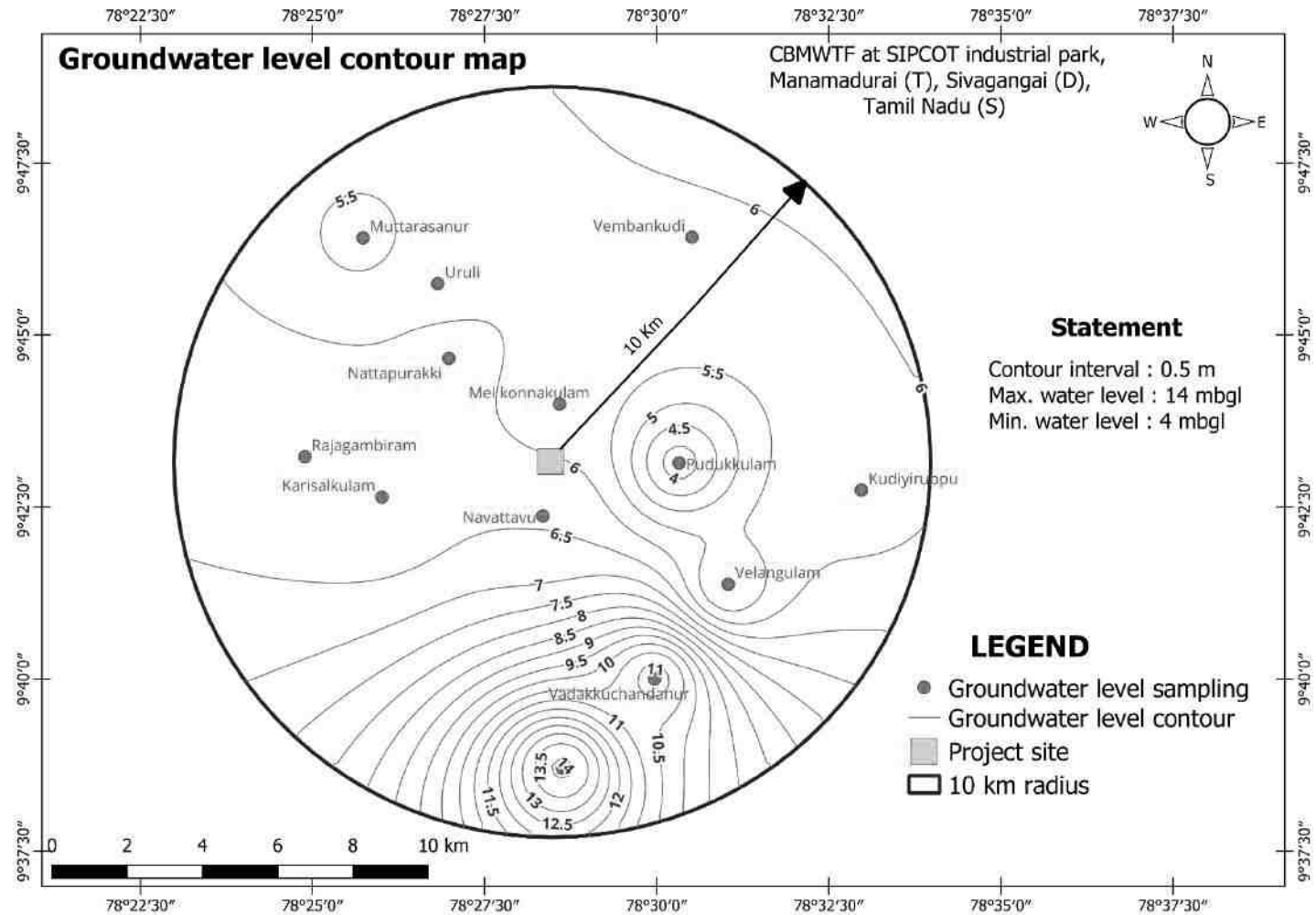
Table 7.19 Water-level depth data of wells

Well number	Place name	Distance & direction	Location coordinates		Water level (m)
GW1	Navattavu	1.5 km (S)	9°42'22.02"N	78°28'20.09"E	6.5
GW2	Mel konnakulam	1.5 km (N)	9°43'59.07"N	78°28'35.03"E	5.5
GW3	Pudukkulam	3 km (E)	9°43'08.05"N	78°30'19.05"E	4.0
GW4	Nattapurakki	3.5 km (NE)	9°44'39.05"N	78°26'58.09"E	6.0
GW5	Karisalkulam	4.5 km (WSW)	9°42'38.07"N	78°26'00.06"E	6.0
GW6	Uruli	5.5 km (NNW)	9°45'44.64"N	78°26'49.22"E	6.0
GW7	Velangulam	5.5 km (SE)	9°41'22.07"N	78°31'02.03"E	5.0
GW8	Rajagambiram	6 (W)	9°43'13.64"N	78°24'53.30"E	6.5
GW9	Vadakkuchandanur	6.5 km (SSE)	9°40'00.00"N	78°29'58.00"E	11.0
GW10	Vembankudi	7 km (NE)	9°46'25.10"N	78°30'30.80"E	6.0
GW11	Muttarasanur	7.5 km (NW)	9°46'24.56"N	78°25'44.06"E	5.5
GW12	Nedungulam	8 km (S)	9°38'42.04"N	78°28'37.08"E	14.0
GW13	Kudiyiruppu	8 km (E)	9°42'44.07"N	78°32'58.06"E	6.0

Note: geographic coordinates as latitude and longitude in degree minutes and seconds system, N is north, E is east; water level in meters (m) below ground level; well type, all are bore-wells except GW3.

Regarding the dynamic groundwater resource assessment, the stage of development is categorized as 'safe' in the assessment unit of manamadurai of sivagangai district in Tamil Nadu state [reference: CGWB 2022]. The project site is in a good potential zone, regionally, for the withdrawal of groundwater. The available resource is exploitable and also utilizable for local use.

Figure 7.9 Groundwater level contour map



Water conservation and storm water management

The fresh (natural) water will be conserved; and minimized by adopting good practices and using treated water for industrial and greenbelt.

The storm water drainage system will be integrated with rainwater harvesting system for more rainwater utilization and also to reduce runoff. It will comprise of inlet, drain pipes, culverts, manholes and outlets; the storm drains, sediment settling, etc., all along road-side and other areas, it will be open and/or slab type rectangular constructed with concrete cement to prevent water leakage. The storm water runoff volume is estimated, and is provided below in **Table 7.20**.

Table 7.20 Storm water runoff estimate

Type of surface	Area of surface (in square meters)	Yield of water (in cubic meters)
Built-up (roof-top)	: 210	2
Other built-up area	: 452	4
Greenbelt	: 4800	12
Open area	: 13847	104
Total volume available per hour ->		122
Note: Rainfall assumed 10 mm/hour. Built-up, includes 'admin building', waste storage shed, workers wash rooms and rest rooms; other built-up area, includes security, bmw processing shed; open area, includes vehicle parking, road, open and future expansion areas. Not included, underground water storage sump, ETP (62 sq.m). Runoff coefficient, percent values 90, 80, 25, 75, type-listed respectively.		

Rainwater from built-up areas will be collected during a rainy day, and channeled to storage sump for reuse. From road, parking, greenbelt, small built-up and other areas, will be collected separately and channeled to storm water drains for treatment (in-house effluent treatment plant), then is stored and reused: a fresh water conservation measure. Tanks will be constructed with reinforced concrete cement with water proofing material to avoid contamination to groundwater.

Size of drain: 0.5 m W × 1 m H

Size of tank: 3.5 m L × 3.5 m W × 1 m H

(where, 'm' is meter, 'W' is width, 'H' is Height, 'L' is length)

Rainwater should not be recharged artificially into groundwater to avoid contamination of groundwater and its aquifer zones; it will be harvested and then reused. Storm water will be fully utilized for project purposes. Excess treated storm water if any will be discharged-off to outside natural drains as per discharge standards. It will be ensured its pH and other important parameters are within standard limits before it gets released to outside water environment.

Use of natural water resources for the project:

The water is required for consumption for various purposes of project construction and operations, and during operations it will be for different project process activities mostly, and also partly utilized for drinking purposes, and the amount of water needed will be of adequate quantity every day. The fresh water needed for project operations will be sourced from SIPCOT industrial park/water tanker supply.

7.12 Geo-impacts:

Anticipated impacts on land and soil during the operation phase

The impact associated with land and soil erosion on the open land areas. There will be a loss of soil stability and soil erosion when surface water drains over them during rain which will be especially more during heavy rainfall. The eroded soil along with surface runoff will be carried from the site to the outside project area, resulting in water pollution to the surface waterbodies present at the downstream side. The spillages from stored containers of engine oil, solvents, process chemicals, and wastewater will leach into and pollute the soil.

Mitigation measures:

To avoid soil erosion problems, arrangements will be made to reduce water flow over bare and erodible soils and also reduce the velocity of flowing water, by carrying out effective re-vegetation of bare ground, creating storm water drainage system with culverts, ditches, surface water diversion channels and storm water pond (underground sump for water storage) for rain events which checks and also controls storm water flow velocities at a reasonable level. So, there could not be any significant

adverse effects to the soil, land and to surface waterbodies flowing at downstream. The engine oils, solvents, and process chemicals will be kept in containers in a safe and designated area only, to avoid leakages and accidental spills and further to avoid soil contamination. The floor surfaces of these storage areas are constructed with smooth and leak-proof construction material to obstruct any spillages to percolate into the ground.

Anticipated impacts on water resources during the operation phase:

In the project area, spillages from used engine oils, solvents, cleaning agents, chemicals, wastewater and contaminants, occur and percolate and infiltrate into the soil and pollute the ground water, and the surface runoff from these areas when mixed with water in the surface waterbodies also pollutes these surface waterbodies thereby causing environmental concern.

The fresh water requirement for the project operation purpose could have an impact on the ground water resources causing depletion locally, causing water-scarce situations, if it is the main source. The rainwater falling on the area, after contact with and/or if it passed through any waste material, the runoff from these areas will also pollute at the downstream surface water environment.

Mitigation measures:

All the contaminated water (first rainfall) will be diverted to the wastewater treatment plant (ETP). The storm water is separately diverted, and pre-treated, and then, the clean water will be diverted for reuse within the project site (facility) for process operations and other uses. The water quality of surface water drainage, and treated wastewater will be monitored within the facility area regularly to avoid damages. Also, there will be regular monitoring and reporting of water quality of both the surface and ground water samples within the study area during the entire operational life of the facility, as per pollution control board norms.

The process water, floor cleaning, vehicle and tank cleaning water will be treated in the ETP located in the premises and recycled for project operations and greenbelt development.

The water requirement for the project will be received from industrial water supply (SIPCOT industrial park/water tanker supply), so there would not have any major impact on the groundwater resource.

The project site is in a good potential zone, regionally, for the abstraction of groundwater. The available resource which is estimated for the net ground water availability as 1355 ham, after deducting natural discharge during the non-monsoon season out of the annual replenishable groundwater resources total 1500 ham, with annual draft for domestic, industrial and agriculture use is 140 ham and the stage of groundwater development is 10 per cent; (source: India-WRIS website of National Water Informatics Centre, Department of Water Resources, River Development and Ganga rejuvenation, Ministry of Jalshakti, GOI-2020), so there will be no impact on groundwater resource even if it is a secondary source.

All the rainwater from roof areas will be collected, pre-treated and harvested for use of facility operations and for greenbelt development. No water will be released to the outside environment. So, there could not be an impact to the surrounding environment neither to surface water resources, to the groundwater resources.

Impact on surface waterbodies and mitigative measures during rainy season:

No major impact is envisaged on surface waterbodies as rainwater harvesting (collection and reuse) and storm water drainage system is properly designed and maintained. There are no natural lakes or ponds present within the site, nor there is a any stream or river passing through the site. Hence the impacts will be minimal on the surface water bodies present outside the project area.

Effects of soil on water resources:

The soil found in the study area was originated and derived from the rock formations present in the higher elevated areas of hills and uplands and deposited in the

topographic lows. The soil is of medium porosity. The permeability is semi-pervious with slow flow, the infiltration rate would be low with 0.5 to 3 cm/hour approximately, this is indicating moderate water holding capacity of this soil type, and contributing to moderate to high surface runoff.

7.13 Emergency preparedness plan for district Disaster Mitigation Measures

The preparation for a natural disaster plan is also considered one of the primary components of the overall emergency preparedness plan. Natural disaster includes cyclones, floods, earthquakes, drought, etc. Floods and earthquakes are two of the most common natural disasters in India. These natural calamities can neither be predicted nor prevented. Owing to the rapid growth in urban population coupled with poorly built man-made structures and inefficient maintenance, there is a risk to life and property in the event of an earthquake and other natural hazards. Therefore, in order to reduce the risk of loss of human life and property and to reduce the cost to society.

Generally, Sivagangai District has major kinds of disasters droughts and occasionally floods. The District has a history of floods and drought conditions. Due to the depletion of the ozone layer and pollution, the average temperature during summer is becoming intolerable. Nevertheless, due to heavy downpours on the formation of cyclones, flash floods are common in this district (Sivagangai). District Disaster Management Authority adopted a continuous and integrated process of planning, organizing, coordinating and implementing measuring plans that are necessary and expedient for prevention as well as mitigation of disasters, under the supervision of the District Collector in consultation with all line departments in accordance with the provisions of the Disaster Management Act. 2005 at the Sivagangai district. The role and responsibilities of different government authority bodies involved in disaster management such as Government officials, the Public, the NGO sector, Civil Defence, and the community in disaster mitigation during different Natural Hazards of disaster are included in the Plan. The following details of the District disaster management plan as given in **Table 7.21**.

Table 7.21 Details of District disaster management plan

Hazards	General Mitigation measures	District Disaster Management Plan
Droughts	<ul style="list-style-type: none"> • Agriculture department will need to provide seeds for drought-resistant crops and any other assistance. Soft loans, subsidies and microcredit may need to be arranged. • Weekly monitoring of the season and crop condition from June onwards till the end of the season will be needed to make the required crop corrections. • Drinking water may need to be provided to the affected pockets with lorries. • Existing water sources such as ponds and small tanks may need simple treatment of bleaching powder to keep the water pure and free from contamination. • The thrust will also have to be on employment generation schemes that will provide cash liquidity in the hands of the people to survive drought. 	<ul style="list-style-type: none"> • Agriculture department will need to play a major role in the choice of drought-resistant crops, improved techniques of irrigation and advising the farmer on crops that are like to destroy livelihoods even if found successful initially. • Advanced technologies of irrigation will need to be promoted such as drip and sprinkler irrigation and water harvesting for agricultural requirements. This will bear benefits in the long – term. • Enforcement of laws regulating ground water levels is necessary before this disaster strikes. • In residential areas, water recycling for gardening purposes will ensure more economical use of water and promote water conservation.
Earthquake	<ul style="list-style-type: none"> • Rescue operation is to be started as quickly as possible with the help of different agencies such as the Army, Security force, Police personnel, Civil Defense, N.G.Os, P.W.D., and Fire Brigade etc. Escape procedures, emergency escape routes, and congregation points should be demarcated and included in the response plan. • Rescued people should be shifted to the nearest rescue shelters. 	<ul style="list-style-type: none"> • Capacity Building: Ensure flood/earthquake search and rescue materials are purchased and kept at a local level. • Arrangements for relief, treatment and rehabilitation should be made later like other diseases.

	<p>Wounded people are to be shifted to the nearest PHC/Hospital.</p> <ul style="list-style-type: none"> • TNEB will take the necessary steps to clear the fallen electric poles, and wires, and, restore of power supply as quickly as possible. 	<ul style="list-style-type: none"> • Flood/Earthquake related departmental action plan and SOP. • Imparting training to the stakeholders involved in flood/earthquake mitigation and management.
Floods	<ul style="list-style-type: none"> • Before monsoon season, de-silting and inspection of the storm water drainage system shall be undertaken to remove any choke-ups/bottlenecks. • Greenbelt development shall be undertaken as much as possible to prevent soil erosion and water run-off. 	<ul style="list-style-type: none"> • Develop a database for disaster management. • Develop Geographic Information System (GIS) based information system for different sectors viz. medical and health, civil supply, fire and emergency services, etc. • Resource mapping and regular updating of real-time data. • Resource mapping and regular updating of real-time data. • Form the Early Warning Teams at the village level and train them on EWS. Ensure the teams are ready with communication equipment around the clock. • Periodical review of the procedures and systems about preparedness and relief. • Strengthen emergency management systems at the taluk and subdivision levels.
<p>Sources: District Disaster Management Plan - 2017 Of Sivagangai District.</p>		

CHAPTER 8 – PROJECT BENEFITS

Chapter 8

Project Benefits

8.1 Introduction

In the context of medical procedures like patient treatment and laboratory sample analysis, hospitals produce substantial amounts of "Bio-medical Waste." Improper disposal of these wastes can pose environmental risks. Due to the infectious nature of this waste, it is crucial to handle and manage it professionally, as it can potentially harm both human health and the environment. Therefore, it has become essential to closely monitor and regulate the management and handling of these biomedical wastes.

Inadequate waste segregation results in the mixing of hospital waste with general waste, leading the entire waste stream hazardous. This improper segregation subsequently leads to improper waste disposal methods. It is essential to address this issue due to the potential transmission of communicable diseases, which can be spread through various means such as water, sweat, blood, bodily fluids, and contaminated tissues. Biomedical waste scattered in and around hospitals attracts flies, insects, rodents, cats, crows and dogs, creating conditions conducive to the transmission of diseases like plague and rabies. Furthermore, individuals involved in sorting hospital waste, such as rag pickers, are at risk of contracting tetanus and HIV infections. Moreover, the recycling of disposable items like syringes, needles, and glass bottles without proper sterilization can contribute to the transmission of diseases such as hepatitis, HIV, and other viral infections. Therefore, it is imperative to address these issues to ensure proper waste management and prevent the spread of diseases.

A Common Bio Medical Waste Treatment Facility is crucial for public health and environmental protection. It offers a controlled environment for advanced biomedical waste treatment, employing strict protocols to reduce contamination risks. This

ensures the safety of healthcare workers, patients, and the community while minimizing harm from infectious materials to both health and the environment.

8.2 Benefits from Biomedical Waste

8.2.1 Physical Infrastructure

The construction and maintenance of a biomedical waste treatment facility often require infrastructure investment in terms of roads, utilities, and transportation systems. This can improve local infrastructure and accessibility and also the facility is equipped to handle infectious waste during public health emergencies. The presence of a facility strengthens the community's capacity to respond to outbreaks or disasters effectively.

Properly managed and regulated biomedical waste treatment facilities can enhance property values in the surrounding area by reducing concerns about environmental hazards and improving the overall quality of life.

The basic requirement of the local community needs will be strengthened by extending healthcare to the community, and building /strengthening existing roads in the area which will help in uplifting the quality of living standards of local communities.

Biomedical waste treatment facilities typically incorporate advanced technologies for pollution control and waste reduction. This commitment to environmental responsibility contributes to the sustainability and attractiveness of the local area.

8.2.2 Employment Opportunities

This Biomedical waste treatment facility require a skilled & unskilled workforce for their operation and maintenance and it also creates job opportunities for local residents, including positions in waste handling, facility management, and administrative roles.

The operation of a treatment facility can stimulate economic activity in the area. It generates revenue for the facility itself and can also lead to the growth of related businesses, such as waste collection and transportation services.

The construction and operation phase of the proposed project will involve a certain number of labourers, contractors and construction workers. The operation phase will involve a number of skilled and unskilled workers and hence improve the existing employment scenario of the region.

8.3 Improvements in the Social Infrastructure

The proposed project is not under the Agriculture/ farming land, it is barren land under the SIPCOT industrial area developed by the Tamil Nadu state government. The proposed project will lead to generating indirect and direct employment opportunities. Employment is expected during construction and operation phases, waste lifting and other ancillary services. Employment in these sectors will be temporary or contractual and involvement of unskilled labour will be more. This will enhance their income and lead to overall economic growth of the area.

The following changes in socio-economic status are expected to take place with this project.

- The project is going to have positive impact on consumption behavior by way of raising average consumption and income through multiplier effect.
- The project is going to bring about changes in the pattern of demand from food to non-food items and sufficient income is generated.
- Due to the corporate social responsible activities by project authorities, the socio economic condition of the people will be improved.
- People perceive that the project will in the long run help in the development of social infrastructures/such as.
 - Education facilities
 - Banking facilities
 - Post offices and Communication facilities

- Medical facilities
- Plantation and parks
- Community facilities

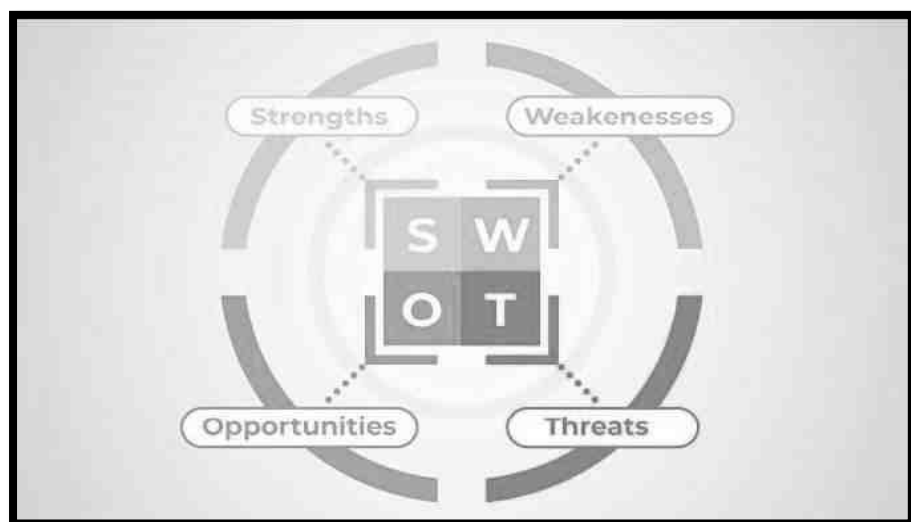
Industrial development and consequent economic development should lead to improvement of the environment through better living and greater social awareness. On the other hand, the proposed project is likely to have several benefits like improvement in indirect employment generation and economic growth of the area, by way of improved infrastructure facilities and better socio-economic conditions. Better hygienic conditions, as Bio-Medical waste with solid waste being dumped at several places will be brought to one place for further treatment and scientific disposal.

8.4 Other Tangible Benefits

- **Reduced costs of waste disposal:** The common facility can centralize the disposal of biomedical waste, which can lead to economies of scale and lower costs for everyone.
- **Reduced risk of infection and disease transmission:** The proper treatment of biomedical waste can help to reduce the risk of infection and disease transmission. This is important for protecting public health.
- **Improved environmental quality:** The proper treatment of biomedical waste can help to improve environmental quality by preventing the release of harmful chemicals and pathogens into the air, water, and soil.
- **Increased safety and security:** The common facility can help to increase safety and security by preventing the illegal dumping of biomedical waste. This can help to reduce the risk of fires, explosions, and other environmental hazards.
- **Creation of jobs and boost to the local economy:** The construction and operation of the common facility can create jobs and boost the local economy. This is because the facility will require a variety of workers, including engineers, technicians, and administrative staff.

- Improved housing demand for rental accommodation will increase: The presence of the common facility can attract new businesses and residents to the area, which can lead to an increase in demand for housing.
- Cultural, recreation and aesthetic facilities will also improve: The increased tax revenue generated by the common facility can be used to improve cultural, recreation, and aesthetic facilities in the area. This can make the area more attractive to businesses and residents.
- Improvement in communication, transport, education, community development and medical facilities: The increased tax revenue generated by the common facility can also be used to improve communication, transport, education, community development, and medical facilities in the area. This can improve the quality of life for everyone in the community.
- Overall change in employment and income opportunity: The combination of all of these factors can lead to an overall change in employment and income opportunity in the area. This can make the area a more desirable place to live and work, which can further boost the local economy.

SWOT Analysis



SWOT Analysis is a useful technique for understanding your Strengths and Weaknesses, and for identifying both the Opportunities open to you and the Threats

you face. What makes SWOT particularly powerful is that, with a little thought, it can help you uncover opportunities that you are well placed to exploit, by understanding the weaknesses of your business, you can manage and eliminate threats that would otherwise catch you unawares.

More than this, by looking at yourself and your competitors using the SWOT framework, you can start to craft a strategy that helps you distinguish yourself from your competitors, so that you can compete successfully in your market and it views all positive and negative factors inside and outside the firm that affect the success. A consistent study of the environment in which the firm operates helps in forecasting/predicting the changing trends and also helps in including them in the decision-making process of the organization.

The other approaching method that can be implemented was SWOT analysis. SWOT is an acronym for strengths, weaknesses, opportunities and threats. A SWOT analysis is a technique commonly used to assist in identifying strategic direction for an organization or practice.

The strengths and weaknesses of a system are determined by internal elements, whereas external forces dictate opportunities and threats. Strengths can be defined as any available resource that can be used to improve its performance. Weaknesses are flaws/shortcomings of any system that may cause to lose a competitive advantage, efficiency or financial resources.

Strengths:

- Employing scientific method for disposal of Bio-Medical waste.
- Recovering reusable and receiving recyclable materials from Bio-Medical Waste.
- Cheaper option for disposal of Bio-Medical waste in scientific manner.
- Maintenance of the project site more properly to prevent the effect to the surrounding area and environment with using the sufficient equipment and facilities, and the technology such as daily cover and insect prevention.

Weakness:

- High capital investment for treatment of Bio-Medical waste.
- Availability of out dated data about Bio-Medical waste generated.

Opportunities:

- Facilities available for similar kind are expensive or of poor environmental conditions.
- Having a brand name in waste management operations in all other parts of country.
- No other facility is available to cater BMW of manamadurai.

Threats:

- Service providers from other facilities far away from manamadurai are allowed to cater. This lead to non-compliance of timeline for treatment of BMW.
- New marketing companies launch by competition.
- Strong relationship between treatment facilities and hospitals.

8.5 Conclusion

In this study, SWOT analysis was determined that the strategic that contain with building on strengths, minimizing weaknesses, exploring opportunities and counteracting threats. Strategies have been identified and formulated from the SWOT matrix in relation to increasing government role, participation of the inhabitant and CBWTF conditions for the Bio-Medical waste management.

The strategies that resulted from this analysis were focused on the inhabitant participation and environment consideration. For purposeful of the inhabitant participation, strategies that arise was connected with the educating the inhabitant, increasing the role of student and young people to involve in the system, increasing the awareness, increasing the effort to recycle and encourage the habitant to use the recycle material. All the strategies cannot be conducted by the community or by the government separately.

The strategies for the environment consideration were focused in managing the Common bio-medical waste management facility site more properly. The strategies were concern to prevent the bad effects to the environment and the influence of the CBWTF site operation to the inhabitant at the surrounding area.

The analysis result showed that SWOT analysis was the one of approaching system that could be used as the tools for maintaining the Bio-Medical waste management system in with the strategies that use the inhabitant participation and environment as the considering factors for approaching.

CHAPTER 9 – COST BENEFIT ANALYSIS

Chapter 9

Cost Benefit Analysis

9.1 Introduction

Cost-benefit analysis is a procedure for evaluating the desirability of a project by weighting benefits against costs. Results may be expressed in different ways, including internal rate of return, net present value and benefit-cost ratio. Appraisal of proposed CBWTF project should be considered as the project makes a positive contribution to the country's economy, technically feasible and environmentally sound and sustainable.

There are good reasons for estimating cost - benefit of major environmental inputs and including them in a project economic analysis. Such analysis would result in:

- More accurate estimates of CBWTF project development impacts
- Inform action base for investment decision making
- Development of an environmental management tool for CBWTF project

These above activities require additional expenses. The cost-benefit analysis has been confined to direct or indirect, costs and benefits. The environmental impacts are quantified as much as possible by measuring the change in output that these impacts cause in the economy. The environmental impacts identified for CBWTF project were measured in two scenarios:

- The proposed 5.5 TPD of CBWTF operates without making any investments for environmental improvements, i.e., without any environmental management
- Environmental investments are implemented as planned and BMW treatment are continued without any hindrance

Differences in the environmental impacts projected in the "with" and "without" scenarios represent environmental costs and benefits quantified and monetized. Costs for this project are mainly investments and operating costs of the new equipment to reduce pollution level to the prescribed national standards.

9.2 Pollution levels from the CBWTF facility

Prior to the environmental investment, the proposed 5.5 TPD CBWTF is expected to generate air emissions, wastewater and solid waste from all the project activities. The dust generation (particulate matter) unit's sets to be established in the CBWTF is estimated by considering the combustion process and stack details of all the DG sets.

The proposed 5.5 TPD CBWTF facility will be developed in an area of 3.6 ac (14569 sq.m) with all supporting auxiliary units. The proposed treatment units consists of 2 × 250 kg/hr incinerator, 1275 liters/batch vaccum based autoclave and 250 kg/hr of shredder along with 8 KLD of ETP for treating the wastewater generated form BMW process & operations. The site is allotted at SIPCOT industrial park near Manamadurai (T), Sivagangai (D), Tamil Nadu.

The proposed incinerators shall be equipped with all necessary Air Pollution Control Devices (APCDs) to comply with prescribed emission norms. Necessary precautions shall be taken to minimize odour and noise. Wastewater generated from the from floor washing/vehicle and container washing shall be treated in Effluent Treatment Plant (ETP). Treated wastewater shall be reused for floor/vehicle washing, greenbelt etc. Ash generated from the incineration and sludge generated from the ETP shall be stored temporarily with proper lining and impervious flooring and eventually will be sent to CHWTSDF.

The proposed project will generate employment opportunities for the local people. Proposed project, setting up of the CBWTF includes Incinerator, Autoclave, Shredder and Effluent Treatment Plant which will create employment including skilled as well as unskilled staff directly or indirectly. During Construction phase, the labors and workers will be hired from nearby villages. Around 50 number of employees are required during operation and construction phase.

The common facility is essential for effective treatment and disposal of BMW generated in the Manamadurai. The estimated cost of the project is Rs. 4.96 crores. The overall cost of environmental investments as EMP budget for the proposed

CBWTF is 49.6 lakhs capital cost and 4.96 lakhs per annum as recurring cost. The project is technically feasible and financially viable.

The Cost Benefit Analysis (CBA), of CBWTF project is to establish an applied welfare economics approach to estimate and compare the total project costs and benefits of alternative policies and scenarios. Construction and operations of all the air and water pollution control facilities involve a range of direct and indirect costs. The operations & maintenance (O&M) costs mainly include raw materials, labour costs, and maintenance of treatment facilities/equipment such as flue gas neutralisation system, wastewater treatment system and training to the employees. Many infrastructure facilities like water supply lines, firefighting systems, electric grid supply, roads and admin buildings, storage yards shall be provided.

Unregulated biomedical waste:

Unregulated BMW management is a public health problem. This has posed a grave threat to not only human health and safety but also to the environment for current and future generations. Safe and reliable methods for handling of BMW are of paramount importance. Effective BMW management is not only a legal necessity but also a social responsibility.

Due to the proposed facility, hazardous bio medical waste will be properly treated and disposed but lack of segregation practices, results in mixing of hospital wastes with general waste making the whole waste stream hazardous. Inappropriate segregation ultimately results in an incorrect method of waste disposal. Various communicable diseases, which spread through water, sweat, blood, body fluids and contaminated organs, are important to be prevented. The bio medical waste spread in and around the hospitals calls flies, insects, rodents, cats and stray animals that are responsible for the spread of communication disease like plague and rabies. Rag pickers in the hospital, sorting out the garbage are at a risk of getting tetanus and HIV infections. The recycling of disposable syringes, needles and other article like glass bottles without proper sterilization are responsible for Hepatitis, HIV, and other viral diseases. From the proposed facility, these kinds of diseases shall be prevented from spreading by providing proper mitigation measures like contacting animal

shelter, providing rodent safety system, rodent proofing, environmental sanitation, proper food storage etc. from the bio medical wastes.

9.3 Conclusions

From an economic, social and environmental perspective the proposed CBWTF project is desirable and it becomes even more desirable by employing scientific method for disposal of and treatment of BMW. Recovering reusable and receiving recyclable materials from BMW. Creation of jobs and boost to the local economy by providing employment opportunities to the local people. Through planned landscaping & greenbelt development adding to the scenic beauty and aesthetics of area within & surrounding the project area, improving the quality of life of the surrounding population and economic growth of the region.

CHAPTER 10 – ENVIRONMENTAL MANAGEMENT PLAN

Chapter 10

Environmental Management Plan

10.1 Introduction

An Environmental Management Plan (EMP) has been prepared for the facility, to minimize negative impacts and is formed on the basis of prevailing environmental conditions and likely impacts of this project on various environmental parameters. This plan will also facilitate monitoring of environmental parameters. The management action plan aims at controlling pollution at the source level to the possible extent with all the available and affordable technology followed by treatment measures before they are let out/discharged. The following mitigation measures are proposed in order to reduce or eliminate environmental consequences that are anticipated to be produced by the proposed project.

10.2 Purpose of environmental management plan

The purpose of environmental management plan are:

- To treat and dispose of all the pollutants viz. air, liquid, gaseous and solid waste to meet the applicable emission standards through utilization of best available control technology.
- To support and implement work to achieve environmental standards and to improve the methods of environmental management.
- To promote greenbelt development.
- To encourage good working conditions for employees.
- To reduce fire and accident hazards.
- Budgeting and allocation of funds for environment management system.

10.3 Environmental management during construction phase

The impacts during construction phase on the environment would be of temporary nature and are expected to reduce gradually on completion of the construction activities.

10.3.1 Air quality mitigation measures

For the proposed project, site leveling and grading will be carried out if required, wherever possible. To maintain the natural elevations they will not be disturbed and only leveling activity will be carried out for providing roads, sewage network, storm water system, and places required for construction of sheds and administrative buildings. According to the engineering assessment, most of the excavated soil generated during construction activities will be reused within the project site for leveling during road formation etc. The excess, if any, will be given to local contractors for disposal in low lying areas, road construction use etc.

During construction period most of the dust will be generated from the movement of construction vehicles on unpaved roads. Unloading and removal of soil material shall also act as a potential source for dust nuisance. The control measures proposed to be taken up are given below:

- Water sprinkling on main haul roads in the project area will be done, at least twice a day. If need arises, frequency will be increased on windy days, to ensure 50% reduction on the dust contribution from the exposed surface.
- The duration of stockpiling of excavated soil will be as short as possible as most of the material will be used as backfill material for the open cut trenches for road development.
- Temporary tin sheets of sufficient height (3m) will be erected around the site of dust generation or all around the project site as barrier for dust control.
- Tree plantations around the project boundary will be initiated at the early stages or by regular watering so that the area will be moist for most part of the day.
- All vehicles carrying raw materials will be instructed to cover with tarpaulin / plastic sheet, unloading and loading activity will be stopped during windy period.
- To reduce the dust movement from civil construction site to the neighborhood external part of the construction activity will be covered by plastic sheets.

10.3.2 Water quality mitigation measures

During site development, necessary precautions will be taken, so that runoff water from the site gets collected to working pit and if any over flow, will be diverted to nearby greenbelt / plantation area. During construction activity, all the equipment washed water will be diverted to working pit to arrest the suspended solids, if any, and the settled water will be reused for construction purposes, and for sprinkling on roads to control the dust emission, etc.

The waste generated from the site workshop will be segregated such as used oil, lubricants, etc. and disposed to authorized recyclers. The domestic wastewater generated from temporary toilets, used by the work force, will be diverted to mobile STP / septic tank / soak pit. Therefore, impact on water quality due to proposed unit would be insignificant.

10.3.3 Noise mitigation measures

Noise generating equipment will be used during daytime, for brief period of its requirement. Proper enclosures will be used for reduction in noise levels. Wherever possible the noise generating equipment will be kept away from the human habitation. Temporary tin sheets of sufficient height (3m) will be erected around the noise generating activity or all around the project site as barrier for minimizing the noise travel to surrounding areas. Therefore, impact on noise environment due to proposed project would be insignificant.

All vehicles entering into the project will be informed to maintain speed limits, and to not blow horns unless it is required. Personal protective equipment like earmuffs, helmets covering ears would be provided to the workers working near noise generating equipment and would see that workers use the protective gadgets regularly.

10.3.4 Solid waste mitigation measures

The solid waste generated during construction period being predominantly inert in nature, construction and demolition waste does not create chemical or biochemical pollution. However maximum effort would be made to reuse and recycle them. The

most of the solid waste material will be used for filing/levelling of low-lying areas, as road construction material, if any excess given to local contractors for lifting and dumping in low lying areas. All attempts would be made to stick to the following measures.

- All construction waste shall be stored within the site itself. A proper screen will be provided so that the waste does not get scattered.
- Attempts will be made to keep the waste segregated into different heaps, as far as possible, so that their further gradation and reuse is facilitated.
- Materials, which can be reused for purpose of construction, levelling, making roads will also be kept in separate heaps from those, which are to be sold.

The use of the construction material basically depends on their separation and conditions of the separated material. A majority of these materials is durable and therefore, has a high potential for reuse. It would, however, be desirable to have quality standards for the recycled materials. Construction waste can be used in the following manner:

- Reuse of bricks, tiles, stone slabs, timber, piping railings etc. to the extent possible and depending upon their conditions.
- Sale/ auction of materials which cannot be used at the site due to design constraint
- Plastics, broken glass, scrap metal, used cement bags, etc. can be sent for recycling in the industries.
- Rubble/ brickbats can be used for building activity, such as leveling, under coat of lanes where the traffic does not constitute heavy moving loads.
- Larger unusable pieces can be sent for filing up low-lying areas.
- Fine material such as sand, dust, etc. can be used as cover material.
- The unearthed soil can be used for leveling as well as for lawn development.
- The broken pieces of the flooring material can be used for leveling in the building or can be disposed off.
- The unused or remaining paints/varnishes/wood can either be reused or can be disposed.

10.3.5 Land environment

Following steps are proposed to take care of impact of construction activity on project land area:

- On completion of civil works, all debris etc., will be completely removed from site to avoid any incompatibility with future use.
- Other materials like paint, diesel etc., will be properly stored and handled to prevent any spillage on land.
- All the wastes will be stored at a designated site within the premises to prevent scattered discharge on land.

10.3.6 Ecology

During construction phase, the proposed facility will not involve any tree cutting exercise. There could be levelling of the site in order to prepare the site for construction, the top soil from the construction area will be collected and will be stored separately and will be used for greenbelt development. However, about 33% of total plot area is proposed for greenbelt development.

10.3.7 Socio-economic

Overall, socio-economic effect of construction phase will be positive due to direct and indirect employment opportunity. Skilled and unskilled people will be employed during construction and operation of the facility.

10.4 Environmental management during operations phase

Comprehensive and effective EMP has to be prepared and implemented to safe-guard environment during operations phase.

10.4.1 Air quality management including odour control

The air pollutants in the plant may be classified broadly into particulate matter like dust, fumes etc. and gases like sulphur dioxide, nitrogen oxide and hydrogen chloride etc. The measure to control the air pollution will ensure the AAQ standards as laid down by central pollution control board for industrial areas. The system proposed for air pollution control will provide acceptable environment condition in the working

areas and abate air pollution in the surrounding area of the plant. Depending on quality of emission from different sources, suitable air pollution control system will be provided. The chimney height will be as per CPCB norms to ensure ground level concentration of different pollutants within permissible limit.

Following measures are proposed to mitigate negative impact of operation phase of the project on the surrounding air environment:

- Incinerator stack will have stack monitoring facility (SMF) consisting of sampling port-hole, platform and access ladder. DG sets will be provided with a stack height meeting MoEF&CC guidelines. Height of the stacks will be as per statutory requirement.
- Adequate spares of critical components of dust collection systems will be kept to ensure trouble – free operations and continuous compliance to emission norms.
- Transport vehicles will be properly maintained to reduce air emissions.
- Vehicles will be periodically checked for pollutant emissions against stipulated norms.
- Idle running of vehicles will be minimized during material loading / unloading operations.

Odour Control

Odour management is one of the issues in CBWTF. The main aim is to minimize the number of sources of odour generation, which exist in site. To undertake direct management of odour generating sources that give rise to odour problems.

The mitigation measures proposed to minimize and control odour are as follows.

- It shall be ensured that the total time taken from generation of BMW to its treatment, which also includes collection and transportation time, shall not exceed 48 hours.
- During transportation, the containers should be covered in order to prevent exposure of public to odours and contamination.

- Good housekeeping practices.
- Dilution of odour concentration by spraying ecosorb (organic and biodegradable chemical) around odour generation areas at regular intervals.
- Plantation of trees to reduce the odour and to carry out the process in closed room for controlling/minimizing odour

10.4.2 Water quality mitigation measures

Total water requirement for the proposed facility is estimated to be around 35 KLD. Water conservation measures will be taken to optimize the fresh water requirement. Moreover, record of water consumption for different usages will be maintained.

- Wastewater generated will be treated in in-house ETP and will be reused for greenbelt, floor/vehicle washing etc.
- Proper and sufficient sanitary facility will be provided to workers to maintain hygienic conditions at site. The sewage is disposed by the mobile STP/ septic tank/soak pit.
- Maximum use of treated wastewater within the plant will be adopted to minimize consumptive water requirements and to achieve “zero” effluent discharge from the plant.
- Record of the wastewater generation and recycle will be maintained on printed logbook/computer.
- Proper housekeeping will be adopted to prevent spillages and contaminated surface runoff going to storm water drains.
- **Storm water drains**

Storm water drains will be provided throughout the facility taking topography into consideration. The rainwater from the roof areas will be collected and stored in the rainwater collection sump after necessary treatment and reused for various project activities and greenbelt.

10.4.3 Noise levels management

The main sources of noise generation are due to movement of vehicles carrying waste, all vehicle (drivers) entering the project will be informed to maintain speed limits, and not blow horns unless it is required.

The other areas where noise generation is anticipated is incinerator section, DG set room, necessary personal protective equipment like earmuffs, helmets covering ears etc., would be provided to the workers working near noise generating equipment and would see that workers use the protective equipment regularly. Regular maintenance of the equipment will be carried out as per the schedule given by suppliers. The noise pollution management measures proposed is given below:

- Acoustic enclosure for all the high noise level equipment
- All the design/installation precautions as specified by the manufacturers with respect to noise control are strictly adhered
- Major noise generating sources are insulated adequately by providing suitable enclosures
- Other than the regular maintenance of the various equipment, ear plugs are provided to the personnel close to the noise generating units
- All the opening like covers, partitions shall be designed properly

10.4.4 Solid waste management

Solid wastes shall be generated in the form of incineration ash from incinerator, ETP sludge from ETP process and used oil from the plant utility. Following steps shall be taken:

- Incineration ash from incinerator will be temporarily stored at ash storage pit with proper lining and impervious flooring and eventually will be sent to nearest TSDF.
- Used oil will be stored properly and re-used as lubricants in the machineries within the premises only.
- Record of solid waste generation and disposal shall be maintained.
- All necessary precautions shall be taken during handling, loading and unloading of solid waste.

10.4.5 Land environment

Waste such as incineration ash generated in the process of incineration is stored in a temporary ash storage area with proper lining and impervious flooring, so as to avoid entry of rainwater during the monsoon and for easy collection and will eventually be sent to nearest TSDF.

10.4.6 Socio - economic

The Socio – economic impact of operational phase will be positive due to direct and indirect employment opportunity for the local villages. Skilled and unskilled people will be employed during construction and operation of the facility.

10.4.7 Ecology

There is no ecological and sensitive areas viz. wildlife sanctuary, national parks, archeologically important areas within 10 km radius of the project site. There are no known rare, endangered or ecologically significant animal and plant species. Due to the development of greenbelt at the project vicinity, the impact on the ecology will be minimal.

10.4.8 Greenbelt development

Greenbelt will be developed for the proposed project in an area of 4800 sqm (0.48 ha) covering 33% of total plot area. Total 960 Trees and small plants will be planted under Greenbelt development considering 2000 Trees/ha of area. The greenbelt will be developed all along the road, around the project boundary, 5-10 m wide green buffer shall be developed along the boundary of the project and 1-2 m wide buffer along the road (two sides). Proper measure will be taken to maintain the greenery. A list of plants suggested for greenbelt and avenue plantation as per CPCB guidelines is given in **Table 10.1**. Greenbelt will be developed in phase wise manner up to 3 years. An amount of around Rs.4.93 lakhs has been allocated as capital cost for greenbelt development in the EMP budget. The action plan for greenbelt development is given in **Table 10.2**.

Table 10.1 List of plants for greenbelt development

Sl. No.	Species name	Common name	Type	Number & Location for greenbelt development			Total
				Boundary (1 st Year)	Along road (1 st & 2 nd Year)	Internal plantation 2 nd and 3 rd Year)	
1	<i>Acacia auriculiformis</i>	Aakashmani	T	20	30	-	50
2	<i>Acacia nilotica</i>	Gum arabic tree	T	30	-	-	30
3	<i>Adina cordifolia</i>	Sapodila	T	30	20	20	70
4	<i>Ailanthus excelsa</i>	Tree of heaven	T	30	25	-	55
5	<i>Albizia lebbek</i>	Indian siris	T	25	20	15	60
6	<i>Albizia amara</i>	Usil	T	25	15	15	55
7	<i>Bauhinia purpurea</i>	Kachnaar	T	-	30	25	55
8	<i>Bauhinia racemosa</i>	Kachnaar	T	-	25	20	45
9	<i>Bauhinia tomentosa</i>	Kachnaar	T	-	25	20	45
10	<i>Dillenia indica</i>	Elephant Apple, Indian Catmon	T	25	20	10	55
11	<i>Diospyros sesamum</i>	Coromandel ebony	T	-	25	20	45
12	<i>Hibiscus rosa-sinensis</i>	China rose	T	-	20	20	40
13	<i>Lagerstroemia speciosa</i>	Pride of India	T	30	20	20	70
14	<i>Madhuca longifolia</i>	Mahua	T	30	-	-	30
15	<i>Pongamia pinnata</i>	Karanj	T	30	20	20	70
16	<i>Saraca asoca</i>	Ashoka tree	T	25	20	15	60
17	<i>Syzygium cumini</i>	Java Plum	T	25	20	15	60
18	<i>Terminalia Arjuna</i>	Arjun Tree	T	25	10	10	45
19	<i>Toona ciliata</i>	Red cedar	T	-	10	10	20
Total				350	355	255	960

a. Conservation plan for schedule/threatened species

Status of species in the study area

Total 41 tree species, 26 shrub species and 33 herb species were identified in the study area. None of the species is falling in any conservation category. Most of the species are widely distributed in the area and locally available. There is no fauna species falling within the endangered category as per IUCN No. Schedule-I species as per IWPA, 1972 found or reported at the area. Hence, conservation plan is not required.

There are no National Park, Wildlife Sanctuary, Tiger Reserve, Biosphere Reserve within 10 km radius of study area. Katturani RF present in 1.50 km (N) and Sattarasankottai RF present in 8.50 km (NE) from the project site. Few Eucalyptus plantation patches also seen in the Study area.

Table 10.2 Action plan for greenbelt development

Particular	Unit rate	Total
Sapling	@ 300 Rs./Sapling	460X300: Rs. 138000
Sapling Guard	@ 150 Rs. /Sapling	460X150: Rs. 69000
Planting charges, manure etc.	@ 100 Rs. /Sapling	460X100: Rs. 46000
Maintenance for two years after plating by two gardeners	@ 5000 Rs/month for min. two years	2X5000X24 month: Rs. 240000
Total		Rs. 493000.00 (4.93 Lakh)

10.5 General considerations

For good housekeeping of the facility, following measures will be planned:

- Maintaining cleanliness of roads to prevent accumulation of dust and waste material.
- Inculcating positive attitude among employees for good house-keeping.
- Maintaining hygienic conditions in canteens, near drinking water source and toilets.

10.6 Concept of waste minimization, recycle/reuse/recover techniques, Energy conservation and Natural Resource Conservation

Recycle/Reuse/Recover Wastewater generated from the proposed facility shall be reutilized after giving suitable treatment. The Incineration ash shall be finally disposed to nearest TSDF.

Energy conservation: Reduction in usage of traditional light bulbs with Light Emitting Diode (LEDs) means reduction in usage energy consumption. Usage of Solar energy at different locations in the plant like parking light, roadside light etc. will be explored.

Natural resource conservation: To conserve ground water, rainwater harvesting (collection and reuse) and storm water drainage system is properly designed and maintained.

Measures to reduce Carbon footprints

Carbon footprint is a commonly used term to describe the total amount of carbon dioxide (CO₂) and other greenhouse gas (GHG) emissions for which an individual or organization is responsible. It is usually defined as the total amount of CO₂ and other GHGs emitted over the full life cycle of a product or service. It measures the total GHG emissions caused directly by a person, organization, event or product.

Considering the type of the project and activities involved; the main source of generation of CO₂ from the CBMWTF would be mainly from operation of DG sets, and operation of Incinerator. A brief estimation of expected total carbon emission from the proposed project has been documented (assuming a total of 28 liter/hour of High-Speed Diesel) in **Table 10.3**.

Table 10.3: Details of expected annual carbon emission of proposed CBWT facility

Carbon Foot Print	Plant Specific Activity	(Diesel) litres/Annum	Annual Carbon emission in (kg)
Direct Emission (Scope 1)	1. DG Set -150 kVA Generator with 15L/h (50% load) fuel consumption. Assuming the DG SET would be operational for 1/2 an hour as the site is located in the Industrial area, so the Fuel consumption would be 7.5 litres for 330 days	2475	6633
	2. Common Incinerator for BMW- Assuming usage of 20.5 litres of Diesel for 330 days	6765	18130
Grand Total		9240	24763
Note: 2.68kg CO ₂ e/lit of Diesel; DG Set - 150 kVA Generator requires approximately 15L/h (50% load) fuel consumption.			

Measures to reduce Green House Gases

There are many ways to reduce greenhouse gas emissions from the facility, by adopting energy efficiency technologies, fuel switching, reduce water usage, developing greenbelt, providing recommended APCDs, etc.

The proposed facility would be involved in scope 1 emissions (i.e., direct emissions) primarily from the incinerator and D.G. set, which would be operated by high-speed diesel. Thus, a detailed anticipated calculation of fuel and emission amounts has been illustrated above, and a few mitigation measures that would be adopted in the proposed facility have been documented.

For the operation of an incinerator in the CBWTF, approximately 20.5 liters of diesel would be utilized in a day. Assuming the machine operates for 330 days, around 18130 kg of carbon emissions have been anticipated in a year. In order to limit the carbon emissions in the atmosphere, the following measures would be taken during the plant's operation:

- The incinerator involves primary and secondary chambers that completely burn the waste as well as pollutants from the gases at a temperature ranging from

800°C(+/-50°C) in primary chamber to 1050°C (+/-50°C) in secondary chamber so, the gases coming out of the incinerator stack are passed through a gas cooler, multi-cyclone, and bag filter for the removal of particulates. Dry lime and activated carbon are injected for neutralization of acidic gases (HCl, HF, and SO₂) and removal of organic constituents.

- Flue gases are passed through bag filters to remove all particulates before being neutralized in a wet alkaline scrubber.
- To prevent the formation of dioxins and furans, the flue gas temperature is rapidly lowered from 500°C to less than 200°C by adopting rapid quench, catalyst, or adsorption by activated carbon.
- Mercury-containing feeding waste will be controlled by using activated carbon treatment.

Moreover, the operation of the DG set would also be responsible for contributing to carbon emissions to some extent. As the facility is located in an industrial area, the probability of a necessary power backup requirement would be quite low. So, assuming the annual consumption of fuel in the generator and operating time, the expected annual carbon emission would be approximately 6633 kg. Thus, a reduction in carbon footprint would be possible by using retro-fitted emission control equipment and following specified CPCB standard guidelines while installing the equipment.

Another, important mitigation measure to suppress the carbon footprint within the facility would be development of greenbelt. 33% of the total project area would be utilized for development of greenbelt. Nearly 960 trees would be planted phase wise within the facility and each of these full grown would absorb approximately between 10 to 35kg of CO₂ per year on average, depending on other factors.

Other Necessary measure in terms of carbon foot print reduction are the following:

Use of energy efficient appliances

Energy-efficient appliances and electrical instruments like Automatic, movement-sensing lights and energy-saving LED bulbs will be use in the admin buildings at the

proposed site which will help reduce the carbon footprint and also reduce the overall power consumption.

Switch to green energy

Solar panels will be installed at various locations, along the road and on the exposed rooftop of the proposed administration block, which will reduce the use of conventional power to certain extent.

Regular maintenance of Vehicles

Continuous use of vehicles reduces the efficiency of vehicles as well as increase the consumption of fuel. Regular maintenance of vehicles is the only way to ensure the efficiency of vehicles as well as reduce the overall consumption of fuel. PUC will be ensured with all vehicles. Outdated vehicles will not be used in the facility.

Use of Natural Gas in the canteen area

Combustion of natural gas emits about half as much carbon dioxide as coal and 30 percent less than oil, as well as far fewer pollutants, per unit of energy delivered. Only natural gas (LPG) will be used in the canteen and office area in place of use of coal or other oil for cooking and other purposes.

Providing common transport

Facility will provide common transportation facility from specified location to the facility as well as return to the destination. This will reduce the use of individual vehicles and also will be cost effective to the individuals.

10.7 Occupational health management

There will be routine observation of health as certain sufferings are likely to appear as a result of exposure by the workers during operations of various facilities. All the employees undergo a medical checkup before joining the facility. Medical checkup will be conducted on regular basis and immunise all its health care workers and others, involved in handling of BMW for protection against diseases including Hepatitis B and Tetanus that are likely to be transmitted by handling of BMW and will be monitored. First aid facilities required to attend immediately for meeting emergency situations are made available at the facility.

10.8 Fire protection system

The fire protection system will protect the entire site area from fire hazards happening accidentally. This fire protection system comprises of a ground level water storage tank to store the anticipated requirement of water. One electric motor driven pump and one diesel high pressure pumps will be provided to pump the water to a high pressure header from where the water is distributed to various high pressure hydrants provided at selected locations. Necessary fire hoses terminated with spouts will be kept ready at each hydrant location to facilitate firefighting.

10.9 Environmental management cell

The Environmental Cell will be headed by the Project Head followed by other officers and technicians. The department is the nodal agency to co-ordinate and provides necessary services on environmental issues during operation of the project. This environmental group is responsible for implementation of environmental management plan, interaction with the environmental regulatory agencies, reviewing draft policy and planning. This department interacts with SPCB and other environment regulatory agencies. The department also interacts with local people to understand their problems and to formulate appropriate community development plan.

The structure of the environmental management cell is given in **Figure 10.1** and the details of the roles and responsibilities is given in **Table 10.4**.

The cell will also be responsible for monitoring of the plant safety and safety related systems which include:

- Checking of safety related operating conditions
- Visual inspection of safety equipment
- Preparation of a maintenance plan and documentation of maintenance work specifying different maintenance intervals and the type of work to be performed
- Other responsibilities of the cell will include followings:
- Conduct and submit annual Environmental Audit. SPCB registered agency will be retained to generate the data in respect of air, water, noise, soil and

meteorological data and prepare the Environmental Audit report. Timely renewal of Consolidated Consents & Authorization (CC & A) will also be taken care of.

- Submitting environmental monitoring report to SPCB. Data monitored by the cell will be submitted to the Board regularly and as per the requirement of SPCB. The cell will also take mitigative or corrective measures as required or suggested by the Board.
- Keeping the management updated on regular basis about the conclusions/results of monitoring activities and proposes measures to improve environment preservation and protection.
- Conducting regular safety drills and training programs to educate employees on safety practices. A qualified and experienced safety officer will be responsible for the identification of the hazardous conditions and unsafe acts of workers and advise on corrective actions, organize training programs and provide professional expert advice on various issues related to occupational safety and health.
- Conducting safety and health audits to ensure that recommended safety and health measures are followed.

Figure 10.1 Environmental management cell

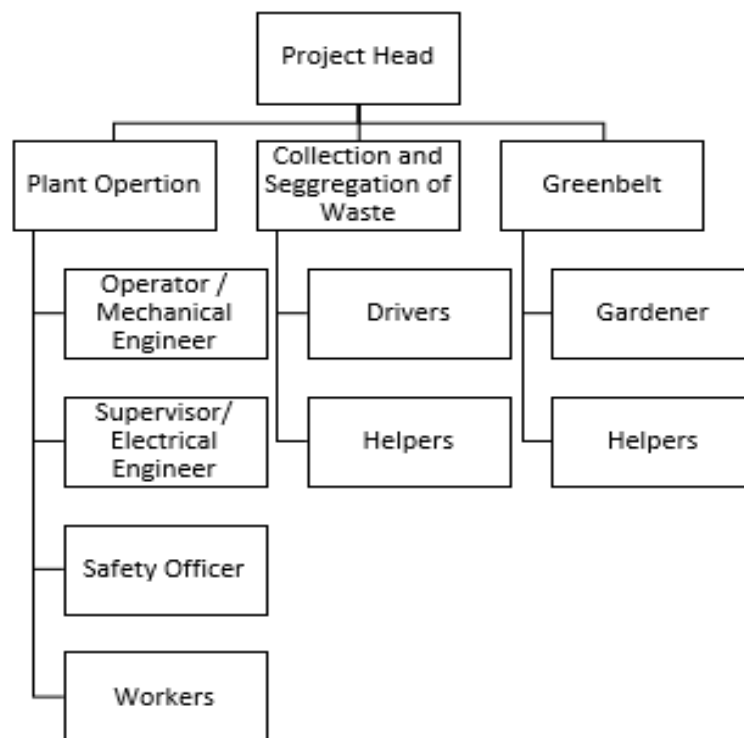


Table 10.4 Environmental management cell

Sl. No	Particulars	Qualification	Experience	Roles & Responsibilities	Remarks
1	Project Head	Post Graduate Degree	10-15 yrs	In charge for corresponding with statutory authorities, Ambient air quality monitoring and solid waste management. Ensuring proper operation of the facility.	Full time
2	Operator	Graduate Engineering Degree	3 yrs	Ensures smooth operation of system and also ensuring proper operation of incinerator with emissions under control. Periodic maintenance of equipments.	Full time
3	Supervisor	Graduate Engineering Degree	5-10 yrs	Supervises all the processes in the facility. Coordinates with employees in operation of the plant.	Full time
4	Safety officer	Graduate / Post graduate	2-5 yrs	Ensure safety at the facility and smooth operation of the system.	Full time
5	Gardener	Working knowledge	1-2 yrs	Greenbelt maintenance	Full time
6	Workers (Skilled & Unskilled)	Working knowledge	1-2 yrs	Regular Monitoring of results from continuous emission monitoring system. Change operating conditions as necessary to reduce the emissions as per need. Maintenance of ETP and greenbelt	Full time
7	Helpers	Working knowledge	1-2 yrs	Ensure proper segregation and collection of waste as per guidelines.	Full time
8	Drivers	Working knowledge	1-2 yrs	Ensure proper segregation and collection of waste as per guidelines.	Full time

CHAPTER 11 – SUMMARY AND CONCLUSION

Chapter 11

Summary & Conclusion

11.1 Overall Justification for Implementation of Project

MEMPL has proposed CBWTF in plot no C-6, SIPCOT Industrial Park, Seikalathur (V), Manamadurai (T), Sivagangai (D), Tamil Nadu. The site is earmarked for red category industries. At present, sivagangai district does not have BMW treatment facility. Currently, the BMW from sivagangai district area is covered by a facility, which is located at a distance of 120 km from the proposed site. The challenges faced by sivagangai district for treatment of BMW are transportation of BMW to a very far distance, leakage / spillage while transportation, environmental contamination and hazards and delay in treatment and disposal of BMW.

Considering the above it is proposed to establish a CBWTF with 5.5 TPD capacity, it shall cover around about 600 numbers of HCEs / HCFs (including Govt. & Private Hospitals), and total bed strength will be around 7,000 numbers. The quantum of BMW generated is about 1750 kg/day and is likely to increase day by day. The area of operation is sivagangai district including eight talukas.

The project falls under Category B1 schedule 7(da) as per the MoEF&CC Notification dated 17th April, 2015 issued under the EIA Notification 2006. Project falls under red category as per the categorization of Industry of CPCB/TNPCB.

11.2 Project details

Medicare has proposed to establish CBWTF and the proposed site is found to be a suitable location considering both environmental and economic factors as per the siting criteria guidelines. The proposed site is more than 500m from all sensitive features. The nearest railway station is manamadurai railway station at a distance of 3.2 km (SW), and the nearest airport is Madurai airport at a distance of 42.5 km (NW). Nearest town manamadurai at a distance of 2.0 km (SW) nearest highway from the proposed site is NH-36 at a distance of 1.31 km (E).

11.2.1 Land details

Land for proposed facility has been provided by SIPCOT Industrial Park. The proposed facility will be developed in an area of 14569.00 Sq. m (3.60 ac) with all associated auxiliary units. The details of the land area breakup are given under the **Table 11.1**.

Table 11.1 Land area breakup details

Sl.No	Description	Area (in Sq. m)	Percentage (%)
1	Security post	1.44	0.01
2	Underground sump	11.97	0.08
3	Admin building	30.00	0.21
4	Waste storage shed	189.93	1.30
5	Vehicle parking (BMW facility)	100.00	0.69
6	Workers wash rooms & rest rooms	39.44	0.27
7	BMW Processing Shed	450.00	3.09
8	Effluent Treatment Plant (ETP)	50.00	0.34
9	Green belt	4800.0	32.95
10	Future Expansion	3690.7	25.33
11	Open area & Roads	5205.51	35.73
Total		14569.00	100.00

The overview of the project is given below in **Table 11.2**.

Table 11.2 Project Overview

Sl.No	Parameters	Description
1	Plant Capacity	Capacity of the Incinerator - 2X250 kg/hr (one primary and one backup) Capacity of Autoclave - 1275 lit/batch Capacity of shredder - 250 kg/hr
2	Total Plot area	3.60 ac (1.45 ha)
3	Source of Water	State Industries Promotion Corporation of Tamil Nadu Limited (SIPCOT) & water tankers
4	Water Requirement	Construction period – 10 KLD Operation period – 50 KLD ➤ Fresh water – 30 KLD ➤ Treated water - 5 KLD Allotment order P-III/SIP-MNM/Medicare/2022 Dt. 23.12.2022 - 50 KL of water quantity is allotted for the proposed facility (Keeping in view of future expansion).
5	Wastewater generation & mode of treatment	Wastewater – 6 KLD Mode of treatment – Effluent Treatment Plant (ETP) ETP Capacity - 8 KLD
6	Source of Power	State Industries Promotion Corporation of Tamil Nadu Limited (SIPCOT)
7	Power Requirement	150 kVA
8	Emergency Power Backup	DG set 1X150 kVA with 3m stack height
9	Hazardous & Solid waste generation and disposal	Municipal solid waste – 1 kg/day (sent to nearest municipal bin) Waste oil from DG set – 2 LPD (sent to used oil recovery facility) Ash from incineration, Sludge from ETP - 170 kg/day (sent to authorized CHWTSDF)
10	Manpower details (Construction & Operation phase)	Total manpower – 50 No's ➤ Administrative - 8 ➤ Skilled - 5 ➤ Unskilled - 20 ➤ Other – 17 Manpower may vary depending on the requirement in the facility
11	Project Cost	4.96 Cr
12	EMP Cost	Capital Cost – Rs.49.6 Lakhs Recurring Cost - Rs.4.96 Lakhs/annum

11.3 Baseline environmental status

Summary of baseline environmental status undertaken at different locations during summer season (June 2023 to Aug 2023) are given below:

11.3.1 Air Quality

Particulate Matter <10 µm (PM₁₀) & Particulate Matter <2.5 µm (PM_{2.5})

The study reveals that 98th Percentile of PM₁₀ recorded within the study area were in the range of 39.8 µg/m³ to 54.1 µg/m³.

The study reveals that 98th Percentile of PM_{2.5} recorded within the study area were in the range of 22.6 µg/m³ to 33.8 µg/m³.

The 24 hourly average values of PM₁₀ and PM_{2.5} were compared with the national ambient air quality standards and it is found that all sampling locations recorded values much lower than the applicable limits of PM₁₀ 100 µg/m³ and PM_{2.5} 60 µg/m³ residential and rural for all locations in study area.

The minimum and maximum values of PM₁₀ was found to be 43.4 µg/m³ and 48.5 µg/m³ in core zone & 33.9 µg/m³ and 54.1 µg/m³ in buffer zone respectively and the average was observed to be 46.5 µg/m³ in core zone and 48.3 µg/m³ in buffer zone.

The minimum and maximum values of PM_{2.5} was found to be 25.5 µg/m³ and 29.5 µg/m³ in core zone & 19.9 µg/m³ and 33.8 µg/m³ in buffer zone respectively and the average was observed to be 27.1 µg/m³ in core zone and 28.9 µg/m³ in buffer zone.

Sulphur Dioxide (SO₂) and Oxides of Nitrogen (NO_x)

The 98th percentile of SO₂ recorded within the study area was in the range of 8.8 µg/m³ to 15.3 µg/m³ and NO_x was in the range of 15.4 to 25.3 µg/m³.

The 24 hourly average values of SO₂ and NO_x were compared with national ambient air quality standards and it was found that all sampling locations recorded values are much lower than the applicable limit of 80 µg/m³ for residential and rural areas.

The minimum and maximum values of SO₂ was found to be 9.5 µg/m³ and 13.4 µg/m³ in core zone & 6.2 µg/m³ and 15.3 µg/m³ in buffer zone respectively and the average was observed to be 11.3 µg/m³ in core zone and 12.1 µg/m³ in buffer zone.

The minimum and maximum values of NO_x was found to be 17.7 µg/m³ and 21.6 µg/m³ in core zone & 12.4 µg/m³ and 25.3 µg/m³ in buffer zone respectively and the average was observed to be 19.1 µg/m³ in core zone and 20.0 µg/m³ in buffer zone.

Ozone (O₃) and Carbon Monoxide (CO)

The 98th percentile of O₃ recorded within the study area was Below Detectable Limit (BDL) of 20 µg/m³.

The 98th percentile of CO recorded within the study area was in the range of BDL to 580 µg/m³.

The 8 hourly average values of O₃ and CO were compared with the national ambient air quality standards and found that all sampling locations recorded values much lower than the applicable limits of O₃ 100 µg/m³ and CO 2000 µg/m³ residential and rural for all locations in study area.

11.3.2 Noise Levels

The day equivalents during the study period are ranging between 50.0 dB (A) to 54.3 dB (A). Whereas the night equivalents were in the range of 40.1 dB (A) to 44.4 dB (A). From the results, it can be seen that day equivalents and night equivalents were within the ambient noise standards of residential area - day time 55 dB (A) and night time 45 dB (A).

The minimum and maximum ambient noise levels in the core zone during L_{day} are 53.7 dB (A) & 53.9 dB (A) and during L_{night} are 43.8 dB (A) & 43.9 dB (A) respectively which is falling within the standard limit of industrial area 75 dB (A).

The minimum and maximum ambient noise levels in the Buffer zone during L_{day} are 50.0 dB (A) & 54.3 dB (A) and during L_{night} are 40.1 dB (A) & 44.4 dB (A) respectively which is falling within the standard limit of residential area.

11.3.3 Water Quality , Soil Quality, Ecology & Biodiversity and Socio - economic

The baseline details of water quality (WQ), soil quality (SQ), ecology & biodiversity (EB) along with socio economic (SE) are summarized in **Table 11.3** for various parameters.

Table 11.3: Summary of baseline status (WQ, SQ, EB & SE)

Water Quality								
GW-10 Locations	Parameter	Min	Max	Acceptable Limit			Permissible Limit	
	pH Value	6.68	7.63	6.5-8.5			No Relaxation	
	TSS (mg/l)	<1.0	<1.0	-			-	
	TDS (mg/l)	267	1170	500			2000	
	Total Hardness (mg/l)	144	600	200			600	
	Electrical Conductivity (μ Mho /cm)	446	1850	-			-	
SW-2 Locations	Parameter	Min	Max	CPCB water quality criteria as updated on 11 th Oct, 2019				
				A	B	C	D	E
	pH	7.46	8.1	6.5-8.5	6.5-8.5	6.0-9.0	6.5-8.5	6.0-8.5
	TSS (mg/l)	< 1.0	< 1.0	-	-	-	-	-
	TDS (mg/l)	545	709	-	-	-	-	-
	Total Hardness (mg/l)	134	228	-	-	-	-	-
Electrical Conductivity (μ Mho /cm)	940	1181	-	-	-	-	2250	
Soil Quality								
Soil Quality-10 Locations	Parameter	Min	Max	Standard Soil Classification – (Indian Council of Agricultural Research, New Delhi)				
	pH	6.27	7.42	Acidic <6.0; Normal to saline 6.0 – 8.5; Tending to become alkaline 8.6-9.0; Alkaline > 9.0				
	EC (μ Mho/cm)	234	461	Normal <1000; Critical for germination 1000 – 2000; Critical for growth 2000-4000; Injurious to most crops > 4000				
	Organic carbon (%)	0.5	1.11	Low < 0.5, Medium 0.5 – 0.75, High > 0.75				

	Nitrogen (kg/ha)	43	89	Low <280; Medium 280 to 560; High >560
	Phosphorous (kg/ha)	71	90	Low <10; Medium 10 to 25; High >25
	Potassium (kg/ha)	296	355	Low <110; Medium 110 to 280; High >280
Ecology & Biodiversity				
Flora within 10 km radius area	Tree	41		
	Shrubs	26		
	Herbs	33		
Fauna within 10 km radius area	Fishes	12		
	Amphibians	2		
	Reptiles	3		
	Avian species	52		
	Mammals	5		
Socio-economic				
10 km radius area	Total Population	53,287		
	Total Male	26,655		
	Total Female	26,632		
	Total SC	10,594		
	Total ST	28		
	Total Working	24,126		
	Total Non-working	29,161		
	Total Literates	37,498		
	Male literates	20,795		
	Female literates	16,703		

11.4 Environmental Impact and mitigation measures

A summary of anticipated environmental impact and mitigation measures are given in **Table 11.4**.

Table 11.4 Details of anticipated impacts and EMP cost for proposed project

Parameter/ component	Construction		Operation	
	Impact	Mitigation measures	Impact	Mitigation measures
Ambient Air Quality	<ul style="list-style-type: none"> ➤ Impact on health due to dust generation ➤ Site development and foundation works ➤ Degradation of Air quality of the area 	<ul style="list-style-type: none"> ➤ Regular water sprinkling ➤ Duration of stockpiling will be kept as short as possible ➤ Covering of piles of soil and debris ➤ Maintenance of machinery ➤ PUC and regular monitoring will be carried out 	<ul style="list-style-type: none"> ➤ Health impact due to increase of GLC caused by emission from Incinerator and DG sets ➤ Odour generation and associated impact on health 	<ul style="list-style-type: none"> ➤ The DG set will be used only during emergency ➤ Incinerator will be provided with a stack height meeting MoEF&CC guidelines, with all necessary APCDs ➤ Development of greenbelt along the internal roads and plant boundary ➤ Speed restriction will be followed with in the project and speed breakers will be provided at entry and exit points ➤ Adopting Odour controlling measures and regular health check-up
Water	<ul style="list-style-type: none"> ➤ Site formation may produce large quantities of runoff with high suspended solids ➤ Impact on water quality due to improper management of domestic sewage ➤ Impact of aquatic flora, fauna if 	<ul style="list-style-type: none"> ➤ The run-off water from the site gets collected to the working pit and if any overflow will be diverted to nearby green belt area ➤ The domestic sewage generated from temporary toilets used by work force will be treated in portable STP or sent to a septic tank/ soak pit 	<ul style="list-style-type: none"> ➤ Impact on quality of water bodies ➤ Health impact due to Consumption of polluted water ➤ Impact on aquatic Flora and Fauna 	<ul style="list-style-type: none"> ➤ No waste water will be discharge outside the premises ➤ The Effluent from floor / Vehicle washings etc will be collected , treated in reused ➤ No GW recharge will be done considering type of project and activity involved

Parameter/ component	Construction		Operation	
	Impact	Mitigation measures	Impact	Mitigation measures
	untreated Wastewater mixed with water quality	<ul style="list-style-type: none"> ➤ No GW extraction for construction phase 		
Noise	<ul style="list-style-type: none"> ➤ Social disturbance and hearing difficulty ➤ Disturbance in natural movement of birds and other animal ➤ Overall increase in Noise level 	<ul style="list-style-type: none"> ➤ Noise generating equipment will be kept away from human habitation and will be used during day time ➤ Regular maintenance of equipment and machineries ➤ PPE like ear plugs/ muffs to all workers ➤ Sufficient engineering control during installation of equipment and machineries 	<ul style="list-style-type: none"> ➤ Social disturbance and hearing difficulty ➤ Disturbance in natural movement of birds and other animal ➤ Overall increase in Noise level 	<ul style="list-style-type: none"> ➤ Acoustic enclosures will be provided for the high noise generating equipment's. ➤ Uses of machineries will be avoided during night time ➤ Movement of heavy vehicles will be map during day time ➤ Unnecessary of blowing horns will be prohibited ➤ PPE like ear plugs/ muffs will be provided to all workers ➤ Noise level monitoring on regular interval ➤ All the openings like covers, partitions are designed properly to mitigate the impacts of noise
Land	<ul style="list-style-type: none"> ➤ Impact on soil quality due to disposal of construction debris ➤ Impact of surface soil due to dust settled on it ➤ Loss of topsoil 	<ul style="list-style-type: none"> ➤ Construction debris will be stored separately and will be managed as per C&D Rules, 2016 ➤ Removed top soil will be stored and will be used for refilling and plantation work ➤ Regular water sprinkling to avoid dispersion of dust 	<ul style="list-style-type: none"> ➤ Improper storage of Incineration ash generated in the process of incineration ➤ Loss of soil fertility due to increase on pollutants ➤ Impact of improper management of wastewater and 	<ul style="list-style-type: none"> ➤ Ash coming from incineration plant will be stored in temporary storage area and sent to nearest TSDF ➤ APCDs will be provided with incinerator to control the air emission ➤ Wastewater will be treated in ETP and reused for floor washing, green belt etc., and sludge

Parameter/ component	Construction		Operation	
	Impact	Mitigation measures	Impact	Mitigation measures
			sludge generation from ETP	generated from ETP will be sent to nearest TSDF
Ecology & Biodiversity	<ul style="list-style-type: none"> ➤ Loss of vegetation due to land clearing ➤ Loss of bird and animal shelters 	<ul style="list-style-type: none"> ➤ Only seasonal vegetation will be removed ➤ Avenue plantation will be done ➤ Greenbelt work during pre-construction and construction phase 	<ul style="list-style-type: none"> ➤ Impact on flora due to dust falling ➤ Disturbance of movement of fauna specially birds ➤ Positive impact due to development of Greenbelt all around the plot area 	<ul style="list-style-type: none"> ➤ APCDs to be attached with Incinerator ➤ Development of Greenbelt on all around the project area ➤ Avenue plantation ➤ Awareness program
Socio-economic	<ul style="list-style-type: none"> ➤ Increased traffic volumes and congestion ➤ Damage to and/or destruction of sub-surface heritage resources ➤ Positive impact due to employment generation 	<ul style="list-style-type: none"> ➤ Proper monitoring of traffic congestion and volume ➤ The project site is selected considering knock-out criteria of CPCB which also consider heritage or archaeological site ➤ The project is located within the Notified Industrial area SIPCOT, TN ➤ Preference will be given to local ➤ Skill training to the workers 	<ul style="list-style-type: none"> ➤ Health impact in case of direct exposure of BMW ➤ Impact on health if contaminated/polluted water consumed ➤ Possibility of accident while handling of waste ➤ Improvement of economic condition due to employment 	<ul style="list-style-type: none"> ➤ PPEs will be provided to the workers ➤ Handling of waste through trained workers as per SOP ➤ Facility of safe drinking water ➤ Proper sanitation facility to be arranged ➤ Preference will be given to local for employment ➤ Regular health check-up of workers and nearby people

11.5 Environmental monitoring program

Detailed Environmental monitoring program has been prepared based on the following criteria:

1. Air emission
2. Noise generation
3. Wastewater discharge
4. Solid and Hazardous waste generation
5. Ground water Quality
6. Flora and Fauna
7. Soil Quality
8. Health

The monitoring program has been prepared for construction phase, operation phase and post operation phase of the project and already explained in **Chapter 6**.

11.6 Risk analysis

Risk assessment was carried out to identify and quantify major hazards and the risk associated with various operations of the proposed project that may lead to an emergency situation which affect public safety and health. A systematic analysis of the chemicals and their quantities of storage have been carried out to determine threshold quantities as notified in MSIHC Rules, 1989 and amended its subsequent amendemnts.

All necessary measures to minimize the risk due to the proposed project will be taken during design stage and operation period viz., fire and safety control measures, emergency preparedness plan, disaster management plan etc.

11.7 Cost estimate of the project & EMP

The total project cost of the proposed project is around Rs.4.96 Crores. An estimated budget of Rs.49.6 lakhs has been proposed for implementing the EMP, with a recurring cost of around Rs.4.96 lakhs per annum.

CHAPTER 12 – DISCLOSURE OF CONSULTANTS ENGAGED

Chapter 12

Disclosure of Consultants engaged

12.1 Accredited consultant organization

Re Sustainability Solutions Private Limited (RSSPL) (formerly known as Ramky Enviro Services Private Limited) has a strength of around 40 scientific and technical persons with a background in Civil, Chemical & Mechanical engineering as well as Environmental Science & Energy Management experts including Microbiology & Biotechnology experts. The field sample analysis is carried out in the laboratory of Hyderabad Waste Management Project (HWMP), a subsidiary company under Re Sustainability Limited, which is a National Accreditation Board for Testing and Calibration Laboratories (NABL) accredited laboratory and as well as recognized as Environmental Laboratory by Ministry of Environment, Forest and Climate Change (MoEF&CC) under the Environment (Protection) Act 1986.

RSSPL is accredited with 13 sectors under National Accreditation Board for Education and Training (NABET) Scheme (Certificate No. NABET/EIA/2225/RA 0278 and Valid up to 26th Sep, 2025) with all 12 FAEs are available as in-house/ empaneled experts and self-sufficient in handling EIA/EMP projects. RSSPL consultancy group also provides training and course work for obtaining M.Sc./M.Tech project works for students under various institutions and Universities. The consultancy group also collaborates with research institutions and reputed educational institutions for carrying out Research & Development activities. The group is also empaneled with reputed government organizations like TSPCB, HPCL, APIIC, EPCO & NTPC. All the applicable Functional Area Experts as per QCI-NABET Scheme, Version-3 were involved in preparation of EIA/EMP report. In-house and empaneled experts are engaged as per requirement of core and significant FAE of the scheme.

12.2 Consultancy services

- Technical support for securing Environmental Clearance from MoEF&CC, New Delhi and SEAC/SEIAA from different states.
- Obtaining Consent for Establishment and Consent for Operate from State Pollution Control Boards for industries.
- Preparing of EIA/EMP reports as per requirement.
- Environmental audits to help industries to recycle and reuse resources and plan for low polluting technologies.
- Risk assessment studies for hazardous chemical storage & processes in order to prepare onsite and offsite disaster and emergency plans.
- Identification and evaluation of hazardous waste disposal sites.
- Environmental management systems standards.
- Characterization and quantification of biomedical waste, municipal solid waste and design of treatment and disposal facilities.
- Effluent treatment plant & sewage treatment plant designs.
- Post project monitoring network design.
- Design of waste treatment plants.
- Health and socio- economic surveys.

12.3 Laboratory services

- Analysis of air samples for ambient air quality and from industrial sources for both routine and industry specific pollutants.
- Water and waste water analysis for all parameters as per standard methods, including pesticides and poly hydrocarbons.
- Solid and hazardous waste analysis including TCLP tests.
- Monitoring of noise levels at source and in ambient air.
- Development of new methods and quality assurances of results obtained.
- Design and settings of analytical laboratories.

12.4 Training services

- Monitoring of environmental parameters: air, water, noise, soil etc.
- Environmental Impact Assessment and Environmental Management Plan.
- Effluent Treatment Plant operations and maintenance.
- Sewage Treatment Plant operations and maintenance.
- ISO 9001: 2015 awareness, documentations, internal auditors.
- Pollution control in industries.

12.5 Field services

- Site selection and suitability studies for setting up of Industries.
- Ambient air quality monitoring for all gaseous pollutants.
- Noise level monitoring & traffic management studies.
- Meteorological data collection as per CPCB norms.
- Stack emission monitoring for all pollutants and assessment of efficiency of control equipment.
- Water, wastewater and soil sample collection.
- Assessment of efficiency of CETP and analysing critical parameters.
- Flora and Fauna assessment through sectorial studies and damage assessment due to development projects.

12.6 Solid waste management services

RSSPL prepares PFR & DPRs based on the field/ engineering data for the following:

- Hazardous waste management
- Municipal solid waste management
- Bio-medical waste management
- E-waste management & recycling facilities

12.7 List of accreditations

- International Organization for Standardization (ISO) 9001:2015 from TUV SUD South Asia Private Limited.
- NABET from Quality Council of India (QCI) for Environmental Consultants.

- NABL ISO/IEC 17025:2017 from Quality Council of India (QCI) for Environmental Laboratory.
- MoEF&CC for Environmental Laboratory.

*Subsequent **Section (Annexure of EIA report)** includes all other applicable and necessary documents, secondary data collected/ provided from project proponent, approval and NOC from various agencies, backup of laboratory analysis data, land allotment etc.*

ANNEXURES



TAMIL NADU POLLUTION CONTROL BOARD

Bio Medical Waste Management

Annual Report – January to December 2022

FORMAT – IV A

Format for submission of the Annual Report Information on Bio-Medical Waste Management (to be submitted by the State Pollution Control Board or Pollution Control Committees and Director General Armed Forces Medical Services to Central Pollution Control Board on or before 31st July of every year for the period from January to December of the preceding calendar year 2022)

Part –I (summary of Information)

1	Name of the organization	:	TAMILNADU POLLUTION CONTROL BOARD
2	Name of the Nodal Officer with contact telephone number and e-mail	:	Er. R. Sarasavani, Joint Chief Environmental Engineer, 8056042464 jceewmtnpcb@gmail.com
3	Total No. of health care facilities/occupiers	:	27603
I	Bedded hospitals and nursing homes (bedded)	:	7922
ii	Clinics dispensaries	:	11483
iii	Veterinary institutions	:	1194
iv	Animal beds	:	147
v	Pathological laboratories	:	2103
vi	Blood banks	:	83
vii	Clinical establishment	:	4580
viii	Research Institutions	:	22
ix	AYUSH	:	69
4	Total No.of beds	:	191114
5	Status of authorization	:	
i	Total number of occupiers applied for authorization	:	27598
ii	Total number of occupiers granted authorization	:	27353
iii	Total number of application under consideration	:	146
iv	Total number of applications rejected	:	99
v	Total number of occupiers in operation without applying for authorisation	:	5
6	Quantity of Bio Medical Waste generation (in kg/day)	:	49721.43

i	Bio-medical waste generation by bedded hospitals (in kg/day)	:	42707
ii	Bio-medical waste generation by non-bedded hospitals (in kg/day)	:	7014.43
iii	Any other	:	Nil
	Total	:	
7	Bio-medical waste treatment and disposal	:	
a	By captive bio-medical waste treatment and disposal by Health Care Facilities	:	NIL
i	Number of Health care facilities having captive treatment and disposal facilities	:	NIL
ii	Total bio medical waste treated and disposed by captive treatment facilities in kg/day	:	NIL
(b)	Bio Medical Waste treatment & disposed by CBMW facility as per Part-4)	:	-
i	No.of CBMW treatment facilities in operation	:	<ul style="list-style-type: none"> • 10 are in operation (Out of 12 CBMWTFs, two facilities were issued with closure direction for non compliance provisions of BMWM Rules, 2016). However, the BMW generated from the HCFs in the Nilgiris district are collected and handed over to the M/s.Kovai Biowaste Management (P) Ltd, Coimbatore and from Ramanathapuram district are collected and handed over to the M/s. Ramky Energy and Environment Ltd., Virudhunagar for treatment and disposal) • One more facility M/s. RE SUSTAINABILITY IWM SOLUTIONS LIMITED, UNIT - 3 (FORMERLY TAMILNADU WASTE MANAGEMENT LIMITED, UNIT - 3) , S.F.No. Plot No. 141 A, 142 and 143. SF No. 726 (Part), Krishnagiri District is issued with Consent to Operate vide Board's Proc. No.T2 / TNPCB / F.2585HSR / RL / HSR / W / 2023 dated 25/03/2023. Yet to commence its operation.
ii	No.of CBMW treatment facilities under construction	:	2
iii	Total bio-medical waste treated in kg/day	:	
iv	Total treated bio-medical waste disposed through authorized recyclers (in kg/day)	:	49721.43
8	Total No.of violation by	:	
i	Health Care facilities (bedded and non-bedded)	:	1 (Bedded)
ii	CBMW Treatment facilities	:	2

iii	Others (Please specify)	:	Nil
9	Show cause notice/direction issued to defaulter	:	
i	CBMW treatment facilities	:	2
ii	Others	:	1 (Bedded)
10	Any other relevant information	:	
i	No.of workshop/trainings conducted during the year	:	33
ii	No.of occupiers installed liquid waste treatment facility	:	5904 Nos. and Other occupiers 1. Discharge the effluent into public sewer after disinfection with Sodium Hypochlorite solution/ UV sterilizer 2. Discharge the effluent into combined STP after disinfection with Sodium Hypochlorite solution/UV sterilizer 3. Discharge the effluent onland for gardening after disinfection with Sodium Hypochlorite solution/UVsteriliser
iii	No.of captive incinerators complying to the norms	:	Nil
iv	No.of occupiers organized trainings	:	1108
v	No.of occupiers constituted BMWM Committees	:	7430
vi	No.of occupiers submitted Annual Report for the previous calendar year	:	2214 Nos. Further, the occupiers are uploading the BMW annual report in their website as per the BMWM Rules, 2016
vii	No.of occupiers practicing pre-treatment of lab microbiology and Bio-technology waste	:	All the bedded hospitals, pathological laboratories, blood banks and Research Institutions are practicing pre-treatment of lab microbiology and biotechnology waste by disinfection before handing it over to the CBMWTFs
viii	No. of CBMW Treatment Facilities that have installed Continuous Online Emission Monitoring Systems	:	10

Part 2 District – wise Bio Medical Waste Generation (for the previous calendar year 2022)

S.No	Name of the State/ Union territory	Name of the District	Bio-medical Waste Generation (in kg/day)	Existing total bio-medical waste treatment capacity (both captive and CBMWTF) in kg/day	
				Equipment	Total
	Tamil Nadu				
1.		Chengalpattu	3021	Incinerator	25200 kg/day
2.		Chennai	10087	Autoclave	13800 kg/day
3.		Cuddalore	1143	Deep	Nil
4.		Kancheepuram	1745	Burial	

5.	Tiruvallur	820	Any other	--
6.	Villupuram & Kallakurichi	823.16		
			Equipment	Total
7.	Coimbatore	9560	Incinerator	11500 kg/day
8.	Tiruppur	1670	Autoclave	13400 kg/day
9.	Nilgiris	250	Deep Burial	Nil
			Any other	--
			Equipment	Total
10.	Dharmapuri	415.09	Incinerator	3300 kg/Day
11.	Krishnagiri	368	Autoclave	825 kg/Day
12.	Karur	369	Deep Burial	Nil
13.	Erode	663.97	Any other	--
14.	Namakkal	208.03		
15.	Salem	804.26		
			Equipment	Total
16.	Kanyakumari	1494	Incinerator	4400 kg/Day
			Autoclave	2400 kg/Day
17.	Thoothukudi	676	Deep Burial	Nil
18.	Tirunelveli & Tenkasi	1386	Any other	--
			Equipment	Total
19.	Madurai	2040	Incinerator	3300 kg/day
20.	Dindigul	640	Autoclave	1600 kg/day
21.	Theni	430.35	Deep Burial	Nil
22.	Ramanathapuram	299.92	Any other	--
23.	Virudhunagar	410.65		
			Equipment	Total
24.	Nagapatinam & Tiruvarur	845	Incinerator	3300 kg/day
25.	Thanjavur	855	Autoclave	2000 kg/day
26.	Trichy	1298	Deep Burial	Nil
27.	Ariyalur & Perambalur	697	Any other	--
28.	Pudukottai	335		
29.	Sivagangai	435		
			Equipment	Total
30.	Vellore, Ranipet & Thirupathur	5375	Incinerator	6000 kg/day
			Autoclave	3600 kg/day
			Deep Burial	Nil
31.	Tiruvannamalai	557	Any other	--

Note:

- The entire quantity of Biomedical wastes generated is treated and disposed through 10 CBMWTFs presently in operation.

Part 4 information on Common Bio medical waste treatment and disposal facilities (for the previous calendar year 2022)

S. No	Name and Address of the common bio Medical Waste treatment facilities with contact person name and telephone number	GPS coordinates	coverage Area in KMs	Name of the cities/ areas covered by CBMWTFs	Total number of Health care facilities Being covered	Total number of beds covered	Total quantity of bio-medical waste Collected from member Health care facilities (in kg/day)	Capacity of treatment equipments installed by common bio medical waste treatment facilities			Total bio-medical waste treated in Kg/day	Method of disposal of treated wastes (incineration ash/sharps /plastics)
								Equipment	Numbers	Total Installed capacity (kg/day)		
1	M/s. G.J Multiclave (India) Pvt Ltd, Themelpakkam, Chengalpattu Taluk, Chengalpattu District. Mr. Siva Kumar Mobile No: 98409196971	12.74449 0° 80.03324 5°	80	Chengalpattu District, Parts of Chennai District, Parts of Kancheepuram District	4300	24978	12260	Incinerator	2	10800 Kg/day	12260	1. Incineration Ash disposed through TSDF 2. Sharps disposed in Sharp pits 3. Plastics disposed through Authorised recycler
								Plasma Pyrolysis	--	--		
								Autoclave	2	8000 Kg/day		
								Hydroclave	--	--		
								Microwave	--	--		
								Shredder	2	6000 kg/day		
								Sharps encapsulation or concrete pit	552	--		
								Deep burial pits	--	--		
								Any other equipment	--	--		
								Effluent treatment plant	1	25 KLD		
Sub-total												
2	M/s.Tamilnadu waste management ltd, Servey No.29/2, 3, K.K.Pudur Road, Kinar village, Chengalpattu Dist. Mr.Sridhar Reddy Mobile No:9047011151	12.52998 7° 79.95400 9°	105 kms	Parts of Kancheepuram District, Thiruvallur District, Maduranthagam Taluk of Chengalpattu District, Parts of Cuddalor District and Villupuram Districts	2241	15409	3972	Incinerator	1	4400 Kg/day	3972	1. Incineration ash - disposed through TSDF 2. Waste sharps – Sharp pits 3. Plastics – Disposed through recyclers
								Plasma Pyrolysis	--	--		
								Autoclave	1	3240 Kg/day		
								Hydroclave	--	--		
								Microwave	--	--		
								Shredder	2	1760 kg/day & 1780 kg/day		
								Sharps encapsulation or concrete pit	2	--		

								Deep burial pits	--				
								Any other equipment	--				
								Effluent treatment plant	1		10 KLD		
								Sub-total	--				
3	M/s. Ken Biolinks Pvt Ltd, 1/150, SLRS Hospital Road, Kandipadu Village, Katpadi Taluk, Vellore District. Mr. SHIVA SUBRAMANIAN +91-98623-11011	13.00168 1 N° 79.19436 3 E°	75 kms	Vellore, Tiruvannamalai, Ranipet, Tirupathur Districts	1799	12703	5932	Incinerator	1		6000 kg/day	5932	1. Incineration ash - disposed through TSDF
								Plasma Pyrolysis	--				2. Waste sharps - Sharp pits
								Autoclave	1		3600 Kg/day		3. Plastics - Disposed through recyclers
								Hydroclave	--				
								Microwave	--				
								Shredder	2		2200-3300 kg/day		
								Sharps encapsulation or concrete pit	8		--		
								Deep burial pits					
								Any other equipment	1-Needle tip cutter or destroyer 1-Chemical disinfection		60 Needles / Hour Hypo Dosing System - 100 lts		
								Effluent treatment plant	1		15 KLD		
								Sub-total					
4	M/s. Medicare Enviro System, Sengipatti Village, Thanjavur Taluk, Thanjavur Dt. Mr. K.Velmurugan, 9600288998	10.7141° N 78.9557° E	140 Kms	Thanjavur, Trichy, Pudukottai, Sivagangai, Nagapatinam, Tiruvavur, Ariyalur & Perambalur	4009	29038	4060	Incinerator	1		3300 Kg/day	4060	1. Incineration ash - disposed through TSDF
								Plasma Pyrolysis	--				2. Waste sharps - Sharp pits
								Autoclave	1		2000 Kg/day		3. Plastics - Disposed through recyclers
								Hydroclave	--				
								Microwave	--				
								Shredder	1		1100 kg/day		
								Sharps encapsulation or concrete pit	8		--		
								Deep burial pits	--		--		

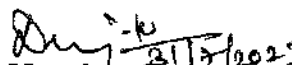
								Any other equipment	--			
								Effluent treatment plant	1	1.5 KLD		
								Sub-total	--			
5	M/s. Ramky Energy & Environment Ltd., Undrimikidikulam, Aruppukottai Taluk, Virudhunagar District. Mr. Mohan 9677122723	9.69 N 79.24 E	250 KM	Madurai Dt. Virudhunagar Dt. Dindigul Dt. Theni Dt. & Govt Hospitals in Ramnad	2837	24210	3638.28	Incinerator	1	3300 Kg/day	3638.28 + 195.64 (collected and handed over by the CBMWTF M/s Neel and Clean Service Squad, Keelakottai Village, Paramakudi Taluk, Ramanathapuram District for the treatment and disposal)	1. Incineration ash - disposed through TSDF 2. Waste sharps -- Sharp pits 3. Plastics -- Disposed through recyclers
							Plasma Pyrolysis	--	--			
							Autoclave	1	1600 Kg/day			
							Hydroclave	--				
							Microwave	--				
							Shredder	2	2200 & 1650 kg/day			
							Sharps encapsulation or concrete pit	2	--			
							Deep burial pits	--	--			
							Any other equipment	--	--			
							Effluent treatment plant	1	5 KLD			
							Sub-total					
6	M/s. Aseptic System Bio Medical Waste Management Co., Pappankulam Village, Nanguneri Taluk, Tirunelveli District. Mr. Murugan 7373715180	77.73575 ° N 8.47752° E	100 KM	Tirunelveli Dt. Tuticorin Dt. Kanyakumari Dt. & Tenkasi Dt.	2733	22930	3556	Incinerator	1	4400 Kg/day	3556	1. Incineration ash - disposed through TSDF 2. Waste sharps -- Sharp pits 3. Plastics -- Disposed through recyclers
							Plasma Pyrolysis					
							Autoclave	1	2400 Kg/day			
							Hydroclave					
							Microwave					
							Shredder	1	4400 kg/day			
							Sharps encapsulation or concrete pit	42	--			
							Deep burial pits	--	--			
							Any other equipment	--	--			
							Effluent treatment plant	1	15 KLD			
							Sub-total	--				

7	M/s. Teknotherm Industries, 183/1A, Orattukupai Village., Chettipalayam Village., Podanur, Coimbatore. Mr. Sudhakar 9626822000		75 Kms	Coimbatore, & Tiruppur Districts	924	18967	10000	Incinerator	1	6000 Kg/day	10000	1. Incineration ash - disposed through TSDF 2. Waste sharps – Sharp pits 3. Plastics – Disposed through recyclers
								Plasma Pyrolysis	--	--		
								Autoclave	1	9000 Kg/day		
								Hydroclave	--	--		
								Microwave	--	--		
								Shredder	1	2200 kg/day		
								Sharps encapsulation or concrete pit	1	--		
								Deep burial pits	--	-		
								Any other equipment	--	--		
								Effluent treatment plant	1	25 KLD		
Sub-total	--											
8	M/s. Ramky Energy And Environment Ltd, No:10, Thangayur Village, Edappadi Taluk, Salem-Dist M.D. Selvapandian, Ph:9840939811,	11.552937, 77.850794	100 kms	Salem Dharmapuri Krishnagiri Namakkal Karur Erode	4926	30392	2828.35	Incinerator	1	3300 Kg/day	2828.35	1. Incineration ash - disposed through TSDF 2. Waste sharps – Sharp pits 3. Plastics – Disposed through recyclers
								Plasma Pyrolysis	-			
								Autoclave	1	825 Kg/day		
								Hydroclave	-			
								Microwave	-			
								Shredder	2	1100 Kg/ day and 2200 Kg/day		
								Sharps encapsulation or concrete pit	2	-		
								Deep burial pits	-			
								Any other equipment	-			
								Effluent treatment plant	1	1.8 KLD		
Sub-total												
9	Society for Bio Medical Waste Management Ottupattaral Village, Coonoor. (IMA Nilgiris)	--	--	--	--	--	--	Incinerator	--		The CBMWTF now under closure since 2019.	
								Plasma Pyrolysis	--			
								Autoclave	--	--		
								Hydroclave				

	Dr. Muralidharan 9443475946							Microwave					
								Shredder	--	--			
								Sharps encapsulation or concrete pit					
								Deep burial pits					
								Any other equipment					
								Effluent treatment plant	--				
								Sub-total					
10	M/s Neat and Clean Service Squad, Keelakottai Village, Paramakudi Taluk, Ramanathapuram District Mr. Pathy 8220013008	9°26'08.5 "N 78°40'37. 8"E	75 Km	Ramanathapuram (Private Hospitals), Sivagangai (Manamadurai Town Panchayat alone)	297	1361	195.64	Incinerator	--				The CBMWTF now under closure. All the waste collected were handed over to M/s Ramky Energy and Environment Limited, Virudhunagar for treatment and disposal
								Plasma	--				
								Pyrolysis					
								Autoclave	--	--			
								Hydroclave					
								Microwave					
								Shredder					
								Sharps encapsulation or concrete pit	--				
								Deep burial pits	--				
								Any other equipment					
								Effluent treatment plant					
								Sub-total					
11	M/s.Kovai Bio Waste Management P Ltd., SF.No.87/2, Orattukupai Village., Chettipalayam Village., Podanur, Coimbatore. Tmt. Bhuvaneshwari 9894012222	Lat:10.93 6115 Long: 77.04663 5	1075 sq.km	Tiruppur, Coimbatore & Nilgiris Districts	2696	5393	1480	Incinerator	1	5500 Kg/day	1480	1. Incineration ash - disposed through TSDF 2. Waste sharps - Sharp pits 3. Plastics - Disposed through recyclers	
								Plasma	--				
								Pyrolysis					
								Autoclave	1	4400 Kg/day			
								Hydroclave	--				
								Microwave	--				
								Shredder	1	2200 kg/day			
								Sharps encapsulation or concrete pit	1				
								Deep burial pits	--				
								Any other	--				

								equipment					
								Effluent treatment plant	1				
								Sub-total					
12	M/s. Pondicherry Solid Waste Management Company Private Limited, S.F.NO.275/2, T. Pudaiyur village, Vrudhachalam Taluk, Cuddalore District	Latit:11.5 17155 Long:79.1 96589	75	Cuddalore, Villupuram, Kallakurichi, Ariyalur, Perambalur	841	5733	1799.16	Incinerator	1	10000 Kg/day	1799.16	1. Incineration ash - disposed through TSDf	
								Plasma Pyrolysis	--			2. Waste sharps - Sharp pits	
								Autoclave	1	2550 Kg/day		3. Plastics - Disposed through recyclers	
								Hydroclave	-				
								Microwave	-				
								Shredder	1	5500 Kg/day			
								Sharps encapsulation or concrete pit	1	1x1x0.85 m			
								Deep burial pits	-	-			
								Any other equipment	-	--			
								Effluent treatment plant	1	10 KLD			
								Sub-total	-	--			

a.	Total number of transportation vehicle used for collection of bio-medical waste on daily basis by the common bio-medical waste treatment facilities	114
b.	List of health care facilities not having membership with the common bio-medical waste treatment facilities and neither having captive treatment facilities	Nil
c.	Number of trainings organized by the common bio -medical waste treatment facility operators	264
d.	Number of Accidents reported by the common bio medical waste treatment facilities	Nil


 For Member Secretary
 20/3/23
 31/7/23

Annual Report
on
Biomedical Waste Management
as per
Biomedical Waste Management Rules, 2016
For the year 2021



Central Pollution Control Board
(Ministry of Environment Forest & Climate Change)
Parivesh Bhawan, East Arjun Nagar
Delhi – 110032

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1 Introduction

The Biomedical Waste has been regulated under Biomedical Waste Management Rules, 2016 (BMWM Rules, 2016) as notified under Environment (Protection) Act, 1986 by the Ministry of Environment Forest & Climate Change. These Rules were first notified in the year 1998 and then revamped in the year 2016 to implement these rules more effectively and to improve the collection, segregation, processing, treatment and disposal of bio-medical wastes in an environmentally sound management thereby, reducing the bio- medical waste generation and its impact on the environment.

BMWM Rules, 2016 prescribed specific duties for Occupier (such as hospitals, nursing homes, clinics, dispensaries, veterinary institutions, animal houses, pathological laboratories, blood banks, AYUSH hospitals, clinical establishments, research or educational institutions, health camps, medical or surgical camps, vaccination camps, blood donation camps, first aid rooms of schools, forensic laboratories and research labs), duties of the operator of Common Biomedical Waste Treatment Facilities (CBWTFs) and also duties for authorities like Ministry of Environment Forest & Climate Change (MoEF & CC), Ministry of Health & Family Welfare (MoH & FW), Ministry of Defence (MoD), Central Pollution Control Board (CPCB), State Government of Health (GoH), State Pollution Control Boards (SPCBs) /Pollution Control Committees (PCCs) and Municipalities or Urban Local Bodies (ULBs). The BMWM Rules, 2016 stipulates about provisions for segregation of biomedical waste as per the colour coded system (Yellow, Red, Blue and White) prescribed under said Rules. These Rules are applicable to all persons who generate, collect, receive, store, transport, treat, dispose, or handle bio medical waste in any form.

These Rules has mandate of preparation of Annual Inventory of biomedical waste generation, its collection, treatment and disposal under Rule 13. Every Occupier and Common Biomedical Waste Treatment Facility Operator is required to prepare annual inventory for biomedical waste management. Further, SPCBs/PCCs shall compile and submit the Annual Report to Central Pollution Control Board for the preceding year before 31st July of every year. Central Pollution Control Board shall compile, review and analyse the annual data submitted by SPCBs / PCCs and submit the same to MoEF &CC.

The inventory with respect to generation, treatment and disposal of biomedical waste is required for effective management of biomedical waste and implementation of BMWM Rules, 2016.

2 Status of Annual Report and Gaps identified

BMWM Rules, 2016 stipulate format for preparation of Annual Report by the Occupier and Operator of CBWTF in Form IV and format for preparation of Annual Report by State Pollution

Control Boards in Form IV(a). All States, Union Territories and Director General of Armed Forces Medical Services (DGAFMS) have submitted the annual reports on biomedical waste management for the year 2021.

States namely Andhra Pradesh, Bihar, Goa, Haryana, Himachal Pradesh, Lakshadweep, Madhya Pradesh, Maharashtra, Meghalaya, Mizoram, Nagaland, Odisha, Puducherry, Punjab, Rajasthan, Sikkim, Tamil Nadu, Telangana, Uttarakhand and West Bengal submitted the annual report information before July, 2022. However, SPCBs namely Andaman Nicobar, Arunachal Pradesh, Assam, Chandigarh, Chhattisgarh, Daman & Diu, Delhi, Gujarat, Jharkhand, J&K, Karnataka, Kerala, Manipur, Tripura, Uttar Pradesh & DGAFMS submitted the annual report information after July, 2022. Annual Report was submitted consistently delayed in the year 2020 and 2021 by SPCBs namely Assam, Chhattisgarh, Jharkhand, J & K, Karnataka, Tripura and U.P.

In the annual report information received from SPCBs/PCCs, following common gaps/ discrepancies have been observed and communicated to respective SPCB/PCC for clarification and rectification:

1. Health Care Facilities (HCFs) are operational without authorization.
2. Many bedded HCFs not installed liquid waste treatment facilities.
3. Information w.r.to deep burial installed by HCFs/CBWTFs is not provided
4. HCFs having captive treatment facility instead of using CBWTF
5. Many HCFs are not utilizing CBWTFs.

SPCBs namely Assam, Bihar, Chandigarh, Daman & Diu, Delhi, DGAFMS, Goa, Haryana, Himachal Pradesh, Kerala, Madhya Pradesh, Maharashtra, Mizoram, Nagaland, Odisha, Puducherry, Punjab, Sikkim, Tamil Nadu and West Bengal have submitted the clarification on above observations of CPCB and the same has been incorporated in this report. However, other SPCBs are not yet responded.

3 Bio-medical Waste management scenario

The total quantum of Biomedical Waste (BMW) generation was reported as 764 tonnes/day of BMW, out of which 721 tonnes/day BMW was treated and disposed off in the country. There are 3,75,256 no. of HCFs, out of which 1,21,396 no. of HCFs are bedded and 2,53,860 no. of HCFs are non-bedded. 2,62,786 no. of HCFs utilise the facilities of CBWTFs for the collection, treatment, & disposal of biomedical waste, while 13,605 HCFs have captive treatment facilities for the treatment and disposal of biomedical waste. There are 215 no. of CBWTFs in operation and 35 no. of CBWTFs are under construction. State-wise details of annual data on BMW is given at Annexure I. The brief BMW scenario of the Country is given below:

➤ No. of HCFs	: 3,75,256
➤ No. of bedded HCFs	: 1,21,396
➤ No. of non-bedded HCFs	: 2,53,860
➤ No. of beds	: 25,61,295
➤ No. of CBWTFs	: 215* + 35**
➤ No. of HCFs granted authorization	: 3,20,751
➤ No of HCFs utilizing CBWTFs	: 2,62,786
➤ No. of HCFs having Captive Treatment Facilities	: 13,605
➤ No. of Captive Incinerators Operated by HCFs	: 102
➤ Quantity of BMW generated in Tonnes/day	: 764
➤ Quantity of BMW treated in Tonnes/day	: 721
➤ No. of HCFs/CBWTFs violated BMW Rules	: 23,199
➤ No. of Show-Cause notices/Directions issued to defaulter HCFs/CBWTFs	: 15,355

Note: (i) * - CBWTFs in operation (ii) ** - CBWTFs under construction

4 Analysis of BMWM Scenario (in the Year 2020 and 2021)

As the data indicates the number of HCFs has been increased over the period, during the year 2020, total number of HCFs were reported as 3,52,014, however the same has increased to 3,75,256 in 2021. Also, total number of authorized healthcare facilities have been increased and there are 3,20,751 no. of HCFs are authorised out of 3,75,256 no. of HCFs. The increase in number of authorization reflects that the HCFs has been identified and authorized by respective SPCBs/PCCs under BMWM Rules, 2016.

The total generation of Biomedical Waste was about 774 tonnes per day in the year 2020. However, the amount of Biomedical Waste generated is estimated to be 764 tonnes per day in 2021. The decrease in amount of Biomedical Waste generation from year 2020 to 2021 in spite of increase in HCFs is may be due to decreased cases of COVID19 affected patients in year 2021.

Annual report information also shows that there is increase in number of CBWTFs from 208 to 215 in the year 2020 and 2021, respectively, for the treatment & disposal of generated biomedical waste. The same is also reflected as there is increase in number of HCFs utilising CBWTFs from 2,44,282 to 2,62,786 during the year 2020 and 2021, respectively. In addition to this, as there is increase in number of CBWTFs for treatment of biomedical waste, there is decrease in number of captive treatment facility from 17,206 to 13,605 and decrease in no. of captive incinerators from 125 to 102. The captive treatment facilities are majorly in operation in hilly areas and remote areas due to inaccessibility of CBWTFs. Detailed comparison on BMWM scenario during 2020 and 2021 is mentioned in Table 1 below:

Table 1: Comparative BMWM scenario in 2020 and 2021

Particulars	Year 2020	Year 2021
No. of HCFs	3,52,014	3,75,256
No. of bedded HCFs	1,13,186	1,21,396
No. of non-bedded HCFs	2,37,938	2,53,860
No. of beds	25,44,116	25,61,295
No. of CBWTFs	208	215* + 35**
No. of HCFs utilizing CBWTF	2,44,282	2,62,786
No. of HCFs granted authorization	1,60,736	3,20,751
No. of HCFs having Captive Treatment Facilities	17,206	13,605
No. of Captive Incinerators Operated by HCFs	125	102
Quantity of BMW generated (Tonnes/day)	774 (656 Non COVID + 118 COVID BMW)	764 (684 Non COVID BMW+80 COVID BMW)
Quantity of BMW treated in Tonnes/day	708	721
No. of HCFs violated BMW Rules	22,261	23,199
No. of Show-cause notices/Directions issued to defaulter HCFs	13,389	15,355

5 COVID waste management during 2020 to 2021

Biomedical waste generation has been increase due to COVID19 pandemic. For safe collection, transport, treatment and disposal of COVID19 biomedical waste, CPCB has prepared “guidelines for Handling, treatment and disposal of waste generated during treatment, diagnosis and quarantine of COVID-19 Patient” in year 2020.

5.1 Revision of CPCB Guidelines in year 2021:

CPCB guidelines for Handling, treatment and disposal of waste generated during treatment, diagnosis and quarantine of COVID-19 Patient has been revised during the year 2020 and 2021 as per requirement. In the year 2021, Rev.-5 of the guideline has been prepared wherein following changes have been incorporated:

- i. Used test kits may be collected separately as domestic hazardous waste characterized under Solid Waste Management Rules, 2016 by local bodies. For this purpose, local bodies may establish common waste deposition centres as per said Rules.
- ii. Users may deposit in nearby PHCs, CHCs, GMCs, hospitals and 24 hours' pharmacies for subsequent disposal through CBWTFs or manufacturers attached with them.
- iii. Disposal as per Manufacturer's instructions – these instructions may include (i) keep the used test kits separately for minimum 72 hours prior to disposal as dry solid waste, or (ii) use the disinfectant given along with kit by manufacturer or (iii) user may use any other disinfectant to disinfect the used kit prior to disposal with general solid waste as dry waste to ensure 10 log 4 reduction as specified under BMWM Rules, 2016.
- iv. Above disposal options are same for the COVID-19 antigen home self-test kits showing both positive or negative test.

5.2 COVID19BWM tracking Application for COVID-19 biomedical waste

In May, 2020, CPCB developed a tracking application namely 'COVID19BWM', which is available on mobile as well as on web version. This application was developed for tracking of COVID-19 biomedical waste. CPCB guideline mandates use of COVID19BWM App by every COVID-19 biomedical waste generator like HCFs having COVID ICUs, quarantine centres/camps, home isolation/home care etc., captive treatment facilities and CBWTFs. The App has also been used during year 2021, around 10813 no. of waste generators was registered in the tracking app and reported in the App. Also, almost all CBWTFs were engaged in treatment & disposal of COVID-19 biomedical waste.

5.3 COVID -19 Biomedical Waste Management during 2021

CPCB reviewed status of COVID waste management in States/UTs during year 2021. As per the available information, an average of around 80 tonnes/day COVID-19 biomedical waste was generated, collected, treated and disposed of during year 2021. Month wise average COVID-19 biomedical waste generation in the Country during the period from January 2021 to December, 2021 is given in Table 2:

Further, during the year 2021, the highest generation of COVID-19 biomedical waste was reported during May 2021 which was about 7,067 Tonnes and the minimum generation of COVID-19 biomedical waste was reported during December 2021 which was about 713 Tonnes.

Table 2 - COVID-19 Biomedical Waste Management during 2021

S. No.	Months	COVID 19 BMW (Tonnes)
1.	January, 2021	1647
2.	February, 2021	1477
3.	March, 2021	2945
4.	April, 2021	3240
5.	May, 2021	7067
6.	June, 2021	4922
7.	July, 2021	2255
8.	August, 2021	1721
9.	September, 2021	1472
10.	October, 2021	1001
11.	November, 2021	738
12.	December, 2021	713
	Total	29,198 tonnes ~ 80 tonnes/day

6 Availability of Healthcare Facilities and their Authorization:

As per the annual report data provided by SPCBs and PCCs for the year 2021, there are 3,75,256 no. of HCFs, out of which 1,21,396 no. of HCFs are bedded and 2,53,860 no. of HCFs are non-bedded. Details of the number of HCFs in states/UTs and DGAFMS are given in fig. 1 and 2;

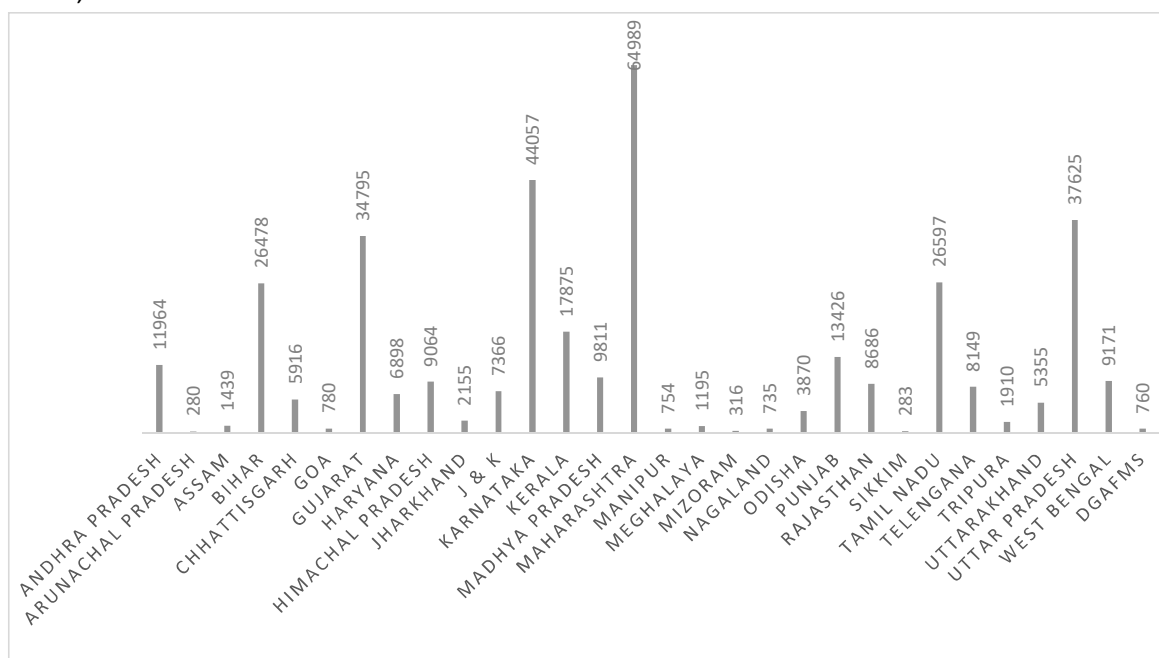


Fig : -1; No. of HCFs in States & DGAFMS

Fig. 1 shows that Maharashtra has the highest number of HCFs and also has highest number of identified and authorized HCFs. Whereas, Arunachal Pradesh has the lowest number of HCFs and less number of HCFs has been authorized. The requirement of HCFs may depend on many factors such as area of State/UT, population density etc.

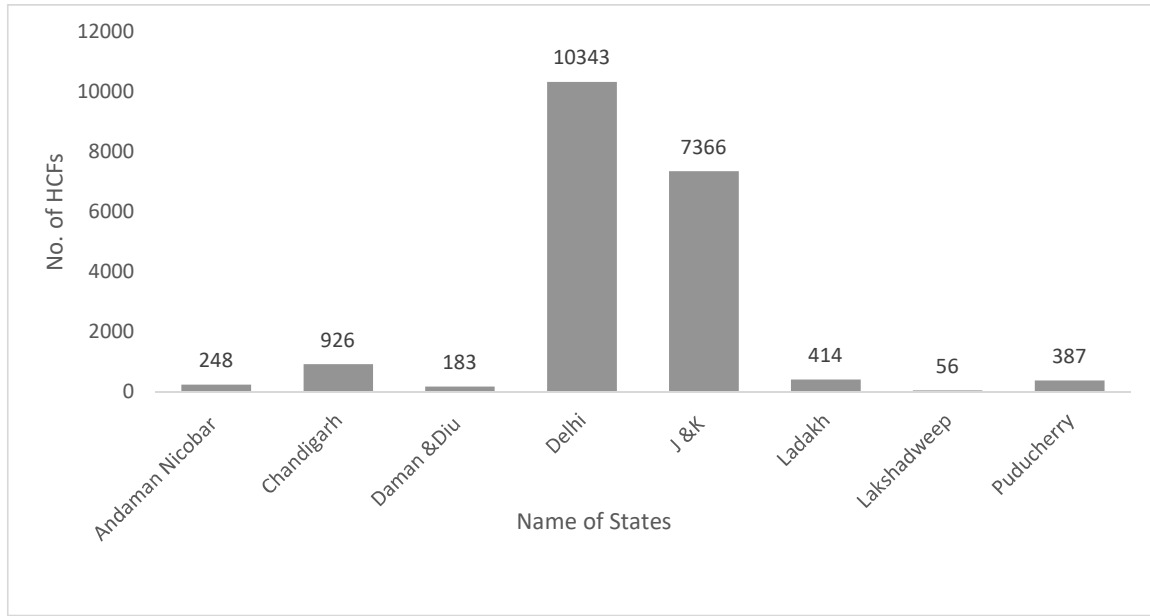


Fig: -2; No. of HCFs in 8 UTs

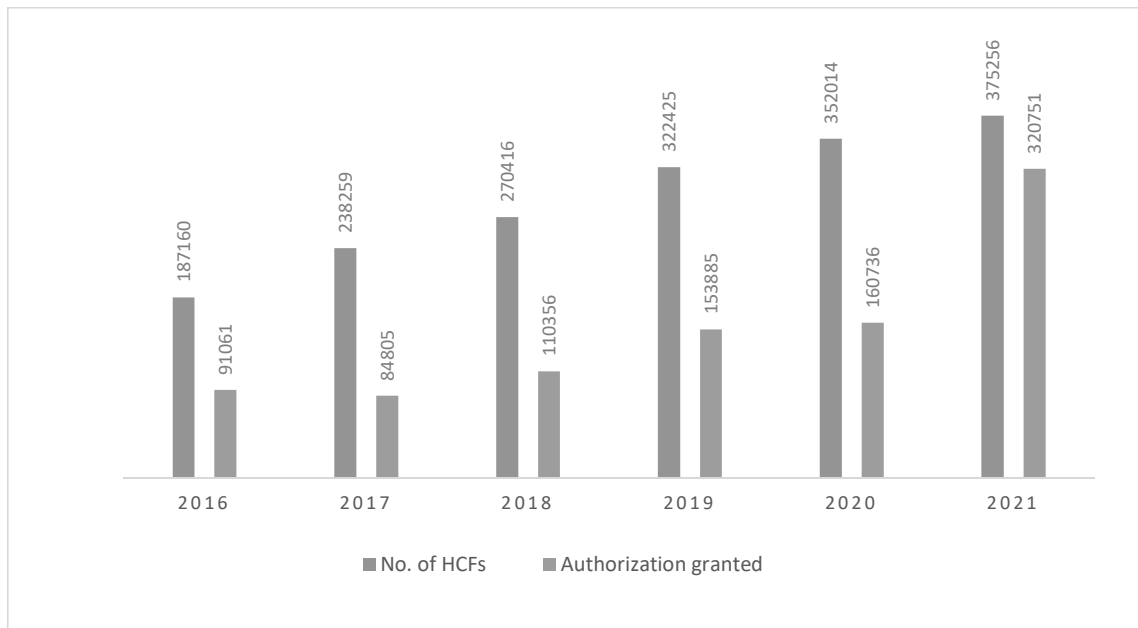


Fig: -3; No. of HCFs and their authorization reported by States/UTs since last five years

Authorization is a tool to capture the information regarding BMWM by the HCFs as well as by CBWTF operators. BMWM Rules, 2016 stipulate that every healthcare facility (bedded & non-bedded) require to obtain authorization from concerned SPCB/PCC. It has been observed that there are HCFs not yet authorized under BMWM Rules, 2016 which is a violation of BMWM Rules, 2016. SPCB/PCC should ensure authorization of every HCFs under BMWM Rules, 2016. Since 2018, the number of authorizations has increased with the increased number of HCFs. Details of the number of HCFs and their authorization reported by States/UTs since last five years are given in fig. 3.

Authorization to all HCFs has been issued by the SPCBs/PCCs namely Andaman & Nicobar, Chandigarh, Delhi, Ladakh, Lakshadweep, Manipur, Mizoram, Sikkim, Tripura, Tamilnadu and West Bengal. As per Annual report information of BMWM for the year 2021, HCFs are in operation without authorization in the States/UTs namely Jammu & Kashmir (81%), Arunachal Pradesh (74%), Bihar (64%), Goa (46%), Daman & Diu (36%) and Nagaland (28%). The same can be seen in fig. 4 i.e. for percentage of HCFs out of total number of HCFs in operation without applying authorization in States/UTs.

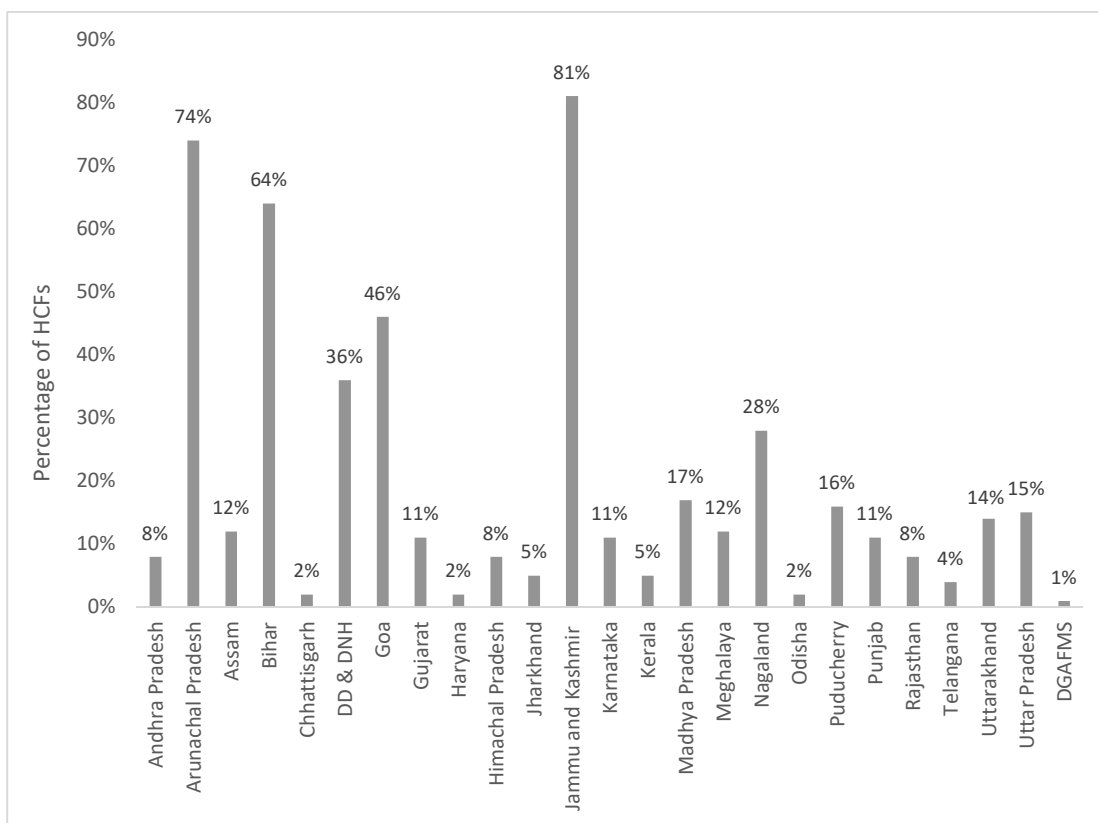


Fig: -4; Percentage of HCFs (Out of total number of HCFs) without applying authorization in States/UTs

7 Biomedical Waste Generation and Treatment

As reported by SPCBs/PCCs, about 764 tonnes/day of BMW were generated during the year 2021 by 3,75,256 numbers of HCFs. Out of 764 tonnes/day of BMW, 721 tonnes/day of BMW is treated and disposed of by CBWTFs and captive treatment facilities (CTFs) installed by Healthcare Facilities.

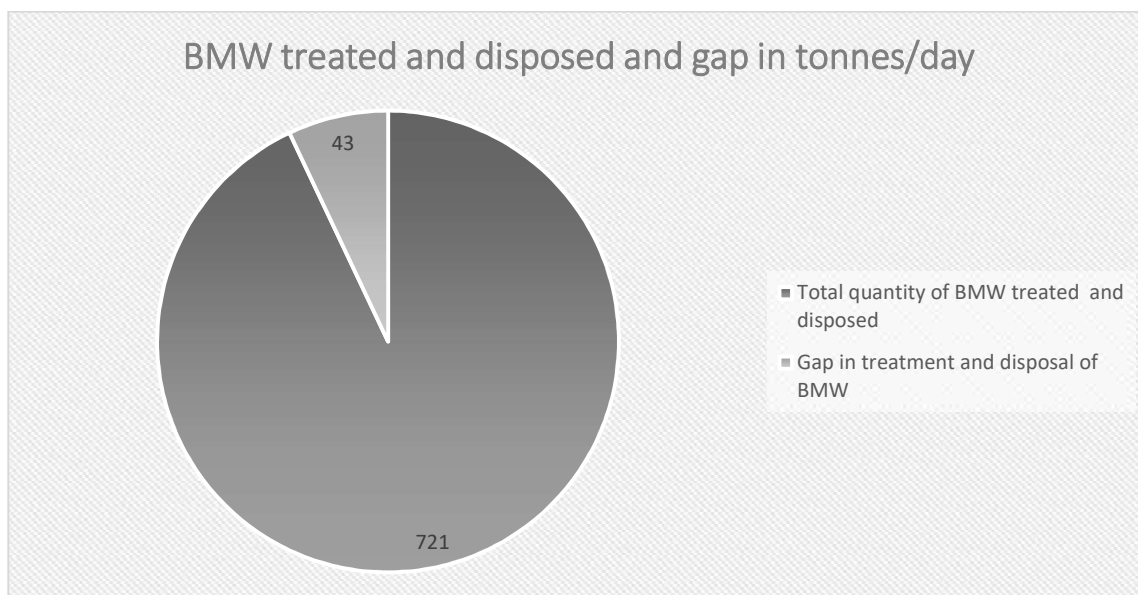


Fig: -5: Quantity of BMW treated & disposed and gap in tonnes/day

As per Annual report information for year 2021, there is a gap between BMW generation and its treatment & disposal. Figure 5 depicts the amount of BMW treated and disposed of, as well as the gap between treatment and disposal. CPCB has communicated the gaps observed to the respective SPCB/PCC to rectify the issue and ensure the disposal of all BMW generated in accordance with the BMWM Rules, 2016.

For environment friendly disposal of BMW there should be no gap between generation and treatment & disposal of biomedical waste. However, the gap in generation, treatment & disposal has been observed in States namely Assam, Bihar, Himachal Pradesh, Jharkhand, Karnataka, Madhya Pradesh, Nagaland, Tripura (fig. 6). Among the above States, the gap in generation, treatment, and disposal has also been observed in 2020 for Bihar, Karnataka, Madhya Pradesh and Nagaland, while the states of Kerala and Maharashtra filled the gap in 2021 for the generation and treatment of BMW.

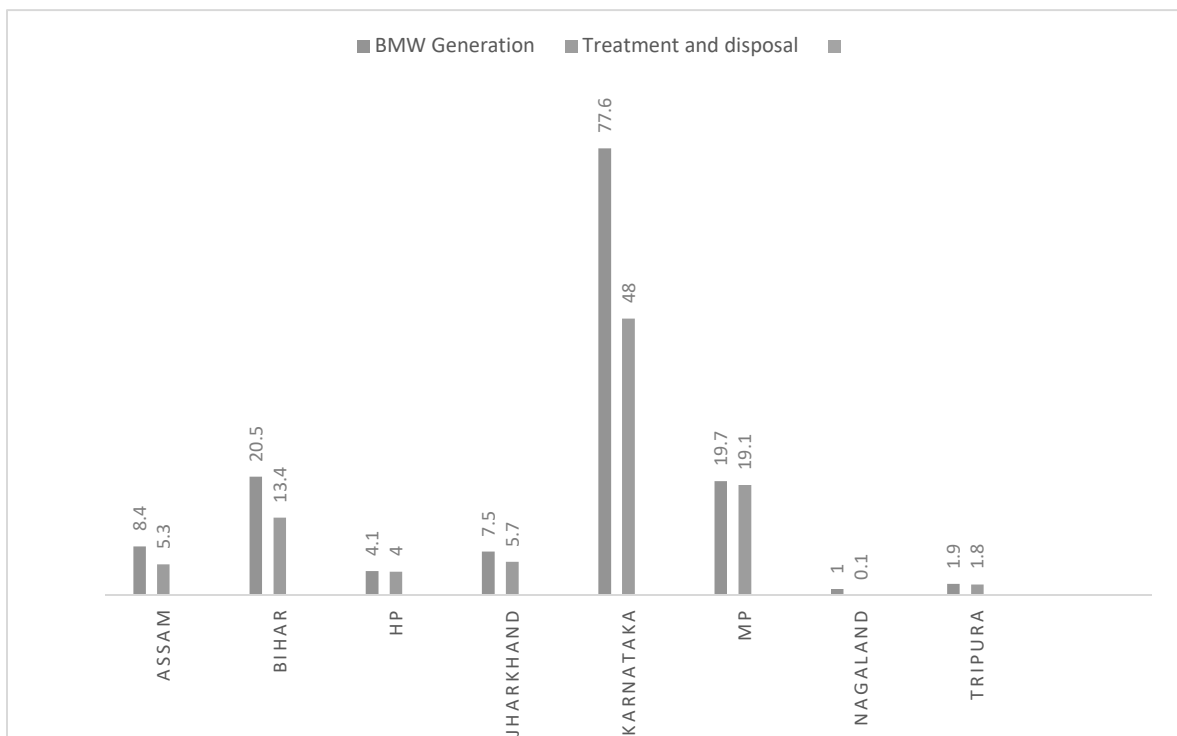


Fig: -6; Status of generation, treatment & disposal of BMW (tonnes/day)

7.1 Availability and adequacy of CBWTFs

As per BMW Rules, 2016, it is the duty of CBWTF operator to take all necessary steps to ensure that the BMW collected from the occupier is transported, handled, stored, treated and disposed of, without any adverse effect to the human health and the environment, in accordance with BMW Rules and guidelines issued by the CPCB.

As per the Annual Report Information submitted by SPCBs/PCCs for the year 2021, currently there are 215 numbers of CBWTFs operated in the Country and 35 CBWTFs are under construction. In 2021, there is increase in number of CBWTFs in Gujarat, Karnataka, Kerala, Madhya Pradesh, and Uttar Pradesh as compared to year 2020. States/UTs namely Andaman & Nicobar, Arunachal Pradesh, Ladakh, Lakashdweep, Mizoram, Nagaland, Sikkim, Tripura do not have CBWTFs for treatment and disposal of biomedical waste. In these States/UTs, Biomedical Waste is disposed of through captive treatment facility or deep burial. In this regard, CPCB requested such SPCBs/PCCs for submitting the proposal for setting up of CBWTFs for which they may avail financial assistance from Ministry of Environment Forests & Climate Change. State-wise details of CBWTFs is given below in fig. 7

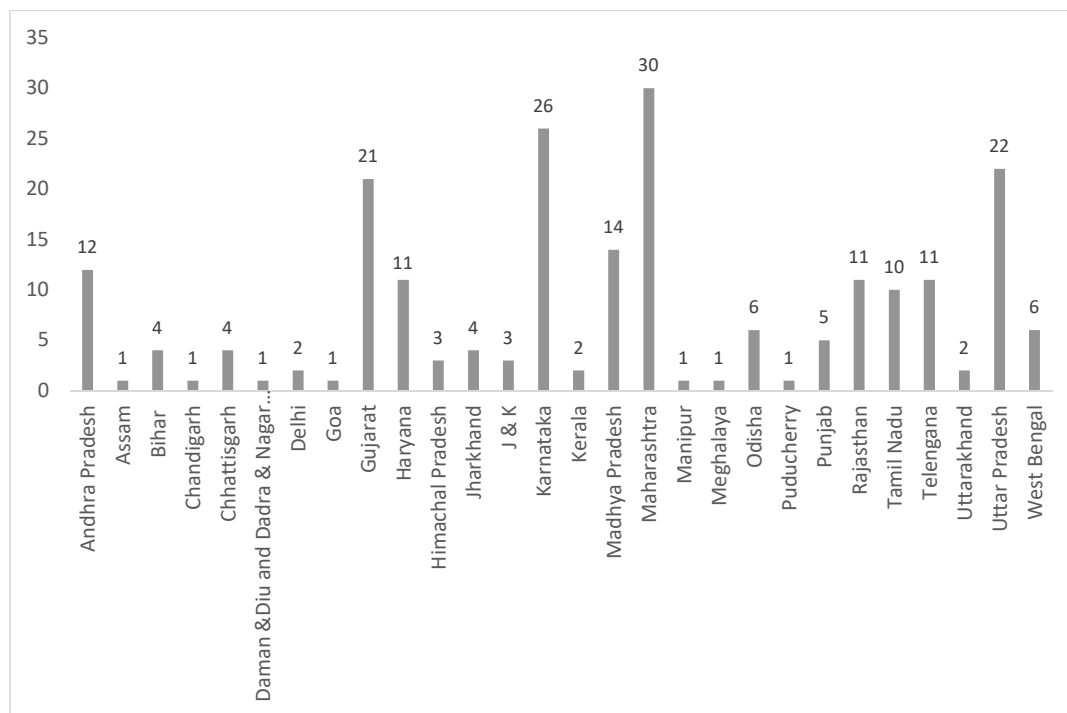


Fig 7:-No. of CBWTFs operational in the States/UTs

As shown in fig. 7, number of CBWTF varies in various States/UTs. The number of CBWTFs may depends on many factors such as number of HCFs, availability of capacity of CBWTFs, accessibility of CBWTFs, population density etc.

In States, Rajasthan and West Bengal, 7 new CBWTFs are proposed to cover all HCFs of State. Daman & Diu and Dadar Nagar Haveli has no CBWTF and handing over BMW to CBWTF situated at Gujarat (M/s En-Cler Biomedical Waste Pvt. Ltd.) for treatment and disposal of biomedical waste and Lakshadweep is handing over biomedical waste to CBWTF situated in Kerala (M/s IMAGE CBWTF in Kerala) for treatment and disposal of biomedical waste.

As per Annual Report information for year 2021, all HCFs operational in States/UTs namely Chandigarh, Delhi, Tamil Nadu, and West Bengal are using CBWTF for treatment and disposal of biomedical waste. In other States namely Bihar, Goa, Himachal Pradesh, Manipur, Odisha, and Uttarakhand, many of HCFs are still not using CBWTFs for treatment and disposal of biomedical waste. The reason of not using CBWTF is may be non-accessibility of CBWTF. States/UTs may look into the accessibility and come up with new CBWTFs to cover all HCFs in the State/UT. Utilization of CBWTFs by HCFs (in percentage) is given in fig. 8.

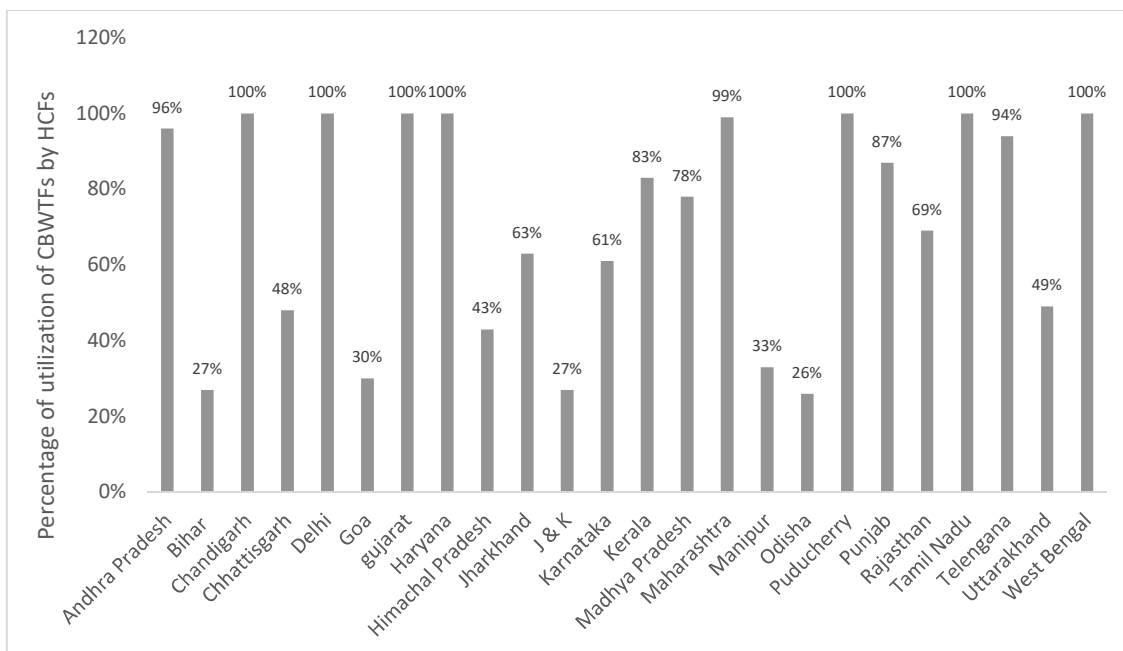


Fig:- 8; Utilization of CBWTFs by HCFs (in percentage) in State/UT.

The CBWTFs in the country are operating at cumulative treatment and disposal capacity of 1619 MT/day, of which incineration capacity is 890 MT/day and autoclave capacity is 729 MT/day. The present generation of 764 MT/day may look adequate for treatment and disposal of BMW. However, availability of CBWTFs may vary at State Level. Available treatment capacity of CBWTFs and utilisation of capacity in the country is shown in fig. 9.

SPCBs/PCCs have submitted compliance reports to the CPCB with respect to performance verification of CBWTFs as per the order passed by Hon'ble National Green Tribunal in the matter of O.A. No. 110 of 2020 regarding News item published on 01.07.2020 in "The Hindu" titled "Ramky Group accused of dumping biomedical waste in the open in Hosur". As per the report received from State Boards, 128 CBWTFs were monitored by the State Boards and 53 out of 128 CBWTFs monitored were reported as complying with the emission and effluent standards, having adequate infrastructure and reporting data as required under BMWM Rules, 2016. Further, common short-comings are given below: -

- i. Separate spaces for receiving untreated colour coded biomedical waste is not provided.
- ii. Details pertaining to Annual Report, treatment and authorization not shared on website.
- iii. Partial implementation of Bar-code tracking system.
- iv. Vehicles are not provided with GPS system.

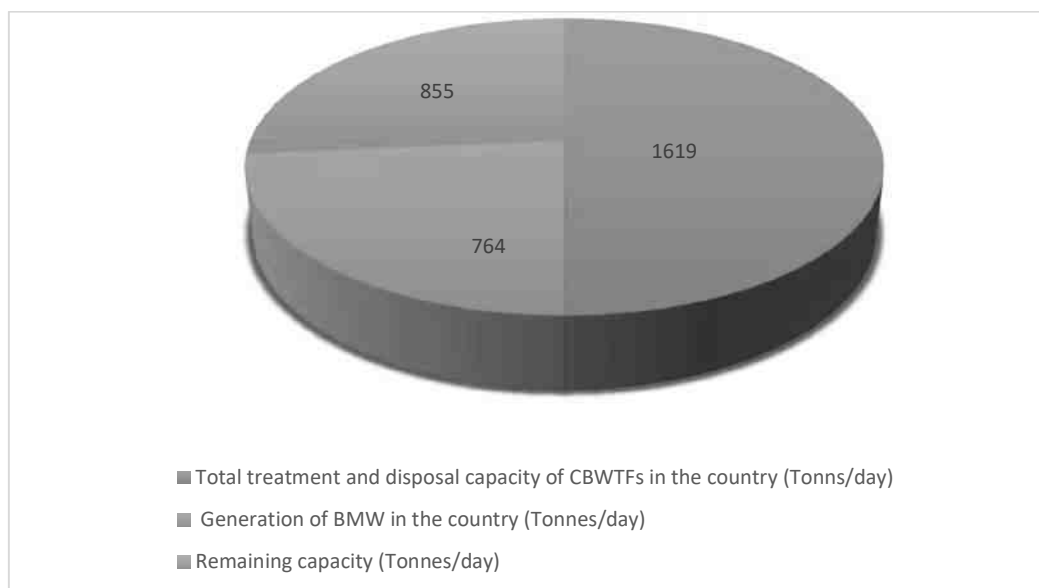


Fig :- 9; Treatment capacity available and utilization of capacity of CBWTFs in the country

7.2 Status of Captive Treatment Facilities

BMWM Rules, 2016 restricts on-site treatment and disposal facility, if a service of CBWTF is available at a distance of 75 Km. However, in case the CBWTF is not available, HCFs may install their own treatment facility for the treatment and disposal of BMW in compliance to the standards prescribed under said Rules. There are 13,605 numbers of captive treatment facilities installed by the Healthcare Facilities.

State namely Himachal Pradesh, Jharkhand, Kerala and Rajasthan have submitted the information on deep burial facilities. As per Annual Report information submitted by SPCBs/PCCs captive treatment facilities decrease in the country after 2019 (fig. 10). Further, CPCB has also issued directions to all SPCBs/PCCs regarding to ensure compliance to the standards prescribed under BMWM Rules, 2016 by captive treatment facilities operated by HCFs. In 2020, HCFs in the states of Haryana, Ladakh, Goa, Mizoram, and Nagaland operated captive incinerators, while in 2021, HCFs in the above states used CBWTF instead of captive incinerators. In addition, one CBWTF has been started in Goa State for the treatment and disposal of BMW.

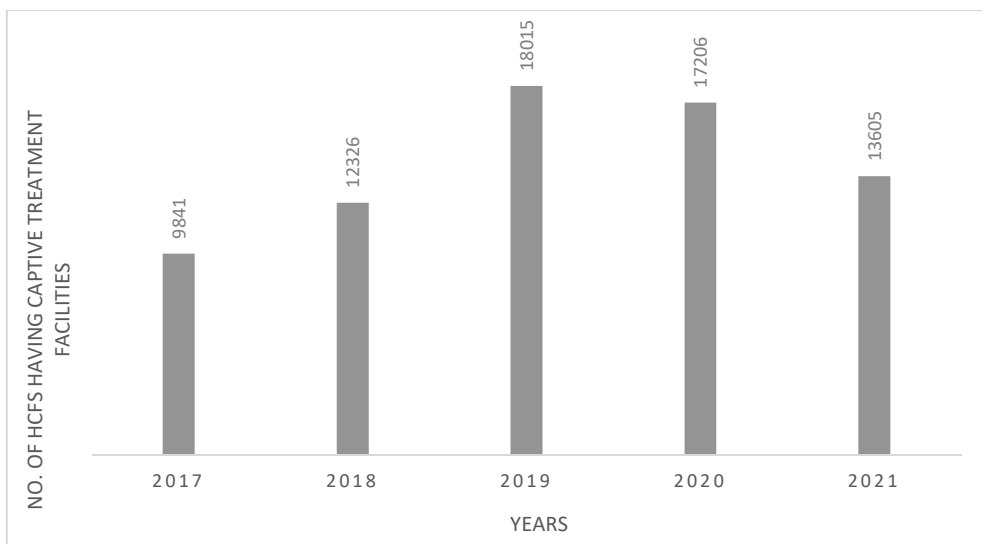


Fig: 10; Number of HCFs having captive treatment facilities

7.3 Status of deep burial

As per the revised guidelines for CBWTFs, SPCB/PCC should not allowed deep burial of BMW as a part of CBWTF. Any existing CBWTF having disposal of BMW by deep burial should have the requisite treatment equipment as stipulated under the BMW Rules. As per the information submitted by the SPCB/PCCs, deep burial pits installed by the HCFs of Andaman & Nicobar, Arunachal Pradesh, Himachal Pradesh, Jharkhand, Kerala, Madhya Pradesh, Meghalaya, Nagaland, Rajasthan and Sikkim States. The status of deep burial pits installed by HCFs is given in fig. 11. CPCB issued directions to all SPCBs/PCCs regarding verification of deep burial pits that they are authorized and designed in line with standards given under BMW Rules, 2016. Respective State Boards should initiate steps to set up CBWTF so as to avoid usage of deep burial pits.

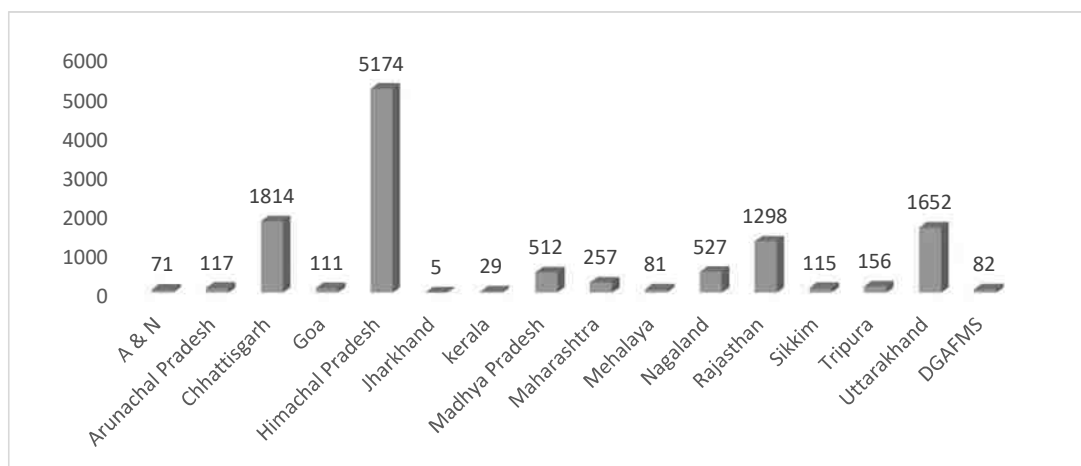
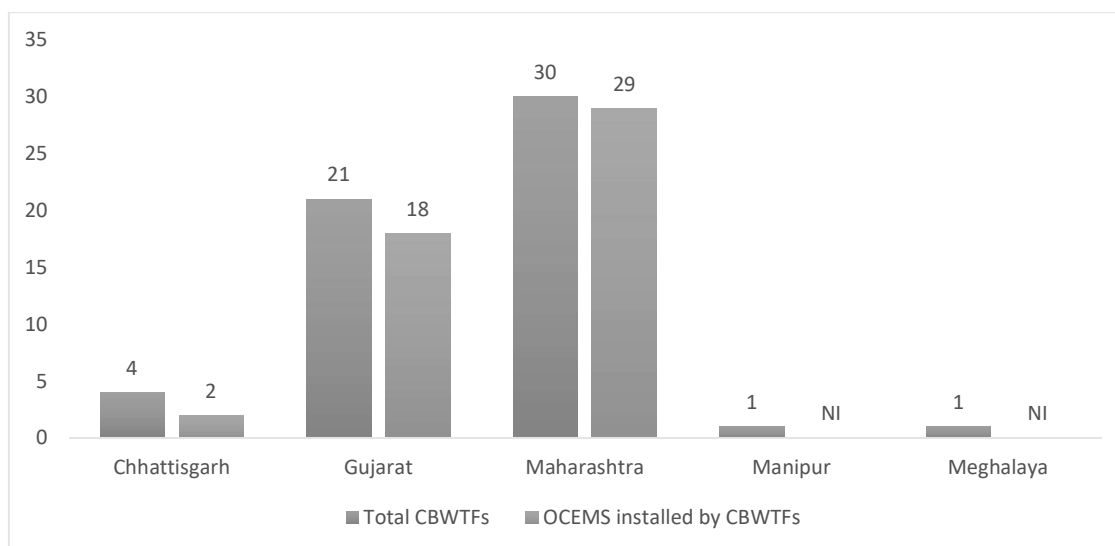


Fig:-11; Deep burial installed by HCFs in States/UTs

8 Online Continuous Emission Monitoring System:

BMWM Rules, 2016 stipulates that every occupier or operator of the common bio-medical waste treatment facility shall install Online Continuous Emission Monitoring System (OCEMS) for the parameters as stipulated by SPCBs/PCCs in authorization and transmit the real time data to the servers at SPCB/PCC and CPCB. As per the submitted information, 207 out of 215 nos. of CBWTFs have installed OCEMS with their incinerators. Further, it has been observed by CPCB that some of the CBWTFs connected to OCEMS portal are not transmitting data regularly to CPCB server. CPCB has conducted meetings with CBWTF operators related to connectivity and calibration of OCEMS and also issued directions to all SPCBs/PCCs regarding to ensure OCEMS data transmission to CPCB server. Details of CBWTFs installed OCEMS is given in fig. 12:



* NI – OCEMS not installed in CBWTF

Fig:- 12; Number of CBWTFs installed OCEMS

All operational CBWTFs of States namely Andhra Pradesh, Assam, Bihar, Chandigarh, Delhi, Goa, Haryana, Himachal Pradesh, J & K, Karnataka, Kerala, Madhya Pradesh, Odisha, Puducherry, Punjab, Rajasthan, Telangana, Tamil Nadu, Uttarakhand, Uttar Pradesh and West Bengal have installed OCEMS, however operational CBWTFs of states namely Manipur and Meghalaya have not installed OCEMS. Further, 2 CBWTFs are using deep burial in Chhattisgarh, 3 CBWTFs in Gujarat, and 1 CBWTF in Maharashtra have not installed OCEMS.

9 Status of Installation of Waste Water Treatment Facility

As per Schedule I of BMWM Rules, 2016, the chemical liquid waste shall be pre-treated before mixing with other wastewater. The combined discharge shall conform to the discharge norms given in Schedule III. Further, bedded HCFs are required to comply with the standard prescribed for liquid waste under Schedule II of BMWM Rules, 2016. However, HCFs may not

necessarily need to install Effluent Treatment Plant (ETP) in case waste water is discharged into a public sewer connected to a terminal sewage treatment plant (STP). Further, water disposed through public sewer are required to meet general standards as notified under the Environment (Protection) Act, 1986. However, all HCFs of Chandigarh State are in the process of installing ETP plant. In terms of installing of Waste Water Treatment Facility, several States are not up to par.

10 DGAFMS scenario

In case of HCFs for armed forces prescribed authority is DGAFMS. As reported, 760 HCFs are established under DGAFMS that generates about 5.8 tonnes/day bio-medical waste, which is entirely treated and disposed off by CBWTFs and Captive Treatment Facility. Out of 760 no. of HCFs, bedded HCFs and Nursing homes are 227, Clinics, Dispensaries are 527, Pathological laboratories are 2, Blood banks are 2 and Research Institutions are 2. Out of 760 no. of HCFs, 678 no. of HCFs are using CBWTFs and 82 no. of HCFs are using Captive Treatment Facility. Further, 1.4 tonnes/day of BMW is being treated by captive treatment facilities of HCFs, which is not recommended under BMWM Rules, 2016 and 4.4 tonnes/day BMW is being treated and disposed off by CBWTF. The status shows that the BMW disposal infrastructure in Armed Forces Medical Establishments does not meet the requirement of Rule. Steps may be taken to upgrade the facilities to ensure compliance of Rule.

11 Technologies for Treatment and Disposal of BMW

It has been observed that the non-burn technologies are available for the treatment & disposal of BMW. However, following provisions of BMWM Rules, 2016 restrict the adoption of non-burn technologies:

- i. Yellow category of BMW is allowed to be treat and dispose of through incineration/plasma pyrolysis/deep burial.
- ii. HCFs are not allowed to install captive treatment facilities in case the service of CBWTF is available within distance of 75 km. However, in case the CBWTF is not available, HCFs may install their own treatment facility for the treatment and disposal of BMW in compliance to the standards prescribed under BMWM Rules, 2016.
- iii. Combination of sterilization and shredding is only allowed for the red and white category of BMW.

Further, as per BMWM Rules, 2016, CPCB may lay down standards for new technologies for treatment and disposal of bio-medical waste and prescribe specifications for treatment and disposal of bio-medical wastes. The proposal for adopting new technology under BMWM Rules, 2016 may be submitted to MoEF &CC and CPCB for assessment of the same.

12 Adoption of Bar-code system

Rule 4 (i) of BMWM Rules, 2016, stipulate that it is the duty of every Health Care Facility (HCF) to establish a bar code system for bags or containers containing BMW to be sent out of the premises or place for any purpose, by 27.03.2019. Also, Rule 5 (c) of the BMWM Rules, 2016 stipulates that it is the duty of every Operator of CBWTF to establish bar code system for handling of BMW. To facilitate implementation of barcode system by Operators of CBWTFs and Hospitals at State levels, CPCB has prepared guidelines for “Barcode System for Effective Management of BMW”. According to the status of bar-code implementation received from SPCBs and PCCs, a total of 17,666 HCFs and 42 CBWTFs in 15 States/UTs have adopted the bar-code system.

Further, Hon’ble Supreme Court of India in the matter of IA No. 181745 of 2019 and I.A. No. 46339 of 2020, in W.P.C. 13029 of 1985 also passed orders directed MoEF & CC / CPCB to work out a national bar-coding system/portal for tracking of biomedical waste. In this matter, CPCB is in process of Implementation of Centralised Barcode System for tracking of biomedical waste.

13 Other issues of concern w.r.to bio-medical waste management

- District Level information of BMWM is not available in every State/UT which is required as per the BMWM Rules, 2016 as well as CPCB guidelines.
- Authorisation by every HCF including non-bedded is not achieved even after six years of notification of BMWM Rules, 2016.
- Domestic BMW is not collected separately from the households by the Urban Local Bodies as required under BMWM Rules, 2016.
- HCFs are using captive treatment facilities in some States instead of using CBWTFs. Further, timely monitoring of captive treatment facilities is required by States/UTs.
- Some CBWTFs and HCFs in the States/UTs have installed deep burial and many of the States/UTs has not provided information w.r.to deep burial pits installed by HCFs. Status of compliance by deep burial may be checked SPCBs/PCCs.
- Liquid waste treatment facility i.e ETP/STP is not installed by all bedded HCFs in the States.
- Gap analysis to assess the requirement of additional treatment facility to treat and dispose of the biomedical waste is not conducted as per CPCB guidelines.
- OCEMS is not effectively implemented by every CBWTF and captive treatment facility.

14 Actions may require/ Way forward

- SPCBs/PCCs shall ensure timely submission of annual report pertaining to their respective State or Union Territory within stipulated time period that is on or before 31st July.
- SPCBs/PCCs ensure to compile the information at District level as required under prescribed format. iv. SPCBs/PCCs shall coordinate with Urban Local Bodies and Municipalities for management of domestic biomedical waste as per Solid Waste Management Rules, 2016 for further channelization of domestic BMW to CBWTFs.
- SPCBs/PCCs should assess the adequacy of the deep burial pits used by the HCFs and ensure their restrictions up-to rural or remote areas and their compliance to deep burial standards as prescribed under BMWM Rules, 2016.
- Gap analysis should be conducted by all SPCBs/PCCs with respect to generation of BMW and available treatment capacity to check adequacy of available treatment capacity of CBWTF.
- SPCBs shall ensure that recyclable waste collected by CBMWTFs should be treated properly and provided to registered recyclers only.
- Adequacy of treatment capacity of existing CBWTFs and their compliance status be regularly assessed by the SPCBs/PCCs to review the requirement of additional treatment facility for the State / Union Territory.
- State Boards should closely monitor or track the movement of BMW generated by HCFs and treated and disposed through CBWTF.
- Any incidents or reports of illegal dumping or open burning of waste and non-complying facilities should be acted upon quickly and appropriate action may be initiated including imposition of Environmental Compensation Charges.
- SPCBs/PCCs may ensure that coverage of CBWTFs is available to every HCF to extent possible to ensure effective treatment and disposal of BMW.
- OCEMS installed in CBMWTFs be operated and maintained properly with regular calibration and quality check. Data be used for self-regulatory purpose.

Annexure - I

Annual Report information on BMWM Scenario in the Country for the Year 2021 (As submitted by SPCBs/PCCs and DGAFMS) as on March, 2023

S.No.	Name of the State/UT	Total no. of Bedded Health Care Facilities (HCFs)	Total no. of Non-bedded Health Care Facilities (HCFs)	Total no. Health Care Facilities (HCFs)	Total no. of Beds	Authorization Status			No. of HCFs utilization CBWTFs	Total Quantity of BMW generated (kg/day)	Total Quantity of BMW Treated and Disposed (kg/day)	Captive BMW Treatment Facilities Operated by the (HCFs)		Common Bio-medical Waste Treatment Facilities (CBWTFs)		Deep burial installed by HCF & CBWTFs		Total BMW treated by captive treatment facilities by HCF in Kg/day	Total BMW treated by CBWTFs kg/day)	Total no. of violation by HCFs/CBWTFs	Total No. of show cause notices/Directions issued to defaulter HCFs/CBWTFs	No. of CBWTFs that have installed OCEMS
						Total no. of HCFs applied for authorization	Total no. of HCFs granted authorization	Total no. of HCFs in operation without Authorization				No. of HCFs having Captive Treatment Facilities	No of Captive Incinerators Operated by HCFs	CBWTFs Operational	CBWTFs under Construction	HCF	CBWTFs					
I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XIII.	XVI.	XV.	XVI.	XVII.	XVII I.	XIX.	XX.	XXI.	XXII.	XXIII.	XXIV.
1	Andaman Nicobar	53	195	248	1598	248	117	Nil	Nil	542.94	542.94	7	5	Nil	Nil	71	Nil	542.94	Nil	Nil	131	Nil
2	Andhra Pradesh	6511	5453	11964	156949	2860	2859	926	11431	19719.87	19719.87	Nil	0	12	1	Nil	Nil	Nil	19719.87	927	931	12
3	Arunachal Pradesh	140	140	280	1861	312	308	172	Nil	347.53	347.53	308	10	Nil	Nil	117	Nil	347.53	nil	172	172	Nil
4	Assam	732	707	1439	23860	896	391	173	339	8421.201	5359.31	457	26	1	Nil	INP	Nil	3478.81	1880.5	469	84	1
5	Bihar	6023	20455	26478	104391	2647	2188	16929	7049	20548.81	13421.55	3	2	4	Nil	Nil	Nil	344.69	13076.86	625	626	4
6	Chandigarh	44	882	926	4817	31	31	Nil	926	5374	5374	Nil	Nil	1	Nil	Nil	Nil	Nil	5374	Nil	Nil	1
7	Chhattisgarh	1924	3992	5916	44223	1300	1075	116	2857	7906.73	7906.73	1816	3	4	2	1814	2	1717.45	6189.28	154	0	2
8	Daman & Diu and Dadra & Nagar Haveli	73	110	183	1521	103	73	66	183	553.85	553.85	NIL	NIL	Waste Handover to Gujarat Facility	NIL	Nil	Nil	NIL	553.85	NIL	Nil	Nil
9	Delhi	1094	9249	10343	58120	1015	719	0	10343	25828.35	25828.35	1	Nil	2	Nil	Nil	Nil	148.35	25680	99	99	2
10	Goa	149	631	780	5051	159	90	363	236	1129	1129	329	Nil	1	Nil	111	Nil	Nil	1129	348	348	1
11	Gujarat	12221	22574	34795	187760	4479	3966	3714	34795	52800	52800	Nil	nil	21	1	Nil	Nil	Nil	52800	6181	6181	18
12	Haryana	3428	3470	6898	63509	5709	5588	179	6898	21436	21436	Nil	Nil	11	Nil	Nil	Nil	Nil	21436	179	179	11
13	Himachal Pradesh	607	8457	9064	16685	8341	7844	723	3886	4130.3	4067.04	2	2	3	1	5174	Nil	109.44	3957.6	26	26	3
14	Jharkhand	1200	955	2155	34873	737	250	104	1359	7523.86	5756.34	5	5	4	1	5	Nil	892.38	4863.96	119	30	4
15	J & K	1589	5777	7366	18102	1415	598	5951	2010	7663.5	7663.5	Nil	Nil	3	Nil	Nil	Nil	Nil	7663.5	5953	409	3
16	Karnataka	8944	35113	44057	229222	33430	177158	5148	27135	77639	48096.28	1904	2	26	2	Nil	Nil	2297	45799.28	2118	831	26

Annual Report on Bio-Medical Waste Management for the Year 2021

17	Kerala	2095	15780	17875	124804	17106	16792	970	14936	61136	61136	44	15	2	Nil	29	Nil	2438	58698	1436	1497	2
18	Ladakh	334	80	414	1078	Nil	Nil	Nil	Nil	34.742	34.742	414	Nil	Nil	0	0	0	34.742	Nil	414	414	0
19	Lakshadweep	9	47	56	240	48	47	Nil	Nil	86.76	86.76	10	Nil	Nil	Nil	INP	Nil	Nil	86.76	Nil	Nil	Nil
20	Madhya Pradesh	4005	5806	9811	130000	8167	7897	1644	7656	19754.33	19124.73	2	2	14	5	512	2	202.82	18921.91	733	431	14
21	Maharashtra	20696	44293	64989	322873	7482	6445	160	64525	80314	80314	259	2	30	3	257	1	213	80101	336	302	29
22	Manipur	96	658	754	4854	754	754	Nil	248	1166.13	1266.22	506	2	1	Nil	INP	Nil	847.82	418.4	1	Nil	Nil
23	Meghalaya	183	1012	1195	7145	1046	1036	149	36	1287	1287	229	Nil	1	Nil	81	Nil	761	526	Nil	Nil	Nil
24	Mizoram	99	217	316	3546	25	25	Nil	Nil	803.57	803.57	99	Nil	Nil	Nil	INP	Nil	803.57	Nil	Nil	Nil	Nil
25	Nagaland	222	513	735	3660	529	529	206	Nil	1006.55	188.42	5	Nil	Nil	Nil	527	Nil	188.42	Nil	Nil	Nil	Nil
26	Odisha	1563	2307	3870	50609	718	682	69	987	16167.947	16167.947	2883	Nil	6	Nil	Nil	Nil	11563.579	4604.368	44	44	6
27	Puducherry	96	291	387	12112	324	304	63	387	4638.5	4638.5	1	1	1	Nil	Nil	Nil	19	4618.5	14	1	1
28	Punjab	4057	9369	13426	76945	4752	3881	1519	11756	18490.13	18490.13	Nil	Nil	5	Nil	Nil	Nil	Nil	18490.13	1293	1293	5
29	Rajasthan	5970	2716	8686	142473	1778	1662	708	6016	19170.28	19170.28	1298	Nil	11	7	1298	1	1821.97	17348.31	598	764	11
30	Sikkim	33	250	283	2299	283	283	Nil	Nil	545.34	545.34	192	7	Nil	nil	115	Nil	545.34	Nil	Nil	Nil	Nil
31	Tamil Nadu	7601	18996	26597	145848	26480	26393	Nil	26597	45215.93	45215.93	0	0	10	3	Nil	Nil	0	45215.93	21	21	10
32	Telangana	4221	3928	8149	122321	5979	5955	316	7696	24235	24235	Nil	Nil	11	Nil	Nil	Nil	Nil	24235	317	317	11
33	Tripura	141	1769	1910	4711	142	142	Nil	Nil	1940.264	1822.125	158	3	Nil	1	156	Nil	1822.125	Nil	Nil	Nil	Nil
34	Uttarakhand	1727	3628	5355	29231	4253	3935	749	2650	6891.37	6891.37	2582	2	2	1	1652	Nil	1206.72	5684.65	324	58	2
35	Uttar Pradesh	20397	17228	37625	356321	INP	31555	5550	INP	71264.2	71264.2	9	10	22	0	Nil	Nil	496.4	70767.8	150	20	22
36	West Bengal	2892	6279	9171	133415	9171	9171	Nil	9171	42286.861	42286.861	Nil	Nil	6	7	Nil	Nil	Nil	42286.861	148	146	6
37	DGAFMS	227	533	760	38659	8	8	1	678	5895.82	5895.82	82	3	Nil	Nil	82	Nil	1430.93	4464.89	Nil	Nil	Nil
	COVID-19 BMW									80*	80*											
	Total	121396	253860	375256	2561295	152727	320751	46668	262786	764*	721*	13605	102	215	35	12001	6	34274.0	606592.2	23199	15355	207

* Data provided in tonnes/day

Annexure - III

Biological Environment – Impacts and Mitigation Measures

➤ Ecological impact assessment methodology

Impacts on biological components were identified by following various steps. All biological impacts have been assessed considering that, all operational/ engineering control suggested in EMP will be properly implemented.

➤ Identification of extent of Likely Impact Zone (LIZ) area

Extent of LIZ area can be mapped through superimposing Air pollution dispersion model, Noise dispersion model, drainage pattern on the project study area.

➤ Identification of likely impacts

Likely impacts on the biological components have been identified on the basis of activities and associated aspects involved in the different phases of project cycle and various ecosystems or habitats falling in the identified LIZ area.

➤ Scoring of biological consequences

The consequences due to impacts on various biological components have been categorized into 5 levels ranging from insignificant to severe consequence and are given below. It consists of Flora, Fauna and habitat/ ecosystem level impacts.

Table 1 Biological Consequences Scoring scheme

Consequences Score (CS)	Likely Impact receiving components (Ecosystem, habitat and species level)
Insignificant Consequence - 1 Score	Site specific clearing (removal) of common Flora i.e. herbs, shrubs, grasses, climbers.
	Vegetation composition does not form a habitat character for any species of conservation significance.
	No short term or long-term impacts are likely to adversely affect the surrounding habitat/ ecosystem.

Consequences Score (CS)	Likely Impact receiving components (Ecosystem, habitat and species level)
	<p>Site specific disturbance to common/ generalist faunal species (e.g. movement pattern, displacement etc.)</p> <p>No negative impacts on surrounding ecosystem functioning or habitat ecology.</p>
<p>Minor Consequence - 2 Score</p>	<p>Site specific loss (removal) of some common species of regenerating tree saplings.</p> <p>Minor temporary impacts on ecosystem functioning or habitat ecology of common/ generalist species.</p> <p>Minor short term/ long term impacts on surrounding/ immediate/ adjacent habitats but are resilient to changes in habitat structure or condition.</p> <p>Impact on surrounding agro-ecosystem/ agriculture when environmental data/ parameters are within permissible limits.</p>
<p>Moderate Consequence - 3 Score</p>	<p>Site specific clearing (removal) of some common well grown tree/ trees</p> <p>Site specific loss of nesting/ breeding habitat of common/ generalist species of Flora-Fauna but will not result in permanent loss of habitat.</p> <p>Short term or long term impacts having potential to affect adversely the surrounding habitat character/ habitat ecology/ functioning of ecosystem.</p> <p>Impact on surrounding agro-ecosystem/ agriculture when physical parameters with marginal increase but can be mitigated. Or likely cumulative impact.</p>
<p>Major Consequence - 4 points</p>	<p>Site specific impact on threatened species but impacted species is widely distributed outside the project site. Short term impacts may lead to loss of abundance or extent, but unlikely to cause local population extinction.</p> <p>Site specific habitat loss of fauna listed in IUCN, World Conservation Monitoring Centre (WCMC), Birdlife, International, or any other international literature - secondary information.</p> <p>Impacts on habitats/ ecosystems of international importance.</p>
<p>Severe Consequence - 5 points</p>	<p>Impact on Notified areas/ species having legal protection under various acts/ notifications including proposed areas/ species or under consideration. Species mentioned in BSI, Red Data Book, ZSI, or literature published by any State Govt. Institute, University or Collage etc.</p>

➤ **Likely impacts on biological environment**

Identification of extent of Likely Impact Zone (LIZ) area

Though the concentrations of the emitted pollutants will be kept within permissible levels through the various engineering controls, it is essential to have eco-management in the LIZ for safeguard and enhanced of ecological environment of the project area. So, accordingly, nearby village areas, Reserve forest, agriculture area/ plantation area, nearby water body and other habitats like open scrub vegetation, and associated biodiversity are falling in the LIZ area.

Identification of likely impacts

Following impacts have been determined on the basis of the various project activities, associated aspects involved in various stages of the project cycle, and ecological setting/ condition of the LIZ area. Activity based determination of impacting ecological components and Likely Impacts on biological components are given below.

Table 2 Activity-aspect based determination of impacting ecological components

Sl.No.	Activity	Aspect	Ecological Components					
			TFL	TFA	AFL	AFA	MFL	MFA
1. Pre- Construction phase								
1.1	Site preparation	Removal of top soil and vegetation	√	--	--	--	--	--
1.2	Movement of Earthmovers and other Vehicles	Generation of Noise and dust	√	√	--	--	--	--
2. Construction phase								
2.1	Movement of Earth movers, DG sets and other vehicles	Generation of Noise and dust	√	√	--	--	--	--
2.2	Emissions from combustion of fossil fuels from stationary or mobile	PM, SO ₂ and NO _x from DG sets	√	√	--	--	--	--

	Sources							
2.3	Handling of materials including construction materials, sewage and waste	Generation of dust or Odours	√	√	--	--	--	--
3. Project operation phase								
3.1	Emissions from the Incinerator and DG Sets.	PM, SO2 and NOx, Dioxin, Furan and other pollutants	√	--	√	--	--	--
3.1	operation of equipment e.g. Incinerator, Shredder and vehicle movement etc.	Generation of Noise	--	√	--	--	--	--
TFL – Terrestrial Flora, TFA – Terrestrial Fauna, AFL – Aquatic Flora, AFA – Aquatic Fauna, MFL – Marine Flora, MFA – Marine Fauna								

Table 3 Likely Impacts on biological components

Sl. No.	Project Aspect Description	Likely Impacts on Ecology and Biodiversity (EB)
1. Site Preparation Phase		
1.1	Removal of site vegetation like herbs, shrubs and grasses (except trees)	Impact-1: Site specific loss of common Floral diversity Impact-2: Site specific loss of associated Faunal diversity Impact-3: Site specific loss of habitat/ habitat diversity
1.2	Generation of dust and Noise due to movement of Earth movers and other vehicles	Impact-4: Site specific impact (dust deposition) on the site Flora & disturbance Fauna
2. Construction Phase		
2.1	Generation of Noise due to movement of Earth movers, DG sets and other vehicles	Impact-5: Site specific impact (dust deposition) on the site Flora & disturbance Fauna

2.2	Generation of PM, SO ₂ and NO _x from DG sets	Impact-6: Site specific impact on the site Flora & Fauna
2.3	Generation of dust or odours due to Handling of materials including construction materials, sewage and waste	Impact-7: Site specific impact on the site Fauna
3. Project operation Phase		
3.1	Emissions of PM, SO ₂ and NO _x , Dioxin & Furan from Incinerator and DG sets combustion of fossil fuels from stationary or mobile sources	Impact-8: Impact on surrounding vegetation including buffer zone area and associated biodiversity.
3.2	Generation of Noise due to operation of Incinerator, Shredder and vehicle movement etc.	Impact-9: Site specific disturbance on the site Fauna

Quantifying biological impact

Impacts on the Flora, Fauna and habitats have assessed in the **Table 4** on the basis of multiplication of Consequence Score (CS) and the Occurrence Frequency Score (OFS) together.

Table 4 Biological impact scoring

Sl.No.	Likely Impact Description	Impact Scoring			Remarks
		CS	OFS	BIS	
1. Site Preparation Phase					
1.	Loss of Floral diversity: Site possesses common floral species (herbs, shrubs and grasses; clearing of same will not result in loss of Flora in true sense. This will be site specific impact.	1	5	5	Less severe
2.	Loss of habitat and associated Faunal diversity: Faunal species reported from study area are common/generalist species which uses wide variety of habitats of the local environment so there is no threat of loss of faunal diversity.	1	5	5	Less Severe
3.	Disturbance to the Fauna & its movement: there will be short term impact on movement of common/generalist species. Project site forms common habitat structure which is very common component of the buffer zone habitats.	1	5	5	Less Severe

4.	Site specific impact (dust deposition) on the site Flora & disturbance Fauna: this will be short term impact during site preparation phase.	1	5	5	Less Severe
2. Construction Phase/ Plant erection					
5	Site specific impact (dust deposition) on the site Flora & disturbance Fauna – Disturbance to the Fauna/ Faunal movement: Project site is recorded with movement of common/ generalist species. These species are adapted to routine general/ normal human activities. However, site-specific short-term impacts are expected.	1	5	5	Less Severe
6	Site specific impact on the site Flora & Fauna due to Generation of PM, SO ₂ and NO _x from DG sets – proper engineering controls will be required. However, site-specific short-term impacts are expected.	1	5	5	Less Severe
7	Site specific impact on the site Fauna due to generation of dust or odours due to Handling of materials including construction materials, sewage and waste – proper engineering controls will be required. However, site specific short term impacts are expected.	1	5	5	Less Severe
3. Operation Phase					
8	Impact on surrounding vegetation including buffer zone and associated biodiversity due to emissions from Incinerator and DG sets combustion of fossil fuels from stationary or mobile sources.	2	5	10	Moderate Severe
9	Site specific disturbance on the site Fauna due to generation of Noise due to operation of Incinerator, Shredder, vehicle movements etc.	1	5	5	Less Severe