CHENNAI METROPOLITAN WATER SUPPLY AND

SEWERAGE BOARD

CHENNAI- 600 002

NATIONAL COMPETITIVE BIDDING

BID DOCUMENT

FOR

PROVIDING COMPREHENSIVE UNDERGROUND SEWERAGE SCHEME TO EDAYANCHAVADI, SADAYANKUPPAM & KADAPAKKAM (DIVISION 15 &16), AREA II IN THE EXPANDED CHENNAI CITY

CONTRACT NO: CNT / SEW / NCB / AMRUT -2.0 & KfW / 003 / 2023-24

BID DOCUMENT

VOLUME – V

(Updated)

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) REPORT

SUPERINTENDING ENGINEER (CONTRACTS & MONITORING)

CHENNAI METROPOLITAN WATER SUPPLY & SEWERAGE BOARD

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Note: The ESIA report is a dynamic document which is subjected to change from time to time during the execution of the project. It is the responsibility of the bidder to view/download the ESIA report from official Website of CMWSSB.

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LIST OF ACRONYMS

CMD	Chairperson & Managing Director
CMWSSB	Chennai Metropolitan Water Supply and Sewerage Board
DPR	Detailed Project Report
EB	Electricity Board
E&S	Environmental and Social
ECSMF	Environmental, Climate Change and Social Management Framework
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment Report
ESF	Environmental and Social Framework
ESMP	Environmental and Social Management Plan
FI	Financial Institution
GCC	Greater Chennai Corporation
GOI	Government Of India
GoTN	Government of Tamil Nadu
GRC	Grievance Redressal Committee
KfW	Kreditanstalt fur Wiederaufbau (KFW Development Bank)
MA&WS	Municipal Administration and Water Supply
MNREGA	Mahatma Gandhi National Rural Employment Guarantee Act 2005.
MoEF& CC	Ministry of Environment and Forests& Climate Change
PAP	Project Affected Person
PIA	Project implementation Agency
PIU	Project Implementation Unit
PMC	Project Management Consultant
ROW	Right of Way
SEC	Sensitive Environmental Components
SG	Sustainability Guidelines-Assessment and management of Environmental, Social and Climate Aspects: Principles and Procedures
SMIF	Sustainable Municipal Infrastructure Financing
STP	Sewerage Treatment Plant
SWM	Solid Waste Management
TNEB	Tamil Nadu Electricity Board
TNPCB	Tamil Nadu Pollution Control Board
TNUIFSL	Tamil Nadu Urban Infrastructure Financial Services Limited
ULB	Urban Local Body
WB	World Bank

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Executive summary

1. Introduction and Background

Chennai City, capital of Tamil Nadu, has been expanded recently from 176 sq.km. to 426 sq.km by annexing the 42 adjacent local bodies which included 9 Municipalities, 8 Town Panchayats and 25 Village Panchayats as per Tamil Nadu Government order vide G.O (MS) No.256, MA &WS (Election) Dept. dt.26.12.2009. As directed in the G.O., the administration of the Greater Chennai Corporation came in to effect from 20.10.2011.

The administration of the Greater Chennai Corporation comprised of 200 wards. The Population of Greater Chennai Corporation was 6.7 million in the year 2011. CMWSSB is a statutory body which provides water supply and sewerage infrastructure facilities to the residents of Chennai City as well as Chennai Metropolitan Area in a phased manner. Accordingly, CMWSSB is already implementing water supply schemes / Under Ground Sewerage Schemes in some of the local bodies in Chennai Metropolitan Area under funds from TNUDP, JNNURM, CMCDM, etc.

As there were a number of local bodies (erstwhile) which were devoid of holistic infrastructure facilities both in water supply and sewerage system in the Greater Chennai Corporation. It became the priority for the Board to cover the implementation of water supply schemes / Under Ground Sewage Schemes in the newly annexed 42 local bodies either by improving the existing water supply and sewerage facilities or by providing new water supply and sewerage facilities. Accordingly, the project area now taken up for consideration confined to providing comprehensive underground sewerage scheme to Edayanchavadi, Sadayankuppam and Kadapakkam in the expanded Chennai city.

2. Description of the project

Objective

The main objective of this sub project is to provide Underground Sewerage Scheme toEdayanchavadi, Sadayankuppam and Kadapakkam area in line with the Master Plan prepared by CMWSSB.

Project Location

Edayanchavadi, Sadayankuppam and Kadapakkam (hereafter called as Project area) are the developing residential area in North side of Greater Chennai Corporation. It borders Ennore to the east, Redhills to the west, Manali to the south, Minjur to the North.It falls under the Madavaram Assembly Constituency and Tiruvallur Parliamentary Constituency. The total length of the road/streets is about 88Km.

Need for the Project

The Proposed Underground Sewerage Scheme in the project area is very much needed for the following reasons

- To achieve the goals set forth in the National Urban Sanitation Policy such as eradication of open defecation.
- Providing sanitation to all and to achieve the pre-set the service level benchmark of 100% on sewage management which includes sewage network for efficient collection of sewage, efficient treatment of the collected sewage and safe disposal of the treated effluent, reuse and recycling of treated sewage, efficient redressal of customer complaints, cost effective sewage management & efficient collection of sewage charges.
- To provide sewerage facilities on par with the erstwhile Chennai City.
- By executing the proposed underground sewerage scheme in the project area, the Govt. of Tamil Nadu & the CMWSSB achieves to provide better facilities within the project area which will create a better platform for the improved quality of living, development and growth of the project area and their surrounding areas as well.
- Providing efficient underground sewerage scheme to project area will experience rapid commercial and Industrial growth and this will result in improved economy and social status of the people.
- In addition to this, every citizen of the nation will achieve fundamental right of access to the basic welfare facilities.

(i) Laying of collection system for a length of 72.772Km (Edayanchavadi,Sadayankuppam and Kadapakkam)
(ii)Construction of 8nos of lift stations;construction of 3 nos of sub pumping stations
(iii)Laying of CI pumping mains for a length of 20.74km.
(iv)Providing house service connection for 4,000 nos

Table 1 Sub project Components

Project area	Collection System (Km)	PS/SPS(No.)	LS (No.)	Pumping Main (Km)	HSC (No.)	MHs (No.)	Avg. Flow (MLD)
Edayanchavadi	47.568	2	3	16.130	2600	1932	11
Sadayankuppam	18.665	1	2	4.600	1000	736	4.24
Kadapakkam	6.539	0	3	1.920	400	253	1.69
Total	72.772	3	8	22.65	4000	2921	16.93

The ultimate flow 16.93 MLD from TNHB Phase II, SPS-04 is disposed into existing STP at Kodungaiyur. The collected sewage is disposed into existing STP at Kodungaiyur.

3. Legal and regulatory framework

Environmental Climate Change and Social Management Framework (ECSMF)was developed for the project including all relevant Environmental Climate and Social regulations and polices.

The same adhered to National and State Environmental and SocialPolicies and regulatory frameworks as well as international ESHS requirements and standards as per KfW Sustainability Guideline. The prevailing key National, State level laws, rules, policies, notifications pertaining to Environmental Climate Change and Social aspects have been reviewed to the proposed UGSS. ESF of World Bank and kfW SG Feb. 2022 have been applied and this ESIA have been prepared in line with the requirement.

4. Applicability of ECSMF

The Project proposed shall be implemented safeguarding the environmental and social concerns of the development activity. The requirements for ensuring environmental and social safeguards have been stipulated in the TNUIFSL's Environmental Climate Change and Social Management Frame work exclusively for this project. And this document is prepared based on updated ECSMF.

5. BaselineEnvironment, Climate and Social structure

The Basic information about the project area is carried out through secondary environmental survey alongwith the data from the various information resources for the attributes of the ambient environment. The social survey was carried out along the pumping main for social baseline data. The baseline data help to understand the existing environmental conditions and socio-economic characteristics of the study area. It is required to compare and assess the impacts on E&S aspects caused during the project life cycle. The project related baseline data on climate, meteorology, land usage, water, air, noise, soil, flora, fauna and social profile of local population among others were collected and the major findings of the key parameters are summarized hereunder.

Temperature

The meteorological data shows the average annual minimum temperature is 26° Celsius and the average annual maximum temperature is 33°Celsius.

Humidity

The average annual percentage of humidity is 69%. Higher rates of relative humidity are observed between November with 76% and lower rates of relative humidity are observed between June with 63%.

Air Quality

The ambient air quality monitoring was carried on 23-01-2023 at various locations at the project area on basis of wind direction and other metrological parameters. Samples are collected for 24 hours basis once a weekand gaseous pollutants such as Sulphur dioxide (SO_2) and Nitrogen dioxide (NO_2). The average concentrations of PM10 are 59.67 $\mu g/m^3$. The average concentrations of PM 2.5 are 23.05 $\mu g/m^3$.The average SO_2 concentrations were recorded as 6.45 $\mu g/m^3$. The average NO_2 (Oxides of Nitrogen) concentrations were recorded as 13.53 $\mu g/m^3$.The observed air pollutants were within the limits as per TNPCB standards.

Noise Environment

The ambient noise quality monitoring was carried on 23-01-2023 at various locations in the project area. The Noise levels observed in the project area during day time were found to be 58.2 dB (A) and in the night time the noise levels observed 54.53 dB (A).

Ground water

Ground water depth varies from depth of 2mts based on the assessment of Groundwater Quality Index in and around the projectarea. As per primary data, the status of ground water quality as per the water quality index is found to be moderatein the project area. The presence of high TDS and hard water occurs in most of the locationsand it is not suitable for drinking purposes. The water treatment technologies like reverse osmosis, distillation, activated carbon etc. can eliminate the prevailing contamination, the present scenario needs consideration on rainwater harvesting, waste water reuse and water treatment techniques.

Soil Environment

Soils in the district of Thiruvallur have been classified into 1) Red Soil 2) Brown Soil 3) Black Soil 4) Alluvial Soil and 5) Mixed Soil. The Major Part is covered by red soil of red sandy / Clasy loam type. Black soil are deep to very deep and generally occur in the depressions adjacent to hilly areas, in the west part Alluvial soils occur along the river courses and eastern part of the coastal area sandy coastal alluvium is seen all along the sea coast as a narrow belt.

Ecological Environment

Ennore creek is an ecological sensitive area found eastern to the project area. The Ennore creek is located in the Thiruvallur District of Tamil Nadu, approximately 20 Km north of Chennai City. This creek is part of a lagoon ecosystem that plays a vital role in balancing the coastal ecosystem in the area. Ennore Creek drains two important rivers, Kosasthalaiyar in the south and Aranaiyar in the north into the Bay of Bengal through the Ennore Estuary.

The creek forms an estuary that is about 400 m wide. Pulicat Lake, the second largest brackish water lake in the country and is a protected area also drains into the Ennore Creek. The B'canalalso runs alongside the creek, intersecting the creek at different points dotted with salt pans, mangroves, fish farms and mud flats. Ennore Creek provides a variety of habitats that support a large number of animal and plant life. The Ennore Creek is the primary source of livelihood for six fishing villages. Mugathwara Kuppam, Kaatu Kuppam and Sivanpadaiveethi Kuppam rely wholly and perenially on the river and creek**.**

Site Specific Environmental features

All the SPS/LS sites are free from encumbrances and owned by Government agencies/departments. The SPS site is located in habituated area, surrounded by residential buildings hence improvement to aesthetics of site, odour control mechanism, noise control are proposed along with planting trees, constructing raised compound wall, planting creepers.The pumping main will be laid within the right of way of the roads belongs to Greater Chennai Corporation / Tamilnadu Road Development Corporation.Collection gravity system is the pipeline network that receives the sewage from the house service connections and conveys to

the pumping station. Machine holes will be constructed at the centre of the road and pipelines will be laid connecting the Machine Holes, for the roads wider than 60ft rider mains have been proposed to avoid frequent crossings.

Social Profile

The available data as per 2011 indicate total 5348 population which is almost equally divided into 2704 males (50.56%) and 2644 (49.43%) females. Within the total literacy rate of 75.2%, male literacy rate was higher (78.62%) compared to the females (71.67%). The social structure denotes that a maximum population belong to other backward castes (70%), followed by the scheduled castes (26.29%) and scheduled tribe (3%). The average household size 3.86 persons was more compared to 3.5 persons at the state level. The main workers and marginal workers were 39.9% and 6.11% respectively and the non-workers constituted 53.9% of total population. The sub-project identified 12 potential temporary economic impacts to roadside vendors/hawkers during the construction phase (Refer Annexure 10 for details). This is due to non-availability of work front in those locations. The people affected by potential temporary economic impacts and other stakeholders from study area were receptive for the proposed project.

4. Potential Environmental and Social Impacts and Mitigation Measures

The project involves construction of collection system, lift station and pumping station and linking to existing STP for treatment and disposal. Environmental impacts from this proposed project are not adverse and mostly generic and temporary in nature. These impacts are identified mostly during construction phase only. These impacts will be mitigated through management measures identified in the Environmental and Social Management Plan. Further there are no sensitive environmental features within the project area. The implementation of underground sewerage scheme to the project areais unlikely to cause any major environmental impacts.

There isno permanent/ temporary social impacts with respect to the sites for construction of pumping stations as all the sites are free from encumbrances and owned by Government agencies / departments. Further, the sewers and pumping mains will be laid within the right of way of the roads belongs to Greater Chennai Corporation / Tamilnadu Road Development Corporation. There are sixpotentialtemporary potential economic impacts during construction of collection system were identified. Further, any impacts identified during the implementation of the project will be mitigated as per the policy provisions of ECSMF / based on the requirement of the funding agency.

Mitigation measures have been developed to reduce all negative impacts to acceptable levels. These were discussed with specialists responsible for the engineering aspects, and as a result significant measures have already been included in the designs for the infrastructure. Various measures suggested for odour control including: appropriately locating sewage wells within site as far as away from the houses; developing tree cover; closed facilities; and design and operation measures to prevent odour build up; standard operating procedures for operation and maintenance; imparting necessary training; safety and personal protection equipment for workers, etc.

Potential impacts during construction are considered significant but temporary, and are common impacts of construction in urban areas, and there are well developed methods to mitigate the

same. Except sewer works, all other construction activities (lifting and pumping stations) will be confined to the selected sites, and the interference with the general public and community around is minimal. In these works, the temporary negative impacts arise mainly from construction dust and noise, hauling of construction material, waste and equipment on local roads (traffic, dust, safety etc.,), mining of construction material from the existing government licensed mining areas, occupation, health and safety aspects.

Sewer works will be carried out along public roads in an urban area congested with people, activities and traffic. Most of the Chennai city area has high density population, very narrow roads and congested with traffic, people and activities. Therefore, sewer works will have significant impacts arising mainly: from the disturbance of residents, businesses and traffic due to construction work; safety risk to workers, public and nearby buildings due to deep trench excavations in the road; access impediment to houses and business, disposal of large quantities of construction waste, etc. These are all general impacts of construction in urban areas, and there are well developed methods of mitigation and managementthat are suggested in the ESMP.

5. Analysis of Alternatives

The alternative analysis is mainly aimed to mitigate the adverse social & environmental climate impacts in the project and make technically feasible and economic & financially viable alternative.

The expected positive and negative impacts to be relatively associated with the different factors and conditions were integrated and the overall impact for the project was calculated. Based on which the infrastructure alternative is finalized is the best alternative considering all the factors including Social and Economic factors.

6. Environmental Climate and Social standards risk classification

Risk classification

Environmental

The sub-project involves construction of collection system, lift station and pumping station and linking to existing STP for treatment and dispoal. Environmental impacts from this proposed project during construction phase are not adverse and mostly generic & temporary in nature. These impacts will be mitigated through management measures identified in the Environmental and Social Management Plan. For operation phase, odour control measures have been identified and included in the project. The environmental risks associated with the project are "**moderate**" as per the updated ECSMF.

Social

All the project sites are free from encumbrances and owned by Government agencies/departments. The pumping main will be laid within the Right of Way of the roads belonging to Greater Chennai Corporation / Tamil Nadu Road Development Corporation. There are no majorsocial impacts envisaged**.** There may be potential temporary economic impacts to hawkers, vendors, while laying of sewer lines. Based on this, the social risk associated with this project is "**moderate**" as per updated ECSMF.

Risk Catagorisation

In view of the above, the sub project of providing UGSS to Edayanchavadi, Sadayankuppam and Kadapakkamis Categorised asBas per the updated ECSMF. However, if temporary or permanent resettlement impacts are identified during project implementation, the implementing agency will prepare a mitigation plan as per the updated ECSMF and compensate the affected based on the impact assessment. The Environmental Climate Change and Social Screening Form are attached in Annexure -1

7. Environmental& Social Management Plan (ESMP)

ESMP is prepared for this project to address the environmental, social and health &safety impacts caused by the project activities. The ESMP details out mitigation measures, responsibilities, monitoring methods, indicators and frequency during the project cycle. The implementation of ESMP will be closely monitored along the parameters like air, water, noise, soil, ecology, health, safety, etc., ensure compliance to all applicable environmental, social and health & safety standards throughout the whole project cycle. Based on the findings of monitoring process, corrective measures will be taken during the project construction and operation as appropriate.

8. Stakeholder Consultation and Disclosure

The stakeholders meeting conducted on 17-06-2023from 11 A.M to 1 P.M. where the stack holders expressed their opinions of the project. The Environmental and Social Impact Assessment Report (ESIA) made available at public locations and disclosed to a wider audience. The consultation process will be continued during project implementation. A Stakeholder Engagement Plan (SEP) is annexed at Annexure-8.

9. Grievance Redress Mechanism

A grievance redress mechanism (GRM) is described within the ESIAReport to ensure any public grievances are addressed and annexed in Annexure-8.

10. Institutional Mechanism

CMWSSB

The Chief Engineer (CE) of CMWSSB and the Project Director supported by the concerned Superintending Engineer (SE) is overall responsible for the project management. The Executive Engineer (EE) will be designated as a Convenorwho will be responsible for coordination, supervision and management of all the activities related to the project. The Executive Engineer (EE) will be assisted by the Assistant Executive Engineer (AEE) and Assistant Engineer (AE).

PMC

The Project Management Consultant (PMC) will have environmental and social experts to ensure adoptionand compliance of safeguards.

Contractor

The Project Manager and EHS Officer of the Contractor under the supervision of the Convenor will be mainly responsible for the E&S safeguards management and implementation of the plan and subplans under the project.

11. Project Benefit

The most significant advantage of the system is maintaining sustainable development, the protection of the environment and improvement of the quality of life, with a further impact on the development of tourism and the economy in general. Considering all the above advantages, there is no doubt that if we all cooperate, the present people and future generation will enjoy a better quality of life in the years to come and that we will secure a better environment to the forthcoming generations.

12. Implementation Monitoring

Implementation of ESMP is to be supervised by CMWSSB/PMC and be periodically reported to TNUIFSL. During implementation, ESIA is to be updated to incorporate consultation details and to reflect any changes in the project scope, sites etc. and it be submitted to TNUIFSL.

CHAPTER-1 Introduction and Background

Chennai City, capital of Tamil Nadu, has been expanded recently from 176 sq.km. to 426 sq.km by annexing the 42 adjacent local bodies which included 9 Municipalities, 8 Town Panchayats and 25 Village Panchayats as per TamilNadu Government order vide G.O (MS) No.256, MA &WS (Election) Dept. dt.26.12.2009. As directed in the G.O., the administration of the Greater Chennai Corporation came in to effect from 20.10.2011.

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As there were a number of local bodies (erstwhile) which were devoid of holistic infrastructure facilities both in water supply and sewerage system in the Greater Chennai Corporation. It became the priority for the Board to cover the implementation of water supply schemes / Under Ground Sewage Schemes in the newly annexed 42 local bodies either by improving the existing water supply and sewerage facilities or by providing new water supply and sewerage facilities. Accordingly, the project area now taken up for consideration confined to providing comprehensive underground sewerage scheme to Edayanchavadi, Sadayankuppam and Kadapakkam (hereafter called as Project area) of Greater Chennai Corporation.

1.1 Status of Water Supply Scheme in 42 Added Areas

CMWSSB has commissioned comprehensive Water Supply Schemes to 31 areas namely viz. Thiruvottriyur, Kathivakkam, Ambattur, Valasaravakkam, Nolambur, Maduravoyal, Karambakkam, Porur, Meenambakkam, Nandambakkam, Alandur, Ullagaram, Puzthivakkam, Injambakkam, Karapakkam, Sholinganallur, Kottivakkam, Palavakkam, Perungudi, Mugalivakkam, Pallikaranai, Mathur, Vadaperumbakkam, Thiyambakkam, Surapet, Puzhal, Puthagaram, Kathirvedu, Jalladampettai, Edayanchavadi, Sadayankuppam and Kadapakkam.

Presently Water Supply Scheme work on 9 areas is under progress; viz. Manali, Chinnasekkadu, Madhavaram, Nerkundram, Ramapuram, Manapakkam, Okkium-Thoraipakkam, Madipakkam and Uthandi.

Announcement was made by the Hon'ble Minister (Municipal Administration) on floor of Legislative Assembly on 24.08.2021 while moving the demand of Municipal Administration and Water Supply Department, that water supply schemes will be taken up in the remaining 2 newly added areas (Neelankarai and Semmenchery) of Chennai City. Accordingly, tender has been issued for Neelankarai and Semmenchery WSS.

1.2 Status of Underground Sewerage Scheme in 42 Added Areas

CMWSSB has commissioned comprehensive Underground Sewerage Scheme to 17 areas viz. Thiruvottiyur, Kathivakkam, Valasarawakkam, Madhavaram, Kathirvedu, Surapattu, Puthagaram, Nolambur, Madhuravoyal, Porur, Meenambakkam, Alandur, Ullagaram, Puzthuthivakkam, Karapakkam, Sholinganallur, Perungudi and Ambattur.

Presently Underground Sewerage Scheme works are under progress in 10 areas viz, Ramapuram, Mugalivakkam, Pallikaranai, Nerkundram, Manali, Chinnasekkadu, Karambakkam, Manapakkam, Nandambakkam and Madipakkam.

Announcement was made by the Hon'ble Minister (Municipal Administration) on floor of Legislative Assembly on 24.08.2021 while moving the demand of Municipal Administration and Water Supply Department that Underground Sewerage Scheme to 17 areas ULBs viz. Mathur, Vadaperumbakkam, Theeyambakkam, Puzhal, Edayanchavadi,Sadayankuppam, Kadapakkam, Nandambakkam, Kottivakkam, Palavakkam, Madipakkam, Jalladampettai, Neelankarai, OkkiyamThoraipakkam, Injambakkam, Uthandi and Semmencheri including Left out streets of Madhavaram will be taken up for the 17 newly added areas at a cost of Rs.2056.00 Cr.

Accordingly, the Detailed Project Reports for the above works were prepared and posed for availing funds from the funding agencies namely TUFIDCO & TNUIFSL. After appraisal, the Government accorded administrative approval for implementation of Underground Sewerage Scheme to the project area at a cost of Rs.219.10Cr under AMRUT 2.0 and External aid / ULB share. Further, the Government accorded administrative approval for the implementation of Underground Sewerage Scheme to the project area at a cost of Rs.120.51 Cr with part funding under AMRUT 2.0. However, the Detailed Project Report for the above work is under appraisal for availing the balance funds from the external funding agencies (KfW) for implementation of the above scheme for which this Environmental and Social Impact Assessment Report (ESIA) has been prepared. Hence, the work will be taken up for implementation after sanction of funds.

Also, for the balance 15 newly added areas, the Detailed Project Reports for providing Underground Sewerage Scheme of Chennai City, namely Kottivakkam, Palavakkam, Neelankarai, Injambakkam, Uthandi, Vadaperumbakkam, Theeyambakkam, Puzhal, Mathur, Edayanchavadi, Sadayankuppam, Kadapakkam, Semmenchery and for the left-out areas of Madhavaram has been appraised for availing part funds under AMRUT 2.0 and administrative Sanction from the Government of Tamil Nadu obtained. Hence, the work will be taken up for implementation after obtaining funds from AMRUT 2.0 and from any of the external funding agencies.

For Kottivakkam, Palavakkam, Neelankarai, Uthandi & Injambakkam, the Detailed Project Report has been appraised for availing funds under AMRUT 2.0 & Singara Chennai 2.0. Accordingly, tender has been invited for Kottivakkam, Palavakkam, Neelankarai, Uthandi, Semmenchery & Injambakkam UGSS.

Now, this Detailed Project Report comprising of providing collection system, pumping main, construction of pumping stations with allied works has been prepared for providing comprehensive Underground Sewerage scheme to the projectarea which falls in Ward No.15 & 16 of Expanded Chennai City.

1.3 UGSS to Edayanchavadi, Sadayankuppam and Kadapakkam

DPRs for Underground Sewerage Scheme to 17 areas ULBs viz. Mathur, Vadaperumbakkam, Theeyambakkam, Puzhal, Nanadambakkam, Kottivakkam, Palavakkam, Madipakkam, Jalladampettai, Neelankarai, OkkiyamThoraipakkam, Injambakkam, Uthandi, Semmencheri, Edayanchavadi, Sadyankuppam, and Kadapakkam and Left out streets of Madhavaram are revised adopting Base year population as 2025 & Ultimate year population as 2055.

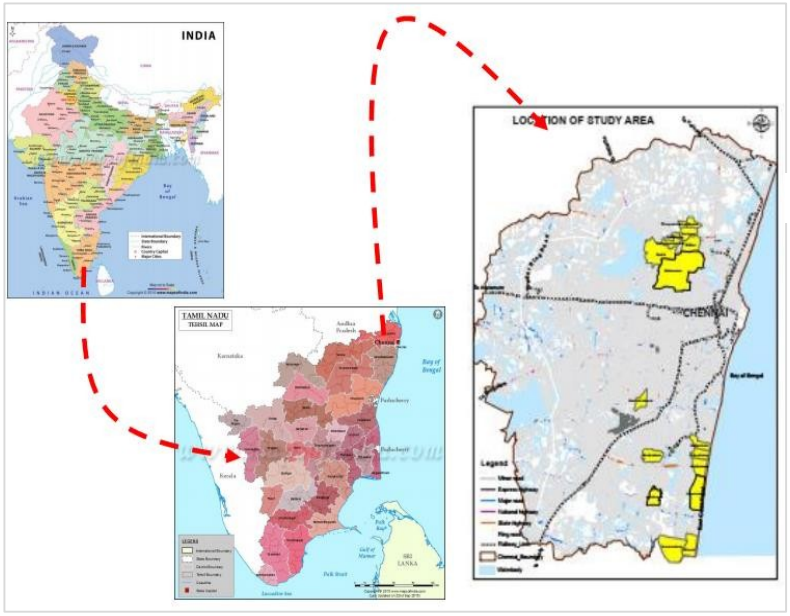
This proposal for providing Underground Sewerage Scheme to Edayanchavadi, Sadayankuppam and Kadapakkam (Division-15 & 16) which comprises of providing Sewerage Collection System, Pumping station including compound wall & allied Electrical works, Pumping Main etc. The project area falls in the newly added areas of Expanded Chennai City.

1.3.1 Objective

The main objective of this project is to provideUnderground Sewerage Scheme to Edayanchavadi, Sadayankuppam and Kadapakkam in Division 15 & 16 area in Chennai Cityin line with the Master Plan prepared for CMWSSB.

The Detailed Project Report comprises of Preparation of detailed designs, drawings &costestimates for providing Underground Sewerage Scheme to the project area. On obtaining funds for implementation of the above scheme, the detailed bid documents for implementationof Underground Sewerage Scheme in the project area shall be prepared.

The Detailed Project Report also includes preparation of Environmental and Social Impact Assessments Report (ESIA). Accordingly, this report has been prepared tonarrate the Environmental and social issues emerging during the implementation of the above scheme and also the management and mitigation plans for sorting the same.



1.3.2 Brief description of study area and existing infrastructure

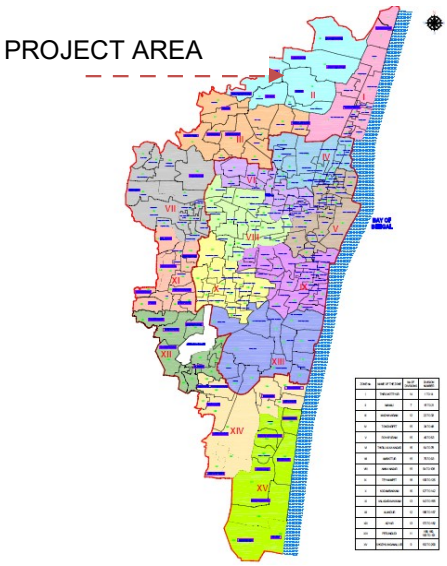


Figure 1 Location of Project Area

1.3.3 Study Area – Edayanchavadi, Sadayankuppam and Kadapakkam

Edayanchavadi is a developing residential area in North Chennai, a metropolitan city in Tamil Nadu. It borders Ennore to the east, Redhills to the west, Manali to the south, Minjur to the North.Theproject area lies along the Harbor corridor of North Chennai. Kadapakkam is also located in North Chennai with Manali New Town, Edayanchavadi in the east and Mathur to the South. Other neighbouring areas include Manali, Madhavaram, Kodungaiyur. The arterial roads to Kadapakkam are the Andarkuppam-Redhills Road, Tiruvottiyur-Ponneri High Road. The Tamilnadu Government had proposed to develop six lanes of Express Road by providing the required infrastructure including water supply and sewerage facilities prior to formation of road. Accordingly, sewerage facilities were provided in the project area for a length of 72.772 km, without considering the present vacant areas. The total length of the road/streets is about 88Km.

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Figure 2Streets viewImages of Edayanchavadi, Sadayankuppam and Kadapakkam

1.3.4 Land use

In the proposed land use map prepared by CMDA for sub project area for the year 2026, 451.6 Ha (51%) has been earmarked for residential, and the rest is distributed among Institutional, Industry and Water body.

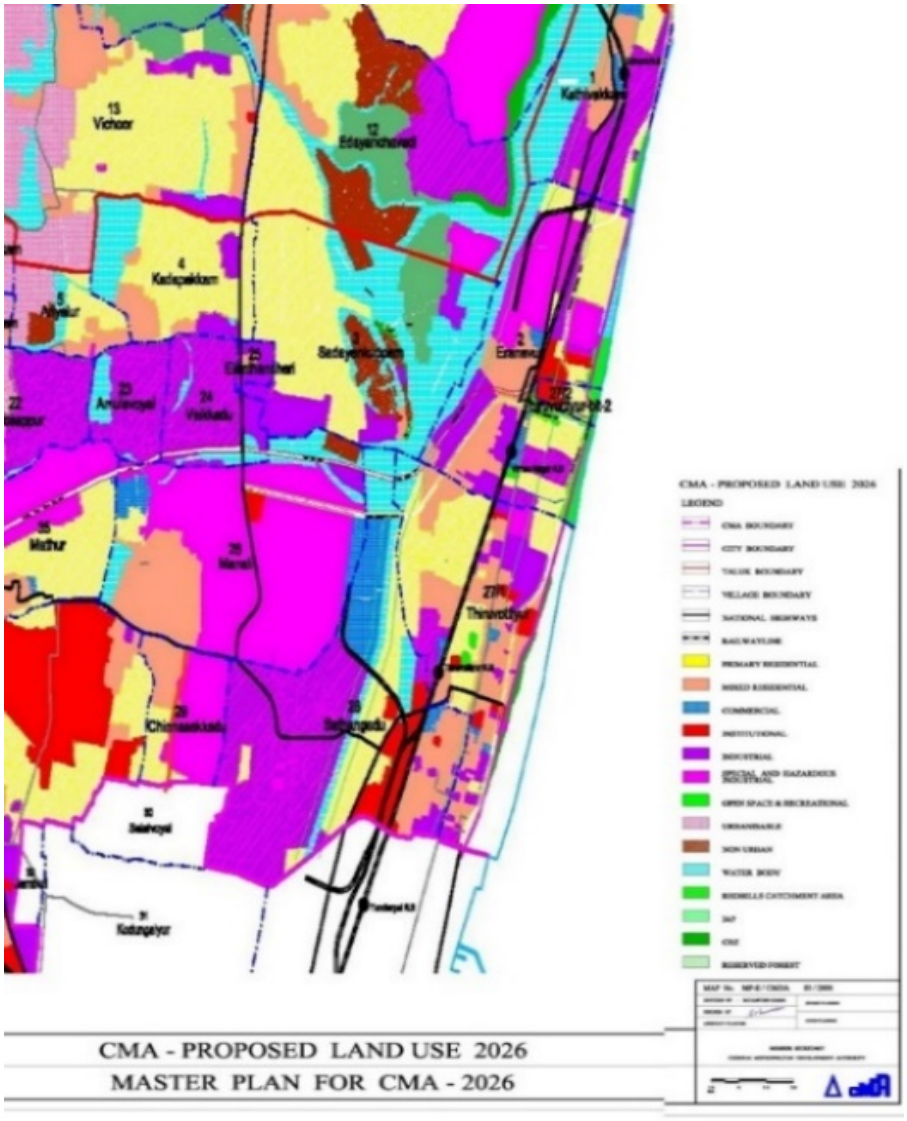


Figure 3 Land-use Map of Edayanchavadi, Sadayankuppam and Kadapakkam

1.3.5 Solid waste management and Storm Water Drains in Study area

Domestic Solid waste collected from door to door is emptied into bins placed at the road junctions. Waste collected in the bins are further emptied by mechanized carrier vehicles provided with lifting, unloading and compressing arrangement which arrives at regular intervals.

Most of the streets are provided with storm water drains. Drains are covered with RCC slabs provided with Machinehole covers at regular intervals. Due to milder slopes, the solid wastes / thrashes thrown into drains frequently clog the drains and overflows during the rainy season.

1.3.6 Existing Water Supply

At present, ground water is extracted from the tube wells and open wells and is pumped to the existing overhead tanks and then distributed to the consumers through House Service Connections and through stand posts. For the slum areas, where piped system is not available water is supplied through hand pumps. The implementation of the work ofproviding Comprehensive Water Supply Scheme to the project areawith supply rate of 150 lpcd with distribution system in all the streets is completed.

1.3.7 Existing Sewerage facilities

At present, there is no organized system of sewage collection and disposal existing in the project area (except the old Manali Town area in Sadayankuppam with sewage system ageing more than 30 years). At the old manali town, the existing length of sewer main is 19.90Kms, with diameter ranging from 150mm to 450mm Stoneware pipe. The existing number of machine holes are 598 no's with maximum depth of 6m.

1.3.8 Proposed Sewerage facilities

The Proposed project involves providing Underground Sewerage Scheme to the projectarea comprising of laying of Collection System including House Service Connections, construction of Pumping Stations / Lift Stations to collect and pump the sewage via pumping main to a downstream pumping station and for onward disposal into the Sewage Treatment Plant for treatment. The length of streets available inthe project area is 88 km.

1.4 Need of the Project

The Proposed Underground Sewerage Scheme in the project area is very much needed for the following reasons:

- At present there is no organized underground sewer system existing in the Project Area except Manali New Town, in Sadayankuppam, with sewage system ageing more than 30 years.

- The individual houses are provided with septic tanks. Most of the households are provided with water borne latrine facilities.

- These latrines are either having septic tanks or holding tanks and the sewage is collected periodically in tankers and disposed in safe disposal site.

- Also, the sullage water from some houses are directly let into open roadside drains, which find their ways to the nearest low-lying areas within these areas. This leads to stagnation, unsanitary conditions and mosquito breeding.

- The practice followed in these areas is to collect the sludge from the septic tank of each household on demand in Lorries.

- For Systematic and scientific way of collection and disposal of sewage fromhousehold and thereby improve the ground water quality.

CHAPTER-2 Description of the Sub - Project

2.1 Details of the sub - project (Project Area)

Providing Collection System including House Service Connections, construction of Pumping Stations / Lift Stations to collect and pump the sewage to a downstream pumping station and further onward disposal into STP for treatment. Proposed project components are

Table 2: Sub-project Components of Edayanchavadi, Sadayankuppam and Kadapakkam (Sub - Project area)

Sl.No	Component	Description
1.	Proposed Sewer Length Material Sewer diameter (mm)	72.772 Km DWC 250-500 mm
2.	No. of Machine holes	2921
3.	Pumping main length (proposed in Km) / Material / Size	22.65m / CI / 150 to 700mm dia
4.	Number of Pumping stations	i. SPS-03 – Manali New Town ii. SPS- 04 – TNHB phase II iii. SPS -05 – TNHB phase I
5.	Number of Lifting stations	i. LS-01 – Perumal kovil ii. LS-02 – Rajiv nagar iii. LS-06A – Sadayankukppam road iv. LS-06B - Burmanagar v. LS-07A – Kadapakkam road vi. LS-07B – Kadapakkam road vii. LS-07C - Kulakarai viii. LS-08 – New Nappalayam
6.	Sewage Treatment Plant (Existing)	i. Kodungaiyur STP (Existing)
7.	No. of House Service Connections	4,000 No's
8.	Quantity to be treated (MLD)	Intermediate Flow -11.92 MLD Ultimate Flow - 16.93 MLD

Table 3 Population Projection

SL NO	NAME OF THE ULB	DESIGN YEAR		
		2025	2040	2055
1.	Edayanchavadi, Sadayankuppam and Kadapakkam.	46,730	99,330	1,41,124

While estimating the flow in sewers 80% of 150LPCD of water supplied and infiltration at the rate of 500L/D/MH for coastal area (Edayanchavadi, Sadayankuppam and Kadapakkam) has been adopted.

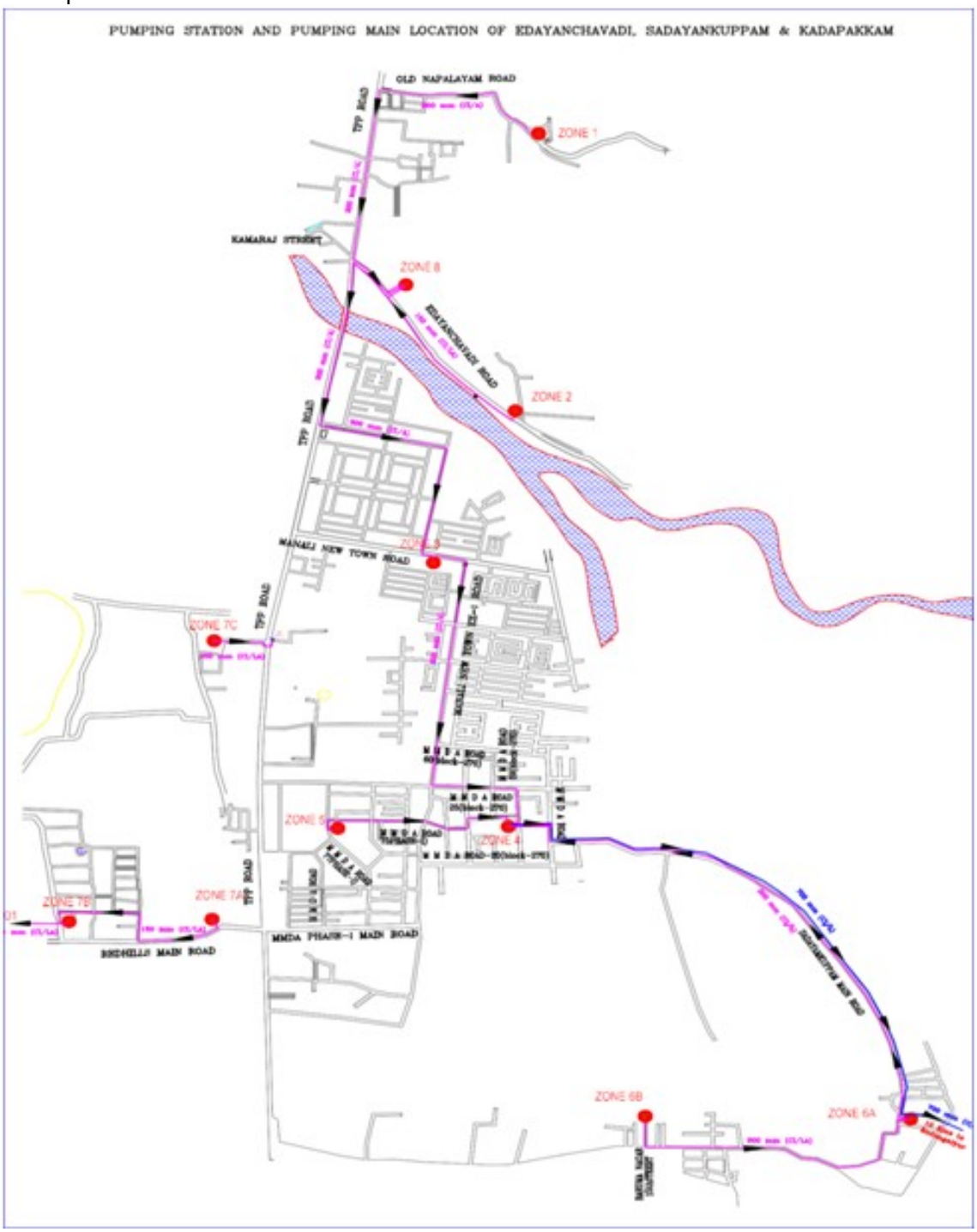


Figure 4 Collection System with Zone Boundary of Edayanchavadi, Sadayankuppam and Kadapakkam Area

2.1.1 Collection System ofSub - Project Area

Table 4 Details of Collection System

Pipe Size (Dia. In mm) DWC PIPELINE	Length of pipe (m)	%
250	71,955	98.88%
300	636	0.87%
400	151	0.21%
500	30	0.04%
Total network length	**72,772**	**100%**

Table 5 Details of Machine holes (Depth wise)

MH Type	Total No of	%
Brick Machine holes		
at 1.0 m	671	22.97
at 1.5 m	1,348	46.15
Precast RCC Machine holes		
at 2.0m	354	12.12
at 2.5m	178	6.09
Cast in - situ RCC Machine holes 1.2m		
at 3.0m	149	5.10
at 3.5m	87	2.98
at 4.0m	87	2.98
at 4.5m	47	1.61
Total no of manholes	**2,921**	100%

2.1.2. Pumping station and Pumping Mains

(i) Lift Station

Lift Station are the large sized RCC well fitted with two no. of Submersible pumps, which will pump the sewage received here through CI Pumping mains either to elevated Machine holes in other zone or to the pumping stations. Lift Station (Suction well) are totally buried within the ground, covered with RCC cover slab with openings for operation and maintenance, cover slabs are designed for maximum wheel loads expected in those roads. Hence, vehicles are allowed freely to run over these LS and will not be a hurdle for traffic. To control pump operations, a kiosk would be erected on side of footpaths, hence there will not be any superstructure in lift Stations.

(ii) Sewage Pumping Station

Pre identified government sites, which would not require land acquisition are preferred for locating pumping stations. Full-fledged sewage pumping station includes, Screen cum grit well, fitted with manually operated screen with provision for grit collection and grit pumps. Suction well would be the next component which will receive sewage from screen cum grit well, 3 non clog submersible sewage pumps would be functioning in and convey sewage to collection system of next zone or if it is a terminal station, pumping to Kodungaiyur STP.

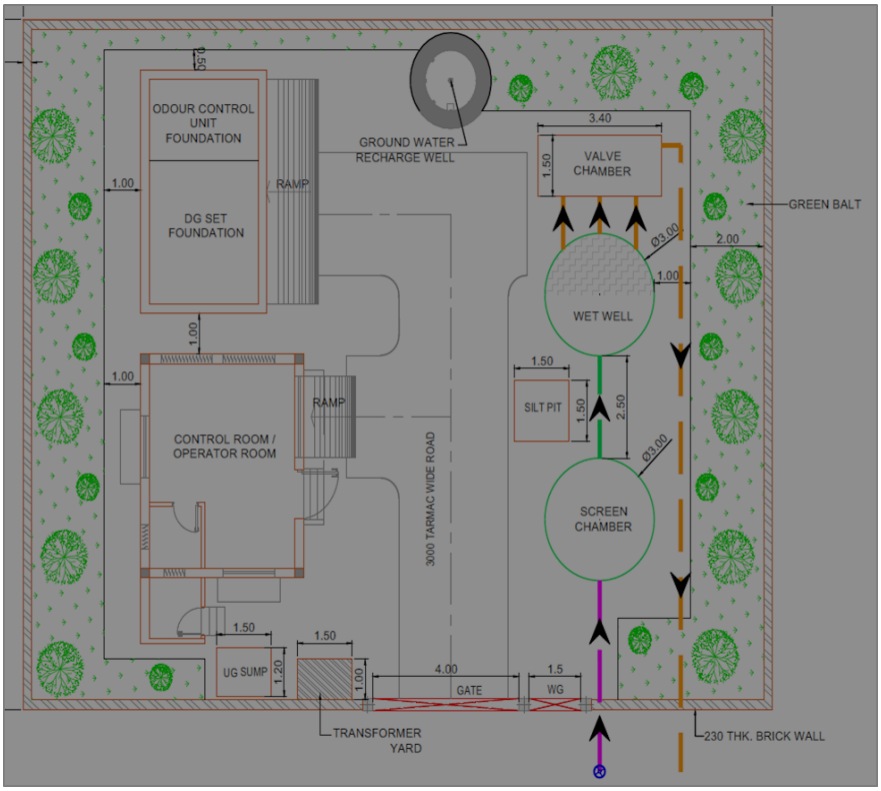


Figure 5 General Layout of Pumping station & other components

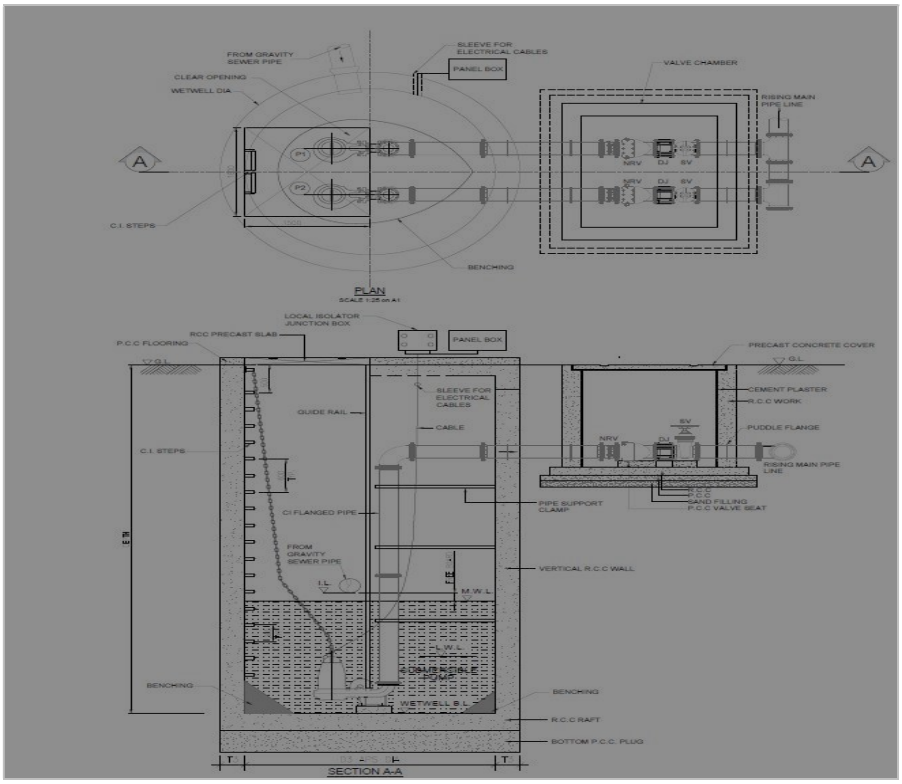


Figure 6 Typical Lift station arrangement

(iii) Pumping main

Cast iron pipe with sizes varying from 150mm dia to 700mm dia are used for conveying the collected sewage. Roads having right of way not less than 12m are chosen for laying of pumping mains and the lines will be laid on shoulders at a depth of 1.2m to 2.0m.

Table 6 Details of Pump Stations & Pumping Mains

Sl. No	LS/SPS	Village / Location	Peak Flow 2055 (Mld)	Diameter/ Depth of Suction Well (m)	Dia / Length of PM (mm/m)	PM Passing Through Streets
1.	LS - 01	Perumal Koil	2.268	2.5 / 6.29	200 / 1,580	Old Nappalayam Rd. & TPP Rd. – (Discharged To LS-08 well directly)
2.	LS - 02	Edayanchavadi Road	1.024	2.5 / 5.29	150 / 850	Edayanchavadi Rd. – (Discharged To LS-08 well directly)
3.	SPS - 03	Manali New Town	14.519	(2.50 / 5.98) (5 / 8.32)	450 / 1,820	Manali New Town Rd. & Extn. Rd. and MMDA Rd. – (Discharged to SPS-04 well directly)

Sl. No	LS/SPS	Village / Location	Peak Flow 2055 (Mld)	Diameter/ Depth of Suction Well (m)	Dia / Length of PM (mm/m)	PM Passing Through Streets
4.	SPS - 04	TNHB Ph-II	31.026	(2.50 / 6.11) (8 / 8.13)	700 / 10,000	Sadayankuppam Rd., Canal Bank Rd. – (Discharged to Kodungayur STP directly)
5.	SPS - 05	TNHB Ph-I	7.107	(2.50/ 6.04) (5 / 7.40)	350 / 900	Sadayankuppam Main Rd. – (Discharged to SPS-04 well directly).
6.	LS - 06A	Sadayankuppam Road	2.359	2.5 / 5.66	200 / 2,300	Sadayankuppam Main Rd. – (Discharged to SPS-04 well directly)
7.	LS - 06B	Burma Nagar	1.550	3.0 / 5.71	200 / 1,400	Sadayankuppam Main Rd. – (Dischagred to LS-06A well directly)
8.	LS - 07A	Andarkuppam Road	1.050	2.5 / 6.22	150 / 970	RedhillsAndarkuppam Rd., - (Discharged to LS-07B well directly).
9.	LS - 07B	Kadapakkam Road	3.341	3 / 6.42	250 / 560	To discharge chamber of Aryalur LS-01. Under VadaperumbakkamTheeyambakkam UGSS.
10.	LS - 07C	Kulakarai	0.186	2.5 / 3.27	150 / 390	Vichoor Rd. – (Discharged to Machine hole of SPS-03 collection system by Discharge chamber)
11.	LS - 08	Edayanchavadi Road	4.969	2.5 / 7.82	300 / 1,880	TPP Service Rd. – (Discharged to SPS-03 directly)

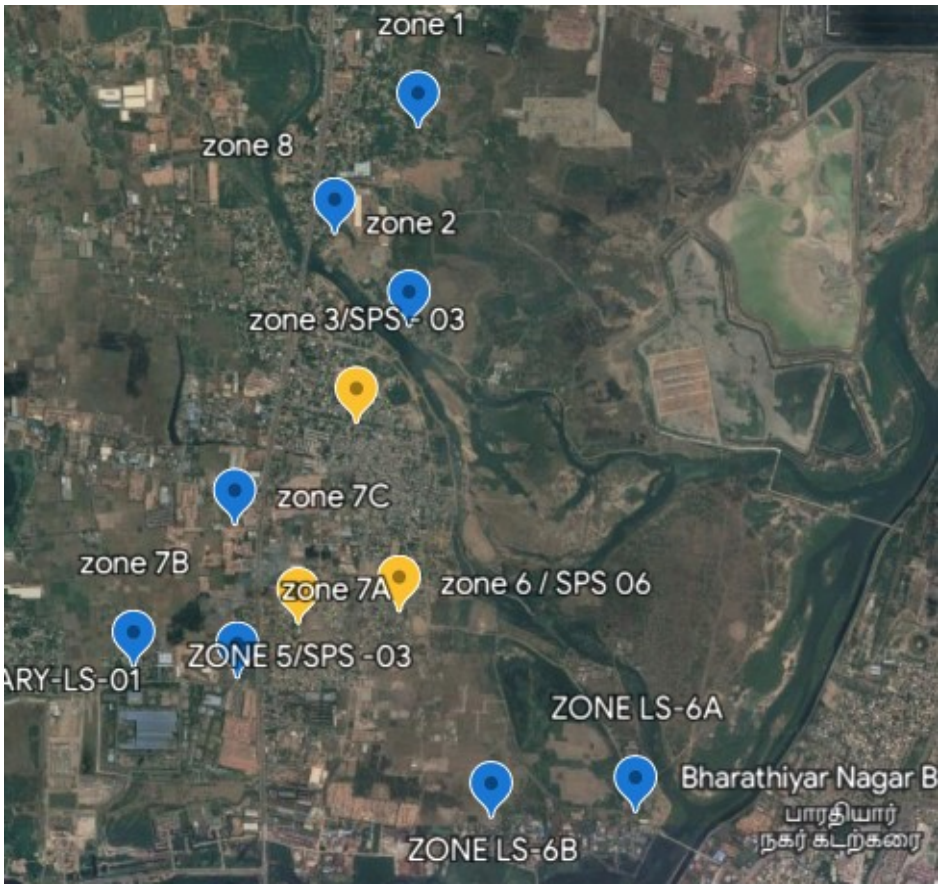


Figure 7 Location of Lift and Pump Stations

2.1.3 Infrastructure (PS/LS) Sites

Based on the sites allotted by the erstwhile local body and presently owned by Corporation of Chennai, zoning of sewerage system has been formulated by CMWSSB covering the project area as given below in Table 5.

Table 7 Location & Size of land required for Construction of Pumping Station

S. No	LS / SPS	Location	Extent of land (Sq. m)	Extent of land required (Sq.m)	Survey No.	Classification	Ownership of land	Remarks
1.	LS - 01	Perumal Koil	225	15m X 15m	-	-	CMWSSB Exg OHT	Applied for NOC from GCC.

S. No	LS / SPS	Location	Extent of land (Sq. m)	Extent of land required (Sq.m)	Survey No.	Classification	Ownership of land	Remarks
2.	LS - 02	Edayanchavadi Road	225	15m X 15m	-	Gramanatham	CMWSSB Exg OHT	Name transfer to done
3.	SPS - 03	Manali New Town	900	30m X 30m	329	Rayathuvari	CMWSSB Exg SPS site	In the possession of CMWSSB but transfer to be done.
4.	SPS - 04	TNHB Ph-II	900	30m X 30m	7PE, 256PE	Rayathuvari	CMWSSB Exg SPS site	In the possession of CMWSSB but transfer to be done.
5.	SPS - 05	TNHB Ph-I	900	30m X 30m	249 PE, 248PE	Rayathuvari	CMWSSB Exg SPS site	In the possession of CMWSSB but transfer to be done.
6.	LS - 06A	Sadayankuppam Road	300	15m X 20m	112	Nathamporamboke	Revenue	EUP requested from Revenue dept.
7.	LS - 06B	Burma Nagar	400	20m X 20m	-	-	GCC	Applied for NOC from GCC.
8.	LS - 07A	AndarkuppamRoad	100	10m X 10m	-	-	GCC	Applied for NOC from GCC.
9.	LS - 07B	Kadapakkam Road	900	30m X 30m	327	Gramanatham	CMWSSB Exg OHT	In the possession of

S. No	LS / SPS	Location	Extent of land (Sq. m)	Extent of land required (Sq.m)	Survey No.	Classification	Ownership of land	Remarks
								CMWSSB but transfer to be done.
10.	LS - 07C	Kulakarai	100	10m X 10m	-	-	GCC	Applied for NOC from GCC.
11.	LS - 08	Edayanchavadi Road	400	20m X 20m	142/3	Rayathupunsei	GCC	Applied for NOC from GCC.

2.2 Kodungaiyur STP

Figure 8Location of existing Sewage Treatment Plant at Kodungaiyur

The plant handles 110 MLD of sewage and the treatment process is based on activated sludge process with anaerobic sludge digestion and biogas utilisation by means of a power plant based on gas engine (capacity 1,317 KVA). After commissioning in 2006, M/s. WABAGLtd., assumed responsibility for operations & maintenance of the plant for over a period of 12 years. It is the largest plant of its kind in India and the most energy efficient one among the 9 STPs in Chennai – achieving 98% self-sufficiency in terms of power consumption.

One of the largest Power Neutral Plant of India and achieves 98% self-sufficiency in terms of power consumption. Enables reuse of treated wastewater to reduce the burden on freshwater-relevant especially in a city like Chennai which depends on groundwater. Supplies 21 MLD of

Treated Sewage to nearby Chennai Petro Chemicals Limited & 5 MLD of treated Sewage to Manali Petro Chemicals for industrial uses. 84 MLD treated wastewater routed to nearby Buckingham canal reducing environment pollution. Silt generated from Inlet chamber is being used to raise the entire low-lying area of the plant.

The sewage generated from Project area for the Intermediate year 2040 and ultimate year 2055 is 11.92 MLD and 16.93 MLD respectively and is proposed to be discharged into the existing STP at Kodungaiyur. Accordingly, the sewage generated from the Project area proposed to be treated in Kodungaiyur STP is about 16.93 MLD for the Ultimate year 2055.

The capacity of Kodungaiyur STP including present and under construction capacities will handle the designed flow from this project.

2.2.3 Associated Facilities

Adequacy

The Kodungaiyur STP campus has 2 STPs. They are 80 MLD capacity and 110 MLD capacity STP. The construction of two new STPs with the capacity of 120 MLD each shall be commissioned in June 2023. The existing 2 numbers of 80 MLD will be de-functioned after the commissioning of the new 120 MLD STPs. The total capacity of all the STPs is 350 MLD which is adequate to take the capacity of 16.93 MLD sewage generated from the proposed project area.

Performance

The existing STP with the technology of Activated Sludge Processing at Kodungaiyurhas the total capacity of 270 MLD (2 numbers of 80 MLD and one 110 MLD). The current flow of sewage being received is230 MLD. The on-goingconstruction of new STP with SBR technology will replace the existing 80 MLD STP to meet the latest discharge norms of TNPCB. The rehabilitation of 110 MLD from activated sludge processing to MBBR is going on and will be completed by Dec. of 2023.

Regulatory compliance

- KodungaiyurSTP: TNPCB is checking the discharged treated water periodically. As per TNPCB observations the threshold limits of discharge norms as required by TNPCB/Central Pollution Control Board (CPCB) within the prescribe limits. The STPs are functioning properly and the treated effluent is discharged as per TNPCB norms.

- Currently, the digested sludge is then fed into mechanical centrifuge. The dewatered sludge cakes are then collected and disposed inside the STP premises for land filling.

2.2.4. Recycle and Reuse of Waste Water

- Water reuse accomplishes three fundamental functions:

- ✓ Treated wastewater is used as a water resource for beneficial purposes,
- ✓ Treated effluent is kept out of streams, lakes, etc., reducing the pollution of surface and ground water
- ✓ Protects public health.

- Water recycling and reusing treated wastewater for beneficial purposes such as agricultural and landscape irrigation, industrial processes, toilet flushing, and replenishing water reservoirs (ground water recharge) offers resource and financial savings. Wastewater treatment can be tailored to meet the water quality requirements of a planned reuse. The use of waste water at decentralized sites reduces the amount of potable water required for other uses and applications.

- The present inflow of sewage received, treated and discharged from Chennai City is 600 MLD (average), out of which 23 MLD of secondary treated water is supplied for Industrial purposes commencing from the year 1993 and 0.23 MLD is supplied to GCC & TNRDC for landscaping and gardening purposes.

- Further, 2 Nos of Tertiary Treatment and Reverse Osmosis Plant (TTRO plants) each of 45 MLD capacity at Koyambedu and Kodungaiyur are commissioned. Currently avg of 41 MLD are supplied to theIndustries.

- After careful consideration, the G.O.TN issued in principle approval vide G.O. No. 131 (MS) MAWS Dt.10.12.2018 for two proposals of each 10MLD capacity for recycle and recharge of tertiary treated water TTUF from Nesapakkam STP and Perungudi STP to Porur and Perungudi lakes.

- The Tertiary Treated Ultra Filtration (TTUF) in Nesapakkam has been completed and the trial operations have begun.

2.2.5. Climate Resilience

Energy Efficiency

- To optimize the power consumption, the Variable Frequency Drive (VFD) for pumps have been proposed in SPS.

- Around 30-40% of energy consumption can be reduced by adopting VFD starter instead of conventional starter. Comparison of conventional starters vs VFD starter and energy saving calculation is attached in Annexure 7.

- LED lamps are proposed to be used in all SPS.

Emission Reduction

- DG sets provided in the project are as per standards for emission as prescribed by pollution control board
- To reduce noise pollution DG sets are provided with acoustic enclosure.

Flood

- The city has been highly vulnerable to extreme weather and erratic rainfall, including periodic droughts and floods.

- Finished Floor Level (FFL) in all SPS has been fixed above the Maximum Flood Level (MFL) occurred during 2015 and marked visibly in wall.

- One dewatering pumping would be kept on a platform above the MFL for pumping water from the pump pit.

- The proposed Pipe carrying bridge would be constructed across B'canal with conditions given by the Public Works Department without hindrance to the flow obstruction during flood and cleaning of waterways.

CHAPTER-3 Legal and Regulatory Framework

In this section, the prevailing key National, State level laws, rules, policies, Acts, notifications pertaining to environmental, climate change and social aspects have been reviewed for their applicability to the proposed UGSS tosub - project and provided in the following table.

Table 8 National and State Regulations on Environmental, Climate Change and Social

Sl. No.	Acts/ Rules/ Regulations	Description	Relevance to sub-project
1.	Wildlife Protection Act, 1972	This Act seeks to protect wildlife, by creating protected areas and controlling trade in wildlife products. Project activities that cross over into protected area regimes then requisite permission must be obtained.	Not Applicable.
2.	Water (Prevention and Control of Pollution) Act, 1974 and Tamil Nadu Water (Prevention and Control of Pollution) Rules, 1974	These laws seek to control pollution of water and enhance the quality of water. Under this law, it is mandatory to obtain consent for discharge of effluents and pay consent fees to Tamil Nadu State Pollution Control Board (TNPCB) for any municipal projects causing water pollution.	Applicable. Activities involving emission of pollutants like establishing batch mixing plants require consent from TNPCB.
3.	The Water (Prevention and Control of Pollution) Cess Act, 1977	This Act provides for levy and collection of a cess by local authorities on water consumed by persons or industries to augment resources for Pollution Control Boards.	Provisions are applicable.
4.	Forest (Conservation) Act, 1980	Forest (Conservation) Act, 1980 was enacted to halt rapid deforestation and governments cannot de-reserve forest land or direct that it be used for non-forest purposes.	Not Applicable. None of the project attracts the provisions.
5.	Air (Prevention and Control of Pollution) Act 1981 and Tamil Nadu Air (Prevention of Control of Pollution) Rules 1983	These laws address the prevention and control of air pollution. Under section 21 of this Act, it is mandatory to obtain consent from Pollution Control Board to establish or operate any industrial operation.	Applicable. Activities involving emission of pollutants like establishing batch mixing plants require consent from TNPCB.
6.	Environment (Protection) Act, 1986	Popularly known as EP Act, it is an umbrella legislation that supplements existing environmental regulations. This law essentially links pollution and natural resource issues.	Applicable.
7.	Manufacture,	These rules aim at providing control for	Applicable.

Sl. No.	Acts/ Rules/ Regulations	Description	Relevance to sub-project
	Storage and Import of Hazardous Chemicals Rules, 1989 (MSIHC Rules, 1989)	the generation, storage and import of hazardous chemicals. According to these rules, the user of hazardous chemicals has to follow procedures as stipulated in the rules to prevent and control hazards from such chemicals and to ensure safety and permission has to be obtained from the authority concerned for such activity. The list of chemicals and threshold limits of handling falling under the purview of these rules is provided in the schedule to the rules.	Hazardous chemicals if any stored/used for the project attracts the provisions.
8.	Hazardous and Other Wastes Management Rules, 2016	This law addresses handling of hazardous and other wastes that fall under specified schedules and necessitates authorisation for such facilities from State Pollution Control Board. Projects attracting these rules will have to follow the guidelines for handling and disposal of hazardous wastes. Measures include storage on a paved surface in a designated area with adequate secondary containment, with adequate labelling and before it is disposed to TNPCB approved vendor.	Applicable. During the construction and during operation, wastes and used oils will be generated which shall be stored and disposed as per the requirements of the rules.
9.	Public Liability Insurance Act, 1991	This act provides for providing immediate relief to the persons affected by accident occurring while handling any hazardous substance and for matters connected therewith.	Applicable.
10.	Bio Medical Waste Management Rules, 2016	This notification by MoEF&CC lays down the method of collection of hospital waste, its transportation and disposal based on scientific methods.	Not applicable.
11.	Fly Ash Notification, 2021	This notification necessitates use of fly ash for various construction activities like road laying, road and flyover embankments, shoreline protection structures in coastal districts, building construction projects etc within 300 kms from the lignite or coal based thermal power plants.	Not Applicable.
12.	Solid waste Management Rules 2016	This notification by Ministry of Environment and Forest lays down the methods of handling Municipal Solid Waste and its scientific disposal.	Applicable. Solid wastes from the construction/ labour

Sl. No.	Acts/ Rules/ Regulations	Description	Relevance to sub-project
		Establishing a facility for disposal requires authorisation from State Pollution Control Board.	camps are to be handled in compliance with the provisions of the rules.
13.	The Noise Pollution (Regulation and Control) Rules, 2000	The ambient noise quality standards for different areas/zones namely industrial, commercial, residential or silence areas/zones are specified in the Schedule of these rules. An area comprising not less than 100 metres around hospitals, educational institutions and courts may be declared as silence area/zone as per these rules.	Provisions are applicable. The noise levels (during construction and during operation of pumping stations) shall not exceed the ambient air quality standards in respect of noise as specified in the Schedule.
14.	EIA Notification, dt 2006 (S.O.1533(E), dt.14/09/2006) and subsequent amendments	The notification specifies that prior environmental clearance is required for the projects listed in the schedule of the notification before any construction work, or preparation of land by the project management except for securing the land, is started on the project or activity. The Schedule of the notification lists eight broad categories of projects that require prior environmental clearance.	Not Applicable.
15.	Wetlands (Conservation and Management) Rules, 2017	The rules list the wetlands that needs to be protected like those covered under Ramsar Convention, those in UNESCO heritage site, those which are ecologically sensitive etc.	Not Applicable. There are no such wetlands within the project area.
16.	The National Green Tribunal Act, 2010	This act provides for establishment of National Green Tribunal for effective and expeditious disposal of cases relating to environmental protection and conservation of forests and other natural resources including enforcement of any legal right to environment and giving relief and compensation for damages to persons and property and for matters connected therewith or incidental. The National Green Tribunal established under this act is a specialized body equipped with the necessary expertise to handle environmental disputes involving multi-disciplinary issues. The Tribunal shall	Provisions are applicable.

Sl. No.	Acts/ Rules/ Regulations	Description	Relevance to sub-project
		not be bound by the procedure laid down under the Code of Civil Procedure, 1908, but shall be guided by principles of natural justice.	
17.	E-Waste (Management and Handling) Rules, 2016	The rules prescribe procedures for manufacture, collection, dismantling, recycling, and disposal of electronic wastes and requires authorisation of the State Pollution Control Board for the same.	Not applicable.
18.	Plastic waste (Management &handling) Rules 2016	This rule provides for collection, segregation, processing, treatment and disposal of the plastic waste in an environmentally sound manner, restriction on thickness of plastic sheet or like, prohibition on identified use, extended producer responsibility, marking and labelling requirement, registration of manufacturer, producer, importer, brand owner and plastic waste processor, reducing the plastic waste generation.	Not applicable.
19.	Prohibition of Employment as Manual Scavengers ‘and their Rehabilitation Act 2013	This act prohibits construction of insanitary latrines and employment or engaging of manual scavenger for the purpose of manual scavenging. No person, local authority or any agency shall, from such date as notified by the State Government (which shall not be later than one year from the date of commencement of this Act), engage or employ, either directly or indirectly, any person for hazardous cleaning of a sewer or a septic tank.	Provisions are applicable.
20.	National Action Plan on Climate Change	India is faced with the challenge of sustaining its rapid economic growth while dealing with the global threat of climate change.	Provisions are applicable for relevant projects.
21.	Energy Conservation Act, 2001	Aims to reduce specific energy consumption in different sectors and sets up a specialized Bureau of Energy Efficiency to institutionalize energy efficiency measures, monitoring, and measurement at plant and macro-levels.	Provisions are applicable for relevant projects.
22.	Energy Conservation Building Code (ECBC)	The Energy Conservation Act 2001 that was passed by the Indian Parliament empowered the Central Government to	Not Applicable.

Sl. No.	Acts/ Rules/ Regulations	Description	Relevance to sub-project
		prescribe an Energy Conservation Building Code (ECBC). This code applies to new commercial buildings with a connected load of 100 kW & more or contract demand of 120 kVA or more; Introduces passive design features such as daylight requirements and shading provisions; Introduces provisions of installing Renewable Energy Systems; Sets minimum energy efficiency standards for design and construction; Encourages energy efficient design or retrofit of buildings .	
23.	The Ancient Monument and Archaeological Sites and Remains (Amendment and Validation) Act 2010	The Rules designate areas within a radius of 100 m and 200 m from the "protected property/ monument/ area" as "prohibited area" and "regulated area" respectively. Hence, no permission for construction of any public projects or any other nature shall be granted in the prohibited areas of the protected monument and protected area In respect of regulated area, the competent authority may grant permission for construction, reconstruction, repair and renovation based on recommendation of the National Monument Authority duly taking note of heritage bye-laws, which shall be prepared in respect of each protected monument and protected areas.	Not relevant. However, in case of chance finds, provisions are applicable.
24.	The Right to Fair Compensation and transparency in LandAcquisition, Rehabilitation andResettlement Act, 2013 (LARR)	The Act provides for enhanced compensation and assistances measures and adopts a more consultative and participatory approach in dealing with the Project Affected Persons. This act came into effect on 1 January 2014 and the Land Acquisition Act, 1894 stands repealed. The Act lays down procedures for estimating fair compensation of the affected families (and not just the titleholders) due to land acquisition, rehabilitation and resettlement. The Act is notified by the GoTN on 21	Provisions of this Act is relevant to this project.

Sl. No.	Acts/ Rules/ Regulations	Description	Relevance to sub-project
		September 2017 (G.O. Ms. No. 298, Revenue & Disaster Management (LA-I(1), 20th September 2017).	
25.	The Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006	It grants legal recognition to the rights of traditional forest dwelling communities.	Not applicable
26.	The Child Labour (Prohibition and Regulation) Amendment Act, 2016. The Child Labour (Prohibition and Regulation) Act,1986	No child below 14 years of age will be employed or permitted to work in any of the occupations set forth in the Act's Part A of the Schedule or in any workshop wherein any of the processes set forth in Part B of the Schedule. Child can help his family or family enterprise, which is other than any hazardous occupations or processes set forth in the Schedule, after his school hours or during vacations.	Applicable.
27.	The Occupational Safety, Health and Working Conditions Code, 2020	This code consolidates and amends the laws regulating the Occupational safety and health and working conditions of the persons employed in an establishment. The Act replaces 13 old central labour laws like The Factories Act, 1948, The Building and other Construction Workers Act, 1996, The Mines Act, 1952, The Inter-State Migrant Workmen Act, 1979, etc	Applicable. Stipulations of the code are to be complied with during construction.
28.	Code on Wages, 2019	The Code on Wages seeks to regulate wages & bonus payments in all employments. The code subsumes four existing acts namely, The Equal Remuneration Act, 1976, The Minimum Wages Act, 1948, The Payment of Bonus Act, 1965, The Payment of Wages Act, 1936.	Applicable. Stipulations of the code are to be complied with during construction.
29.	Workmen Compensation Act, 1923.	The Act provides for compensation by the employer to their workmen in case of injury by accident arising out of and during employment.	Applicable.
30.	Coastal Regulation Zone (CRZ) Notification, 2019	This notification under Environment (Protection) Act, 1986 supplements the law on site clearance by declaring certain zones as CRZ and regulates activities in these zones. Projects	Applicable. A section of the project alignment falls under the CRZ purview. Hence CRZ

Sl. No.	Acts/ Rules/ Regulations	Description	Relevance to sub-project
		attracting this notification shall obtain CRZ clearance for implementation from the authority as required.	clearance is to be obtained prior to start of work in the area.
	State Regulations		
31.	Chennai Metropolitan Area Ground water (Regulation) Amendment Act, 2002	This amendment to the original act was made to impose provision of rainwater harvesting in every building either private or government to augment ground water storage in such manner as may be prescribed. The act also mentions that water bodies, including ponds, lakes, tanks and the like, whether public or private should be used only for the purpose of storage of water and not for any other purposes. These provisions are also included in the Panchayats Act and the Municipal Act.	Provisions are applicable
32.	The Tamil Nadu Preservation of Private Forest Act, 1949	Guidelines for extraction of trees from non-forest area stipulates that permission for tree cutting shall be taken from State Forest department	Applicable.
33.	The Tamil Nadu Hill Areas (Preservation of Trees) Act, 1955	This Act regulates the cutting of trees and cultivation of land in hill areas of Tamil Nadu, (Coonoor, Kodaikanal, Kotagiri, Ootacamund, Yercaud). Any tree cutting in these areas requires permission from the Committee under this Act.	Not Applicable.
34.	The Street Vendors (Protection of Livelihood and Regulation of Street Vending) Act, 2014 and Rules[c] 2015 notified by GOTN.	The Street Vendors Act came into force on March 5, 2014, and seeks to protect the livelihoods of street vendors while regulating street vending. The Act recognizes street vendors of different types including mobile (moving) vendors, stationary (vending from a particular place), natural markets (spaces where buyers and sellers traditionally congregate), vendors with temporary built-up structures, hawkers, peddlers and squatters. It provides for regulation of street vendors, defines the rights and duties of street vendors and requires definition of designated vending zones, issue of certificates of vending and identity cards to street vendors, and proposes vending fees and maintenance charges. Under the	Applicable if the project components are involved in the designated vending zones.

Sl. No.	Acts/ Rules/ Regulations	Description	Relevance to sub-project
		Act, each state government is required to define the public purpose for which a street vendor may be evicted and the manner of relocation, manner of giving notice, and provides for a dispute resolution mechanism. As per the Act, planning and regulation of street vending is to be undertaken at town level by the Town Vending Committee. The Act also provides for social audit of the activities of the Town Vending Committee. This act that specifically aims to protect the rights of urban street vendors and to regulate street vending activities. It provides for Survey of street vendors and protection from eviction or relocation; issuance of certificate for vending; provides for rights and obligations of street vendors; development of street vending plans; organizing of capacity building programmes to enable the street vendors to exercise the rights contemplated under this Act; undertake research, education and training programmes to advance knowledge and understanding of the role of the informal sector in the economy, in general and the street vendors, in particular and to raise awareness.	
35.	State Green Committee/District Green Committee	To consider the cutting of trees in public places and public offices. Ref G.O.(Ms). no.38 dated 02.07.2021 of the Environmental Climate Change and Forest (FR.13) Department, Government of Tamil Nadu	Applicable. Wherever tree cutting is envisaged, permission to be obtained.
36.	Occupational, Safety, Health and Working Conditions (Tamil Nadu) Rules 2022.	This draft rule notified on 11.04.2022	Applicable. Stipulations of the code are to be complied with during construction.
37.	Code on Wages (Tamil Nadu) Rules, 2022	This draft rule notified on 11.04.2022	Applicable. Stipulations of the code are to be complied with during construction.

Sl. No.	Acts/ Rules/ Regulations	Description	Relevance to sub-project
	Climate change		
38.	National action plan on climate change (30.06.2008) TNSAPCC, 31.03.2015	India is faced with the challenge of sustaining its rapid economic growth while dealing with the global threat of climate change. India, in 2008, has set up National Action plan on climate change (NAPCC) which outlined policies aimed at sustainable growth and dealing with climate change concerns effectively. NAPCC outlines eight national missions to address various adaptation and mitigation measures pertaining to Solar Energy, Enhanced Energy Efficiency, Sustainable Habitat, Water, Sustaining Himalayan Ecosystem, Green India, Sustaining Agriculture, Strategic Knowledge on Climate Change.	Provisions are applicable.
39.	Energy Conservation Act, 2001	Aims to reduce specific energy consumption in different sectors, and sets up a specialized Bureau of Energy Efficiency to institutionalize energy efficiency measures, monitoring, and measurement at plant and macro-levels.	Provisions applicable.
40.	Energy conservation building code:	The Energy Conservation Act 2001 that was passed by the Indian Parliament, empowered the Central Government to prescribe an Energy Conservation Building Code (ECBC). ECBC was launched in 2007 on a voluntary basis by the Bureau of Energy Efficiency (BEE and was revised in 2017. ECBC sets minimum energy efficiency standards for design and construction encouraging energy efficient design or retrofit of buildings without constraining the building function, comfort, health, or the productivity of the occupants and appropriate regard for economic considerations. Mandatory Scope Covers commercial Buildings having their Connected Load of 100kW and above or contract demand 120kVA and above and is ECBC is recommended for all new buildings and additions to existing	Applicable.

Sl. No.	Acts/ Rules/ Regulations	Description	Relevance to sub-project
		buildings with the total load exceeding 200KW or 120kVA.	
	Safeguard Policies - Multilateral Funding Agencies		
41.	KFW's Sustainability Guideline (SG) Assessment and Management of Environmental, Social and Climate Aspects: Principles and Procedures, February 2022	The SG of KfW describes principles and procedures to assess the environmental, social and climate impacts during the preparation of FC measures financed by KfW. Objective of the guidelines is to define a common binding framework to incorporate environmental, social and climate standards into the planning, appraisal, implementation, and monitoring of FC measures and to enhance transparency, predictability and accountability in the decision-making processes of the internal environmental and social due diligence (ESDD) and climate mainstreaming.According to KFW's SG,World Bank Environmental and Social Standards (1-10) outlined in the World Bank Environmental and Social Framework (ESF) general and sector-specific ESHS guidelines& ILO standards are applicable and are to be complied with.	Applicable for the sub-project and compliance to be ensured during implementation.

Sl. No.	Acts/ Rules/ Regulations	Description	Relevance to sub-project
42.	The World Bank's ESF, 2018	The World Bank's Environmental and Social Framework (ESF) sets the World Bank's commitment to sustainable development through a Bank policy and a set of Environmental and Social standards that are designed to support borrowers' projects, with the aim of ending extreme poverty and promoting shared prosperity. The ESF is the key E&S risk management tool which guides the borrowers to identify, assess, mitigate and report on project E&S risks, impacts and mitigation measures ant the effectiveness of their implementation. As per the guiding principles of the ESF, all projects funded by the World Bank require the borrowers to – (a) achieve compliance with all applicable federal/national, state and local laws and regulations related to environmental and social matters; and (b) meet the requirements of the Environmental and Social Standards (ESS) outlined in the World Bank's Environmental and Social Framework (ESF).	The project is evaluated against the E&S Standards and NationalGovernment Regulations are followed. ESS standards applicable to the project have been provided in Chapter 7 Table - 7.1 in this report. Accordingly, this ESIA & ESMP with SEP and GRM has been prepared. LMP/WMP is to be prepared by the prospective contractor prior to start of works.

3.1 Clearances / Permissions

3.1.1 Clearance to be obtained by CMWSSB

Sl. No	Proposed activity	Statutory authority	Applicable legislation	Status
1.	Highway crossings for laying of pipes.	NHAI, SH, TNRDC	National Highways Rules 1957	To be applied
2.	Electrical and Electronic Connections for pumping stations/ lift stations	TNEB	Tamil Nadu Electricity Supply Code (as amended up to 31-12-2009)	To be applied
3.	Traffic diversion for Construction of collection system, Machine holes, lift stations pumping mains etc.,	Deputy Commissioner of Police Traffic Chennai	MoRTH 112 SP 55 of IRC codes	To be applied

4.	Delineation of land for construction of pumping stations.	District collector	Tamil Nadu Town and Country Planning Act, 1971 (Tamil Nadu Act 35 of 1972).	3 SPS sites are in possession of CMWSSB. For the remaining 8 sites, land alienation is in progress of sites NOC to be obtained – 2 (Refer Table 7)
5.	Pipe Carrying bridge construction across Kosasthalaiyar River and B'canal	Public Works Department& CRZMA authority.		Initiated by CMWSSB
6.	Trenchless crossing of railway lines for laying pipes	Southern Railways		To be applied

3.1.2 Clearance to be obtained by the Contractor

Sl. No.	Construction Activity	Statutory Authority	Statute under which clearance is required	Implementation	Supervision
1.	Labour License and all other statutory work permits including Contract Labour& Interstate Migrant Worker License (if any)	The Contract Labour (Regulations & Abolition) Act, 1970 - The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996	Tamil Nadu Labour Department	Contractor	CMWSSB

Sl. No.	Construction Activity	Statutory Authority	Statute under which clearance is required	Implementation	Supervision
2.	Workmen compensation Insurance / Accident Insurance, EPF and ESIC (as applicable)	Tamil Nadu Labour welfare Fund Act	Tamil Nadu Labour Department	Contractor	CMWSSB
3.	Hot mix plants, Crushers and Batching plants	Tamil Nadu Pollution Control Board (TNPCB)	Consent to establish And consent to operate under Air Act, 1981	Contractor	CMWSSB
4.	Discharges from construction activities	TNPCB	Consent to establish and consent to operate under Water Act, 1974	Contractor	CMWSSB
5.	Sand mining, quarries and borrow areas	Department of Geology and mining, Government of Tamil Nadu	Contractor to obtain material from the existing Government licensed mines/quarries, Contractor will require prior approval of PIU for obtaining material from a particularsource.PIU to review and approve only existing licensed mines.	Contractor	CMWSSB
6.	Ground water extraction	Tamil Nadu Groundwater Development and Management Act 2000	CMWSSB	Contractor	CMWSSB
7.	Temporary traffic diversion measures	MoRTH 112 SP 55of IRC codes	Traffic Police Chennai	Contractor	CMWSSB

CHAPTER – 4 Environmental and Social Baseline

This chapter presents the baseline data required to understand the environmental, ecological attributes and socio-economic characteristics of the study area, the pipeline route. The baseline includes climate, meteorology, topography, geology, hydrology, drainage, rainfall, land usage, water, air, noise, soil, flora, fauna and social profile of local population. The study was conducted along the stretch of sewage water pipeline traversing throughurban areas of Edaiyanchavadi, Sadayankuppam, Kadapakkam of TamilNadu state (referred as study area). The objective is to comprehend the current environmental conditions and socio-economic status of people which would help in comparing and assessing the impacts on E&S aspects caused by the project in pre-construction, construction and operation phases.

4.1 Methodology

The Baseline has been collected from the primary and secondary sources and E&S screening of all the project sites and alignments.

The desk review of the available documentation and reports of this project is carried out including DPR. The survey in the study area was conducted to identify the social Impacts's in the second week of Jan 2023. Also, the additional data were collected from relevant websites, online as well as offline. Data thus collected from the secondary sources- published and unpublished literature, government documents, reports, etc were reviewed.

The ground truthing undertaken on-site, verified and updated the required data. The secondary information collected from different sources include the Ministry of Environment, Forest and Climate Change (MOEF&CC), Census of India 2011, District Census Handbook, Geological Survey of India, Indian Meteorological Department, State Pollution Control Board (SPCB), Underground Water department, PWD, tourism and other relevant departments of the state and Central governments. The data sources are indicated at Table 9.

Table 9 Sources of E&S data

S.No.	Attribute	Parameter	Source of Data
1.	Land use /cover	Land use patterns	Satellite Imagery
2.	Geology	Rock formation and mineral profile	Geological Survey of India and project site study
3.	Air, water, noise, soil	Measurement levels	Tamil Nadu Pollution Control Board, Tamil Nadu.
4.	Meteorology	Temperature, cloud, wind, etc.	Indian Metrological Department Chennai and other journals and studies.
5.	Ecology	Existing terrestrial flora and fauna	GCC in Chennai, WRD in India.
6.	Socio-economic aspects	Socio-economic characteristics	Census of India, 2011; District Hand Book, survey in project area

4.2 Features

The features such as climate, topography, geology, drainage, vegetative cover of Tamil Nadu state, Tiruvallur District is described in following sections.

A. Tamil Nadu state

4.2.1. Climate

The winter season in the project area commences early in December and continues till middleof March. The climate in the cold weather is pleasant. The days are bright and sunny, Under the Köppen climate classification the greater part of Tamil Nadu falls under Tropicalsavanna climate and a smaller portion of the state falls under Humid subtropical climate; theclimate of the state ranges from dry sub-humid to semi-arid. The summer in Tamil Nadu runsthroughout March, April and May and is characterized by intense heat and scant rainfall acrossthe state.

Tamil Nadu is heavily dependent on monsoon rains, and thereby is prone to droughts when themonsoons fail. The state has distinct periods of rainfall, which are the advancing monsoonperiod, South-west monsoon (from June to September) with strong southwest winds, the North-east monsoon (from October to December), with dominant northeast winds, and the Dry season (from January to May). The normal annual rainfall of the state is about 945 mm (37.2 in) ofwhich 48% is through the North East monsoon, and 32% through the South West monsoon.

4.2.2. Topography

The western, southern and the north-western parts are hilly and rich in vegetation. Tamil Naduis the only state in India which has both the Western Ghat and the Eastern Ghat mountainranges which meet at the Nilgiri hills. The Western Ghats dominate the entire western borderwith Kerala, effectively blocking much of the rain bearing clouds of the South West Monsoonfrom entering the state. The eastern parts are fertile coastal plains. The northern parts are amixof hills and plains. The central and the south-central regions are arid plains.

Tamil Nadu has a coastline of about 1076 km which is the country's second longest coastline. Tamil Nadu falls mostly in a region of low seismic hazard with the exception of the western border areas that lie in a low to moderate hazard zone. The western, southern and the north-western parts are hilly and rich in vegetation. Tamil Naduis the only state in India which has both the Western Ghat and the Eastern Ghat mountainranges which meet at the Nilgirihills.The Western Ghats dominate the entire western borderwith Kerala, effectively blocking much of the rain bearing clouds of the South West Monsoonfrom entering the state. The eastern parts are fertile coastal plains. The northern parts are a mixof hills and plains. The central and the south-central regions are arid plainson both the eastern and western coastlines. The topography of the state is represented through Figure. 9.

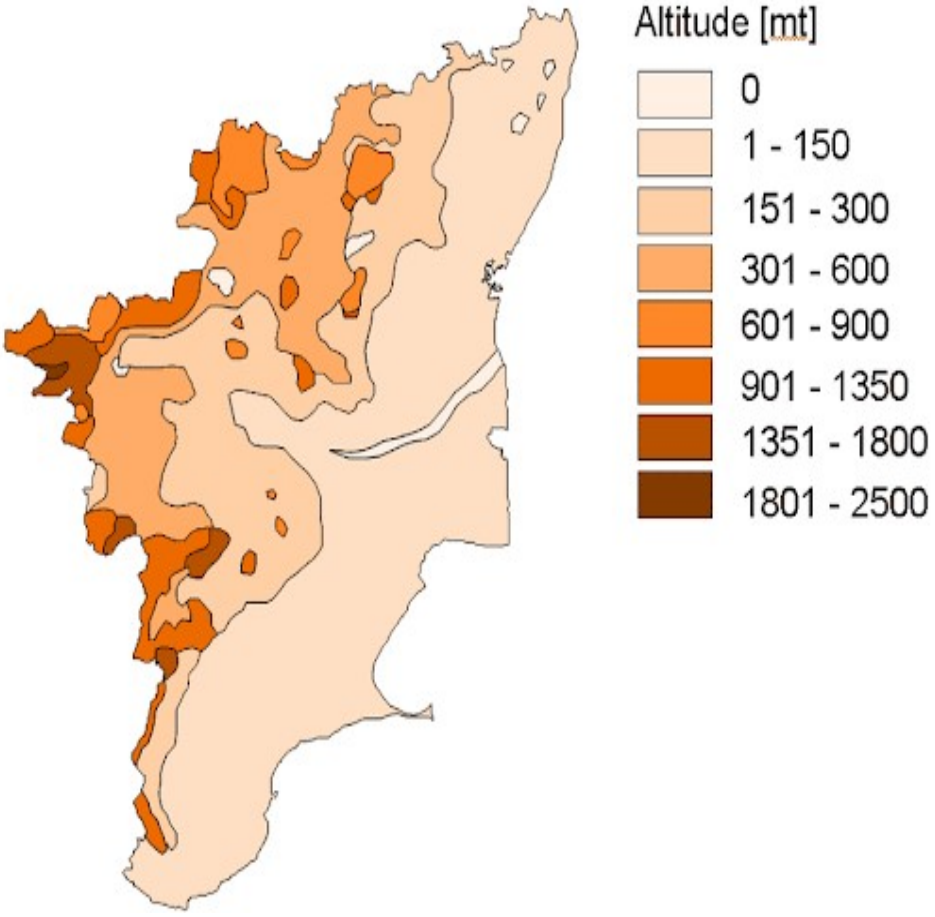


Figure 9Topographical map of Tamil Nadu state

4.2.3. Geology

Geological description of an area provides the information on the earth formation, the rocks of which it is made, the structure of those rocks and their occurrence in the area. Geologically, the Tamilnadu state comprises of Crystalline rocks of Archaean to late Proterozoic age occupying over 80% of the area of the state, while the rest is covered by the Phanerozoic sedimentary rocks mainly along the coastal belt and in a few inland river valleys. The hard rock terrain comprises predominantly of Charnockite and Khondalite groups and their migmatitic derivatives, supracrystal sequences of Sathyamangalam and Kolar groups and Peninsular Gneissic Complex (Bhavani Group), intruded by ultramafic-mafic complexes, basic dykes, granites and syenites. The sedimentary rocks of the coastal belt include fluviatile, fluvio-marine and marine sequences, such as Gondwana supergroup (Carboniferous to Permian and Upper Jurassic to Lower Cretaceous), marine sediments of Cauvery basin (Lower Cretaceous to Paleogene), Cuddalore/ Panambarai Formation (Mio-Pliocene) and sediments of Quaternary and Recent

age. Geologically, the study area comes under Charnokite gneiss and Pyroxene granulites and also coastal sediments and alluvium. Geological map of Tamil Nadu is provided in Figure 10.

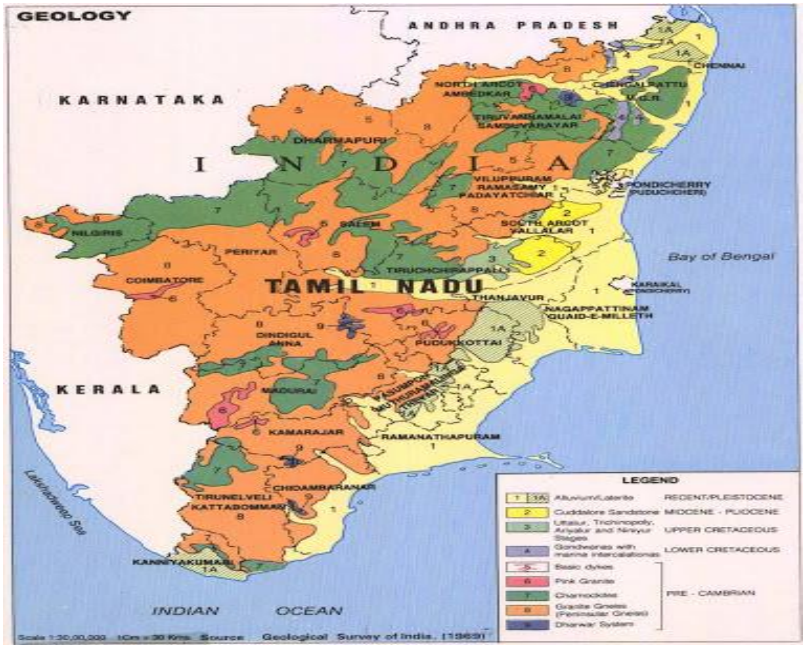


Figure 10Geological map of Tamil Nadu state

4.2.4. Hydrology

Nearly 73% of the total area of the state is occupied by a variety of hard and fissured crystalline rocks like charnockite, gneisses and granites. The depth of open wells varies from 6 to 30 mbgl, while the depth of borewells generally varies from 30-100 m. The sedimentary formations consist of sand stones, limestones and shales whereas Quaternary sediments in the State represented by older alluvium and recent alluvium and coastal sands. In the Cauvery delta, the artesian pressure ranges between 4.5 m to 17 mbgl with free flow upto 270 m3/hr. The yield of wells in the alluvium varies from 27 to 212 m3/hr. The yield of wells in the fissured formation varies from 7 to 35 m3/hr. The map is given below in Figure 11.

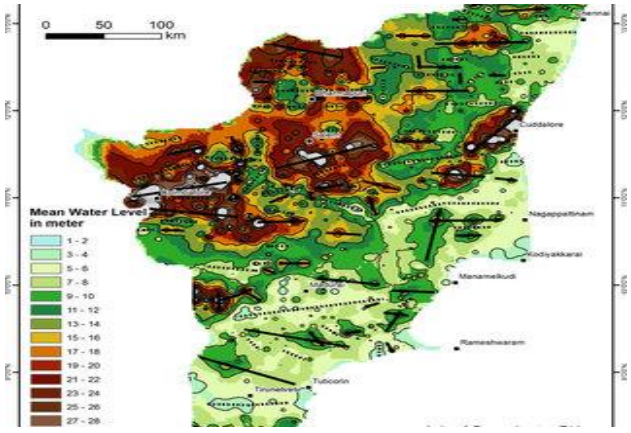


Figure 11Hydrological map of Tamil Nadu State

4.2.5. Drainage

Drainage details out the river systems and the pattern formed in the form of watersheds such as streams, rivers, and lakes in the region. Also, it describes the direction of flow and the route it takes from its entry into any region till the exit into the adjacent region. The drainage pattern in Tamil Nadu is developed by the river Palar and Cheyyar and its tributaries. The drainage pattern in general is sub-dendritic and radial. All the rivers are seasonal and carry substantial flows during monsoon period. River Palar, a major river works as a drain for the district originates from Western Ghats in Karnataka state, and discharges in Bay of Bengal near Pudupattinam. The Cheyyar, a tributary of Palar River originates from the Jawadu hills of Tiruvannamalai district. It has a north easternly flow in Kancheepuram district and confluences with the Palar near Pazhalyaseevaram. Other seasonal rivers like Korattalaiar and Tandiar drain from the district partly on the northern and southern parts respectively. The map is given at Figure 12.

Figure 12Drainage map of Tamil Nadu State

4.2.6. Forest

Tamil Nadu is located in the southern most state of the Indian peninsula is spread over 130,058sq.km, which constitutes 3.96 % of the area of the country. It lies between latitude 8°05' and13 ° 34' North latitudes and 76 ° 14' and 80 ° 21' East longitudes. The Tamil Nadu State ofForest gives a detailed view of the health of the forest cover of the State based on the ForestSurvey of India (FSI) and India State of Forest Report (ISFR) 2015 assessment. The State hasa spectrum of nine major forest types ranging from wet evergreen forest to moist deciduous, drydeciduous, sholas, grass lands and scrub forest. The Western Ghats, the longest hill range inthe state is one of the 25 global hotspots of bio-diversity and one of the three mega centersofendemism in India.The forest and tree cover of the State is about 30,952 sq. km which constitutes 23.80% of the total geographical area of the State. The map is given at Figure 13.

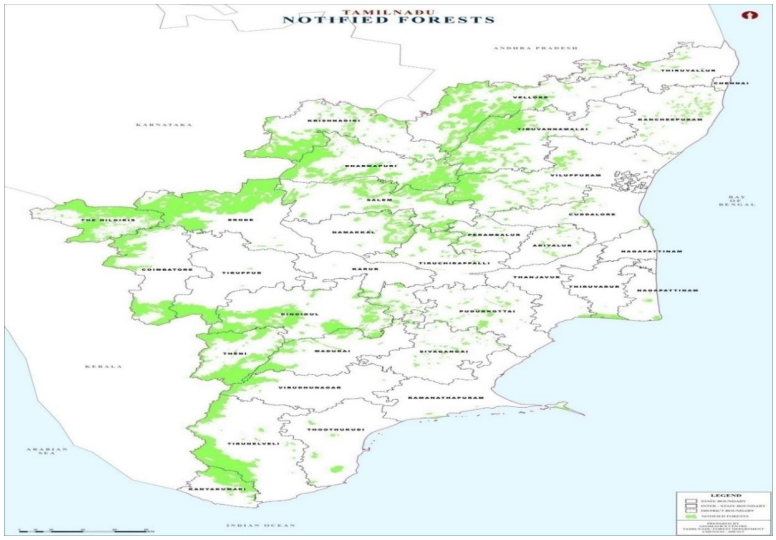


Figure 13Forest area Map of Tamil Nadu State

4.3. Thiruvallur district

4.3.1 Climate

Like other parts of Tamil Nadu, hot climate prevails during the months of April and May and humid climate during the rest of the year except in December, January and February when it is slightly cold. The average normal rainfall of the district is 1104 mm. Out of this about 50 % is received during north east monsoon period and about 40 % is received during south west monsoon period. The average temperature of the district is a maximum of 37.9°C and a minimum of 18. 5°C. Monsoon season is from June to September, and brings heavy rains in the area coupled with cool breeze. Monsoon winters are largely cooler in comparison with other places in Southern India

Table 10Climate details of Thiruvallur district

Month	MEANS					
	Daily Minimum Temperature (°C)	Daily Maximum Temperature (°C)	Minimum Temperature		Maximum Temperature	
			Value	Date	Value	Date
Jan	20.9	29.9	15.7	27-01-1969	33.9	25-01-2006
Feb	21.8	31.7	16	04-02-1989	36.6	26-02-2001
Mar	23.8	34	18.2	02-03-1989	40.6	29-03-1953
Apr	26.2	35.9	20.7	27-04-1968	42.7	30-04-1991
May	27.7	38.3	21	26-05-2005	49.1	13-05-2001
Jun	27.4	37.5	21	22-06-1961	43.2	03-06-2012
Jul	26.4	35.8	20.6	14-07-1985	40.4	06-07-2015
Aug	25.7	34.9	21.4	16-08-1967	39.6	01-08-2018
Sep	25.4	34.4	20.9	29-09-2011	39.2	28-09-2002
Oct	24.6	32.6	19.6	31-10-1974	39.4	01-10-1920
Nov	23.2	30.4	16.7	08-11-1954	35.6	02-11-1999
Dec	21.7	29.4	16.1	31-12-1947	33.1	10-12-2010
Annual	24.6	33.7	15.7	27-01-1969	49.1	13-05-2001

Source:http://mausam.imd.gov.in

4.3.2 Rainfall

The pre-monsoon rainfall is almost uniform throughout the district. The coastal areas get more rain rather than the interior areas. The district is mainly depending on the seasonal rains, the distress conditions prevail in the event of the failure of rains. Northeast and Southwest monsoon are the major sources with 54% and 46% contribution each to the total annual rainfall.

Table 11Decadal rainfall in Thiruvallur district (in mm)

Month	Mean			
	Total Rainfall(mm)	Number of Rainy Days	Rainfall	
			Value	Date
Jan	20.0	1.4	91.7	28-01-1947
Feb	4.7	0.6	136.8	24-02-2000
Mar	3.4	0.2	88.1	05-03-1944
Apr	17.5	1.0	121.6	06-04-2005
May	49.7	1.8	214.9	17-05-1943
Jun	75.4	4.5	282.2	14-06-1996
Jul	113.1	6.7	115.4	10-07-2020
Aug	141.4	8.8	98.7	16-08-1967
Sep	143.9	7.4	199.0	30-09-1984
Oct	278.3	10.6	229.6	10-10-1943
Nov	377.3	11.5	346.6	25-11-1976
Dec	183.7	5.7	282.8	03-12-2005
Annual	1408.4	60.2	346.6	25-11-1976

Source: http://mausam.imd.gov.in

4.3.3. Topography

Topography describes the shape and terrain of the land which provides details on the elevation and slope with reference to the mean sea level. Studying the terrain is important to manage the construction cost, minimize risks from natural hazards and minimize the impact of the proposed project on the environmental resources. The geographical area of the Chengalpattu district is spread into 2945 sq. km. The elevation of the area ranges from 227 amsl in the west to a sea level in the east. The major part of the area is characterized by an undulating topography with innumerable depressions, which are used as irrigation tanks. The coastal plain displays a fairly low level or gently rolling surface and only lightly elevated above the local water surfaces on rivers. The straight trend of the coastline is a result of development of a vast alluvial plain. There are a number of sand dunes in the coastal tract. The coastal landforms include estuarine tidal, mud flats or lagoons and salt marsh etc.

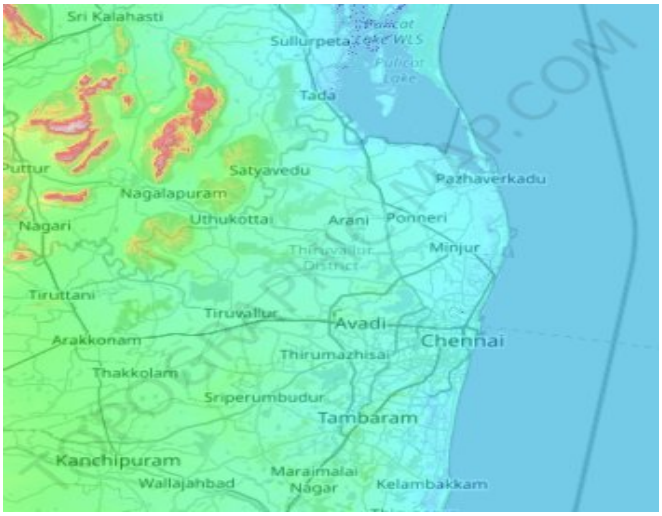


Figure 14 Topographical Map of Thiruvallur District

4.3.4 Relative humidity

High relative humidity between 30 and 88 per cent prevail throughout the year. Relative humidity is maximum in the morning and minimum in the evening. Higher rates of relative humidity are observed between November and January i.e., 85 to 88 percent. In the months of June, the humidity is lower i.e., around 30 percent. Average relative humidity recorded were 78 percent and 68 percent in the morning and evening respectively.

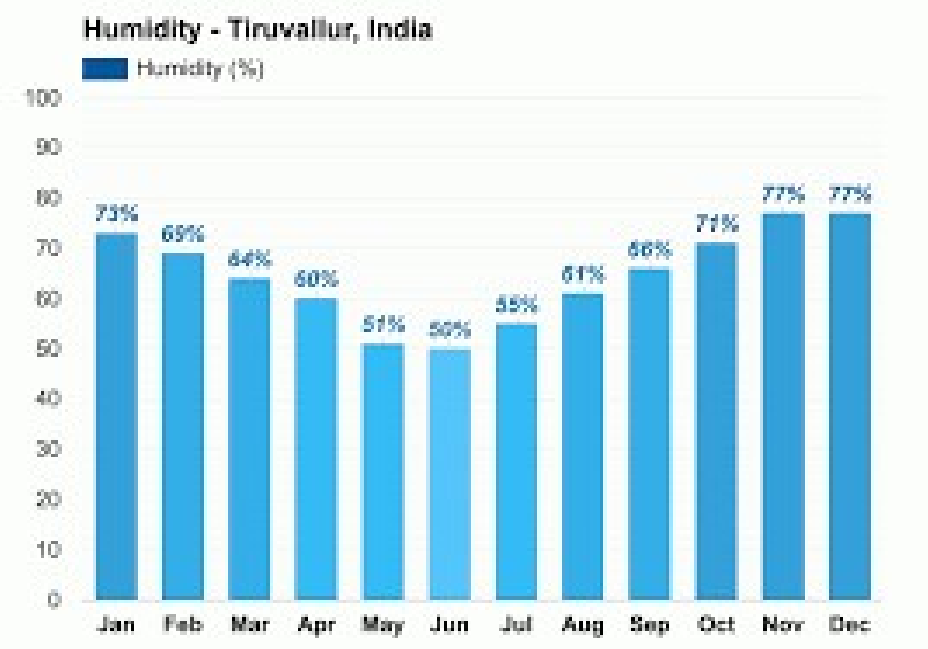


Figure 15Relative humidity of Thiruvallur District

4.3.5 Cloud cover

Generally light clouds are observed in winter mornings. During pre-monsoon and the post-monsoon evenings the skies are either clear or lightly clouded. But in post-monsoon mornings as well as monsoon morning heavy clouds are commonly observed. And, the skies are light to moderately cloud in the evening time throughout the year.

4.3.6. Wind speed direction

The available data indicate the trend of wind speed direction during pre-monsoon, monsoon, post monsoon and winter season in a year, wind rose is given at Figure 16.

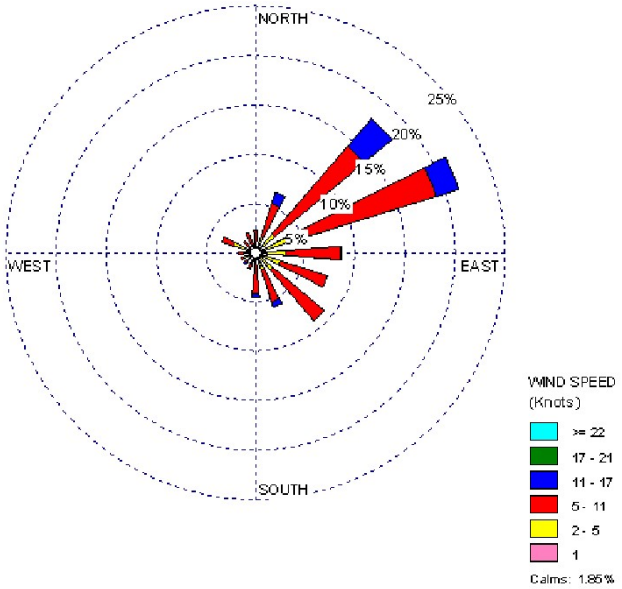


Figure 16Wind-rose diagram

4.3.7 Hydrogeology

The Tiruvallur district is underlain by both sedimentary and fissured formations. The important aquifer system in the district is constituted by unconsolidated and semi-consolidated formations and weathered, fissured and fractured crystalline rocks. The hydrogeological study of the area is underlain by sedimentary and fissured formations. The important aquifer system is constituted by consolidated and semi consolidated formations of Granite, Gneisses, Charnokite and Sandstones, Conglomerate, Clay, Shale types of rocks. Ground water occurs under unconfined to semi confined and discontinuous, restricted to weathered residuum and fracture zones.

4.3.8. Ground water level

Tamil Nadu State Ground and Surface Water Resources Data Centre, WRD, Government of Tamil Nadu jointly with Central Ground Water Board (CGWB) determine the status of ground water level for each tehsil every year and publish the findings once in four years after monitoring the important wells. The Ground Water Report, 2007 declared the Thiruporur block of Tiruvallur

district having 81% of long-term groundwater recharge as semi-critical area for future groundwater development.

Latest data of June 2020 indicate the average ground water level status in Tiruvallur district as 4.92 meter below ground level (BGL) as compared to the water level in June 2019 which was 6.08 metre BGL. It has thus risen by 1.6-meter BGL in 1 year from 2019 to 2020. The 25-year trend of ground water level in district is given at Figure 17

Table 12 Ground water level from Jan 2017 – May 2021

Jan 2017	May 2017	Jan 2018	May 2018	Jan 2019	May 2019	Jan 2020	May 2020	Jan 2021	May 2021	5 Years Pre-Monsoon Average	5Years Post Monsoon Average
8.5	13.9	8.9	21.7	9.5	12.3	8.5	15.3	5.9	14.7	13.1	7.3

Source: http://mausam.imd.gov.in

4.3.9. Soil type

It is essential to determine the potentiality of soil in the area and to identify the impacts of urban development on soil quality. The sampling locations have been identified with objectives to determine the baseline soil characteristics of the study area.

The soil analysis reveals that pH of the soil range between 8.31 to 8.76 which indicate that soil is moderately to strongly alkaline. The soil contains organic matter from 2.25% to 2.85%, which is more than sufficient. The phosphorus is below detection limit and nitrogen is less in quantity.

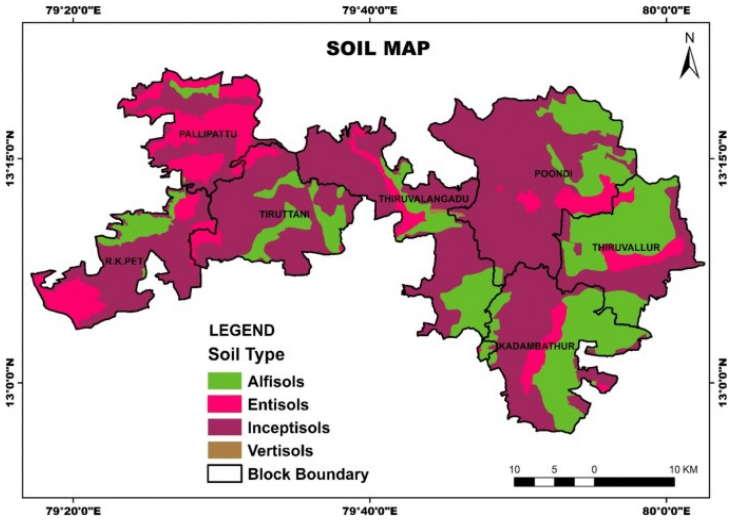


Figure 17Soil Distribution Map

4.3.10. Air quality

The ambient air quality monitoring was carried on 23-01-2023 at 05 locations on basis of wind direction and other metrological parameters. Samples are collected for 24 hours basis Once a week, and gaseous pollutants such as Sulphur dioxide (SO_2) and Nitrogen dioxide (NO_2).

Table 13The Ambient Air Monitoring Stations

S.No	Location	Sample Code	Latitude and Longitude
1.	Burma main Road	AAQ - 1	13° 10' 57.8928" N 80° 16' 28.1172" E
2.	Burma Nagar	AAQ - 2	13° 11' 0.0672" N 80° 17' 6.0612" E
3.	60thSt,Manali New town	AAQ – 3	13° 12' 19.7604" N 80° 16' 28.0308" E
4.	87th block Manali New town	AAQ – 4	13° 12' 13.2336" N 80° 16' 49.4004" E
5.	Kalakkral,Manali New town	AAQ – 5	13° 12' 11.2464" N 80° 16' 5.1996" E

Table 14Summary of Ambient Air Quality (µg/m3)

S.No	Parameters	AAQ - 1	AAQ – 2	AAQ - 3	AAQ - 4	AAQ -5	AAQ-6	CPCB Standard
1.	PM 10 (µg/m³)	64.6	60.1	58.8	60.3	61.9	57.7	100
2.	PM 2.5 (µg/m³)	24.3	21.8	16.9	12.8	18.8	15.4	60
3.	SO_2 (µg/m³)	7.35	6.22	6.28	3.72	17.3	5.95	80
4.	NOx (µg/m³)	14.9	14.3	13.8	7.50	15.4	12.8	80
5.	CO (mg/m³)	BDL(DL:1.15)	BDL(DL:1.15)	58.8	60.3	61.9	57.7	2

The ambient air quality survey conducted by the TNPCB reveals that amient air quality level could not exceed the limits. Mostly the test had conducted in household and junctions of road side area.

Figure 18 Photos of Air Quality Monitoring

4.3.11. Noise Environment

The Ambient Noise quality monitoring was carried on 23-01-2023 at 06 locations. The Results are as Follows

Table 15 The Ambient Noise Monitoring Stations

S.No	Location	Sample Code	Latitude and Longitude
1.	Burma main Road	N - 1	13° 10' 57.8928" N 80° 16' 28.1172" E
2.	Burma Nagar	N - 2	13° 11' 0.0672" N 80° 17' 6.0612" E
3.	60thSt,Manali New town	N-3	13° 12' 19.7604" N 80° 16' 28.0308" E
4.	87th block Manali New town	N-4	13° 12' 13.2336" N 80° 16' 49.4004" E
5.	Kalakkral,Manali New town	N-5	13° 12' 11.2464" N 80° 16' 5.1996" E
6.	AyyaKovilSt,Manali New town	N-6	13° 12' 2.7828" N 80° 16' 33.3552" E

Table 16 Summary of Ambient noise level measurement

S.No	Parameters	N-1	N-2	N-3	N-4	N-5	N-6
1.	Leq. Day {dB(A)}	64.8	58.4	57.1	55.8	60.4	59.4
2.	Leq. Night {dB(A)}	60.2	54.8	53.5	52.6	56.2	55.8
3.	Average {dB(A)}	62.5	56.6	55.3	54.2	58.3	57.6

The Noise level survey conducted by the TNPCB reveals that noise level exceeded the limits mostly in commercial areas, mainly due to vehicular movement.

Figure 19Photos of Noise Monitoring

4.3.12. Soil

The Soil quality monitoring was carried on 23-01-2023 at 6 locations. The Results are as Follows

Table 17The Soil Monitoring Stations

S.No	Location	Sample Code	Latitude and Longitude
1.	Burma main Road	S - 1	13° 10' 57.8928" N 80° 16' 28.1172" E
2.	Burma Nagar	S - 2	13° 11' 0.0672" N 80° 17' 6.0612" E
3.	60 thSt,Manali New town	S-3	13° 12' 19.7604" N 80° 16' 28.0308" E
4.	87 th block Manali New town	S-4	13° 12' 13.2336" N 80° 16' 49.4004" E
5.	Kalakkral,Manali New town	S-5	13° 12' 11.2464" N 80° 16' 5.1996" E
6.	AyyaKovil St,Manali New town	S-6	13° 12' 2.7828" N 80° 16' 33.3552" E

Table 18 Summary of Soil Environment

S.No	Parameters	Units	S-1	S-2	S-3	S-4	S-5	S-6
1.	pH @ 25°C	--	8.68	8.61	8.86	8.81	8.62	8.72
2.	Conductivity	uS/cm	568	622	540	502	426	394

	@ 25°C							
3.	Total Kjheldal Nitrogen	%	0.017	0.018	0.027	0.024	0.021	0.026
4.	Total Phosphorus	meq /100g	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)
5.	Soluble Potassium	meq /100g	1.03	1.05	1.06	1.04	1.00	1.07
6.	Exchangeable Calcium	meq /100g	7.5	7.1	8.4	7.6	7.1	7.9
7.	Exchangeable Magnesium	meq /100g	4.0	3.6	4.1	3.8	3.9	4.3
8.	Exchangeable Sodium	meq /100g	1.69	1.62	1.76	1.81	1.79	1.75
9.	Organic Matter	%	1.05	1.02	1.12	1.06	1.08	1.03
10.	Texture Classification	--	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy
11.	Sand	%	54.3	53.8	54.8	57.1	52.9	55.8
12.	Clay	%	23.8	25.6	18.1	19.4	21.3	20.1
13.	Slit	%	21.9	20.6	27.1	23.5	25.8	24.1

All the soil parameters are falling within the concentration limits of compost in SWM Rules, 2016 and Hazardous waste (management & handling) Rule, 1989 and its amendments.

Figure 20 Photo of Soil Sample Collection

4.3.13. Ground Water Quality

The Ground Water quality monitoring was carried on 23-01-2023 at 6 locations. The Results are as follows.

Table 19 The Ground Water Monitoring Stations

S.No	Location	Sample Code	Latitude and Longitude
1.	Burma main Road	GW - 1	13° 10' 57.8928" N 80° 16' 28.1172" E
2.	Burma Nagar	GW - 2	13° 11' 0.0672" N 80° 17' 6.0612" E
3.	60th St, Manali New town	GW-3	13° 12' 19.7604" N 80° 16' 28.0308" E
4.	87th block Manali New town	GW-4	13° 12' 13.2336" N 80° 16' 49.4004" E
5.	Kalakkral, Manali New town	GW-5	13° 12' 11.2464" N 80° 16' 5.1996" E
6.	Ayya Kovil St, Manali New town	GW-6	13° 12' 2.7828" N 80° 16' 33.3552" E

Table 20 Summary of Ground Water Sample Analysis

S.No	Parameters	Units	GW-1	GW-2	GW-3	GW-4	GW-5	GW-6	Permissible Limits As Per IS10500-2012
1.	pH @ 25°C	--	7.81	7.62	7.39	7.48	7.16	7.43	6.5-8.5
2.	Iron as Fe	mg/l	0.10	0.14	0.10	0.07	0.12	0.16	0.3
3.	Chlorine Residual	mg/l	BDL (<0.2)	BDL (<0.2)	BDL (<0.2)	BDL (<0.2)	BDL (<0.2)	BDL (<0.2)	1.0
4.	Total Chromium	mg/l	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	--
5.	Hexavalent Chromium Cr6+	mg/l	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	--
6.	Total Dissolved Solids (TDS)	mg/l	940	765	860	722	810	690	2000
7.	Total Suspended solids (TSS)	mg/l	BDL (<1.0)	BDL (<1.0)	2.0	BDL (<1.0)	BDL (<1.0)	2.0	--
8.	Chemical Oxygen Demand	mg/l	BDL (<4.0)	BDL (<4.0)	BDL (<4.0)	BDL (<4.0)	BDL (<4.0)	BDL (<4.0)	--
9.		mg/l	BDL	BDL	BDL	BDL	BDL	BDL	--

S.No	Parameters	Units	GW-1	GW-2	GW-3	GW-4	GW-5	GW-6	Permissible Limits As Per IS10500-2012
	BOD @27°C for 3 days		(<2.0)	(<2.0)	(<2.0)	(<2.0)	(<2.0)	(<2.0)	
10.	Calcium	mg/l	104	97.0	58.0	49.0	34.0	48.0	200
11.	Cyanide	mg/l	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	0.05
12.	Cadmium	mg/l	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	0.003
13.	Nickel	mg/l	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	0.02
14.	Copper	mg/l	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	1.5
15.	Lead	mg/l	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	0.01
16.	Zinc	mg/l	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	15
17.	Total Phosphorous as PO4	mg/l	1.04	1.01	0.94	0.98	0.73	0.68	--
18.	Total Kjeldhal Nitrogen (TKN)	mg/l	BDL (<1.0)	BDL (<1.0)	BDL (<1.0)	BDL (<1.0)	BDL (<1.0)	BDL (<1.0)	--
19.	Ammonia as NH3	mg/l	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	--
20.	Dissolved Oxygen	mg/l	6.8	6.9	6.8	6.9	6.8	7.0	--
21.	Chloride as CL	mg/l	296	250	292	272	224	200	1000
22.	Sulphate as SO4	mg/l	62.0	51.0	49.0	54.0	40.0	37.0	400
23.	Total Hardness as CACO3	mg/l	384	322	272	256	220	232	600
24.	TotaL Alkalinity as CACO3	mg/l	IS 3025 part-23	314	260	242	232	210	600

Figure 21Photos of Ground Water Sample Collection

The baseline status of ground water quality has been established through sampling and analysis of various water quality parameters as part of the environmental monitoring conducted by the Consultants. At eight locations water samples were collected and analyzed for various parameters. The sampling locations were selected based on existing land use and nature of water sensitive locations. Water quality results were compared with BIS water quality standards.

The values of pH in the water samples collected from study area ranges from 7.25 to 7.46 for ground water. The observed values of pH are within permissible limits of BIS 10500. The values of Turbidity for ground water samples are within permissible limit which ranges from 1-3 NTU. Total alkalinity for all ground water samples is found within permissible limit. The observations are concluded that most of the parameters are above acceptable limit of BIS 10500:2012 standards. Hence ground water is not suitable for drinking purpose.

4.3.14. Surface Water Quality

The Surface Water quality monitoring was carried on 23-01-2023 at 1 location. The Results are as follows.

Table 21The Surface Water Monitoring Stations

S.No	Location	Sample Code	Latitude and Longitude
1.	Kosasthalaiyar River	SW-1	13° 10' 50.844" N 80° 16' 28.2864" E

Table 22 Summary of Surface Water Sample Analysis

Sl. No	PARAMETERS	UNIT	TEST METHOD	SW-1	Surface Water Quality Standards (as per IS: 2296).				
					A	B	C	D	E
1.	Taste	--	IS 3025-Part 5	Disagreeable	None	--	--	--	--
2.	Odour	--	IS 3025-Part 5	Disagreeable	Unobj	--	--	--	--
3.	Colour	Hazen	IS 3025-Part 4	40.0	10	300	300	--	--
4.	pH @ 25°C	--	IS 3025-Part 11	7.21	8.5	8.5	8.5	8.5	8.5
5.	Conductivity @ 25°C	uS/cm	IS 3025-Part 14	910	--	--	--	1000	2250
6.	Dissolved Oxygen	mg/l	IS 3025-Part 38	4.1	6	5	4	4	--
7.	BOD @27°C for 3 days	mg/l	IS 3025-Part 44	22.0	2	3	3	--	--
8.	Total Dissolved Solids (TDS)	mg/l	IS 3025-Part 16	570	500	--	1500	--	2100
9.	Oil and Grease	mg/l	IS 3025-Part 39	BDL(DL:1.0)	--	--	0.1	0.1	--
10	Mineral Oil	mg/l	IS 3025-Part 39	BDL(DL:1.0)	0.01	--	--	--	--
11	Total Hardness as $CaCO_3$	mg/l	IS 3025-Part 21	180	300	--	--	--	--
12	Chloride as Cl	mg/l	IS 3025-Part 32	122	250	--	600	--	600
13	Sulfate as SO4	mg/l	APHA-23rd Edn	37.0	400	--	400	--	1000
14	Nitrates as NO3	mg/l	IS 3025-Part 34	2.46	20	--	50	--	--
15	Free CO2	mg/l	APHA-23rd Edn	BDL(DL:1.0)	--	--	--	6	--
16	Free Ammonia as N	mg/l	IS 3025-Part 34	1.96	--	--	--	1.2	--
17	Fluorides as F	mg/l	APHA-23rd Edn	0.34	1.5	1.5	1.5	--	--
18	Calcium as Ca	mg/l	IS 3025-Part 40	40.0	80.10	--	--	--	--

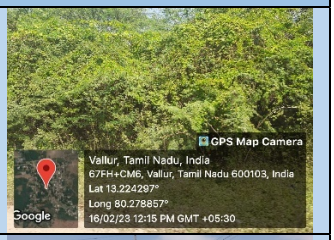
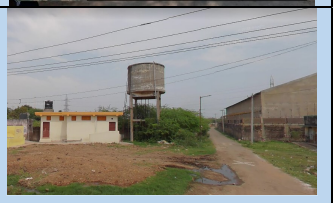
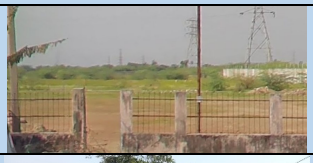
Sl. No	PARAMETERS	UNIT	TEST METHOD	SW-1	Surface Water Quality Standards (as per IS: 2296).				
					A	B	C	D	E
19	Magnesium as Mg	mg/l	IS 3025-Part 46	19.2	24.28	--	--	--	--
20	Copper	mg/l	IS 3025 Part 42	BDL(DL:0.2)	1.5	--	1.5	--	--
21	Iron as Fe	mg/l	IS 3025-Part 53	0.67	0.3	--	50	--	--
22	Manganese as Mn	mg/l	IS 3025-Part 59	BDL(DL:0.5)	0.5	--	--	--	--
23	Boron as B	mg/l	IS 3025-Part 57	BDL(DL:0.1)	--	--	--	--	2
24	Lead as Pb	mg/l	IS 3025 Part 47	BDL(DL:0.1)	0.1	--	0.1	--	--
25	Chromium Cr6+	mg/l	IS 3025-Part 52	BDL(DL:0.1)	0.05	0.05	0.05	--	--
26	Percentage Sodium	%	IS 11624	46.5	--	--	--	--	60
27	Sodium absorption ratio	meq/l	IS 11624	0.96	--	--	--	--	26
28	Total Coliforms	MPN/100ml	IS 1622:1981	120	50	500	5000	--	--

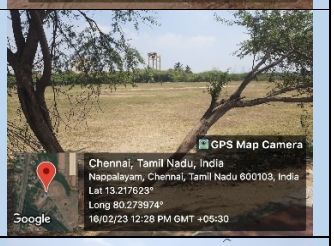
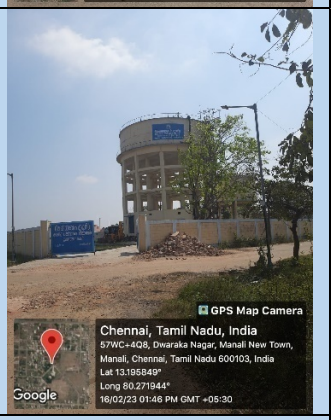
Figure 22 Photo of Surface Water Sample Collection

4.4. Noise Sensitive Receptors

The receptor of noise will be close to the construction site areas, offices, religious structures, market area and other public areas for which special mitigation measures will be taken care of during construction phase by providing proper noise barrier / acoustic and other sources close to the sensitive noise receptors.

4.5. Site specific Environmental features

SL NO	INFRASTRUCTURE	SPS / LS	LOCATION & ENVIRONMENTAL FEATURE	SITE PHOTOGRAPH
1	Lift Stations (ZONE-01)	LS - 01	Edayanchavadi – It is present in the Junction of Perumal koil Street. An existing OHT is present.	
2	Lift Stations (ZONE-02)	LS - 02	Edayanchavadi -It is Present in the Junction of Edayanchavadi road, Existing 0.5 lakh liter OHT and temple present near it.	
3	Lift Stations (ZONE-06)	LS – 6A	Sadayankuppam (VAO office near) – Existing OHT site without any trees. The LS site is located within park in habituated area, surrounded by residential buildings on one side and Institutional building (Govt. School) on other side with the road access form 1st main road. Hence improvement to aesthetics of site, odour control mechanism, noise control are proposed along with planting trees, constructing raised compound wall, planting creepers.	
4	Lift Stations (ZONE-06)	LS – 6B	Sadayankuppam -Burma Nagar 15 th Street	
5	Lift Stations (ZONE-07)	LS – 7A	Kadapakkam- Present in Andal Kuppam Road Harbour Bypass Road present near it Industrial Area	
6	Lift Stations (ZONE-07)	LS – 7B	Kadapakkam - Present Near Panchayat union office and CMWSSB Office in Andarkuppam road	

SL NO	INFRASTRUCTURE	SPS / LS	LOCATION & ENVIRONMENTAL FEATURE	SITE PHOTOGRAPH
7	Lift Stations (ZONE-07)	LS – 7C	Present near truck lay bay in Edayanchavadi	
8	Lift Stations (ZONE-08)	LS – 08	Edayanchavadi - Near Edayanchavadi Government school and located at open land	
9	Sub Pumping Station (ZONE-03)	SPS - 03	Edayanchavadi - Present in Existing SPS site of CMWSSB	
10	Sub Pumping Station (ZONE-04)	SPS – 04	Present Near TNHB Phase 2 children's park of MMDA Layout Edayanchavadi (Existing old SPS site of CMWSSB)	
11	Sub Pumping Station (ZONE-05)	SPS - 05	Edayanchavadi - Present near Dwaraka Nagar Existing 2 lakh litre OHT and Government higher secondary school (Existing old SPS site of CMWSSB)	
12	Collection system		Collection gravity system is the pipeline network that receives the sewage from the house service connections and conveys to the pumping station. Machine holes will be constructed at the centre of the road and Pipelines will be laid connecting the Machine Holes, for the roads wider than 60ft rider mains have	

SL NO	INFRASTRUCTURE	SPS / LS	LOCATION & ENVIRONMENTAL FEATURE	SITE PHOTOGRAPH
			been proposed to avoid frequent crossings.	
13	Pumping mains		Pumping mains of varying diameter have been proposed to convey the sewage collected at the lift stations or pumping stations to the network of next zone or to the STP through CI pipelines. Pumping mains will be laid on shoulder / footpaths of the roads. Care has been taken considering the available widths while selecting the alignment of roads.	

All the above sites are free from encumbrances and owned by Government agencies/departments. The pumping main will be laid within the Right of Way of the roads belongs to Greater Chennai Corporation / Tamil Nadu Road Development Corporation. The land details and records are provided in Annexure 2.

4.6. Socio-economic profile of Tiruvallur District

Tiruvallur district is situated on the North Eastern part of Tamil Nadu and is surrounded by Kancheepuram district in the South, Vellore district in the West, Bay of Bengal in the East and Andhra Pradesh State in the North. The district spreads over an area of about 3422 Sq.km. This district consists of 1 Corporation, 9 taluks, 14 blocks, 4 Municipalities and 10 town Panchayats.

4.6.1. Project Area

Edayanchavadi, Sadayankuppam, and Kadapakkam area is bounded by ernaur on the east, manali and mathur on the west, elanthur on the north and manali NH on the south. It falls under the manali Assembly Constituency and North Chennai Parliamentary Constituency, division 15 – 16 in Greater Chennai Corporation.The total length of the road/streets is about 88 Km.

4.6.2. Connectivity

The Chennai International Airport is just 42km South-east of the town which could be reached in about 45 minutes by road. The airport is placed in between Chennai- Bangalore broad-gauge railway line and Chennai-Tirupathi Trunk Road. Many places in this district are connected by Railway Routes and there are 120 Kms of Route Length and 321 Kms. Of Track Length lay under Broad gauge and so far, 37 Railway Stations are instituted in this district

4.6.3. Economy

Economy of Tiruvallur district in Tamil Nadu is largely dependent on agriculture and allied activities. About forty seven percent of the total work forces of this district are engaged in the agricultural sector. Some of the major crops grown in the district are rice, cumbu - ragi, green gram, sugarcane, black gram and groundnut. Apart from this, certain horticultural crops like mango, vegetables and guava have also bean cultivated successfully. Apart from seasonal rivers like Kallar, Kesathaliar, Nandi, Aravar, Coovam and Buckhingham Canal there are no perennial rivers in this district. As these seasonal rivers are not sufficient, irrigation through tanks, open wells and tube wells are commonly found in the district of Tiruvallur.

4.6.4. Social structure

The vulnerable groups such as Scheduled Caste (SC) and Scheduled Tribe (ST) population were 22.08 % and 1.13% respectively. An overwhelming majority (77.40%) population belong to other backward caste (OBC) as shown in Table 22.

Table 23Social structure

Taluks	Population 2011	Male	Female	Households
Villivakkam	260,112	132,555	127,557	65,573
Puzhal	90,733	46,120	44,613	22,729
Minjur	176,837	88,440	88,397	46,611
Sholavaram	141,603	71,106	70,497	36,253
Gummidipoondi	170,877	85,803	85,074	45,141
Tiruvelangadu	92,280	46,091	46,189	23,189
Tiruttani	74,230	37,124	37,106	18,179
Pallipattu	78,816	39,384	39,432	18,186
R K Pet	104,496	52,844	51,652	24,441
Tiruvallur	140,113	69,924	70,189	35,663
Poondi	102,279	51,098	51,181	26,178
Kadambattur	127,964	64,332	63,632	32,392
Ellapuram	120,509	59,727	60,782	32,073
Poonamallee	137,050	68,957	68,093	35,154
Ponneri	389,862	195,181	194,681	100,866
Uthukkottai	152,631	75,475	77,156	40,313
Ambattur	906,580	457,820	448,760	231,525
Mathavaram	596,156	301,303	294,853	150,990

4.6.5. Literacy Level

It indicates that 84.03% of population was literate. It varied from under primary (including basic knowledge of reading and writing) to metric and higher education level. Amongst them the male literacy rate was higher (89.69 %) compared to the females (78.32%) in the study area.

4.6.6. Occupational pattern

The occupational pattern of population in the study area covers main workers, marginal workers and non-workers. The census classified workers as main workers who had worked for the major part of the reference period i.e., 6 months or more. The marginal workers are those workers who had not worked for the major part of the reference period i.e., less than 6 months and non-workers are persons who did not work at all during the reference period. As per 2011 census, the main workers and marginal workers were 39.9% and 6.11% respectively and the non-workers constituted 53.9% of total population.

CHAPTER-5 Potential Environmental and Social Impacts and Mitigation Measures

This section identifies and assesses the potential changes in the environment and social aspects that could be expected from the proposed project. The impacts have been predicted for the proposed activities assuming that the impact due to the existing activities has already been covered under base line environmental monitoring and continue to remains same till the operation of the project. The proposed project activities would create impact on the environment in two distinct phases i.e., construction and operation phases. Impacts are identified, predicted and evaluated based on the analysis of the information collected from following,

- Project information (as discussed in Chapter-2) and
- Baseline information and site visits of the study area (as discussed in Chapter-4)

This section also describes mitigation measures, which have been suggested for the adverse impacts likely to be caused due to activities of both construction and operation phases of the project. The identification of likely impacts during construction and operational phases of the proposed project has been done based on likely activities having their impact on one or another environmental parameter. The details of the activities and their impacts have been worked out in the following sections.

5.1 Identification of likely impacts

Every activity and operation have either adverse or beneficial impacts on the environment. The environmental and social impact identification has been done based on proposed sub project activities. Potential environmental and socialimpacts of the proposed infrastructure components are presented in this section. Mitigation measures to minimize / mitigate negative impacts, if any, are recommended along with the agency responsible for implementation. Monitoring actions to be conducted during the implementation phase is also recommended to reduce the impact.

Screening of potential environmental and social impacts are categorized into four categories Considering subproject phases: location impacts and design impacts (pre-construction phase), construction phase impacts and operations and maintenance phase impacts.

(i) Location impacts include impacts associated with site selection and includeloss of on-site biophysical array and encroachment either directly or indirectly onadjacent environments. It also includes impacts on people who will lose theirlivelihood or any other structures by the development of that site.

(ii) Design impacts include impacts arising from Investment Program design, including technology used, scale of operation/throughput, waste production, discharge specifications, pollution sources and ancillary services.

(iii) Construction impacts include impacts caused by site clearing, earthworks, machinery, vehicles, workers, occupational health and safety. Construction site impacts include erosion, dust, noise, traffic congestion and waste production.

(iv) O&M impacts include impacts arising from the operation and maintenance activities of the infrastructure facility. These include routine management ofoperational waste streams, and occupational health and safety issues.
This section of the ESIA reviews possible project-related impacts, in order to identify Issues requiring further attention and screen out issues of no relevance. The Environmental and Social Screening formats are provided in the Annexures 1.

In the case of this project most of the individual elements involve simple construction and operation, so impacts will be mainly localized and not greatly significant negative impacts associated with sewage facilities such as odour are already considered in the design and siting, most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving excavation and earth movements; and being mostly located in an urban area, will not cause direct impact on biodiversity values. The project will be in properties held by the local government and access to the project location is through public rights-of-way and existing roads hence, land acquisition and encroachment on private property will not occur.

5.1.1 Design &Location impacts

Sewer system – collection and conveyance

The sewerage system is designed as a separate system of sewage collection (i.e., caters only to wastewater). Existing surface road side drains in the project area cater to collection and conveyance of runoff during rains. The underground gravity sewers will carry sewage from households to the nearest lifting or pumping station, onwards to next sewer zone or to terminal sewage pumping station from where the sewage is pumped to the existing STP.

Sewer system will cater to domestic wastewater - grey water (from kitchen and bath areas) plus black water (toilet waste/excreta), and every household outlet carrying the wastewater will be connected to the sewer network. To maximize the benefits as intended, CMWSSB will ensure that all existing septic tanks are phased out by bypassing the inlet and connecting the toilet discharge from each house directly to sewerage system. Accumulation of silt in sewers in areas of low over time, overflows, blockages, power outages, harmful working conditions for the workers cleaning sewers etc. are some of the issues that are taken into consideration during the sewer system design. Measures such as the following are included in sewer system design to ensure that the system provides the benefits as intended:

- Limit the sewer depth to 4.5mts, so that O&M of the system will be easy.
- Sewers shall be laid away from water supply lines and drains (at least 1 m), if not possible, sewer lines shall be laid below the water lines.
- In all cases, the sewer line should be laid deeper than the water pipeline (the difference between top of the sewer and bottom of water pipeline should be at least 300 mm);

- In unavoidable cases, where sewers are to be laid close to storm water drains, appropriate pipe material (that has no or least infiltration risk) shall be selected (DWC &CI pipes adopted)
- For shallower sewers and especially in narrow roads, wherever possible use small inspection chambers in lieu of Machine holes.
- Design Machine holes covers to withstand anticipated loads and ensure that the covers can be readily replaced if broken to minimize silt/garbage entry.
- Ensure sufficient hydraulic capacity to accommodate peak flows and adequate slope in gravity mains to prevent buildup of solids and hydrogen sulfide generation.

5.1.2 Sewage Pumping Stations and Lift Stations

Sewage Pump Station will also perform same function as sewage lift stations but cater to much larger area or sewage flow, and will also have several components, and occupy comparatively larger area. At these pumping or lifting stations, the operation involves accumulation of incoming sewage in the suction well and then pumping out as the sewage level reaches the designed pumping depth. The water level in the well rises up before the pumping cycle starts and as the pumping is performed the water level goes down registering its lowest depth at the end of pumping of cycle. This cycle of rising and lowering will continue throughout day and night. However, the duration between successive pumping cycles will significantly vary depending on the sewage generation. During morning and evening peak hours, sewage will accumulate quickly, and pumping frequency will be high. The sewage retention time in the suction well therefore varies throughout the day, with very high retention periods during the nights and mid-days.

5.1.3 Odour from Pumping Stations

In the suction wells, the sewage emits gases, which accumulated in the air above water surface. The gas may include odorous compounds like hydrogen sulfides (H_2S), amines, fatty acids, aldehydes, ketones and other volatile organic compounds (VOCs). As the water level rises before the pumping cycle, it physically displaces the air, along with the odorous gas compounds. H_2S is the most dominant odor causing compound and therefore can cause nuisance to nearby area. When sewage becomes stagnant, H_2S is generated in the anaerobic conditions. The quantum of H_2S generation depend on quantity of accumulated sewage and sewage retention time that create anaerobic conditions. Both increase in quantity of sewage accumulation and retention time will increase the H_2S generation. Since most of the pumping stations are located in residential areas, it is proposed to have tall compound wall with creepers, climbers, fragrance flower plants and green belt around the unit as an environmental safeguard. In addition, odour control mechanism is proposed in all the pumping stations, depending on size of the well and quantum of sewage, system is designed and proposed in BOQ, also maximum of 10m distance between sensitive receptors like residence, schools, hospitals etc., from the unit is kept as guiding factor.

5.1.4 Pumping station wells

Therefore proposal to develop green buffer zone around the facility with a combination of tall and densely growing trees in multi rows as per the land availability to control odour and also act

as visual shield, and improve aesthetical appearance and mechanical odour control measures are proposed.Since human intervention is involved and safety shall be primary and critical consideration, additional protection by way of a metaled grating / grill work shall be provided over the sections (or full cross section if required) where workers will stand / work for inspection and repair/O and M purposes.

Provision of passive gas ventilation arrangement by providing a take-off vent from top of well by positioning vent in such a way that cover slab fitment / movement / drawl if required for maintenance purposes is not compromised.Height of vent to be provided appropriately and a minimum 2m above the lintel level (top level) of window(s) / passageways / doors in the nearby adjoining buildings.Submersible sewage pumps of suitable rating, minimum submergence requirements, open impeller with cutting-tearing arrangement and high strength-corrosion resistant heavy duty construction shall be proposed.

In locations / cases where sewage flow in the present to intermediate design stage is envisaged to be low, position of the submersible pumps and design of the collection well floor by providing necessary side benching / sloped flooring to allow for higher submergence during low flow shall be made to ensure regular pump operation and avoid sewage stagnation beyond the permissible limit.

Diesel Generators shall be provided for all pump stations with space for control room. In cases of lift Station (road-side or road-center type structures with only provision of kerb-side kiosk), an electrical cut-out provision shall be made for connecting an Emergency Mobile / Skid Mounted Diesel Generator for pumping out during long period of electricity supply interruption.Develop standard operating procedures / operational manual for O&M of lifting and pump stations; this shall include measures for emergency situations.Provide training to the staff in SOPs and emergency procedures.Top Covered Lifting stations are located on side of wider roads, and diameter is limited to 2.5mts, wherever government land is available diameter criteria is relaxed.

5.1.5 Noise from pumping operations

Operation of pumps and motors and diesel generators is a major source of noise. As the pumping and lifting stations are located in the residential areas, with few located very close to the houses, noise generated from lifting / pumping stations can have continuous negative impacts on the surrounding population. High noise levels can affect the health of operators and staff at the facilities, and therefore, noise levels need to be maintained within and outside the plant at acceptable levels. Procure good quality latest technology high pressure pumps that guarantee controlled noise at a level of around 80 dB(A) at a distance of 1 m.

Use appropriate building materials and construction techniques for pump houses which can absorb sound rather than reflect noise, use acoustic enclosures – manufacturer specified, for all pumps, motors. Procure only Central Pollution Control Board (CPCB) approved generators to meet air emission and noise level requirements. Provide sound mufflers for ventilators in the plant rooms; and sound proof doors. Provide ear plugs designated for noise reduction to workers.

5.1.6 Energy Efficiency

Project area is mostly plain and gently sloping ground, it is therefore not technically feasible or economical to design a completely gravity system to collect sewage from individual houses and

transfer the same the STP. It necessitated provision of lifting and pumping stations, which are optimized to the extent possible to minimize the overall pumping. In the current design, sewage will be collected from the houses via sewer network and conveyed by gravity to the lifting station. Lifting stations are designed just to lift the sewage to higher level and deliver it to a nearby sewer Machine holes on the higher elevation, from there it can flow again by gravity, rather than pumping directly to a pumping station. This optimized the energy consumption.

To optimize the power consumption, the hydraulic design shall follow optimal approach and the following also considered in design and selection of pumping systems. According to Manual for the Development of Municipal Energy Efficiency Projects in India (jointly developed by Bureau of Energy Efficiency (BEE) and International Finance Corporation in 2008), energy savings, at minimum, of 25% to 40% is possible with appropriate measures. The following measures have been considered and incorporated into the subproject designs wherever possible:

- Using low-noise and energy efficient pumping systems
- Efficient Pumping system operation
- Installation of Variable Frequency Drives (VFDs)

5.1.7 Utilities

Telephone lines, electric poles and wires, water lines, drains, if exists within the proposed project locations may require to be shifted. Some of the proposed sites are within OHT compound, small pump houses and old buildings. Since CMWSSB implementing comprehensive water supply system in all the added areas these existing structures will be defunct and hence shall be removed. Existing structures do not involve any hazardous material (chemical) and shall be managed in compliance with C&D waste management rules, in coordination with GCC.

Provision is made in BOQ for dismantling of these structures. All the selected project sites are vacant and unused government lands, there are no notable existing utilities. Sewer lines are proposed mid of ways wherever road width is more than 18m and Rider mains are proposed on other sides. In such cases, the work may require shifting of utilities on the shoulder. To mitigate the adverse impacts due to relocation of the utilities, the contractor, in collaboration with the CMWSSB will

- Identify the locations and operators of these utilities to prevent unnecessary disruption of services during construction phase; and
- Instruct construction contractors to prepare a contingency plan to include actions to be done in case of unintentional interruption of service.

5.1.8 Site Selection of Construction Work Camps, Stockpile Areas, Storage Areas, and Disposal Areas

Priority is to locate near the project location, but it shall be at least 100m away from residential areas, groundwater wells and surface water bodies. However, if it is deemed necessary to locate elsewhere, sites to be considered will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems.

Residential areas will not be considered for setting up construction camps to protect the human environment (i.e., to curb accident risks, health risks due to air and water pollution, dust, noise etc. It is also intended to prevent any social conflicts, shortages of amenities, and crime). Extreme care will be taken to avoid disposals near forest areas, water bodies, or its nearby

areas. The contractor will prepare Waste Management Plan prior to construction and submit to CMWSSB.

5.1.9 Site Selection of Sources of Materials

Significant quantities of coarse aggregate and fine aggregate will be required for construction works. Contractor should procure these materials only from the licensed quarries with valid permits. Contractor should, to the maximum extent possible, procure material from existing quarries. It will be the main contractor's responsibility to verify the suitability and legal status of all material sources and to obtain the approval of Department of Geology and Mining and local revenue administration, as required. The record should be maintained and made available for verification by CMWSSB as and when required.

5.1.10 Social and Cultural Resources

Any work involving ground disturbance can uncover and damage archaeological and historical remains. For this project, excavation will occur in project sites for foundations, laying pipelines, and for construction of underground structures at pumping/lifting stations. In the project site there are no archeologically or historically recognized sites or places close to project sites or within the project area. However, in case of such finds are recognized during excavation, all necessary measures are to be taken to ensure they are protected and conserved.

Construction contractors to follow these measures in conducting any excavation work.

- Create awareness among the workers, supervisors and engineers about the chance finds during excavation work.
- Stop work immediately to allow further investigation if any finds are suspected.
- Inform State Archaeological Department if a find is suspected, and taking any action they require to ensure its removal or protection in situ.

5.2 Construction impacts

Main civil works in the subproject include laying of sewer lines and construction of sewage pumping and lifting stations at the identified sites. Sewage pumping and lifting stations works will be confined to sites, and construction will include general activities like site clearance, excavation for foundations, and creation of concrete structures will be one of the major construction activities for this project, as many of the subproject components will be fixed to concrete plinths and most will be housed in buildings with at least some concrete structural elements. Most such structures will be constructed from reinforced concrete (RC), where steel reinforcing rods and bars are placed and attached by hand to create an interior skeleton for the foundations, walls, columns, plinths, etc, and heavy-duty metal and timber/plywood formwork is bolted around the outside to build a mould into which pre-mixed concrete is poured.

Once the concrete has set, the formwork is removed, and the concrete surface is finished by masons by hand if necessary. Some buildings, such as the pumping station, facilities, etc., may be constructed from brick work, in which case this work will be done using standard house-building techniques. Since these works are confined to the boundary of identified sites, there is no direct or significant interference of construction work with the surrounding land use. However, construction dust, noise, use of local roads for transportation of construction material, waste, labour camps etc., will have negative impacts, which needs to be avoided or mitigated properly.

Sewers will be laid along almost all the roads. Lateral sewers collect sewage from households provided with house service connections (proposed in this project) will be laid in all streets and roads, the larger sewers that collect sewage from tertiary sewers and convey to pumping stations will be laid mostly on wider main roads. For all the Highways and Major Road crossings, trenchless technology will be adopted.

Open cut trenching method of sewer laying involves trench excavation in the road, placing sewers in the trench, jointing and testing, and refilling with the excavated soil. Pipelines proposed are of two types, DWC (Double wall corrugated) and CI (Cast iron) pipes, up to 4.5mt depth and diameter up to 600mm DWC is adopted and beyond 600mm dia, and depth more than 4.5mts irrespective of diameter CI pipes are considered.

Earth work excavation will be undertaken by machine (backhoe excavator) and include danger lighting and using sight rails and barricades. The work will also be supplemented manually where there is no proper working area (e.g., very narrow streets) for the backhouse excavators. As trenches are deep (up to 5.5 m), there is risk of collapse of trenches and/or damage to surrounding buildings, safety risk to pedestrians and traffic. Necessary precautions such as bracing / shoring in the trench will be provided for the normal working hours will be 8 hours daily, the total duration of each stage depends on the soil condition and other local features. Excavated soil will be used for refilling the trench after placing the sewer and therefore residual soil after pipe laying and refilling is not significant and needs to be disposed safely.

Although sewer laying work involves quite simple techniques of civil work, the invasive nature of excavation in the urban area where there are a variety of human activities, will result in impacts to the environment and sensitive receptors such as residents, businesses, and the community in general. These anticipated impacts are temporary and for short duration, however, needs to be mitigated.

UGSS proposed under this area is well developed urban pockets of Chennai. All are busy and packed; hence Contract Company needs to take all site safety, Environmental safe guard measures strictly also PPE (Personnel protective equipment) to all who are at site shall be provided.

Anticipated impacts during the construction phase are discussed below along with appropriate mitigation measures to avoid, minimize or mitigate those impacts to acceptable levels.

5.2.1 Sources of Materials

Significant amount of sand and coarse aggregate will be required for this project, which will be sourced from quarries. Quarries inevitably cause extensive physical changes; as construction materials are excavated from the ground, leaving large cavities, or levelling hillsides, etc. The physical damage caused by quarries is controlled by allowing them to operate within specific limited areas only, so the damage is restricted in extent and not allowed to spread indiscriminately. Contractor should, to the maximum extent possible, procure material from existing quarries. It will be the main contractor's responsibility to verify the suitability and legal status of all material sources and to obtain the approval of Department of Geology and Mining and local revenue administration, as required. The record should be maintained and made available for verification by CMWSSB as and when required.

The construction contractor will be required to:

- Obtain construction materials only from government approved quarries with prior approval of PIU.

- PIU to review, and ensure that proposed quarry sources have all necessary clearances/ permissions in place prior to approval.
- Contractor to submit to PIU on a monthly basis documentation on material obtained from each source (quarry/ borrow pit).
- No new borrow areas, quarries etc., shall be developed for the project.

5.2.2 Air Quality

Construction work, especially from earthwork activities, coupled with dry and windy working conditions, material and debris transport, and works along the public roads carrying significant traffic and has high potential to generate dust in an air.

Significant quantities of earthwork will be conducted in the subproject, spread all over the project area. Also, emissions from construction vehicles, equipment, and machinery used for excavation and construction will induce impacts on the air quality. Anticipated impacts include dust and increase in concentration of vehicle-related pollutants such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons. Dust generation from construction work in individual and confined work sites lifting and pumping stations etc., will be mainly during the initial construction phase of earth work, as the site is confined, dust can be effectively controlled with common measures. Dust generation will be significant during sewer laying along the roads. Increase in dust/ particulate matter in ambient air is detrimental and may have adverse impacts on people and environment. To mitigate the impacts, construction contractors will be required to ensure followings for all construction works:

- Provide a dust screen (6 m high) around the construction sites of pumping and lifting stations, provide 2 m high barricades for the sewer works.
- Damp down the soil and any stockpiled material on site by water sprinkling. (Water sprinkled 3-4 times a day - before the start of work, 1-2 times in between, and at the end of the day). when working in the roads there should permanently be one person responsible for directing when water sprinkling needs to take place to stop the dust moving
- Reduce the need to sprinkle water by stabilizing surface soils where loaders, support equipment and vehicles will operate by using water and maintain surface soils in a stabilized condition.
- Apply water prior to levelling or any other earth moving activity to keep the soil moist throughout the process.
- Cover the soil stocked at the sites with tarpaulins and surround by dust screens.
- Control access to work area, prevent unnecessary movement of vehicle, public trespassing into work areas; limiting soil disturbance will minimize dust generation
- Use tarpaulins to cover the loose material (soil, sand, aggregate etc.,) when transported by open trucks.
- Control dust generation while unloading the loose material (particularly aggregate, sand, soil) at the site by sprinkling water and unloading inside the barricaded area; minimize the drop height when moving the excavated soil
- Clean wheels and undercarriage of haul trucks prior to leaving construction site
- Ensure that all the construction equipment, machinery is fitted with pollution control devices, which are operating correctly, and have a valid pollution under control (PUC) certificate.
- No vehicles or plant to be left idling at site generators to be at placed maximum distance from properties

5.2.3 For sewer works

- Barricade the construction area using hard barricades (of 2 m height) on both sides.
- Initiate site clearance and excavation work only after barricading of the site is done.
- Confine all the material, excavated soil, debris, equipment, machinery (excavators, cranes etc.,) to the barricaded area.
- Limit the stocking of excavated material at the site; remove the excess soil from the site immediately to the designated disposal area.
- Undertake the work section wise: a 500 m section should be demarcated and barricaded; open up several such sections at a time, but care shall be taken to locate such sections in different zones.
- Conduct work sequentially - excavation, sewer laying, backfilling; testing section-wise (for a minimum length as possible) so that backfilling, stabilization of soil can be done.
- Remove the excavated soil of first section to the disposal site as the work progresses sequentially, by the time second section is excavated, the first section will be ready for back filling, use the freshly excavated soil for back filling, this will avoid stocking of material, and minimize the dust.
- Backfilled trench at any completed section after removal of barricading will be the main source of dust pollution. The traffic, pedestrian movement and wind will generate dust from backfilled section. Road restoration shall be undertaken immediately after successful testing of the section.

5.2.4 Immediate Road restoration after refilling the trench

Excavation and refilling activities disturb the top soil, and under the influence of wind, traffic, pedestrians, and other activities etc., produces dust. There is large potential to generate significant quantities of dust after refilling the trench, and prior to road relaying. It is a common practice not to restore the road immediately after refilling the trench so as to allow sufficient time for the refilled material to stabilize naturally. Given the dry and windy conditions, and heavy traffic and other activities along the roads, the refilled trenches with loose top soil along the roads will generate maximum dust, and create very unhealthy conditions. Moreover, as the barricades/dust screens will removed after the trench is refilled, there will be absolutely nothing to control the dust generation.

Dust control activities like wetting of top soil will not be effective given the site conditions. It is therefore necessary to restore/relay the road surface immediately or take suitable steps to arrest the dust. Soil consolidation technique shall be used so that road can be restored immediately. Immediately consolidate the backfilled soil and restore the road surface, if immediate road restoration is not possible, provide a layer of plain cement concrete (PCC) of suitable mix on the backfilled trench so that dust generation, erosion is arrested and it will also provide a smooth riding surface for the traffic until the road is properly restored. Backfilled trench without any road restoration is a major source of dust.

5.2.5 Surface Water Quality

Run-off from stockpiled materials and chemicals from fuels and lubricants during construction works can contaminate water quality of the receiving water bodies and streams/rivers. Project area receives rainfall in southwest and northeast monsoon seasons, between June/July to November/December. The important water bodies such as Buckingham canal in the project area and plenty of small ponds and lakes. Hence It is important that runoff from the construction areas, which may contain silt and chemical traces do not enter these water bodies. Though

impact will be temporary but needs to be mitigated and hence Construction contractor to ensure to implement necessary mitigation measures.

All earthworks be conducted during the dry season to prevent the problem of soil/silt run-off during rains.

- Avoid stockpiling of earth fill especially during the monsoon season; unless covered by tarpaulins or plastic sheet, do not stock earth/material close to water bodies (at least100 m)
- Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, only designated disposal areas shall be used.
- Install temporary silt traps, oil traps or sedimentation basins along the drainage leading to the water bodies;
- Place storage areas (with impermeable surface) for fuels and lubricants away from any drainage leading to water bodies, these should be at least 100 m away from water bodies and groundwater wells.
- Store fuel, construction chemicals etc., on an impervious floor, also avoid spillage by careful handling; provide spill collection sets for effective spill management.
- Dispose any wastes generated by construction activities in designated sites and conduct surface quality inspection according to the Environmental & Social Management Plan (ESMP).

Construction of pipe bridges crossing of B' canals below the river bed will have negative impact on water quality of B'canal and following precautionary measures to be taken.

- Conduct works in the water body (especially foundation work) only during no-flow season.
- Select a construction method which is less disruptive (e.g., precast type).
- Use spill traps / metal basins to avoid accidental spillage of construction chemicals, fuels, lubricants in the water body.
- Clean up the site immediately after construction is complete; construction debris, materials, etc., shall be cleared and pre project condition restored or improved.

5.2.6 Surface and Groundwater Quality

Another physical impact that is often associated with excavation is the effect on drainage and the local water table if groundwater and surface water collect in the voids. In the project area, groundwater table is fairly shallow, in adjacent of B'Canal water table is as high as 2m. Hence necessary care should be taken to prevent pollution of ground water during execution. In this direction contractor needs to take following measures:

- As far as possible control the entry of runoff from upper areas into the excavated pits, and work area by creation of temporary drains or bunds around the periphery of work area.
- Pump out the water collected in the pits / excavations to a temporary sedimentation pond dispose of only clarified water into drainage channels/streams after sedimentation in the temporary ponds.
- Avoid oil spillages, keep mechanical equipment and automobiles in good condition
- Consider safety aspects related to pit collapse due to accumulation of water.

5.2.7 Generation of Construction Wastes

Solid wastes generated from the construction activities are excess excavated earth (spoils), discarded construction materials, cement bags, wood, steel, oils, fuels, empty containers and other similar items. Domestic solid wastes may also be generated from the workers' camp. Improper waste management could cause odour and vermin problems, pollution and flow obstruction of nearby watercourses could negatively impact the landscape. The following mitigation measures to minimize impacts from waste generation shall be implemented by the contractor:

- Prepare and implement a Construction Waste (Spoils) Management Plan.
- As far as possible utilize the debris and excess soil in construction purpose, for example for raising the ground level or construction of access roads etc.
- Avoid stockpiling any excess spoils at the site for long time. Excess excavated soils should be disposed off to approved designated areas immediately.
- If disposal is required, the site shall be selected preferably from barren, infertile lands and sites should located away from residential areas, forests, water bodies and any other sensitive land uses.
- Domestic solid wastes should be properly segregated in biodegradable and non-biodegradable for collection and disposal to designated solid waste disposal site; create a compost pit (with impermeable bottom and sides) at workers camp sites for disposal of biodegradable waste; non-biodegradable / recyclable material shall be collected separately and sold in the local recycling material market.
- Residual and hazardous wastes such as oils, fuels, and lubricants shall be disposed off via licensed (by TNPCB) third parties.
- Prohibit burning of construction and/or domestic waste.
- Ensure that wastes are not haphazardly thrown in and around the project site, provide proper collection bins, and create awareness to use the dust bins, recycle waste material where possible.
- Conduct site clearance and restoration to original condition after the completion of construction work. PIU to ensure that site is properly restored prior to issuing of construction completion certificate.

5.2.8 Noise and Vibration Levels

Except few pumping stations, rest of the pumping stations, lifting stations and sewers are located within the town area. Sewer lines are spread over entire project area. All these sites are located within habitations, where there are houses, schools and hospitals, religious places and businesses. The sensitive receptors are the general population in these areas. Increase in noise level may be caused by excavation, particularly breaking of cement concrete or bitumen roads for laying of sewers, operation of construction equipment, and the transportation of equipment, materials and people. Vibration generated from construction activity, for instance from the use of pneumatic drills, will have impact on nearby buildings. Trenches deeper than 2-3 m require removal of rocks (soft to hard), will generate heavy noise and vibration. This impact is negative short-term, and reversible by mitigation measures; hence the construction contractor needs to ensuresfollowings.

- Plan activities in consultation with PIU so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance, especially near schools and other sensitive receptors.

- Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and use portable acoustic street barriers to minimize sound impact to surrounding sensitive receptor.
- Maintain maximum sound levels not exceeding 70 decibels (dB(A)) when measured at a distance of 10 m or more from the vehicles.
- Identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity; if any building at risk, structural survey be completed prior to work, to provide baseline in case any issues from vibration, and if building is structurally unsound that measures taken to avoid any further damage.
- Horns should not be used unless it is necessary to warn other road users or animals.
- Consult local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as nights, religious and cultural festivals.

5.2.9 Accessibility and Traffic Disruptions

Excavation along and across the roads for laying of sewers, hauling of construction materials and operation of equipment on-site will cause traffic problems. Sewers are proposed along all the main roads and streets such as TPP road and Manali High Road. These roads are the arterial roads connects Chennai from east to west and north to south carrying huge traffic. These roads also center of commercial activities. There are internal important roads within the project area connecting different parts of city. As the sewer lines are proposed to be laid within the road carriage way, it will disrupt the traffic in one-traffic lane. In the narrower roads, sewers will be laid in the center of the road, and therefore during the work traffic movement will be mostly disrupted. Works related to all the remaining components (lifting and pumping stations) will be confined to the selected sites, therefore there is no direct interference of these works with the traffic and accessibility.

The impacts due to vehicular movement and construction machinery can be minimized by using the designated routes for movement of heavy vehicles and machinery to avoid the soil compaction in areas other than the site. The transportation of construction material will be generally supplied in night when the traffic is minimum. Indicative traffic management plan given below will be updated prior to the diversion of traffic where required for the construction activities.

Hauling of construction material, equipment, construction waste, etc., to and from the work site may increase the road traffic on local roads. This will further cause inconvenience to the local community and road users. Potential impact is negative but short term and reversible by mitigation measures.

5.2.9.1 For Excavation

- Prepare a sewer work implementation plan and undertake the work accordingly, ensure that for each road where the work is being undertaken there is an alternative road for the traffic diversion, take up the work in sequential way so that public inconvenience is minimal, Plan the sewer work in coordination with the traffic police, provide temporary diversions, where necessary with clear signage and effectively communicate with general public.
- Avoiding conducting work in all roads in a colony at one go, it will render all roads unusable due to excavations at the same time, creating large scale inconvenience. Undertake the work section wise: a section should be demarcated and barricaded; open up several such sections at a time, but care shall be taken to locate such sections in different

zones. Confine work areas in the road carriageway to the minimum possible extent, all the activities, including material and waste/surplus soil stocking should be confined to this area. Proper barricading should be provided, avoid material/surplus soil stocking in congested areas take action to immediately removed from site/ or brought to the as and when required.

- Limit the width of trench excavation as much as possible by adopting best construction practices, adopt vertical cutting approach with proper shoring and bracing, this is especially to be practiced in narrow roads and deeper sewers, if they deep trenches are excavated with slopes, the roads may render completely unusable during the construction period. Leave spaces for access between mounds of soil to maintain access to the houses / properties, access to any house or property shall not be blocked completely, alternative arrangements, at least to maintain pedestrian access at all times to be provided.
- Provide pedestrian access in all the locations; provide wooden/metal planks with safety rails over the open trenches at each house to maintain the access. Inform the affected local population in advance about the work schedule a week before, and a day before start of work. Plan and execute the work in such a way that the period of disturbance/ loss of access is minimum. Keep the site free from all unnecessary obstructions.
- Necessary care to be taken during excavation to protect all the property connections (water, gas, electrical, telecom, septic tanks etc.) to avoid inconvenience to the local residents and disruption to works.
- Notify public by prior information notices, providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints. Provide information to the public through media newspapers and local cable television (TV) services. At work site, public information/caution boards shall be provided including contact for public complaints.

5.2.9.2 Hauling (material, waste/debris and equipment) activities

- Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites.
- Schedule transport and hauling activities during non-peak hours (peak hours 7 to 10 AM and 4 to 7 PM).
- Locate entry and exit points in areas where there is low potential for traffic congestion.
- Drive vehicles in a considerate manner.
- Notify affected public by public information notices, providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.

5.2.9.3 Control dust generation

- Immediately consolidate the backfilled soil and restore the road surface, this will also avoid any business loss due to dust and access inconvenience of construction work.
- Employee best construction practices, speed up construction work with better equipment, increase workforce, etc., in the areas with predominantly commercial, and with sensitive features like hospitals, and schools.
- Consult businesses and institutions regarding operating hours and factoring this in work schedules.
- Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.

5.2.9.4 Socio-Economics

Sites for all projects components are carefully selected in government owned vacant lands and therefore there is no requirement for land acquisition or any resettlement. Blocking of access to the business / livelihood activities, especially during pipeline laying along the roads, may impact the income of households. However, given the alignment of pipeline within the road carriage way, and also the measures suggested for ensuring accessibility during sewer works, notable but temporary impact is envisaged. Some shops and other premises along the roads may lose business income if the access will be impeded by excavation of trenches, the presence of heavy vehicles and machinery, etc. Access disruption to hospitals, socio cultural places etc., will inconvenience public. Implementation of the following best construction measures will avoid the disturbance, reduce the inconvenience and disturbance to the public.

- Inform all businesses and residents about the nature and duration of any work well in advance so that they can make necessary preparations.

- Do not block any access completely. Leave spaces for access between barricades/mounds of excavated soil and other stored materials and machinery, and providing footbridges so that people can crossover open trenches.

- Barricade the construction area and regulate movement of people and vehicles in the vicinity, and maintain the surroundings safely with proper direction boards, lighting and security personnel – people should feel safe to move around.

5.2.9.5 Occupational Health and Safety.

Workers need to be mindful of the occupational hazards which can arise from working in confined areas such as trenches, working at heights, near the heavy equipment operating areas etc. Potential impacts are negative and long-term but reversible by mitigation measures. The construction contractor will be required to provide all at site with personnel protective equipment such as boots, Spectacles, Hand gloves Helmets and to follow all national, state and local labour laws. Develop and implement site-specific occupational health and safety (OHS) Plan, informed by OHS risk assessment seeking to avoid, minimize and mitigate risk, which shall include measures such as:

- safe and documented construction procedures to be followed for all site activities.
- Ensuring all workers are provided with and use personal protective equipment.
- OHS Training for all site personnel.
- Exclude public from the work sites.
- Documentation of work-related accidents.
- Follow International Standards such as the World Bank Group's Environmental, Health and Safety Guidelines.
- Ensure that qualified first-aid is provided at all times. Equipped first-aid stations shall be easily accessible throughout the sites;
- Secure all installations from unauthorized intrusion and accident risks.
- Provide H&S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers.

- Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted.
- Ensure the visibility of workers through their use of high visibility vests and other PPE when working in or walking through heavy equipment operating areas.
- Ensure moving equipment is outfitted with audible back-up alarms.
- Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate.
- Disallow worker exposure to noise level greater than 85 dBA for duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.
- Provide supplies of potable drinking water.
- Provide clean eating areas where workers are not exposed to hazardous or noxious substances.

5.2.9.6 Community Health and Safety

- Sewers works and deep excavations along the roads and narrow streets, and hauling of equipment and vehicles have potential to create safety risks to the community. Deep excavations without any proper protection may endanger the close by buildings. Hazards posed to the public, specifically in high-pedestrian areas may include traffic accidents and vehicle collision with pedestrians. Potential impact is negative but short-term and reversible by mitigation measures. The construction contractor needs to ensure following during execution.
- Confine work areas, prevent public access to all areas where construction works are on-going through the use of barricading and security personnel.
- Attach warning signs, blinkers to the barricading to caution the public about the hazards associated with the works, and presence of deep excavation.
- Minimize the duration of time when the sewer trench is left open through careful planning; plan the work properly from excavation to refilling and road relaying.
- Control dust pollution – implement dust control measures as suggested under air quality section.
- Ensure appropriate and safe passage for pedestrians along the work sites.
- Provide road signs and flag persons to warn of on-going trenching activities.
- Restrict construction vehicle movements to defined access roads and demarcated working areas (unless in the event of an emergency).
- Enforce strict speed limit (10 - 20 kmph) for plying on unpaved roads, construction tracks.
- Provide temporary traffic control (e.g., flagmen) and signs where necessary to improve safety and smooth traffic flow.
- Where traffic is diverted around crossings, traffic control or careful selection of the exit from the working areas will be provided with the aim of ensuring that vehicles join the road in a safe manner.
- At sensitive locations particularly where there are schools and markets close to the road, awareness of safety issues will be raised through neighborhood awareness meetings
- All drivers and equipment operators will undergo safety training.

- Maintain regularly the construction equipment and vehicles; use manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.

5.2.9.7 Construction Camps

Contractor may require setting up construction camps – for temporary storage of construction material such as Pipes, cement, steel, fixtures, fuel, lubricants etc.,) and stocking of surplus soil, and may also include separate living areas for migrant workers. The contractor will however be encouraged to engage local workers as much as possible. Operation of work camps can cause temporary air, noise and water pollution, and may become a source of conflicts, and unhealthy environment if not operated properly. **Potential impacts are negative but short-term and reversible by mitigation measures.** The construction contractor will be required to ensure:

- Consult PIU before locating project offices, sheds, and construction plants.
- Select a camp site away from residential areas (at least 100m buffer shall be maintained) or locate the camp site within the existing facilities of City Corporation.
- Avoid tree cutting for setting up camp facilities.
- Provide a proper fencing/compound wall for camp sites. Camp site shall not be located near (100 m) water bodies, flood plains, flood prone/low lying areas, or any ecologically, socially, archeologically sensitive areas
- Separate the workers living areas and material storage areas clearly with a fencing and separate entry and exit.
- Ensure conditions of livability at work camps are maintained at the highest standards possible at all times, living quarters and construction camps shall be provided with standard materials (as far as possible to use portable ready to fit-in reusable cabins with proper ventilation), thatched huts, and facilities constructed with materials like GI sheets, tarpaulins, etc., shall not be used as accommodation for workers.
- Camp shall be provided with proper drainage, there shall not be any water accumulation.
- Provide drinking water, water for other uses, and sanitation facilities for employees, drinking water should be regularly tested to confirm that drinking water standards are met.
- Prohibit employees from cutting of trees for firewood, contractor should provide cooking fuel (cooking gas) fire wood not allowed.
- Train employees in the storage and handling of materials which can potentially cause soil contamination
- Wastewater from the camps shall be disposed properly either into sewer system, if sewer system is not available, provide on-site sanitation with septic tank and soak pit arrangements (100 m away from surface water body or groundwater well).
- Recover used oil and lubricants and reuse or remove from the site.
- Manage solid waste according to the following preference hierarchy reuse, recycling and disposal to designated areas, provide a compost pit for bio degradable waste, and non-biodegradable / recyclable waste shall be collected and sold in local market.
- Remove all wreckage, rubbish, or temporary structures which are no longer required.
- At the completion of work, camp area shall be cleaned and restored to pre-project conditions, and submit report to PIU, PIU to review and approve camp clearance and closure of work site.

5.3 Operation and Maintenance Impacts

Operation and Maintenance of the sewerage system will be carried out by CMWSSB O&M wing. Operation will involve collection and conveyance of wastewater from houses to nearest lifting /pumping stations, operation of lifting / pumping stations to pump accumulated sewage main pumping stations, operation of main pumping stations to pump accumulated sewage to STP. Proposed project does not involve new STP and annexed with STP already under operation. Sewage sludge contains harmful substances such as bacteria and pathogens, and nutrients like nitrogen, phosphates. Improper handling and disposal of the sludge will have adverse impacts on health and environment however proper sludge management is already happening in existing STP.

5.3.1 Quality of Raw Sewage

As mentioned earlier, one of the critical aspects in STP operation is, change in raw sewage characteristics at inlet of STP may affect the process and output quality. The system is designed for municipal wastewater, which does not include industrial effluent. Characteristics of industrial effluent widely vary depending on the type of industry, and therefore disposal of effluent into sewers may greatly vary the inlet quality at STP, and will upset process and affect the efficiency, hence industrial effluents must not be allowed to system. Following measures are to be implemented:

- No wastewater from industrial premises (including domestic wastewater) shall be allowed to dispose into municipal sewers.
- Monitor regularly and ensure that there is no illegal discharge through Machine holes or inspection chambers; conduct public awareness programs; in coordination with TNPCB

5.3.2 Odour and Noise from Sewage lifting and pumping stations

Various measures are such as green belt, high compound wall with climbers, so that air cant entrap in atmosphere, fragrant flower plants with land scaping and Mechanical type of odour control proposals are included in the design of these facilities giving utmost importance to odour and noise.

Therefore, it is anticipated there will not be any significant generation of odour or noise that will impact the surrounding households. Following measures are to be implemented during the operation:

- Strictly follow standard operating procedures/operational manual for operation and maintenance of lifting and pump stations.
- Ensure that operating staff is properly trained, and have clear understanding of odor issues vis a vis its relation with operational practices.
- Ensure that pumping cycles are properly followed; and there is no buildup of sewage beyond design volume in the wells.
- Conduct H2S monitoring (periodically at pumping stations and lifting stations).

5.3.3 Sewer network

During the system design life (15/30 years for mechanical/civil components) it shall not require major repairs or refurbishments and should operate with little maintenance beyond routine actions required to keep the equipment in working order. The stability and integrity of the system will be monitored periodically to detect any problems and allow remedial action if required. Any repairs will be small-scale involving manual, temporary, and short-term works involving regular

checking and recording of performance for signs of deterioration, servicing and replacement of parts.

There are also certain environmental risks from the operation of the sewer system, most notably from leaking sewer pipes as untreated fecal material can damage human health and contaminate both soil and groundwater. It will be imperative therefore that the operating agency establishes a procedure to routinely check the operation and integrity of the sewers, and to implement rapid and effective repairs wherever necessary. There is an occupation health risk to workers engaged in sewer maintenance activities. Following measures should be followed:

- Regular cleaning of grit chambers and sewer lines to remove grease, grit, and other debris that may lead to sewer backups. Cleaning should be conducted more frequently for problem areas.
- Inspection of the condition of sanitary sewer structures and identifying areas that need repair or maintenance. Items to note may include cracked/deteriorating pipes, leaking joints or seals at Machine holes; frequent line blockages, lines that generally flow at or near capacity and suspected infiltration or exfiltration.
- Monitoring of sewer flow to identify potential inflows and outflows.
- Conduct repairs on priority based on the nature and severity of the problem. Immediate clearing of blockage or repair is warranted where an over flow is occurring or for urgent problems that may cause an imminent overflow (e.g., pumping station failures, sewer line ruptures, or sewer line blockages)
- Maintain records, review previous sewer maintenance records to help identify “hot spots” or areas with frequent maintenance problems and locations of potential system failure, and conduct preventative maintenance, rehabilitation, or replacement of lines as needed;
- When a spill, leak, and/or overflow occurs, keep sewage from entering the storm drain system by covering or blocking storm drain inlets or by containing and diverting the sewage away from open channels and other storm drain facilities (using sandbags, inflatable dams, etc.). Remove the sewage using vacuum equipment or use other measures to divert it back to the sanitary sewer system.
- Prohibit/prevent disposal of wastewater/effluent from industrial units in the sewers; ensure regular checking to ensure no illegal entry of industrial wastewater into sewers
- Develop an Emergency Response System for the sewerage system leaks, burst and overflows, etc.
- Provide necessary health and safety training to the staff in sewer cleaning and maintenance
- Provide all necessary personnel protection equipment
- Do not conduct manual cleaning of sewers; for personnel engaged sewer maintenance work, there is a risk due to oxygen deficiency and harmful gaseous emissions (hydrogen sulfide, methane, etc.) provide for adequate equipment (including oxygen masks) for emergency use.

5.4 Social Impact Assessment

5.4.1 Project components and social impacts

Components wise social impacts are explained in detail in the following Table 24.

Table 24 Project Components and Social Impacts Matrix

Area	Collection System (M)	MH (Nos)	Pumping Main(Km)	LS (Nos)	SPS (Nos)	STP
Edayanchavadi, Sadayankuppam, and Kadapakkam	72.772 2921		22.650	08	3	1. Kodungaiyur
Description	The collection system comprises of laying of sewer line with machine holes for every 30m. The line will be laid in the middle of the road by cutting open the black to portions.	The MHs are having provision for house service connections. Each MH will be able to connect five houses on either side	Pumping main with varying size (dia) (150mm to 700mm) is proposed. The pumping mains will be laid in the berm of the road within the carriage width of the ROW.	1. Zone 01(LS – 01) 2. Zone 02 (LS – 02) 3. Zone 06 (LS -06A) 4. Zone – 06 (LS-06B) 5. Zone – 07 (LS – 07A) 6. Zone – 07 (LS – 07B) 7. Zone – 07 (LS – 07C) 8. Zone -08 (LS – 08)	1. Zone-03 (SPS – 03) 2. Zone-04 (SPS – 04) 3. Zone-05 (SPS – 05)	It is proposed to convey the collected sewage to the existing STP. It is located at Kodungaiyur.
Social Impacts	The sewer line will be laid in the roads under the control of Greater Chennai Corporation. There are **6** potential temporary economic impact	The MHs will be constructed in the middle of the road. Hence there is no permanent or	The land use of the project area is mostly residential. Hence laying of pumping main is devoid of permanent or temporary resettlement	The above sites are free from encumbrances and permanent or temporary resettlement impacts are not envisaged	The above sites are free from encumbrances and permanent or temporary resettlement impacts are not envisaged	The collected sewage is disposed into the existing STPs for treatment and disposal. Hence no permanent or temporary involuntary impacts.

		temporary resettlement impacts.	impacts.			
Risk Assessment	Moderate Risk	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk

5.4.2 Social Screening Survey

The social survey was carried out on 07-02-2023 to identify the social impacts in the project area. Potential Temporary impacts identified in the pumping main alignment only. As per the ECSMF entitlement matrix, the potential temporary economic impacts are compensated for 7 days with notified minimum wage of Rs. 643 per day. The total of Rs. 54,012/- shall be given for potential temporary economic impacts. The survey alignment, data analysis, cut-off date and photographs are provided in the Annexure 8.

5.4.3 Awareness about the project

The respondents are well aware about the project, its purpose to provide sewer line connection, impacts, compensation, etc. The Potential Temporary Economic Impacts and other stakeholders from study area were receptive for the proposed project.The stakeholder engagement plan (SEP) is given in the Annexure 6. Further, the pictures of Potential Temporary Economic Impacts identified and consultations held with them are given in Annexure 8.

5.5 Pumping Stations and Lift Stations

Out of all 11 lift/pumping stations, the pumping stations at Zone-04 (SPS-04) is proposed to pump the collected sewage to the existing STP in Kodungaiyur for this project. The details of each of the pumping station is summarized below. Typical specs of the pumping station comprise of two wells with varying dia, interconnecting pipes, pumping arrangements, odour control mechanism, grit pits pumping room, transformer yard, inlet and outlet pipes, compound wall on all the four sides, tree plantation etc. This is confined to a single site. There is no social impact in this site.

5.5.1 Zone 01 (LS-01)

The lift stations will be provided in thecorner of the road near perumal kovil street, flushed with road and a power control kiosk will be kept in the road side. In this lift station sewages are collected towards LS-08. A lift station typically will have one enlarged machine hole with diameter limited to 2.5m with pumping arrangements, and one control kiosk. **There is no social impact in this site.**

5.5.2 Zone 02 (LS-02)

The liftstation 02 will be provided in the site of the old existing OHT and the sewage water and waste are collected towards LS-08. In this liftstation where present in near perumalkovil and junction of the road. **There is no social impact in this site.**

5.5.3 Zone 03 (SPS-03)

The sewage collected from Lift stations LS-01, LS-02 and LS-08 are pumped to Zone 03 (SPS-03). This sub pumping station located at Manali New Town in CMWSSB existing SPSsite.**There is no social impact in this site.**

5.5.4 Zone 04 (SPS 04)

This is the terminal pumping station to be constructed in TNHB Phase-II area in a dilapidated SPS site of CMWSSB. The collection of sewage SPS – 03, SPS-05 and LS-06A are pumped towards SPS-04/Zone-04. **There is no social impact in this site.**

5.5.5 Zone 05 (SPS 05)

The sub pumping station is to be constructed in TNHB Phase-I area in place of a dilapidated SPS site of CMWSSB at Edayanchavadi near Dwarakanagar. The collected sewage is pumped toward SPS – 04 of Zone-04. **There is no social impact in this site**.

5.5.6 Zone 06 (LS 06A)

In this lift stations is to be constructed in place of an existing old dilapidated primary school in Sadayankukppam. This site is located within habituate area (Primary school). The waste water under lift towards SPS 04 site. **There is no social impact in this site.**

5.5.7 Zone 06 (LS 06B)

In this lift station is to be constructed as roadside lift station in 14th street of Burmanagar. In this sewage wastes are collected and transported to Zone 06(LS-06A) and subsequently to Zone-04 (SPS-04). **There is no social impact in this site**.

5.5.8 Zone 07 (LS 07A)

The road lift station is located at the junction of Andarkuppam road and Red-hills Andarkuppam road. In this sewage wastes are collected and transported to LS-07B. **There is no social impact in this site.**

5.5.9 Zone 07 (LS 07B)

The zone 07/LS – 07B located at panchayat union office and CMWSSB office near roadside.
In the wastes are collected and transport towards ARY LS -01. **There is no social impact in this site.**

5.5.10 Zone 07 (LS 07C)

The zone 07/LS – 07C were located present truck lay-by in Edayanchavadi. In this sewage water are collected and transport towards SPS-03 at Existing Sub pumping station. **There is no social impact in this site.**

5.5.11Zone 08 (LS 08)

In this lift station is present in Edayanchavadi road and the sewage was collected and transported toward Existing SPS site (SPS-03). **There is no social impact in this site.**

6.1 Conclusion

However, if temporary or permanent resettlement impacts are identified in addition to the potential temporary economic impacts identified, during project implementation, the implementing agency will prepare a Resettlement Plan/ update ESIA as per the updated ECSMF and compensate the Project Affected Person (PAP) based on the entitlement matrix set out in the ECSMF.

CHAPTER 6 Analysis of Alternatives

The present proposal consists of providing comprehensive sewerage system covering 72.772 Km length of Collection System, which consists of 11 nos. of Sub pumping stations/Lift stations and pumping mains for a length of 22.65 Km to convey the sewage to the existing Sewage Treatment Plant in Kodungaiyur.

6.1 Technology Alternatives

A comparison of Technology alternatives to the above proposal is summarized as below:

6.1.1 Decentralized System

By this system, pockets of area (zoning) have to be considered for providing UGSS in a decentralized way, which will have the following disadvantages

- Not cost effective.
- Environmental impact is more by considering the small area in which more number of Pumping Station and Treatment Plant has to be considered in the midst of the Residential area.
- Period of completion cannot be scheduled in a comprehensive way as each pocket (zone) will be started in a different time frame.

6.1.2 Septage Management

By this system, each household will have a separate septic tank for collection of sewage individually and it has to be decanted to the nearest Pumping Station/Treatment Plant in a definite time accordingly to cycle their individual capacity, which will have the following disadvantages against the proposal of comprehensive Sewerage System considered in this project.

The goal of:

- Eradication of open defecation cannot be achieved.
- Providing sanitation to all with the service level benchmark of 100% cannot be achieved holistically.
- Sewerage facilities on par with the erstwhile Chennai City cannot be achieved.
- Better platform for improved quality of living, development and growth of project area and the surrounding area cannot be established.
- Most importantly, every Citizen of the Nation to achieve fundamental right of access to the basic civic amenities/facilities cannot be achieved.

6.2 Infrastructure Alternatives

The sites for the construction of Pumping Station had been carefully chosen based on the availability (ownership) of land, topography for the construction of 3 numbers of SPS and 8 numbers of LS considered in this proposal. It is also ascertained that the site is chosen so that Land alienation process is very less. As such, the site location chosen below is the best alternative considering all the factors including Social and Economic factors.

6.2.1 Land Details

Table 24: Location & Size of land required for Construction of Pumping Station

S. No	LS / SPS	Location	Survey No.	Classification	Ownership of land
1.	LS - 01	Perumal Koil	-	-	CMWSSB Exg OHT
2.	LS - 02	Edayanchavadi Road	-	Gramanatham	CMWSSB Exg OHT
3.	SPS - 03	Manali New Town	329	Rayathuvari	CMWSSB Exg SPS site
4.	SPS - 04	TNHB Ph-II	7PE, 256PE	Rayathuvari	CMWSSB Exg SPS site
5.	SPS - 05	TNHB Ph-I	249 PE, 248PE	Rayathuvari	CMWSSB Exg SPS site
6.	LS - 06A	Sadayankuppam Road	112	Nathamporamboke	Revenue
7.	LS - 06B	Burma Nagar	-	-	GCC
8.	LS - 07A	AndarkuppamRoad	-	-	GCC
9.	LS - 07B	Kadapakkam Road	327	Gramanatham	CMWSSB Exg OHT
10.	LS - 07C	Kulakarai	-	-	GCC
11.	LS - 08	Edayanchavadi Road	142/3	Rayathupunsei	Revenue

Conclusion

On analyzing the technology alternatives, site alternatives as stated above, considering all other factors such as taking into account of sewerage facilities already provided 30 years ago, in the Edayanchavadi, Sadayankuppam and Kadapakkam area, it can be very well concluded that providing comprehensive UGSS for Edayanchavadi, Sadayankuppam and Kadapakkam area as per above proposal is the best.

CHAPTER-7 Environmental and Social Standards and Risk Classification

7.1 Applicable Environmental and Social Standards

Relevance of the 10 ESS standards is provided below.

Environmental and Social Standards	Relevance to this sub- project & actions
ESS1 Assessment and Management of Environmental and Social Risks and Impacts	This project involves construction of machine holes, pumping stations, laying of sewer line, pumping mains, transmission mains and also involves project utility sites. There are no sensitive or protected environmental features within the project area. The impacts due to the project construction. ESS1 is relevant for this sub-project
ESS2 Labor and Working Conditions	Labours including migrant labour, local labours according to the skill sets will be expected to be engaged. ESS2 is relevant for this project. As per ESS2, LMP is to be prepared by the contractor. The LMP will describe the findings of the ESIA, national labor policies and practices, the types of project workers that are likely to be involved, worker influx, the procedures to apply ESS2, and a grievance mechanism. ESS2 is relevant for this sub-project.
ESS3 Resource Efficiency and Pollution Prevention and Management	There will be Air, Noise, Water pollution during the implementation and which will be managed through ECSMF. ESS3 is relevant for this sub-project.
ESS4 Community Health and Safety	Risk to community health and safety is considered as minor and manageable through ESMP. During implementation pedestrian, vehicles, labour working in the trench excavation works and laying of sewer lines and appropriate safety measures will be included in the ESMP. ESS4 is relevant for this sub-project.
ESS5 Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	There is no land acquisition, restricts on land use and involuntary resettlement requirements. Sewer mains will

Environmental and Social Standards	Relevance to this sub- project & actions
	be laid in the centre of public roads, within the road carriage way, and pumping/lifting stations will be constructed on identified government owned vacant lands. Temporary restrictions in movement may be there due to laying of sewer mains. There may be potential temporary economic impacts to hawkers, vendors, while laying of sewer lines GRM to be in place prior to starting of the works as per updated ECSMF. ESS5 is relevant for this sub-project.
ESS6 Biodiversity Conservation and Sustainable Management of Living Natural Resources	The project caters to the developed urban area and project sites are located within the project area adjacent to developments, the project activities will not have impacts on natural habitat and biodiversity. ESS6 is not relevant to this sub-project.
ESS7 Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	ESS7 is not relevant to this sub-project.
ESS8 Cultural Heritage	The project area does not have any protected site or monuments of cultural importance. However, chance find procedures have been included as part of the ESMP for compliance during project implementation. ESS8 is not relevant to this sub-project.
ESS9 Financial Intermediaries	ESS9 is not relevant to this sub-project.
ESS10 Stakeholder Engagement and Information Disclosure	Accordingly, stakeholder Engagement plan is prepared and included in the ESIA. This ESS10 is applicable to the sub – project.

The relevance of Environemental Social Standards 1 to 10 of the World Bank ESF is explained in the above Table. The Subproject is likely to have numerous positive impacts on the environment and public health. No sewage treatment facility is included in the subproject as it is proposed to utilize the available capacity of existing sewage treatment plant (STP). According to technical studies, the existing STP at Kodungaiyur will be utilized for treating the sewage generated from the sub-project area and their existing capacities are also found to be adequate. Further, theSTPis functioning normally, and treating the sewage to discharge standards specified by Tamil Nadu Pollution Control Board (TNPCB).

Proper functioning of STP is critical for the sustainability of new sewer infrastructure and realization of intended purpose (removing the human waste from those areas served by the network rapidly and treated to an acceptable standard) and benefits (improved environmental conditions, public health, etc.). All the above STP is equipped with inbuilt lab facilities and the quality parameters are analysed daily in addition to the quality parameters monitored by TNPCB on monthly basis. Sludge generated from STP is used to generate bio gas (methane CH4) by way of sludge digestion, which then used as fuel to generate electricity. The generated electricity is used to operate the STP. This sludge digestion process though digester resulted in the reduction of sludge generated in the treatment process. The above process reduces the carbon emissions to the atmosphere by way of methane capture from the raw sludge. The digested sludge is then fed into mechanical centrifuge for dewatering the sludge. The dewatered sludge cakes is then collected and disposed into the corporation dump site.

In order to further improve and enhance the operation of STP, CMWSSB has taken various initiatives and appointed consultants to study the existing sludge management system at the STP, and suggest reuse options. This will further improve the efficiency of the existing sewage treatment systems. As the subproject utilizes existing STP that are functioning properly, no adverse impacts are envisaged.

CHAPTER-8 Environmental and Social Management Plan (ESMP)

Objectives

The ESMP is developed to mitigate the adverse E&S risks and impacts of sewage water line sub-project area. It explains the mitigation measures, responsibility, implementation phase, monitoring method, monitoring indicators and frequency during pre-construction, construction, operation and decommissioning phases. The Contractor supervised by the PIU is mainly responsible for the implementation of plans during the project life cycle. The contractor also prepare contract specific ESMP. This sub- project specific ESMP is provided in Table-25.

Table 25 Environmental and Social Management Plan

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
Pre-constructionphase							
1.1	Engineering design and alternative analysis	Ensure that the investigation and analysis of alternative engineering design and technologies, and the route location of the proposed sewer line network (the project) cause minimum environmental and social risk and impact during the project cycle; Ensure the activities like trenching, excavation, pipes joint welding result into	PIU/PMC, Contractor	Design/Pre-construction	Review the performance of design and technology and route decided for the project; and consult the experts and learn from the experiences gained from such projects elsewhere	Minimum E&S risk and impact; Minimum or no impact on local ecology, water bodies and forest; Minimum impact on land and livelihood of local communities	Periodically

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		minimum or no loss to terrestrial ecosystem; and Alternatives in terms of cost effectiveness, low maintenance, minimum and area for pipeline route selected along the existing roads for the project will cause minimum E&S impact. Construction of compound wall around pumping stations, chain-link mesh above with climbers and creepers are proposed to act as screen. Tree cover (depending upon space availability) along the compound wall is proposed as they are good absorbers of Sulphur dioxide. Trees, shrubs having dense foliage with a large surface area fits requirements, because				; and cost effective and O&M efficient.	

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		leaves absorb pollutants, evergreen trees are found to be more effective, and follow mentioned species are proposed. Provide mechanical odour control equipments in the pumping stations and lifting station to mitigate odour nuisance.					
1.2	Utility relocation	Identify the common utilities to be affected such as telephone cables, electric cables, electric poles, water pipelines, public water taps, etc; and Seek prior approval and inform the concerned agencies for utilities shifting before construction starts.	PIU /PMC, Contractor/ Authority of concerned utilities	Preconstruction phase	Review detailed layout plan and site inspection	Utilities shifted in time where necessary	One time
1.3	Permits and approvals	Obtain all permits and approvals required for E&S aspects during pre-construction, construction, operation and decommissioning phases.	PIU /PMC, Contractor	Before construction commences	Keep record of all permit, approvals and authorizations	Permits and approvals are available	One to two times

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		Ensure that all necessary approvals for construction to be obtained by contractor like labourlicence / labour insurance are obtained before start of construction.	Contractor				
1.4	Source of Materials	Obtain construction materials only from government approved quarries with prior approval of PIU. PIU to review, and ensure that proposed quarry sources have all necessary clearances/ permissions in place prior to approval. Contractor to submit to PIU on a monthly basis documentation on material obtained from each sources (quarry/ borrow pit) No new borrow areas, quarries etc., shall be developed for the project;	PIU /PMC, Contractor	Pre-Construction and Construction Phase	Records, approvals	Approvals available	Periodically
1.5	Material	Storing the pipeline	Contractor/	Pre- construction	Site inspection	Location	Semi-

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
	storage and portable office cabin	fittings and associated materials; Establish a suitable place for site camp at the start of the civil works, which will allow for site offices in portable cabin.	CMWSSB/ PMC			and its access; and Basic facilities and civic amenities.	annually
1.6	Labour accommodation and facilities	Identify the suitable building in terms of location, sufficient area, access, security, basic amenities, etc. Follow all relevant provisions of the Contract Labour (Regulation and Abolition) Act, 1970, IFC guidelines, the building and other Construction Workers (Regulation of Employment and Conditions of Service) Act,1996, ILO convention 62-Safety provisions (Building) Convention and applicable laws for rented labour accommodation;	Contractor	During Pre-construction	Visual inspection; Consultations with labour, and local communities nearby; Site inspection; Facilities made available; Type of illness and its causes; and Discussions about the level of health awareness and safety precautions taken by the workers while	All the facilities available as per law and standards; Assess the satisfaction level of labourers; Cordial relation between labour and local communities ; Easy access of first-aid box with required medicine	Everyday

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		The location, layout and basic facility provision for labour accommodation will be reviewed by the Convenor and suggestions to be communicated to the contractor prior to the construction; Maintain necessary living accommodation and ancillary facilities in functional and hygienic conditions; Provide adequate number of toilets, bathing area, kitchen, safe fuel/ LPG for cooking and uncontaminated water for drinking, cooking and washing; Prohibit employees from cutting of trees for firewood; fire wood not allowed; Labour accommodation			working on the work site.	and accessories at each working site, labour accommodation, labour and office to workers all the time; and Arrangement made with the Doctors at then nearest government health and medical center/ private clinic.	

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		and temporary shade near work sites shall provide protection from heat, rain, flooding, insects, snakes and mosquitoes. It should have adequate provisions for emergency such as fire safety, security, etc; Adequate healthcare is to be provided for the workforce; Ensure adequate water supply in all toilets and urinals; Provide separate toilets/ bathrooms for women laborers and shall be screened from those for men (marked in vernacular language. Provide first aid medical kit at labour accommodation, temporary labour shed and working site; train the labour for usage of items in injury, emergency, coordinate					

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		with nearest government and private medical centers for the medical services, display the contact number of medical doctor(s) and keep a vehicle for emergency travel all the time; As per provisions of WHO and MOHFW guidelines of Covid-19, sanitizer, soap, mask, etc. should be made available in sufficient quantity and its use by the workers mandatorily and maintain social distancing all the time; The contractor will provide garbage bins in the camps and ensure that these are regularly emptied and disposed off in co-ordination with the CMWSSB / GCC. Ensure medical tests and treatment of Covid-					

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		19 positive cases immediately; and Maintain the required data and documents at site and regularly submit the compliance report to the PIU. Contractor to prepare and submit the Labour Management Plan to the project engineer.					
1.7	Public disclosure	Ensure timely and fully project information dissemination through distribution of prior notice, pamphlet in local language, oral communication, meetings, websites, etc.	PIU/PMC, Contractor	Pre- construction phase	Consultation with potential temporary economic impacts and other stakeholders	Methods used for public disclosure; and Project awareness.	One time
1.8	Grievances redressal system	Establish the efficient grievance redressal mechanism and accordingly constitute the grievance redressal committee (GRC) as outlined in the ESIA project level with representatives of all the stakeholders as members, including	CMWSSB /PMC, Contractor	Project life cycle	Review the proceeding and minutes of meetings; and Consultations with the members of GRC.	GRC established; GRC meetings held; Number of cases received and	Monthly or as required

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		women and vulnerable groups of local communities; Ensure the wider publicity of procedure, functioning and availability of GRC since the inception of the project; All the grievances received shall be acknowledged and proper recording and tracking should be carried out; GRC will adjudicate the complaints in 6-8 weeks depending upon the severity of case; Convenor will be the coordinator for organizing GRC meetings as required, writing the proceedings, minutes of meeting, informing the aggrieved party about the decision of GRC, etc;				resolved; Decision taken with in a timeframe; and Court case filed or with drawn.	

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
1.9	Sensitive Areas	The sensitive areas like Schools, hospitals to be provided with suitable noise barriers and safety measures, prior to the start of work in order to minimize the dust and noise impacts due to vehicle movement during construction and their effectiveness to be checked.	PIU /PMC, Contractor	Pre- construction phase	Site inspection	Location and its access; and Basic facilities and civic amenities.	Periodically
Construction and operation phases							
2.1	Labour mobilizatio n	Contractor shall prepare a Labour Management Plan which shall be reviewed by the Engineer incharge of PIU and approved. Accordingly, mobilize the labour on worksite for the laying of sewer line, machine hole, chambers and construction of pumping stations, lift stations and control	Contractor, PMC/PIU	Construction phase	Review site management and labourplan; and Site inspection	Number and date of labourmobili zation; and Date of starting works.	Periodically

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		rooms if any.					
2.2	Appointment and Mobilization of Environment & Safety Officer	The contractor will appoint qualified and experienced Environment & Safety Officer (ESO), who will be mobilized prior to start of works. ESO will dedicatedly work and ensure implementation of Environmental Management Plan including Occupational, Health and Safety measures during the project implementation.	Contractor	Pre-Construction Phase	Review reports and records	No compliance at site	One time
2.3.	Site clearance, Jungle clearance, Tree cutting, etc,.	Identify the number of trees that will be affected with girth size and species type. Avoid tree cutting and loss of vegetation, shrubs, grasses, etc. to the maximum extent possible; Trees where necessary shall be removed from the construction site before commencement of construction with prior permission from	Contractor, PIU/PMC/CMWSSB	Construction phase	Site Inspection by PMC, PIU officials.	No tree cutting Minimum vegetation loss; Number and species of trees cut and replanted; and Survival of number and species of	Monthly

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		the concern department and other authority as applicable; Compensatory plantation for every tree cut by way of re-plantation at ten times the trees cut; Growth and survival of trees planted shall be ensured and monitoring should be conducted at least for 3 years. Survival rate of plants shall be reported to the CMWSSB on monthly basis; Contractor shall develop plantation program for the site; Greenbelt will be developed around the site.				trees planted.	
2.4.	Site preparation	Disturbance to land surface contours to be kept to minimum; Maintaining the natural drainage pattern	Contractor, PIU/PMC	Beginning of construction	Site inspection	Natural drainage maintained; and Minimum	One time and periodically

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		existing onsite; Adequate drains and slopes to be laid across the proposed project site prior to start of excavation work to ensure adequate cross drainage; and Ensure that the earmarked operational area for laying of pipeline and pumping house is barricaded with specific access (entry and exit) points. Barricading of the earmarked sites, besides the safety, will limit the disturbances or construction impacts to the adjacent areas within the premises. Necessary precautions such as bracing / shoring in the trench will be provided for trenches of more than 1.2 m deep or as required based on site				excavation for drainage and levelling	

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		conditions.					
2.5	Site Camp	Locate the suitable place for site camp at the start of civil works for the labours constructing sewer line/ pumping station at a place approved by the PIU; Provide water and/or other facilities at the site camp; Establish a suitable site office in portable cabin at the start of the civil works in the land provided at pumping station; and Designate the area beyond the boundary of the site as No-Go areas for all personnel on site. No vehicles, machinery, materials and people shall be permitted in the No-Go area at any time without the permission.	Contractor, PIU/PMC	Prior to start of construction	Review approved site camp and site office layout; and Site inspection	Approved site plan layout; and Area outside the site camp and site office designated as No-go area.	Once

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		Include the above in the LMP.					
2.6.	Barricading working site	Ensure that the construction site should be barricaded at all time with adequate marking, flags, reflectors etc. to isolate it from other operating areas; and Hard Barricade the pipeline route and identified construction areas at pumping station prior to construction activities.	Contractor	Prior to start of construction	Site inspection	Proper barricading in place; and Accident or casualty reported	One time
2.7	Water lines and drains	Adequate precautions should be taken while laying the sewer line to avoid the possibility of damage of existing water supply lines; and Avoid any damage to storm water drains	Contractor	During construction	Site inspection	Leakage of water	Regularly
2.8.	Stakeholder consultations	Under take detailed mapping and analysis of key stakeholders. Based on the stakeholder analysis, stakeholder engagement plan is	Contractor/ PIU/PMC	Construction phase	Consultations with local communities, beneficiaries,potential temporary economic	Awareness level of stakeholders, particularly the local communities	Regularly

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		prepared that will be updated as required; Ensure that stakeholder including impacted persons are consulted and made aware about the project's purpose, risks/ impacts, mitigation measures and time- frame; and Maintain the records and documentation of the procedure followed and the output of stakeholder engagement.			impacts and other stakeholders	, beneficiaries of the proposed sewage water supply; and Perception of local communities , Potential Temporary economic Impacts about the project and its impact and mitigation measures.	
2.9.	Traffic management	Route for use by construction traffic with in site to be planned with proper signage, flagman, barriers and safety to minimize encountering of workers with vehicles as per National Road Safety Policy 2010. Route for movement of heavy machinery shall	Contractor, PIU/ PMC	Construction phases	Review traffic management plan; and Site inspection	Implementation of traffic management plan adequately; Number of complaints received; and Incidence of accidents	

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		be designated to avoid the soil compaction in other areas; All vehicles deployed at site shall be certified for pollution under control (PUC), undertake regular maintenance of vehicles; Transportation of construction material will be generally scheduled in night when the traffic is minimum; Holding area shall be provided within the site for vehicles waiting to deliver loads at site to avoid queuing outside the site; Ensure that the vehicles follow speed norms of the traffic department; and Investigate and respond to complaints					

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		about traffic.					
2.10	Construction material and machinery	Modern machineries such as JCBs, porcelain, road roller, etc. shall be used to increase work efficiency and minimize the construction period; Ensure that material transported is properly covered with Tarpaulin, etc. Schedule material deliveries after daylight hours; and Identify and repair minor leaks and prevent machineries/equipment failures.	Contractor, PIU/ PMC	Construction phase	Review the material procurement detail; and Site inspection	Noise level and working of heavy machineries in order; and Construction material and its transportation follow the norms.	
2.11.	Construction material storage	Ready mix concrete (RMC) will be outsourced and contractor shall identify designated covered area for storage of construction material such as pipeline fittings, etc. with proper marking and measures	Contractor, PIU/PMC	Construction phase	Site inspection; and review the material record maintained.	Clean and organized storage site; and Incidence of injury in loading, unloading and	Periodically

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		to avoid dust emissions; Construction material stored in open shall be covered in order to avoid wind-blown dust emissions; Ensure and maintain record of proper stacking, loading and unloading of material and provide sufficient space for the movement of heavy vehicles inside the yard; Ensure handling the construction material safely by the labour;				handling the material.	
2.12.	Construction works (concrete, Cement, etc.)	Use ready-mix concrete outsourced for the works on pumping station and lift station site and construction of machine holes and chambers to the maximum extent possible; and	Contractor	Construction phase	Site inspection	Incidence of mixing concrete on working site; Visible concrete on site; and Contamination of water	Regularly

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		If required, ensure that cement is mixed on mortar boards and not directly on the ground unless unavoidable.				and soil.	
2.13.	Top soil protection	Topsoil removed prior to commencement of construction activities shall be stored (stockpile no higher than 2 meter) separately and reused for backfilling and landscape development with in the project area; Keep topsoil stockpiles in an area protected from the wind and water; Land disturbance shall be restricted to the footprint of the project components and remaining area will be kept undisturbed to the extent possible; Ensure suitable control of run-off during the construction phase to	Contractor, PIU/PMC	Construction phase	Site inspection; and Assessment of disturbed (project components construction area) and undisturbed area.	Incidence of erosion; Storage and uses of topsoil; and Topsoil erosion on adjacent land.	Regularly

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		prevent erosion of topsoil on adjacent land and undeveloped portions of the site; and All excavations should be closed at the earliest before the start of rainy season.					
2.14	Noise from vehicles and machineries	Servicing of all vehicles, machinery, power generating equipment shall be done regularly as per the manufacturer's guidelines and during routine servicing operations, the effectiveness of exhaust silencers will be checked and if found defective will be replaced; All machines to be used shall conform to the relevant Indian Standards (IS), will be free from patent defect, kept in good working order, properly maintained and inspected regularly;	Contractor, PIU/PMC	Construction phases	Review of monitoring records Random Noise measurements	Level of noise generated; and Number of registered complaints	Regularly

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		Acoustic enclosure measures will be provided during operation to reduce noise level of machinery and DG set; Construction activities shall be carried out in a planned manner restricting high noise generating construction activities only during daytime; Contractor will maintain the proper record for all the construction vehicles which shall have the valid fitness certificate, NOC, insurance, etc. Ensure noise level in the residential and industrial areas with in the permissible limit; Regular monitoring of noise shall be conducted at site during the operations of machines and					

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		equipment; and Technicians/mechanics working on noise generating machineries will use PPEs such as ear plug, muffler, etc.					
2.15.	Dust emissions	Avoid clearing of vegetation until absolutely necessary; Trucks carrying construction material shall be adequately covered with tarpaulin sheet to avoid the dust pollution and the material spillage; DG set shall have adequate stack height as per TNPCB requirement; Dust levels will be controlled, through spraying of water from water tankers fitted with pressurized fine spray; Maintain all generators, vehicles, vessels and other equipment in	Contractor	Construction phase	Site inspection; Incidence of dust plumes; and Review of dust emission control measures.	Emission from construction site; Incidence of dust plumes observed; Dust mitigation measures followed; and Number of complaints received.	Regularly

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		good working order to minimise exhaust fumes; and Locate soil stockpiles in sheltered areas where they are not exposed to the erosive effects of wind.					
2.16.	Air quality	Maintain all vehicles, DG sets/generator sand other equipment in good working condition to minimise GHG emission, exhaust fumes, etc.; Avoid excavation, handling and transport of materials which may generate dust under high wind conditions or when a visible dust plume is present; Water sprinkling, cover dumping and stockpiles of lose material with plastic sheets or nets, particularly in windy conditions should be used to reduce airborne dust at	Contractor	Construction phases	Site inspection; Incidence of air pollution; and Review of fuel emission control measures.	Fuel emission from vehicles; Air pollution mitigation measures followed; and Number of complaints received.	Regularly

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		construction sites; and Prevent burning, fire, use of wood for cooking in the project sites to avoid air contamination.					
2.17.	Under ground water	Contractor shall ensure that all vehicle / machinery and equipment operation, maintenance and refueling will be carried out in such a manner that spillage of fuels and lubricants will not contaminate the ground water. Workforce will be trained about environmental pollution aspect and activities should stop immediately and resume only when problem is resolved; and Faulty equipment, vehicles and other source of possible oil and lubricant	Contractor	Construction &operation phases	Site inspection; and Review of spillage control measures.	Fuel or lubricant spillage; and Undergroun d water pollution mitigation measures followed.	Regularly

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		contamination should be repaired on priority and must be kept in good condition all the time.					
2.18	Protection of lakes/ water bodies	Contractor shall ensure that all vehicle / machinery and equipment operation, maintenance and refueling will be carried out in such a manner that spillage of fuels and lubricants will not contaminate the water bodies and construction of pipe carrying bridges across Buckingham canal; Water bodies need to be cordoned off by using protective barriers such as green cloth and subsequently plantation; and In case of water logging, water will be pumped out during the construction of pipelines.	Contractor	Construction phases	Site inspection; and Review of spillage control measures.	Fuel or lubricant spillage; and water pollution mitigation measures followed.	Regularly
2.1	Protection	Conduct training to	Contractor,	Construction phases	Site	Discovery of	When

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
9	of archaeological and heritage	impart knowledge and create awareness among the workers about the significance of archaeological, paleontological and geological aspects and the applicable Indian Treasure Trove Act, 1878; The fossils, coins, articles of value of antiquity, human skeletal and other remains or things might be exposed during construction activities. In such situation, stop the work, do not remove and damage any article; Inform the Convenor and concerned authority(Archaeological Survey of India) immediately to take-action per referred Act and recommence the work after receiving written permission; and also, prevent any type	PIU /PMC		inspection; and Actions taken by the workers, PIU and ASI.	archaeological/ paleontological material; Level of awareness among workers; and Protection and reporting of identified material when discovered.	occurrence of chance finding

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		of impact on the cultural heritage, monument, etc.					
2.20	Safety of workforce	Adequate precautions shall be taken to prevent the accidents from the machineries. All machines shall confirm to the relevant Indian Standards Code and shall be regularly inspected for its working condition; Where loose soil is met with, shoring and strutting shall be provided to avoid collapse of soil. Provide job specific safety induction training, including environmental awareness and ensure daily toolbox talk to workers at the working area; Ensure availability and mandatory use of PPEs at the site; Use of protective	Contractor, PIU/PMC	Construction phases	Site inspection; and Observation of workers with PPE and safety measures while working on work site.	Quantity and timely supply of PPEs; Awareness level about the use of PPEs; and Incidence of injury, accident, infirmity.	Everyday

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		footwear and protective goggles by the workers involved in mixing of materials like cement, concrete etc. at pumping station; Use of earplugs by the workers exposed to loud noise, and those engaged in crushing, compaction, concrete mixing operations; Ensure sufficient quantity of all PPEs, necessary safety appliances such as safety goggles, helmets, boots, safety belts, ear plugs, mask, etc. to workers and staffs; Adequate measures and care to be taken while approaching any open water bodies for construction of bridges. Ensure railing around such sites are intact and in good condition; and					

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		The contractor will comply with all the precautions as required for ensuring the safety of the workmen as per the International Labor Organization (ILO) and applicable laws of India and Tamil Nadu state as applicable.					
2.21	Work-zone safety Management	Temporary barricades shall be provided to delineate construction zone as well material stacking areas. The construction site and the labour facility shall be appropriately barricaded to prevent entry and accidental tress-passing of workers, staff and others into the construction sites. All operational areas shall be access controlled. Watch and ward facilities at all times shall be provided by the contractor.	Contractor, PIU/PMC	Construction phase	Site inspection	Availability of safety measures Absence of safety Incidents	Everyday

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		Proper retro reflective warning signage will be installed on the access road next to the construction site about movement of construction machinery and vehicles. In excavations for longitudinal surface road drains, culverts etc., a high visibility warning and retro reflective signage shall be displayed in vermicular language and English. Entry of unauthorized persons should be prevented. Excavations will be adequately barricaded and well lit – with signages /info boards. There shall be adequate lighting arrangement at night and adequate					

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		barricading to prevent mishaps after construction activity ceases for the day. A readily available first aid unit with necessary supplies, drinking water, resting shed, sanitation etc shall be made available in every work zone.					
2.22.	Exposure to electrical equipment	The Contractor shall take all required precautions to prevent danger from electrical equipment at pumping room, etc. and ensure that: No material will be so stacked or placed as to cause danger or inconvenience to any person or the public; All necessary fencing and lights will be provided in construction area; Deactivation and proper grounding of	Contractor, PIU/PMC	Construction phase	Site inspection; Observation of power supply system; and Electricity safety precaution taken by workers while working on work site.	Incidence of current shock, injury, electrocution	Daily

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		live power equipment and distribution lines to be ensured before initiating work; All energized electrical devices to be marked with warning signs. Use the symbol of danger as warning of high electricity voltage or current flow on cable boxes or where required to avoid any incidence of current shock or electrocution; and Provision of specialized electrical safety training to those workers working with or around exposed components of electric circuits.					
2.23.	Fire Safety	Ensure that no fires are permitted on or adjacent to site; Ensure that no smoking is permitted on the working site; Ensure that sufficient	Contractor	Project life cycle	Inspect Attendance register for fire fighting training conducted; and Observation of	Number of Fire incidents; Certified extinguishers in appropriate	When required

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		and certified fire fighting equipment are placed and maintained on the site; Equip all fuel stores and waste storage areas with fire extinguishers; Ensure that all workforce and staff on site are aware of the location of fire fighting equipment on the site; and Conduct training program on use of extinguishers, sand, etc for fire-fighting and ensure that they are trained in its operations.			fire extinguishers and certificate at the sites.	locations; and Workers knowledge to operate the fire extinguisher	
2.24	Emergency response to manage cyclone and other disaster conditions	Contractor shall ensure efficient communication system in place which will be required during occurrence of any natural hazard; Evacuation plan shall be in place for the site;	Contractor, PIU/ PMC	Project life cycle	Inspect attendance register for training program; and Inspect fire extinguishers and certificate	DMP in place; Communication system in existence; Display of evacuation	When required

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		Evacuation plan or route is displayed clearly through signs or picture at prominent places within the sites; Ensure effective coordination within the workforce and concerned departments and display contact number of concerned persons at prominent places; and Conduct training program and mock drills to workers to deal with the disaster situations due to occurrence of cyclones and tsunami.				route; Capacity of workers to manage; and Disaster and emergency situations	
2.25	Demolition of existing structures from proposed PS site (if required)	Prior to carrying out any building demolition, detailed building appraisal by means of surveys and appropriate assessments shall be carried out.	Contractor, PIU/PMC	Construction phases	Site Inspection; Review of waste management plan; disposal registers	Air quality, noise level;	When required

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		In case of asbestos present in the buildings, specific measures for removal and disposal have to be taken and included in the site specific ESMPs Hoarding and covered walkway is to be provided for protection of the public during the demolition of buildings since hoarding isolates the demolition site from the public, thus preventing unauthorized access and trespassing. Metal scaffolds shall be used for top-down demolition. Both bamboo scaffolds and metal scaffolds are considered acceptable provided that they are erected according to the Construction Sites (Safety) Regulations and the codes of practices on scaffolding					

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		safety. Concrete breaking, handling of debris and hauling process are main sources of dust from building demolition. Dust mitigation measures complying with the Air Pollution Control (Construction Dust) Regulations shall be adopted to minimize dust emissions. Silent type power mechanical equipment shall be used to reduce noise impact as much as practicable or possibilities of engaging man power with light dismantling tools with PPE are studied and engaged. Debris waste and other materials shall not be thrown, tipped or shot down from a height where they are liable to cause injury to any					

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		person on or near the site. Disposal of debris has to be controlled and to be reused in filling of low ground with due permissions from local authority. Wasted reinforcement will be handled as per the departmental procedure.					
2.26	Submission of updated environmental & social management plan (ESMP) / site environmental plan (SEP); ESMP implementation and reporting	The contractor to prepared project specific ESMP.	Contactor/ PMC	Project cycle	Review of reports and records	Compliance at the site	One-time / As and when need arises
Social aspect							
2.27	Compensation and	Provide compensation and assistance to	CMWSSB/PMC/Contractor	Construction Phase	Verify the disbursement	Potential temporary	One time

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
	Assistances to potential temporary economic impacts	potential temporary economic impacts; Employ people of local communities for project works with a priority to potential temporary economic impacts based on their skills; Employ the potential temporary economic impacts, particularly willing women on priority in project related unskilled, semi-skilled and skilled works as applicable; Any social impacts identified needs to be mitigated as per ECSMF			of compensation and assistance; and Conduct consultation with local communities	economic impacts were compensated at replacement cost against the income loss	
2.28	Loss of access	The contractor shall ensure that access to connecting roads; market, residence and other places should not be blocked. In case, it is unavoidable, then alternate route should be provided to people. The community should	Contractor	Construction	Visual inspection	Crossing/ access closed	Regularly

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		be made aware about the diversion plan along with expected deadline for the completion of work. After completion of the work, the access should be restored as per original condition. The contractor is required to provide notice to the shop owners of the need to shift kiosk/wares displayed on ROW as soon as the work plan is ready with minimum 7 working days. No works can be commenced unless 100% shifted in sections ready for implementation.					
3.Decommissioning phase							
3.1	Site clearance and rehabilitation/ Post-construction clean-up	Remove all construction equipment, vehicles, surplus materials, site office facilities, temporary fencing, structures and other items from the project	Contractor	After completion of construction phase and operation phase	Site inspection; and Review of record of activities upon completion of	Restoration of construction sites in original condition; and Sites are	Weekly

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		site including pumping stations and lifting stations; Clean up and remove any spills and contaminated soil in the appropriate manner; Do not bury discarded materials on site or on any other land not designated for this purpose; The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc. and these shall be cleaned up. Level the disturbed area and restore to a condition resembling its natural profile; and Ensure site is fully clean and tidy before the exit and prior to its handover to the officer			construction phase and commissioning phase	fully rehabilitated prior to commissioning of project	

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		of CMWSSB and other authorized persons.					
4. Operation and Maintenance phase							
4.1	Odour nuisance during operation of Sewage lifting and pumping stations	Strictly follow standard operating procedures / operational manual for operation and maintenance of lifting and pump stations Ensure that operating staff is properly trained, and have Clear understanding of odour issues Ensure that pumping cycles are properly followed; and there is no build-up of sewage beyond design volume in the wells Conduct monitoring (periodically at all operational pumping stations and lifting stations	CMWSSB / Contractor	Operation and Maintenance phase	Odour control measures; monitoring of H2S and ammonia; site inspection	No odour is experience around the pumping station	Periodical
4.2	Workers exposure to toxic gases in sewers	During cleaning/ maintenance operation, the sewer line will be adequately vented to ensure that no toxic or	CMWSSB	Operation and Maintenance phase	Site inspection	Nil grievances/ incidents	Regularly

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
	and hazardous material during sewer maintenance work	hazardous gases are present in the line. Ensure availability of PPE for maintenance workers. Follow safety and Emergency preparedness plan .					
4.3	Occupational health hazardous and safety	Use safety shoes or boots with non-slip soles, safety harnes Check electrical equipment for safety before use; verify that all electric cables are properly insulated; take faulty or suspect electrical equipment to a qualified electricity technician for testing and repair Wear safety goggles in all cases where the eyes may be exposed to dust, flying particles, or splashes of harmful liquids All workers should undergo periodic examinations by occupational physician to reveal early	CMWSSB	Operation and Maintenance phase	Site inspection, verification of registeres and availability of PPEs.	Monthly reporting of different types of PPE provided.	Regularly.

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		symptoms of possible chronic effects or allergies					
4.4	ESHS and Other risks	Sewer Lines: During O&M stage provide necessary ESHS training to the staff in sewer cleaning and maintencence. Ensure availability of PPE for maintenance workers. Pumping stations/lift stations: During O&M stage provide necessary ESHS training to the staff in pumping stations in grit handling, maintenance of wells, pumping equipment, pipeline, etc., Ensure availability of PPE for maintenance workers. STP: During O&M stage provide necessary ESHS training to the staff in STP operations, handling of chemicals, chlorine, other consumables.	CMWSSB/Contractor	Operation and Maintenance phase	Site inspection progress reporting (Monthly, Quarterly, Semi-annual, Annual)	No of training conducted. Type of PPE provided t the staff. Site inspection	Regularly

S. No.	Aspect	Mitigationmeasures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		Ensure availability of PPE for maintenance workers.					
5	**Contractors planning and reporting requirements**						
5.1	Contractors reporting Reports	Preparation of Contractors ESMP/LMP/SEP/WMP/ TMP/ESHS Plan and monthly complaint reports	Contractor	Pre construction/Implementation/O&M Phase	Review and approval of reports submitted by the contractor.	No of reports submitted and approved	One time/Continuous

8.2 Monitoring and Evaluation

The E&S experts of the PMC will review the updated ESMP and sub-plans submitted by the contractor and will ensure that such plans are in line with the applicable laws and regulations. The experts will supervise the implementation of plans and will report on the E&S safeguard status and performance under the project. The internal monitoring reports will at minimum include, but may not be limited to the following:

- Reporting period and context;
- Summary of project status;
- Regulatory compliance;
- Institutional set up and manpower management status;
- Environmental, social, health and safety of workers and local communities;
- Implementation status of ESMP, SEP, WMP.
- Monitoring of waste disposal and management;
- Monitoring of environmental attributes (air, water, noise) and social mitigationmeasures (e.g. compensation to potential temporary economic impacts at replacement value);
- Complaints and grievances redressal; and
- Stakeholder engagement and community development activities.
- Labour Management

PMC will prepare the internal monitoring report and submit to the PIU every month, and PIU will submit monthly report to TNUIFSL. Accordingly, the required budget for monitoring will be made available during the construction and the budget for operation phase will be updated and allocated later. The PIU in consultation with Contractor and PMC will update the monitoring parameters, frequency and budget as appropriate. Details of schedule of activities are given in Table 24.

Table 26 Schedule of activities

S.No.	Schedule of activities	Responsibility	Time line
1	Obtain required permits and licenses	PIU/Contractor	Prior to Pre-construction
2	Designate the Convenor	PIU	Pre- construction
3	Constitute the GRC& disclose in all the project work sites and zonal offices.	PIU	Pre- construction
4	Mobilization of EHS officer	Contractor	Prior to construction
5	Mobilization of one environment expert	PMC	During construction
6	Mobilization of one social expert	PMC	During construction
7	Social – Revalidation Survey	PMC	Prior to start of work in the 6 potential temporary economic impacts identified stretches.

8.3 Environment Monitoring Plan

To monitor the extent of environmental impact of the proposed project, the contractor has to periodically monitor the ambient environmental quality along the proposed project area. The monitoring requirement for the different environmental components is presented in table below:

Table 27 Stage Wise Environmental Monitoring Plan

Project Stage: Construction Air Quality Monitoring

A	Parameter	PM10, PM2.5, SO2, NOx, CO and Pb
B	Sampling Method	Use method specified by CPCB for analysis
C	Standards	National Ambient Air Quality Standards 2009, Air (Prevention and Control of Pollution) Act,1981 Or relevant CPCB standards/guidelines
D	Frequency	Once every season except monsoon during construction period
E	Duration	As per CPCB guidelines for monitoring
F	Location	Sensitive locations, especially in the downwind direction along the network alignment.
G	Measures	Wherever air pollution parameters increase above specified standards, additional measures as decided by the engineer shall be adopted
H	Implementation	Contractor through approved monitoring agencies
I	Supervision	CMWSSB

Project Stage: Construction &operation AND maintenance -Water Quality Monitoring

A	Parameter	Parameters for Surface water quality standards (IS; 2296) Water pH, TDS, Total hardness, Sulphate, Fluorides, Chloride, Fe, Pb for groundwater.
B	Sampling Method	Grab sample to be collected and analysis as per Standard Methods for Examination of water and Wastewater.
C	Standards	Indian standards for Inland Surface Water (IS; 2296, 1982) and for Drinking water (IS; 10500,2012) Or relevant CPCB standards / guidelines
D	Frequency	Once every season during construction and during operation period.
E	Duration	--
F	Location	Suitable location within project area (preferable near PS, STP locations and receiving waterbody in the downstream of point of disposal)
G	Measures	At locations of variation in water quality/increased pollution, remedial measures to be adopted /all inflow channels shall be checked for pollution loads
H	Implementation	Contractor through approved monitoring agencies
I	Supervision	CMWSSB

Project Stage: Construction& Operation - Noise Level Monitoring

A	Parameter	Noise levels on dB (A) scale
B	Sampling Method	Free field at 1 m from the equipment whose noise level are being measured Equivalent noise levels using an integrated noise level meter kept at a distance of 15m from edge of pavement
C	Standards	National Ambient Air Quality Standards in respect of Noise, Noise

		Pollution (Regulation and Control) Rules, 2000
D	Frequency	Seasonal during construction period
E	Duration	Reading to be taken at 15 seconds interval for 15 minutes every hour and then average out for analysis
F	Location	Wherever the contractor decides to locate the equipment yard. At sensitive locations such as schools, hospitals etc along the alignment
G	Measures	In case of noise levels causing disturbance to the sensitive receptors, management measures as suggested in the ESMP shall be carried out.
H	Implementation	Contractor through approved monitoring agencies
I	Supervision	CMWSSB

Project Stage: Operation and Maintenance - Odour Level Monitoring

A	Parameter	H2S level within and next PS
B	Sampling Method	Use method specified by CPCB for analysis
C	Standards	National Ambient Air Quality Standards 2009, Air (Prevention and Control of Pollution) Act,1981 Or relevant CPCB standards/guidelines
D	Frequency	Half yearly (yearly twice) and as and when based on public complaints (throughout the operation phase)
E	Duration	As per CPCB guidelines for monitoring
F	Location	All LS / SPS and Terminal PS 3 points – at inlet, upwind direction of the asset and downwind direction of asset
G	Measures	Wherever H2S parameters increase above specified standards, additional measures as decided by the engineer shall be adopted
H	Implementation	Through approved monitoring agencies – Contractor (during Implementation) / CMWSSB (during O&M)
I	Supervision	CMWSSB

Project Stage: Construction & Operation - Soil Monitoring

A	Parameter	Soil quality parameters (Pb, SAR and Oil & Grease, monitoring silt for presence of toxic metals, etc)
B	Sampling Method	Sample of soil collected to be acidified and analysed using absorption Spectrophotometer
C	Standards	Threshold for each contaminated set by IRIS database of USEPA until national standards are promulgated
D	Frequency	During the pre-monsoon post monsoon seasons each year for the entire construction and operation phase
E	Duration	Grab sampling
F	Location	At sample locations in the receiving water bodies, at the places of dumping silt, excavated earth
G	Measures	At location of increased in pollution levels, source shall be identified and measures adopted.
H	Implementation	Contractor through approved monitoring agencies
I	Supervision	CMWSSB

Cost Estimate for Environmental Management Program

The estimated ESMP implementation cost comprises of EMP as well as Compensation for the social impacts. It is provided in the following table.

Table 28 Cost Estimate for Environmental Management Program

S.No.	E&S monitoring parameters	Frequency	Responsibility	Amount (INR in lakhs)
1	Organize meetings with line departments.	Bi-annual	PIU	To be quoted in Bill No. V of Volume III (BoQ)
2	Workshop on E&S safeguards and on-job training as identified.	Annually	PIU/PMC	
3	Use of IEC material and use of media channel to create public awareness onwaste management	Regularly	Contractor	
4	Consultations with stakeholders regularly	Regularly	PIU/PMC/ Contractor	
5	Meetings of GRC	Monthly	PIU	
6	Air quality monitoring	Quarterly	PMC/ Contractor	
7	Surface water quality monitoring	Quarterly	PMC/ Contractor	
8	Ground water quality monitoring	Quarterly	PMC/ Contractor	
9	Soil quality monitoring	Bi-annual	PMC/ Contractor	
10	Noise quality monitoring	Quarterly	PMC/ Contractor	
11	Wind speed and direction	Bi-annual	PMC/ Contractor	
12	Health camp, occupational health and prevention of Covid 19	Regularly	Contractor	
13	Compensation and assistance to potential temporary economic impacts & revalidation survey during project implementation.	One time* plus lump sum	PIU	
			Total	

Note: *Entitlements include 1. Provisional sum for compensation of temporary income loss minimum wage[1] is Rs.643 per day. The estimated duration is 7 days. All the 6 identifed potential temporary economic impacts are considered as BPL households. As per the updated ECSMF the one-time assistance of Rs. 54,012 is adopted.

CHAPTER-9 Stakeholder Engagement and Grievance Redressal Mechanism

Stakeholders' engagement is an integral part of developing an understanding about the project and the associated risks and impacts as perceived by the public. It helps in planning and setting up priorities for project management. SEP has been prepared and is provided in Annexure 10.

9.1 Introduction

Information on Public Consultation is given adequately to the Public by means of notice, personal contact, etc. As per the World Bank policy on access to information and disclosure, the proposed project attracts Public Hearing. Proceedings of the Public Hearing/Stake Holders Meeting conducted on 17/06/2023.

9.2 Process of Stakeholder Consultation

The Public Hearing was arranged by the Chennai Metropolitan Water Supply & Sewerage Board (CMWSSB). The concerned persons having plausible take in environment and social aspect were requested to attend the meeting. Wide canvassing has been made by issuing notices door to door and keeping displays. The minutes of public consultation are as follows.
The following were present during public meeting.

ii. Stakeholders (Sub-project area people)
iii. Officials
iv. Social Expert
v. Counsellors
vi. Members from Residential welfare association
vii. Consultants

Stake holder consultation started by EE, CMWSSB, explained the project details and listed out the street name in the respective areas.

9.3 Members present

General public, Representative of resident welfare association, NGO, Elected representatives including councilors besides concerned officials of CMWSSB, Chennai were present. The scanned attendance sheet is provided in Annexure 6

Table 29 Member present

Sl. No	Name	Designation
1.	S.Nandhini A.Rajendran	Councillor Ward-15 Councillor Ward-16
2.	P.Karpagam, Superintending Engineer (North)	Superintending Engineer, CMWSSB
3.	R.Venkatesan, Area Engineer-2, N.Singaravelan, Executive Engineer (Planning and Design), S.Karthic, Executive Engineer (Co-ordination) & Assistant	Executive Engineer, CMWSSB

	Executive Engineer (In-charge) (Planning and Design)	
4.	D. Viswanathan, Deputy Area Engineer-04	Assistant Executive Engineer, CMWSSB
5.	S. Sudarshan (Planning and Design) M. Mohamad Yashik (Div. Engineer-15 & Div. Engineer-16 incharge)	Assistant Engineer, CMWSSB
6.	Field works of Area-02 office	Staff, CMWSSB
7.	Dr.A.D.Nandhini	Social Expert
8.	R.Aadharsh Rajkumar	Consultancy
9.	Manali New town Kudiyiruppor Sangam Members TNHB Phase-I Welfare association members TNHB Phase-II Welfare association members	NGOs

9.4 Welcome speech

Welcome speech is delivered by Superintending Engineer Mrs. P. Karpagam, CMWSSB, and Chennai. She briefed the project preparation and different proposals in her speech. After her speech, Assistant Engineer (P&D) Mr. S. Sudarshan B.E., also express his valuable suggestions.

9.5 information Dissemination

On behalf of consultant, Mr. S. Sudarshan B.E., (Assistant Engineer, CMWSSB, Chennai) explained the objectives, scope and deliverable's pertaining to the consultancy assignment. He also explained broadly the current status of project. Dr. A.D. Nundinuy Ph.D, Social Expert has explained broadly on people consideration and queries. The views of stakeholders are also taken into consideration and all the points are incorporated in minutes of meeting.

9.6 Suggestion from the participant and action taken

Table 30 Suggestion forms the participant and action taken

Sl. No	Name of person/ULB	Queries	Action to be taken by CMWSSB
1.	P. Chanramohan/manali new town	In Manali new town area, drinking water doesn't come properly.	The water is supplied daily.
2.	S. Nanthini Sanugam /manali new town	We welcome this project, kindly do work fast.	The tenders were already called for, once the tender is settled, we will start the project work.
3.	R. Basker/ old nappalayam	I Welcome this project, kindly do the work immediately.	The tenders were already called for, once the tender is settled, we will start the project work.
4.	A. Rajendran/ manali new town	Please do immediate restoration of road after completion of the cutting of road.	The roads will be restored by Greater Chennai corporation, once the work is completed.

5.	P.K. Kannan Advocate / TNHB welfare association	We welcome this project. Please place a Display Board with details of the concerned project officials, during the project implementation phase.	We will place the display board with details of the officials concerned.
6.	P.D. Ravichandran/Manali new town	In rainy reason sewage comes to household area	After the completion of the project, the problem will not occur.
7.	M. Hemanathan	After completion of the project the connection cost should not higher than the amount paid now.	As per rules and regulations of CMWSSB, the tax will be collected.
8.	A.Muhamathu vaseem	In Manali New Town area, the houses level is lower when compared with roadlevel. Because of this sewage water come to households in rainy season. Please rectify the problem.	The sewage generated from the house holds will be completed collected in the Machinehole. So, sewage stagnation will be not occurred once the project is implemented.

*Note: The public consultation documents and social expet documents were attached in the annexure 6.

9.7 Minutes of Meeting

Minutes of the meeting of the Stakeholders Meeting for “Comprehensive Underground Sewerage Scheme for the Edayanchavadi, Sadayankuppam, and and Kadapakkam ULB” held on 17.06.2023 at 11 A.M To 01 P.M at Area-II CMWSSB, Manali, Chennai.

9.8 Conclusion

Mr. S. Karthic (Executive Engineer, CMWSSB) concluded the meeting by thanking all the participants who have attended the meeting.

CHAPTER-10 Institutional and Implementation Mechanism

10.1. Implementation of proposed project and institutional arrangement

PIU

The Chief Engineer (CE) of CMWSSB supported by the concerned Superintending Engineer (SE) is overall responsible for the project management.

The Executive Engineer (EE) who will be responsible for coordination, supervision and management of all the activities related to the project. The Executive Engineer (EE) will be assisted by the Assistant Executive Engineer (AEE) and Assistant Engineer (AE).

PMC

The PMC will have Environmental and Social experts in place and supervise the implementation of the E&S safeguards, and report to PIU/ CMWSSB.

Contractor

Contractor will appoint EHS personnel who along with the Project Manager be responsible for implementation of Environmental and Social management plan and mitigation measures and submit the compliance report PIU. PIU will supervise activities of Environmental and social safeguards for ensuring adoption and compliance of ECSMF and report to TNUIFSL.

CHAPTER-11 Project Benefits

The sewerage project, in respect of which considerable public and social resources are being used, form a basic infrastructure for the country and an indisputable indicator of civilization and development. The works cover a number of substantial social needs and aim to improve the quality of life and to protect public health and the environment.

11.1 Upgrading the quality of life

The quality of life and the hygienic conditions in the areas where the system operates have already improved. The operation of the sewerage system has relieved these areas to a great extent from previous problems that were caused by the continuous emptying of cesspools. In the past, hotels and blocks of apartments were required to empty and maintain septic tanks and soak ways. The sewerage system provides a healthier and more appropriate way to manage liquid wastes.

11.2 Preserving the natural environment

Presently, all sewage waste is discharged in septic tanks and cesspits, resulting in the pollution of the ground water of the areas where such waste was discharged. Polluted waters then ended in the sea and caused various risks and other environmental problems. Though the areas under study are recently added in to CMA, substantial residential, commercial and industrial developments have already occurred in the obscene of the basic infrastructure such as Water supply and underground sewerage system. Implementation of comprehensive underground sewerage system would definitely enhance the natural environment. The wastewater treatment plant produces by-products such as treated bio solids and methane. Treated sludge is used as a soil-improving substance mainly for tree cultivations whilst methane is being used for electricity generation, covering part of the power, required to operate the plant.

11.3 Saving and processing waters

Water is a substantial natural resource for our country and it should be managed in the best possible manner. The tertiary treated effluent at the wastewater treatment plant can be reused for non-domestic purposes such as gardening, boilers, floor washings at industries and also for agricultural and other purposes.

11.4 Economic development and tourism

The most significant advantage of the system is maintaining sustainable development, the protection of the environment and improvement of the quality of life, with a further impact on the development of tourism and the economy in general.

11.5. Standard of living

As a result of the above, the sewerage system contributes to further development and increase of the standard of living of the city. Considering all the above advantages, there is no doubt that if we all cooperate, ourselves and our children will enjoy a better quality of life in the years to come and that we will secure a better environment to the forthcoming generations.

Annexure 1 Environment, Climate Change and Social Screening Form

Project Details		
Sl.no	**Components**	**Details**
1	Project Objective and components	UGSS to Edayanchavadi, Sadayankuppam, kadapakkam
2	Details of Alignment / Components (main components including construction activities)	Pipe length – 77.772 kms, No. of LS – 08 No. of SPS – 03 No. of HSC - 4000
3	Location of the Project Sites (all sites including alignment of networks, other structures like pumping stations; offices, locations where treated waste water, sludge & C&D wastes will be disposed/reused directly, any other) Current Land use (Provide information for all sites involved in the project), any historic land use (related to heritage, or contamination) Site Survey No:/s (with ownership), Geographical coordinates of the site	Location of the project sites are Edayanchavadi, Sadayankuppam, kadapakkam. The collected sewage treated at Kodungaiyur STP, and the treated water discharged into Buckingham canal. The vacant land identified for LS 01, 02, 07B, SPS 03, 04, 05 – belongs to CMWSSB. The vacant land identified for LS, 06B, 07A, 07C, 08 – belongs to GCC. The vacant land identified for LS, 06A– belongs to Revenue. The identified vacant lands are free from contamination such as municipal solid waste, and not related to any Historic, Heritage site.

Proposed Resource Use

Resource Use				
Sl.no	Proposed Resources	Area/ Quantity	Unit	Details
(i).	Land Area proposed to be used: Location wise (in sq km / sq m)	93.492	Sq.Km	The collection system land area – 72.772 Km Vacant land area – 4.625 sqkm

(ii).	Estimated energy consumption for the project activities – Source wise	1583044	kWh	LS (8) – 596269 SPS (3) - 986775
(iii).	Estimated usage of water quantity for the project: Ground Water and Surface water?	3000	KL	

Baseline Environmental Conditions

Sl.no	Environmental Aspects	Yes	No	Details (mention distance to these features in meters/kilometres, and quantities in g/kg/T as applicable. Also mention if any project components is excluded / regulated based on location/activities as per National / State regulations & need permits/follow guidance)
1	Is the project site located on or adjacent to any of the following (Provide information for all sites and alignment of the project components/subcomponents, associated activities; mention distance to these features in meters/kilometres)			
i)	Critically Vulnerable Coastal Areas, Ecosensitive Areas		No	The location of the project area is 2 km away from the Bay of Bengal Sea. There is no ecosensitive or critically vunnerable area present near the project area.
ii)	Cultural Heritage site, Protected monuments		No	There is no cultural heritage near the project area.
iii)	Natural Forests / Protected Areas Is the project in an eco-sensitive or adjoining an eco-sensitive area or its demarcated buffers? If yes, provide details.		No	There is no forest or protected area present near the project area.
iv)	Any other Wetlands/ Mangrove/ Estuarine Region?	Yes		Ennore estuarine is around 6 km from the project area. There is no mangrove or other wet lands are present near the project site.

v)	Any Natural Habitat areas, areas with natural features such as the Coasts, Lakes/ other water bodies?	Yes		The proposed LS – 08 site is located 500m to Kosasthalaiyarriver and LS – 02 site is located 50m to Kosasthalai river.
vi)	Any other Sensitive Environmental Components?		No	There is no anyother environmental sensitive components present in the project area.
vii)	Any Residences, schools, hospitals, sensitive receptors?	Yes		The proposed SPS sites are 10m to residential area. The proposed LS – 06A site is 5m away to Govt Primary school, Sadayankuppam.
viii)	Any culturally – socially important paths, areas/religious occupancies, sacred groves, burial grounds, tourist or pilgrim congregation areas, borders, etc?	Yes		The Hindu sacred place, Ayyavazhi Temple, is located the alignment between LS – 08 to SPS – 04.
ix)	Any Drinking water source, upstream and downstream uses of rivers, etc which may be impacted by proposed discharge of treated sewage / sludge from water supply or sewage treatment plant?		No	There is no drining water source is used for the disposal of the treated water. The treated water from the STP is further treated at TTRO and supplied to industries.
x)	Any Low-lying areas prone to flooding/areas of Tidal Influence used as part of the Project or near the project components?		No	There is no low-lying area for flooding in the project area.
xi)	Details of Surface water quality at intake point or Disposal point of treated sewage	Yes		Surface water samples were collected around the project area. The results are given in the Chapter 4 of this report.
xii)	Any areas affected by other disasters?	Yes		Chennai recorded the highest rainfall of 1000 mm in Jan 2015. Further in 2004 Tsunami, Chennai coast is one of the worst affected coastal areas.
2	Groundwater: Is the site in Critical / Over Exploited condition?	Yes		The ground water is overexploited in Chennai area.

3	Is the area disaster-prone? If yes; list all disaster zone categories applicable	Yes		The Chennai city is listed as medium vulnerable catogary prone to flood of disaster zone. The cause of flood is by heavy rainfall.
4	Describe the soil and vegetation on site	Yes		The location is geologically classified in to sedimentary (alluvial) formation.
5	Is the site area and condition suitable for proposed development?	Yes		The project site area and condition are suitable for the construction of UGSS.
6	Describe existing pollution/contamination or degradation in the site(s)	Yes		Baseline environmental monitoring was carried out for ambient air, noise, soil, surface and ground water. The results showed that noise level in area near the main road are above the permissible limit at night due to vehicular movements. Air quality and water quality parameters are under the limit of standards. The results of the environmental monitoring are shown in Chapter 4.
7	Near Dams, Barrages		No	There is no dams and barrages near the project site.
8	Any other remark on baseline condition?		No	Except noise level at night in areas near the main roads are above the limit.

Anticipated Environmental Impacts: Impacts on Land, Geology and Soils

Sl.no	Impacts	Yes/ May create	No	Details (mention distance to these features in meters/kilometers, and quantities in g/kg/T as applicable. Also mention if any project components is excluded / regulated based on location/activities as per National / State regulations & need permits/follow guidance)

8.	Will the proposed project cause the following on Land / Soil?			
i)	Impact on Surrounding Environmental Conditions including Occupation on Low lying lands/flood plains		No	There is no impact on flood plains due to the product.
ii)	Substantial removal of Top Soil (mention area in sqm)		No	Excavated earth shall be used for refilling of the pipeline. The excess soil from the LS and SPS construction site shall be used for land filling of the low-lying area.
iii)	Any degradation of land / eco-systems expected due to the project?		No	There is no degradation of land or eco system involved in the project activity.
iv)	Loss or impacts on Cultural/heritage properties/precincts, features		No	There is no impact on cultural heritage due to the construction of the project components.
v)	Does the project activity involve cutting and filling/ blasting etc?		No	There is no blasting activity involved in the project activity.
vi)	Will the project cause physical changes in the project area (e.g., changes to the topography) due to earth filling, excavation, earthwork or any other activity?		No	There is no physical change in the project area due to the construction of the project components. Excavated earth shall be used for refilling of the pipeline. The excess soil from the LS and SPS construction site shall be used for land filling of the low-lying area which shall not affect any physical changes.
vii)	Will the project involve any quarrying/ mining etc?		No	There is no quarrying or mining activity involved in the project.
viii	Will the project / any of its component contaminate or pollute the Land? (for example sludge, disposal of untreated sewage/bypass)		No	The project components shall not pollute the land. The collected sewage shall be treated by the existing STP. The treated water is

				used for agriculture purpose and sludge is dried and used as fertilizer.
ix)	Pre-existing contamination on site/s		No	There is no pre-existing contamination on the project sites.

Impacts on Water Environment

Sl.no	Impacts	Yes/ May Create	No	Details (mention distance to these features in meters/kilometres, and quantities in g/kg/T as applicable. Also mention if any project components is excluded / regulated based on location/activities as per National / State regulations & need permits/follow guidance)
9	Will the subproject or its components cause any of the following impact on Water sources (Quantity or Quality):			
i)	Will the activities have proposed at the site(s) impact water quality (surface or underground) and water resource availability and use? Will this sub-project involve the dredging of water bodies, sea, canals, etc.	Yes		The proposed sewer network collects the sewage and pump to Kodungaiyur STP. The treated sewage water discharged in to the intake pond of existing tertiary traetment reverse osmosis (TTRO) plant. The reated water supplied to industries.
ii)	Impacts on Water Resources		No	There is no impact on water resources.
iii)	Pollution of Water bodies/ground water nearby or downstream		No	The reated water supplied to industries after TTRO treatement.
iv)	Will the project affect the river /cannel flow pattern, stream pattern or any other irrigation canal?		No	The project shall not affect the flow pattern of any river or stream.
v)	Will the project result in stagnation of water flow or pondage or weed growth due to increased pollution/siltation		No	The project shall not result in stagnation of water flow.

Impacts on Biodiversity and Host Communities

Sl.no	Environmental Impacts	Yes/ May Create	No	Details (mention distance to these features in meters/kilometres, and quantities in g/kg/T as applicable. Also mention if any project components is excluded / regulated Lsbased on location/activities as per National / State regulations & need permits/follow guidance)
10	Will the subproject or its components cause any of the following impacts on Biodiversity or the neighborhood			
i)	Will the project necessitates cutting of? Trees / Loss of Vegetation		No	There is no tree cutting activity involved.
ii)	Will the project result in Health & Safety Risks in the neighborhood including the release of toxic gases, accident risks		No	There is no health and safety risk in the neighbourhood due to the construction of the project components. The odour that may arise from the pumping station is controlled by odour control measures proposed at the pumping stations.
iii)	Potential risk of habitat fragmentation due to the clearing activities? (e.g., Hindrance to the local biodiversity like disturbing the migratory path of animals/ birds etc.)		No	There is no potential risk of habitat fragmentation due to the project activity.
iv)	Potential Noise and Light Pollution or disturbance to surrounding habitats/communities	Yes		During excavation, construction activity generates noise pollution to the nearby residential area.
v)	Potential disruption to common property, accessibility, traffic disruptions, conflicts or disruption to the local community within the	Yes		Utility cables, water pipe lines, TNEB lines, shall be disturbed during excavation of

Sl.no	Environmental Impacts	Yes/ May Create	No	Details (mention distance to these features in meters/kilometres, and quantities in g/kg/T as applicable. Also mention if any project components is excluded / regulated Lsbased on location/activities as per National / State regulations & need permits/follow guidance)
	subproject area?			pipeline.

Impacts due to Storage and Wastes: Pollution and Hazards

Sl.no	Type	Yes	No	Details (mention distance to these features in meters/kilometres, and quantities in g/kg/T as applicable. Also mention if any project components is excluded / regulated based on location/activities as per National / State regulations & need permits/follow guidance)
11	Will the subproject or its components cause any impact due to storage of materials, wastes or pollution due to releases during various project activities			
i)	Will the project use or store dangerous substances (e.g., large quantities of hazardous chemicals/ materials like Chlorine, Diesel, Petroleum products; any other?		No	There is no storage of hazardous chemicals or materials like chlorine is involved in the project components.
ii)	Will the project produce solid or liquid wastes; including construction/demolition wastes (including dredging, de-weeding wastes, muck/silt, dust, sludge, C&D wastes, hazardous wastes (such as asbestos from existing network), e-wastes (from equipment)); polluted liquids?	Yes		There is no solid or liquid waste due to demolition waste. The construction waste shall be disposed in appropriate way as described in the ESMP.

Sl.no	Type	Yes	No	Details (mention distance to these features in meters/kilometres, and quantities in g/kg/T as applicable. Also mention if any project components is excluded / regulated based on location/activities as per National / State regulations & need permits/follow guidance)
iii)	Will the project cause or increase air pollution or odour nuisance?	Yes		During the operation phase of LS and SPS, may generate nuisance odour to the nearby residential area. To mitigate odor control measures are proposed in all LS & PS
iv)	Will the project generate or increase noise levels which will impact surrounding biodiversity or communities?		No	There is no noise generating components involved in the project activity.
v)	Will the project generate or increase visual blight or light pollution?		No	There is no light prollution due to the project.
vi)	Will the project cause water pollution? (of waterbodies/ groundwater)?		No	There is no water pollution due to the project.
vii)	Will the project involve dangerous construction activities which may be a safety concern to workers/ host communities		No	There is no dangerous construction involved in the project. Safety measures shall be followed at the deep excavation area.
viii	Is there a potential for release of toxic gases or accident risks (e.g. potential fire outbreaks)		No	There is no potential release of toxic gases from the project.
12	Describe any other features of the project that could influence the ambient environment		No	There is no air quality disturbance due to the project activity.

Baseline Climate Data		
13. Project Area Baseline Note: Please provide details for ULB and also site. Please provide quantitative information where relevant.		
i)	Agro climatic zone	North East Agro climatic zone

ii)	No of Water Bodies in the ULB area	1
iii)	Name of the River(s) in the ULB	Kosasthalaiyar River
iv)	Proximity to River (kms)	30 m
v)	Proximity to Sea (kms)	5.56 km
vi)	Proximity to hilly terrains (kms)	No
vii)	High Flood Level of the River	97.97
viii)	Flooding Events (Years) (Based on historic data of extreme flood events and future projections based on available analysis)	In year 2005, project area continued to receive heavy rains, recording 241 mm in 24 hours on 28th October 2005, and 320 mm in 24 hours on 2nd December 2015.
ix)	Flooding hotspots in the ULB	No of flooding hotspots
x)	Available Water sources (Surface / ground)	Sadayankuppam Lake; Kosasthalaiyar River
xii)	Groundwater Level and potential zone	2-5; phreatic zone
xiii)	Normal Temperature & long-term average; trends in changes in temperature	Normal temperature is 29-degree c. Long term average temperature is 28-degree c.
xiv)	Rainfall trends & long-term average	Long term average rainfall is 1014 mm.
xv)	Land Use	Proposed project sites are vacant land.
xvi)	% of Green Cover in the ULB area	6.25
xvii)	% of Water Bodies/Rivers	9%
xviii)	Seismic Zone	2
xix)	Coverage rain water harvesting structures (in %)	
	a) Residential	91%

	b) Commercial & Institutional		100%		
	c) Government/ULB		100%		
xx)	RWH in buildings – Mandating byelaws		Yes		
xxi)	Frequency of drought in study area. Does the area face water scarcity? Please provide details.		Number of drought year – 3 Frequency - 4		
xxii)	Frequency and intensity of cyclones in study area.		1 or 2 severe cyclones every year		
14	Climate Change Impacts in project area				
(i)	Climate signal Please select the relevant signals	Climate hazard Please select the relevant hazards	Yes	No	Details
	☐ Sea level rise ☐ Frequency of tropical storms ☐ Intensity of tropical storms ☐ Higher precipitation amounts ☐ Shifting seasons ☐ Higher temperatures ☐ Less precipitation ☐ Lower temperatures ☐ Others	☐ Salt water intrusion	Yes		The saline water intrusion in projectarea is being caused by over-extraction of the groundwater. This causes the water pressure in the groundwater table to drop leading to the entry of the saline water from the sea which is 2 km away.
		☐ Flooding of the coast	Yes		The flood in the coastal area of Chennai was recorded in 2015 and 2021 due to extreme rainfall.
		☐ River flood	Yes		The Kosasthalaiyar river flood in was recorded in 2015 due to heavy rainfall.
		☐ Bank erosion (sea/river)	Yes		The coastal area in Chennai recorded a maximum erosion of -43 m/year.
		☐ Flash flood (heavy rain)	Yes		The flash flood was recorded in 2015 and 2021 with extreme rainfall.

		☐Landslides		No	There is no landslide prone area in the project area.
		☐ Forest/Bush fires		No	There is no forest or bush near the project area.
		☐ Water shortage/drought	Yes		Decrease in rainfall has contributed to the drop in water pressure and ground water level depletion.
		☐ Effects of heat		No	There is no heat effect at the project area.
		☐ Effects of cold		No	There is no heat effect at the project area.
		☐ Effects of winds	Yes		The project area is located near the shore. All the project components are designed to withstand the maximum wind pressure.
		☐ Effects of air quality		No	There is no major deviations or trend in the air quality at the project area.
		☐ Effects of storm surge	Yes		The project area is located near the shore. All the project components are designed to withstand the maximum lift pressure and wind pressure.
		☐ Soil quality/land degradation		No	There is no impact or change in the soil quality. The excavated soil shall be reused for filling.
		☐ Others		No	
ii)	Energy consumption for the project? Will the project result in GHG emission?		Yes		99.63 KW amount of energy shall be consumed. The project components of LS and SPS contain the pump which uses the electricity and emit the GHG.

iii)	Will the project affect any other water or other user? (downstream intake points of Water Supply projects, downstream water use by people, animals; irrigation)		No	There no other affect due to the project.
iv)	Is the project located in exploited ground water block?	Yes		The project is located at the over exploited ground water block. This project will increase the ground water table by treating the sewage water.
v)	Is the project area vulnerable to temperature fluctuations and drought?		No	The project area is not vulnerable to temperature fluctuatipons and drought.
vi)	Is the site vulnerable to hazards such as Earthquakes, Landslides, Flooding, Storm surge, Severe wind damage, Fire, Explosion, Other (specify)		No	The project area is not vulnerable to earchquakes, landslides, fire, explosion. The project area is located near the shore and there shall be storm surge and flooding due to heavy rain.
vii)	Will the project result in generation of wastes / by-product?	Yes		The project generates the sludge. The treated sludge is used as a fertilizer and given for agriculture purpose to farmers.
viii)	Will the project impact the water resource availability (surface/ ground water) and use (effluent/sewage disposal, bypasses from STPs/PS, leachate, runoff, wastes deposition, erosion)		No	The project will not impact the water source availability.
ix)	Will the project cause flooding of adjoining low-lying areas		No	The project will not cause flooding due to the project activity. During the failure of the LS and SPS may leads to flooding and this shall be controlled by stand by diesel generators and pumps.

(x)	Will the project impact water quality or quantity in natural/constructed Lakes, or ponds		No	The project will not impact the water source availability.

Project Environmental Enhancement Measures

Sl.No	Enhancement Measures	Yes	No	Details
15	Has the subproject design considered environmental enhancement measures?			
i)	Energy conservation measures/ energy recovery options incorporated in subproject design? Quantify the reduction in CO2 emission from the sub-project.	Yes		VFD has been proposed for all SPS's and there will be 30-40% savings in energy consumption.
ii)	Has the project considered alternate /renewable energy?	Yes		The project considered saving of the energy cost per year using VFD starter in SPS/LS instead of using conventional starter.
iii)	Has the project considered waste minimization (waste reuse/recycle options/circular economy)	Yes		The treated water is proposed to utilise for existing TTRO plant at Kodungaiyur. The treated sludge shall be used as fertilizer and given to farmers.
iv)	Rainwater harvesting, water recycling and other water resource enhancement measures proposed in the project?	Yes		The rain water harvesting system is proposed at the construction sites of SPS.
v)	Does the project include measures for prevention of wastage of water resource?	Yes		The waste water is collected and treated. The treated water shall be used for various purpose such as TTRO.
vi)	What waterbody conservation/ drinking water source improvements/drought management options are being proposed?	Yes		This project will collecte the sewage water from the project area and treat the sewage water for reuse purpose. This project shall enhance

				the ground water table and prevent the water pollution by letting sewage in the environment.
vii)	Design Considerations for protection of project components from extreme events - flood, drought, other natural disasters	Yes		The project components are designed to meet the extreme events such as flood. The SPS/ LS are designed above the HFL and ground water lifting pressure is considered for the construction of project components during heavy flood.
viii)	Greenbelt development proposed for the project?	Yes		Green belt development is proposed at the construction sites of SPS and LS.
ix)	Is the sub-project including design elements to strengthen infrastructure resilience? If so what?	Yes		The subproject shall provide the beter sanitation facility to the project area, improve the health status of the people in the locality, provide esthetic appearance to the city.
x)	Has the project considered nature-based solutions and if so what?	Yes		The collection pipeline is designed beased on the gravity.
xi)	Is the sub-project combining infrastructure and nature-based solutions? If so how?		No	
xii)	What design considerations is the project including to mitigate heat island effect?	Yes		The latest technology is proposed for pumps and electrical items to save the energy.
xiii)	What design considerations is the project including to preserve and expand green cover?	Yes		The SPS are designed with the VFD over the conventional starter for energy saving and cost saving.

				Wherever possible green belts are proposed in pumping stations.

Land Use, Resettlement, and/or Land Acquisition

Sl.no	Components	Yes	No	Details
1	Does the project involve acquisition of private land?		No	There is no acquisition of land for the project
2	Alienation of any type of Government land including that owned by Urban Local Body?		No	The land is owned by CMWSSB.
3	Clearance of encroachment from Government/ Local body Land?		No	The land is not under any encroachment, it is vacant land.
4	Clearance of squatters/hawkers from Government/ Local Body Land?		No	The land is owned by CMWSSB.
5	Number of structures, both authorized and/or unauthorized to be acquired/ cleared/		No	There is no acquisition of structures for the project.
6	Number of households to be displaced?		No	There is no displacement of houses for the project.
7	Village common properties to be alienated Pasture Land (acres) Acquisition / burial ground and others specify?		No	There is no acquisition of land for the project.
8	Existing land uses on and around the project area (e.g., community facilities, agriculture, tourism, private property) will be affected?		No	There is no community facility or agriculture activity is affected due to the project. The access to the property, houses shall be temporarily disturbed for a day or two due to excavation of road/street.
9	Will the project result in construction workers or other people moving into or having access to the area (for a long-time period and in large numbers compared to permanent residents)?		No	The local labours are given preference for the construction works.
10	Are financial compensation measures expected to be needed?		No	There is no finanicial compensation involved in the project.

Loss of Crops, Fruit Trees, Household Infrastructure and livelihood				
Sl.no	Components	Yes	No	Details
11	Will the project result in the permanent or temporary loss of the following?		No	
11.1	Crops?		No	The project activity shall not carry out at any agriculture land.
11.2	Fruit trees? Specify with numbers		No	There is no tree cutting involved due to the construction activity.
11.3	Petty Shops		No	There is no dislocation or temporarty economic impact due to the project activity.
11.4	Vegetable/Fish/Meat vending		No	There is no dislocation or temporarty economic impact due to the project activity.
11.5	Cycle repair shop		No	There is no dislocation or temporarty economic impact due to the project activity.
11.6	Garage		No	There is no dislocation or temporary economic impact due to the project activity.
11.7	Tea stalls		No	There is no dislocation or temporary economic impact due to the project activity.
11.8	Grazing		No	There is no dislocation or temporary economic impact due to the project activity.
11.9	Loss of access to forest produce		No	There is no loss of vegetation or access to the forest produce due to the project activity.
11.10	Any others - specify		No	
Welfare, Employment, and Gender				
12	Is the project likely to provide local employment opportunities, including employment opportunities for women?	Yes		The local people shall get the employment during the construction of project components.

13	Is the project being planned with sufficient attention to local poverty alleviation objectives?	Yes		The construction of the project components may involve the local people as labours for the construction work. This will provide the opportunity of the employment for the local people and help their life to improve economically.
14	Is the project being designed with sufficient local participation (including the participation of women) in the planning, design, and implementation process?		No	The project may involve the local people including women during the construction activity. But there is no local participation during the design and planning of the project.
Historical, Archaeological, or Cultural Heritage Sites				
15	Historical heritage site(s) require excavation near the same?		No	There is no heritage site required to excavate for this project.
16	Archaeological heritage site(s) require excavation near the same?		No	There is no archaeological site required to excavate for this project.
17	Cultural heritage site(s) require excavation near the same?		No	There is no cultural heritage site required to excavate for this project.
18	Graves or sacred locations require excavations near the same?		No	There is no graves or sacred site required to excavate for this project.
Tribal Population/Indigenous People				
19	Does this project involve acquisition / alienation of any land belonging to Tribal people?		No	There is no acquisition or alienation land for this project.
20	Will the project lead to displacement / other adverse impacts on tribal / indigenous peoples?		No	There is no displacement activity involved in the project.
Beneficiaries				
Sl.no	Components	Yes	No	Details

21	Population proposed to be benefitted by the proposed project	Approx. no.:	47,000
22	No. of Females proposed to be benefitted by the proposed project	Approx. no.:	23,000
23	Vulnerable households /population to be benefitted	Approx. no.:	200 (Households)
24	No. of Families to be benefitted	Approx. no.:	4,000

Date: _____

Signature and name of the Borrower

Authorised Signatory

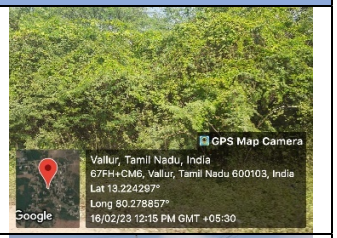
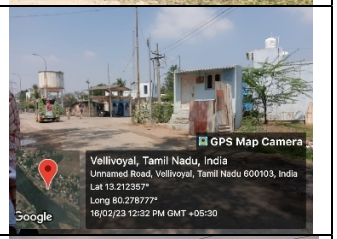
Note: This Screening sheet must be completed for each of the proposed subproject along with the DPR and ESIA Report.

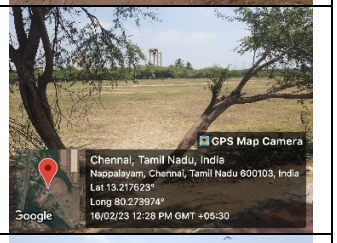
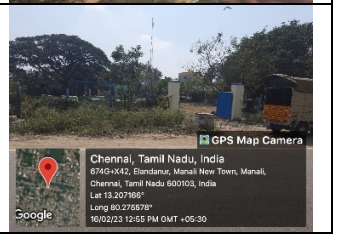
Indicative Enclosures:

1. Provide maps with the geographical location of the project; Google maps with project sites and project alignment
2. An appropriately scaled map clearly showing the project area and project sites with land use, existing buildings, infrastructure, vegetation, adjacent land use, utility lines, access roads and any planned construction, and
3. Any other information to describe the project, locations and possible impact as required.
4. Provide relevant maps on flooding hotspots, LULC, etc
5. Land details for the project sites with (i) extent available and required, (ii) location, (iii) survey numbers, (iv) FMB extract, (v) current land use, landuse classification (vi) land ownership, alienation/acquisition status, (vii) certificate giving availability of sites required for the project by the borrower, (viii) location photographs with Geo-co-ordinates of all project sites and alignment (start, end point).

Vulnerable PAPs are those living below poverty line, SC / ST families and women headed households, Widows, Physically Challenged persons; Elderly persons above the age of 60 years among the affected families.

Annexure 2 Land Details and Photographs of proposed Pumping Station & Lift Stations sites

S. No	Location	SPS / LS	Coordinates	Survey N0	Classification	Owner Ship	Extent of Land (Sqm)	Existing Land Use on Site	Remarks
1	Lift Stations	LS - 01	13.224297 N, 80.278857 E.	-	Road side	CMWSSB	225	CMWSSB Exg OHT	
2	Lift Stations	LS - 02	13.212357 N, 80.278777 E.	-	-	CMWSSB	225	CMWSSB Exg OHT	
3	Lift Stations	LS – 6A	13° 10' 57.8928" N 80° 16' 28.1172" E	112	Nathamporamboke	Revenue	300	Revenue Exg building	
4	Lift Stations	LS – 6B	13° 11' 0.0672" N 80° 17' 6.0612" E	-	-	Greater Chennai Corporation	400	Roadside	

5	Lift Stations	LS – 7A	13.190983 N, 80.243612 E,	-	Road side	Grater Chennai Corportation	100	Roadside	
6	Lift Stations	LS – 7B	13.192348 N, 80.254814 E.	-	-	CMWSSB	900	CMWSSB Exg OHT	
7	Lift Stations	LS – 7C	13.192269 N, 80.252492 E.	-	Road side	Greater Chennai Corporation	100	Roadside	
8	Lift Stations	LS – 08	13.217623 N, 80.273974 E.	142/3	Meikal land	Revenue	400	GCC	
9	Sub Pumping Station	SPS - 03	13.207166 N 80.275578 E	-	-	CMWSSB	1024	CMWSSB Exg SPS site	

10	Sub Pumping Station	SPS – 04	13.19661 N, 80.277888 E.	-	-	CMWSSB	992	CMWSSB Exg SPS site	
11	Sub Pumping Station	SPS - 05	13.196364 N, 80.271872 E.	-	-	CMWSSB	900	CMWSSB Exg SPS site	

Annexure 3 Public Information Notice Template

Public Announcement
Providing Underground Sewerage System to Edayanchavadi, Sadayankuppam and Kadapakkam

Under this project, works are being conducted by xxxx Contractor to provide sewerage network in Edayanchavadi, Sadayankuppam and Kadapakkam area in Greater Chennai Corporation.

As part of this, works for laying pipeline / sewerage network will be taken up in -------- road---/ street/ lane ……. From……to (provide dates).

We request you to kindly co-operate for smooth implementation of the works.

We also request you to drive vehicles / pedestrians to walk carefully

Inconvenience caused is regretted.

PIU - Contact No.
Contractor – Contact no.

Annexure 4 Sample Grievance Registration From

(To be available in Tamil and English)

The _____Project welcomes complaints, suggestions, queries, and comments regarding project implementation. We encourage persons with grievance to provide their name and contact information to enable us to get in touch with you for clarification and feedback.
Should you choose to include your personal details but want that information to remain confidential, please inform us by writing/typing *(CONFIDENTIAL)* above your name. Thank you.

<table>
<tr><td>Date</td><td>Place of registration</td><td colspan="4">Project Town

Project:</td></tr>
<tr><td colspan="6">Contact information/personal details</td></tr>
<tr><td>Name</td><td colspan="2"></td><td>Gender</td><td>* Male
* Female</td><td>Age</td><td></td></tr>
<tr><td>Home address</td><td colspan="5"></td></tr>
<tr><td>Place</td><td colspan="5"></td></tr>
<tr><td>Phone no.</td><td colspan="5"></td></tr>
<tr><td>E-mail</td><td colspan="5"></td></tr>
<tr><td colspan="6">Complaint/suggestion/comment/question Please provide the details (who, what, where, and how) of your grievance below:

If included as attachment/note/letter, please tick here:</td></tr>
<tr><td colspan="6">How do you want us to reach you for feedback or update on your comment/grievance?</td></tr>
</table>

FOR OFFICIAL USE ONLY

Registered by: (Name of official registering grievance)	
Mode of communication: Note/letter E-mail Verbal/telephonic	
Reviewed by: (Names/positions of officials reviewing grievance)	
Action taken:	
Whether action taken disclosed:	Yes No
Means of disclosure:	

Annexure 5 Calculation of Energy Efficiency by using VFD Starter for Pumps

SL.NO	Description	Pump HP	Energy Consumption per day using conventional starter (kWh)	Energy Cost per day @ Rs.8.00using conventional starter	Energy Cost per Year using conventional starter	Energy Consumption per day using VFD starter (kWh)	Energy Cost per day @ Rs.8.00 using VFD starter	Energy Cost per Year using VFD starter	Energy Cost Saving	% of energy efficiency for one year (2025)
1	SPS 03	15 HP (3 Nos)	186.80	1494.42	545461.84	72.94	583.50	212978.49	332483.35	39.05
2	SPS 04	70 HP (3 Nos)	767.19	6137.52	2240194.80	239.47	1915.79	699263.05	1540931.75	31.21
3	SPS 05	7.5 HP (3 Nos)	86.93	695.45	253839.25	25.53	204.20	74533.64	179305.61	29.36

Annexure 6 Stakeholders Engagement Plan

Stakeholder Engagement and Information Disclosure Strategy				
Project : Underground Sewerage Scheme in Edayanchavadi, Sadayankuppam and Kadapakkam– Laying of *collection system, trunk main/pumping mains, and construction of Lift Stations/ Pumping Stations*				
Target stakeholders	**Information to be disclosed**	**Proposed engagement & disclosure method**	**Timing of Engagement**	**Responsible Parties**
1. Project Affected Persons- impacted by temporary economic or physical displacement- tenants/ hawkers/ vendors on alignments	• Project design details, alignments and their impacts • Provisions for compensating economic and physical displacement, timelines for completing rehabilitation • Communication on final rehabilitation/ compensation approved by govt. • Grievance mechanism in place	• FGDs and small group consultations • Print-Newspaper, Newsletter / leaflets/ Pamphlet • Radio information capsules	• At least twice- before & after compensating • During alignment/ PS works	• PIU/CMWSSB • Contractor
Households / people residing along alignment of transmission lines or in proximity to PS sites	• Project design details, planned alignments and their impacts • Design and site alternatives explored for impact minimization • Accidents and road safety/ traffic management issues and measures planned to be in place; • Information on likely disruptions to services and arrangement during construction including its duration and likely timings • Management of air and noise	• Newsletters/ pamphlets/ flyers • Focus group discussions • TV-Radio-Print-Digital based information dissemination • Helpline/ Toll-free numbers displayed at project locations and prominently	• Continuous, as required in construction stage • One week prior to start of construction in the respective stretches	• PIU/CMWSSB • Contractor

Stakeholder Engagement and Information Disclosure Strategy				
Project : Underground Sewerage Scheme in Edayanchavadi, Sadayankuppam and Kadapakkam– Laying of *collection system, trunk main/pumping mains, and construction of Lift Stations/ Pumping Stations*				
Target stakeholders	**Information to be disclosed**	**Proposed engagement & disclosure method**	**Timing of Engagement**	**Responsible Parties**
	pollution; Disruption to services and arrangement during construction • Community and Occupational Safety measures planned for; • Excavation works-sludge/ earth disposal plans • Labour management plans/ proposed camp sites • Grievance mechanism process	accessed areas • Suggestion boxes at site offices		
Other Interested Parties: • Resident Welfare Associations (RWAs) • Elected Reps of Municipal Corporation • Civil Society Organisations • Print and Tele Media • Staff of Line departments • Service providers and duty bearers • Staff of Municipal Corporations	• Project design details, planned alignments and their impacts • Design and site alternatives explored for impact minimization • Accidents and road safety/ traffic management issues and measures planned to be in place; • Information on likely disruptions to services and arrangement during construction including its duration and likely timings • Community and Occupational Safety measures planned for WTP/ OHSR constructions and transmissions;	• One-on-one meetings • Formal Small group meetings • Open forums and Town-hall meetings for RWAs and ERs • Formal presentations to closed groups like regulators, service providers and duty bearers	• Continuous, as and when required during construction	• PIU/CMWSSB • Contractor

Stakeholder Engagement and Information Disclosure Strategy				
Project : Underground Sewerage Scheme in Edayanchavadi, Sadayankuppam and Kadapakkam– Laying of *collection system, trunk main/pumping mains, and construction of Lift Stations/ Pumping Stations*				
Target stakeholders	**Information to be disclosed**	**Proposed engagement & disclosure method**	**Timing of Engagement**	**Responsible Parties**
• Community / Religious leaders • Regulatory agencies	• Excavation works-sludge/ earth disposal plans • Labour management plans/ proposed camp sites • Grievance mechanism process			
Civil Works Contractor, staff & subcontractors	• Project design details, alternatives, planned alignments and their impacts • Baseline information on environmental and social aspects • Project's induced environmental and social risk • Accidents & road safety/ traffic management measures planned • Orientation on EHS provisions • Sexual harassment provisions and requirements • Labor Management Procedures • Orientation on RAP implementation and requirements • ESIA requirements and measures proposed • Grievance mechanism proposed	• Provisions in Bid/ contract documents • One-on-One and formal small group meetings/ discussions • Formal presentations/ training to contractors project management team	• Once, at the time of contract signing and orientation during pre-construction phase • Periodic briefings and orientation at site • Feedback as and when required on site and monitoring reports	• PIU/CMWSSB • Contractor

Stakeholder Engagement and Information Disclosure Strategy				
Project : Underground Sewerage Scheme in Edayanchavadi, Sadayankuppam and Kadapakkam– Laying of *collection system, trunk main/pumping mains, and construction of Lift Stations/ Pumping Stations*				
Target stakeholders	**Information to be disclosed**	**Proposed engagement & disclosure method**	**Timing of Engagement**	**Responsible Parties**
	under the project, requirements • Feedback on consultant/ contractor implementation and supervision reports			

S. No.	Aspect	Mitigation measures	Responsibility	Implementation stage	Monitoring method	Performance Indicator	Frequency
1	Public disclosure	Placement of hoarding at public and prominent places indicating in English and Tamil language project details, name and contactnumber of Convenor and the Contractor.	Convenor/ Contractor	Pre-construction phase	No. of hoardings and locations chosen	Effectiveness of message communicated	Once
2	Conduct consultations with the potential	Understand the perception of stakeholders, the positive and	PMC E&S experts, Contractor EHS officer/	Project life cycle beginning from the early stage of pre-	Site observations, Review of available documents;	Procedure followed for conducting consultation;	

S. No.	Aspect	Mitigation measures	Responsibility	Implementation stage	Monitoring method	Performance Indicator	Frequency
	temperary economic impacts, beneficiaries, local communities and other stakeholders	negative impact of the project; Analyze the concerns and issues of potential temperary economic impacts, local communities and other stakeholders; Address the concerns raised as per ESMP provisions; andImplementation of project with a Gender responsive Approach.	Project Manager and Convenor of PIU	construction	Support or opposition of stakeholders in project activities; Project progress level; And Consultations conducted with stakeholders.	No. of meetings/ consultations held; No. of participants in each meeting; Profile of participants such as male and female; Type and severity of issues raised; Response and action taken; Awareness level aboutthe project; Temporary loss of potential temperary economic impacts compensated Favourable social atmosphere towards project and support to participation in project activities; and Increased engagement in terms of number and	

S. No.	Aspect	Mitigation measures	Responsibility	Implementation stage	Monitoring method	Performance Indicator	Frequency
						level of stakeholders and women in the project activities.	
3.	Effective functioning of GRC	Resolve the E&S related complaints and disputes in a time bound manner amicably without any cost.	GRC members headed by the authority	Project life cycle beginning from the early stage of pre-construction.	Site inspections; Consultations held withpotentialtemperary economic impacts, and other stakeholders; Project related E&S complaints received inwriting or verbally.	Adequacy of information & dissemination about the GRC and its objectives among the stakeholders; No. of GRC meetings held and timeframe; GRC members present in each meeting; No. of complaints/grievances received and resolved; Time taken; Satisfaction of affectedparties; andCourt cases filed or withdrawn.	Whenever required
4.	Organize meetings with line departments to seek project support as required	Coordination and meetings with the line departments, namely District Administration, SPCB, PWD, Traffic Police, GCC/ ULBs/ Town	PIU CE/ SE/EE	Project Planning stage onwards	Review the feedbackof participants of themeeting; Date, time, and venuefixed as per suitability ofother	No. of officials participated in the meetings and signed the attendance sheet; Relevant information shared; Comments/suggestions	Semi annually

S. No.	Aspect	Mitigation measures	Responsibility	Implementation stage	Monitoring method	Performance Indicator	Frequency
		Panchayat and line agencies; Understand the role of line department and support envisaged for project implementation and operation; and obtain an update related to potential temporary economic impacts, beneficiaries and other stakeholders.			departments; Communicated information in advance (letter signedby the CE/SE of theCMWSSB); Presentation about the project (PPT), including objectives of the meeting, expectations from the participants; andQ&A details.	offered, Effectiveness of meeting in project implementation and operation; Improved communication, coordination helpful in project activities; Increased understanding about the project related tasks; and Other facilitation roles.	
5.	Public awareness about the project	Organize public eventsand engage all stakeholders like related government departments, local communities, beneficiaries of the project, women's group, NGOs in project areas.	PIU, PMC, Contractors	Pre-construction stage and onwards	Review the public awareness activities undertaken; Feedback of target groups to assess the effectiveness of suchactivities.	People understand importance of project and need for environmental and social sustainability;	Semi annually

Stakeholder engagement format

S.No.	Activities	Details of Meetings/Consultations
1.	Officials who conducted meetings and consultations with the PAPs and other stakeholders in project villages	
2.	Name of locations and number of person participated	
3.	Profile of stakeholders (shopkeepers, residents, women, officials from other department, etc. as applicable)	
4.	Date of meetings/ consultations held	
5.	Issues and demands raised by the PAPs and other stakeholders	
6.	How these problems and demands are being solved?	

Appendix 6.1

Proceedings of the Public Hearing/Stake Holders Meeting conducted on 17/06/2023

Information on Public Consultation is given adequately to the Public by means of notice, personal contact, etc. As per the World Bank policy on access to information and disclosure, the proposed project attracts Public Hearing.

The Public Hearing was arranged by the Chennai Metropolitan Water Supply & Sewerage Board (CMWSSB). The concerned persons having plausible take in environment and social aspect were requested to attend the meeting. Wide canvassing has been made by issuing notices door to door and keeping displays. The minutes of public consultation are as follows.

The following were present during public meeting.
1. Counsellors
2. Members from Residential welfare association
3. Officials
4. Social Expert

Stake holder consultation was started by SE, CMWSSB, explaining the project details as listed below:

- The total length of streets is 89.50kms covering Edayanchavadi, Sadayankuppam and Kadapakkam.
- The entire sewerage system is design for the population estimated for 2055. Totally 4000 houses will be benefitted out of this scheme.
- The collected sewage from this project is pumped to Sewage Treatment Plant in Kodungaiyur.

ULB to explain the designed service levels and the need for reduction in service levels. Both during floods and drought ULB will strive to maintain a reduced service level.
If you implement the new scheme what about the old scheme? Will you be able to merge the old scheme with the new scheme?

Selvan, Manali: How are you planning to pump the sewage? Will it be discharged into local open grounds? Will it pollute the ground water?
Official: The entire sewage generated from this scheme will be pumped to Kodungaiyur STP by a 10 Kms pumping main line. The sewage will not be let open as per design.

Counsellor: What about the existing line in Manali New Town?
Official: The existing system will be functional until the entire scheme is completed. The new system will be laid parallelly, once the new pipe lines, pumping main and pumping stations are constructed, the existing 30 years old system will be decommissioned.
Counsellor: The existing line are in depth condition, how you are planning to connect both? Will you be able to change the connection in all the existing house hold? The existing house needs to pay money for this?
Officials: It is free for households with existing sewer connections.

Counsellors: The place like Edayanchavadi comes under village panchayat so we are paying Rs.120 as tax till date. We don't have assessment copy, when we approach you for any work will you ask for assessment copy or not?
Other Counsellors: Since the places are upgraded to Panchayat to corporation, the officials from Corporation come and assess the areas.
Secretory, Edayanchavadi: The scheme is going to implement in all the surrounding areas of Edayanchavadi or it comes only for Edayanchavadi?

Official: The scheme is to be implemented for area that comes under the Chennai city limit of Division-15 & 16 ie., Edayanchavadi, Sadayankuppam and Kadapakkam.

Social Expert: Do you face Water problem during Rainy season?
Selvan: The drainage water comes into our houses during rainy seasons.
Mohammed Hussain: The existing Pumping is not in a proper way, if we pump from here the sewage water is pumped very slowly, we are facing this issue for the last 10 years. Now the roads are raised up so the new scheme will come to the present level then how do you merge the scheme with existing scheme?
Official: The pumping main and pumps designed now are capable of pumping to required head.

Social expert: Have you formed any union to sort out these issues?
Mohammed Hussain: As we joined together as residential welfare association and given petition for several time.
Counselor: Every election the candidates promising that they will clear the acylation bund, the article published in Hindu regarding this. Before it was under CMA and did not handover to Board. After the 2013 it was handed over to board.
Social Expert: Apart from drainage, do you face flooded situation at street?
Perumal: The rain water and septic tank water merges and the street was fully flooded. The scheme was framed without refer the layouts.
Social Expert: I will register the opinion.
Counsellor: Why the press is not available?
Officials: As this is a consultation meeting conducted by the board, press is not invited.
RWA (Resident Welfare Association): yes we face more water scarcity before but now the situation got changed we get ground water for all the household for other drinking purpose we buy water canes.
Social Expert: Do the ULB help you in clear the existing sewer issue?
Respondent: Before they used to do but now which is not like that, they let the septic tank overflow and keep the places filled with mud. The over flowed septic tank water comes to the road, which is the situation in most of the apartments. We too have complained about this. It will take one week to drain. The flooded water should be drained it by own none of the officials visit and drain the water from the street.
Social Expert: In summer how many days you get water?
RWA: We don't get water for 4 to 5 months in every summer
Counsellor: The quality of the water is good at Manali, sometimes sewage gets mixed with that get polluted.
Officials: In such incidents, CMWSSB will attend the complaint and arrest the leaks within 2 to 3 days.
Social Expert: Than how do you manage for house hold purposes?
RWA: We use our own borewell water for all our household purposes. We spend money on RO, cane water and also, we pay tax to the government.
Social Expert: Whenever the new DPR released the collective ideas and opinion received from the common people which is my role to give as a report on this to the government. I also register that you have drainage connections, the problems you face with the connection with sewage and without sewage. I will register your opinion one by one which will be helpful for me.
RWA: We already submitted the list of areas which does not have sewage connection. In our area the place which are located in very down so the drainage water over flows in summer season. The water stagnation removes, in last period the collection station is not maintained properly the pumping station is also not maintained properly. The sand in the widen road is accumulated in collection well and pipes got bracken we don't know which is relocated or not we don't know. They have given connection for 10 or 11 houses and rest of the houses said that you get through the connection with septic tank the situation is that the

septic tank is not closed still which is in open condition. If you close the septic tank the total system of this project will be collapsed and because which is not maintained properly.
Social Expert: can you please tell me the situation of your area during the flood?
RWA: During the rainy season the water is missing with septic tank water, in some areas by passing the water with other areas without removing the blockage, which creates the Mosquitos problems
Counsellor: we have done the survey of the areas without sewage connection and estimated to reimplementing the scheme at our area. 45 percent of the areas under funding proposals. The new evaluation DPR prepared related that any concern please let us know?
RWA: Can you please let us know the time period to complete the project?
Social Expert: In next three years 2024, 2025, 2026?
RWA: Under water sewage is the major concern in comparison with other issues like water scarcity, health and sanitation issues and so on. The work should be started before rainy season. During the election the work will be stopped.
In our area the places where the blockage resists which needs to be corrected and removed before the rainy season.
RWA: The lacking of manpower and machineries is there, where are you going to locate the pumping station?
Officials: The pumping stations will be located in sites under the possession of CMWSSB.
RWA: We have taken resolution to bring Underground Sewage system and drinking water connections in all the areas of Sadayankuppam and Kadapakkam. By this project let us hope that sewage problem in this ULB will be put to an end.
Mr. (Executive Engineer, CMWSSB) concluded the meeting by thanking all the participants who have attended the meeting.

1. Attendances

PROVIDING COMPREHENSICE SEWERAGE SCHEME TO EDAYANCHAVADI, SADAYANKUPPAM AND KADAPAKKAM IN AREA-II OFFICE (MANALI)

SL No	Name & Address	Mobile No	Sign
1	P. Udhayakumar / ANDARKUPPAM	9962687911	
2	K. THANGASIVAM / KANNIAMMANPET	9884791579	
3	S. Gowrimani / Andarkuppam	8825952677	
4	P.D. Ravichandran 15. Ward	9840160066	
5	K Selvam Manchinambedu 15 Ward	9840278217	
6	A. [illegible]	9941466324	
7	K. ANGUSAMY	[illegible]	
8	R. Baskar	7904617864	
9	PK@Kannan Advocate (TNHB Phase-I & II Association) Associate Secretary	9884422756	
10	N. Hemnath TNHB Phase-2	9840375248	
11	D. Balakrishnan/TNHB Phase II	9962036847	
12	M. HEMANADHAN Phase-II & II Association	[illegible]	
13	R. Pugazhendi 59/22 MNT 9840260046		
14	P. CHANDRA MOHAN 9940097517		
15	M PERUMAL T.N.H.B. GS.	9444725163	

SL No	Name & Address	Mobile No	Sign
1.	P. KARPAGAM, SECN, CMWSSB	8144931000.	P. Karpagam 17/06/2023
2	R VENKATESAN, Asst Engineer-II CMWSSB	8144930902	17/6/2023
3	N. Singaravelan EE/P&D	8144930970	
4.	S. MARTHIC, EE/Coord/AEE i/c	8144930900	
5.	S. SUDARSHAN, A.E./P&D	8144930568	17/6/23
6	Dr. A.D MUNDIYAN/Social Expert	9940205623	
7.	R. Aadharsh Rajkumar. Environmental Engineer.	8072435765	

2. Feedback Forms

10 [illegible]

சென்னைப் பெருநகர் குடிநீர் வழங்கல் கழிவுநீரகற்று வாரியம்

கலந்தாய்வு கூட்ட கருத்து படிவம்

விரிவான பாதாளச் சாக்கடை திட்டம்
இடையான்சாவடி சடையான்குப்பம் மற்றும் கடப்பாக்கம்

இடம்: நெ. 162, நெடுஞ்செழியன் சாலை, மணலி,
சென்னை – 600 068

தேதி: 17.06.2023

பெயர் :	P. சந்திர மோகன்
பதவி / தொழில் :	தலைவர். மணலி புதுநகர் குடியிருப்போர் நலச்சங்கம்
முகவரி :	10/4. மணலி புதுநகர் சென்னை-600103
கைபேசி எண் :	99400 97517
மின்னஞ்சல் :	

உங்கள் கருத்துக்கள் மற்றும் ஆலோசனைகளை பதிவு செய்யவும்

அதிகாரிகளுக்கு வணக்கம்.

மணலி புதுநகர் [illegible]

இவண்
P. சந்திரமோகன் தலைவர்
மணலி புதுநகர் [illegible] சென்னை 103

10 copy

சென்னைப் பெருநகர் குடிநீர் வழங்கல் கழிவுநீரகற்று வாரியம்

கலந்தாய்வு கூட்ட கருத்து படிவம்

விரிவான பாதாளச் சாக்கடை திட்டம்
இடையான்சாவடிசடையான்குப்பம் மற்றும் கடப்பாக்கம்

இடம்: நெ. 162, நெடுஞ்செழியன் சாலை, மணலி,
சென்னை - 600 068

தேதி: 17.06.2023

பெயர் :	சி.நந்தினி சண்முகம்
பதவி / தொழில் :	வார்டு மாமன்ற உறுப்பினர்
முகவரி :	15/15 பெரிய பா.தீர்த்த கடு மணலிபுது நகர், சென்னை -103
கைபேசி எண் :	9445467015
மின்னஞ்சல் :	

உங்கள் கருத்துக்கள் மற்றும் ஆலோசனைகளை பதிவு செய்யவும்

இந்த பாதாள சாக்கடை திட்டத்தை வரவேற்கிறேன்.
இந்த திட்டத்தை விரைவில் என்னுடைய இடையஞ்சாவடி
பகுதிக்கு விரைவில் அமைத்து கொடுக்க வேண்டும்
இத்திட்டம் அமைவதால் மக்கள் பெரிதும் பயன்
படுவார்கள்.

S.N.
17/6/23

10 வது

சென்னைப் பெருநகர் குடிநீர் வழங்கல் கழிவுநீரகற்று வாரியம்

கலந்தாய்வு கூட்ட கருத்து படிவம்

விரிவான பாதாளச் சாக்கடை திட்டம்
இடையான்சாவடிசடையான்குப்பம் மற்றும் கடப்பாக்கம்

இடம்: நெ. 162, நெடுஞ்செழியன் சாலை, மணலி,
சென்னை - 600 068

தேதி: 17.06.2023

பெயர் :	R. பாஸ்கர்
பதவி / தொழில் :	வட்ட பகுதி பிரதிநிதி. 15வது வட்டம்.
முகவரி :	NO: 33 பெருமாள் கோவில் தெரு, சடையன்குப்பம் பாளையம், பாரதிய காலனி, மணலி புது நகர். சென்னை-600103.
கைபேசி எண் :	7904617864
மின்னஞ்சல் :	Baskardhana 1978@gmail.com.

உங்கள் கருத்துக்கள் மற்றும் ஆலோசனைகளை பதிவு செய்யவும்

வரவேற்கத்தக்க ~~[illegible]~~ திட்டம். இத்திட்டம் மேலும் எங்கள் பகுதி மக்களுக்கு, பயன் அளிக்க கூடிய திட்டம். பாதாள சாக்கடை திட்டத்தினை செயல்படுத்தி விரைந்து முடிக்குமாறு எங்கள் பகுதி மக்கள் சார்பாக கேட்டுக் கொள்கிறேன்.

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சென்னைப் பெருநகர் குடிநீர் வழங்கல் கழிவுநீரகற்று வாரியம்

கலந்தாய்வு கூட்ட கருத்து படிவம்

விரிவான பாதாளச் சாக்கடை திட்டம்
இடையான்சாவடிசடையான்குப்பம் மற்றும் கடப்பாக்கம்

இடம்: நெ. 162, நெடுஞ்செழியன் சாலை, மணலி,
சென்னை - 600 068

தேதி: 17.06.2023

பெயர் :	A. Rajendran.
பதவி / தொழில் :	16th Councillar.
முகவரி :	79/37, Manali New Town. Chennai - 600 103.
கைபேசி எண் :	7904237557.
மின்னஞ்சல் :	rajenadithya@gmail.com.

உங்கள் கருத்துக்கள் மற்றும் ஆலோசனைகளை பதிவு செய்யவும்

பாதாள சாக்கடை திட்டம் ஒரு தெருவில் ஆரம்பித்து அந்த தெருவை முடித்தவுடன் அடுத்த தெருவுக்கு செல்ல வேண்டும். சடையான் குப்பம் பகுதியில் phase-1 மற்றும் phase-2 பகுதிகள் முதலில் ஆரம்பிக்க வேண்டும்.

A. Rajendran.

10 [illegible]

சென்னைப் பெருநகர் குடிநீர் வழங்கல் கழிவுநீரகற்று வாரியம்

கலந்தாய்வு கூட்ட கருத்து படிவம்

விரிவான பாதாளச் சாக்கடை திட்டம்
இடையான்சாவடிசடையான்குப்பம் மற்றும் கடப்பாக்கம்

இடம்: நெ. 162, நெடுஞ்செழியன் சாலை, மணலி, சென்னை – 600 068

தேதி: 17.06.2023

பெயர் :	PK@ KANNAN. ADVOCATE.
பதவி / தொழில் :	SECRETARY TNHB MANALI PHASE-I & II WELFARE ASSOCIATION
முகவரி :	NO. 89/14, MANALI NEW TOWN, CHENNAI – 600103
கைபேசி எண் :	988 44 22756
மின்னஞ்சல் :	PKSKV20@gmail.com.

உங்கள் கருத்துக்கள் மற்றும் ஆலோசனைகளை பதிவு செய்யவும்

(1) இந்த பாதாள சாக்கடை திட்டம் தொடங்கும்போது Display Board வைக்க வேண்டும்.

(2) ஒவ்வொரு தெருவும் இணைப்பை தொடங்கி அதனை முறைப்படி முடிந்து அதிகாரிகள் வேலை முடிந்துவிட்டது என்று completion certificate கொடுக்க வேண்டும். அந்த தெருவில் ரோடு போட வேண்டும்

(3) Pumping station முறைப்படி பராமரிக்க வேண்டும்

சடையன்குப்பம், இடையன்சாவடி பகுதிகளுக்கு இந்த பாதாள சாக்கடை திட்டம் வேண்டும் என்று அதனை உடனடியாக விரைந்து தொடங்கி முடித்து கொடுக்க வேண்டும் என்று TNHB Manali Phase-I & II Welfare Association சார்பில் கேட்டுக் கொள்கிறேன்

[signature] 17/6/23

கையொப்பம்

[signature] 17/6/23

சென்னைப் பெருநகர் குடிநீர் வழங்கல் கழிவுநீரகற்று வாரியம்

கலந்தாய்வு கூட்ட கருத்து படிவம்

விரிவான பாதாளச் சாக்கடை திட்டம்
வடபெரும்பாக்கம், தீயம்பாக்கம் மற்றும் மாத்தூர்

தேதி: 17.06.2023

இடம்: நெ. 162, நெடுஞ்செழியன் சாலை, மணலி,
சென்னை – 600 068

பெயர் :	M. பெரியசாமி பொதுச்செயலாளர் T.N.H.B. Ph I, II.
பதவி / தொழில் :	
முகவரி :	NO. 395/1. பேஸ் II T.N.H.B. மணலி புது நகர் ரோடு 103.
கைபேசி எண் :	9444725161
மின்னஞ்சல் :	

உங்கள் கருத்துக்கள் மற்றும் ஆலோசனைகளை பதிவு செய்யவும்

T.N.H.B. பேஸ் I II. பாதாளசாக்கடை
திட்டம் தேவை மழைநீர் திட்ட
நீர் வெளியேற வடிகால்களை கழிவுநீர்
அமைக்க வேண்டும்

M. [signature]

கையொப்பம்

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சென்னைப் பெருநகர் குடிநீர் வழங்கல் கழிவுநீரகற்று வாரியம்

கலந்தாய்வு கூட்ட கருத்து படிவம்

விரிவான பாதாளச் சாக்கடை திட்டம்
இடையான்சாவடிசடையான்குப்பம் மற்றும் கடப்பாக்கம்

இடம்: நெ. 162, நெடுஞ்செழியன் சாலை, மணலி, சென்னை - 600 068

தேதி: 17.06.2023

பெயர் :	P. D. Ravi chandran
பதவி / தொழில் :	DMK 15th ward து. [illegible]
முகவரி :	No: 25/04 [illegible] Chennai 600 103
கைபேசி எண் :	9840160066
மின்னஞ்சல் :	PDRavichandran.MNI@gmail.Com

உங்கள் கருத்துக்கள் மற்றும் ஆலோசனைகளை பதிவு செய்யவும்

(1) [illegible handwritten Tamil text]

[signature]

கையொப்பம்

10 ca

சென்னைப் பெருநகர் குடிநீர் வழங்கல் கழிவுநீரகற்று வாரியம்

கலந்தாய்வு கூட்ட கருத்து படிவம்

விரிவான பாதாளச் சாக்கடை திட்டம்
இடையான்சாவடிசடையான்குப்பம் மற்றும் கடப்பாக்கம்

இடம்: நெ. 162, நெடுஞ்செழியன் சாலை, மணலி, சென்னை - 600 068

தேதி: 17.06.2023

பெயர் :	D. BALAKRISHNAN
பதவி / தொழில் :	Retired TYPIST SECRETARIAT Ch-9
முகவரி :	5/83, Dwaraga Nagar TNHB, Phase II
கைபேசி எண் :	9962036847
மின்னஞ்சல் :	

உங்கள் கருத்துக்கள் மற்றும் ஆலோசனைகளை பதிவு செய்யவும்

Good Scheme for the People.
kindly Execute them
as far as possible.
Thank you

D. Bala

கையொப்பம்

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சென்னைப் பெருநகர் குடிநீர் வழங்கல் கழிவுநீரகற்று வாரியம்

கலந்தாய்வு கூட்ட கருத்து படிவம்

விரிவான பாதாளச் சாக்கடை திட்டம்
இடையான்சாவடிசடையான்குப்பம் மற்றும் கடப்பாக்கம்

இடம்: நெ. 162, நெடுஞ்செழியன் சாலை, மணலி, சென்னை – 600 068

தேதி: 17.06.2023

பெயர் :	M. HEMANATHAN
பதவி / தொழில் :	Business.
முகவரி :	NO. 2/572, Phase-I Manali New Town, Chennai - 600103
கைபேசி எண் :	9840397951
மின்னஞ்சல் :	

உங்கள் கருத்துக்கள் மற்றும் ஆலோசனைகளை பதிவு செய்யவும்

* இந்த பாதாள சாக்கடை திட்டம் மக்களுக்கு உகந்த விஷயம் அமைய வேண்டும் பெரும்பாலும் கழிவுநீர் இணைப்புக்கும் அரசாங்கம் எவ்வளவு தொகை கட்ட வேண்டுமோ அந்த தொகையை கட்டிய பிறகும் அதற்கு மேல எந்த தொகையும் வாங்க கூடாது

Hemanathan
கையொப்பம்

10 [illegible]

சென்னைப் பெருநகர் குடிநீர் வழங்கல் கழிவுநீரகற்று வாரியம்

கலந்தாய்வு கூட்ட கருத்து படிவம்

விரிவான பாதாளச் சாக்கடை திட்டம்
இடையான்சாவடிசடையான்குப்பம் மற்றும் கடப்பாக்கம்

இடம்: நெ. 162, நெடுஞ்செழியன் சாலை, மணலி,
சென்னை – 600 068

தேதி: 17.06.2023

பெயர் :	A. சுகன்யா [illegible]
பதவி / தொழில் :	[illegible]
முகவரி :	4/34, மணலிபுதுநகர், சென்னை-103.
கைபேசி எண் :	9941766724.
மின்னஞ்சல் :	

உங்கள் கருத்துக்கள் மற்றும் ஆலோசனைகளை பதிவு செய்யவும்

சுற்றுப்புற கிராமத்துக்கு பாதாள சாக்கடை திட்டம் வருவது வரவேற்கத்தக்கது. ஆனால் புதிய இணைப்பு சாலையின் உயரத்தில் [illegible] உள்ளது. மணலிபுது நகரில் உள்ள CMDA குடியிருப்பு வீடுகளில் உள்ள கழிவுநீர் இணைப்புகள் மிகவும் தாழ்வாக உள்ளது. மழைக்காலத்தில் கழிவு நீர் வீடுகளில் புகுந்து தொல்லை ஏற்படுகிறது. இது புதிய இணைப்பிற்கு தகுந்தவாறு பழைய இணைப்பினை மேம்படுத்த வேண்டுகின்றேன், மேம்படுத்த தொகையை மக்கள் மீது வரியாக [illegible] [illegible] [illegible] [illegible] உதவி அளிக்கவும்

[signature]

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சென்னைப் பெருநகர் குடிநீர் வழங்கல் கழிவுநீரகற்று வாரியம்

கலந்தாய்வு கூட்ட கருத்து படிவம்

விரிவான பாதாளச் சாக்கடை திட்டம்
இடையான்சாவடிசடையான்குப்பம் மற்றும் கடப்பாக்கம்

இடம்: நெ. 162, நெடுஞ்செழியன் சாலை, மணலி,
சென்னை – 600 068

தேதி: 17.06.2023

பெயர் :	N. Hemnath
பதவி / தொழில் :	Private Company
முகவரி :	No: 5/78, Phase-2, manali new Town
கைபேசி எண் :	9840375248
மின்னஞ்சல் :	Hemes143@gmail.com

உங்கள் கருத்துக்கள் மற்றும் ஆலோசனைகளை பதிவு செய்யவும்

Good System, kindly
do fast Sir.

கையொப்பம்

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சென்னைப் பெருநகர் குடிநீர் வழங்கல் கழிவுநீரகற்று வாரியம்

கலந்தாய்வு கூட்ட கருத்து படிவம்

விரிவான பாதாளச் சாக்கடை திட்டம்
இடையான்சாவடிசடையான்குப்பம் மற்றும் கடப்பாக்கம்

இடம்: நெ. 162, நெடுஞ்செழியன் சாலை, மணலி,
சென்னை – 600 068

தேதி: 17.06.2023

பெயர் :	S. [illegible]
பதவி / தொழில் :	வட்ட செயலாளர் 15வது வட்டம்
முகவரி :	எண்: 153 கங்கையம்மன் கோவில் தெரு [illegible], சென்னை - 19
கைபேசி எண் :	9840471940
மின்னஞ்சல் :	

உங்கள் கருத்துக்கள் மற்றும் ஆலோசனைகளை பதிவு செய்யவும்

15வது வட்டத்திற்குட்பட்ட அனைத்து நகர் பகுதிகளும் திட்டம் நிறைவேறவும். [illegible] உள்ள குடிநீர் [illegible] வேண்டும்.

[signature]

கையொப்பம்

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சென்னைப் பெருநகர் குடிநீர் வழங்கல் கழிவுநீரகற்று வாரியம்

கலந்தாய்வு கூட்ட கருத்து படிவம்

விரிவான பாதாளச் சாக்கடை திட்டம்
இடையான்சாவடிசடையான்குப்பம் மற்றும் கடப்பாக்கம்

இடம்: நெ. 162, நெடுஞ்செழியன் சாலை, மணலி, சென்னை - 600 068

தேதி: 17.06.2023

பெயர் :	S. சிருமணி
பதவி / தொழில் :	ஆண்டார்குப்பம் கிராமக் தலைவர் / அ.தி.மு.க 16வட்ட (மே) துணைசெயலாளர் / அம்தொழில்
முகவரி :	3/32 பெருமாள் கோவில்தெரு ஆண்டார் குப்பம்
கைபேசி எண் :	8825952672 / 9840045368
மின்னஞ்சல் :	

உங்கள் கருத்துக்கள் மற்றும் ஆலோசனைகளை பதிவு செய்யவும்

1, சாலை அருகே உள்ள வீடுகளுக்கு மிக இணைப்பு கொடுக்கப்படுவிடும்

2, சாலையே இல்லாமல் இருக்கும் தெருவில் எப்படி இணைப்பு கொடுக்க போகிறீர்கள்?

கையொப்பம்

10 வது

சென்னைப் பெருநகர் குடிநீர் வழங்கல் கழிவுநீரகற்று வாரியம்

கலந்தாய்வு கூட்ட கருத்து படிவம்

விரிவான பாதாளச் சாக்கடை திட்டம்
இடையான்சாவடிசடையான்குப்பம் மற்றும் கடப்பாக்கம்

இடம்: நெ. 162, நெடுஞ்செழியன் சாலை, மணலி, சென்னை – 600 068

தேதி: 17.06.2023

பெயர் :	P. UDHAYA KUMAR
பதவி / தொழில் :	CONTRACTOR / ஒப்பந்தப்புப்பம் கிராம பெருமைகள்
முகவரி :	3/19 Perumal Koil St ANDARKUPPAM CH-103
கைபேசி எண் :	9962687911
மின்னஞ்சல் :	dhanshan1979@gmail.com

உங்கள் கருத்துக்கள் மற்றும் ஆலோசனைகளை பதிவு செய்யவும்

எங்கள் வீடு கழிவு கழிநீர் குழாய் அமைப்பது விரைவாக முடித்து விரைவாக முடிக்கவும்

கையொப்பம்

சென்னைப் பெருநகர் குடிநீர் வழங்கல் கழிவுநீரகற்று வாரியம்

கலந்தாய்வு கூட்ட கருத்து படிவம்

விரிவான பாதாளச் சாக்கடை திட்டம்
இடையான்சாவடிசடையான்குப்பம் மற்றும் கடப்பாக்கம்

இடம்: நெ. 162, நெடுஞ்செழியன் சாலை, மணலி, சென்னை – 600 068

தேதி: 17.06.2023

பெயர் :	K. [illegible]
பதவி / தொழில் :	Ex- chairman Zone-II Manali
முகவரி :	2/21 [illegible] CH-103
கைபேசி எண் :	9884791579
மின்னஞ்சல் :	

உங்கள் கருத்துக்கள் மற்றும் ஆலோசனைகளை பதிவு செய்யவும்

ஒப்பந்ததாரர் இறுதி செய்து அதன் பிறகு அவர்கள் குறைந்தளவில் மக்கள் இருந்து கேட்டு கட்டணம் கட்டத வேண்டுமென கேட்டுக் கொள்கின்றேன்.

கையொப்பம்

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சென்னைப் பெருநகர் குடிநீர் வழங்கல் கழிவுநீரகற்று வாரியம்

கலந்தாய்வு கூட்ட கருத்து படிவம்

விரிவான பாதாளச் சாக்கடை திட்டம்
இடையான்சாவடிசடையான்குப்பம் மற்றும் கடப்பாக்கம்

இடம்: நெ. 162, நெடுஞ்செழியன் சாலை, மணலி,
சென்னை - 600 068

தேதி: 17.06.2023

பெயர் :	R. புகழேந்தி
பதவி / தொழில் :	மணலிபுதுநகர் குடியிருப்போர் நலசங்கம் தலை
முகவரி :	59/22 மணலிபுது நகர்
கைபேசி எண் :	9840260046.
மின்னஞ்சல் :	சென்னை 103.

உங்கள் கருத்துக்கள் மற்றும் ஆலோசனைகளை பதிவு செய்யவும்

எங்கள் பகுதியில் குடிநீர் மிகவும் கலங்கலாக வருகிறது. மற்றும் நீர் காலில் வருகிறது. இதை சரிபடுத்துமாறு கேட்டுக் கொள்கிறேன்

10 of 10

சென்னைப் பெருநகர் குடிநீர் வழங்கல் கழிவுநீரகற்று வாரியம்

கலந்தாய்வு கூட்ட கருத்து படிவம்

விரிவான பாதாளச் சாக்கடை திட்டம்
இடையான்சாவடிசடையான்குப்பம் மற்றும் கடப்பாக்கம்

இடம்: நெ. 162, நெடுஞ்செழியன் சாலை, மணலி, சென்னை – 600 068

தேதி: 17.06.2023

பெயர் :	D. LOGADASS
பதவி / தொழில் :	SURVIOR.
முகவரி :	135/7 1st Street Sadayan kuppam manali New town ch. 103
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உங்கள் கருத்துக்கள் மற்றும் ஆலோசனைகளை பதிவு செய்யவும்

1) அனைத்து பாதுகாப்பு அம்சங்களும் முறையாக கடைபிடிக்க வேண்டும்.

D.

கையொப்பம்

10 வது

சென்னைப் பெருநகர் குடிநீர் வழங்கல் கழிவுநீரகற்று வாரியம்

கலந்தாய்வு கூட்ட கருத்து படிவம்

விரிவான பாதாளச் சாக்கடை திட்டம்
இடையான்சாவடிசடையான்குப்பம் மற்றும் கடப்பாக்கம்

இடம்: நெ. 162, நெடுஞ்செழியன் சாலை, மணலி, சென்னை – 600 068

தேதி: 17.06.2023

பெயர் :	M. இலக்கண்ணன்
பதவி / தொழில் :	மருத்துவ பரிந்தி
முகவரி :	No. 361/359 19th இடையன் குப்பம் பல்லாவரம்
கைபேசி எண் :	9962744907
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உங்கள் கருத்துக்கள் மற்றும் ஆலோசனைகளை பதிவு செய்யவும்

1) பல்லாவரம் இடையன் குப்பம் பகுதியில் குறுக்குசாலை அமைக்க பட வேண்டும்

2) ஒரு தெருவின் பணிகள் முழுமை பெற்ற பின்பு மற்ற தெருவில் அமைக்க வேண்டும்

3) அனைத்து பாதுகாப்பு நடைமுறைகளும் சரியாக பின்பற்றப்பட்டு பணிகள் நடைபெற வேண்டும்

M. Ilakkannan

கையொப்பம்

10 copy

சென்னைப் பெருநகர் குடிநீர் வழங்கல் கழிவுநீரகற்று வாரியம்

கலந்தாய்வு கூட்ட கருத்து படிவம்

விரிவான பாதாளச் சாக்கடை திட்டம்
இடையான்சாவடிசடையான்குப்பம் மற்றும் கடப்பாக்கம்

இடம்: நெ. 162, நெடுஞ்செழியன் சாலை, மணலி,
சென்னை – 600 068

தேதி: 17.06.2023

பெயர் :	வே. முனுசாமி
பதவி / தொழில் :	சுய தொழில் [illegible]
முகவரி :	4/194 16வது தெரு பர்மா நகர் சடையன் குப்பம் பர்மா நகர் சென்னை - 103
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மின்னஞ்சல் :	munusamyvn1988@gmail.com

உங்கள் கருத்துக்கள் மற்றும் ஆலோசனைகளை பதிவு செய்யவும்

ஐயா: சடையன் குப்பம் பர்மா நகர் பகுதியில் பாதாளச் சாக்கடை திட்டம் செயல் படுத்தும் இன் குடிசை வாழ் மக்கள் மற்றும் மீனவர் வசிக்கும் இடம் அமைத்து செய்து தருமாறு வேலை செய்து தரும் மாறு கேட்டு கொள்கிறோம்

V. Mun

கையொப்பம்

சென்னைப் பெருநகர் குடிநீர் வழங்கல் கழிவுநீரகற்று வாரியம்

கலந்தாய்வு கூட்ட கருத்து படிவம்

விரிவான பாதாளச் சாக்கடை திட்டம்
வடபெரும்பாக்கம், தீயம்பாக்கம் மற்றும் மாத்தூர்

இடம்: நெ. 162, நெடுஞ்செழியன் சாலை, மணலி,
சென்னை – 600 068

தேதி: 17.06.2023

பெயர் :	M. சதீஷ்குமார்
பதவி / தொழில் :	JCB operator
முகவரி :	193/16th தெரு பர்மா நகர், சுனாமி குப்பம் [illegible] சென்னை – 103
கைபேசி எண் :	7092294762
மின்னஞ்சல் :	sathishkumar1051988@gamail.com

உங்கள் கருத்துக்கள் மற்றும் ஆலோசனைகளை பதிவு செய்யவும்

பர்மா நகர். சுனாமி குப்பம். பகுதியில் முதல் கட்டமாக, பாதாளச் சாக்கடை, திட்டத்தை விரைவாக செய்து தருமாறு. கேட்டுக் கொள்கிறேன்

M. Sathishkumar
கையொப்பம்

3. Photographs

4. Newspaper clips

பாதாள சாக்கடை பணி விரைந்து முடிக்க கோரிக்கை

மணலி, ஜூன் 18– மணலி மண்டலம், வடபெரும்பாக்கம், தீயம்பாக்கம், மாத்தூர், இடையஞ்சாவடி, சடையங்குப்பம், கடப்பாக்கம் ஆகிய பகுதிகளில், புதிய பாதாளச் சாக்கடை திட்டத்தை செயல்படுத்த, சென்னை குடிநீர் வழங்கல் வாரியம் திட்டமிட்டு, 794.28 கோடி ரூபாய் ஒதுக்கீடு செய்துள்ளது.

இந்த பணிகளுக்கு, 'டெண்டர்' விடப்பட்டு விரைவில் பணிகள் துவக்கப்பட உள்ள நிலையில், பாதாள சாக்கடை திட்ட கட்டமைப்பு பணிகள் குறித்த கருத்து கேட்பு கூட்டம், மணலி மண்டல குடிநீர் வழங்கல் வாரிய அலுவலகத்தில், நேற்று காலை நடந்தது.

இதில், கழிவுநீர் மற்றும் குடிநீர் வழங்கல் வாரிய மேற்பார்வை பொறியாளர் கற்பகம், செயற்பொறியாளர்கள் சிங்காரவேல், வெங்கடேசன் உள்ளிட்ட அதிகாரிகள் அடங்கிய குழு, பொதுமக்களிடம் கருத்து கேட்டனர்.

அப்போது, 16வது வார்டு கவுன்சிலர் ராஜேந்திரன் பேசுகையில், ''மணலி புதுநகர் பகுதி – I மற்றும் பகுதி – IIல், கட்டடங்கள் அதிகமாக இருப்பதால் பணிகளை அங்கிருந்து துவக்க வேண்டும். விரைந்து முடிக்கும் வகையில், பல குழுக்களாக பணிகள் மேற்கொள்ள வேண்டும்,'' என்றார்.

மேலும், 15வது வார்டு கவுன்சிலர் நந்தினி பேசுகையில், ''புதிய பாதாள சாக்கடை திட்டம் செயல்படுத்தும் போது, ஏற்கனவே செயல்பாட்டில் உள்ள பாதாள சாக்கடை குழாய்களை முழுமையாக பராமரிக்க வேண்டும்,'' என்றார்.

Annexure 7 Waste management plan

S. No.	Aspect	Mitigation measure/Procedure	Responsibility	Implementation	Monitoring methods	Performance indicators	Frequency
1.	Up keep of storage/ yard	Dispose-off the waste from the material storage to the designated site; and Ensure regular collection and removal of refuse and litter from the working site, office, labour accommodation, etc.	Contractor	Construction phase	Visual Inspection	Incidence of contamination	Daily
2.	Labour accommodation	Place sufficient number of garbage bins/containers at prominent locations of the project working sitesandlabour accommodations; Ensure emptying the garbage bins and dispose-off from the labour accommodation regularly in a hygienic manner; Dispose-off domestic waste water into drainage; Ensure sufficient number of bathingand ablution facilities in labour accommodations, sheds, and all the site staff; Create awareness about the importance and safe disposal of waste at work sites, labour accommodation and surroundings among the workers; and	Contractor	Construction phase	Visual inspections; and Records of waste disposal.	Incidence of staff not using facilities; and Incidence of pollution.	Daily

		Impart training about handling the different types of wastes, waste management, including hazardous waste.					
3.	Waste management measures	Collect all waste bins, containers from all sites; Collect recyclable wastes separatelyand arrange for its collection by the authorized vendor; Prevent littering and pollution by construction staff at work sites by providing bins or waste bags in sufficient locations; Provide separate bins/containers for hazardous materials and mark these clearly; Store hazardous / polluting materials on impermeable ground until disposed-off or collected by the authorized vendor; Do not allow any burning or burying of waste on site; and dispose of rubble and other waste construction materials at the designated site.	Contractor	Throughout project life cycle	Regular audits of the CWMP implementation; Visual inspection of waste collection and disposal; and Construction areas for littering	CWMP inplace; Extentto which CWMP is complied with; Presenceoflitter; Extentof filling rubbish bins; Total volume of general and hazardous waste storage capacity onsite; Extent of waste segregation; and Frequency of waste collection and disposal	Daily/ weekly as applicable
4.	Disposal of residual construction debris, exces soil and other materials	The contractor shall identify the site for debris and waste disposal that should be finalized prior to start of the earth works; Apply good practices and minimize the construction debris by the	Contractor	Construction phase	Audit of excess and residual construction material disposal recordsand data; and	Excavated soiland other wastes visible; and Cleanliness and maintenance of	Dailyandregularly.

		optimum use of material; Reuse the excavated soil and other material in back filling, landscaping, filling low lying area and public places. Yet the unused residue of soil and sedimentation left will be disposed of; Ensure that disposed waste do not cause soil and ground water pollution; Contractor should ensure that designated landfill site should be located in non-residential area at least 1000 meter away so that residents, flora and fauna are not impacted; Regularly clean up concretes pilled during construction; Sweep / rake / stack excess aggregate / stone chip / gravel / pavers into piles; Emptied cement and other material bags, containers and unusable bins sold to a licensed vendor; Dispose excess and residual waste to the designated site; The training should be imparted to			Visual inspection.	sites.	

		all staff about the effects of waste and litter and follow the appropriate disposal procedures; and Construction waste at site should be handled as per Construction and Demolition Waste Management Rules, 2016.					
5.	Hazardous waste disposal	Ensurethatcontaminants (includingcement)are not placeddirectlyonthegroundtoprevent runoff reaching the water resources; Ensure that the spillage of fuels, oil, lubricants collected does not contaminate the soil and water; Ensure the training of work force about environmental pollution and its management; Ensure disposal of hazardous waste at the designated site by the authorized vendor and prevention of pollution therein; Ensurehazardousmaterials such as solventbasedpaints, fuel, cleaning and polishing chemicals are handled with extreme precaution during their storing, transportation, and usage. Such material should be stored on impervious space/ floor; Ensure that only trained workers	Contractor	Construction and operation phases	Audit of hazardous material disposal recordsand data; and Visual inspection of hazardous materials handling, storage areas and disposal practices.	Incidence of non- compliance with safety procedures concerning hazardous waste material; Availability of spillage kits; Incidence of spillage of hazardous materials on site; and Evidence of leaks and contamination of soil and water	Daily or as required

		are involved in collection, storage, and disposal process; All precautions, safety and health measures are followed; Dispose of non- recyclable and recyclable metal objects through authorized vendor; and Regularly audit the records maintained for hazardous and other waste generated and disposal to designated site.					
6.	Closure and rehabilitation of construction and labour sites	Contractor to restore the original condition of the site prior to demobilization; Uponworks completion, clear all structures, rubbish, fill-in and seal all the pits and trenches; Remove all construction equipment, vehicles, equipment, waste and surplusmaterials, temporary fencing and other items from the site; Clean up and remove any spills and contaminated soil in the appropriate manner; Donotburydiscarded materials on site or any other land not designated for this purpose;	Contractor	After completion of the civil works in construction phase	Physical verification of the site as well as items listed in the records of contractor; and Rehabilitation measures conducted after completion of construction and operation works.	Clean and clearsite; Site rehabilitated; and Original condition of construct ion and other sites restored	Onetime

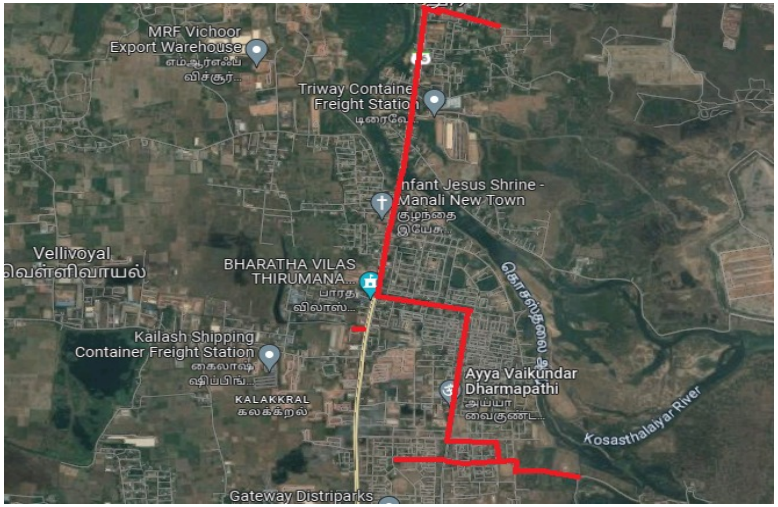
		Hand ove rthe completed construction site and the sites used for material storage and labour accommodations and sheds will be handed over; and Handover the project site after completionof operation phase.					

Annexure 8 Socio economic detailsof Potential Temporary Economical Impacts

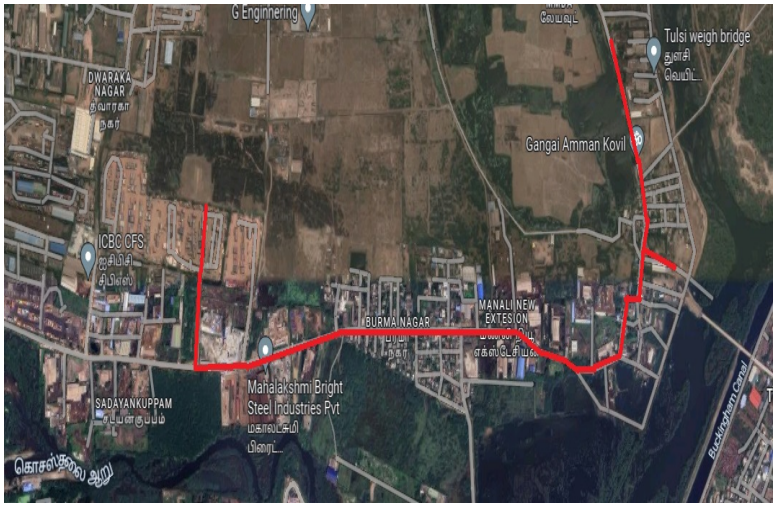
S. No.	Name	Gender	Age	Education	Marital Status	Family Members	Residential Structure / Ownership status	Type of Commercial structure	Average Income per day	Vulnerblecatagory
1	Kasturi	Female	60	Primary	Married	4	Rented	Fruit Seller	400	No
2	Rajendran	Male	50	Primary	Married	4	Rented	Tea Shop	650	No
3	Pazhaniammal	Female	62	Primary	Married	2	Rented	Tiffin Shop	600	No
4	Sumathi	Female	45	Primary	Married	4	Own	Tiffin Shop	550	No
5	Kaliyappan	Male	72	Primary	Married	2	Rented	Coconut Seller	500	No
6	Deva	Male	50	Primary	Married	4	Rented	Street Vendor	400	No

Source: Social Survey date: 07-02-2023 - cut-off date: 08-02-2023

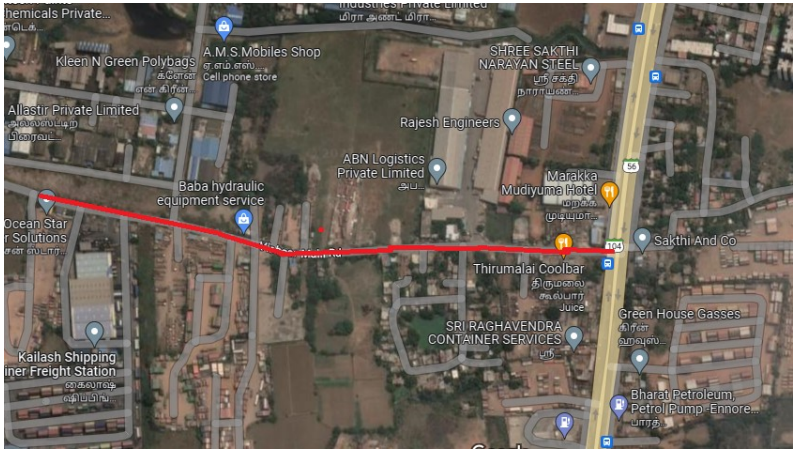
Appendix 8.1 Survey alignment Map of Edayanchavadi, Sadayankuppam, Kadapakkam



Social survey alignment map for Edayanchavadi

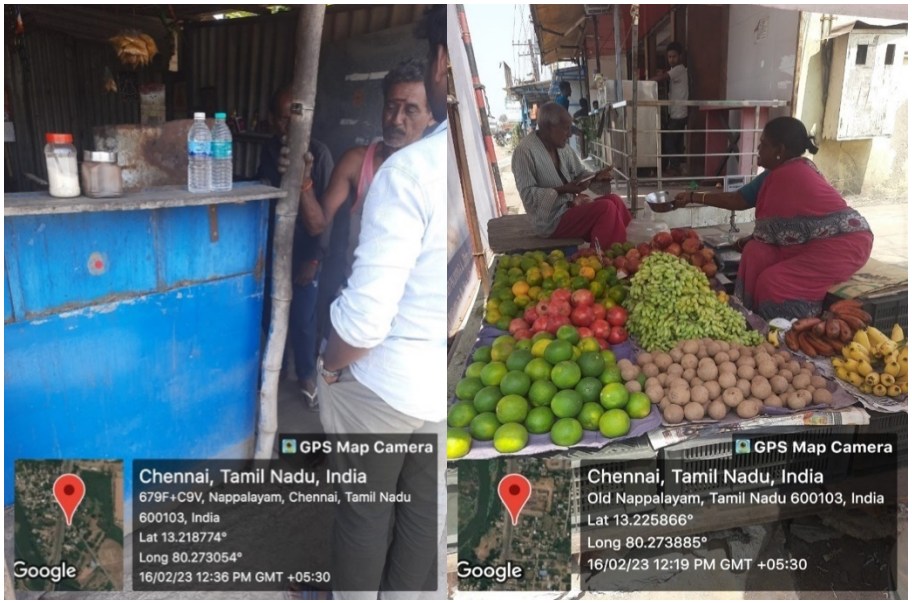


Survey alignment map for Sadayankuppam



Survey alignment map for kadapakkam

Appendix 8.2 Potential Temporary Economic Impacts identified under the project


GPS Map Camera
Chennai, Tamil Nadu, India
679F+C9V, Nappalayam, Chennai, Tamil Nadu 600103, India
Lat 13.218774°
Long 80.273054°
16/02/23 12:36 PM GMT +05:30
Google
GPS Map Camera
Chennai, Tamil Nadu, India
Old Nappalayam, Tamil Nadu 600103, India
Lat 13.225866°
Long 80.273885°
16/02/23 12:19 PM GMT +05:30
Google


18, Sadayankuppam, Manali New Town, Manali, Chennai, Tamil Nadu 600103, India
Latitude 13.183274° Longitude 80.286037°
LOCAL 12:06:15 GMT 06:36:15 TUESDAY 02.07.2023 ALTITUDE 4 METER

Annexure 9 Labour Management Plan

LMP shall be prepared by the contractor following the requirements of the ESS2 on Labour and Working Conditions. The LMP is a living document, which is initiated early in project preparation, and is reviewed and updated throughout development and implementation of the project. Outline for LMP is provided below which is indicative and shall be made specific to the sub-project.

Description	Mitigation Measures	Responsibility	
		Implementation	Supervision
Applicable Laws	The contractor should ensure the compliance of applicable Indian Labour Laws such as Factories Act 1948, Building and Other Construction Workers Act 1996, Inter State Migrant Workmen Act 1979, Contract Labour (Regulation & Abolition) Act 1970, Workmen Compensation Act 1923, Child Labour (Prohibition & Regulation) Act 1986, Minimum Wages Act 1948, Employee State Insurance Act 1948, Employees Provident Fund Act 1991, Payment of Wages Act 1936, Payment of Bonus Act 1965, Equal Remuneration Act 1976, Payment of Gratuity Act 1972 and other International Labour organization conventions as ratified by India.	Contractor	PIU/PMC
Applicable Licences	Labour Licence and all other statutory work permits including Contract Labour& Interstate Migrant Worker License. Workmen compensation Insurance / Accident Insurance, EPF and ESIC.	Contractor	PIU/PMC
Site layout	Thelocation of the site, design and basic facility provision in the labour accommodation will be reviewed and approved by the PIU prior to the construction;	Contractor	PIU/PMC
Facilities	Maintain necessary living accommodation and ancillary facilities in functional and hygienic conditions; Provide adequate number of toiletsseparate for men and women workers, bathing area, kitchen, safe fuel/LPG for cooking and uncontaminated water for drinking, cooking	Contractor	PIU/PMC

Description	Mitigation Measures	Responsibility	
		Implementation	Supervision
	and washing; Ensure adequate water supply in all toilets and urinals; The labour camp should have protection from heat, rain, flooding, insects, snakes and mosquitoes. It should have adequate provisions for emergency such as fire safety, security, etc; Require the non-discrimination and harassment and should be socialized/ basis for training, and covers potential ethnic discrimination.		
Health and Safety	Provide first aid medical kit at labour accommodation; train the labour for usage of items in injury, emergency, coordinate with nearest government and private medical centers for the medical services, display the contact number of medical doctor(s) and keep a vehicle for emergency travel all the time; necessary HIV/AIDS prevention measures will be taken at labour camp; HIV/AIDS awareness program will be organized by the contractor's Environment & Safety Officer; Where feasible, manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; ULB shall ensure proper segregated storage, collection, transport, treatment and disposal of all wastes following the SWM / C&D waste Rules 2016;	Contractor	PIU/PMC

Description	Mitigation Measures	Responsibility	
		Implementation	Supervision
	remove all wreckage, rubbish, or temporary structures which are no longer required;		
Labour use	The total number of workers to be employed on the project, and the different types of workers: direct workers, contracted workers, temporary or seasonal workers and community workers. (Where numbers are not yet firm, an estimate should be provided) broad description and an indication of the likely characteristics of the project workers e.g., local workers, national or international migrants, female workers, workers between the minimum age and 18; details of the migrant workers, labour camp location should be shared with local Police station as per regulatory norms.	Contractor	PIU/PMC
Grievance	Establish a mechanism for grievance redressal for both direct and contract labourers, disclose contact details of officials concerned. Sign boards and GRC name boards should be written in local, multilingual languages and English at the labour camp.	Contractor	PIU/PMC
Policies and Procedures	Provide workers with contracts with fair terms and conditions Require the contractor to preferentially engage unskilled local workforce form the local communities Make all contracted workers to follow the rules for on-site behaviour (with colleagues) and conduct in the community. Conduct induction and toolbox talks outlining expected conduct and local community values.	Contractor	PIU/PMC

Description	Mitigation Measures	Responsibility	
		Implementation	Supervision
	Introduce disciplinary measures for violations and misbehaviours. Settheminimumageofproject workers eligible for any type for work. Train the labour for environmental protection, occupational and community health and safety and gender equality. Follow the equal wages policy without any discrepancies or gender partialities. Ensure minimum legal labour standards as per ILO regulations (child/forced labour, no discrimination, working hours, minimum wages) are met with. Contractors shall implement codes of conduct concerning employment and workforce behaviour (including but not limited to safety rules, zero tolerance for substance abuse, environmental sensitivity of the area, dangers of sexually transmissible diseases and HIV/AIDS, gender equality and sexual harassment, respect for the beliefs and customs of the populations and community relations in general).		

Annexure 10 Carbon Emission calculation for 110 MLD STP Plant at Kodungaiyur

Description	Direct Emissions	Indirect Emissions	Other Indirect Emissions
Emission t/a	4,052	5,476	1,058
Percentage of total plant emissions	49.4%	41.9%	8.7%

Carbon Mitigation calculation for 110 MLD STP Plant at Kodungaiyur

Description	From Direct Emissions	From Indirect Emissions	From other Indirect Emissions
Utilization of biogas through sludge digestion (t/a)	401	-	-
Reduction of purchase of electricity (t/a)	-	4107	-
Green Belt development with 288 Spider lilly plant t/a	21	-	-

Sludge generated from STPs is used to generate bio gas (methane CH4) by way of sludge digestion, which then used as fuel to generate electricity. The generated electricity is used to operate the STPs. The CH4 recovery can be used as energy combustion, on the one hand, the CO2 produced by combustion has a lower warming potential than the direct emission of CH4, thus it reducesoverall 4529 t/a GHG emissions, can also reduce power consumption and reduce costs. The indirect emissions from power consumption accounted for 41.9%, the working effects of blowers, water pumps, aerators and other equipment during operation are carefully designed to reduce inefficient energy consumption and save power consumption by 75%.

The carbon emissions of sewage treatment plants are divided into three parts: direct emissions, indirect emissions, and other indirect emissions.

Direct Emissions:
Direct GHG emissions from sewage treatment plants are mainly CO_2 from the aerobic decomposition and conversion of organic matter in the biological treatment process, CO_2 and CH_4 from the anaerobic digestion process, N_2O from the denitrification process, and direct emissions from other links.

Indirect emissions:
The purchased electricity consumed by the operation of blowers, pumps, aerators and other equipment in the sewage treatment plant generates indirect emissions.

Other indirect emissions:
Indirect GHG emissions from the purchased medicines, purchased raw materials, and fuel transportation consumed by the sewage treatment plant.

The CO_2, CH_4, N_2O and other greenhouse gases emitted by the sewage treatment plant are uniformly measured by the amount of CO_2 produced. According to the global warming potential (GWP), the potential value of CO_2 is 1, and the potential values of CH_4 and N_2O are 23 and 296 respectively; CH_4 and N_2O can be converted into carbon emission equivalent according to the corresponding potential values.

Direct emissions
It is the amount of CO_2 directly emitted during sewage treatment. According to the "Greenhouse Gas Inventory Protocol-Corporate Accounting and Reporting Standards", in the total GHG emissions, the CO_2 emissions of wastewater must be included.
The calculation formula of CO_2 production is:

$$M_{CO_2} = Q * EF_{CO_2}$$

In formula : M_{CO_2} Biological treatment process emissions, in g

Q Amount of sewage treated during calculation, in m^3

EF_{CO_2} The emission factor

Indirect emissions
During the operation of the sewage treatment plant, blowers, pumps, aeration equipment and other equipment consume a large amount of electricity, the carbon emissions of the purchased electricity during the production process are the indirect emissions of the sewage treatment plant, the calculation formula:

$$M_{CO_2 \cdot E} = E * EF_{CO_2 \cdot E}$$

In formula:

$M_{CO_2 \cdot E}$	Indirect CO_2 emissions from power consumption, kg;
E	Power consumption, unit: kw/h;
$EF_{CO2 \cdot E}$	The emission factor of electric energy consumption, in $kgCO_2/kw \cdot h$

Other indirect emissions
Some chemicals are used in the sewage treatment process, such as disinfectants, flocculants, etc., the formula for calculating carbon emissions of purchased chemicals:

$$M_{CO_2 \cdot Y} = \sum Y_i * EF_{CO_2 \cdot Y_i}$$

In formula:

$M_{CO_2 \cdot Y}$	Indirect CO_2 emissions from chemicals consumption, in kg;
Y_i	Consumption of medicine i, unit: kg;
$EF_{CO_2 \cdot Y_i}$	i The emission factor of CO_2 consumed by chemicals, in $kgCO_2/kg$.

Each chemicals calculated its CO_2 emissions with corresponding emission coefficients. The emission factor of coagulant is 25kgCO_2/kg of coagulant, and the emission factor of disinfectant is 1.4 kgCO_2/kg of agent.

From the analysis of the GHG emission composition of the whole plant, it can be seen that the GHG directly discharged from the sewage treatment process and the indirect discharge generated by the power consumption are the main emission sources, accounting for 48% and 40.6% of the total discharge of the whole plant respectively. In direct emissions, direct CO_2 emissions accounted for 84.9%, direct emissions of CH_4 accounted for only 9.3%, and N_2O emissions accounted for 5.8%. Among the GHG indirect emissions generated by power consumption, the power consumption of the production process reached 98.2% of the power consumption of the whole plant, and the aeration unit consumed the largest power consumption, which was 52.4% of the power consumption of the whole plant, the power consumption of the three parts of the unit reached 89.3% of the power consumption of the whole plant. Among other indirect emissions, chemical consumption accounts for a relatively low proportion of the plant's GHG emissions.

Mitigation measures:

The process design cause gaps in the composition of GHG emissions, if anaerobic processes are used, CH_4 emissions will increase significantly, and indirect emissions from chemical consumption will also increase significantly. For reducing direct GHG emissions, ecological treatment processes such as stabilizing ponds, constructed wetlands, building greenhouses, cultivating aquatic plants, and planting trees, use plants to absorb nutrients such as nitrogen and phosphorus in sewage, absorb CO_2, and transform into plant bodies. Using the canopy area of the plant and the corresponding carbon fixation coefficient, the amount of GHG recovered by the ecological process can be determined.

CH_4 recovery can be used as energy combustion, on the one hand, the CO_2 produced by combustion has a lower warming potential than the direct emission of CH_4; on the other hand, it can save energy consumption and reduce GHG emissions. If CH_4 can be recycled, it can reduce GHG emissions by 672.57 t/a, and it can also reduce power consumption and reduce costs. Moreover, CH_4 is a renewable energy source, which meets the requirements of the country's low-carbon circular economy development.

Indirect emissions from power consumption accounted for 40.6%, the working effects of blowers, water pumps, aerators and other equipment during operation are carefully designed to reduce inefficient energy consumption and save power consumption.

Annexure 11 Immediate Incident Notification Form

Any Major Incident occurring on the Construction site of the Sub-Projects or caused by the Construction activities shall be reported by the Contractor/ Borrower / PIA to the Project Executing Agency (PEA) as soon as possible and not later than 24 hours after the incident occurred.

Definition of Major Incident:

Any social, labour, health and safety, security or environmental incident or accident having or which would reasonably be expected to have a negative impact on the Project. This may include explosions, fires, spills or workplace accidents which result in serious or multiple injury or major pollution. Any Injury of any employee (of Contractor or subcontractors/ suppliers) that causes loss of working time (Loss Time Injury) is considered as a major Incident.

Guidance for Accidents and Incidents Reporting

1 Basic Information

- date, time, weather / lighting / conditions
- statement of facts
- details of deaths, injuries, damage, immediate losses
- details of witnesses
- details of whether scene was secured / photographed
- details of any item tested / sampling / sent for testing / removed from scene
- details of person leading investigation
- time lapse between accident and investigation

Basic data should be clear, unambiguous, and factual (i.e. free from interpretation). Any gaps in the data should be highlighted and addressed in the investigation.

2 Investigation

- reconstructed timeline of events, with the incident/accident in the mid-point, and linked events streamed either side, with clear identification of individuals/teams/third parties (e.g. contractors) that are linked and therefore require interviewing
- robust but sensitive questioning of witnesses and linked individuals/third parties to
- clarify facts, assist with timeline reconstruction and advance the investigation. Statements/ notes of interviews to be included.

The investigation must follow the facts, witnesses and linked individuals/third parties and the timeline, and not be constrained by the incident/accident event in isolation.
In case publications on the event are available, these should be attached to the report (e.g. press articles, online articles, radio and TV- spots).

3 Analysis

- using basic data, interview outcomes and reconstructed timeline, identification of:
  - immediate causes
  - underlying causes (actions in the past that have allowed or caused undetected unsafe conditions/acts)
  - root causes (generally organisational/management failings, sometimes not directly/ obviously in relation to accident/incident regarding location/time)

- identification of absent/inadequate/failed/unused risk identification, - management- and control measures, reference/gap analysis against relevant national legislation and against the international standards as applicable and agreed upon for the Project
- conclusions and summary of root causes and underlying causes for the accident/incident.

Analysis must be sufficiently rigorous to go wherever the investigation has led. Identification of root, underlying and immediate causes must be sufficiently credible and robust to withstand third-party scrutiny.

4 Way forward

- for EACH root cause, underlying and immediate cause, a corrective/preventive action is required (these may be numerous and interlinked)
- for EACH action, a named person with sufficient resource to deliver upon it and a clear timeline (action plan) is required. In addition, a named person should have overall responsibility for monitoring / reporting on progress (with timelines).
- demonstration, that all actions together will prevent recurrence; evidence that current risk assessments/procedures have been revised to reflect this
- details of communications to stakeholders, to include a concise summary of the investigation, including the action plan, and lessons learned.
- details of ongoing support and assistance to those impacted directly or indirectly by the accident.

Types of reportable injury

The death of any person
All deaths to workers and non-workers, with the exception of suicides, must be reported if they arise from a work-related accident, including an act of physical violence to a worker.
Specified injuries to workers

- fractures, other than to fingers, thumbs and toes
- amputations
- any injury likely to lead to permanent loss of sight or reduction in sight
- any crush injury to the head or torso causing damage to the brain or internal organs
- serious burns (including scalding) which:
  - covers more than 10% of the body
  - causes significant damage to the eyes, respiratory system or other vital organs
- any scalping requiring hospital treatment
- any loss of consciousness caused by head injury or asphyxia
- any other injury arising from working in an enclosed space which:
  - leads to hypothermia or heat-induced illness
  - requires resuscitation or admittance to hospital for more than 24 hours

Source:http://www.hse.gov.uk/riddor/reportable-incidents.htm

IMMEDIATE INCIDENT NOTIFICATION

1. Incident Details					
Project Company		**Date of incident**			
		Time of Incident			
Location of incident		**Type of Incident**	**Environmental**	☐	
			Injury	*Workforce*	☐
				Public/Local community	☐
			Social incident (e.g., violent labor unrest)	☐	

2. WHAT HAPPENED
Brief description of incident

3. INJURED WORKERS						
Employee / Contractor	**Sex**	**Age**	**Job Title / Description**	**Time with company**	**Cause**	**Injury Type (Major / Fatal)**

4. INJURED MEMBERS OF PUBLIC						
Name	**Sex**	**Age**	**Community**	**Place of Residence**	**Cause**	**Injury Type (Major / Fatal)**

5. ENVIRONMENTAL INCIDENT			
Type (Spill / Gas Release)	**Total Loss (Litres /kG)**	**Cause**	**Damage**

6. WITNESSES TO INCIDENT			
Name	**Sex**	**Place of Residence**	**Description of incident**

7. OTHER RELEVANT INFORMATION				
Have the authorities been informed?	**Yes**	☐	**No**	☐
Please provide further information here				
Media attention?	**Yes**	☐	**No**	☐
Please provide further information here				
Any effects off-site?	**Yes**	☐	**No**	☐
Please provide further information here				
Photographs taken? *(Please include them in this report)*	**Yes**	☐	**No**	☐
Date				
Which immediate corrective actions have been taken after the accident? By whom?				
Please describe here if the accident led to changes into the works organisation or process, if specific equipment has been acquired/mobilised, if protection measures were implemented, if works have stopped etc.				
Person completing form:				
Name and position:				

Contact details:	**Phone**		**Email**	