



Initial Environmental Examination

PUBLIC

February 2026

India: Tamil Nadu Urban Flagship Investment Program- Tranche 1

Subproject: Tiruchirappalli Underground Sewerage System
Part 1 of 2: Main Report (Pages 1 – 129) and Annexures

Prepared by Tiruchirappalli City Corporation for the Asian Development Bank (ADB). This is an updated version of the draft Initial Environmental Examination originally posted in May 2018 available on <https://www.adb.org/projects/documents/ind-49107-004-iee-2>.

Asian Development Bank

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Initial Environmental Examination

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IND: Tamil Nadu Urban Flagship Investment Program – Tiruchirappalli Underground Sewerage System

Prepared by Tiruchirappalli City Corporation of Government of Tamil Nadu for the Asian Development Bank.

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CURRENCY EQUIVALENTS

(As of 31st October 2025)

Currency Unit – Indian rupee (₹)

₹1.00 – \$0.012

\$1.00 = ₹88.64

ABBREVIATIONS

| | | |
|---------|---|--|
| ADB | – | Asian Development Bank |
| ASI | – | Archaeological Survey of India |
| CMSC | – | Construction Management and Supervision Consultant |
| CPCB | – | Central Pollution Control Board |
| CTE | – | Consent to Establish |
| CTO | – | Consent to Operate |
| EAC | – | Expert Appraisal Committee |
| EHS | – | Environmental, Health and Safety |
| EIA | – | Environmental Impact Assessment |
| EMP | – | Environmental Management Plan |
| ESS | – | Environmental and Social Safeguards |
| ESZ | – | Eco Sensitive Zone |
| GRC | – | Grievance Redress Committee |
| GRM | – | Grievance Redress Mechanism |
| GOI | – | Government of India |
| GoTN | – | Government of Tamil Nadu |
| IEE | – | Initial Environmental Examination |
| MOEFCC | – | Ministry of Environment, Forest and Climate Change |
| NOC | – | No Objection Certificate |
| PIU | – | Project Implementation Unit |
| PMU | – | Project Management Unit |
| ROW | – | Right of Way |
| SIDCO | – | Small Industries Development Corporation |
| SPS | – | Safeguard Policy Statement |
| STP | – | Sewage Treatment Plant |
| TCC | – | Tiruchirappalli City Corporation |
| TNPCB | – | Tamil Nadu Pollution Control Board |
| TNUFIP | – | Tamil Nadu Urban Flagship Investment Program |
| TNUIFSL | – | Tamil Nadu Urban Infrastructure Financial Services Limited |
| TWADB | – | Tamil Nadu Water and Drainage Board |
| ULB | – | Urban Local Body |
| WHO | – | World Health Organization |
| WTP | – | Water Treatment Plant |

WEIGHTS AND MEASURES

| | |
|-----------------|------------------------|
| °C | degreeCelsius |
| km | kilometer |
| lpcd | liter per capitaperday |
| m | meter |
| Mgd | million gallons perday |
| ml | milliliter |
| Mld | million litres perday |
| mm | millimeter |
| nos. | numbers |
| km ² | squarekilometer |

NOTE

In this report, "\$" refers to United States dollars.

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EXECUTIVE SUMMARY

1. The Tamil Nadu Urban Flagship Investment Program (TNUFIP) will advance India's national urban flagship programs to develop priority urban and environmental infrastructure in ten cities located within strategic industrial corridors of TamilNadu (the State), including those within the East Coast Economic Corridor (ECEC), to enhance environmental sustainability, climate resilience, and livability. It will also strengthen the capacity of state and local institutions and improve urban governance. TNUFIP is Aligned with the following impact: urban livability and climate resilience in cities of economic importance improved. TNUFIP will have the following outcomes: smart and climate resilient urban services delivered in ten cities in priority industrialcorridors.
2. The TNUFIP is structured under three outputs:(i) sewage collection and drainage improved and climate-friendly sewage treatment systems introduced,(ii) access to reliable and smart drinking water services improved, and (iii) Institutional capacity, public awareness, and urban governance strengthened. TNUFIP will be implemented over an 8-year period beginning in 2018 and will be funded by Asian Development Bank (ADB). via its multi tranche financing facility(MFF).
3. **The Subproject.** Tiruchirappalli is one of the largest cities in the state of TamilNadu, located on the Chennai – Dindigul National Highway (NH - 45). It is situated in the center of the state, on the banks of the Cauvery River. This subproject, isimplemented under the ADB funded TNUFIP.It is proposed to provide underground sewerage system in the presently uncovered areas core part of Tiruchirappalli City and itsexteneded area. These are in eastern part of the Tiruchirappalli City Corporation (TCC). Sub project includes the following civil works components as per site conditions: (i) sewage collection system (285.77 kilometre (km) length of sewers and 11076 machineholes, (ii) 37 nos. of lift stations, (iii) 6 nos. of pump stations, (iv) 32.08 km length sewage pumping main, (v) new sewage treatment plant (STP) of 37(MLD) capacity at Keelakalkandarkottai, and (vi) 36469 house service connections. Treatment facility is under Design-Build- Operate-Transfer (DBOT) contract and the STP design is based on the Sequential Batch Reactor (SBR)technology
4. **Project implementation arrangements.** The Municipal Administration and Water Supply Department (MAWS) of Government of Tamil Nadu acting through the Tamil Nadu Urban Infrastructure Financial Services Limited (TNUIFSL) is the state-level executing agency. A project management unit (PMU) established in TNUIFSL headed by a Project Director and Deputy Project Director (senior official from Commissioner ate of Municipal Administration, CMA), and comprising dedicated full-time staff from TNUIFSL for overall project and financial management. The implementing agencies are project urban local bodies (ULBs). TCC is the Implementing Agency for this subproject. A project implementation unit (PIU) established in TCC headed by a full- time Project Manager (Executive Engineer or above) and comprising dedicated full- time staff of the TCC for day-to-day implementation of the sub project. PIU is assisted by Construction Management and Supervision Consultant (CMSC) for implementation. Environmental and Social Safeguards (ESS) Managers in PMU/TNUIFSL coordinate all the safeguard related activities of the sub project and ensure the compliance with environmental management plan (EMP) and EARF. Environmental Specialist of the CMSC, assists PIU in implementation of subproject in compliance with EMP and EARF, and carries out all necessarytasks.

5. **Screening and assessment of potential impacts.** ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS), 2009 also requires that ADB-financed sub-projects to comply with host country regulations. As per the Government of India (GoI) Environmental Impact Assessment (EIA) Notification, 2006, this subproject does not require EIA study or environmental clearance. For the STP sub-component, the consent to establish would be obtained prior to commencement of works from the Tamil Nadu Pollution Control Board¹. The potential environmental impacts of the subproject have been assessed using ADB Rapid Environmental Assessment (REA) Checklist for Sewerage. The potential negative impacts were identified in relation to pre- construction, during construction, and operation.
6. **Categorization.** Based on results of the assessment and ADB Safeguard Policy Statement (SPS), 2009, the subproject is classified as environmental Category B, i.e., subproject potential adverse environmental impacts are less adverse than those of category A, and are site- specific, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination (IEE) is required.
7. **Description of the Environment.** Subproject components are located in Tiruchirappalli City, an urban area surrounded by land that was converted for agricultural use many years ago. Sewer lines are laid in the public roads, within the road carriage way, and pumping/lifting stations are constructed on identified government owned vacant land parcels, in or close to residential areas. Tiruchirappalli is bound on the north by Namakkal District, northeast by Perambalur District, east by Thanjavur District, southeast by Pudukottai District, south by Sivaganga and Madurai Districts, southwest by Dindigul District and on the west by Karur District. The city is known for its educational institutions, industries, and temples, and is a commercial and tourist hub of Tamil Nadu. The most prominent landmark is the Archaeological Survey of India (ASI) protected Rock Fort Temple and Erumbeeswarar Temple. No components are located within the boundary of the protected monument; however, sewer network in the surrounding residential areas fall within the 300 m regulated zone of Erumbeeswarar Temple and will require prior permission from National Monument Authority (NMA) to execute the works.
8. **Potential environmental impacts and mitigation measures.** The sub project is unlikely to cause significant adverse impacts that are irreversible, diverse or unprecedented because: (i) the components involve straight forward construction and operation, so impacts are mainly localized; (ii) there are no significant sensitive environmental features in the project sites although careful attention needs to be paid to minimizing disruption to population of urban area and (iii) predicted impacts are site- specific and likely to be associated with the construction process and are produced because the process is invasive, involving excavation and earth movements. Subproject includes construction of new 37 MLD STP. There are no significant impacts Considering the following (i) the location of STP away from the habitations, (ii) design of treatment process to treat wastewater to meet disposal standards, (iii) disposal of treated wastewater into an irrigation channel, in which at present untreated wastewater from subproject areas is discharged.
9. In this IEE, negative impacts were identified in relation to pre-construction, construction, and operation phases. Planning principles and design considerations

¹The Consent to Operate the STP would be obtained from TNPCB prior to commissioning of the STP.

have been reviewed and incorporated into the site planning and design process wherever possible; thus, environmental impacts as being due to the project design or location were not significant. Sewage pumping and lifting stations, which collect sewage and pump to a higher elevation pump station or to the STP, are likely to generate odor. Lifting stations are comparatively small, and therefore odor nuisance is limited. Although utmost care is taken to locate pumping and lifting stations away from the houses, due to design considerations and land constraints, some sites are located close to the houses. Another impact is that of STP operation: from malfunction or decrease in treatment efficiency and sludge handling and disposal which may occur rarely. This will result in release of untreated or partially treated wastewater rarely, that will pollute environment and cause public health issues. Accumulation of silt in sewers in areas of low over time, overflows, blockages, power outages, harmful working conditions for the workers cleaning sewers etc. may create nuisance, unhealthy and hazardous conditions and can be avoided by proper monitoring of the operation.

10. From the STP, it is proposed to dispose treated wastewater into Uyyakondan channel, flowing at 2.7 km from the STP site. This is a major irrigation channel, taking off from Cauveri River at Kulathalai Kattnali, upstream of Tiruchirappalli, and flows about 40-50km prior to reaching the city, and then flows through the Centre of Tiruchirappalli city for about 18km, carrying stormwater, and wastewater from the unsewered city areas. It finally discharges into Valavandhankottai pond/tank at Thuvakudi, about 20-22km from the proposed STP discharge point. Channel water is used for only irrigation. No water quality data available at present, however, channel mostly carries wastewater within the city, and therefore existing quality likely to be poor except during upstream flow. Baseline water quality of channel established during the detailed design phase. Discharge from STP will be properly treated to meet the disposal standards, and therefore no table impacts envisaged on channel water quality. This open channel flows for another 20-22km downstream, allowing further dilution via self-purification prior to reaching the tank/pond. Pond water is used only irrigation. Wastewater is treated to set standards at the STP prior to its disposal into Uyyakondan channel. Considering the existing status of channel, and the degree of treatment and self- purification via 20-22 km turbulent flow in open channel, there will not be any significant impacts. Proper systems will be put in place at the STP to ensure that treated wastewater always meet the stipulated standards prior to its disposal into this channel.
11. 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 design related measures suggested for: STP treatment process design to meet disposal standards, ensuring efficient treatment, odor control including: appropriately locating sewage wells within site as far as away from the houses; developing tree cover; enclosed facilities; gas collection and treatment facilities, and design and operation measures to prevent odor buildup; standard operating procedures for operation and maintenance; imparting necessary training; safety and personal protection equipment for workers, etc., For the existing STP, rehabilitation works will ensure that wastewater is properly treated to meet disposal standards prior to its disposal.
12. 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) are confined to the selected sites, and the interference with the public and community around is minimal. In the sewer works, the temporary negative impacts arise mainly from construction dust and noise, hauling of

construction material from the existing government licensed mining areas, waste and equipment on local roads (traffic, dust, safety etc.), mining of construction material, occupation health and safety aspects. Sewer works are reconstructed along public roads in an urban area congested with people, activities, and traffic. Therefore, sewer works may have adverse, but temporary, 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; with some sections involving controlled blasting; especially in narrow roads, access impediment to houses and business, disposal of large quantities of construction waste, etc. The District Collector has accorded permission for executing the controlled blasting. These are all general impacts of construction in urban areas, and there are well developed methods of mitigation that are suggested in the EMP.

13. **Environmental Management Plan.** An environmental management plan (EMP) has been developed to provide mitigation measures to reduce all negative impacts to acceptable levels, along with the delegation of responsibility to appropriate agency. Hard rock removal through controlled blasting for excavation has been identified for some sections of the pipeline alignment and in the pumping station sites. Mitigation measures to ensure safety of humans and structures within the area of influence and impacts due to controlled blasting during the implementation have been included in EMP. The EMP will guide the environmentally-sound construction of the subproject. EMP includes a monitoring program to measure the effectiveness of EMP implementation and include observations on- and off-site, document checks, and interviews with workers and beneficiaries.
14. The EMP is included in the bid and contract documents to ensure compliance with the conditions set out in this document. The contractor will be required to submit a site environmental management plan (SEMP) to PIU, for review and approval, which reflecting the associated mitigation and monitoring measures for controlled blasting activities proposed now. The site environmental management plan (SEMP), including (i) the sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; and (iii) monitoring program as per EMP. No works are allowed to commence prior to approval of SEMP. A copy of the EMP/approved SEMP, kept on site during the construction period at all times.
15. **Consultation, disclosure and grievance redress mechanism.** The stake holders were involved in developing the IEE through discussions on-site and a public consultation workshop at city level, after which views expressed were incorporated into the IEE and in the planning and development of the project. The IEE will be made available at public locations and will be disclosed to a wider audience via the ADB, TCC and TNUIFSL websites. The stakeholders were involved in developing the updated IEE through on-site discussions within the limitations imposed by the district authorities during on-going corona virus disease (COVID-19) pandemic. The consultation process will be further strengthened after relaxation of present restrictions due to COVID-19 pandemic and continued thereafter during project implementation. A grievance redress mechanism (GRM) is described in the IEE has already been made fully functional to ensure quick redressal of public grievances.
16. **Monitoring and Reporting.** Contractors are submitting monthly EMP implementation report to PIU and with the assistance of CMSC, PIU is monitoring the compliance of Contractor and submitting Quarterly Environmental Monitoring Report to PMU. The PMU has been overseeing the implementation and compliance and submits semi-annual monitoring reports to ADB. ADB will post the environmental monitoring reports on its website. Monitoring reports will also be posted on TCC and TNUIFSL websites

17. Conclusions and Recommendations. Therefore, as per ADB SPS, this subproject is classified as environmental category B and does not require further environmental impact assessment. To conform to government guidelines, consent to establish (CTE) have been obtained for new 37 MLD STP from Tamil Nadu Pollution Control Board (TNPCB), and consent to operate (CTO) shall be obtained for the new and the rehabilitation of existing STP prior to operation. For works located within the regulated zone of the protected monument (with in 300m boundary), permission has been obtained from National Monument Authority. This IEE is updated by PIU based on final design during construction and incorporating details of controlled blasting and approved by PMU. The updated IEE is submitted to ADB for concurrence and disclosure.

I.INTRODUCTION

A. Background

1. The TamilNadu Urban Flagship Investment Program (TNUFIP) will advance India's national urban flagship programs to develop priority urban and environmental infrastructure in ten cities located within strategic industrial corridors of TamilNadu (the State), including those with in the East Coast Economic Corridor (ECEC), to enhance environmental sustainability, climate resilience, and livability. It will also strengthen the capacity of state and local institutions and improve urbanguovernance.
2. TNUFIP is implemented over an 8-year period beginning in 2018, and funded by Asian Development Bank (ADB) via its multi tranche financing facility(MFF).The executing agency is the Department of Municipal Administration and Water Supply (MAWS) of the State acting through the TamilNadu Urban Infrastructure Financial Services Limited(TNUIFSL) who established a program management unit (PMU). The urban local bodies (ULBs) are the implementing agencies for projects and established program implementing units(PIU).
3. TNUFIP is aligned with the following impact: urban livability and climate resilience in cities of economic importance improved. TNUFIP will have the following outcomes: smart and climate resilient urban services delivered in ten cities in priority industrial corridors. The TNUFIP is structured under following threeoutputs:
 - (i) **Output 1: Sewage collection and drainage improved and climate-friendly sewage treatment systems introduced.** This includes: (i) new (179 million liters per day [MLD]) and rehabilitated sewage (175 MLD) treatment capacity developed with solar power for operations installed on a pilot basis; (ii) reuse of treated sewage water for industrial purposes in selected areas; (iii) new and improved sewage collection pipelines (2,810 kilometers [km]) constructed with 100% household connections made (426,600 household connections); (iv) 173 new sewage pumping stations of 6,390 kilowatts (KW) capacity added;(v) 20 community water and sanitation committees formed with female participation; and (vi) climate resilient drainage and flood management systems established (250 km tertiary and 50 km primary andsecondary).
 - (ii) **Output 2: Access to reliable and smart drinking water services improved.** This will includes: (i) smart water supply distribution systems (1,520 km pipelines) established within 110 new district metered area stored NRW and provide regular water supply with100% household connections (171,000householdconnections); (ii)new transmission mains(120 km); (iii) 30 number of pump houses of 1,530 KW capacity; and (iv) new water storage reservoirs (40 reservoirs totaling 70 million liters). The TNUFIP will scale up smart water pilots in Chennai under TA-9048 to reduce nonrevenue water levels and optimize operational efficiency through the latest technologies in smart metering and digital diagnostictools.
 - (iii) **Output 3: Institutional capacity, public awareness, and urban governance strengthened.** This includes: (i) establishing a new state-level Urban Data and Governance Improvement Cell in the Commissionerate of Municipal

Administration(CMA);(ii)establishing a new Project Design and Management Center in CMA; (iii) introducing and implementing a state-wide performance- based urban governance improvement program for all 135 cities in Tamil Nadu to improve financial management, revenues, administration, service delivery, gender and social inclusion, and waste water reuse and fecal sludge management;and(iv)implementingpublicawarenesscampaignsinareasofwater conservation, sanitation, and hygiene in 10 project cities. Project design consultants (PDC) will be recruited to prepare new projects meeting ADB requirements.

4. **Scope of Project 1.** Tranche 1 is representative of MFF investments and will support subprojects in 6 cities (Chennai, Coimbatore, Rajapalayam, Tiruchirappalli, Tirunelveli, and Vellore). Outputs of tranche1includes:
 - (i) **Output 1: Sewage collection and drainage improved, and climate-friendly sewage treatment systems introduced.** This includes: (i) 5 new STPs of 153 MLD treatment capacity including one STP with 2 megawatts (MW) solar-power installation for operations;(ii) 2 rehabilitated STPs of 61 MLD capacity; (iii) 8,000 cubic meter (m³) per day of treated wastewater reused; (iv) 1,860 km of new sewage collection pipelines with 100% household connections; (v) 124 new pump/ lift stations of 4,470 KW capacity; and (vi) 297,500 new household sewer connections. The breakdown by city is as follows: (i) sewage collection systemwith new 32 MLD STP and one rehabilitated 24 MLD STP in Tirunelveli with treated effluent supplied for industrial reuse; (ii) sewage collection system with new 2 MW solar- powered 30.53 MLD STP in Coimbatore; (iii) sewage collection system with new 37 MLD STP and one rehabilitated 30 MLD STP in Tiruchirappalli;(iv) sewage collection system with new 50 MLD STP in Vellore; (v) sewage collection system in four areas of Chennai; and(vi) sewage collection with new 10 MLD STP in Rajapalayam, and 12 community water and sanitation committees formed with femaleparticipation.
 - (ii) **Output 2: Access to reliable and smart drinking water services improved.** This support 4 areas of Chennai with the following:(i) 275.6 km of smart water supply distribution pipes in 20 newly established district metered areas to manage and reduceNRW connected to computerized control and data acquisitionsystems; (ii) 30,800householdmeteredconnections;(iii)11kmofnewtransmissionpipes;(iv) 9 new storage reservoirs (4 underground and 5 overhead) of 11 million liters capacity; and (v) 5 pump stations of 230 KW capacity.
 - (iii) **Output 3: Institutional capacity, public awareness, and urban governance strengthened.** This includes: (i) establishing a new state-level Urban Data and Governance Improvement Cell in the CMA; (ii) establishing a new Project Design and Management Center in the CMA; (iii) introducing and implementing a state-wide performance-based urban governance improvement program for all 135 cities under CMA to improve financial management (audited accounts), municipal revenues (taxes, user fees), administration (filling vacancies), and gender mainstreaming (gender equality social inclusion plan implementation); and(iv) implementing public awareness campaigns in areas of water conservation, sanitation, and hygiene. The PDC will be recruited for preparing projects in subsequenttranches.
5. Tiruchirappalli City has an existing underground sewerage scheme covering part of the core (old) city area. TCC has recently implemented Tiruchirappalli-Srirangam sewerage scheme, under the National River Conservation Project (NRCP) grant, to cover part of core area. A considerable portion of the core city area is still unsewered, along with the added areas and poses significant health

risk and pollution by way of sewage discharge into low-lying area and water bodies including the Cauvery and kollidam rivers. It is proposed to provide a sewer system in the presently uncovered area of TCC under the ADB funded TNUFIP. subproject includes as per site conditions: (i) sewage collection system (285.77 kilometre (km) length of sewers and 11076 machine holes, (ii) 37 nos. of lift stations, (iii) 6 nos. of pump stations, (iv) 32.08 km length sewage pumping main, (v) new sewage treatment plant (STP) of 37(MLD) capacity at Keelakalkandarkottai, and (vi) 36469 house service connections.

B. Purpose of this Initial Environmental Examination Report

6. ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS), 2009. The potential environmental impacts of the subproject have been assessed using ADB Rapid Environmental Assessment (REA) Checklist for Water Supply (Appendix 1). Then potential negative impacts were identified in relation to pre-construction, construction and operation of the improved infrastructure, and results of the assessment show that the subproject is unlikely to cause significant adverse impacts that are irreversible, diverse, or unprecedented. Thus, this initial environmental examination (IEE) has been updated in accordance with ADB SPS's requirements for environment category B projects.
7. This IEE is based on the detailed project report prepared by TCC. The update is to reflect the inclusion of controlled blasting as one of the construction methodologies encountered during implementation and STP detailed design of which has been prepared by the DBOT contractor. The IEE was based mainly on field reconnaissance surveys and secondary sources of information. No field monitoring (environmental survey was conducted), however, the environmental monitoring program developed as part of the environmental management plan (EMP) require the contractors to establish the baseline environmental conditions prior to commencement of civil works. The results are reported as part of the environmental monitoring report and are the basis to ensure no degradation will happen during subproject implementation. Stake holder consultation was an integral part of the IEE.

C. Report Structure

8. This Report contains the following ten (10) sections including the executive summary at the beginning of the report:
 - (i) Executivesummary.
 - (ii) Introduction.
 - (iii) Description of theproject.
 - (iv) Policy, legal and administrativeframework.
 - (v) Description of theenvironment.
 - (vi) Anticipated environmental impacts and mitigationmeasures.
 - (vii) Public consultation and information disclosure.
 - (viii) Grievance redressmechanism.
 - (ix) Environmental management plan;and
 - (x) Conclusion andrecommendation.

II. DESCRIPTION OF THE PROJECT

A. PROJECT AREA

9. Tiruchirappalli is one of the largest cities in the state of TamilNadu, located on the Chennai - Dindigul National Highway (NH - 45). It is situated in the center of the state, on the banks of Cauvery River (Figure 1), which runs west to east along the northern periphery of the city. Tiruchirappalli City, spreading over an area of 146.90 square kilometers (km²), was upgraded from Special Grade Municipality to Corporation in the year 1994. Srirangam, a small island situated in Cauvery River, and is part of the city. In 2011, the corporation limit was expanded eastwards to include adjoining local bodies (four village panchayats of Paappakurichi, Ellakudi, Aalathur and KeelkalkandarKottai, and Thiruverumbur Town Panchayat), and corporation area increased by 20.33 km² to 167.23 km². TCC has a population of 916,674 (census 2011) and 65 municipal wards, grouped into four administrative zones: Srirangam, Ariyamangalam, Golden Rock and K. Abishekapuram.
10. The city has prepared a sewage master plan which proposes to extend the existing underground sewage system (UGSS) to cover all the zones, through a four-phase program. Phase one has already been completed, so the ADB supported TNUFIP focus on Phase II, which includes recently added areas in the eastern area and remaining uncovered areas in the core city area. The new UGSS includes piped network, pump/ lift stations and additional treatment capacity through construction of 37 MLD STP in KeelakalkandarKottai and improvements to the existing STP in Panjappur located on the Tiruchirappalli–Madurai highway. The project area under TNUFIP has been divided into 13 sewerage zones based on contour levels, and hierarchy of the drain system and their tentative locations arrived at for designing the most cost-effective system. The sewage collection system, to the extent possible, has been prepared to convey sewage by gravity.

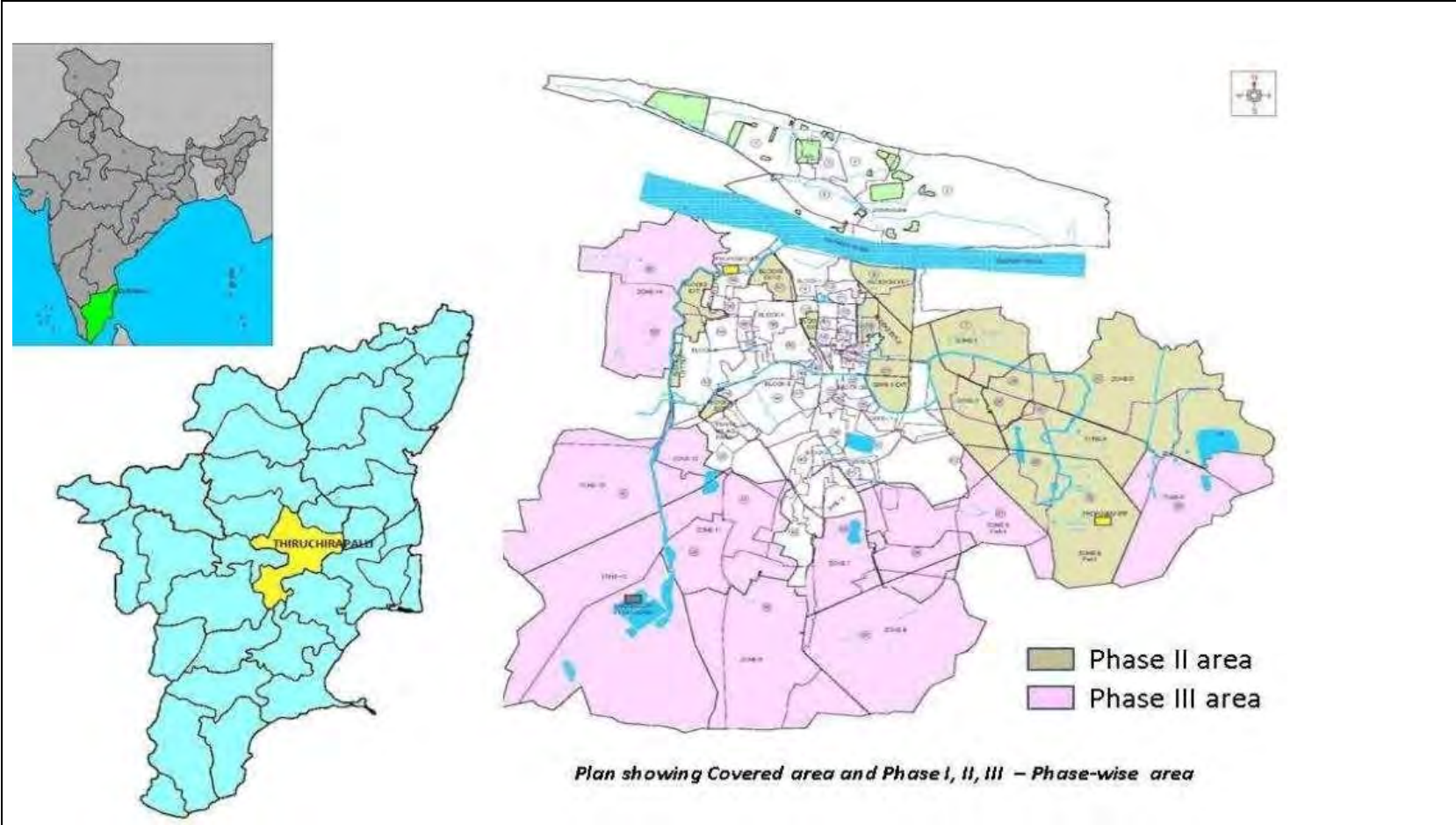
B. EXISTING SEWERAGE SYSTEM

11. The existing UGSS covers most of the higher density old town areas with gravity collection and pumping to the waste stabilization ponds STP at Panjappur on the southern periphery of TCC with effluent discharged to Koraiyar River and ultimately to the Cauvery River. Sewage from the uncovered areas within TCC limits is discharged to open drains which ultimately discharge into the network of channels including the Uyyakondan, Koraiyar and Thirumanjana Cauvery which finally empty into the Cauvery and Coleroon Rivers. A small capacity treatment pond, spread over 10 acre of land and of approximate capacity 25 MLD, at Panjakarai on Srirangam island discharges effluent to Coleroon River (the northern branch of Cauvery River that skirts Srirangam on the north). Details of sewerage schemes implemented till date in TCC are presented below:
 - (i) **Srirangam UGSS Scheme (1956)**. Srirangam (erstwhile municipality) was the first area to be provided with UGSS in 1956. Gravity UGSS with three pump stations were constructed in the developed areas. Sewage was conveyed to the sewage pond at Panjakarai.
 - (ii) **Trichy UGSS Scheme (1987)**. The next UGSS scheme was implemented during 1987-1992 covering the high-density areas, covering seven (7) blocks constituting the core area of current TCC. Sewage was conveyed through a network of pumping stations to the main pumping station at Promenade Road and from there, to the lagoons/STP at Panjappur, about 7 km south of City along the Tiruchirappalli– Madurai - Tuticorin Highway (NH-45B).

- (iii) **National River Action Plan (NRAP) Scheme (1995/1996).** Under this Government of India scheme, intervention measures for abatement of pollution of Cauvery River was implemented. Interceptor collectors in major open drains within the city limits were constructed and sewage pumped to the waste stabilization pond (WSP) based STP at Panjappur for treatment and disposal.
 - (iv) **UGSS Augmentation Scheme under National River Conservation Plan (NRCP), 2008.** Under this Govt scheme, augmentation of the UGSS commenced in 2003 and was completed in 2008. This scheme essentially covered old town area of Srirangam, Golden Rock zone (erstwhile Golden Rock Municipal area also known as "Ponmalai" and subsequently merged into TCC) and areas in Tiruchirappalli. The island of Srirangam was fully covered with a network of sub-pumping stations (6 nos.) and lift stations (6 nos.) which were needed due to sub-surface conditions, sandy with high groundwater table, which precluded laying of sewers at depths greater than 3 m. Sewage from Srirangam is pumped across Cauvery River along Chennai – Dindigul National Highway (NH45) to the Golden Rock Pump Station (GRPS-1) in the city. Sewage from areas in the city is conveyed to GRPS – 2 along the National Highway 45 By-Pass Road. Sewage from both the afore mentioned GRPS is conveyed through individual pumping mains to the MPS– II at Anna Stadium and ultimately to the STP at Panjappur.
12. Overall, at present, about 31 percent of total TCC area is covered with sewerage system, which serve about 52 percent of the total TCC population. The city, situated on the south bank of Cauvery River, comprises a network of storm water drains and channels which convey runoff and partially treated wastewater and discharge into water bodies. City is prone to flooding during monsoon season due to flash floods in Cauvery and Coleroon rivers. Increasing urbanization from regional industrial growth and expansion of city limits by inclusion of adjoining sub-urban and rural local bodies has further increased the demand for proper UGSS service. The zones which require UGSS coverage areas follows: (i) East Zone– Ariyamangalam east and north-east of the core town area, (ii) West Zone– K.Abhisekapuram west and south of the core town area, and (iii) South Zone, Golden Rock to south and south-east of core town area.
 13. The sewage master plan of TCC includes three remaining phases for UGSS expansion as follows: Phase II – East Zone; Phase III – West Zone, and Phase IV – South Zone. Phase II and III are implemented under TNUFIP, with Phase II implemented under Tranche 1, and Phase III in subsequent Tranche 2. Phase IV is not yet planned. This subproject therefore focuses on Phase II and includes provision of UGSS to the East Zone (Ariyamangalam) comprising, presently uncovered areas in the Old City, and extended areas in the eastern part of the city. The overall coverage, in terms of population, by Phase II completion will be about 75%. The balance 25% will be covered under Phases III and IV.
 14. **Existing situation in subproject area (East Zone).** At present in east zone, sanitation is based on septic tanks and sullage/soak pits. During the monsoon season the capacity of these on-site facilities is exceeded causing sullage and septic tank overflow to enter open drains that discharge into the Uyyakondan channel that skirts the southern periphery of the Eastern Zone areas. This is an irrigation channel, and also acts as a major storm water drain traverses the entire width of TCC towards the eastern boundary and ultimately discharges into Vallavandhan Kottai Pond. Additionally, low-lying high-density areas in the city town area also discharge untreated sewage to Koraiyar river. Therefore, TCC has identified the wards in the eastern zone (Ariyamangalam) and un-serviced areas of

the old city as high priority areas to be covered by UGSS through this Phase II scheme in order to abate pollution of major channels and CauveryRiver.

Figure 1: Location of Subproject



C. PROPOSED PROJECT

15. This subproject shall provide sewerage system in east zone (phase II) which covers all areas in Ariyamangalam Zone and omitted areas in the old city area of TCC. Collection system for Phase-II has been divided into thirteen (13) sewer sub-zones: 1 to 6 are in the Ariyamangalam Zone (added areas and areas located in east zone) and the balance 7 comprise old city area. Sewer sub-zoning is done for design of the collection system to maximize gravity flow. Collection / command area of the sewer sub-zone is designed to be collected at a sewage pumping station (SPS) if gravity collection is not feasible. Intermediate pumping to avoid significant depth of excavation or to provide sewerage in low-lying or counter-sloped areas has been achieved using lift stations. System is designed as a separate underground system catering only to domestic wastewater; storm runoff generated during rains will be carried by existing open drains and disposed into natural streams/ water bodies. Industrial wastewater not disposed into sewers. System is designed for 110 liters per capita per day, based on sewage generation rate of 80% of water supply. System is designed with gravity flow as far as possible, however topography do not permit a complete gravity system from collection to inlet at the STP, and therefore wherever required sewage lifting and pumping stations introduced to optimize the system design.

16. Table 1 shows the nature and size of the various components of the subproject. Location of subproject components and conceptual layout plans are shown in Figure 2 to Figure 9.

17. The scope of work is revised due to the following reasons.

- During the preparation of the Detailed Project Report (DPR), the total length of the street was considered for the sewer line. However, during execution, the actual length of the sewer line was measured after accounting for the dimensions of manholes, resulting in a reduction in the length of the sewer line. Consequently, the number of manholes and HSC were also adjusted according to the actual site conditions.
- To reduce the depth of excavation on the Keelakalkandar kottai state highway and avoid disturbing the existing 900mm dia. DI pumping main, an additional Sewage Pumping Station (SPS), namely SPS 6A, was provided at Maruthi Nagar in Zone 6. This modification has resulted in an increase in the length of the pumping main.

Table 1: Components of the Subproject

| Infrastructure | Function | Description | Location | | |
|---------------------|---|--|---|-------------|----------------------------------|
| Sewer network | Collect wastewater from houses and convey by a combination of gravity and pressure pumping to the STP | <p>287.825 km - 200-1000 mm diameter sewers</p> <ul style="list-style-type: none"> - 226.979 km uPVCpipes - 47.605 km DWCPipes - 13.241 km Clpipes <p>Manholes 11264 nos. (brickwork & reinforced cement concrete) Minimum distance between manholes of 30 m is adopted for sewer size up to 400 mm and larger spacing upto100m for large diameter sewers. Manholes type and sizes are as follows: For depths up to 2.5 m(Rectangular)</p> <ul style="list-style-type: none"> • Up to 1.2m depth – 0.75mx1.20m • Up to 2.5m depth – 0.90m x 1.50m for depths above 2.5 m(Circular) • Up to 6.0m depth –1.5mdiameter Above 6.0m depth –1.8mdiameter | <p>Sewers are laid underground in the roads and internal streets in the project area comprising 13 sewerage sub-zones (Ariyamangalam Zone-6 nos.; and omitted areas in Old Town-7nos.).</p> <p>Sewer lines are laid in the Centre of road by cutting black top, within the road right of way. In wider road laid along the edge of the road, but mostly within the black top portion. For the roads where, adequate land in the road shoulder is available along the black top and is clear of any structures or activities, pipes will be laid in this earthen shoulder. Large diameter pipes will be laid mostly on main roads (300–1000mm), while the tertiary sewers of small size (200mm to300mm dia) that collect wastewater from each house are laid in all streets in the subproject area.</p> <p>Trench size to bury the sewer will be of 0.8m to1.6 m wide and1.2m to 5m deep (6m in small terminal stretches near pump stations)</p> <p>For manholes, an area of 1.5 mx1.5m to 2.5m x 2.5m will be excavated</p> | | |
| Sewage stations(LS) | Lifting station and Lift Man hole is a small pumping station to lift the sewage to higher level and discharge into a ridge manhole for transporting to the pumpingstation. Lifting station has a collection well. | <p>36 nos.</p> <p><i>Components of LS</i></p> <ul style="list-style-type: none"> • Liftwell(circular) • Non-clog submersible pumpsets • Control panelbox <p><i>Lift stations are essentially are enlarged manholes (either road-side on available land or on road center by enlarging a collection system manhole) fitted with two sewage pumps (small capacity) and a curb or road-side wall mounted Pump Control Panel.</i></p> | <p>Lift well is constructed on the road (like manhole) where the sewer ends terminates into the lift well. Pumps are installed in the well, and a control panel box installed near the well. Lift stations are proposed at following locations:</p> | | |
| | With submersible Pumps accommodated inside. The Screen arrangement is provided in the previousmanhole to the lift station. | | S. No | Zone | Lifting Station Location |
| | | | 1 | 1 | (Arimangalum) Arputha Sami Puram |
| | | | 2 | 2 | Patel Nagar |
| | | | 3 | | Diamond Layout |
| | | | 4 | | Gandhi Nagar |

| Infrastructure | Function | Description | Location | | |
|----------------|----------|-------------|----------|----------|--|
| | | | 5 | | Balaji Nagar |
| | | | 6 | 3 | Papakurichy Village-Kamraj Nagar |
| | | | 7 | | Mahalaxmi Nagar Extn |
| | | | 8 | | Muthu Nagar (New town) |
| | | | 9 | | Cholan Avenue |
| | | | 10 | 4 | Amman Nagar East |
| | | | 11 | | Amman Nagar West Extension |
| | | | 12 | | Balaji Nagar 10 th cross |
| | | | 13 | 2 | Malai Nagar 1 (LM) |
| | | | 14 | 2 | Malai Nagar 2 (LM) |
| | | | 15 | 3 | Balaji Nagar 18 th Cross (LM) |
| | | | 16 | | Andal Nagar (LM) |
| | | | 17 | | Kumaran Nagar (LM) |
| | | | 18 | 4 | Sriram Nagar (LM) |
| | | | 19 | 4 | Alli Street (LM) |
| | | | 20 | | Devathanam, Jayakumar Nagar |
| | | | 21 | B2-U1 | Sangeevi Nagar |
| | | | 22 | | John Thoppu |
| | | | 23 | B2-U2 | Vethathrinagar |
| | | | 24 | | Vishwas Nagar Main Road, Thavallur Extn |
| | | | 25 | | Thigaraj Nagar |
| | | | 26 | B3-U1 | Vekailamman Nagar |
| | | | 27 | | Siva Nager Extension |
| | | | 28 | B3-U2 | Annamalai Nagar |
| | | | 29 | B4-U | Nathersapallivasal |
| | | | 30 | B5-U | Raja colony |
| | | | 31 | B6-U | Ammayapanagar |
| | | | 32 | GRP S1-U | Pichai Nagar |

| Infrastructure | Function | Description | Location | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------------|---|--|--|------------|--|----------|-----|-------|-------|----|-----|-------|-------|----|-----|-------|-------|----|-----|-------|------|----|-----|-------|------|----|-----|----|------|----|-----|-------|------|----|--|---------------|--|--|--|--|--|
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 33 | | Natheracha pallivassal (Lift Manhole) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 34 | | Rajacolony | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 35 | | Jeyamangalamcolony (Ammayapannagar) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 36 | | PitchaiNagar/VaasanNagar | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sewage pumping stations (SPS) | Collect sewage and pump to main pumpingstations | 6 nos. Components of SPS <ul style="list-style-type: none"> Inletchamber Screenchamber Gritwell Suctionwell Pump room (3 x2m2) Non-clog submersible pumpsets | Sewage pump stations are proposed at following locations: <ol style="list-style-type: none"> Chidambarnagar-Ariyamangalam Ariyamangalam (Inside Solid waste dumpyard) WinNagar Rajarajeshwari Nagar Keelakalkandarkottai Maruthi Nagar | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pumping main Sewers | Transfer sewage from SPS to another SPS or to STP | 24 km 150-700 mm diameter CI sewers | Pumping main laid along the main roads, and the internal roads connecting sewage pumping stations and STP. Sewers laid underground in the road carriage way. Pumping mains include main sewers from two main SPS to proposed | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | <table border="1"> <thead> <tr> <th>Dia (mm)</th> <th>Length (m)</th> <th>%</th> <th>Material</th> </tr> </thead> <tbody> <tr> <td>150</td> <td>7,785</td> <td>31.3%</td> <td>CI</td> </tr> <tr> <td>200</td> <td>6,155</td> <td>24.8%</td> <td>CI</td> </tr> <tr> <td>250</td> <td>3,995</td> <td>16.1%</td> <td>CI</td> </tr> <tr> <td>350</td> <td>2,160</td> <td>8.7%</td> <td>CI</td> </tr> <tr> <td>500</td> <td>1,900</td> <td>7.6%</td> <td>CI</td> </tr> <tr> <td>600</td> <td>50</td> <td>0.2%</td> <td>CI</td> </tr> <tr> <td>700</td> <td>2,810</td> <td>0.9%</td> <td>CI</td> </tr> <tr> <td></td> <td>24,855</td> <td></td> <td></td> </tr> </tbody> </table> | Dia (mm) | Length (m) | % | Material | 150 | 7,785 | 31.3% | CI | 200 | 6,155 | 24.8% | CI | 250 | 3,995 | 16.1% | CI | 350 | 2,160 | 8.7% | CI | 500 | 1,900 | 7.6% | CI | 600 | 50 | 0.2% | CI | 700 | 2,810 | 0.9% | CI | | 24,855 | | | STP at KeelakalkandarKottai; from sub-SPS and Lift Stations to main SPS; and, from Lift Stations (13 nos.) within collection system to existing MPS/ SPS in Old Town Area. | | |
| Dia (mm) | Length (m) | % | Material | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 150 | 7,785 | 31.3% | CI | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 200 | 6,155 | 24.8% | CI | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 250 | 3,995 | 16.1% | CI | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 350 | 2,160 | 8.7% | CI | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 500 | 1,900 | 7.6% | CI | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 600 | 50 | 0.2% | CI | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 700 | 2,810 | 0.9% | CI | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 24,855 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sewage Treatment Plant (STP) | Treatment of collected wastewater to comply with disposal standards | New STP of capacity 37 MLD Proposed process: SBR (Sequential Batch Reactor). Components: <ul style="list-style-type: none"> Inlet Chamber | Proposed STP is located at Keelakalkandar Kottai in the outskirts of the city. Land is owned by the TCC. Site is surrounded by vacant/agricultural lands. A threshing platform used by local villagers for threshing and drying of crops, occupies a small portion of the proposed site. This is considered in the social impact assessment studies, and the | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Infrastructure | Function | Description | Location |
|---------------------------|---|--|---|
| | | <ul style="list-style-type: none"> • Mechanical Coarse Screen Channel. • Manual Coarse Screen Channel • Mechanical Fine Screen Channel • Mechanical Grit Chamber • Inlet Distribution Channel to SBR • Sequential Batch Reactor (SBR)Basin • Disinfection Chlorine Contact Tank • Sludge Handling Thickener Feed Sump • Gravity Sludge Thickener • Thickened Sludge Sump | <p>Resettlement Plan being prepared for the subproject addressed the issues related loss of common property resource. A small village temple situated in western side, about 300 m from proposed STP site. Nearest house is located at about 500 m from the site.</p> <p>Treated wastewater from the STP will be disposed into Uyyakondan channel, an irrigation channel that skirts the southern periphery of the Eastern Zone (the subproject area). This is also acting a major storm water drain in the city traversing the entire width of TCC and ultimately discharges into Vallavandhan Kottai Pond (irrigation tank). At present, this channel also caters to the untreated/partially treated wastewater from the subproject area, and ultimately discharging the wastewater into the irrigation tank. With the implementation of this subproject, wastewater from subproject area will be collected by underground drains, treated at the STP, and disposed into Uyyakondan channel.with the following standards as perCTE/ CTO.</p> <p>pH 5.5 – 9, BOD 10 mg/l, TSS 20 mg/l, COD 50 mg/l, Nitrogen total – 10 mg/l, Phosphorus total – 1 mg/l, Faecal coliform – desirable 100 – permissible 230.MPN. (Most Probable Number per100 millilitre)</p> |
| Outfall sewer | Disposal of treated water from new STPinto Uyyakondan channel | 2.7 km length 800 mm dia CI (cast iron) pipe | From STP at KeelakalkandarKottai to Uyyakondan channel, situated south of the STP. |
| House service connections | Collect sewage from individual housesand convey into network | 36,469 nos.(domestic) | At each household, connected to wastewater outlet drain |

Figure 2: Sewer Network of the Sub-Project

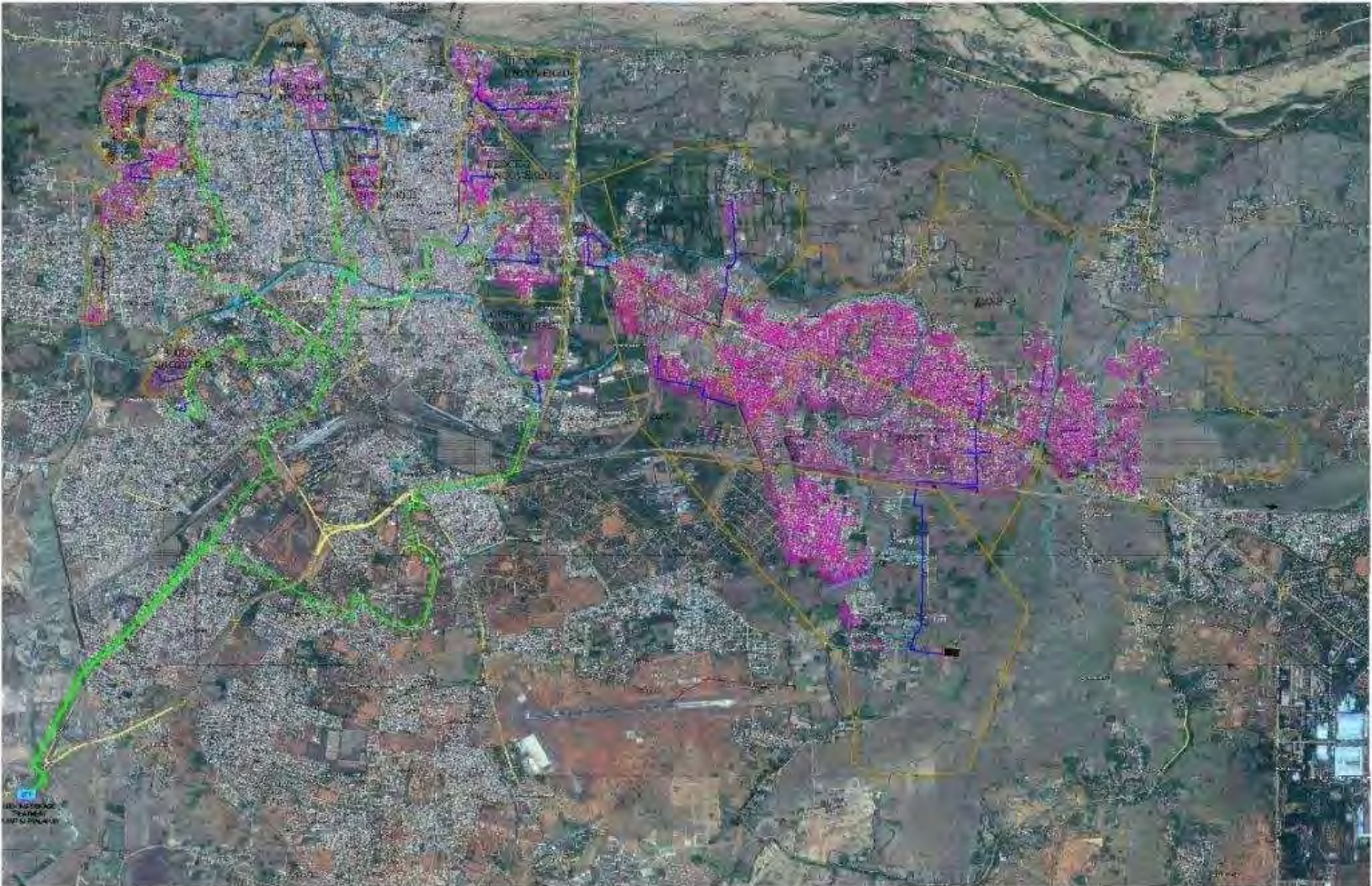


Figure 3: Layout Plan on Revenue Map for SPS1

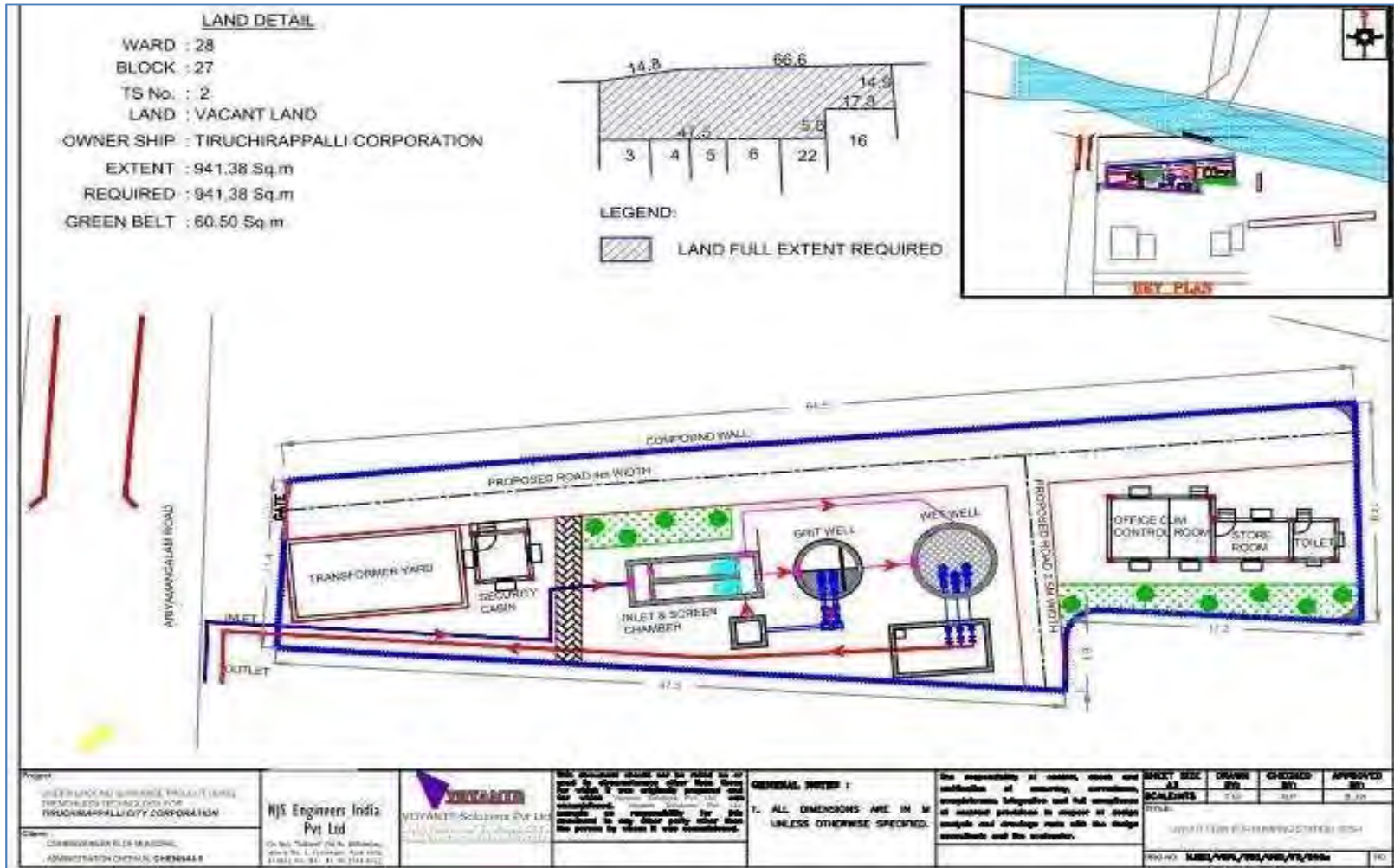


Figure 4: Layout Plan on Revenue Map for SPS 2

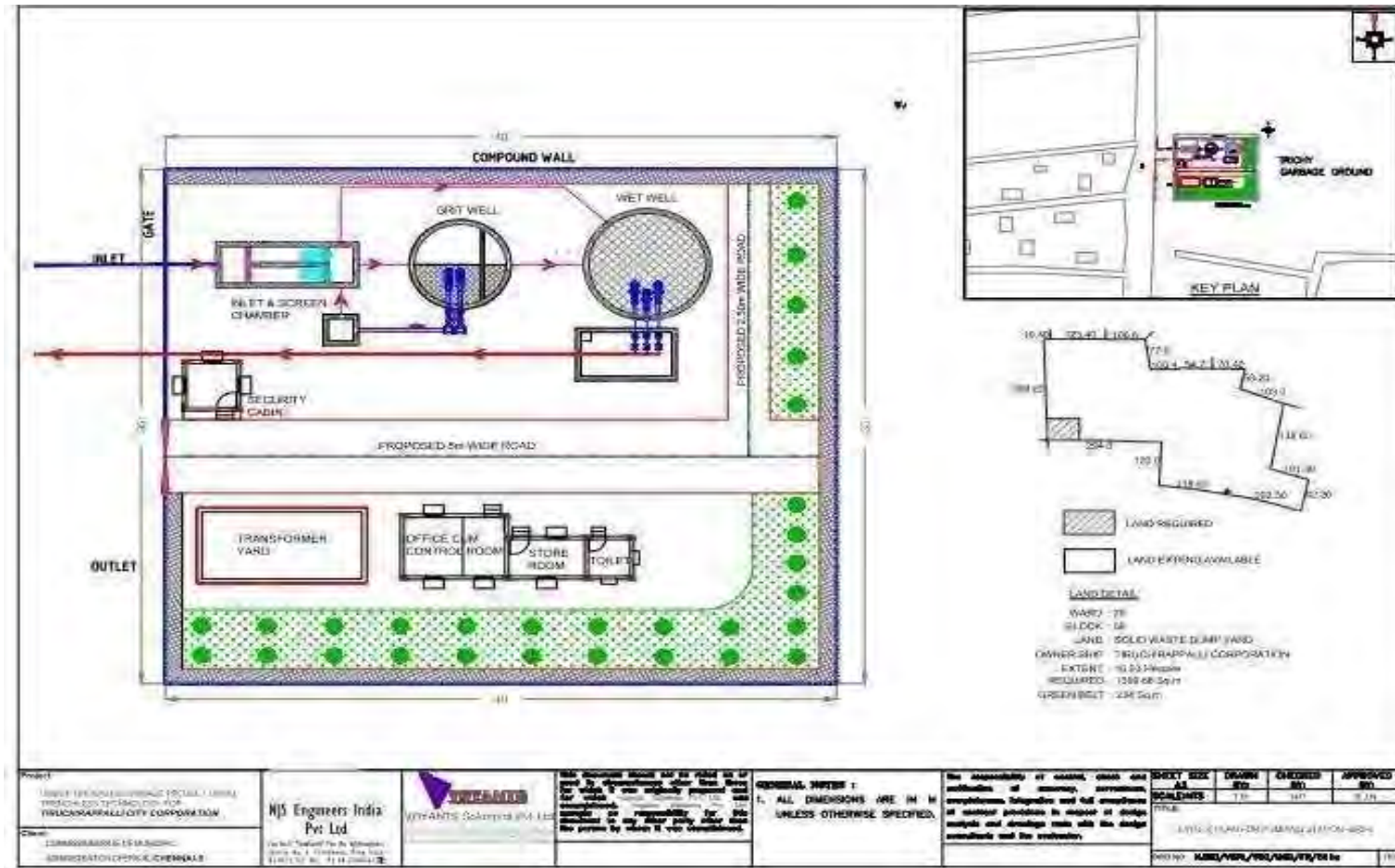


Figure 5: Layout Plan on Revenue Map for SPS 3

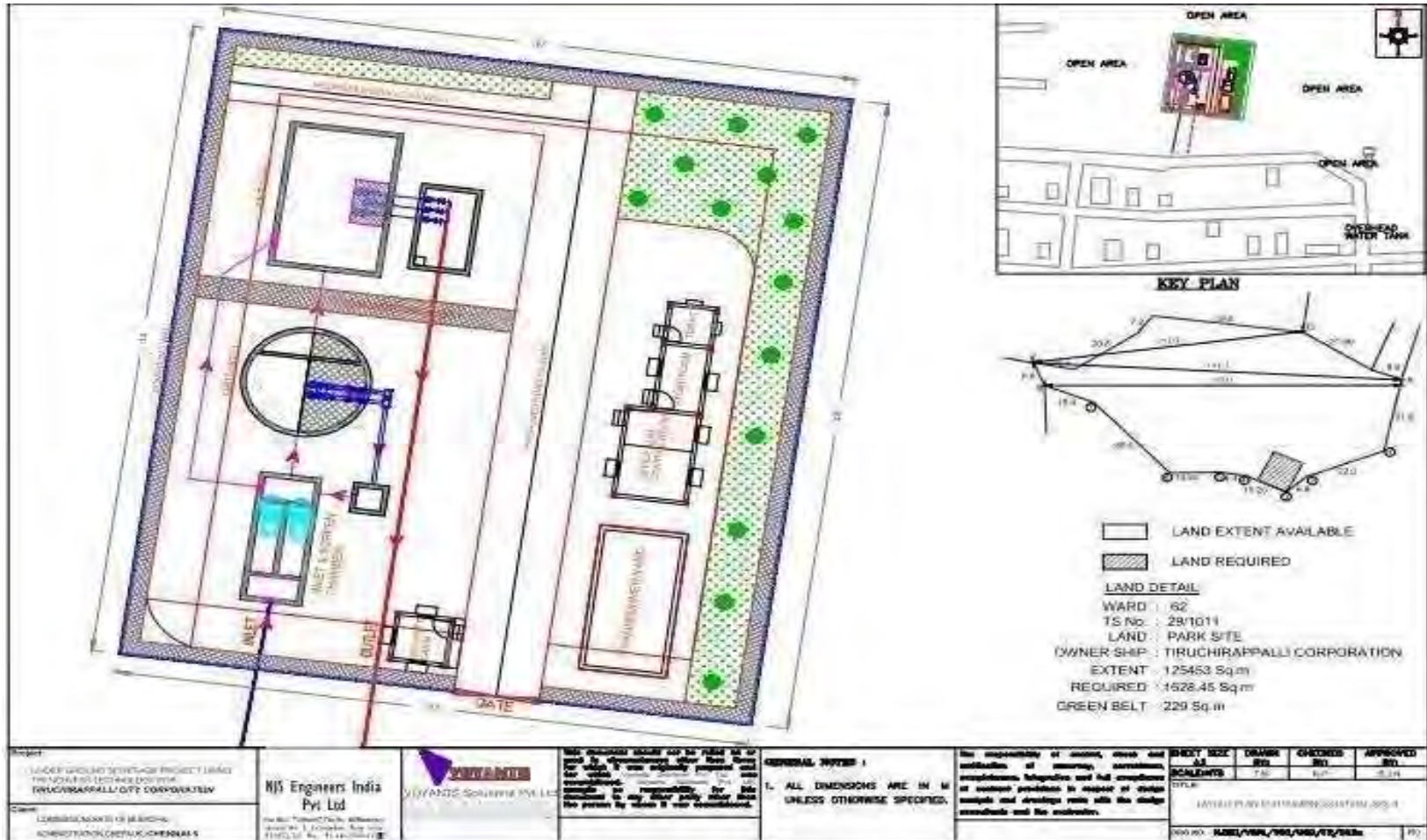


Figure 6: Layout Plan on Revenue Map for SPS-4

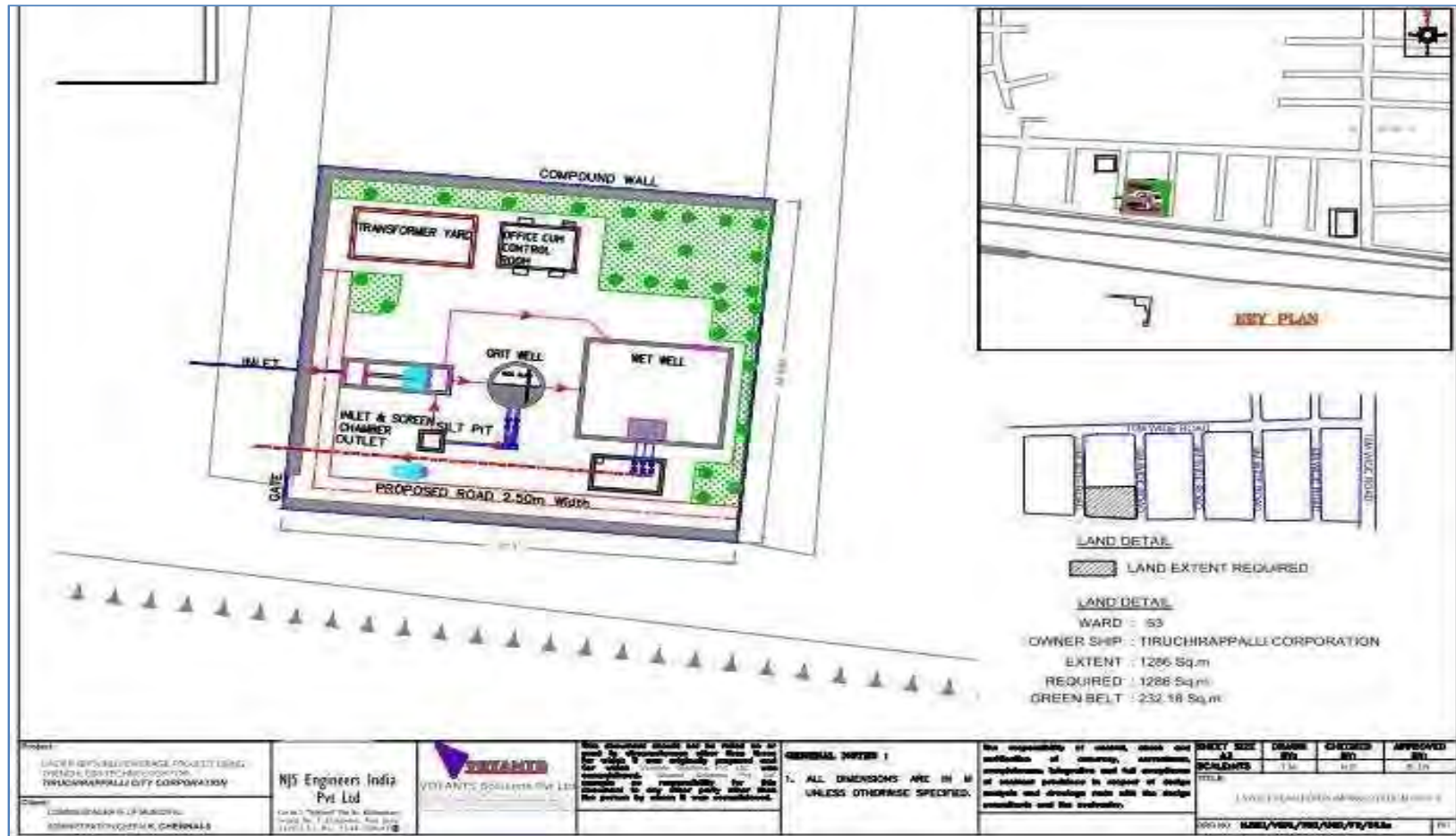


Figure 7: Layout Plan on revenue map for SPS-6

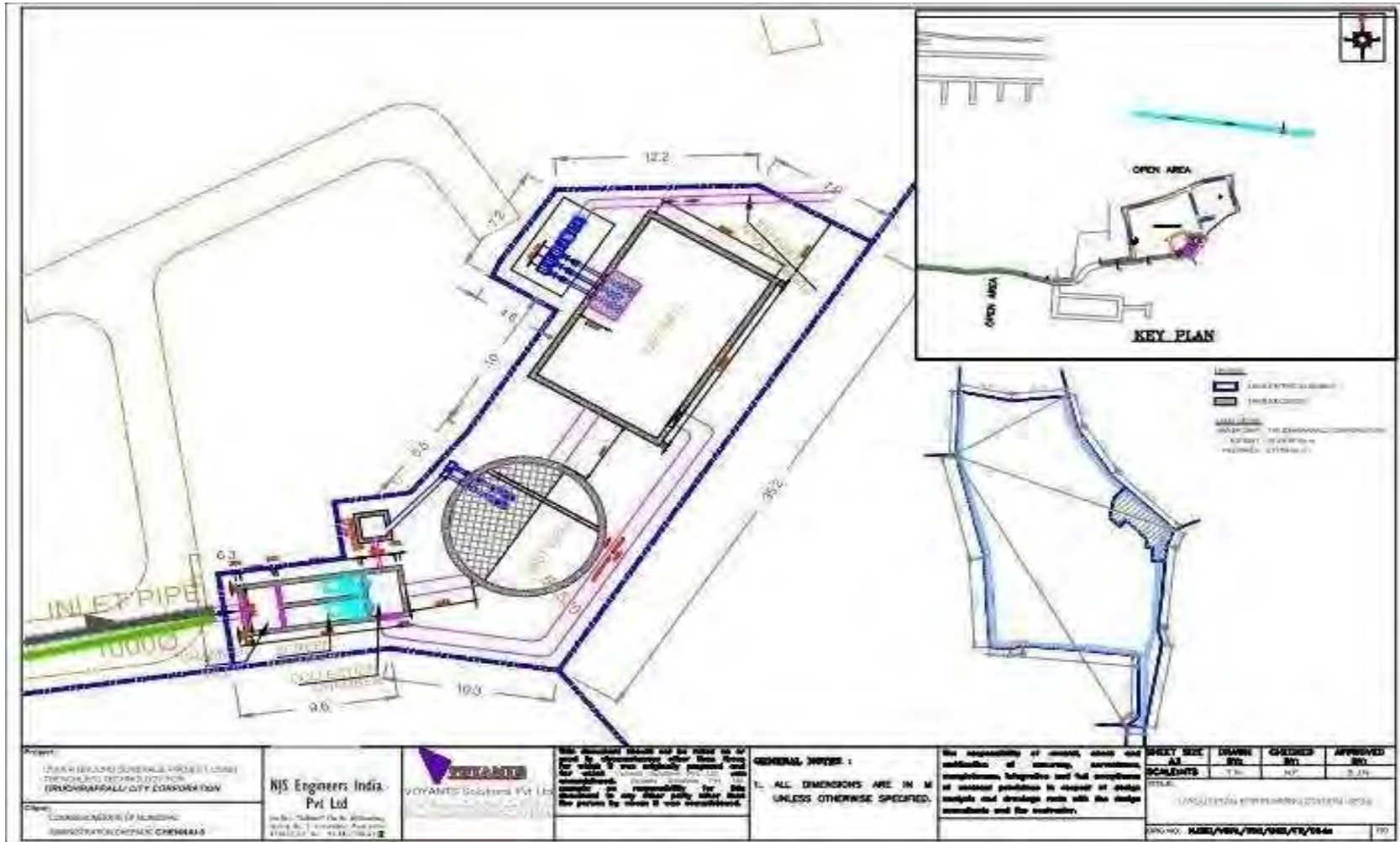


Figure 8: Layout Plan of SPS-6A

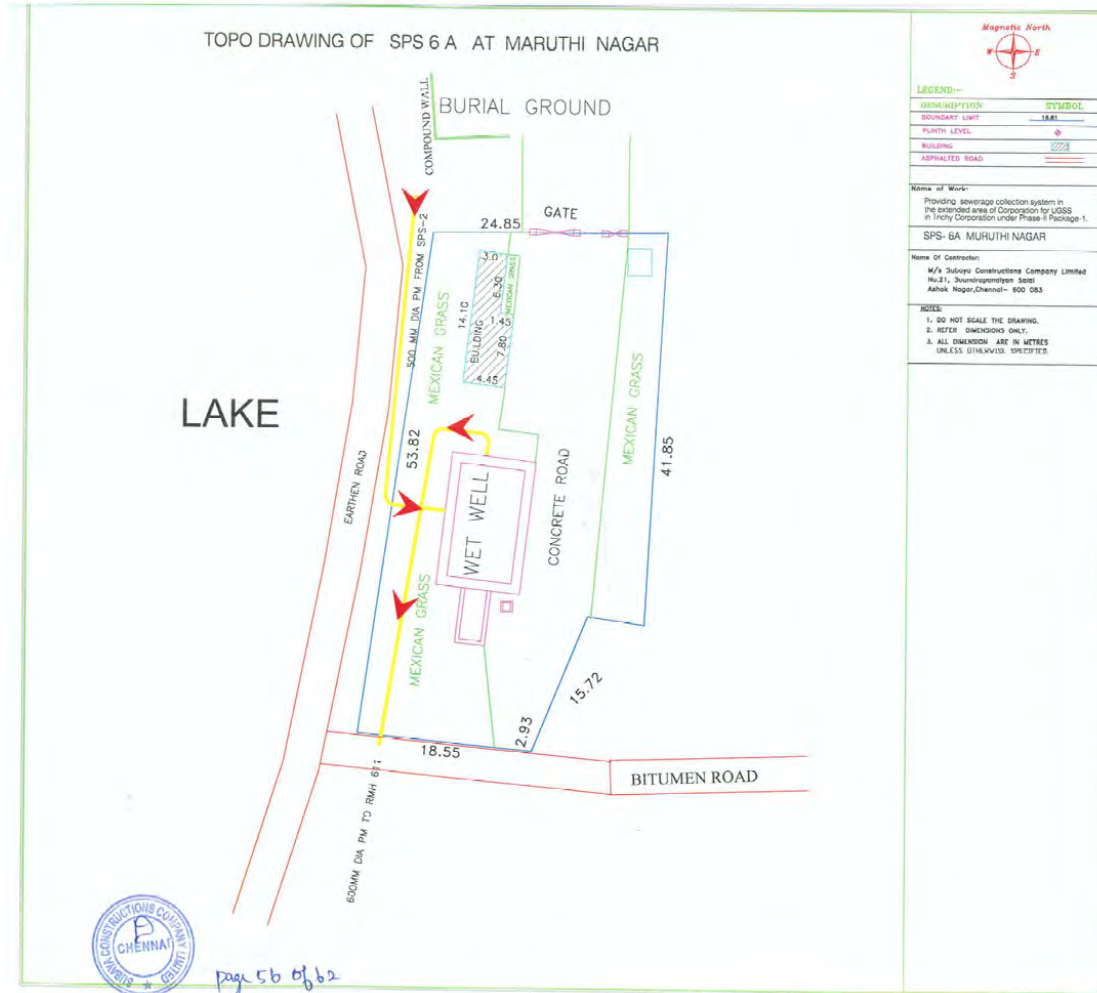


Figure 9: Layout plan for STP

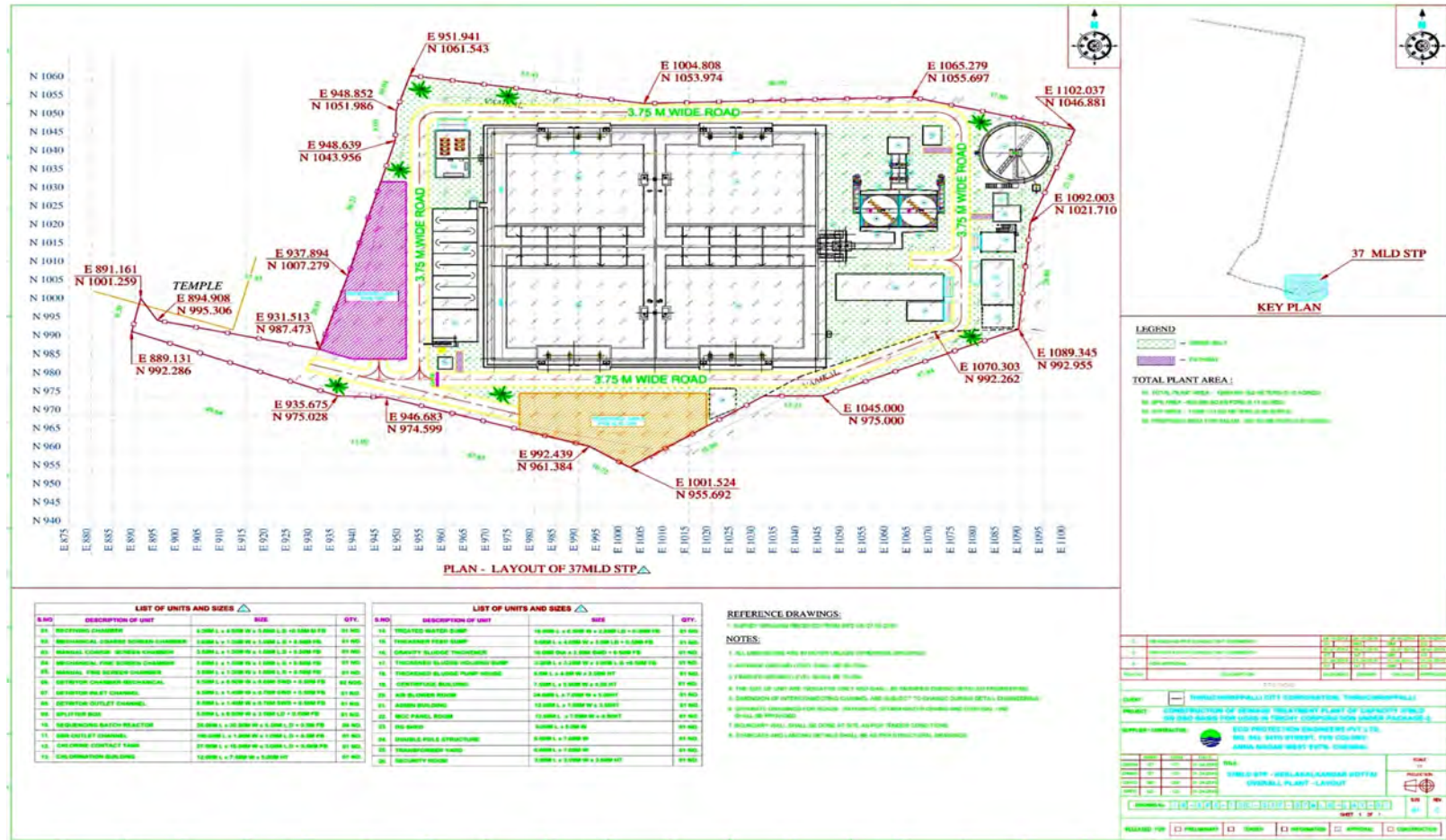


Figure 10: STP Hydraulic Flow Diagram

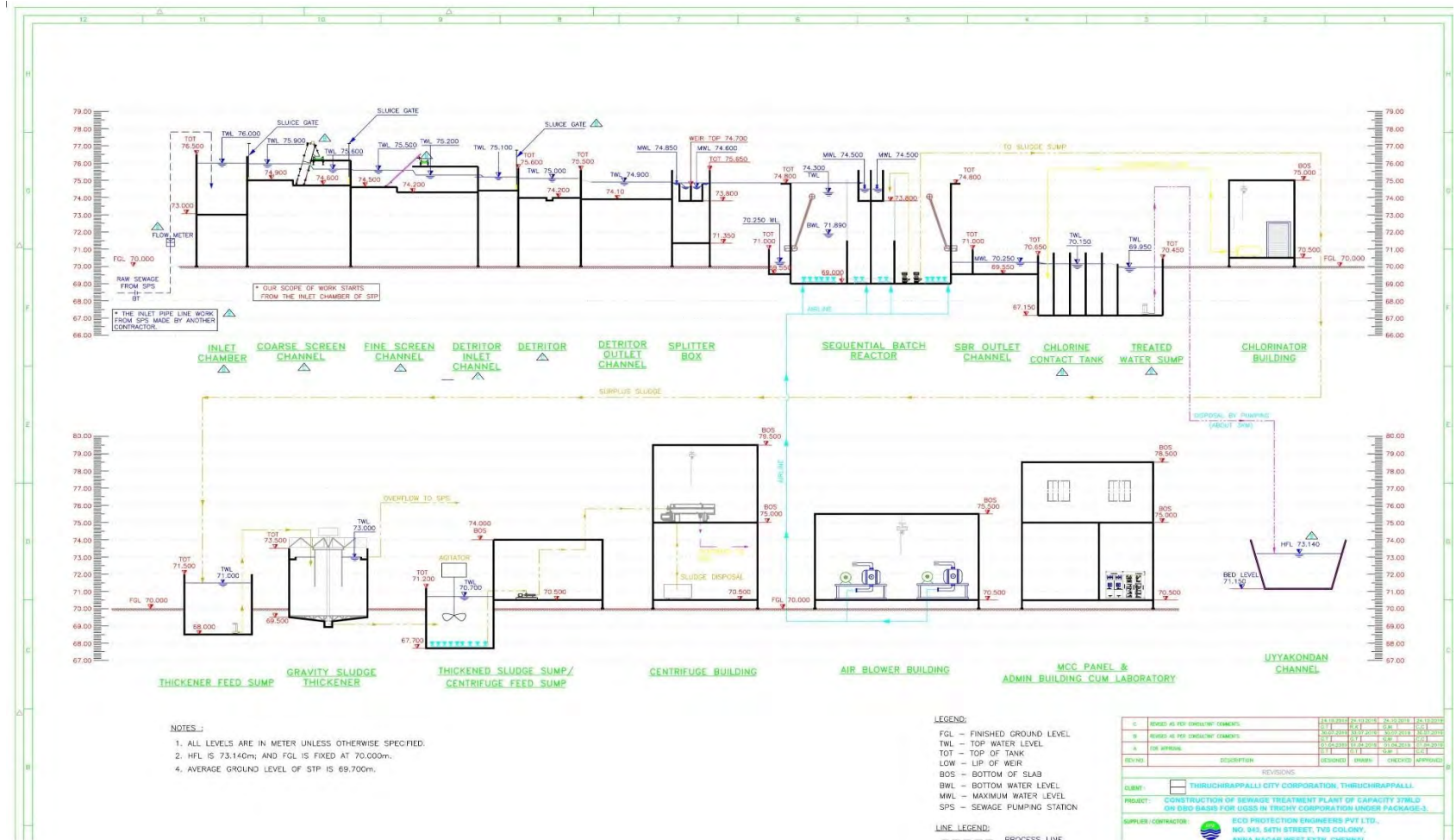
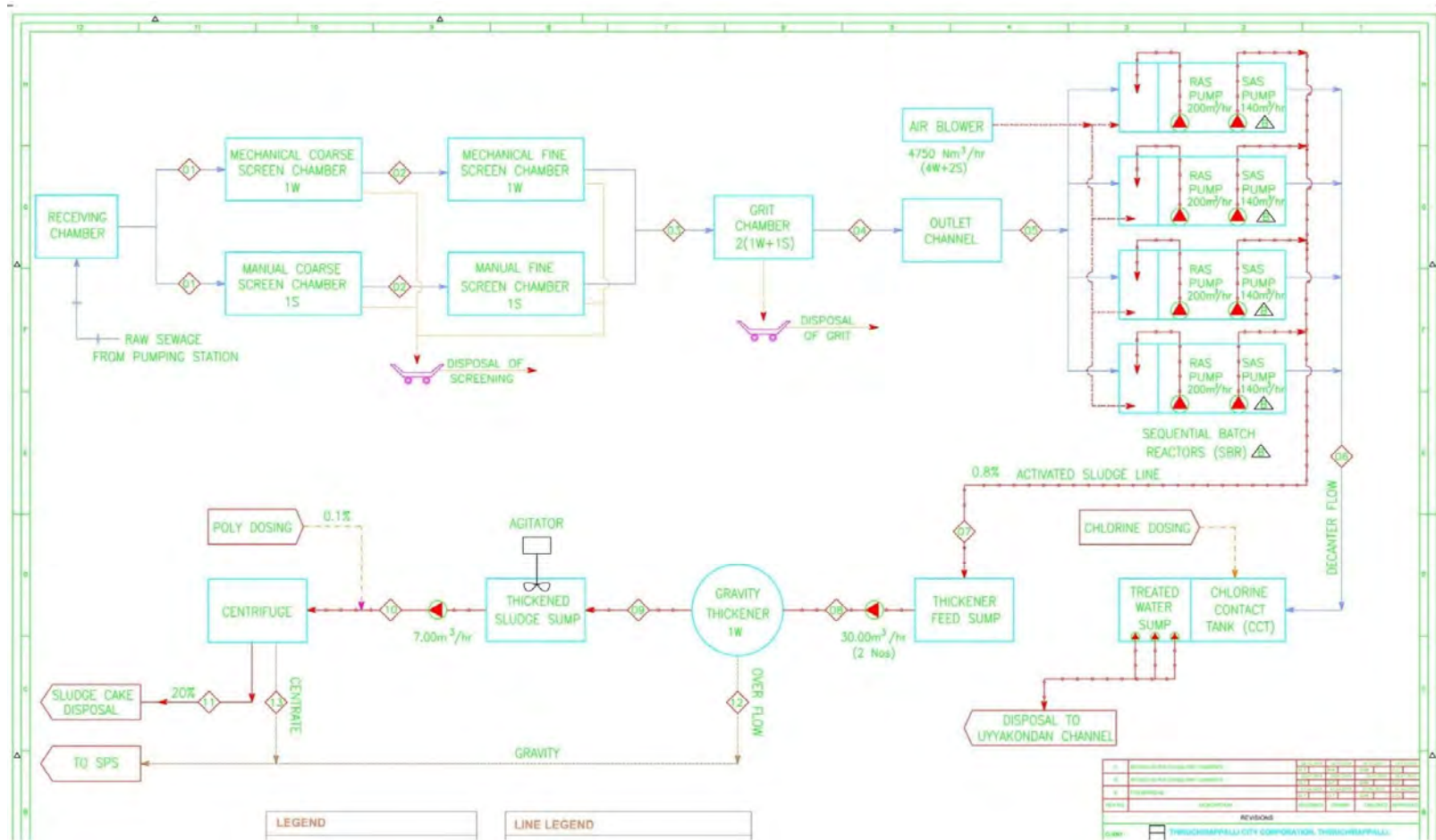


Figure 11:STP Process Diagram



D. Implementation Schedule

18. Contracts have been awarded in three packages. Contract for Package 2 was awarded on 18th May 2018 and the Construction was started in July 2018 and will take 36 months to complete. Contract for Package 1 was awarded on 19th December 2018 and the Construction was started February 2019 and will take 36 months to complete. Contract for Package 3 was awarded on 3rd January 2019 and the Construction was started in March 2020 and will take about 30 months to complete. The detailed implementation schedule (including design/pre-construction, construction, commissioning, and operation phases) are provided in the Table 2, 3 and 4

Table 2: Implementation Schedule for Package - 1

| sl. no. | Description of works | Target | Milestone I (6 months) | Milestone II (12 months) | Milestone III (18 months) | Milestone IV (24 months) | Milestone V (30 months) | Milestone VI (36 months) |
|---------|---|------------|------------------------|--------------------------|---------------------------|--------------------------|-------------------------|----------------------------|
| 1 | Supply of pipes and specials, etc | 257.322 km | 20% | 40% | 60% | 95% | 100% | Flow test |
| 2 | Laying, Jointing and Testing of Pipes Completed for Sewer Line Including Pumping Main and MH, etc., | 257.322 km | 10% | 40% | 60% | 90% | 100% | 100% Balance |
| 3 | Sewage Pumping Stations and Lift stations | 16 Nos | 10% | 40% | 65% | 80% | 90% | 100% (Including Trial run) |
| 4 | House Service Connection | 33847 Nos | | 10% | 20% | 50% | 80% | Flow test |
| 5 | Commissioning and trial running. | | | | | | 100% | 100% |

Table 3: Implementation Schedule for Package - 2

| sl. no. | Description of works | Target | Milestone I (6 months) | Milestone II (12 months) | Milestone III (18 months) | Milestone IV (24 months) | Milestone V (30 months) | Milestone VI (36 months) |
|---------|---|----------|------------------------|--------------------------|---------------------------|--------------------------|-------------------------|--------------------------|
| 1 | Supply of pipes and specials, etc | 78.79 km | 20% | 40% | 60% | 95% | 100% | Flow test |
| 2 | Laying, Jointing and Testing of Pipes Completed for Sewer Line Including Pumping Main and MH, etc., | 78.79 km | 10% | 40% | 60% | 90% | 100% | 100% Balance |

| | | | | | | | | |
|---|--|-----------|-----|-----|-----|-----|------|----------------------------|
| 3 | Lift Stations including Electromechanical works and Additional well construction | 13 Nos | 10% | 40% | 65% | 80% | 90% | 100% (including Trial run) |
| 4 | House Service Connection | 10722 Nos | | 10% | 20% | 50% | 80% | Flow test |
| 5 | Commissioning and trial running. | | | | | | 100% | 100% |

Table 4: Implementation Schedule for Package 3

| S.No. | Description of Milestones | Time for completion |
|-------|---|---------------------|
| 1 | Submission of layout, Unit sizing, Process design and drawings | 4 Weeks |
| 2 | Mobilization to the site and establishment of field office and quality control laboratory | 3 Weeks |
| 3 | Approval of design and drawings | 4 Months |
| 4 | Completion of civil works | 19 Months |
| 5 | Completion of installation of Plant and equipment | 24 Months |
| 6 | Completion of Trial run of the Treatment Plant | 30 Months |
| 7 | Completion of Commissioning and performance guarantee test and Operational Acceptance Certificate by the Employer | 30 Months |

III. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. ADB POLICY

19. ADB requires the consideration of environmental issues in all aspects of ADB's operations, and the requirements for environmental assessment are described in ADB SPS, 2009. This states that ADB requires environmental assessment of all ADB investments.
20. **Screening and categorization.** The nature of the environmental assessment required for a project depends on the significance of its environmental impacts, which are related to the type and location of the project; the sensitivity, scale, nature, and magnitude of its potential impacts; and the availability of cost-effective mitigation measures. Projects are screened for their expected environmental impacts, and are assigned to one of the following four categories:
 - (i) Category A. A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required.
 - (ii) Category B. A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination is required.
 - (iii) Category C. A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.
 - (iv) Category FI. A proposed project is classified as category FI if it involves investment of ADB funds to or through a Financial Intermediary (FI).
21. **Environmental Management Plan.** An EMP, which addresses the potential impacts and risks identified by the environmental assessment, shall be prepared. The level of detail and complexity of the EMP and the priority of the identified measures and actions are commensurate with the project's impact and risks.
22. **Public disclosure.** ADB will post the safeguard documents on its website as well as disclose relevant information in accessible manner in local communities:
 - (i) Final or updated IEE upon receipt; and
 - (ii) Environmental monitoring reports submitted by the implementing agency during project implementation upon receipt.

B. NATIONAL ENVIRONMENTAL LAWS

23. **Environmental assessment.** The Government of India EIA Notification of 2006 (replacing the EIA Notification of 1994), sets out the requirement for Environmental Assessment in India. This states that Environmental Clearance is required for specified activities/projects, and this must be obtained before any construction work or land preparation (except land acquisition) may commence. Projects are categorized as A or B depending on the scale of the project and the nature of its impacts.
24. Category A projects require Environmental Clearance from the central Ministry of Environment, Forests and Climate Change (MoEFCC). The proponent is required to provide preliminary details of the project in the prescribed manner with all requisite details, after which an Expert Appraisal Committee (EAC) of the MoEFCC

prepares comprehensive Terms of Reference (ToR) for the EIA study. On completion of the study and review of the report by the EAC, MoEFCC considers the recommendation of the EAC and provides the Environmental Clearance if appropriate.

25. Category B projects require environmental clearance from the State Environment Impact Assessment Authority (SEIAA). The State level EAC categorizes the project as either B1 (requiring EIA study) or B2 (no EIA study), and prepares To R for B1 projects within 60 days. On completion of the study and review of the report by the EAC, the SEIAA issues the Environmental Clearance based on the EAC recommendation. The Notification also provides that any project or activity classified as category B will be treated as category A if it is located in whole or in part within 10 km from the boundary of protected areas, notified areas or inter-state or international boundaries.
26. None of the components of this underground sewerage system subproject falls under the ambit of the EIA Notification 2006, and therefore EIA Study or Environmental Clearance is not required for this subproject.
27. **Applicable environmental regulations.** Besides EIA Notification 2006, there are various other acts, rules, policies, and regulations currently in force in India that deal with environmental issues that could apply to infrastructure development. The specific regulatory compliance requirements of the subproject are shown in Table 5.

Table 5: Applicable Environmental Regulations

| Law | Description | Requirement |
|--|--|---|
| Water (Prevention and Control of Pollution) Act of 1974, Rules of 1975, and amendments | Act was enacted to provide for the prevention and control of water pollution and the maintaining or restoring of wholesomeness of water. Control of water pollution is achieved through administering conditions imposed in consent issued under to this Act. All pollution potential activities will require consent to establish (CTE) from Tamil Nadu Pollution Control Board (TNPCB) before starting Implementation and consent to operate (CTO) before commissioning. | Construction of STP require CTE and CTO from TNPCB, before starting of construction and before commissioning of STP respectively. CTE for the new STP has been obtained from TNPCB. For Rehabilitation of the existing defunct STP, CTO from TNPCB is required prior to operation. |
| Environment (Protection) Act, 1986 and Central Pollution Control Board (CPCB) Environmental Standards. | Emissions and discharges from the facilities to be created or refurbished or augmented shall comply with the notified standards | To comply with applicable notified standards. Table 6 and Table 7 below respectively present wastewater disposal standards for STPs and sludge composting standards for use as compost manure |
| Noise Pollution (Regulation and Control) Rules, 2000 amended upto 2010. | Rule 3 of the Act specifies ambient air quality standards in respect of noise for different areas/zones. | To comply with the noise standards. |

| Law | Description | Requirement |
|---|---|---|
| Air (Prevention and Control of Pollution) Act, 1981, amended 1987 and its Rules, 1982. | <p>- Applicable for equipment and machinery's potential to emit air pollution (including but not limited to diesel generators and vehicles);</p> <p>- CTE and CTO from TNPCB.</p> <p>- Compliance to conditions and emissions standards stipulated in the CTE and CTO.</p> | For the subproject, the following will require CTE and CTO from TNPCB: (i) diesel generators; and (ii) hot mix plants, wet mix plants, stone crushers, etc. if installed for construction. |
| Solid | Rules to manage municipal solid waste generated; provides rules for segregation, storage, collection, processing, and disposal. | Solid waste generated at proposed facilities shall be managed and disposed in accordance with the SWM Rules |
| Construction and Demolition Waste Management Rules, 2016 | Rules to manage construction and to waste resulting from construction, remodeling, repair and demolition of any civil structure. Rules define C and D waste as waste comprising of building materials, debris resulting from construction, re-modeling, repair and demolition of any civil structure. | Construction and demolition waste generated from the project construction shall be managed and disposed as per the rules |
| Labor Laws | The contractor shall not make employment decisions based upon personal characteristics unrelated to job requirements. The contractor shall base the employment relationship upon equal opportunity and fair treatment, and shall not discriminate with respect to aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment or retirement, and discipline. The contractor shall provide equal wages and benefits to men and women for work of equal value or type. | Appendix 2 provides applicable labor laws including amendments issued from time to time applicable to establishments engaged in construction of civil works. |
| The Ancient Monument and Archaeological Sites and Remains (Amendment and Validation) Act 2010 | <p>The Rules designate areas within a radius of 100 m and 300 m from the "protected property/ monument/ area" as "prohibited area" and "regulated area" respectively.</p> <p>Henceforth, 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.</p> <p>In respect of regulated area, the Competent Authority may grant permission for construction, reconstruction, repair and renovation on the basis of recommendation of the National Monument Authority duly taking</p> | <p>The proposed sewer network in Zone-3 is passing within the 300m of the Erumbeeswarar Temple (an Archaeological survey of India or ASI protected monument). Some sewer lines fall within 100 m boundary of ASI monument.</p> <p>All the works within 300m require prior approval of competent authority (National Monument Authority). NOC has been received from ASI and the</p> |

| Law | Description | Requirement |
|-----|---|---------------------------------|
| | note of heritage bye-laws, which shall be prepared in respect of each protected monument and protected area | same is provided as Appendix-12 |

Table 6: Effluent Disposal Standards of Sewage Treatment Plants Applicable to All Modes of Disposal

| S. No. | Parameter | Standard | |
|--------|--|---|-----------------------------|
| | | Location | Concentration not to exceed |
| 1 | pH. | Anywhere in the country | 6.5 - 9.0 |
| 2 | Bio-Chemical (BOD) Oxygen Demand | Metro Cities*, all State Capitals except in the State of Assam, Manipur, Meghalaya Mizoram, Nagaland, Tripura Sikkim, Himachal Pradesh, Uttarakhand, and Union territory of Andaman and Nicobar Islands, Dadar and Nagar Haveli Daman and Diu and Lakshadweep | 20mg/l |
| | | Areas/regions Above other than mentioned | 20mg/l |
| 3 | Total Suspended Solids (TSS) | Metro Cities*, all State Capitals except in the State of Assam, Manipur, Meghalaya Mizoram, Nagaland, Tripura Sikkim, Himachal Pradesh, Uttarakhand, and Union territory of Andaman and Nicobar Islands, Dadar and Nagar Haveli Daman and Diu and Lakshadweep | <50 mg/l |
| | | Areas/regions other than mentioned Above | <100mg/l |
| 4 | Fecal Coliform (FC) (Most Probable Number per 100 milliliter, MPN/100ml) | Anywhere in the country | <1000 |

*Metro Cities are Mumbai, Delhi, Kolkata, Chennai, Bengaluru, Hyderabad, Ahmedabad and Pune.

Note:

- (i) All values in mg/l except for pH and Fecal Coliform.
- (ii) These standards shall be applicable for discharge into water bodies as well as for land disposal/applications.
- (iii) The standards for Fecal Coliform shall not apply in respect of use of treated effluent for industrial purposes.

These Standards shall apply to all STPs to be commissioned on or after the 1st June 2019 and the old/existing STPs shall achieve these standards within a period of five years from date of publication of this notification in the Official Gazette.

In case of discharge of treated effluent into sea, it shall be through proper marine outfall and the existing shore discharge shall be converted to marine outfalls, and in cases where the marine outfall provides a minimum initial dilution of 150 times at the point of discharge and a minimum dilution of 1500 times at a point 100 meters away from discharge point, then, the existing norms shall apply as specified in the general discharge standards.

Reuse/Recycling of treated effluent shall be encouraged and in cases where part of the treated effluent is reused and recycled involving possibility of human contact, standards as specified above shall apply.

Central Pollution Control Board/State Pollution Control Boards/Pollution Control Committees may issue more stringent norms taking account to local condition under section 5 of the Environment (Protection) Act, 1986".

Table 7: Standards for Sludge Reuse as Manure

| Standards for Composting. As there are no specific standards notified for sludge reuse, the compost quality standards notified under the Solid Waste Management Rules, 2016 (Schedule II A, Standards for Composting) have been adopted here. According to the standards "In order to ensure safe application of compost, the following specifications for compost quality shall be met, namely: - | | | |
|---|-------------------|---|---|
| Parameters | Units | Organic Compost (FCO 2009) | Phosphate Rich Organic Manure (FCO 2013) |
| Arsenic | mg/kg | 10 | 10 |
| Cadmium | mg/kg | 5 | 5 |
| Chromium | | 50 | 50 |
| Copper | | 300 | 300 |
| Lead | | 100 | 100 |
| Mercury | | 0.15 | 0.15 |
| Nickel | | 50 | 50 |
| Zinc | | 1000 | 1000 |
| C/N ratio | | <20 | <20:1 |
| PH | | 6.5 – 7.5 | (1:5 solution) maximum 6.7 |
| Moisture, percent by weight, maximum | | 15.0 – 25.0 | 25.0 |
| Bulk density (g/cm ³) | | <1 | Less than 1.6 |
| Total Organic Carbon, per cent by weight, minimum | | 12 | 7.9 |
| Total Nitrogen (as N), per cent by weight, minimum | percent by weight | 0.8 | 0.4 |
| Total Phosphate (as P ₂ O ₅) percent by weight, minimum | percent by weight | 0.4 | 10.4 |
| Total Potassium (as K ₂ O), percent by weight, minimum | percent by weight | 0.4 | - |
| Color | | | |
| Odor | | Absence of foul Odor | |
| Particle size | | minimum 90% material should pass through 4.0 mm sieve | minimum 90% material should pass through 4.0 mm sieve |
| Conductivity, not more Than | dsm-1 | 4 | 8.2 |
| * compost (final product) exceeding the above stated concentration limits shall not be used for food crops. however, it may be utilized for purposes other than growing food crops. | | | |

28. **Clearances/permissions to be obtained by Contractor.** Following Table 8 shows the list of clearances/permissions required for project construction. This list indicative and the contractor should ascertain the requirements prior to start of the construction and obtain all necessary clearances/permission prior to start of construction.

Table 8: Clearances and Permissions Required for Construction

| Sl. no | Construction Activity | Statutory Authority | Statute under which Clearance is Required | Implementation | Supervision |
|--------|---|--|--|--|---|
| 1 | Construction of new STP and Rehabilitation of existing STP | TNPCB | Consent to establish (CTE) and consent to operate (CTO) under Water Act, 1974 for new STP and CTO for Rehabilitation of existing STP. | Project Implementation Unit (PIU) and Contractor | PIU CTE for the new STP has been obtained from TNPCB on 13.02.20 |
| 2 | Construction of network within 300m of Monument | ASI | Permission obtained from ASI on 10.06.20 | Project Implementation Unit (PIU) and Contractor | PIU |
| 3 | National Highways | NHAI | 5 crossings, 21 along Highway. Permission awaited and is being followed. | Project Implementation Unit (PIU) and Contractor | PIU |
| 4 | State Highways | State Highways | 5 locations. Permission received for 1 location and awaited for 4 locations. | Project Implementation Unit (PIU) and Contractor | PIU |
| 5 | PWD 1) Disposal of treated effluent 2) Canal crossing | PWD/ WRD | 1) Effluent Disposal Permission obtained on 02.01.20. 2) Permission awaited for canal crossing and is being followed. | Project Implementation Unit (PIU) and Contractor | PIU |
| 6 | Tree Cutting | District Collector | Clearances from the authorities as per the Tamil Nadu Timber Transit Rules, 1968 or latest. | PIU | Implementing Agency and Project Management Unit (PMU) |
| 7 | Hot mix plants, Crushers and Batching plants | TNPCB | CTE and CTO under Air Act, 1981 | Contractor | PIU |
| 8 | Discharges from construction activities | TNPCB | CTE and CTO under Water Act, 1974 | Contractor | PIU |
| 9 | Storage, handling and transport of hazardous materials | TNPCB | Hazardous Wastes (Management and Handling) Rules, 1989 Manufacturing, Storage and Import of Hazardous Chemicals Rules, 1989 | Contractor | PIU |
| 10 | Sand mining, quarries and borrow areas | Department of Geology and mining, GoTN | Not applicable Contractor to obtain material from the existing government licensed mines/quarries; Contractor will require prior approval of PIU for obtaining material from a particular source. PIU to review and approve only existing licensed mines | Contractor | PIU |
| 11 | Permission for Controlled Blasting for excavation | District Collector, Trichy | Explosives Rules, 2008 Permission obtained from the | Contractor | PIU |

| Sl. no | Construction Activity | Statutory Authority | Statute under which Clearance is Required | Implementation | Supervision |
|--------|--------------------------------------|--|--|----------------|-------------|
| | | | District Collector dt22.10.2020 (enclosed in appendix-10) | | |
| 12 | Groundwater extraction | Public Works Department | (Groundwater) Tamil Nadu Groundwater Development and Management Act 2000 | Contractor | PIU |
| 13 | Disposal of bituminous wastes | Tamil Nadu State Pollution Control Board | Hazardous Wastes (Management and Handling) Rules. 1989 | Contractor | PIU |
| 14 | Temporary traffic diversion measures | - | MoRTH 112 SP 55 of IRC codes | Contractor | PIU |

ADB SPS Requirements. During the design, construction, and operation of the project the Project Management Unit (PMU) and Project Implementation Units (PIUs) will apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines ((both General Guidelines and sector specific guidelines of water and sanitation projects to be referred http://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/policies-standards/ehs-guidelines)). These standards contain performance levels and measures that are normally acceptable and applicable to projects. When Government of India regulations differ from these levels and measures, the PMU and PIUs will achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the PMU and PIUs will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADBSPS.

Table 9: WHO Ambient Air Quality Guidelines

| Table 1.1.1: WHO Ambient Air Quality Guidelines ^{7,8} | | |
|--|----------------------|---|
| | Averaging Period | Guideline value in $\mu\text{g}/\text{m}^3$ |
| Sulfur dioxide (SO ₂) | 24-hour | 125 (Interim target-1) 50 (Interim target-2) 20 (guideline) |
| | 10 minute | 500 (guideline) |
| Nitrogen dioxide (NO ₂) | 1-year | 40 (guideline) |
| | 1-hour | 200 (guideline) |
| Particulate Matter PM ₁₀ | 1-year | 70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline) |
| | 24-hour | 150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline) |
| Particulate Matter PM _{2.5} | 1-year | 35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline) |
| | 24-hour | 75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline) |
| Ozone | 8-hour daily maximum | 160 (Interim target-1) 100 (guideline) |

Table 10: World Bank Group's EHS Noise Level Guidelines

| Table 1.7.1- Noise Level Guidelines⁵⁴ | | |
|--|--|------------------------------------|
| Receptor | One Hour L_{Aeq} (dBA) | |
| | Daytime 07:00 - 22:00 | Nighttime 22:00 - 07:00 |
| Residential; institutional; educational ⁵⁵ | 55 | 45 |
| Industrial; commercial | 70 | 70 |

IV. DESCRIPTION OF THE ENVIRONMENT

A. METHODOLOGY USED FOR BASELINE STUDY

29. **Data collection and stakeholder consultations.** Data for this study has been primarily collected through comprehensive literature survey, discussion with stakeholder agencies, and field visits to the proposed sub project sites.
30. The literature survey broadly covered the following:
 - (i) Project details, reports, maps, and other documents prepared by technical consultants, TCC, ADB project preparatory technical assistance (PPTA) Team, etc.
 - (ii) Discussions with Technical experts of the PPTA team, TNUIFSL, implementing agency, DPR preparation agency, and other relevant government agencies.
 - (iii) Secondary data from previous project reports and published articles and
 - (iv) Literature on land use, soil, geology, hydrology, climate, socio-economic profiles, and other planning documents collected from government agencies and websites.
31. **Ocular inspection.** Several visits to the project sites were made during IEE preparation period in 2017 to assess the existing environment (physical, biological, and socioeconomic) and gather information about the proposed sites and scale of the proposed project. A separate socioeconomic study was conducted to determine the demographic information, existing service levels, stakeholder needs and priorities.

B. PHYSICAL RESOURCES

1. LOCATION, AREA AND CONNECTIVITY

31. Tiruchirappalli is one of the largest cities in the state of Tamil Nadu, located on the Chennai – Dindigul National Highway (NH - 45). It is situated in the center of the state, on the banks of the Cauvery river. Tiruchirappalli is well connected with major cities in Tamil Nadu by rail and road network. By virtue of its location, Tiruchirappalli City serves as an important link from north to south and east to west across the state. Tiruchirappalli, Srirangam and Golden rock are part of Tiruchirappalli urban agglomeration and developing as a regional metropolis, extending its influence over the entire Tiruchirappalli and Thanjavur districts. The influence of Tiruchirappalli extends up to Cuddalore, Villupuram, Vellore, Salem, Erode, Dindigul and Pudukottai Districts. Geographically, Tiruchirappalli is situated at the middle of Tamil Nadu, connected by 4 National Highways, 2 State Highways and several District Roads with other major towns of the state. Tiruchirappalli is an important Divisional Headquarters of Southern Railways. Tiruchirappalli is well connected by rail to Chennai, Kanyakumari, Madurai, Thanjavur, Rameswaram, Coimbatore and Bangalore. Tiruchirappalli junction is the main station for passengers as well as goods movement. Tiruchirappalli has an International Airport located on the Pudukottai road at 6 km. City is connected by air with Chennai, Madurai, Thiruvananthapuram, Sri Lanka, Singapore and Arab countries.
32. Tiruchirappalli is bound on the north by Namakkal District, northeast by Perambalur District, east by Thanjavur District, southeast by Pudukottai District, south by Sivaganga and Madurai Districts, southwest by Dindigul

District and on the west by Karur District. It is a city known for its educational institutions, industries, and temples. Tiruchirappalli is a commercial and tourist hub of Tamil Nadu. The most prominent landmark is ASI protected Rock Fort Temple, a spectacular monument perched on a massive rocky outcrop which rises abruptly from the plains to tower over the old city.

33. Tiruchirappalli City spreading over an area of 146.90km² was upgraded from Special Grade Municipality to Corporation in the year 1994. During the year 2011, the adjacent local bodies in the eastern direction of City, such as Paappakurichi Village Panchayat, Ellakudi Village Panchayat, Aalathur Village Panchayat, Keelkalkandar Kottai Village Panchayat and Thiruverumbur Town Panchayat measuring 20.33km² were added with Corporation. Thus, the total area of TCC became 167km². TCC area is divided into 65 wards with a population of 9.16 lakhs (2011).

2. TOPOGRAPHY, SOILS AND GEOLOGY

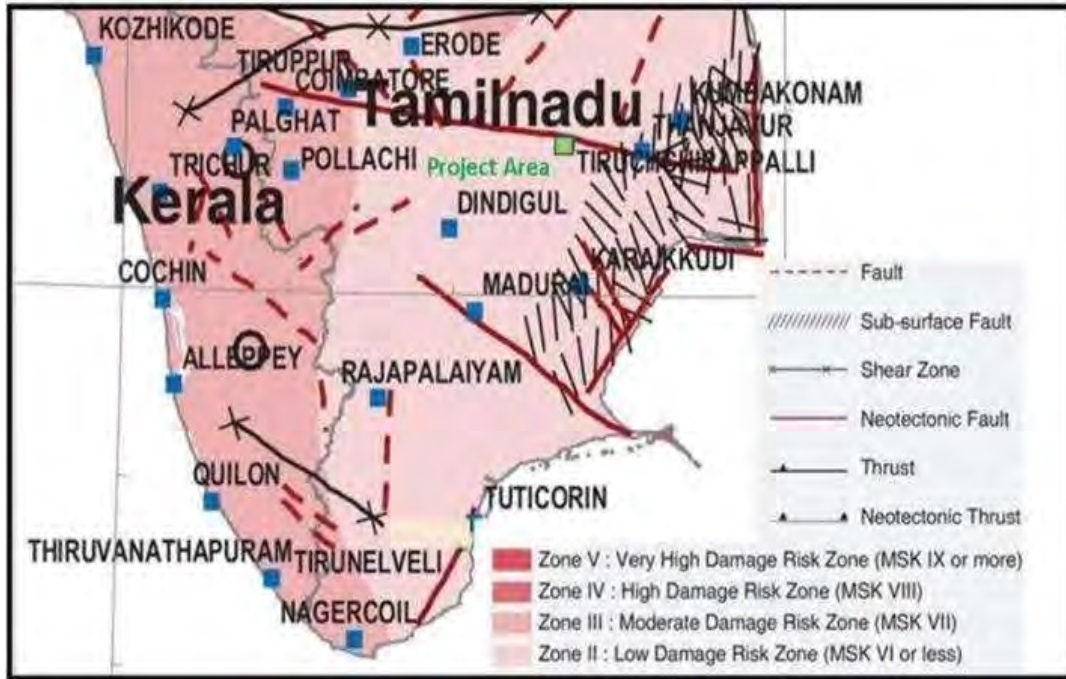
34. Tiruchirappalli lies between 10° 10' and 11° 20' of the northern latitude and 78° 10' and 79° 0' of eastern longitude. The general slope of the city is towards east. Pachamalai Hill is an important peak rising up to 1,015-m, located at Sengattupatti Reserve Forest.
35. Tiruchirappalli falls under Cauvery river basin. The Cauvery River is the most important river in the district and the tributaries of Cauvery, i.e. Coleroon River, Koraiyar river, Ariyar, Malattar channel and Uyyakondan channel also drain in Tiruchirappalli. The river splits into two branches, the northern branch being called the Coleroon (Kollidam) and the southern branch called Cauvery River. Ponnaniar, Uppamodai and Siddhayalli reservoirs are mainly used for irrigation purposes in this region. The gradient of groundwater table, in general, is towards Cauvery river. Cauvery river flows from NW to SE and drains about 81,155 km² of the southern peninsula. The river has been dammed since 2nd century AD at the Grand Anicut. The drainage network of the river is dense, and the river forms a delta at Tiruchirappalli. Prominent geomorphic units identified in Tiruchirappalli are alluvial plains, shallow and deep buried sediments, valley fills and structural hills.
36. Geologically, Tiruchirappalli is underlain by formations ranging in age from Achaean to recent formation. Crystalline rocks comprising Charnockites, gneiss occupy a major part of the district. Alluvial deposits are restricted to major drainage courses and foothill zones. The geology of Tiruchirappalli is mainly hard rock, mostly Charnockites and mixed gneiss with river alluvium. There are no known or reported cases of land subsidence in or close to the subproject area. The cretaceous formations consisting of limestone, calcareous shale, clay, argillaceous sandstones, etc. occur in parts of Tiruchirappalli. The hydrogeology of the city is represented by hard rock aquifers along the northern and north-western part.
37. The important aquifer systems in Tiruchirappalli are constituted by weathered and fractured crystalline rocks. Groundwater occurs under phreatic conditions in the weathered residuum and under semi-confined to confined conditions in deeper fracture zones. Recent alluvial deposits and semi-consolidated formations are found to form localized, discontinuous aquifers with low to moderate field potentials.

3. SEISMOLOGY

38. Bureau of Indian Standards, based on the past seismic history, grouped the country into four seismic zones, viz. Zone-II, -III, -IV and -V. Of these, Zone

V is the most seismically active region, while zone II is the least. The project area is in Low Damage Risk Zone II and as per the Modified Mercalli (MM) intensity scale, which measures the impact of the earthquakes on the surface of the earth, the project region is in MSK VI or less which indicates low intensity.

Figure 12: Seismic Zone of Project Area



Source: BMTPC.

4. CLIMATIC CONDITIONS

39. The variation of temperature throughout the year exhibits hot and dry climate with high temperatures and low degree of humidity. The region experiences four main seasons: Winter Season (December to February), Summer Season (March to May), Windy Season (June to August) and Monsoon (September to November).

40. The normal annual rainfall over the district varies from about 730mm to about 900mm. It is the minimum around Musiri (731.9 mm) in the western part. It gradually increases towards north, east and south and reaches a maximum around Manapparai (908.5mm). The district has a tropical climate. The period from April to June is generally hot and dry. The weather is pleasant during the period from November to January. Usually mornings are more humid than afternoons. The relative humidity varies between 50% and 85% in the mornings while in the afternoon it varies between 70% and 92%.

Table 11: Annual Rainfall in Tiruchirappalli

| Year | 2011 | 2012 | 2013 | 2014 | 2015 | Normal Rainfall |
|----------------|--------|--------|--------|--------|-------|-----------------|
| Rainfall in mm | 806.90 | 626.90 | 522.90 | 535.70 | 862.0 | 818.0 |

Source: IMD Chennai.

SURFACEWATER

41. The entire district forms part of Cauvery river basin. Cauvery is the major, and the only perennial river in the district. The northern branch of Cauvery, known as ‘Coleroon’ is mainly a flood carried, while the southern branch retains the name Cauvery. The entire district falls in Cauvery basin and drained by Cauvery River and its tributaries like Ayyar, Upper and partly by Maruthaiyar, Ponnaniyar, Koraiyar and partly by Vellar river System. The drainage pattern, in general, is dendritic. The general slope of district is towards the central part where Cauvery and Coleroon rivers flow. There are small residual hills scattered in western and southern part of the district, prominent among the mis Rock Forthill, located in the heart of Tiruchirappalli, Periyakulam, a big lake, and Vathiyar Kulam Lake area located within the project area, and Koraiyar river flows in the west of the project area. Water quality monitoring of Cavery river is conducted regularly by Central Pollution Control Board (CPCB), and sampling points are established throughout its course. In Tiruchirapally City, there are 2 sampling points - one just upstream and one just downstream of the city, and 2 more sampling points are located at about 30 km upstream (at Pettaivaithalai,) and 30km downstream (at Grand Anaicut). Samples are collected regularly from these sampling points. According to the water quality data of 2014, river water quality is classified as B as per the surface water quality classification of central pollution control board; pH of water ranged between 7.4 and 8.4 and Bio-chemical oxygen demand (BOD) ranged between 1.2 and 10.8 mg/l. Following Table presents the Cauvery River water quality. There are several channels/streams criss-cross the city. These include Uyyakondan, Koraiyar and Thirumanjana Cauvery which finally empty into the Cauvery and Coleroon Rivers. At present, waste water from the unsewered areas of the city enter these channels and ultimately pollute rivers. From the proposed STP, the treated wastewater will be discharged into Uyyakondan Channel that discharges into Vallavandhankottai irrigation Tank/pond. At present water quality data is available, the baseline profile of Uyyakondan channel has been established during the detailed design phase by DBO Contractor.

| Designated Best Use Water Quality Criteria | | |
|---|----------------|--|
| Designated-Best-Use | Class of water | Criteria |
| Drinking Water Source without conventional treatment but after disinfection | A | Total Coliforms Organism MPN/100ml shall be 50 or less pH between 6.5 and 8.5 Dissolved Oxygen 6mg/l or more Biochemical Oxygen Demand 5 days 20C 2mg/l or less |
| Outdoor bathing (Organised) | B | Total Coliforms Organism MPN/100ml shall be 500 or less pH between 6.5 and 8.5 Dissolved Oxygen 5mg/l or more Biochemical Oxygen Demand 5 days 20C 3mg/l or less |
| Drinking water source after conventional treatment and disinfection | C | Total Coliforms Organism MPN/100ml shall be 5000 or less pH between 6 to 9 Dissolved Oxygen 4mg/l or more Biochemical Oxygen Demand 5 days 20C 3mg/l or less |
| Propagation of Wild life and Fisheries | D | pH between 6.5 to 8.5 Dissolved Oxygen 4mg/l or more Free Ammonia (as N) 1.2 mg/l or less |
| Irrigation, Industrial Cooling, Controlled Waste disposal | E | pH between 6.0 to 8.5 Electrical Conductivity at 25C micro mhos/cm Max. 2250 Sodium absorption Ratio Max. 26 Boron Max. 2mg/l |

(Source: CPCB)

Table 12: Water Quality of Cauvery River near Tiruchirappalli

| Locations | D=O (mg/l) | | | pH | | | Conductivity (µmhos/cm) | | | BOD (mg/l) | | | Nitrate- N+ Nitrite-N (mg/l) | | | FecalColiform (MPN/100ml) | | | TotalColiform (MPN/100ml) | | |
|---|------------|------|------|---------|-----|------|-------------------------|------|------|------------|-----|------|------------------------------|------|------|---------------------------|----------|--------|---------------------------|----------|---------|
| | Min | Max | Mean | Min | Max | Mean | Min | Max | Mean | Min | Max | Mean | Min | Max | Mean | Min | Max | Mean | Min | Max | Mean |
| Water Quality | > 4 mg/l | | | 6.5-8.5 | | | | | | < 3 mg/l | | | | | | <2500MPN/100ml | | | < 5000MPN/100ml | | |
| Cauvery At Pettaivaithalai, Tiruchirappalli | 6.4 | 10.8 | 8.6 | 7.9 | 8.8 | 8.3 | 287 | 812 | 575 | 0.5 | 3.7 | 1.3 | 0 | 0.5 | 0.2 | 260 | 170000 | 24822 | 320 | 350000 | 54768 |
| Cauvery At Tiruchirappalli U/S | 5.9 | 9.7 | 8.1 | 7.9 | 8.7 | 8.4 | 236 | 686 | 489 | 0.2 | 7.2 | 1.8 | 0.03 | 0.37 | 0.2 | 220 | 170000 | 23957 | 330 | 280000 | 57494 |
| Cauvery At Tiruchirappalli D/S | 1.2 | 8.4 | 5.5 | 7.4 | 8.6 | 8 | 279 | 1438 | 829 | 0.7 | 18 | 5.5 | 0 | 6.14 | 0.7 | 320 | 11000000 | 975610 | 390 | 22000000 | 1939974 |
| Cauvery At Tiruchirappalli, GrandAnaicut | 3.7 | 10.2 | 6.5 | 7.8 | 8.8 | 8.2 | 274 | 1323 | 728 | 0.8 | 12 | 3.7 | 0.05 | 0.48 | 0.2 | 320 | 540000 | 73607 | 390 | 920000 | 127304 |

Source: cpcbenviis.nic.in.

The values that exceed standards are shaded for easy reference

Table 12A. Water Quality: Surface Waters samples at Koraiyar discharge point & at Uyyakondan channel

| S. No. | Parameters | Unit | S1 | S2 | S3 | S4 | Limitas per IS 10500, 2012 | |
|--------|---------------------------------------|-----------|---------------------|-----------------------|-------------------------------|---------------------------------|--|---------------|
| | | | Koraiyar (Upstream) | Koraiyar (Downstream) | Uyyakondan channel (Upstream) | Uyyakondan channel (Downstream) | Acceptable | Permissible |
| 1 | pH@25°C | -- | 8.1 | 7.16 | 7.12 | 7.58 | 6.5– 8.5 | No Relaxation |
| 2 | Oil and Grease | mg/l | BDL(DL:1.0) | BDL(DL:1.0) | BDL(DL:1.0) | BDL(DL:1.0) | -- | -- |
| 3 | Chloride as Cl | mg/l | 452 | 216 | 412 | 156 | 250 | 1000 |
| 4 | Fluoride as F | mg/l | 1.26 | 0.46 | 0.92 | 0.51 | 1.0 | 1.5 |
| 5 | Nitrate as NO ₃ | mg/l | 8.05 | 3.3 | 6 | 3.8 | 45 | No Relaxation |
| 6 | Total Hardness as CaCO ₃ | mg/l | 650 | 446 | 302 | 202 | 200 | 600 |
| 7 | Turbidity | NTU | BDL(DL:1.0) | BDL(DL:1.0) | BDL(DL:1.0) | BDL(DL:1.0) | 1 | 5 |
| 8 | Chemical Oxygen Demand | mg/l | 434 | 381 | 312 | 186 | -- | -- |
| 9 | BOD@27°C for 3 days | mg/l | 192 | 160 | 124 | 97 | -- | -- |
| 10 | Total Alkalinity as CaCO ₃ | mg/l | 396 | 338 | 396 | 338 | 200 | 600 |
| 11 | Dissolved Oxygen | mg/l | 1 | 1.3 | 1 | 1.3 | - | -- |
| 12 | Total Coliforms | CFU/100ml | Present | Present | Present | Present | Shall not be detectable in any 100 ml sample | |
| 13 | Faecal Coliforms | CFU/100ml | Present | Present | Present | Present | | |

(Source: EMP report, May 2019)

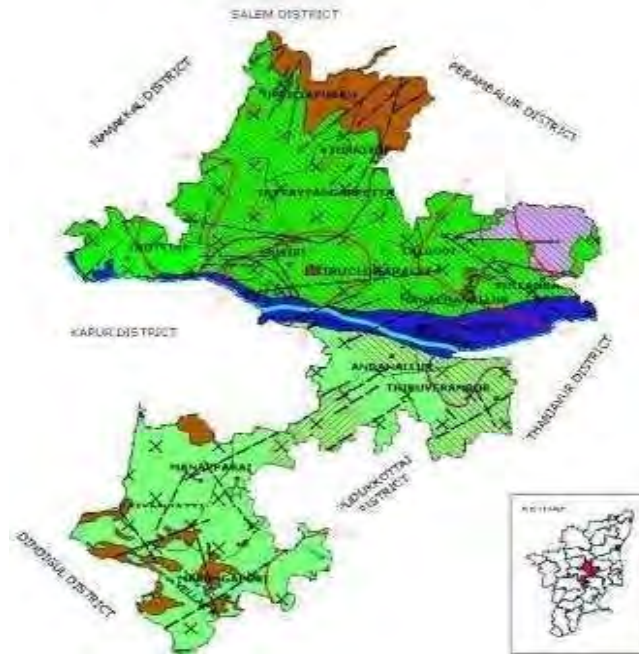
Note: BDL is Below Detectable Limit; DL: Minimum Detectable Limit

Based on the above table 12A of surface water sample collected and analysis within sub project area at different sampling locations shows that value found exceeding the acceptable limits of parameter such as Chlorides and Total Alkalinity throughout sampling locations. Bacteriological test shows presence of Total Coliforms and Faecal Coliform throughout all sampling locations. Monitoring was conducted on 10th April 2019 at different location.

6. GROUNDWATER

42. The estimation of groundwater resources for the district has shown that out of 14 blocks, 4 blocks are categorized as over exploited, one block as 'critical' and rest are 'safe'.

Figure 13: Ground Water Prospects in Project Area



| | Wells Feasible | Rigs Suitable | Depth Of Well (M) | Discharge (LPM) | Suitable Artificial |
|--|---|-----------------------|---------------------|---|---------------------------------|
| | Dug Well/Tube Well | Manual Direct Rotary | 10 - 20 40 - 100 | 100 - 300 | Percolation Pond/Recharge Shaft |
| | Dug Well/Tube Well | Manual Direct Pottery | 10 - 20 60 - 150 | 60 - 300 400 - 1000 | Recharge Shaft |
| | Dug Well/Bore Well | Manual DTH | 12 - 20 60 - 100 | 50 - 60 | Percolation Pond/Recharge Well |
| | Dug Well/Bore Well | Manual DTH | 10 - 15 60 - 150 | 80 To 180 | Check Dam/ Percolation Ponds |
| | Block boundary | | | Block boundary | |
| | District Headquarter | | | Block Headquarter | |
| | Water Leveling Monsoon (Vertical Mean 1990-2002) M/ky | | | EO In Monsoons / On At 25°C | |
| | River | | | Lineament | |
| | Chloride Greater Than Maximum Permissible Limit (1.0mg/L) | | | Nitrate Greater Than Maximum Permissible Limit (45mg/L) | |
| | Hilly Area | | | | |

Source: CGWB.

43. **Groundwater Quality.** Ground water in phreatic aquifers in Tiruchchirappalli district, in general, is colorless, odorless, and slightly alkaline in nature. The electrical conductivity of ground water in phreatic zone (in micro siemens a t25°C) during May 2006 was in therange of 570 to 4550µS/cm and major parts of the district are having the electrical conductivity above 1700 µS/cm. According to Central Pollution Control Board (CGWB), In general the ground water is suitable for drinking and domestic uses in respect of all the constituents except Fluoride of higher concentration at Siruganallur (1.85 mg/L) and few places are having higher concentration of more than BIS permissible limit.
44. **Ambient Air and Noise Quality:** No regular ambient air or noise quality monitoring is conducted by TNPCB in Tiruchirappalli. Following data shows the random monitoring conducted for 24hoursbyTNCPB/CPCB to record air quality in2014.The datashowstheoxidesofSulphurand nitrogen in ambient air is well below the ambient air quality standards, however, particulate matter is above the standard. Of the 5 monitoring locations, two locations recorded particulate matter well within the limited, one location slightly above the limits, and at the remaining two locations, particulate matter is much higher than the limit. Dry weather conditions and traffic contribute to the high particulate matter in ambient air. No data on ambient noise levelsavailable. In table 13A clearly shows that ambient air quality found satisfactory throughout all sampling location and parameters found within permissible limits of Standards of NAAQS, 2009. Ambient air quality monitoring was conducted at different location on 11th April 2019 & 24.06.2023 (SPS 6A).

Table 13: Ambient Air Quality inTiruchirappalli

| | Monitoring Location in the City | Average Concentrations of Air Pollutants (24 hours) in µg/m3 | | |
|-------------------------|------------------------------------|--|-----------------|------|
| | | SO ₂ | NO ₂ | RSPM |
| 1 | Gandhi Nagar | 12 | 17 | 92 |
| 2 | Main guard gate | 11 | 17 | 68 |
| 3 | Bishop Heber college | 9 | 14 | 40 |
| 4 | Golden Rock | 10 | 15 | 48 |
| 5 | Central bus Stand, Tiruchirappalli | 13 | 19 | 113 |
| NAAQ standard (24 hrs.) | | 80 | 80 | 60 |

Source: Air pollution data base in Tamil Nadu ENVIS CenterGoTN – 2014.

Table13A:SummaryofAmbientAirQuality(µg/m3) of Subproject Area

| Parameters | | AAQ-1 | AAQ-2 | AAQ-3 | AAQ-4 | AAQ-5 | AAQ-6 | CPCB/MoE F/NAAQ Standards (2009) |
|--------------------------------------|--------|-------------------|--------------|----------------------|---------------|----------------------|----------------------|----------------------------------|
| | | Chidambaran Nagar | Balaji Nagar | Raja Rajeswari Nagar | Ariyamangalam | Erubeeshwarar Temple | Maruthi Nagar SPS-6A | |
| PM 10 (µg/m ³) | 24 hrs | 67.2 | 85.7 | 69.5 | 76.5 | 52.5 | 48.9 | 100 |
| PM 2.5 (µg/m ³) | 24 hrs | 35.2 | 43.2 | 33.7 | 39.5 | 25.0 | 21.6 | 60 |
| SO ₂ (µg/m ³) | 24 hrs | 8.3 | 10.1 | 7.3 | 13.1 | 13.2 | 7.05 | 80 |
| NO _x (µg/m ³) | 24 hrs | 16.7 | 21.4 | 14.6 | 22.5 | 22.4 | 13.8 | 80 |
| CO(mg/m ³) | | <1.2 | <1.2 | <1.2 | <1.2 | <1.2 | BDL (DL1.15) | 2 |

(Source: EMP May 2019&lab report June 2023)

Noise monitoring conducted at different locations (Table 13 B) and value of noise level found within permissible limits of standards as per norms. Monitoring was conducted 10th April 2019.

Table13B.Ambientnoiselevelmeasurement

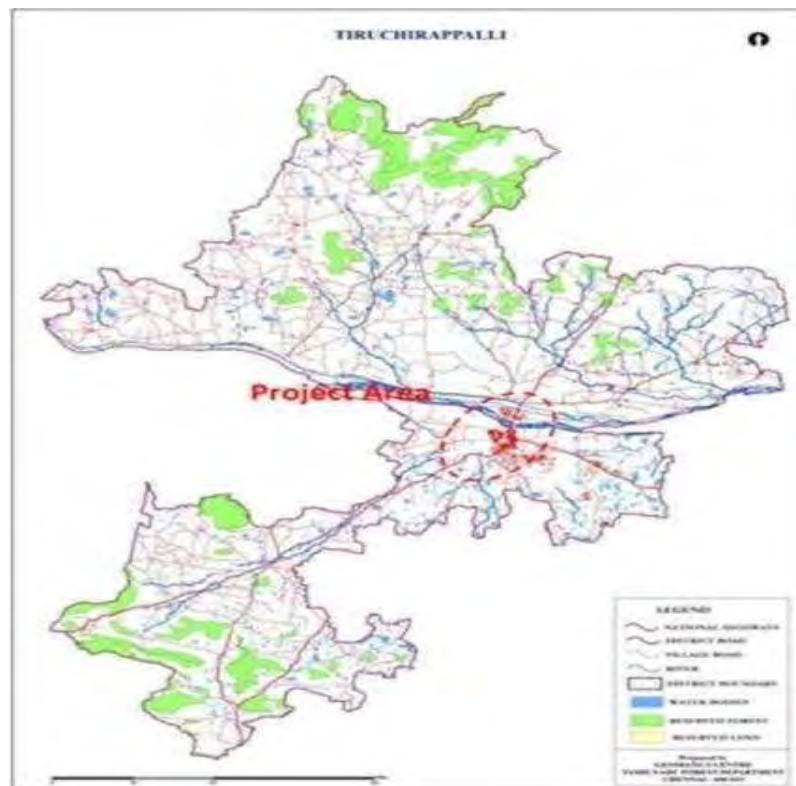
| Parameters | N1 | N2 | N3 | N4 | N5 | CPCB/ MoEF Standards |
|------------|----------------------|-----------------|----------------------------|---------------|-------------------------|----------------------------|
| | Chidambaram Nagar | Balaji Nagar | Raja Rajeswari Nagar | Ariyamangalam | Erubeeshwarar Temple | |
| LeqDay | 70.2 | 74.3 | 62.2 | 48.4 | 59.1 | 75 |
| LeqNight | 65.6 | 70.4 | 56.4 | 41.6 | 50.3 | |
| Leqdb(A) | 67.9 | 72.35 | 59.3 | 45 | 54.2 | |

(Source: EMP Report, May 2019)

C. EcologicalResources

45. Tamil Nadu is in the southernmost State of the Indian peninsula is spread over 130,058 km², which constitutes 3.96% of the area of the country. Tamil Nadu has a spectrum of nine major forest types ranging from wet evergreen forest to moist deciduous, dry deciduous, sholas, grass lands and scrub forest. The Western Ghats, the longest hill range in the State is one of the 25 global hotspots of biodiversity and one of the three mega centers of endemism in India.
46. Project area, Tiruchirappalli town, is an urban area surrounded by land that was converted for agricultural use many years ago. Tiruchirappalli city is surrounded by vast agricultural lands. There is no remaining natural habitat in the town, and the flora is limited to artificially planted trees and shrubs, and the fauna comprises domesticated animals (cows, goats, pigs and chickens), plus other species able to live close to man (urban birds, rodents and some insects). There are no sensitive areas like forest or protected areas in the project area or nearby project area.

Figure 14: Forest Map of District and Environmental Features



D. ECONOMIC DEVELOPMENT

1. LAND USE

47. The total geographical area of Tiruchirappalli is 33988 hectares, of which net Land put to non- agriculture occupied 13059 hectares and this accounted for 38.42 percent of the total area in the district. Area under net cultivable area accounted for 28.13 percent of the total land, i.e. 9560 hectares (Table-9).

Table 14: Land Use Pattern in Tiruchirappalli (Area in Ha)

| Land Use | 2005 | |
|--------------------------------------|-----------|--------|
| | Area (ha) | % |
| Forest | 234 | 0.69 |
| Barron and uncultivated land | 1134 | 3.34 |
| Land put to non- agriculture | 13059 | 38.42 |
| Cultivable waste | 1850 | 5.44 |
| Permanent pasture | 54 | 0.16 |
| Area under not included in cultivate | 1174 | 3.45 |
| Current Fallows | 926 | 2.72 |
| Other Fallows | 5997 | 17.64 |
| Net cultivable area | 9560 | 28.13 |
| Total | 33988 | 100.00 |

Source: Records of Office of Joint Director of Agriculture, Tiruchirappalli.

2. INDUSTRY AND AGRICULTURE

48. The Bharath Heavy Electricals Limited established one of its Manufacturing units in Tiruchirappalli for producing high pressure boilers in 1961 and envisaged creation of ancillary units in the private sector, in and around Tiruchirappalli to off load items of low and medium Technology. As a result, in the last three decades a phenomenal growth of small-scale industries numbering as on date to 400 units have been set up by entrepreneurs in Thuvakkudi, Ariyamangalam, Thiruverumbur Indl. Estates. The Industrial units are giving gainful and consistent employment to nearly 18,000 people.
49. Other public sector undertakings and a Railway Workshop at Ponmalai are part of industrial growth of the District. The district also has a large number of units established in Textiles and apparels followed by engineering and repairing and servicing. Large numbers of micro, small and medium scale enterprises (MSMEs) have been established in textile and apparels and engineering units. Majority of the investments in this district have taken place in non-electrical machinery. Large part of the investments has also taken place in metals and metal products.

Table 15: Small Industries Development Corporation (SIDCO) Industrial Estates in Tiruchirappalli District

| Name of Estate | Area (acres) |
|--------------------------|--------------|
| Ariyamangalam | 17.64 |
| Thuvakudi | 478.84 |
| Thiruverumbur | 74.54 |
| Thuvakudi (WCR) | 14.24 |
| Vazhavanthankotti –WIP | 86.00 |
| Vazhavanthankotti - P I | 56.00 |
| Vazhavanthankotti – P II | 38.00 |
| Kumbakudi | 87.50 |

50. **Agriculture.** The Cauvery River irrigates about 51,000 ha in Tiruchirappalli, Lalgudi and Musiri Divisions. Variety of crops are grown in this district and agriculture is the main occupation for most of the people in the district. Rice, millets, cereals, pulses, sugarcane, groundnut, cotton and banana are most common crops cultivated in the district.
51. **Education.** About 33 engineering colleges have come up in and around Tiruchirappalli, that includes the well-known National Institute of Technology, Tiruchirappalli. The City also has a prestigious management institution, the Bharathidasan Institute of Management. Among the many arts and science colleges, St. Joseph's College is the oldest. This city has given great Tamil scholars whose contributions to Tamil literature have been very significant.

3. INFRASTRUCTURE

52. **Water Supply.** Cauvery River is the major source of water supply in Tiruchirappalli City. The protected water supply scheme to erstwhile Tiruchirappalli Municipality was implemented in 1895 with the head works located on the banks of Cauvery river at Kambarasanpettai, which is 3 km upstream of the city. Under the comprehensive water supply system, the ULB has provided 96,075 individual connections i.e. 76,686 (80%) metered and 19,389 (20%) unmetered. In terms of population, individual service connections cover 46% of the total population. 4,037 public fountains at various locations cover 35% of the city's population. Bore wells with hand pumps cover another 5% and rest 13% are uncovered by the existing system).
53. Water supply improvement scheme for TCC is currently under implementation at a project cost of ₹2214 million with assistance from JICA (Japan International Cooperation Agency) fund through TNUIFSL. This scheme aims to provide equitable water supply in all parts of the city ensuring 135 lpcdnorms.
54. **Sewerage.** TCC is equipped with a partially implemented UGSS. Sewage from sewerage areas within corporation limits is collected through the existing collection system and conveyed by gravity to existing lift stations and sub-pumping stations, and then pumped through the main sewage pump stations to the STPs. Sewage from unsewered areas is presently discharged through open drains and channels which ultimately drain into the network of channels such as Uyyakondan, Koraiyar, Thirumanjana Cauvery etc., which finally empty into the Cauvery and Coleroon rivers, except Uyyakondan which terminates at Vallavandhan Kottai Pond/tank. The existing STPs comprises of oxidation ponds (87 MLD). Wastewater from the Panjappur STP is discharged into Koraiyar river in the south. Presently the UGSS in TCC covers 42,666 residential and 557 commercial assessments as of 2015.
55. **Solid Waste Management.** Solid waste management in the city is handled by TCC. About 400 tons of solid waste is collected from the city, mostly by door-to-door collection system. From household's waste is transferred to transfer stations, and from there to composting and dumping yards located in the city outskirts. A composting and dumping yard is located in Ariyamangalam in the subproject area. TCC also procured two plastic shredding machines and training imparted to the women self-help group members as well as to the sanitary workers. Shredded plastics in progress and it is being used for road laying works.
56. **Transportation.** Tiruchirappalli is situated at the middle of Tamil Nadu, connected by 4 national highways, 2 state highways, and several district roads with other major towns of the state. Tiruchirappalli is an important divisional headquarters of Southern Railways. Tiruchirappalli is well connected by rail to Chennai, Kanyakumari, Madurai, Thanjavur, Rameswaram, Coimbatore and Bangalore. Tiruchirappalli junction is the main station for passengers as well as goods movement. Tiruchirappalli has an International Airport. located on the Pudukottai road at a distance of 6 km. City is connected by air with Chennai, Madurai, Thiruvananthapuram, Sri Lanka, Singapore and Arab countries.

E. SOCIO CULTURAL RESOURCES

1. DEMOGRAPHY

57. As per Census 2011, Tiruchirappalli city population was 847,387 of which 418,400 are males while 428,987 are females. Total households are 214,529. Population of children less than 6 year is 79,723 which is 9.41 % of total population. Sex ratio is 1,025 against state average of 996. Child sex ratio is 960 compared TamilNadu state average of 943. Literacy rate is 91.38% higher than state average of 80.09 %; male and female literacy rates are 94.85% and 88.01%, respectively.

Table 16: Demographic Characteristics of Tiruchirappalli District (Census)

| Description | 2011 | 2001 |
|-------------------------------------|-----------|-----------|
| Actual Population | 2,722,290 | 2,418,366 |
| Male | 1,352,284 | 1,208,534 |
| Female | 1,370,006 | 1,209,832 |
| Population Growth | 12.57% | 10.10% |
| Area km ² | 4,509 | 4,509 |
| Density/km ² | 604 | 536 |
| Proportion to Tamil Nadu Population | 3.77% | 3.88% |
| Sex Ratio (Per 1000) | 1013 | 1001 |
| Child Sex Ratio (0-6 Age) | 947 | 955 |
| Average Literacy | 83.23 | 77.9 |
| Male Literacy | 89.72 | 86.55 |
| Female Literacy | 76.87 | 69.31 |
| Total Child Population (0-6 Age) | 272,456 | 270,043 |
| Male Population (0-6 Age) | 139,946 | 138,162 |
| Female Population (0-6 Age) | 132,510 | 131,881 |
| Literates | 2,038,981 | 1,673,478 |
| Male Literates | 1,087,765 | 926,354 |
| Female Literates | 951,216 | 747,124 |

2. HISTORY, CULTURE AND TOURISM

58. Woraiyur, a part of present-day Tiruchirappalli, was the capital city of Cholas from 300 BC onwards. This is supported by archaeological evidences and ancient literatures. There are also literary sources which tell that Woraiyur continued to be under the control of Cholas even during the days of Kalabhra interregnum (A.D. 300 - 575). Later, Woraiyur along with the present-day Tiruchirappalli and its neighboring areas came under the control of Mahendra Varma Pallava I, who ascended the throne in AD 590. Till AD 880, according to the inscriptions, this region was under the hegemony of either the Pallvas or the Pandyas. It was in AD 880, Aditya Chola brought a downfall to the Pallava dynasty. From that time onwards, Tiruchirappalli and its region became a part of Greater Cholas. In AD 1225 the area was occupied by the Hoysalas. Afterwards, it came under the rule of later Pandyas till the advent of Mughal rule.
59. Tiruchirappalli was for some time under the Mughal rule, which was put to an end by the Vijayanagar rulers. The Nayaks, the Governors of Vijayanagar empire, ruled this area till AD 1736. It was Viswanatha Nayak who built the present day Teppakulam and the Fort. The Nayak dynasty came to an end during the days of Meenakshi.
60. The Muslims ruled this region again with the aid of either the French or the English armies. For some years, Tiruchirappalli was under the rule of Chanda

Sahib and Mohamed Ali. Finally, the English brought Tiruchirappalli and other areas under their control. Soon after the area was ceded to East India Company as per the agreement at the eve of the Kanatic war, Tiruchirappalli district was formed under the Collectorship of Mr. John (Junior) Wallace in 1801. District was then under the hegemony of British for about 150 years till India's independence.

61. **Culture and Tourism:** Owing to its rich history and culture, Tiruchirappalli has various archeological and religious places of prominence. Following two monuments are notified as nationally important monuments by ASI, and one monument (Erumbeeshwarar Temple) is located within the project area. No components are located within the temple/monument area, sewer lines proposed in the surrounding residential areas are close to the monument (i.e. within 300m boundary of the monument, which is called regulated boundary of ASI), requiring prior permission to conduct works.
- I. **Erumbeeswarar Temple.** Hindu temple dedicated to the deity Shiva. Built on a 60-foot (18 m) tall hill, it is accessible via a flight of steps. The temple's main shrines and its two prakarams (outer courtyards) are on top of the hill, while a hall and the temple tank are located at the foothills. The temple is one in a series built by Aditya Chola (871- 907 CE) along the banks of Cauvery river, to commemorate his victory in the Tirupurambiyam Battle. It has several inscriptions from the Chola Empire dating back to the 10th century. This is located within the project area.



- II. **Rock Fort Temple.** Rock Fort Temple (well-known Uchipillayar Temple), the landmark of the city, is on the shores of Cauvery River. It is perched on a massive rocky outcrop at an altitude of 83m above the mean sea level. The Thayumanaswamy Temple, dedicated to Lord Shiva, is situated halfway to the top. It has a 100-pillar hall and a vimana covered with gold. On the southern face of the rock are several beautifully carved rock-cut cave temples of the Pallava period. This is located outside the project area.
2. **Other prominent places of interest around Tiruchirappalli, which are located outside project area are:**
- III. **Srirangam:** The Sri Ranganatha Swamy Temple at Srirangam, situated 6 km north of the city, is among the most revered shrines dedicated to Lord Vishnu in South India, and is the largest temple complex in the world. Shrouded in a haze of coconut palms away to the north, the temple is built on an island in the middle of Cauvery and covers an area of 2.5km². Enclosed by seven rectangular walled courtyards, this


temple has 21 spires (“gopurams”), the largest of which was completed in 1987 and measures 73m in height. Srirangam is connected to the mainland by a bridge. The temple is replete with excellent carvings and numerous shrines dedicated to various gods.





- IV. Thiruvanaikaval: The Jambukeswara Temple, dedicated to Lord Shiva, is situated just 2 km east of Srirangam and houses five concentric walls and seven gopurams. Legend has it that an elephant once worshipped the Lord under the holy Jambu tree, and hence the name Jambukeswara. The principal deity is the Shiva lingam, almost submerged in water, which flows from the subterranean spring in the sanctumsanctorum
- V. Samayapuram: The Samayapuram Mariamman Temple is located 12-km north of the City at the junction of the National Highway connecting Tiruchirappalli and Chennai. The Mariamman Temple is one of the most visited shrines in Tamil Nadu, dedicated to Mariamman, a manifestation of the prime energy Shakti as the mother Goddess. Samayapuram was a local capital of the Vijayanagar rulers in the vicinity of Tiruchirappalli and was known as Vikramapuram.
- VI. Natharvali Dargah: It is an ancient Dargah, which is more than 1000 years old with marvelous architecture with the dome being made up of shining marbles giving a great look to the Dargah. It is situated in the heart of Tiruchirappalli City.
- 62. **Other Places of Interest.** The other temples in and around the city, but are located outside project area, include Thiruvallarai Vishnu Temple, Uraiyur Nachiyaar Temple, Uraiyur Vekkali Amman Temple, Thiruppaigeeli Siva Temple, Brahma temple at Thirupattur and Thirupparaithurai Shiva temple. Kollam pond in Crawford lies along the Tiruchirappalli-Madurai Railway line. This pond is home to different types of bird varieties including common crane, ducks and the king fisher Subproject Site Environmental Features. Features of the selected subproject sites are presented in the following table.

F. Sub Project Site Environmental Features

Features of the selected subproject sites are presented in the following table


Table 17: Site Environmental Features

| Infrastructure | Location and Environmental Features | Site Photograph |
|--------------------------------------|--|--|
| Proposed Sewage pumping stations – 1 | <p>Sewage pumping stations – 1 at Chidambaram Nagar, Ariyamangalam Proposed site is in ward no 28 near Uyyakondan channel on vacant land owned by TCC</p> <p>Site is located on roadside in between a warehouse and Uyyakondan channel. Development around the site very sparse, houses are located away from the site (> 100 m) t. Site is covered with shrubs and bushes, and couple of trees, which needs to be cut down.</p> |  |

| Infrastructure | Location and Environmental Features | Site Photograph |
|---|--|--|
| Proposed Sewage pumping stations – 2 | <p>Sewage pumping stations – 2 at Solid waste dumping site, Ariyamangalam</p> <p>This is in village Ariyamangalam within the existing solid waste dumping site. Sufficient vacant land available in the site to accommodate SPS. The land owned by TCC. There are no house close by (>50 m)</p> |  |
| Proposed Sewage pumping stations – 3 | <p>Sewage pumping stations – 3 at Win Nagar</p> <p>Site is in the outskirts of the city, there are no houses close by (> 100 m). The SPS is proposed on land owned by TCC.</p> <p>The SPS-3 will be constructed without affected two trees.</p> |  |
| Proposed Sewage pumping stations – 4 | <p>Sewage pumping stations – 4 at Rajarajeshwari Nagar</p> <p>The proposed SPS is in the outskirts of the city in Rajarajeshwarinagar near Railway line. The land owned by TCC. Houses are located away from the site (>50 m)</p> |  |
| Proposed Sewage treatment plant and Sewage pumping stations – 6 | <p>STP and Sewage pumping stations–6 station and Sewage treatment plant at KeelakalkandarKottai</p> <p>The proposed sewage pumping stations and STP are in the outskirts of the city in KeelakalkandarKottai along with 37 MLD STP. The land is presently owned by the TCC, but it has a crop Threshing platform used by local villagers for Threshing and drying of the crops. New platform has been constructed and is being used by the public.</p> <p>A small village temple situated in western side which will be about 300 meter from the center of the STP campus. At the STP site, a buffer zone of local plants species will be</p> |  |

| Infrastructure | Location and Environmental Features | Site Photograph |
|--|---|--|
| | <p>developed and maintained along with STP for protection of aesthetic value of area.</p> <p>Site is located away from the houses (>500 m). Providing a green buffer of 5-10 M wide all around the STP with trees in multi-rows and land scaping. This will act as a visual screen around the facility and will improve the aesthetic appearance.</p> |  |
| <p>Proposed Sewage pumping stations – 6A</p> | <p>Sewage pumping stations – 6A at Maruthi Nagar</p> <p>The site is open and vacant and no sensitive receptor located nearby. The proposed SPS is in the outskirts of the city in Maruthi Nagar near pond. The land owned by TCC. Houses are located away from the site (>50 m). There is no eco-sensitive areas/ Zones such as National Parks and Wildlife Sanctuaries exist within or nearby the site. No tree exist at site hence no cutting anticipated. One pond is located opposite of the site approx. 10m distance. No impact anticipated on pond. Presently pond is filled with waste water.</p> |  |
| <p>Rehabilitation of Existing Sewage treatment Plant</p> | <p>Rehabilitation of existing 30 MLD plant at Panjappur</p> <p>The existing STP is located at about 7 km from Tiruchirappalli Railway Station lying to the east of the Madurai Road in Panjappur village. The TCC has about 230 ha of land, and STP is in this land. There are no houses nearby the site (>400 m)</p> |  |

| Infrastructure | Location and Environmental Features | Site Photograph |
|----------------------------------|--|--|
| | <p>After treatment from polishing ponds, the treated effluent is discharging into Koraiyar River.</p> <p>There are 2 existing STPs at this site: (i)30 MLD STP constructed in 1987, improved in 2003, and (ii) 50 MLD STP constructed in 2008. Total installed treatment capacity of the existing plants at Panjappur is 80 MLD. Under this subproject, the Old STP of 30 MLD, which is currently not in working condition, is proposed for rehabilitation. This STP will be used to treat additional sewage generated from the areas which are being provided with sewer system under this subproject.</p> |  |
| <p>Sewage lift stations (LS)</p> | <p>Roadside Lifting station is a small pumping station to lift the sewage to higher level and to discharge into ridge manhole for transporting to the pumping station.</p> <p>Lifting station has a collection well with submersible pumps accommodated inside.</p> <p>Lift stations are essentially proposed as enlarged manholes (either roadside on available land or on road center by enlarging a collection system manhole) fitted with two sewage pumps (small capacity) and a curb or road-side wall mounted Pump Control Panel. Where lifting stations are proposed along the roads, there is no buffer land for trees and high compound available, at such places other design and operation related measures are included in the project design</p> |   |

| Infrastructure | Location and Environmental Features | Site Photograph |
|----------------------|---|---|
| <p>Sewer network</p> | <p>Sewer lines will be laid in the center of road by cutting open the surface. In wider roads, like NH, divided 2-way roads etc., sewers will be laid along the edge of the road, but mostly within the carriageway. In the outskirts where, adequate land in the road shoulder is available along the blacktop and is clear of any structures or activities, sewers will be laid in the earthenshoulder.</p> <p>Large diameter sewers will be laid on main roads (300 – 700 mm), while the tertiary sewers of small size (150 mm to 300 mm dia) that collect wastewater from each house will be laid in all streets in the subprojectarea. Trench size to bury the sewer will be of 0.8 m to 1.5 m wide and 1 m to 6 m deep.</p> <p>Most of the roads in central part of the town (old town area) are narrow and congested with traffic, pedestrians and activities.</p> <p>Sewers will also be laid in the roads located within 300 m of Erumebeeshwarar temple (ASI monument) to provide sewerage system to the areas around the temple</p> <p>Some sections of the sewer line alignment about 65 km and PS sites are identified to involve removal of hard rock for excavation during construction. During construction, alternatives like drilling and chiseling, controlled blasting etc. will be examined and suitable technology shall be finalized depending upon the site conditions, with safety measures.</p> |  <p>1. ZONE-1 - 4.00 Km 2. ZONE-2 - 7.00 Km 3. ZONE-3 - 28.50 Km 4. ZONE-4 - 16.50 Km 5. ZONE-6 - 9.60 Km</p> <p>Total - 65.60 KM</p> |

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

63. Potential environmental impacts 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.
64. Screening of potential environmental 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.
 - a. **Location impacts** include impacts associated with site selection and include loss of on-site biophysical array and encroachment either directly or indirectly on adjacent environments. It also includes impacts on people who will lose their livelihood or any other structures by the development of that site.
 - b. **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.
 - c. **Construction impacts** include impacts caused by site clearing, earthworks, machinery, vehicles and workers. Construction site impacts include erosion, dust, noise, traffic congestion and waste production.
 - d. **O&M impacts** include impacts arising from the operation and maintenance activities of the infrastructure facility. These include routine management of operational waste streams, and occupational health and safety issues.
65. Screening of environmental impacts has been based on the impact magnitude (negligible/moderate/severe – in the order of increasing degree) and impact duration (temporary/permanent).
66. This section of the IEE reviews possible project-related impacts, in order to identify issues requiring further attention and screen out issues of no relevance. ADB SPS (2009) require that impacts and risks will be analyzed during pre-construction, construction, and operational stages in the context of the project's area of influence.
67. The ADB Rapid Environmental Assessment Checklist in http://www.adb.org/documents/guidelines/environmental_assessment/eaguidelines002.asp has been used to screen the project for environmental impacts and to determine the scope of the IEE.
68. In the case of this project (i) most of the individual elements involves simple construction and operation, techniques except for blasting activities proposed for sections of sewerage alignment, and pumping stations, so impacts will be mainly localized and not greatly significant; (ii) negative impacts associated with sewage facilities such as odor are already considered in the design and siting, (iii) 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 (iv) being mostly located in an urban area, will not cause direct impact on biodiversity values. The blasting proposed is "controlled blasting" following necessary precautionary measures including usage of appropriate quantities of explosives hence that the near by structures and properties are unlikely to be affected and impacts related to controlled blasting such as dust generation, increased noise levels and vibrations would be mitigated. 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.

A. Pre-Construction Impacts – Design and Location Design of the Components.

69. Technical design of the (i) sewage pumping and lifting stations; and (ii) sewer

network including manholes and house connections, follows the relevant national planning and design guidelines, focusing on providing a robust system which is easy to operate, sustainable, efficient and economically viable.

70. **Sewage treatment.** A new STP and rehabilitation of an existing STP are in the subproject. It is also to utilize the existing 88 MLD capacity waste stabilization pond (WSP) based STP at Panjappur. The installed treatment capacity of the existing plant at Panjappur is 88MLD (58MLD +30MLD) of which 58MLD plant is working and 30MLD plant is defunct. Since additional sewage flow will be generated by proposed sewer network in the currently uncovered areas under the subproject, rehabilitation of 30MLD plant is proposed to handle this additional flow from the sub project area.
71. A new 37 MLD STP is to be constructed at the identified site to treat the sewage generated from the Zone 1,2,3,4 and part of zone-6 under Phase-II. This STP will also meet the demand of zones 5, remaining part of zone-6, where sewer system is proposed under Phase-III. STP will be implemented on DBOT basis, and in 2 modules. It is proposed that the treated wastewater will be discharged into Uyyakondan channel, which is flowing at a distance of 2.7 km northeast of STP site. This channel ultimately discharges into Vallavandhan Kottai Pond (irrigation tank), after flowing for about 20-22 km from the proposed STP discharge point. Water from Vallavandhan Kottai is used for irrigation in its command area.
72. Uyyakondan is an irrigation channel passing through the Centre of Tiruchirappalli city and also serves as the ultimate carrier of storm water on the southern part of the city. It takes off River Cauvery from the head sluice located at Pettavaithalai, and after flowing over a distance of 70 km it discharges into Vallavandhan Kottai Pond, an irrigation tank. It flows for about 18 km in the city. The initial stretch of 8km passes through the old Trichy town, which is already covered with sewer system. The remaining 10 km stretch passes through the eastern side of Trichy, which does not have a sewer system, and therefore untreated sewage is mostly discharged into this channel. Channel after leaving the Trichy city flows down for about 25 km and discharges ultimately into Vallavandhan Kottai Pond/tank, from where water is used for irrigation.
73. An alternative option of reusing the treated wastewater for industrial purposes is also being explored, and a study has already been initiated to prepare the feasibility report for reuse. If this reuse option is found feasible, the treated wastewater will be further treated to the required quality for industrial reuse. Depending on the demand, wastewater will be reused, and remaining wastewater, if any, will be discharged into Uyyakondan channel.
74. STP is proposed for implementation under design-build Operate & Transfer mode of contract, and therefore the STP has been designed by a successful bidder to meet the treatment standards. The treatment methodology used is Sequential Batch Reactor (SBR) Technology
75. **Nuisance from STP.** The STP Keelakalkandar Kottai is located away from developed areas, and there is no development at present in and around the site, which is mostly comprised of agricultural and vacant lands. Nearest house is at about 500 m, and this area too is sparsely developed. However, considering the future development potential, adequate green buffer around the plant should be developed to minimize/mitigate impacts such as odor, poor aesthetics, etc. Following measures shall be implemented:
 - a. Providing a green buffer of 5 -10 M wide all around the STP with trees in multi-rows and land scaping. This will act as a visual screen around the facility and will improve the aesthetic appearance. The unit shall develop green belt of adequate width around the premises.
76. **Nuisance from STP.** STP at Keelakalkandar Kottai is located away from developed areas, and there is no development at present in and around the site, which is mostly comprised of agricultural and vacant lands. Nearest house is at about 500 m, and this area too is sparsely developed. However, considering the future development

potential, adequate green buffer around the plant should be developed to minimize/mitigate impacts such as bad or, poor aesthetics, etc. Following measures shall be implemented:

- a. Providing a green buffer of 5 -10 M wide all around the STP with trees in multi-rows and land scaping. This will act as a visual screen around the facility and will improve the aesthetic appearance. The unit shall develop green belt of adequate width around the premises.
77. **Sewage sludge** generally consists of organic matter, pathogens, metals and micro pollutants. The concentration of parameters such as metals can be influenced by input to the sewers system from industry. Since no industrial wastewater is allowed into sewers, it is unlikely that sludge contains heavy metals. The sludge from reactors will be collected in sludge sump and conveyed to centrifuge for dewatering. The sludge in the form of a wet cake will be further air-dried in the sludge drying beds. The treatment and drying processes kill enteric bacteria and pathogens, and because of its high content of nitrates, phosphates, and other plant nutrients the sludge is an excellent organic fertilizer for application to the land. Adequate drying is however necessary to ensure maximum kill of enteric bacteria. To achieve adequate drying minimum drying period shall be ensured. The drying period, which will be varying depending on the season will be determined during operation and be followed. A sludge management plan will be developed by the STP facility designer. Properly dried sludge can be used as soil conditioner. Periodic testing of dried sludge will be conducted to ensure that it does not contain heavy metals that make it unsuitable for food crops. Tests will be conducted to confirm the concentrations below the following standards. As there are no specific standards notified for sludge reuse, the compost quality standards notified under the Solid Waste Management Rules, 2016 have been adopted here (refer Table 4 for standards to be met).

Following measures to implement during the implementation phase:

- a. Prepare sludge management plan ensures a collection, adequate treatment prior to reuse/disposal
- b. Conduct periodic testing of sludge to check its quality according to set standards for reuse as manure/soil conditioner.
- c. Provide training on safe handling of sludge, along with proper apparatus and personnel protection equipment (PPEs) to worker

78. Existing STP Rehabilitation. The major repair and rehabilitation work proposed in the existing defunct WSP based STP of 30 MLD capacity at Panjappur will improve its functioning and treatment efficiency. Site is located away from residential areas (> 400 m). Sludge drying beds will also be provide to further treat/dry/compost the partially dried sludge collected from the WSP ponds. This is to ensure proper treatment prior to its reuse as manure or disposal. At present, as this is defunct, there is no valid CTO from TNPCB. Hence CTO is to be obtained after completion of works, prior to start of operation of rehabilitated STP. Periodic testing of sludge and provision of training and appropriate apparatus along with PPEs will be provided to workers.

79. **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 rain. The underground gravity sewers will carry sewage from households to the nearest lifting or pumping station, from where the sewage is pumped to the STP. To maximize the benefits as intended, TCC 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.
80. 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 asintended:

- a. selection of construction methodology near protected monuments in discussion with the ASI, having the excavation observed by person with archaeological knowledge for chance finds,etc.
 - b. Limit the sewer depth wherepossible.
 - c. Sewers shall be laid away from water supply lines and drains (at least 1 m), if not possible, sewer lines shall be laid below thewaterlines.
 - d. 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 300mm);
 - e. 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 (stoneware pipes shall beavoided)
 - f. For shallower sewers and especially in narrow roads, uses mall inspection chambers in lieu ofmanholes.
 - g. Controlled blasting would be undertaken in some stretches where hard rock is encountered based on the site conditions.For the safety of humans and the structures within the area influenced by the blasting, the vibrations related impacts would be addressed by designing the blast charge by complying with the provisions elaborated in the applicable Indian regulations and standards. All records shall be maintained by the Contractors and PIU. Training related to controlled blasting activity will be included in the overall safeguards training programme meant for PIUs and Contractors.
 - a. Design manhole covers to withstand anticipated loads and ensure that the covers can be readily replaced if broken to minimize silt/garbage entry.
 - b. Ensure sufficient hydraulic capacity to accommodate peak flows and adequate slope in gravity mains to prevent buildup of solids and hydrogen sulphidegeneration.
81. **Sewage Pumping stations and lift stations.** It is proposed to construct 24 sewage lift stations, 5 new sewage pumping stations. These will receive sewage from the catchment area via the sewer network and pump to higher level manholes or pumping stations or to STP as per the design. Lift stations are necessitated where in the design the depth of sewer exceeds the downstream interlinking manhole invert levels. Therefore, in such situations, the feasible and practical solution was to opt for capacity lift station with submersible pumps to lift and convey the collected sewage from peripheral areas to the downstream system through a bell-mouth chamber. Lift stations will cater to small area, and will be located at lowest point where the sewage from catchment area will be collected and then pumped to a higher-level manhole for further gravity flow or to a pumping station, from where it is ultimately pumped to the STP. Lift station will consist of a sewage sump or suction well, below the ground, to receive sewage, submersible pumps in the sump to pump out, and an electrical panel board for operation of pumps above the ground. A generator set will also be provided at each liftstation. Controlled blasting related activities may have to be undertaken at some locations for the presence of hard rock anticipated.
82. **Sewage pump stations** 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. Components of the proposed sewage pumping stationsinclude
- i. Screenwell.
 - ii. Gritwell.

iii. Collectionwell

83. At the sewage 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 the 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. Bypass provisions would be incorporated in the design for addressing unlikely overflow conditions.
84. **Odor from pump and lift stations.** In the suction wells, the sewage emits gases, which accumulate in the air above water surface. The gas may include odorous compounds like hydrogen sulphide (H₂S), 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. H₂S is the most dominant odor causing compound and therefore can cause nuisance to nearby households. When sewage becomes stagnant, H₂S is generated in the anaerobic conditions. The quantum of H₂S 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 H₂S generation. Design considerations are included to minimize the both as much as possible. Pumping stations cater to large area and will have high capacity of suction wells and pump sets, while lift stations are small with lower capacity of suction wells and pumps sets. The retention time is kept to its lowest possible so that there is no stagnation of sewage for long time which could create anaerobic condition.

Measures for pumping stations

- a. Maintain buffer distance from nearest residences.
- b. Locate pumping station as far as away from the road.
- c. 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 odor and also act as visual shield, and improve aesthetic appearance.
- d. Proposed wells to be closed using RCC slabs. Design of RCC slab to consider both superimposed loads (human and equipment loads) and severe corrosion risk from sewer gas from within wells.
- e. RCC Slab to be designed and fixed in a modular manner such that access to pumps/appurtenances and other equipment can be provided for maintenance / replacement / renewal purposes.
- f. Since human intervention is involved and safety shall be primary and critical consideration, additional protection by way of a metal 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&M purposes.
- g. 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.
- h. 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.
- i. Provision of odor control/mitigation system as per site conditions/requirements. Suitable granular activated carbon filter with bird-screen fitted at the vent outlet to

control odor. Size of GAC (including material size) should be selected based on the vent diameter and expelled air flow rate expected.

- j. 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.
- k. 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.
- l. Diesel Generators shall be provided for all pump stations and in cases of lift stations with space for control room. In cases of lift manholes (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.
- m. Develop standard operating procedures / operational manual for operation and maintenance of lifting and pump stations; this shall include measures for emerge situations.
- n. Provide training to the staff in SOPs and emergency procedures;
- o. Periodic monitoring of H₂S levels at sewage pumping and lifting stations using handheld H₂S meters².

85. **Lifting stations** are also to be located at technically feasible locations (lowest point to where sewage can be conveyed from households by gravity) within or closet other residential areas which are being served by respective lifting station. Given very limited land availability in urban areas like the project area, that too of government owned lands, locating the lifting stations away from the houses is not practical in Tiruchirappalli, sites for lifting stations were identified based on the technical suitability and availability of government owned land parcels to avoid land acquisition. Many of the sites are located along the river, which is the lowest point, and most of the area are highly dense. Odor nuisance from lifting stations is very limited compared to pumping stations. Lift stations are essentially proposed as enlarged manholes (either road-side on available land or on road center by enlarging a collection system manhole) fitted with two sewage pumps (small capacity) and a curb or road-side wall mounted Pump Control Panel. Following odor control and mitigation measures are considered:

- a. Provide closed wells fitted with necessary ventilation wherever required.
- b. Provide green belt (tree cover) around the lift stations, wherever possible.
- c. a suitable arrangement such to capture the gaseous emissions from the wells and treat via scrubber/activated carbon filter before letting out into the ambient air; such system should be designed appropriately to meet the likely emissions/flow rate of respective lifting stations.

86. **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/pump stations can have continuous negative impacts on the surrounding population. High inside 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 as per applicable regulatory standards.

- a. Procure good quality latest technology high pressure pumps that guarantee controlled noise at a level of around 80 dB(A) at a distance of 1m³;

³ Indian Standards require to maintain the noise level of 70 dBA or less during night time. However, in case of STPs/WTPs/Water Supply Head works, where heavy duty pump sets are to be installed and the noise levels may even exceed 80 decibels at 1 m distance, noise level will be measured

- b. Use appropriate building materials and construction techniques for pump houses which can absorb sound rather than reflect noise.
 - c. Use acoustic enclosures – manufacturer specified, for all pumps, motors.
 - d. Procure only CPCB approved generators to meet air emission and noise level requirements.
 - e. Provide sound mufflers for ventilators in the plant rooms, and soundproof doors
 - f. Provide ear plugs designated for noise reduction to workers.
 - g. Consult the ASI and local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals.
 - h. Excavation and construction methodology to be used near the monuments (within the regulated area of 300 m of any monument) shall be finalized in consultation with ASI; no equipment causing vibration and heavy noise should be used.
87. **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 to the STP on the outskirts of the city. It necessitates 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 manhole on the higher elevation, from there it can flow again by gravity, rather than pumping directly to a pumping station. This optimizes the energy consumption.
88. 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 shall be considered and incorporated into the subproject designs:
- a. Using low-noise and energy efficient pumping systems.
 - b. Efficient Pumping system operation.
 - c. Installation of Variable Frequency Drives (VFDs).
89. **Tree cutting at selected project sites.** As presented in the baseline profile of subproject sites, there are trees present in Keelakalkandarkottai STP site. Eight trees within the area required will be removed and replanted within the site by the contractor in consultation with the TCMC. Hence no tree cutting is required in STP site. Sewers are proposed within the roads, and therefore no tree cutting envisaged. Following measures are being implemented to minimize and/or compensate for the loss of tree cover.
- i. Minimize removal of trees by adopting to site condition and with appropriate; layout design of pumping stations, particularly at Proposed STP Keelakalkandar Kottai site.
 - ii. Obtain prior permission for tree cutting.
 - iii. Plant and maintain 10 trees for each tree that is removed.
90. **Site selection of construction work camps, stockpile areas, storage areas, and disposal areas.** Priority is to locate these near the project location but 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

at the time of commissioning the units and necessary mitigation measures such as noise barriers will be installed if required.

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 and noise and to prevent social conflicts, shortages of amenities, and crime). Extreme care will be taken to avoid disposals near forest areas, water bodies, or in areas.

91. **Debris, construction waste, sludge from STP rehabilitation works.** Significant quantities of construction waste, debris etc., will be generated from the repair and rehabilitation works at the existing STP in Panjappur. Dried sludge are scrapped and removed for disposal. Similarly, it is to remove bottom and side clay layer from the STP ponds. Following measures are implemented during the design/preconstruction phase
 - a. Conduct sampling and testing of sludge from all ponds (one composite sample from each pond); parameters to be tested are given in environmental monitoring plan.
 - b. Devise the disposal method based on sludge characteristics (if it is hazardous, it shall be handled and disposed as per the Hazardous waste rules of MoEFCC);
 - c. Sludge (if not hazardous) shall be transported to solid waste disposal sites in the city and shall be disposed or used as daily cover for other waste.
 - d. Clay layer are also be tested if it appears to be contaminated by visual appearance; in any case, a top layer of 6 inch shall be considered as part of the sludge and disposed accordingly.
 - e. Clay may be used in solid waste disposal site as daily cover on the waste.
 - f. Devise any suitable reuse method based on the quality of clay.
 - g. Employ proper methods for removal of sludge and clay with safety of workers, environment utmost priority; provide on-site awareness sessions and training for workers on working conditions and safe handling of sludge and provide PPEs to workers; Any other construction waste / debris shall be properly disposed; priority shall be given to reuse, recycle so that disposal is avoided, provided it is suitable and safe for such usage.

92. **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 quarries permitted/licensed by Department of Geology and Mining. Contractor should procure material from existing quarries. No new quarry areas should be created / established for the subproject.

93. **Social and Cultural Resources – Works near Protected Monuments and Chance Finds.** No works are proposed in the protected monument (Erumbeswarar Temple, see fig) located in the subproject area. However, as this monument is located within the city surrounded by residential areas, some works (sewer lines) are also to be conducted in the regulated area (i.e. up to 300 m from the monument boundary), No direct interference with the monuments anticipated. Moreover, all works within 300 m distance of monument will be conducted with the prior permission of ASI/NMA. Necessary precautionary measures, as listed below, including if any measures suggested by ASI, to be followed. 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. Tiruchirappalli is an historical city, there are few sites protected by or ASI. Given its historical importance, there may be archaeological / historical remains under ground, and risk of uncovering them cannot be ruled out, especially in the old town area. City Corporation will follow chance find protocol to ensure that any chance finds are recognized, and measures are taken to ensure they are protected and conserved. Measures for works in regulated buffer zone (300 m) outside monument

Measures for works in regulated buffer zone (300 m) outside monument

- a. Obtain prior permission from ASI/NMA for the works to be conducted within the regulated zone of monument; submit detailed construction drawings clearly indicating the details of proposed excavations and works, use of equipment and machinery, etc.,



to ASI for their review; incorporate any suggestions/recommendations of ASI in project design and implementation

- b. Consult ASI) and local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals.
- c. Excavation and construction methodology to be used near the monuments (within the regulated area of 300 m of any monument) shall be in line with the ASI recommendations.
- d. No equipment causing vibration (eg, pneumatic drills, excavators etc.) and heavy noise should be used; works shall be conducted manually.
- e. Dust control measures shall be put in place; all work areas to be barricaded and enclosed with dust screens.
- f. Conduct air quality and noise monitoring weekly throughout construction phase in the 300 m regulated area.

MEASURES FOR CHANCE FINDS

- i. Construction contractors to follow these measures in conducting any excavation work.
1. Create awareness among the workers, supervisors and engineers about the chance

| TRICHY UGSS PHASE II - PACKAGE 1 | | |
|----------------------------------|--------|-------------------------|
| HARD ROCK AREAS LENGTH | | |
| SI NO | ZONE | QUANTITY (LENGTH IN KM) |
| 1 | ZONE-1 | 4.00 |
| 2 | ZONE-2 | 7.00 |
| 3 | ZONE-3 | 28.50 |
| 4 | ZONE-4 | 16.50 |
| 5 | ZONE-6 | 9.60 |
| TOTAL | | 65.60 KM |

96. Sewage pumping and lifting stations works are confined to sites, and construction include general activities like site clearance, excavation for foundations, and creation of concrete structures is one of the major construction activities for this project, as many of the subproject components are fixed to concrete plinths and mostly housed in buildings with at least some concrete structural elements. Most such structures are 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 form work is bolted around the outside to build a mould into which pre-mixed concrete is poured. Once the concrete has set the form work is removed, and the concrete surface is finished by masons by hand if necessary. Some buildings, such as the pump 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., have negative impacts, which needs to be avoided or mitigated properly
97. Subproject also include linear works (laying of 312 km of tertiary sewers, and 24 km of pumping mains along the roads). This covers entire all uncovered and newly extended area of Tiruchirappalli City. Sewers will be laid along almost all the roads. Small sewers (tertiary sewers) that collect sewage from households will be laid in all streets and roads, the larger sewers that collect sewage from tertiary sewers and convey to pumping stations are laid mostly on wider main roads. Sewers are laid by open cut method and Pipe Jacking method are used for NH, Rail and Canal Crossing.
98. 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. The pipes for tertiary sewers are double wall corrugated (DWC) pipes and uPVC pipes and trunk sewers and conveying mains (pumping mains) are of cast iron. The diameter of gravity sewer ranges from 200 mm to 1000mm of which nearly 92% of the sewers are of size between 200 mm and 250mm. The size of pumping main ranges from 150mm to 700mm. According to the design the sewers will be laid at a depth of 1 to 6.5 m. The width of the trench excavation along the roads vary from 0.8 m to 1.4 m and the depth varies from a minimum of 1m to 6.5m. Nearly 92% length of sewers will be laid in trench of depth 3 m or less, and only about 3 % of sewers will be laid deeper between 5 and 6.5m.

The design is optimized to minimize the sewer depth to the extent possible with an optimal combination of sewer depth and pumping requirements. Details of sewer construction are provided in the following Table 18

Table 18: Sewer Construction

| Proposed Depth of Sewers | Total Length of Sewers to be Laid (in m) | % of Length |
|--------------------------|--|-------------|
| Up to 2m | 220979 | 71% |
| 2m – 4m | 70093 | 23% |
| 4m – 6.5m | 19550 | 6% |

99. Earth work excavation is undertaken by machine (backhoe excavator) and includes danger lighting and using sight rails and barricades. The work also be supplemented manually where there is no proper working area (e.g.very narrow streets) for the back house excavators. As trenches are deep (up to 6.5m), 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 trenches of more than 1.2 m deep. 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. Total earthwork excavation will be nearly 542,565 m³, of which nearly 98% will be reused, and the remaining 10,851 m³ of excess soil needs to be disposed safely to areas approved by the authorities. The bituminous would be reused to the extent possible and remaining bituminous waste would be disposed as per the regulatory requirements. Some sections of the alignment and the pumping stations hard rock formation are encountered, and controlled blasting may require in such locations for excavation. Necessary statutory permits for undertaking controlled blasting has been obtained from the district collector (Appendix-10) and necessary precautions to prevent safety risk to both public and nearby structures as provisioned in the prevailing Indian regulations and standards would be adhered.
100. Although sewer laying work involves quite simple techniques of civil work, except the stretches where controlled blasting is proposed, 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.
101. Comprising old town area of Tiruchirappalli, project area is mostly characterized by high density residential areas and very narrow streets and roads. Outer areas are comparatively less dense, however, erstwhile village areas which are added to corporation, and which are part of subproject area, are also have dense habitations in the core village areas. Outer areas are mainly a mix of old village habitations with narrow streets, and few well planned newly developed / developing residential layouts in the lands previously under agricultural use. Old and new developments are intercepted with agricultural and vacant lands.
102. Anticipated impacts during the construction phase are discussed below along with appropriate mitigation measures to avoid, minimize, or mitigate those impacts to acceptable levels.
103. **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. New quarries are subject to a rigorous process of environmental assessment to ensure appropriate siting and adequate environmental controls on the operation. It will therefore be important to ensure that construction materials for this project are obtained from existing government approved licensed quarries only,

to ensure these controls are in place. In Tiruchirappalli, construction sand is normally obtained from Public works department, GoTN's authorized mining areas, and gravel and aggregate is available locally in Tiruchirappalli district (about 10 km from the city). Contractor should not create any new borrow pits / quarries. The contractor should also make a concerted effort to re-use as much excavated material from this project as possible. The construction contractor will be required to:

- a. Obtain construction materials only from government approved quarries with prior approval of PIU.
 - b. PIU to review and ensure that proposed quarry sources have all necessary clearances/ permissions in place prior to approval.
 - c. Contractor to submit to PIU on a monthly basis documentation on material obtained from each source (quarry/ borrowpit).
 - d. Avoid creation of new borrow areas, quarries etc., for the project; if unavoidable, contractor to obtain all clearances and permissions as required under law, including Environmental Clearance prior to approval by PIU.
104. **Air Quality.** Construction work, especially from earthwork activities, including controlled blasting works, coupled with dry and windy working conditions, material and debris transport, and works along the public roads carrying significant traffic, have high potential to generate dust. Significant quantities of earthwork will be conducted in the subproject, spread all over the project area. Nearly 542,565 m³ of earthwork is anticipated from the subproject, and 98% of which will be reused for filling the trenches. 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:

For all construction works

- a. Provide a dust screen of adequate height around the construction sites of pumping and lifting stations; provide 2 m high barricades for the sewerworks
- b. Damp down the soil and any stock piled material on site by water sprinkling; (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;
- c. 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.
- d. Apply water prior to levelling or any other earth moving activity to keep the soil moist throughout the process.
- e. Cover the soil stocked at the sites with tarpaulins and surround by dust screens
- f. Control access to work area, prevent unnecessary movement of vehicle, public trespassing into work area. Limiting soil disturbance will minimize dust generation.
- g. Use tarpaulins to cover the loose material (soil, sand, aggregate etc.,) when transported by open trucks.
- h. 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

- i. Clean wheels and undercarriage of haul trucks prior to leaving construction site.
- j. 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.
- k. no vehicles or plant to be left idling at site generators to be at placed maximum distance from properties.

FOR SEWER WORKS

- i. Inform the residents likely to be affected by the work in the locality about the upcoming sewer laying works well in advance so that necessary are planned by the residents with reduced inconvenience.
 - ii. For sections where the controlled blasting is proposed, the residents shall be provided with the schedule of blasting at least three days in advance and residents are explained about the preventive, precautionary, mitigation and emergency response measures being taken to address their concerns.
 - iii. The project staff from the PIU, consultants and contractors would undertake a survey of structures (including videography and/or photography) lying within the area of influence of blasting from the vibrations related impacts (preferably in the presence of the owners of the said structures) during pre- and post-blasting situations to assess and/or ascertain regarding the damages, if any, caused to the structures because of blasting activities.
 - iv. Barricade the construction areas using hard barricades (of 2m height) on both sides
 - v. Initiate site clearance and excavation work only after barricading of the site is done.
 - vi. Confine all the material, excavated soil, debris, equipment, machinery (excavators, cranes etc.), to the barricaded area.
 - vii. Limit the stocking of excavated material at the site; remove the excess soil from the site immediately to the designated disposal area.
 - viii. Undertake the work section wise: a 500 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;
 - ix. The section proposed for blasting shall be supervised by properly trained staff to ensure no movement of pedestrians, motorized or non-motorized vehicles, and residents takes place during blasting within the area of influence.
 - x. For sections involving controlled blasting, ensure that adequate cover is provided to the trenches to prevent emission of dust during controlled blasting.
 - xi. Ensure that the excavated soil and debris along the section identified for blasting is sprinkled with adequate water prior to blasting to reduce dust emissions upon explosion of charge placed for breaking the hard rock.
 - xii. Ensure that adequate precautions are taken to avoid flying debris post blasting (such as covering the trench with sturdy metallic sheets having sufficient weights to absorb the blast waves);
 - xiii. 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.
 - i. 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.
 - ii. 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.
105. **Immediate road restoration after refilling the trench.** Excavation and refilling activities disturb the topsoil, 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 topsoil along the roads will generate maximum dust and create very unhealthy conditions. Moreover, as the barricades/dust screens will be removed after the trench is refilled, there will be absolutely nothing to control the dust generation. Dust control activities like wetting of topsoil 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.

- i. 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.
106. **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/streams. Project area receives rainfall in southwest and northeast monsoon seasons, between June/July to November/December. Periyakulam, a big lake, and Vathiyar kulam lake are located within the project area, and Koraiyar river flows in the west of the project area, The Uyyakondan channel also flows through the project area besides, there are canals and other small water bodies in and around the project area. Project area mostly drains into these water bodies. It is important that runoff from the construction areas, which may contain silt and chemical traces do not enter the waterbodies. Impact will be temporary but needs to be mitigated. Construction contractor will be required to
- a. All earthworks be conducted during the dry season to prevent the problem of soil/silt run-off during rain.
 - b. Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets; do not stock earth/material close to water bodies (at least 100m)
 - c. Prioritize re-use of excess spoil sand materials in the construction works. If spoils will be disposed, only designated disposal areas shall be used.
 - d. Install temporary silt traps, oil traps, or sedimentation basins along the drainage leading to the waterbodies.
 - e. Place storage areas (with impermeable surface) for fuels and lubricants away from any drainage leading to water bodies; these should be at least 100m away from water bodies and groundwater wells;
 - f. Store fuel, construction chemicals etc., on an impervious floor, also avoid spillage by careful handling; provide spill collection sets for effective spill management.
 - g. Dispose any wastes generated by construction activities in designated sites and
 - h. Conduct surface quality inspection according to the Environmental Management Plan (EMP).
107. Construction of bridges across canals/streams to cross over sewers will have negative impact on water quality of canals/streams. Following measures to be implemented:
- a. Conduct works in the water body (especially foundation work) only during no-flow season.
 - b. Select a construction method which is less disruptive (e.g., precast type);
 - c. Do not spill construction chemicals, fuels, lubricants in the waterbody.
- Clean up the site immediately after construction is complete; construction debris,

materials, etc., shall be cleared and pre-project condition restored or improved

108. **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 much deeper than the anticipated excavation depth and therefore this impact is not envisaged. However, during the rains, water will be collected in open pits and trenches. The water collected in excavated pits will contain silt and disposal of this in drainage channels lead to silting. To avoid this the contractor needs to be implement the followingmeasures:
- I. 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 workarea.
 - II. 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 temporaryponds.
 - III. Consider safety aspects related to pit collapse due to accumulation ofwater.
109. **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 and other similar items. Domestic solid wastes may also be generated from the workers' camp. Improper waste management could cause odor and vermin problems, pollution and flow obstruction of nearby watercourses and could negatively impact the landscape. Total earthwork excavation will be nearly 542,565 m³, of which nearly 98% will be reused, and the remaining 10,851m³ of excess oil needs to be disposed safely. The following mitigation measures to minimize impacts from waste generation shall be implemented by the contractor:
- a. Prepare and implement a Construction Waste (Spoils) Management Plan (format is given inAppendix3);
 - b. 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.;
 - c. Avoid stockpiling any excess spoils at the site for long time. Excess excavated oils should be disposed of to approved designated areasimmediately.
 - d. If disposal is required, the site shall be selected preferably from barren, in fertile lands; sites should locate away from residential areas, forests, water bodies and any other sensitive landuses.
 - e. 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 materialmarket;
 - f. Residual and hazardous wastes such as oils, fuels, and lubricants shall be disposed of via licensed (by TNPCB) thirdparties.
 - g. Prohibit burning of construction and/or domesticwaste.
 - h. Ensure that wastes are not hardly thrown in and around the project site; provide proper collection bins, and create awareness to use the dust bins; recycle waste material wherepossible
 - i. 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 completioncertificate.
110. Significant quantities of construction waste, debris, etc., will be generated from the proposed repair and rehabilitation works at the existing STP in Panjappur. These are discussed in the preconstruction stage impacts, and measures as suggested shall be implemented.

111. **Noise and Vibration Levels.** Except new pumping all the work sites i.e., 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, controlled blasting for hard rocks along the alignment 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. The construction contractor will be required to:
- I. Plan activities in consultation with PIU so that activities with the greatest potential to generate noise and vibrations such as controlled blasting are conducted during periods of the day which will result in least disturbance, especially near schools and other sensitive receptors
 - II. Minimize noise from construction equipment by using vehicle silencers, fitting jack hammers with noise-reducing mufflers, and use portable street barriers to minimize sound impact to surrounding sensitive receptor; and
 - III. Maintain maximum sound levels within the limits as permitted by the prevailing Indian regulations and standards.
 - IV. Ensure to conduct a pre-blasting survey through videography and photography of residential properties and other structures falling along the sewerage alignment to ascertain the prevailing conditions of structures likely to be impacted by the controlled blasting and take adequate measures to minimise such impacts.
 - V. Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach.
 - VI. Consult local communities in advance of the work to identify and address key issues and avoid working at sensitive times, such as religious and cultural festivals.
 - VII. All the controlled blasting shall be done by an approved and licensed Explosive contractor after submitting a blasting plan to PIU.
112. Besides the above, works in the regulated buffer zone of protected monuments requires special precautions to avoid any potential disturbance/damage to the monuments. Noise, dust and vibration emanating from the works, if not properly planned or executed may disturb / damage the monument. Following measures are to be implemented:
- I. Obtain prior permission from ASI/NMA for the works to be conducted within the regulated zone of monument; submit detailed construction drawings clearly indicating the details of proposed excavations and works, use of equipment and machinery, etc., to ASI for their review; incorporate any suggestions/recommendations of ASI in project design and implementation
 - II. Excavation and construction methodology to be used near the monuments (within the regulated area of 300 m of any monument) shall be in line with the ASI recommendations
 - III. No equipment causing vibration (eg, pneumatic drills, excavators etc.) and heavy noise should be used; works shall be conducted manually
 - IV. Dust control measures shall be put in place; all work areas to be barricaded and enclosed with dust screens
 - V. Conduct air quality and noise monitoring weekly throughout construction phase in the 300 m regulated area.

113. **Accessibility and Traffic Disruptions.** Excavation along the roads for laying of sewers, (especially controlled blasting)hauling of construction materials and operation of equipment on-site will cause traffic problems. There are several roads (national and state highways, and other major roads providing regional connectivity) in the project area that carry considerable traffic. These roads also center of commercial activities. Internal roads in the project area are narrow, except in the newly developing residential layout which comparatively have wide roads. In old city area, roads are very narrow and congested with activities, traffic and pedestrians. 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 mostlydisrupted.
114. 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 andaccessibility.
115. 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 inconvenience the local community and road users. Potential impact is negative but short term and reversible by mitigation measures. The construction contractor will be requiredto:

SEWER WORKS

- a. Prepare a sewer work implementation plan in each zone separately 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 isminimal;
- b. Plan the sewer work in coordination with the traffic police; provide temporary diversions, where necessary with clear signage and effectively communicate with generalpublic.
- c. 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 500 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 – immediately removed from site/ or brought to the as and whenrequired.
- d. 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 constructionperiod;
- e. 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.
- f. Provide pedestrian access in all the locations; provide wooden/metal planks with safety rails over the open trenches at each house to maintain theaccess.
- g. Inform the affected local population in advance about the work schedule, a week before, and a day before start ofwork.
- h. Plan and execute the work in such a way that the period of disturbance/loss of access isminimum.
- i. Keep the site free from all unnecessary obstructions.
- j. Notify affected public by public 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.

- k. At work site, public information/caution boards shall be provided including contact number for publiccomplaints.
- l. For sections where the controlled blasting is proposed, the residents are provided with the schedule of blasting at least three days in advance and the residents are explained about the preventative precautionary, mitigation and emergency response measures being taken to address their concerns
- m. The contractor in coordination with urban local body officials would conduct pre-blasting physical surveys through videography and photography of adjacent residential properties and other structure along the sewerage alignment and take adequate measures to minimize such impacts.

Hauling (material, waste/debris and equipment) activities

- i. Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of deliverysites.
 - ii. Schedule transport and hauling activities during non-peak hours (peak hours 7 to10 AM and 4 to7PM);
 - iii. Locate entry and exit points in areas where there is low potential for traffic congestion.
 - iv. Drive vehicles in a consideratemanner.
 - v. Notify affected public by public information notices, providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.
 - vi. For controlled blasting required quantity of explosives shall be transported to the blasting site only through suitable explosive vehicle. After blasting is over, the balance explosives shall be returned to the licensed storage.
116. **Socio-Economic – Income.** Sites for all project's 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. Resettlement and social issues are being studied in a parallel resettlement planning study of thissubproject.
- a. Informal businesses and residents about the nature and duration of any work well in advance so that they can make necessarypreparations;
 - b. Do not block any access; leave spaces for access between barricades/mounds of excavated soil and other stored materials and machinery, and providing footbridges so that people can crossover opentrenches;
 - c. 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 movearound;
 - d. Control dustgeneration;
 - e. 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
 - f. Employee best construction practices, speed up construction work with better

- equipment, increase work force, etc., in the areas with predominantly commercial and with sensitive features like hospitals, and schools;
- g. Consult businesses and institutions regarding operating hours and factoring this in work schedules; and
 - h. Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.
117. **Socio-Economic – Employment.** Manpower will be required during the 24-months construction stage. This can result in generation of temporary employment and increase in local revenue. Thus, potential impact is positive and long-term. The construction contractor will be required to employ local labour force as far as possible
118. **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, controlled blasting etc. Potential impacts are negative and long-term but reversible by mitigation measures. The construction contractor will be required to:
- a. Follow all national, state and local labor laws (indicative list is in Appendix 2);
 - b. Develop and implement site-specific occupational health and safety (OHS) Plan, informed by OHS risk assessment seeking to avoid, minimize and mitigate risk, including controlled blasting activity, which shall include measures such as: (a) safe and documented construction procedures to be followed for all site activities; (b) ensuring all workers are provided with and use personal protective equipment; (c) OHS Training⁴⁴ for all site personnel, (d) excluding public from the work sites; and (e) documentation of work-related accidents; Follow International Standards such as the World Bank Group's Environment, Health and Safety Guidelines⁵
 - c. Ensure that qualified first aid is provided at all times. Equipped first-aid stations shall be easily accessible throughout the sites.
 - d. Secure all installations from unauthorized intrusion and accident risks.
 - e. Provide Health and Safety 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.
 - f. 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.
 - g. 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.
 - h. Ensure moving equipment is outfitted with audible back-up alarms.
 - i. 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; and
 - j. Disallow worker exposure to noise level greater than 85 dBA for duration of

⁴⁴Some of the key areas that may be covered during training as they relate to the primary causes of accidents include (i) slips, trips and falls; (ii) personal protective equipment; (iii) ergonomics, repetitive motion, and manual handling; (iv) workplace transport; and (v) legislation and responsibilities. Training can provide the foundations of competence but it does not necessarily result in a competent worker. Therefore, it is essential to assess staff competence to ensure that the training provided is relevant and effective. Supervision and monitoring arrangements shall be in place to ensure that training has been effective and the worker is competent at their job. The level of supervision and monitoring required is a management decision that shall be based on the risks associated with the job, the level of competence required, the experience of the individual and whether the worker works as part of a team or is a lone worker.

⁵<http://www.ifc.org/wps/wcm/connect/a99ab8804365b27aa60fb6d3e9bda932/EHS-Guidelines+101-Webinar.pdf?MOD=AJPERES>

more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.

- k. Provide supplies of potable drinking water.
- l. Provide clean eating areas where workers are not exposed to hazardous or noxious substances

119. **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 will be required to:

- l. Confine work areas: prevent public access to all areas where construction works are on-going through the use of barricading and security personnel.
- m. Attach warning signs, blinkers to the barricading to caution the public about the hazards associated with the works, and presence of deep excavation
- n. 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.
- o. Control dust pollution – implement dust control measures as suggested under air quality section.
- p. Ensure appropriate and safe passage for pedestrians along the worksites.
- q. Provide road signs and flag persons to warn of on-going trenching activities.
- r. Restrict construction vehicle movements to defined access roads and demarcated working areas (unless in the event of an emergency);
- s. Enforce strict speed limit (20-30 kmph) for plying on unpaved roads, construction tracks.
- t. Provide temporary traffic control (e.g. Flagmen) and signs where necessary to improve safety and smooth traffic flow.
- u. 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.
- v. At sensitive locations particularly where there are schools and markets close to the road, awareness of safety issues will be raised through neighbourhood awareness meetings.
- w. All drivers and equipment operators will undergo safety training.
- x. Maintain regularly the construction equipment and vehicles; use manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction.

Safety Measures for Controlled blasting during excavation: Presence of sub-surface rock in the alignment has been identified in few locations in Trichy Corporation. During excavation, alternatives like drilling and chiseling, controlled blasting etc. have been examined and suitable technology has been identified depending upon the site conditions. Wherever controlled blasting is proposed, the following measures shall be carried out for execution in a safe manner.

- (i) Carry out Controlled blasting in consultation with PIU so that blasting activities with generating least vibration are conducted during periods of the day which will result in least disturbance, especially near schools and other sensitive receptors
- (ii) The contractor shall submit a blasting plan in advance to PIU: and implement in accordance to the plan
- (iii) Permission shall be obtained from the District Collector for controlled blasting for excavation and the conditions issued shall be complied with during implementation

- (iv) Blasting shall be done through a licensed Explosive Contractor only
- (v) For controlled blasting, explosives including blasting caps, shall be transported to the blasting site only through exclusive vehicle in safe manner in accordance with the requirements of the blasting license. After blasting is over, the balance explosives shall be returned to the licensed storage.
- (vi) Cost for implementation of mitigation measures and liability are the responsibility of Contractor
- (vii) Proper prior notice will be issued to the residents before Commencing UGSS activity works Schedule
- (viii) Prior information will be given to Police Officials
- (ix) Workers(flagman) shall be stationed on both end of roads to warn people before firing any blasts and not to permit the traffic
- (x) When blasting, ample warning shall be given to all persons within the vicinity prior to blasting. Warning signs shall be erected a minimum of 24 hours prior to blasting. Warning signs shall be erected a minimum of 24 hours prior to the blast time. The warning signs will state the time and date of each blast
- (xi) Contractor shall ensure necessary precautions/protection (like excavated earth, sand-filled bags, etc) to reduce duct emissions, noise levels and vibrations. Sites shall be provided with necessary shields all around.
- (xii) Minimum explosive will be used for Control Blasting for residential areas.
- (xiii) After a blast has been fired, careful inspection shall be made to determine that all charges have exploded before employees are returned to the operation
- (xiv) The contractor shall be responsible for any and all damages to property or injury to persons resulting from blasting or accidental or premature explosions that may occur in connection with use of explosives. The contractor shall do the activities after obtaining the blasting permission from District Collector, Trichy
- (xv) For the diversion of traffic in the blasting area, the contractor shall prepare a traffic management plan and obtained permission from Trichy Corporation and traffic police.

120. **Construction Camps.** Contractor may require to set up construction camps – for temporary storage of construction material (sewer, 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:

- (i) Consult PIU before locating project offices, sheds, and construction plants;
- (ii) 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
- (iii) Avoid tree cutting for setting up camp facilities;
- (iv) Provide a proper fencing/compound wall for camp sites;
- (v) 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
- (vi) Separate the workers living areas and material storage areas clearly with a

- fencing and separate entry and exit
- (vii) Ensure conditions of live ability 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;
 - (viii) Camp shall be provided with proper drainage, there shall not be any water accumulation;
 - (ix) 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
 - (x) Prohibit employees from cutting of trees for firewood; contractor should provide cooking fuel (cooking gas); fire wood not allowed;
 - (xi) Train employees in the storage and handling of materials which can potentially cause soil contamination;
 - (xii) 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)
 - (xiii) Recover used oil and lubricants and reuse or remove from the site;
 - (xiv) 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;
 - (xv) Remove all wreckage, rubbish, or temporary structures which are no longer required; and
 - (xvi) 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 worksite.

C. OPERATION AND MAINTENANCE IMPACTS

121. Operation and Maintenance of the sewerage system will be carried out by TCC. Operation will involve collection and conveyance of wastewater from houses to nearest lifting / pumping stations; operation of lifting/pumping stations to pump accumulated sewage to main pumping stations; operation of main pumping stations to pump accumulated sewage to STP, treatment of sewage at STP to meet the disposal standards; and final disposal of treated wastewater, and treatment and disposal of sludge. STP is proposed under DBOT modality, and the contractor will prepare detailed designs for STP including the outfall sewer and disposal arrangements. At present, treatment and disposal system is designed in outline only (preliminary design); and during the detailed design phase, the assessment will be updated accordingly.
122. **Treated wastewater disposal from STP.** As per the design, it is to dispose treated wastewater into Uyyakondan channel, flowing at 2.7 km from the STP site. This is a major irrigation channel, taking off from Cauvery River at Kulathalai Kattnali, upstream of Tiruchirappalli, and flows about 40-50 km prior to reaching the city, and then flows through the Centre of Tiruchirappalli city for about 18 km, carrying storm water, and wastewater from the unsewered city areas. It finally discharges into Valavandankottai pond/tank at Thuvakudi, about 20-22 km from the proposed STP discharge point. Channel water is used for only irrigation. Channel mostly carries wastewater within the city, and therefore existing quality likely to be poor except during upstream flow.

Baseline water quality of channel has been established by the STP contractor during the detailed design phase. Discharge from STP will be properly treated to

meet the disposal standards, and therefore no notable impacts envisaged on channel water quality. This open channel flows for another 20-22 km downstream, allowing further dilution via self-purification prior to reaching the tank/pond.

Waste water is treated to set standards at the STP prior to its disposal into Uyyakondan channel.

Considering the existing status of channel and the degree of treatment and self-purification via 20- 22 km turbulent flow in open channel, no significant impacts envisaged. Proper systems should be put in place at the STP to ensure that treated wastewater at all times meet the stipulated standards prior to its disposal into this channel.

123. As stated above, the existing capacity of channel is adequate to convey the discharge to downstream water bodies. This proposal has been reviewed by DBOT Contractor during detailed design to ensure its techno economic and environmental feasibility by studying the water quality and hydrologic characteristics of the receiving water bodies (Uyyankondan channel) to avoid any inundation risks due to channel discharge from STP and possible water quality degradation etc. The permission of disposal of effluent has obtained from PWD and final discharge point has been firmed up.

124. **Sewage sludge.** No estimate sewage sludge generation from the STP is available. Since start of its operation, sludge has not been removed from the ponds. 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. A sludge management plan will be prepared; this will be simple activity for the WSP based STP. The ponds will be allowed to dry naturally, and the sludge will be collected from the basins by mechanical means. Sludge will be further air dried/composted in sludge drying beds for adequate time. The treatment and drying processes kill enteric bacteria and pathogens, and because of its high content of nitrates, phosphates and other plant nutrients. The sludge is an excellent organic fertilizer for application to the land. The reuse of sludge should be preceded by rigorous bacteriological tests to confirm that the treatment methods render all dried sludge and effluent free from enteric bacteria and pathogens, so that it is safe to humans, animals and crops. Sludge shall also need to be periodically tested for presence of heavy metals, to check if it meets the compost standards specified the Solid Waste Management Rules, 2016.

125. **Quality of Raw Sewage.** As discussed previously, 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 waste water, 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. Tiruchirappalli houses various small and medium scale units; food, cotton, textiles, wood, paper, plastic, chemical, engineering, electrical units are established. Although proposed sewer network will not cater to industrial wastewater, It is important to ensure that no wastewater from industries enters the sewer network with strict monitoring and enforcement. Following measures are to be implemented:

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

126. **Odor and Noise from Sewage lifting and pumping stations.** Various measures are included in the design of these facilities giving utmost importance

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

- a. Strictly follows and hard operating procedures/operational manual for operation and maintenance of lifting and pump stations.
 - b. Ensure that operating staff is properly trained and have clear understanding of odor issues vis a vis its relation with operational practices.
 - c. Ensure that pumping cycles are properly followed; and there is no buildup of sewage beyond design volume in the wells.
 - d. Conduct periodic H₂S monitoring at pumping and lifting stations using hand held H₂S meters.⁶
127. **Sewer network.** During the system design life (15/30 years for mechanical/civil components) it shall not require major repair so 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.
128. There are also certain environmental risks from the operation of the sewer system, most notably from leaking sewer pipes as untreated faecal material can damage human health and contaminate both soil and groundwater.

There is an occupation health risk to workers engaged in sewer maintenance activities. Following measures should be followed:

- (i) **Establish regular maintenance program, including:**
 - a. 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
 - b. 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 manhole; frequent line blockages; lines that generally flow at or near capacity; and suspected infiltration or exfiltration; and
 - c. Monitoring of sewer flow to identify potential inflows and outflows
 - d. Conduct repairs on priority based on the nature and severity of the problem. Immediate clearing of blockage or repair is warranted where an overflow is currently occurring or for urgent problems that may cause an imminent overflow (e.g. pump station failures, sewer line ruptures, or sewer line blockages);
- (ii) Maintain records; review previous sewer maintenance records to help identify

⁶There are no any standards notified by Government of India or Government of Tamil Nadu. However, Central Pollution Control Board (CPCB) has stipulated Guidelines on Odor Pollution and its Control. These guidelines deal only with the basics of odor pollution, its sources and measurement, technologies for its control etc. but do not specify any threshold limits for odor-causing pollutants. Therefore, as part of mitigation, provision for odor control measures has been made in the sewage pumping stations for all UGSS subprojects. However, in case of STPs, the odor-causing processing units will be located far off to the extent possible within the premises so as to mitigate the odor nuisance. Further, the technology for treating sewage plays a vital role since release of gases like H₂S cannot be avoided in the process involving anaerobic decomposition whereas release of H₂S will almost be nil in case of aerobic treatment. PIU and design engineers have not specified any odor standards adopted elsewhere in the preliminary design as not to limit the technology that can be considered by the bidders in the treatment of domestic sewage. Sufficient mitigation measures have been taken for all sewage pumping stations and will be taken for all STPs when finalizing/revising the IEEs based on the detailed engineering design.

“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;

- (iii) 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.
- (iv) 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.
- (v) Develop an Emergency Response System for the sewerage system leaks, burst and over flows, etc.
- (vi) Provide necessary health and safety training to the staff in sewer cleaning and maintenance.
- (vii) Provide all necessary personnel protection equipment.
- (viii) 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 sulphide, methane, etc.); provide for adequate equipment (including oxygen masks) for emergency use.

VI. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. OVERVIEW

129. The active participation of stakeholders including local community, NGOs/CBOs, etc., in all stages of project preparation and implementation is essential for successful implementation of the project. It will ensure that the subprojects are designed, constructed, and operated with utmost consideration to local needs, ensures community acceptance, and will bring maximum benefits to the people. Public consultation and information disclosure is a must as per the ADB policy.
130. Most of the main stakeholders have already been identified and consulted during preparation of this IEE, and any others that are identified during project implementation will be brought into the process in the future. Primary stakeholders of the subproject are: residents, shopkeepers and business people who live and work near sites where facilities will be built (sewer network and pumping/lifting stations), government and utility agencies responsible for provision of various services in project area. Secondary stakeholder are: NGOs and CBOs working in the area, community representatives, beneficiary community in general, government agencies, TNUIFSL, Government of Tamil Nadu and the ADB.

B. PUBLIC CONSULTATION

131. The public consultation and disclosure program is a continuous process throughout the project implementation, including project planning, design and construction.

1. Consultation during Project Preparation

132. The subproject proposal is formulated by Tiruchirappalli corporation in consultation with the public representatives' bodies in the project area to suit their requirements.
133. Focus-group discussions with affected persons and other stakeholders were conducted to learn their views and concerns. A socio-economic household survey has been conducted in the project area, covering sample households, to understand the household characteristics, health status, and the infrastructure service levels, and also the demand for infrastructure services. General public and the people residing along the project activity areas were also consulted. A project area level consultation workshop is conducted in Tiruchirappalli with the public representatives and prominent citizens, NGOs etc. The formal consultations were held on November 3, 2017 (details are provided in Appendix 9).
134. Prior to start of construction, PIU had conducted information dissemination sessions at various places and solicit the help of the local community, leaders/prominent for the project work. Focus group meetings conducted to discuss and plan construction work (mainly pipe line work) with local communities to reduce disturbance and other impact and also regarding the project grievance redress mechanism. Project information and construction schedule are provided to the public via mass media (newspapers, television, ULB websites etc.). A constant communication also established with the affected communities to redress the environmental issues likely to surface during construction phase. Contractors

are providing prior public information (in Tamil and English) about the construction work in the area, 7 days prior to the start of work and again a day before the start of work via pamphlets (a sample public information template is provided in Appendix 4). At the work sites, public information boards also provided to disseminate project related information. Further consultation and awareness program conducted on 24th October 2019 at keelakalkandar kottai in regard to construction of new STP site and also LS site. Enclosed in appendix-9

2. Consultation during construction

Prior to start of construction, PIU had conducted information dissemination sessions at various places and solicit the help of the local community, leaders/prominent for the project work. Focus group meetings conducted to discuss and plan construction work (mainly pipe line work) with local communities to reduce disturbance and other impact and also regarding the project grievance redress mechanism. Project information and construction schedule are provided to the public via mass media (newspapers, television, ULB websites etc.). A constant communication also established with the affected communities to redress the environmental issues likely to surface during construction phase. Contractors are providing prior public information (in Tamil and English) about the construction work in the area, 7 days prior to the start of work and again a day before the start of work via pamphlets (a sample public information template is provided in Appendix 4). At the work sites, public information boards also provided to disseminate project related information. Further consultation and awareness program was conducted on 24th October 2019 at keelakalkandarkottai in regard to construction of new STP. During construction stage of the project, dissemination programs was conducted at various locations like i.e Win Nagar and Rajrajeswari Nagar of the Trichy City Corporation created awareness among the public about the proposed controlled blasting activity for hard rock removal during excavation. The dissemination for the controlled blasting, regulatory requirements & compliance to conditions, safety measures will be followed, etc.

C. INFORMATION DISCLOSURE

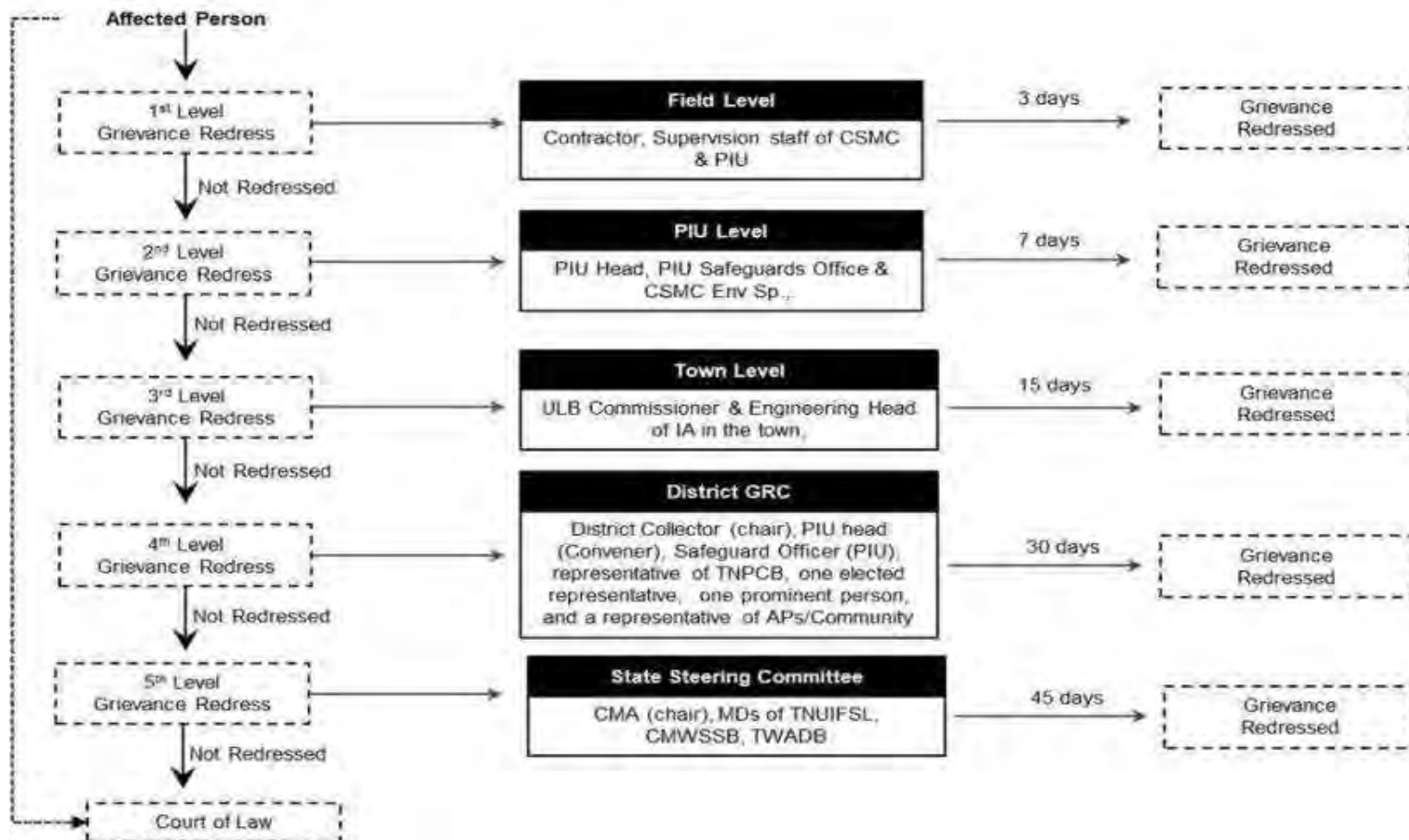
136. Executive summary of the IEE has been translated in Tamil and made available at the offices of PMU, PIU, and TCC and also displayed on their notice boards. Hard copies of the IEE will be accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. Electronic version of the IEE in English and Executive Summary in Tamil will be placed in the official website of the TNUIFSL and TCC after approval of the IEE by ADB. Stakeholders will also be made aware of grievance register and redress mechanism.
137. Public information campaigns to explain the project details to a wider population will be conducted. Public disclosure meetings will be conducted at key project stages to inform the public of progress and future plans. Prior to start of construction, the PIU will issue Notification on the start date of implementation in local newspapers. A board showing the details of the project will be displayed at the construction sites for the information of general public.
138. Local communities will be continuously consulted regarding location of construction camps, access and hauling routes and other likely disturbances during construction. The road closure together with the proposed detours will be communicated via advertising, pamphlets, radio broadcasts, road signage, etc.

VII. GRIEVANCE REDRESS MECHANISM

139. A common GRM is in place to redress social, environmental or any other project related grievances. The GRM described below has been developed in consultation with stakeholders. Public awareness campaign will be conducted to ensure that awareness on the project and its grievance redress procedures is generated. The campaign will ensure that the poor, vulnerable and others are made aware of grievance redress procedures and entitlements per project entitlement matrix, and Project Management Unit (PMU) and Trichy Project Implementation Unit (PIU) will ensure that their grievances are addressed.
140. Affected persons will have the flexibility of conveying grievances/suggestions by dropping grievance redress/suggestion forms in complaints/suggestion boxes or through telephone hotlines at accessible locations, by e-mail, by post, or by writing in a complaint register in ULB or PIU or TCMC offices. PIU Safeguards officer will have the responsibility for timely grievance redress on safeguards and gender issues and for registration of grievances, related disclosure, and communication with the aggrieved party.
141. GRM provides an accessible inclusive, gender-sensitive and culturally appropriate platform for receiving and facilitating resolution of affected person grievances related to the project. A two-tier grievance redress mechanism is conceived, one, at project level and another, beyond project level. For the project level GRM, a Grievance Redress Committee (GRC) will be established in PIUs; Safeguards officer, supported by the social, gender and environmental safeguards specialist of CMSC will be responsible for creating awareness among affected communities and help them through the process of grievance redress, recording and registering grievances of non-literate affected persons.
142. GRM aims to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the project. All grievances—major or minor, will be registered. Documentation of the name of the complainant, date of receipt of the complaint, address/contact details of the person, location of the problem area, and how the problem was resolved will be undertaken. -through for each grievance, periodic information dissemination to complainants on the status of their grievance and recording their feedback (satisfaction/dissatisfaction and suggestions).
143. In case of grievances that are immediate and urgent in the perception of the complainant, the contractor, and supervision personnel of the CMSC and PIU will resolve the issue on site, and any issue that is not resolved at this level will be dealt at PIU head level for immediate resolution. Should the PIU fail to resolve any grievance within the stipulated time period, the unresolved grievances will be taken up at TCMC level. In the event that certain grievances cannot be resolved even at TCMC level, particularly in matters related to land purchase/acquisition, payment of compensation, environmental pollution etc., they will be referred to the district level Grievance Redress Committee (GRC) headed by the District Collector. Any issue which requires higher than district level inter-departmental coordination or grievance redress, will be referred to the state level Steering Committee.
144. GRC will meet every month (if there are pending, registered grievances), determine the merit of each grievance, and resolve grievances within specified time upon receiving the complaint- failing which the grievance will be addressed by the state-level Steering Committee. The Steering Committee will resolve escalated/unresolved grievances received.
145. **Composition of GRC.** GRC will be headed by the District Collector, and members include: PIU head, Safeguards Officer of PIU, representative of

- TNPCB, one elected representative / prominent citizen from the area, and a representative of affected community. GRC must have a womenmember.
146. **State level steering committee** will include Commissioner of Municipal Administration as chair, member include managing directors of TNUIFSL, CMWSSB, TWAD Board and others as necessary.
 147. **Areas of Jurisdiction.** The areas of jurisdiction of the GRC, headed by the District Collector will be (i) all locations or sites within the district where subproject facilities are proposed, or (ii) their areas of influence within the District. The SC will have jurisdictional authority across the state (i.e., areas of influence of subproject facilities beyond district boundaries, if any).
 148. The multi-tier GRM for the project is outlined in Figure 14, each tier having time-bound schedules and with responsible persons identified to address grievances and seek appropriate persons advice at each stage, as required. The GRC will continue to function throughout the project duration. The implementing agencies/ULBs shall issue notifications to establish the respective PIU level grievance redress cells, with details of composition, process of grievance redress to be followed, and time limit for grievance redress at each level.

Figure 16: Proposed TNUFIP Grievance Redress Mechanism



149. **Recordkeeping.** Records of all grievances received, including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions and the date the sewer effected and final outcome will be kept by PIU(with the support of CMSC)and submitted toPMU.
150. **Information dissemination methods of the GRM.** The PIU, assisted by CMSC will be responsible for information dissemination to affected persons and general public inthe project area on grievance redress mechanism. Public awareness campaign will be conducted to ensure that awareness on the project and its grievance redress procedures is generated. The campaign will ensure that the poor, vulnerable and others are made aware of grievance redress procedures and entitlements per agreed entitlement matrix including. whom to contact and when, where/ how to register grievance, various stages of grievance redress process, time likely to be taken for redress of minor and major grievances, etc. Grievances received and responses provided will be documented and reported back to the affected persons. The number of grievances recorded and resolved and the outcomes will be displayed/disclosed in the PIU, offices, ULB notice boards and on the web, as well as reported in the semi-annual environmental and social monitoring reports to be submitted to ADB. A Sample Grievance Registration Form has been attached inAppendix5.
151. **Periodicreviewanddocumentationoflessonslearned.**ThePMUwillperiodicallyrevi ew the functioning of the GRM and record information on the effectiveness of the mechanism, especially on the PIU's ability to prevent and addressgrievances.
152. **Costs.** All costs involved in resolving the complaints (meetings, consultations, communication and reporting/information dissemination) will be borne by the respective PIU. Cost estimates for grievance redress are included in resettlement costestimates.
153. **Country legal procedure.** An aggrieved person shall have access to the country's legal system at any stage, and accessing the country's legal system can run parallel to accessing the GRM and is not dependent on the negative outcome of theGRM.
154. **ADB's Accountability Mechanism.** In the event that the established GRM is not in a position to resolve the issue, the affected person also can use the ADB Accountability Mechanism through directly contacting (inwriting) the Complaint Receiving Officer (CRO) at ADB headquarters or the ADB India Resident Mission. The complaint can be submitted inany of the official languages of ADB's developing member countries. Before submitting a complaint to the Accountability Mechanism, it is recommended that affected people make a good faith effort to resolve their problems by working with the concerned ADB operations department (in this case, the resident mission). Only after doing that, and if they are still dissatisfied, they could approach the Accountability Mechanism. The ADB Accountability Mechanism information will be included in the project-relevant information to be distributed to the affected communities, as part of the projectGRM.

VIII. ENVIRONMENTAL MANAGEMENT PLAN

A. ENVIRONMENTAL MANAGEMENT PLAN

155. An environmental management plan (EMP) has been developed to provide mitigation measures to reduce all negative impacts to acceptable levels.
156. The EMP will guide the environmentally-sound construction of the subproject and ensure efficient lines of communication between TNUIFSL, PMU, TCMC, PIU, consultants and contractors. The EMP will (i) ensure that the activities are undertaken in a responsible non-detrimental manner.
157. (i) provide a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on site; (ii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iii) detail specific actions deemed necessary to assist in mitigating the environmental impact of the subproject; and (iv) ensure that safety recommendations are complied with. The EMP includes a monitoring program to measure the environmental condition and effectiveness of implementation of the mitigation measures. It will include observations on- and off-site, document checks, and interviews with workers and beneficiaries
158. The contractor will be required to submit to PIU, for review and approval, a site environmental management plan (SEMP) including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; and (iii) monitoring program as per SEMP. No works are allowed to commence prior to approval of SEMP.
159. A copy of the EMP/approved SEMP are always kept on site during the construction period. The EMP included in the bid and contract documents. Non-compliance with or any deviation from, the conditions set out in this document constitutes a failure in compliance.
160. For civil works, the contractor required to (i) carry out all of the mitigation and monitoring measures set forth in the approved EMP; and (ii) implement any corrective or preventative actions set out in safeguards monitoring reports that the employer will prepare from time to time to monitor implementation of this IEE, EMP and SEMP. The contractor shall allocate budget for compliance with these IEE, EMP and SEMP measures, requirements and actions.
161. The following tables show the potential environmental impacts, proposed mitigation measures and responsible agencies for implementation and monitoring

Table 19: Design Stage Environmental Impacts and Mitigation Measures (included in DPR)

| Field | Anticipated Impact | Mitigation Measures | Responsibility of Mitigation | Cost and Source of Funds |
|---------------|---|--|------------------------------|---------------------------------|
| Design of STP | Deficient treatment due to substandard operation / system malfunction | <ul style="list-style-type: none"> (i) Design process to meet the Central Pollution Control Board (CPCB) disposal standards of inland water disposal (ii) Ensuring continuous uninterrupted power supply, including a back-up facility (such as generator). (iii) Providing operating manual with all standard operating procedures (SOPs) for operation and maintenance of the facility (iv) Necessary training to ULB staff dealing with STP. (v) Extended contractor period for O&M, proper transfer of facility to ULB with adequate technical know-how on O&M and hands-on training to ULB staff (vi) Provision for online monitoring of crucial wastewater quality parameters at the inlet and outlet of the plant | DBOT and PIU Contractor | Project cost Contractor - DB |
| | Degradation of receiving water body quality and inundation risk | <ul style="list-style-type: none"> (i) Conduct baseline water quality assessment of Uyyakondan channel, Valavandhankottai pond/tank and River Cauvery at discharge points; assess impacts on water quality due to STP discharge, and ensure that water quality is not degraded from the existing condition (ii) Assess hydrological parameters of receiving water bodies (Uyyakondan channel and Valavandhankottai pond/tank) for safe discharge of STP water, implement appropriate measures as required based on the assessment to eliminate risk of inundation (iii) Obtain TNPCB and Public Works Department (PWD) consent to dispose treated wastewater into Uyyakondan channel | DBOT and PIU Contractor | Project cost Contractor - DB |

| Field | Anticipated Impact | Mitigation Measures | Responsibility of Mitigation | | Cost and Source of Funds |
|---------------|--|--|------------------------------|---------------|---------------------------------|
| | Odor nuisance | (i) Providing a green buffer of 15-20 m wide all around the STP with trees in multi-rows and land scaping. This will act as a visual screen around the facility and will improve the aesthetic appearance. | DBOT and PIU | Contractor | Project cost Contractor - DB |
| | Sludge disposal | (i) Provide training on safe handling of sludge, along with proper apparatus and personnel protection equipment (PPEs) to workers (ii) Conduct periodic testing of sludge to check its quality according to set standards for reuse as manure/soil conditioner (iii) Provide training on safe handling of sludge, along with proper apparatus and personnel protection equipment (PPEs) to workers | DBOT and PIU | Contractor | Project cost Contractor - DB |
| | Tree cutting | (i) Minimize removal of trees by adopting to site condition and with appropriate layout design/alignment, particularly at Proposed STP site (ii) Obtain prior permission for tree cutting (iii) Plant and maintain 10 trees for each tree that is removed | PIU/TCC | Project Costs | Tree cutting |
| Sewer network | Nuisance due to leaks, overflows, contamination of water supplies, occupation health and safety of workers, etc. | (i) Limit the sewer depth where possible (ii) 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 waterlines (iii) 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 300mm) (iv) 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 (stoneware pipes shall be avoided) (v) For shallower sewers and especially in narrow roads, | PIU/TCC | Project Costs | Sewer network |

| Field | Anticipated Impact | Mitigation Measures | Responsibility of Mitigation | Cost and Source of Funds |
|--|----------------------------------|--|------------------------------|--|
| | | <p>use small inspection chambers in lieu of manholes.</p> <p>(vi) Design manhole covers to withstand anticipated loads and ensure that the covers can be readily replaced if broken to minimize silt/garbage entry</p> <p>(vii) Ensure sufficient hydraulic capacity to accommodate peak flows and adequate slope in gravity mains to prevent buildup of solids and hydrogen sulfide generation.</p> <p>Ensure to conduct a pre-controlled blasting survey through videography and photography of residential properties and other structures falling along the sewerage alignment to ascertain the prevailing conditions of the structures likely to be impacted by the controlled blasting and take adequate measures to minimize such impacts.</p> | | |
| Construction works in the regulated buffer zone of ASI monument (Erumbeeswarar Temple) | Disturbance / damage to monument | <p>(i) Obtain prior permission from ASI/NMA for the works to be conducted within the regulated zone of monument; submit detailed construction drawings clearly indicating the details of proposed excavations and works, use of equipment and machinery, etc., to ASI for their review; incorporate any suggestions/recommendations of ASI in project design and implementation</p> <p>(ii) Consult ASI and local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals.</p> <p>(iii) Excavation and construction methodology to be used near the monuments (within the regulated area of 300 m of any monument) shall be in line with the ASI recommendations</p> <p>(iv) No equipment causing vibration (eg, pneumatic drills, excavators etc.,) and heavy noise should be used; works shall be conducted manually</p> | PIU/TCC Project Costs | Construction works in the regulated buffer zone of ASI monument (Erumbeeswarar Temple) |

| Field | Anticipated Impact | Mitigation Measures | Responsibility of Mitigation | Cost and Source of Funds |
|-------------------------|--------------------|--|------------------------------|--------------------------|
| | | (v) Dust control measures shall be put in place; all work areas to be barricaded and enclosed with dust screens Conduct air quality and noise monitoring weekly throughout construction phase in the 300 m regulated area | | |
| Sewage pumping stations | Odor nuisance | Measures specific (additional) to New Pumping Station near household area (i) Maintain maximum buffer distance from the nearest residences to the pumping station wells; (ii) Locate pumping station as far as away from the road (iii) 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 odor and also act as visual shield, and improve aesthetical appearance. Design measures for all pumping stations (i) Proposed wells to be closed using RCC slabs. Design of RCC slab to consider both superimposed loads (human and equipment loads) and severe corrosion risk from sewer gas from within wells. (ii) RCC Slab to be designed and fixed in a modular manner such that access to pumps / appurtenances and other equipment can be provided for maintenance / replacement /renewal purposes. (iii) Since human intervention is involved and safety shall be primary and critical consideration, additional protection by way of a metallised 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&M purposes. Provision of passive gas ventilation arrangement by | PIU/TCC Project Costs | Sewage pumping stations |

| Field | Anticipated Impact | Mitigation Measures | Responsibility of Mitigation | Cost and Source of Funds |
|-------|--------------------|--|------------------------------|--------------------------|
| | | <p>providing a take-of 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.</p> <p>(v) Height of vent to be provided appropriately and a minimum 2 m above the lintel level (top level) of window(s) / passageways / doors in the nearby adjoining buildings.</p> <p>(vi) Provision of odor control / mitigation system as per site conditions /requirements</p> <ul style="list-style-type: none"> • Suitable granular activated carbon filter with bird-screen fitted at the vent outlet to control odor. Size of GAC (including material size) should be selected based on the vent diameter and expelled air flow rate expected. <p>(vii) 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.</p> <p>(viii) 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.</p> <p>(ix) Diesel Generators shall be provided for all pump stations and in cases of lift stations with space for</p> | | |

| Field | Anticipated Impact | Mitigation Measures | Responsibility of Mitigation | Cost and Source of Funds | |
|-------------------------------------|--------------------|--|------------------------------|--------------------------|-------------------------------------|
| | | <p>control room. In cases of lift manholes (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.</p> <p>Develop standard operating procedures / operational manual for operation and maintenance of lifting and pump stations; this shall include measures for emerge situations</p> <p>(x) Provide training to the staff in SOPs and emergency procedures Conduct periodic H₂S monitoring</p> | | | |
| Sewage lifting stations | Odor nuisance | <p>(i) Provide closed wells fitted with necessary ventilation and odor abatement systems such as GAC air filters fitted to the ventilation shaft out let(s).</p> <p>(ii) Provide greenbelt (tree cover) around the lift stations, wherever possible</p> | PIU/TCC | Project costs | Sewage lifting stations |
| Sewage pumping and lifting stations | Noise | <p>(i) Procure good quality latest technology high pressure pumps that guarantee controlled noise at a level of around 80 dB(A) at a distance of 1m</p> <p>(ii) Use appropriate building materials and construction techniques for pump houses which can absorb sound rather than reflect noise</p> <p>(iii) Use acoustic enclosures – manufacturer specified, for all pumps, motors</p> <p>(iv) Procure only CPCB approved generators to meet air emission and noise level requirements</p> <p>(v) Provide sound mufflers for ventilators in the plant rooms; and sound proof doors</p> <p>(vi) Provide ear plugs designated for noise reduction to workers</p> <p>(vii) Consult the Archaeological survey of India (ASI) and</p> | PIU/TCC | Project costs | Sewage pumping and lifting stations |

| Field | Anticipated Impact | Mitigation Measures | Responsibility of Mitigation | Cost and Source of Funds |
|-------------------------------------|--|---|--|-------------------------------------|
| | | <p>local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals.</p> <p>(viii) Excavation and construction methodology to be used near the monuments (within the regulated area of 300 m of any monument) shall be finalized in consultation with ASI; no equipment causing vibration and heavy noise should be used</p> <p>(ix) Obtain prior permission from ASI/NMA for components located within the regulated zone of monument; incorporate any suggestions/recommendations of ASI in project design and implementation</p> <p>(x) Ensure to conduct a pre blasting survey through videography and photography of residential properties and other structures falling along the sewerage alignment to ascertain the prevailing conditions of the structures likely to be impacted by the controlled blasting and take adequate measures to minimize such impacts</p> | | |
| Sewage pumping and lifting stations | Energy consumption | <p>(i) Using low-noise and energy efficient pumping systems</p> <p>(ii) Efficient Pumping system operation</p> <p>(iii) Installation of Variable Frequency Drives (VFDs)</p> | PIU/TCC Project Costs | Sewage pumping and lifting stations |
| Controlled blasting | Ground vibrations Noise (airblast) Flying debris Dust | <p>For the safety of humans and the structures within the area influenced by the blasting, the vibrations related impacts would be addressed by designing the blast charge by complying with the provisions elaborated in the applicable Indian regulations and standards.</p> <p>All records shall be maintained by the Contractors and PIU.</p> <p>Training related to controlled blasting activity will be included</p> | Contractor and ContractorCo PIU sts | Controlled blasting |

| Field | Anticipated Impact | Mitigation Measures | Responsibility of Mitigation | Cost and Source of Funds |
|-------|--------------------|--|------------------------------|--------------------------|
| | | <p>in the overall safeguards training programme meant for PIUs and Contractors.</p> <p>An emergency response system shall be developed at the site level to address the situations emerging due to accidents or any other unfortunate incidents pertaining to human and structure safety. Training related to controlled blasting activity will be included in the overall safeguards training programme meant for PIUs and Contractors.</p> <p>(i) The project staff from the PIU, consultants and contractors would undertake a pre-blasting survey of structures (including videography and/or photography) lying within the area of influence of blasting from the vibrations related impacts (preferably in the presence of the owners of the said structures) to assess and/or ascertain regarding the prevailing conditions of the structures prior to blasting activities. Based on the assessment, the Project staff would consider necessary measures to avoid, minimize or mitigate such impacts.</p> | | |

Table 20: Pre-Construction Stage Environmental Impacts and Mitigation Measures

| Field | Anticipated Impact | Mitigation Measures | Responsible Party | Cost and Source of Funds |
|--|--|--|--|--------------------------|
| Submission of updated EMP / SEP EMP implementation and reporting | Unsatisfactory compliance to EMP | (i) Appoint EHS Supervisor to ensure EMP implementation (ii) Submission of updated EMP/SEP (iii) Timely submission monthly of monitoring reports including documentary evidence on EMP implementation such as photographs | Contractor | Contractor cost |
| Generation of sludge, clay, construction waste/debris from repair work of existing STP | Health and environmental impacts due to improper handling and disposal | (i) Conduct sampling and testing of sludge from all ponds (one composite sample from each pond); parameters to be tested are given in environmental monitoring plan (ii) Devise the disposal method based on sludge characteristics (if it is hazardous, it shall be handled and disposed as per the Hazardous waste rules of MoEFCC) (iii) Sludge (if not hazardous) shall be transported to solid waste disposal sites in the city, and shall be disposed or used as daily cover for other waste (iv) Clay layer shall also be tested if it appears to be contaminated by visual appearance; in any case, a top layer of 6 inch shall be considered as part of the sludge and disposed accordingly (v) Clay may be used in solid waste disposal site as daily cover on the waste (vi) Devise any suitable reuse method based on the quality of clay (vii) Employ proper methods for removal of sludge and clay with safety of workers, environment utmost priority; provide on-site awareness sessions and training for workers on working conditions and safe handling of sludge and provide PPEs to workers (viii) Any other construction waste / debris shall be properly disposed; priority shall be given to reuse, recycle so that disposal is avoided, provided it is suitable and safe for such usage | PIU/DBOT Contractor | Contractor cost |
| Utilities | Telephonelines, electric poles and wires, water lines withinproposed project area | (i) Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase; and (ii) Requireconstructioncontractorstopprepareacontingencyplantoinclude actions to be taken in case of unintentional interruption of services. | Contractor in Coordination with PIU | Contractor cost |
| Construction work camps, stockpile areas, storage areas, and disposal areas. | Conflicts with local community; disruption to traffic flow and sensitive receptors | (i) Prioritize areas within or nearest possible vacant space in the project location; (ii) If it is deemed necessary to locate elsewhere, consider sites that will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems; (iii) Do not consider residential areas; | Contractor to finalize locations in consultation and approval of PIU | Contractor cost |

| Field | Anticipated Impact | Mitigation Measures | Responsible f | Cost and Source of Funds |
|---|---|---|---|---|
| | | <ul style="list-style-type: none"> (iv) Take extreme care in selecting sites to avoid direct disposal to water body which will inconvenience the community. (v) For excess spoil disposal, ensure (a) site shall be selected preferably from barren, infertile lands. In case agricultural land needs to be selected consent from landowners (not lessees) will be obtained; (b) debris disposal site shall be at least 200 m away from surface water bodies; (c) no residential areas shall be located within 50 m downwind side of the site; and (vi) site is minimum 250 m away from sensitive locations like settlements, ponds/lakes or other water bodies. | | |
| Sources of Materials | Extraction of materials can disrupt natural and contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution. | <ul style="list-style-type: none"> (i) Obtain construction materials only from the existing government approved quarries with prior approval of PIU (ii) PIU to review, and ensure that proposed quarry sources have all necessary clearances/ permissions in place prior to approval (iii) Contractor to submit to PIU on a monthly basis documentation on material obtained from each source (quarry/ borrow pit) (vii) None borrow are as, quarries etc., shall be developed for the project | Contractor to prepare list of approved quarry sites and sources of materials with the approval of PIU | Contractor cost |
| Consents, permits, clearances, NOCs, etc. | Failure to obtain necessary consents, permits, NOCs, etc. can result to design revisions and/or stoppage of works | <ul style="list-style-type: none"> (i) Obtain all necessary consents, permits, clearance, NOCs, etc. prior to award of civil works. (ii) Ensure that all necessary approvals for construction to be obtained by contractor are in place before start of construction (iv) Acknowledge in writing and provide report on compliance all obtained consents, permits, clearance, NOCs, etc. | Contractor and PIU | Cost of obtaining all consents, permits, clearance, NOCs, etc. prior to start of civil works responsibility of PIU. |
| Chance finds | Damage / disturbance to artifacts | <ul style="list-style-type: none"> (i) Construction contractors to follow these measures in conducting any excavation work (ii) Create awareness among the workers, supervisors and engineers about the chance finds during excavation work (iii) Stop work immediately to allow further investigation if any finds are suspected; (iv) Inform State Archaeological Department if a dissuspected, and taking (v) any action they require to ensure its removal or protection in situ. | Contractor and PIU | Contractor cost |
| Temporary economic impacts | Disruption to vendors, hawkers on ROW during sewer laying works. | <ul style="list-style-type: none"> (v) Construction contractors to follow these measures in conducting any excavation work (vi) Create awareness among the workers, supervisors and engineers about the chance finds during excavation work | CC and PIU | Contractor / PIU |

| Field | Anticipated Impact | Mitigation Measures | Responsible Party | Cost and Source of Funds |
|-----------------------------|--|---|-------------------|--------------------------|
| | | (vii) Stop work immediately to allow further investigation if any finds are suspected; (viii) Inform State Archaeological Department if a discovery is suspected and taking (ix) any action they require to ensure its removal or protection in situ. | | |
| EMP Implementation Training | Irreversible impact to the environment, workers, and community | (i) Project manager and all key workers will be required to undergo training on EMP implementation including spoils/waste management, Standard operating procedures (SOP) for construction works; occupational health and safety (OHandS), core labor laws, applicable environmental laws, etc. | Contractor | Contractor cost |

Table 21: Construction Stage Environmental Impacts and Mitigation Measures

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|-----------------------------|---|--|----------------------------|--------------------------|
| EMP Implementation Training | Irreversible impact to the environment, workers, and community | (i) Project manager and all key workers will be required to undergo training on EMP implementation including spoils/waste management, Standard operating procedures (SOP) for construction works; occupational health and safety (OHandS), core labor laws, applicable environmental laws, etc. | Contractor | Contractor cost |
| Air Quality | Dust, emissions from construction vehicles, equipment, and machinery used for installation of pipelines resulting to dusts and increase in concentration of vehicle-related pollutants such as carbonmonoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons. | <p>For all construction works</p> <ul style="list-style-type: none"> (i) Provide a dust screen (6 m high) around the construction sites of pumping and lifting stations, and STP; provide 2 m high barricades for the sewer works (ii) Damp down the soil and any stockpiled material on site by water sprinkling; (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; (iii) 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 (iv) Apply water prior to leveling or any other earth moving activity to keep the soil moist throughout the process (v) Cover the soil stocked at the sites with tarpaulins and surround by dust screens. (vi) Control access to work area, prevent unnecessary movement of vehicle, public trespassing into work areas; limiting soil disturbance will minimize dust generation (vii) Use tarpaulins to cover the loose material (soil, sand, aggregate etc.,) when transported by open trucks. <p>Control dust generation while unloading the loose material (particularly aggregate, sand, soil) at the site by sprinkling water and unloading inside the</p> | Contractor | Contractor cost |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|-------|--------------------|--|----------------------------|--------------------------|
| | | <p>barricaded area; minimize the drop height when moving the excavated soil.</p> <ul style="list-style-type: none"> (i) Clean wheels and undercarriage of haul trucks prior to leaving construction site (ii) Ensure that all the construction equipment, machinery are fitted with pollution control devises, which are operating correctly, and have a valid pollution under control (PUC)certificate (iii) no vehicles or plant to be left idling at site generators to be at placed maximum distance from properties <p>For sewer works</p> <p>Barricade the construction area using hard barricades (of 2 m height) on both sides</p> <ul style="list-style-type: none"> (ii) Initiate site clearance and excavation work only after barricading of the site isdone (iii) Confine all the material, excavated soil, debris, equipment, machinery (excavators, cranes etc.), to the barricaded area (iv) Ensure that adequate cover is provided to the trenches to prevent emission of debris during controlled blasting. (v) Limit the stocking of excavated material at the site; remove the excess soil from the site immediately to the designated disposal area (vi) 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 indifferent zones <p>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.</p> <ul style="list-style-type: none"> (viii) 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 | | |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|-----------------------|--|--|----------------------------|--------------------------|
| | | <p>under taken immediately.</p> <p>(ix) 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.</p> <p>(x) For sections involving controlled blasting, ensure that dust curtains of adequate height are provided to the trenches to prevent emission of dust during drilling for charge holes and controlled blasting.</p> <p>Ensure that the excavated soil and debris along the section identified for blasting is sprinkled with adequate water prior to blasting to reduce dust emissions upon explosion of charge placed for breaking the hard rock;</p> | | |
| Surface water quality | <p>Mobilization of settled Siltmaterials, chemical contamination from fuels and lubricants during construction can contaminate nearby surface water quality. Ponding of water in the pits / foundation excavations</p> | <p>(i) All earthworks be conducted during the dry season to prevent the problem of soil/silt run-off during rains</p> <p>(ii) Avoid stock piling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets; do not stock earth/material close to water bodies (at least 100m)</p> <p>(iii) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, only designated disposal areas shall be used;</p> <p>(iv) Install temporary silt traps, oil traps or sedimentation basins along the drainage leading to the water bodies;</p> <p>(v) 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 ground water wells)</p> <p>(vi) Store fuel, construction chemicals etc., on an impervious floor, also avoid spillage by careful handling; provide spill collection sets for effective spill management</p> <p>(vii) Dispose any wastes generated by construction activities in designated sites;</p> <p>(viii) Conduct surface quality inspection according to the Environmental Management Plan(EMP).</p> | Contractor | Contractor cost |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|---|---|---|----------------------------|--------------------------|
| Pipe bridge construction across streams and canals bridge construction across streams and canals | Degradation of water quality / silting of water body | (i) Conduct works in the water body (especially foundation work) only during no-flow season (ii) Select a construction method which is less disruptive (eg, precast type) (iii) Do no accidental spill construction chemicals, fuels, lubricants in the water body, by using spill traps / metal basins (iv) Clean up the site immediately after construction is complete; construction debris, materials, etc., shall be cleared and pre-project condition restored or improved | Contractor | Contractor cost |
| | Water accumulation in trenches/pits | (i) 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 (ii) 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 Consider safety aspects related to pit collapse due to accumulation of water | Contractor | Contractor cost |
| Noise and vibration level and vibration Levels and vibration Levels | Increase in noise level due to earth-moving and excavation equipment, and the transportation of | (i) 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 | Contractor | Contractor cost |
| | equipment, materials, and people | (ii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and use portable street barriers to minimize sound impact to surrounding sensitive receptor; and (iii) Maintain maximum sound levels not exceeding 70 decibels (dBA) when measured at a distance of 10 m or more from the vehicle/s. (iv) 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 | | |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|---|---|---|----------------------------|--------------------------|
| | | <p>structurally unsound that measures taken to avoid any further damage</p> <p>(V) Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach.</p> <p>(vi) Consult local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as night times, religious and cultural festivals.</p> <p>Works near the ASI monument</p> <p>(i) Obtain prior permission from ASI/NMA for the works to be conducted within the regulated zone of monument; submit detailed construction drawings clearly indicating the details of proposed excavations and works, use of equipment and machinery, etc., to ASI for their review; incorporate any suggestions/recommendations of ASI in project design and implementation</p> <p>(ii) Excavation and construction methodology to be used near the monuments (within the regulated area of 300 m of any monument) shall be in line with the ASI recommendations</p> <p>(iii) No equipment causing vibration (eg, pneumatic drills, excavators etc.,) and heavy noise should be used; works shall be conducted manually</p> <p>(iv) Dust control measures shall be put in place; all work areas to be barricaded and enclosed with dust screens</p> <p>Conduct air quality and noise monitoring weekly throughout construction phase in the 300 m regulated area</p> | | |
| Landscape and aesthetics – Waste Generation | Impacts due to excess excavated earth, excess construction Materials ,and solid waste such as removed | <p>(i) Prepare and implement a Construction Waste Management Plan (refer Appendix3)</p> <p>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.,</p> | Contractor | Contractor cost |
| Removal of | Increase in vibration due | During excavation for sewer works, wherever removal of rock is identified, alternatives like drilling and chiseling, controlled blasting etc. will be | Construction | Cost for |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|--|--|---|----------------------------|---|
| rock during excavation for sewer works | to the controlled blasting and associated activities | <p>examined and the suitable technology shall be finalized depending upon the site conditions. Following measures for ensuring safety shall be ensured during controlled blasting.</p> <ul style="list-style-type: none"> (i) Carryout controlled blasting in consultation with PIU so that blasting activities with the least potential to generate vibration are conducted during periods of the day which will result in least disturbance, especially near schools and other sensitive receptors. (ii) Permission obtained on 22.10.2020 from The District Collector for controlled blasting for excavation. Conditions stipulated in the permission issued by the District Collector shall be complied with during implementation. (iii) The contractor shall submit a blasting plan to PIU; and implement in accordance with the plan. (iv) Blasting shall be done through a licensed Explosive Contractor only (v) For controlled blasting, explosives including blasting caps, shall be transported to the blasting site only through exclusive vehicle in safe manner in accordance with the requirements of the blasting license. After blasting is over, the balance explosives shall be returned to the licensed storage. (vi) Cost for implementation of mitigation measures and liability are the responsibility of contractor. (vii) Proper prior notice will be issued to the Residents before Commencing UGSS activity works Schedule (viii) Proper information will be Given to Police Officials (ix) Workers (Flagman) shall be stationed on both end of roads to warn people before firing any blasts and not to permit the traffic. (x) When blasting, ample warning shall be given to all persons within the vicinity prior to blasting. Warning signs shall be erected a minimum of 24 hours prior to the blast time. The warning signs will state the time and date of each blast. (xi) Contractor shall ensure necessary precautions / protection (like excavated earth, sand-filled bags, etc.) to reduce Ground Vibrations, Reduce noise levels, etc. Sites shall be provided with necessary shields all around. (xii) Minimum Explosive will be used for Control Blasting for Residential areas | Contractor | implementation of mitigation measures responsibility of contractor. |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|-------|--------------------|--|----------------------------|--------------------------|
| | | <p>(xiii) After a blast has been fired, the Blast Control Specialist shall make a careful inspection to determine that all charges have exploded before employees can return to the operation.</p> <p>(xiv) The contractor shall be responsible for all damage to property or injury to persons resulting from blasting or accidental or premature explosions that may occur in connection with his use of explosives.</p> <p>(xv) The contractor shall do the activities after obtaining the blasting permission from District Collector, Trichy.</p> <p>(xvi) For the diversion of traffic in the blasting area, the contractor shall prepare a traffic management plan and obtain permission from Trichy Corporation and traffic police.</p> <p>(xvii) Ensure to conduct a pre-blasting survey through videography and photography of residential properties and other structures falling along the sewerage alignment to ascertain the prevailing conditions of the structures likely to be impacted by the controlled blasting and take adequate measures to minimize such impacts</p> <p>(ix) Inform the affected local population in advance about the work schedule, a week before, and a day before to start of work</p> <p>(x) Plan and execute the work in such a way that the period of disturbance/ loss of access is minimum.</p> <p>(xi) Keep the site free from all unnecessary obstructions.</p> <p>(xii) Notify affected public by public 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</p> <p>(xiii) At work site, public information/caution boards shall be provided including contact for public complaints</p> <p>Controlled blasting</p> <p>(i) The contractor shall submit a controlled blasting plan to PIU in advance; and implement in accordance with the plan.</p> <p>(ii) Proper prior notice will be issued to the Residents before Commencing UGSS activity works Schedule</p> <p>(iii) Proper information will be Given to Police Officials</p> <p>(iv) Workers (Flagman) shall be stationed on both end of roads to warn</p> | | |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|---------------------|--|--|----------------------------|--------------------------|
| | | <p>people before firing any blasting and not to permit the traffic.</p> <p>(v) Adequate warning shall be given to all persons within the vicinity prior to blasting. Warning signs shall be erected a minimum of 24 hours prior to the blast time. The warning signs will state the time and date of each blast.</p> <p>(vi) For the diversion of traffic in the blasting area, the contractor shall prepare a traffic management plan and obtain permission from Trichy city Corporation and traffic police.</p> <p>Hauling (material, waste/debris and equipment) activities</p> <p>(vii) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites</p> <p>(viii) Schedule transport and hauling activities during non-peak hours; (peak hours 7 to 10 AM and 4 to 7 PM)</p> <p>(ix) Locate entry and exit points in areas where there is low potential for traffic congestion;</p> <p>(x) Drive vehicles in a considerate manner</p> <p>Notify affected public by public information notices, providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.</p> | | |
| Controlled blasting | Ground vibrations Noise (airblast) Flying debris Dust | <p>Carryout controlled blasting in consultation with PIU so that blasting activities are conducted during periods of the day which will result in least disturbance; especially near schools and other sensitive receptors.</p> <p>The contractor shall submit a blasting plan in advance to PIU for approval; and implement in accordance to the plan once approved.</p> <p>The controlled blasting at identified locations shall be permitted only after the requisite statutory permissions from regulatory authorities are obtained. The contractor shall comply with all terms and conditions stipulated in such permissions. The controlled blasting would be monitored by following the necessary requirements to prevent safety risk to both public and nearby structures as provisioned in the prevailing Indian regulations and standards. The District Collector of Trichy as accorded permission for carrying out control blasting after observing all safety measures and NOC from ADB is awaited for carrying out the control blasting.</p> | Contractor and PIU | Contractor Costs |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|-------|--------------------|---|----------------------------|--------------------------|
| | | <p>Blasting shall be carried out through a licensed Explosive Contractor only.</p> <p>For controlled blasting, explosives including blasting caps, shall be transported to the blasting site only through exclusive vehicle in safe manner in accordance with the requirements of the blasting license. After blasting is over, the balance explosives shall be returned to the licensed storage.</p> <p>Cost for implementation of mitigation measures and liability are the responsibility of contractor.</p> <p>Proper prior notice will be issued to the residents before commencing blasting activity works. Inform the residents likely to be affected by the works in the locality about the upcoming blasting works well in advance so that necessary arrangements are planned by the residents with reduced inconvenience.</p> <p>For sections where the controlled blasting is proposed, the residents shall be provided with the schedule of blasting at least three days in advance and the residents are explained about the preventive, precautionary, mitigation and emergency response measures being taken to address their concerns.</p> <p>Prior information will be given to Police Officials</p> <p>Workers (Flagman) shall be stationed on both end of roads to warn people before firing any blasts and not to permit the traffic. The section proposed for blasting shall be supervised by properly trained staff to ensure no movement of pedestrians, motorized or nonmotorized vehicles, and residents takes place during blasting within the area of influence. For the diversion of traffic in the blasting area, the contractor shall prepare a traffic management plan and obtain permission from Trichy Corporation and traffic police.</p> <p>When blasting, ample warning shall be given to all persons within the vicinity</p> | | |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|-------|--------------------|---|----------------------------|--------------------------|
| | | <p>prior to blasting. Warning signs shall be erected a minimum of 24 hours prior to the blast time. The warning signs will state the time and date of each blast.</p> <p>Sites shall be provided with necessary shields all around.</p> <p>Minimum explosive will be used for Controlled Blasting specifically within residential areas.</p> <p>After a blast has been fired, the Blast Control Specialist shall make a careful inspection to determine that all charges have exploded before employees are allowed to return to the operation, and subsequently the movement of residents /pedestrians and vehicles is permitted.</p> <p>Ensure appropriate measures are taken to maintain maximum ambient noise levels within the limits as permitted by the prevailing Indian regulations and standards. The ambient noise levels would be monitored to ascertain the efficacy of acoustic measures thus implemented and compliance with associated regulatory permissions.</p> <p>Ensure that adequate precautions are taken to avoid flying debris post blasting (such as covering the trench with sturdy metallic sheets with sand filled bags to absorb the blast waves);</p> <p>For sections involving controlled blasting, ensure that dust curtains of adequate height are provided to the trenches to prevent emission of dust during drilling for charge holes and controlled blasting.</p> <p>Ensure that the excavated soil and debris along the section identified for blasting is sprinkled with adequate water prior to blasting to reduce dust emissions upon explosion of charge placed for breaking the hard rock.</p> <p>The project staff from the PIU, consultants and contractors would undertake a post-blasting survey of structures (including videography and/or photography) lying within the area of influence of blasting from the vibrations related impacts (preferably in the presence of the owners of the said structures) to assess and/or ascertain regarding the damages, if any, caused</p> | | |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|--|--|---|----------------------------|--------------------------|
| | | <p>to the structures because of blasting activities.</p> <p>The contractor shall be responsible for any and all damages to property or injury to persons resulting from blasting or accidental or premature explosions that may occur in connection with use of explosives. The log of such events would be properly maintained. The contractor shall provide immediate support and relief measures commensurate with the damages.</p> <p>Training related to controlled blasting activity will be included in the overall safeguards training programme meant for PIUs and Contractors.</p> | | |
| Socio-Economic Loss of access to houses and business | Loss of income | <ul style="list-style-type: none"> (i) Inform all businesses and residents about the nature and duration of any work well in advance so that they can make necessary preparations. (ii) Do not block any access; 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 (iii) 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 (iv) 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. (vi) 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; (vii) Consult businesses and institutions regarding operating hours and factoring this in work schedules; and Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints. | Contractor | Contractor cost |
| Socio-Economic | Generation of temporary employment and increase in local | <ul style="list-style-type: none"> (i) Employ local labor force as far as possible (iii) Comply with labor laws | Contractor | Contractor cost |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|--------------------------------|--|--|----------------------------|--------------------------|
| – Employment | Revenue | | | |
| Occupational Health and Safety | Occupational hazards which can arise during work | <ul style="list-style-type: none"> i. Follow all national, state and local labor laws (indicative list is in Appendix2); ii. Develop and implement site-specific occupational health and safety (OH and S) Plan, informed by OHS risk assessment seeking to avoid, minimize and mitigate risk, which shall include measures such as: (a) safe and documented construction procedures to be followed for all site activities; (b) ensuring all workers are provided with and use person all protective equipment; iii. For controlled blasting activity, identify the risks involved for the laborer's and public and include measures in the OHS plan. Provide necessary training and PPEs to the laborer's to ensure safety during implementation. iv. OH, and S Training⁷ for all site personnel, (d) excluding public from the work sites; and (e) documentation of work-related accidents; Follow International Standards such as the World Bank Group's Environment, Health and Safety Guidelines⁸. v. Ensure that qualified first aid is always provided. Equipped first-aid stations shall be easily accessible throughout the sites. vi. Secure all installations from unauthorized intrusion and accident risks vii. Provide H and S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, viii. personal protective protection, and preventing injuring to fellow workers; ix. 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; x. Consult businesses and institutions regarding operating hours and | Contractor | Contractor cost |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|--------------------------------|--|---|----------------------------|--------------------------|
| | | factoring this in work schedules; and xi. Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints. | | |
| Socio-Economic – Employment | Generation of temporary employment and increase in local Revenue | (i) Employ local labor force as far as possible (iii) Comply with labor laws | Contractor | Contractor cost |
| Occupational Health and Safety | Occupational hazards which can arise during work | (i) Follow all national, state and local labor laws (indicative list is in Appendix2); (ii) Develop and implement site-specific occupational health and safety (OH and S) Plan, informed by OHS risk assessment seeking to avoid, minimize and mitigate risk, which shall include measures such as: (a) safe and documented construction procedures to be followed for all site activities; (b) ensuring all workers are provided with and use person all protective equipment; (iii) For controlled blasting activity, identify the risks involved for the laborer's and public and include measures in the OHS plan. Provide necessary training and PPEs to the laborer's to ensure safety during implementation. (c) OH, and S Training 7 for all site personnel, (d) excluding public from the work sites; and (e) documentation of work-related accidents; Follow International Standards such as the World Bank Group's Environment, Health and Safety Guidelines8. (iv) Ensure that qualified first aid is always provided. Equipped first-aid stations shall be easily accessible throughout the sites. (v) Secure all installations from unauthorized intrusion and accident risks (vi) Provide H and S orientation training to all new workers to ensure that | Contractor | Contractor cost |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|-------|--------------------|---|----------------------------|--------------------------|
| | | they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers; | | |

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⁷ Some of the key areas that may be covered during training as they relate to the primary causes of accidents include (i) slips, trips and falls; (ii) personal protective equipment; (iii) ergonomics, repetitive motion, and manual handling; (iv) workplace transport; and (v) legislation and responsibilities. Training can provide the foundations of competence, but it does not necessarily result in a competent worker. Therefore, it is essential to assess staff competence to ensure that the training provided is relevant and effective. Supervision and monitoring arrangements shall be in place to ensure that training has been effective, and the worker is competent at their job. The level of supervision and monitoring required is a management decision that shall be based on the risks associated with the job, the level of competence required, the experience of the individual and whether the worker works as part of a team or is a lone worker.

⁸<http://www.ifc.org/wps/wcm/connect/a99ab8804365b27aa60fb6d3e9bda932/EHS-Guidelines+101-Webinar.pdf?MOD=AJPERES>

Table 22: Operation Stage Environmental Impacts and Mitigation Measures

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|--|---|--|---|--------------------------|
| STP operation – inadequate treatment | Non-compliance with government regulations; public health, safety and environmental impacts | <p>For operation of the STPs,</p> <ul style="list-style-type: none"> (i) Conduct regular wastewater quality monitoring (at inlet and at outlet of STP) to ensure that the treated effluent quality complies with the standards. (ii) Implement sludge management plan - : sludge management to collect, treat and dispose the accumulated sludge safely; sludge will be tested periodically for heavy metal concentration. (iii) Provide flow measurement devices at inlet and outlet, and maintain flow records (iv) Provision of appropriate training and personal protection equipment to the workers and staff (v) Conduct periodic testing of dried sludge /compost to check presence of heavy metals and confirming the concentration stouseas compost. It shall not be used for food crops. (vi) No wastewater from industrial premises (including domestic wastewater) shall be allowed to dispose into municipal sewers <p>Monitor regularly and ensure that there is no illegal discharge through manholes or inspection chambers; conduct public awareness programs; in coordination with TNPCB</p> | DBOT Contractor TCC / | Operating costs |
| Operation of sewage lifting and pumping Stations | Odor nuisance | <ul style="list-style-type: none"> (i) Strictly follow standard operating procedures / operational manual for operation and maintenance of lifting and pump stations (ii) Ensure that operating staff is properly trained, and have clear understanding of odor issues vis, a vis its relation with operational practices (iii) Ensure that pumping cycles are properly followed; and there is no buildup of sewage beyond design volume in the wells (iv) Conduct H₂S monitoring periodically | Programme Implementation Unit (PIU)/ Trichy Municipal Corporation | Operatingcosts |
| Operation and maintenance of | Blocks,overflows,system malfunction,occupational | Establish regular maintenance program, including: Regular cleaning of grit chambers and sewer lines tor remove grease, grit, and other debris that may lead | PIU and TCC | Operating costs |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|----------------|--------------------|---|----------------------------|--------------------------|
| SewerageSystem | health and safety | <p>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</p> <ul style="list-style-type: none"> cracked/deteriorating pipes; leaking joints or seals at manhole; frequent line blockages; lines that generally flow at or near capacity; and suspected infiltration or exfiltration; and • 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 overflow is currently occurring or for urgent problems that may cause an imminent overflow (e.g. pump station failures, sewer line ruptures, or sewer line blockages); (ii) 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. (iii) 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. (iv) 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 (v) Develop an Emergency Response System for the sewerage system leaks, burst and overflows. (vi) Provide necessary health and safety training to the staff in sewer cleaning and maintenance (vii) Provide all necessary personnel protection equipment <p>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 sulphide, methane, etc.); provide for adequate equipment (including oxygen masks) for emergency use</p> | | |

Table 23: Pre-Construction and Construction Stage Environmental Monitoring Plan

| Monitoring Field | Monitoring Location | Monitoring Parameters | Frequency | Responsibility | Cost and Source of Funds |
|---|--|--|--|----------------|--|
| Preconstruction/Design | | | | | |
| Baseline water quality of receiving water body (Uyyakondan Channel, VallavandhanKottaiPond) | 5 points (4 in channel - at discharge point, upstream & downstream, and 1 near Vallavandhavankottai pond/tank 1 in the pond/tank,) | pH, TDS, TSS, DO, BOD, COD, E-coli, Total coli form, Nitrate, Total Phosphates, Oil and grease, Total hardness, Sulphate, Fluoride, Chloride, Ammonia, Aluminum, Manganese, Iron, Zinc, Nickel, Magnesium, Phenolic compounds, Chromium, Arsenic, Mercury, Cadmium, Lead, Pesticides | Twice (Pre-monsoon and post monsoon during design phase) | Contractor | Cost for implementation of monitoring measures responsibility of DB contractor (10 samples x 8000 per sample = 80,000) |
| Sludge quality from existing STP ponds | 5 points (1 composite sample from each pond) | EC, pH, calcium, magnesium, % of total organic matter, Total organic carbon, N, P, K, Aluminum, fecal coliform, As, Cu, Cd, Cr, Pb, Fe, Mn, Hg, Zn, Ni. | Once | Contractor | Cost for implementation of monitoring measures responsibility of DB contractor (5 samples x 10000 per sample = 50,000) |

CONSTRUCTION PHASE

| Monitoring Field | Monitoring Location | Monitoring Parameters | Frequency | Responsibility | Cost and Source of Funds |
|---|---------------------|--|----------------------------|--|---|
| Construction disturbances, nuisances, public and worker safety, | All work sites | Implementation of construction stage EMP including safety measures, dust control, noise control, traffic management, and Safety during controlled blasting Site inspection checklist to review implementation is appended at Appendix 7 | Weekly during construction | Supervising staff and safeguards specialists of CMSC | Staff and consultant costs are part of incremental administration costs |

| | | | | | |
|-----------------------|---|---|--|-------------------------|--|
| Ambient air quality | 5 locations (locations 50 m downwind direction near sewer and pumping/lifting station work sites in the city); | <ul style="list-style-type: none"> PM10, PM2.5 NO2, SO2, CO | Once before start of construction Quarterly (yearly 4-times) during construction (3-year construction period) | Construction Contractor | Cost for implementation of monitoring measures responsibility of contractor (65 samples x 5000 per sample = 325,000) |
| | 1 location at Erubeeshwarartemple | <ul style="list-style-type: none"> PM10, PM2.5 NO2, SO2, CO | Once prior to start of the works within 300 m of monument fortnightly once during the works within 300 m of monument | Construction Contractor | Cost for implementation of monitoring measures responsibility of contractor (12 samples x5000 Per sample = 60,000) |
| Ambient noise | 5 locations (locations near sewer and pumping / lifting station work sites in the city); | <ul style="list-style-type: none"> Day time and night time noise levels | Once before start of construction Quarterly (yearly 4-times) during construction (3 year construction period) | Construction Contractor | Cost for implementation of monitoring measures responsibility of contractor (65 samples x 1500 per sample = 97,500) |
| | 1 location at Erubeeshwarartemple | <ul style="list-style-type: none"> Day time and night time noise levels | Once prior to start of the works within 300 m of monument fortnightly once during the works within 300 m of monument | Construction Contractor | Cost for implementation of monitoring measures responsibility of contractor (12 samples x 1500 per sample =18,000) |
| Surface water quality | 4 locations (2 points in river Koraiar u/s and d/s of discharge point, Uyyakondan channel u/s and d/s of project area | <ul style="list-style-type: none"> pH, Oil and grease, Cl, F, NO3, TC, FC, Hardness, Turbidity BOD, COD, DO, TotalAlkalinity | Once before start of construction Half yearly during construction (3 year construction period) | Construction Contractor | Cost for implementation of monitoring measures responsibility of contractor (28 samples x 4000 per sample = 112,000) |

Table 24: Operation Stage Environmental Monitoring Plan

| Monitoring Field | Monitoring Location | Monitoring Parameters | Frequency | Responsibility | Cost and Source of Funds |
|---|--|--|---|----------------|--|
| Monitoring of Treated wastewater quality from STP | Inlet and outlet of STPs | Parameters as specified by TNPCB in the consent/disposal standards notified for STPs. | Monthly Once | TCC | TCC Operating Cost |
| Water quality of receiving channel | 3 points in channel (1 at STP discharge location, 1 u/s and 1 d/s) 1 point in Vallavandhan Kottai Pond/tank | pH, Cl, F, NO ₃ , TC, FC, Hardness, Turbidity BOD, COD, DO, Total Alkalinity, heavy metals and pesticides | Monthly once during operation Yearly twice (pre- & post monsoon) | TCC | O&M costs (water quality will be tested at the internal laboratory part of STP) |
| Odor monitoring at pumping stations | 3 points (downwind direction) at all pumping stations: near suction well; outside the pumping station and at nearest House | Hydrogen sulphide (H ₂ S) | Periodical (throughout the operation phase) | TCC | Handheld H ₂ S meters to be procured as part of the project and operated by operating staff |
| Odor monitoring at lifting stations | 2 points (downwind direction) at all lifting stations: near suction well and at nearest house | Hydrogen sulphide (H ₂ S) | Periodical (throughout the operation phase) | TCC | Handheld H ₂ S meters to be procured as part of the project and operated by operating staff |
| Sludge quality and suitability as manure | STP | Analysis for concentration of heavy metals and confirm that value are within the following limits (see Table 4) | Start of operation and Yearly once | TCC | O&M costs (testing to be done at an accredited external laboratory) |

B. IMPLEMENTATION ARRANGEMENTS

162. The Municipal and Water Supply Department (MAWS) acting through TNUIFSL is the executing agency. A program steering committee, headed by Principal Secretary, MAWS, GOTN, provide overall guidance and strategic directions to the program. A program management unit (PMU) for TNUFIP, headed by the Managing Director, TNUIFSL acting as Program Director have been established within TNUIFSL for overall management, planning, implementing, monitoring, reporting, and coordinating TNUFIP. The CMA acts as the Deputy Program Director in the PMU. The project ULBs, represented by respective Municipal Commissioners, are the implementing agencies for works in cities/towns and have established program implementing units (PIUs) headed by a municipal engineer as full-time Project Manager. PIUs comprise of dedicated staff responsible for overseeing implementation of projects on a day-to-day basis. The PIUs is supported by a contract management and supervision consultant (CMSC) recruited by TNUIFSL. For the institutional capacity, public awareness, and urban governance component, CMA acting through hits Commissioner, will establish a PIU and appoint a governance improvement and awareness consultant (GIAC) responsible for supporting theseactivities.
163. The implementing agency for this subproject is TCC. A Project Implementation Unit (PIU) has been established in TCC headed by full-time a Project Manager (a senior official of TCC) and comprising dedicated full-time staff from engineering and other departments of TCC. PIU under the TCC is responsible for planning, implementation, monitoring and supervision and coordination of all activities of subproject. A Construction, Management and Supervision Consultant (CMSC) has been appointed to assist PIU in day-to-day implementation of the subproject.
164. **Safeguards Compliance Responsibilities.** Environmental and Social Safeguards (ESS) managers in the PMU, TNUIFSL have overall responsibility of safeguard compliance with ADB SPS2009. ESS Managers report to Vice President in the Projects Wing. At PIU level, a Safeguards Officer has been nominatedwho an Assistant Engineer rank officer and will coordinate safeguard tasks at PIU. As expert support is available to PIU via CMSC, and the role of Safeguard Officer is mainly to coordination, overseeing the implementation of safeguard tasks, grievance redress and reporting.
- PMU Safeguard Responsibilities.** Key tasks and responsibilities of the ESS Manager (Environment), for this subproject include the following

DPR finalization and Bidding stage:

- a. Ensure that all design related measures of the EMP are includeddesigns.
- b. Ensure that EMP is included in bidding documents and civil works contracts including requirement for EHS supervisor with thecontractor
- c. Ensure that the bid/contract documents include specific provisions requiring contractors to comply with all applicable labor laws and core laborstandards
- d. Ensure that staff required for implementation of EMP (EHS officer)is included in the bid requirements
- e. Ensure that EMP cost is included in the projectcost
- f. Prior to invitation of bids and prior to award of contract ensure that all clearance/permissions as required for implementation of subproject are in place to the extentpossible.

CONSTRUCTION STAGE:

- (i) Prior to start ofconstruction:
 - a. Ensure that all necessary clearances/permissions/licenses, including that of

contractor's are in place prior to start of construction.

- b. Provide oversight on environmental management aspects of subprojects and ensure EMPs are implemented by PIUs and contractors.
- (ii) Oversee and provide guidance to the PIU to properly carry out the environmental monitoring as per the EMP
- (iii) Oversee grievance redress mechanism to address any grievances brought about in a timely manner; ensure that records are properly maintained
- (iv) Consolidate quarterly environmental monitoring reports from PIU and submit semi-annual monitoring reports to ADB
- (v) Oversee site closures to ensure that all work/facility sites are restored properly prior to issuing work completion certificate to the contractor

Operation stage.

Ensure that all clearances as required for operation of project are in place prior to operation, such as consent to operate (CTO) for STPs from TNPCB

165. **PIU Safeguard Responsibilities.** Key tasks and responsibilities of the PIU assisted by CMSC for this subproject include the following:

DPR FINALIZATION AND BIDDING STAGE:

- a. Include design related measures of the EMP in the project design and DPR
- b. Include EMP in the bidding documents and civil works contracts, including requirement of staff (EHS supervisor) with contractor for EMP implementation
- c. Provide necessary budget in the project as IEE for EMO Implementation
- d. Ensure that the bid/contract documents include specific provisions requiring contractors to comply with all applicable labor laws and core labor standards including:
 - i. Labor welfare measures and provision of amenities.
 - ii. Prohibition of child labor as defined in national legislation for construction and maintenance activities.
 - iii. equal pay for equal work of equal value regardless of gender, ethnicity, or caste.
 - iv. elimination of forced labor.
 - v. The requirement to disseminate information on sexually transmitted diseases, including HIV/AIDS, to employees and local communities surrounding the project sites.
 - vi. In the pre-bid meeting, provide insight into EMP measures, and overall compliance requirements to the bidders.
- e. Obtain all clearance/permissions as required for implementation of subproject, prior to invitation of bids and/or prior to award of contract as appropriate.

CONSTRUCTION STAGE:

- (i) Identify regulatory clearance requirements and obtain all necessary clearances prior to start of construction; ensure construction work by contractor is conducted in compliance with all government rules and regulations including pollution control, labour welfare and safety etc.
- (ii) Obtain CTE from TNPCB and NMA permission for works within 300 m regulated boundary of ASI monument as applicable prior to construction.
- (iii) Prior to start of construction organize an induction course for the training of contractors, preparing the mon EMP implementation, environmental monitoring, and on taking immediate action to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation.
- (iv) Ensure contractor compliance with staff resources as per the IEE/EMP/Bid
- (v) Guide contractor on updating EMP / preparing Site Environmental Plan at the start of the project
- (vi) Update IEE and EMP; ensure that IEE reflects the final design being implemented by contractor

- (vii) Conduct public consultation and information disclosure as necessary
- (viii) Take necessary action for obtaining rights of way
- (ix) Supervise day-to-day EMP implementation on site by contractor, including the environmental monitoring plan.
- (x) Supervise ambient environmental monitoring by contractors
- (xi) Take corrective actions when necessary to ensure no environmental impacts
- (xii) Submit quarterly environmental monitoring reports to PMU
- (xiii) Conduct continuous public consultation and awareness
- (xiv) Address any grievances brought about through the grievance redress mechanism in a timely manner as per the EMP
- (xv) Monitor Contractor's compliance with the measures set forth in the EMP and any corrective or preventative actions set forth in a safeguard monitoring report that the PMU will prepare from time to time.
- (xvi) Implement corrective or preventative actions in case of non-compliance or new/unanticipated impacts.
- (xvii) Inform PMU promptly in case if any significant impacts surfaces, which were not identified in the IEE and develop necessary corrective actions as necessary and ensure implementation by the contractors; include all such impacts and suggested actions in the Quarterly Environmental Monitoring Reports
- (xviii) Implementation grievance redress system, and undertake appropriate actions to redress the complaints; ensure that complaints/grievances are addressed in a timely manner and resolutions are properly documented.
- (xix) Review and approve monthly progress reports submitted by Contractor on EMP compliance,
- (xx) Prepare quarterly environmental monitoring reports and submit to PMU/TNUIFSL
- (xxi) Provide any assistance in environmental safeguard related tasks as required by PMU to ensure compliance and reporting to ADB

OPERATION STAGE:

- (i) Ensure that all clearances as required for operation of project are in place prior to operation, such as consent to operate (CTO) for STPs from TNPCB
- (i i) Conduct environmental management and monitoring activities as per the EMP

166. Contractor's Responsibilities:

BIDDING STAGE:

- a. Understand the EMP requirements and allocate necessary resources (budget, staff, etc.,)
- b. Understand the regulatory compliance requirements related to labour welfare, safety, environment, etc.

CONSTRUCTION STAGE:

- (i) Mobilize EHS Supervisor prior to start of work.
- (ii) Prepare SEMP and submit to PIU.
- (iii) Ensure that all regulatory clearances (both projects related, and contractor related) are in place prior start of the construction work.
- (iv) Confirm with PIU availability of rights of way at all project sites prior to start of work.
- (v) Prepare and submit:
 - a. Construction waste management (CWM) plan (sample is in Appendix 3)
 - b. Traffic management (TM) plan (sample is Appendix 6)
 - c. OHS Plan, pollution control plan, dust emergency response plan
- (vi) Implement the mitigation measures as per the EMP including CWM and TM Plans
- (vii) Follow the EMP measures/guidelines for establishment of temporary construction camps, construction waste disposal sites, and material borrow areas, etc.

- (viii) Implement EMP and ensure compliance with all the mitigation and enhancement measures.
- (ix) Conduct environmental monitoring (air, noise, water etc..) as per the EMP
- (x) Undertake immediate action as suggested by PIU to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation.
- (xi) Submit monthly progress reports on EMP implementation to PIU.
- (xii) Act promptly on public complaints and grievances related to construction work and redress in a timely manner in coordination with PIU and CMSC.
- (xiii) Comply with applicable government rules and regulations.

C. TRAINING NEEDS

167. The following Table 25 presents the outline of capacity building program to ensure EMP implementation. These capacity building and trainings will be conducted at the offices of PMU and PIU by the environmental safeguard's specialist of PMU/PIU and their consultants, which are part of project implementation set-up, and therefore no separate or additional costs are envisaged. Adequate costs are already considered in project's capacity building program. The detailed program and specific modules will be customized for the available skill set after assessing the capabilities of the target participants and the requirements of the project by the PMU.

Table 25: Outline Capacity Building Program on Environmental Management Plan Implementation

| Description | Target Participants and Venue | Estimate (₹) | Cost and Source of Funds |
|---|--|--------------|---|
| <p>1. Introduction and Sensitization to Environmental Issues (1 day)</p> <ul style="list-style-type: none"> - ADB Safeguards Policy Statement. - Government of India and Tamil Nadu. applicable safeguard laws, regulations and policies including but not limited to core labor standards, OHS, etc. - Incorporation of EMP into the project design and contracts. - Monitoring, reporting and corrective action planning. | <p>All staff and consultants involved in the project</p> <p>At PMU (combined program for all PIU).</p> | <p>-</p> | <p>Included in the overall program cost</p> |
| <p>2. EMP implementation (1/2 day)</p> <ul style="list-style-type: none"> - EMP mitigation and monitoring measures - Roles and responsibilities. - Public relations, - Consultations. - Grievance redress. - Monitoring and corrective action planning. - Reporting and disclosure. - Construction site standard operating procedures (SOP) - Chance find (archeological) protocol - Work near the ASI monuments - AC pipe protocol - Traffic management plan - Waste management plan - Site clean-up and restoration - Controlled Blasting | <p>All PIU staff, contractor staff and consultants involved in the subproject.</p> <p>At PIU</p> | <p>-</p> | <p>Conducted by CMSC at the PIU office; part of project implementation cost</p> |

| | | | |
|--|---|----------|---|
| <p>3. Contractors Orientation to Workers (1/2 day)</p> <ul style="list-style-type: none"> - Environment, health and safety in project construction - Health & safety measures during coronavirus disease (COVID-19) pandemic | <p>Once before start of work, and thereafter regular briefing every month once.</p> <p>Daily briefing on safety prior to start of work.</p> <p>All workers (including unskilled laborers)</p> <p>Awareness and on-site training for workers and staff on sludge handling and disposal in existing STP repair work</p> | <p>-</p> | <p>Contractors' EHS officer to conduct program, with guidance of CMSC</p> |
|--|---|----------|---|

D.MONITORING ANDREPORTING

168. Immediately after mobilization and prior to commencement of the works, the contractor will submit a compliance report to PIU that all identified pre-construction mitigation measures as detailed in the EMP are undertaken. Contractor should confirm that the staff for EMP implementation (EHS supervisor) is mobilized. PIU will review and approve the report and permit commencement of works.
169. During construction, results from internal monitoring by the contractor will be reflected in their monthly EMP implementation reports to the PIU. CMSC will monitor, review and advise contractors for corrective actions if necessary. Environmental monitoring report summarizing compliance and corrective measures, if any, taken will be prepared by CMSC team at PIU and submitted to PMU (Report format is at Appendix 8). During operation, PIU will conduct management and monitoring actions as per the operation stage EMP, and submit to PMU an annual report.
170. Based on PIU Quarterly monitoring reports and oversight visits to subproject work sites, PMU will submit semi-annual Environmental Monitoring Report (EMR). Once concurrence from the ADB is received the report will be disclosed on TNUIFSL, PMU and TCC websites.
171. ADB will review project performance against the TNUFIP commitments as agreed in the legal documents (loan and project agreements etc.). The extent of ADB's monitoring and supervision activities will be commensurate with the project's risks and impacts. Monitoring and supervising of social and environmental safeguards will be integrated into the project performance management system

D.Environmental Management Plan Implementation Cost

172. Most of the mitigation measures require the contractors to adopt good site practices, which should be part of their normal procedures already, so there are unlikely to be major costs associated with compliance. The costs which are specific to EMP implementation and are not covered elsewhere in the projects are given below.

Table 26: Cost Estimates to Implement the EMP

| | Particulars | Stages | Unit | Total Number | Rate (₹) | Cost (₹) | Costs Covered By |
|-----------|--|-------------------------------|--------------------|---------------------|-----------------|------------------|--|
| A. | Implementation staff | | | | | | |
| B. | Mitigation Measures | | | | | | |
| 2 | Providing odor control system sewage pumping & lifting stations (gas capturing & treatment at required stations) and handheld H2S meters for monitoring | Design | Lump sum provision | - | - | 5,000,000 | Provisional sums of contract (PIU) |
| 3 | Measures related to make the STP compliant with TNPCB consent | Design/ construction | - | - | - | - | TCC own funds |
| 4 | Provision for tree cutting and compensatory plantation measures (1: 10 ratio re-plantation) | Construction | Per tree | 100 | 1,000 | 100,000 | Project costs (PIU) |
| 5 | Preparation of plans traffic management plan, waste (spoils) management plan etc.,), traffic management at work sites (Pavement Markings, Channelizing Devices, Arrow Panels and Warning Lights) | Construction | Lump sum | - | - | 300,000 | Civil works contract |
| 6 | Safety barricading | Construction | Lump sum | Lumpsum | - | 2,000,000 | Civil works contract |
| | Subtotal (B) | | | | | 7,400,000 | |
| C. | Monitoring Measures | | | | | | |
| 1 | Air quality monitoring | Construction | per sample | 77 | 5,000 | 385,000 | Civil works contract |
| 2 | Noise levels monitoring | Construction | Per sample | 77 | 1,500 | 115,500 | Civil work contract |
| 3 | Surface water monitoring | Construction | Per sample | 28 | 4,000 | 112,000 | Civil work Contract |
| 4 | Baseline water quality of receiving water bodies of STP discharge | Design | Per sample | 10 | 8000 | 80,000 | Civil work contract |
| 5 | Sludge quality from existing STP ponds | Design | Per sample | 5 | 10000 | 50,000 | Civil work contract |
| | Subtotal (C) | | | | | 742,500 | |
| D. | Capacity Building | | | | | | |
| 1. | Training on EMP implementation | Pre-construction | | | | - | Part of PIU and PMU , consultant tasks |
| 2. | Contractors Orientation to Workers on EMP implementation | Prior to dispatch to worksite | | | | - | Civil works contractor cost |
| | Subtotal (D) | | | | | | |
| | Particulars | Stages | Unit | Total Number | Rate (₹) | Cost (₹) | Costs Covered By |
| | Total (A+B+C+D) | | | | ₹ | 9,402,500 | |

Contractor cost- 4,302,500

PIU Cost - 5,100,000

Total Cost - 9,324,500

IX. CONCLUSION AND RECOMMENDATIONS

173. The process described in this document has assessed the environmental impacts of all elements of the proposed underground sewerage subproject covering municipal area of Tiruchirappalli. All potential impacts were identified in relation to pre-construction, construction, and operation phases. Planning principles and design considerations have been reviewed and incorporated into the site planning and design process wherever possible; thus, environmental impacts as being due to the project design or location were not significant. 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. This means that the number of impacts and their significance has already been reduced by amending the design. Various design related measures suggested for: STP treatment process design to meet disposal standards, ensuring efficient treatment, rehabilitation of existing STP to ensure proper treatment and sludge management, odor control at pumping stations, uninterrupted power supply provision; standard operating procedures for operation and maintenance; and imparting necessary training for ULB staff; providing necessary safety, no manual cleaning of sewers, and personal protection equipment for workers (protection against oxygen deficiency, harmful gaseous emissions) and sludge handling, and development of green buffer zone around the STP.
174. Sewage and pumping stations sites, which collect sewage from the sewer network and pump to higher level to convey to sewage to STP for safe treatment and disposal, are located within or near residential areas, which it will serve. These facilities may generate odor and may cause nuisance to nearby households. Site selection is done with utmost care to located as far as away from the houses, however, given design considerations and land constraints, some of the sites identified are close to the houses. New sewage pumping stations(5nos.) are located within or close to residential areas. Various site planning, green buffer and design related measures are included in the project to prevent and control odor generation. These include appropriately locating sewage wells within site maintaining maximum distance from the nearby houses; developing tree cover; closed facilities; design and operation measures to prevent odor; and providing gas collection and treatment facilities. Erumbeeswarar temple a protected monument, is located within the subproject areas surrounded by residential areas. The sewer network in this area also falls under the 300 m regulated buffer zone of monument. No impacts to the monuments as the work area is not located within the monument, and that works within 300 m area of the monument conducted with the prior permission of competent authority and under the supervision of ASI staff. Various measures are also suggested.
175. New lifting and pumping station sites (24 in all) are situated on government owned vacant land parcels, and sewers will be laid on the public roads. Therefore, subproject do not involve any private land acquisition.
176. Except sewer works, all other construction activities are confined to the selected sites, and the interference with the general public and community around is minimal. Major repair and rehabilitation work proposed at the existing STP, which is likely to generate large quantities of construction waste including sludge and used clay from sewage ponds. Proper measures to quality check, disposal and safe handling by workers suggested. There will be temporary negative impacts, arising mainly from construction dust and noise, hauling of construction material, waste and

equipment on local roads (traffic, dust, safety etc.), mining of construction material, occupation health and safety aspects. Sewer line works are conducted along public roads in an urban area congested with people, activities and traffic, subproject is likely to significant impacts during construction. Impacts mainly arise from the construction dust and noise; from the disturbance of residents, businesses, traffic by the construction work, safety risk to workers, public and nearby buildings due to deep trench excavations, especially in narrow roads, dust, access impediment to houses and business, disposal of large quantities of construction waste, etc. Some section of the proposed alignment may have to opt for controlled blasting as the construction methodology for excavation owing to presence of hard rock. These are all general impacts of construction in urban areas and there are well developed methods of mitigation that are suggested in the EMP.

177. Once the new system is operating, the facilities will operate with routine maintenance, which should not affect the environment. Improved system operation will comply with the O&M manual and standard operating procedures to be developed for all the activities.
178. Mitigation will be assured by a program of environmental monitoring conducted during construction and operation to ensure that all measures are implemented, and to determine whether the environment is protected as intended. This will include observations on- and off-site, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported to the PMU. There will also be longer-term surveys to monitor treatment efficiency of STP (raw and treated sewage quality), and sludge Mitigation and monitoring measures, along with the project agency responsible for such actions, form part of the Environmental Management Plan.
179. Stakeholders were involved in developing the IEE through face-to-face discussions, onsite meetings, and acidity level consultation workshop, which was conducted for larger public participation in the project. Views expressed by the stake holders were incorporated into the IEE and the planning and development of the project. The IEE will be made available at public locations and will be disclosed to a wider audience via the PMU, TCC and ADB websites. The consultation process will be continued during project implementation to ensure that stakeholders are engaged in the project and have the opportunity to participate in its development and implementation.
180. The project's grievance redress mechanism will provide the citizens with a platform for redress their grievances, and describes the informal and formal channels, time frame, and mechanisms for resolving complaints about environmental performance.
181. The EMP will assist the project agencies and contractor in mitigating the environmental impacts and guide the environmentally sound execution of the proposed project. A copy of the updated EM/SEP shall be kept on-site during the construction period at all times. The EMP shall be made binding on all contractors operating on the site and will be included in the contractual clauses. Non-compliance with, or any deviation from, the conditions set out in this document shall constitute a failure in compliance.
182. The citizens of the Tiruchirappalli City will be the major beneficiaries of this subproject. The new sewerage system will remove the human waste from those areas served by the network rapidly and treated to an acceptable standard, and treated wastewater is utilized beneficial

purposes. In addition to improved environmental conditions, the subproject will improve the overall public health in the project area. Diseases of poor sanitation, such as diarrhea and dysentery, should be reduced so people should spend less on health care and lose fewer working days due to illness, so their economic status should also improve, as well as their overall health.

183. Therefore, as per ADB, SPS, the project is classified, as environmental category B and does not require further environmental impact assessment. However, to conform to government guidelines STP requires consent to establish (CTE) and consent to operate (CTO) from TNPCB. The CTE has been obtained from TNPCB ON 13.02.2020 and PWD has given clearance to Trichy city corporation for disposal of treated effluent in to Uyyakondan channel. Existing STP will also require CTO and will be obtained on completion of the work. For the project components located within the regulated zone of protected monument; permission from ASI has been obtained and construction will be carried out as per the condition stipulated by ASI. Contract for new STP has been awarded under DBOT modality, the detailed design; treatment and disposal have been finalized. This IEE have been updated during the detailed design of the STP and the measures for controlled blasting during implementation phase and during implementation phase review

Appendix 1: RAPID ENVIRONMENTAL ASSESSMENT CHECKLIST

| |
|-----------------|
| Sewerage |
|-----------------|

| | | |
|--|--------|--|
| <p>Instructions:</p> <ul style="list-style-type: none"> □ This checklist is to be prepared to support the environmental classification of a project. It is to be attached to the environmental categorization form that is to be prepared and submitted to the Chief Compliance Officer of the Regional and Sustainable development department. □ This checklist is to be completed with the assistance of an Environment Specialist in a Regional Department. □ This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on 1) involuntary resettlement, 2) indigenous peoples planning, 3) poverty reduction 4) participation 5) gender and development. □ Answer the questions assuming the “without mitigation” case. The purpose is to identify potential impacts. Use the “remarks” section to discuss any anticipated mitigation measures. | | |
| Screening Questions | Yes/No | Remarks |
| A. Project Siting | | |
| Is the project area... | | |
| • Densely populated? | Yes | Subproject activities are located in Tiruchirappalli City, a fast-developing urban area in the state of Tamil Nadu. Subproject area includes old town area of Tiruchirappalli, which is very densely populated. Outer areas are comparatively less dense. Old villages areas in the outer city have dense residential pockets, with narrow roads. Newly developing residential areas have low density and well planned layouts. Agriculture is still practiced in the outer areas. |
| • Heavy with development activities? | Yes | It is a developing area, urban expansion is considerable |
| • Adjacent to or within any environmentally sensitive areas? | No | - |
| • Cultural heritage site | Yes | The ASI protected monument Erumbeswarar temple is in close proximity to the nearby proposed network in Zone-3. However, no components are located within the protected monument. Permission from ASI has been Obtained |
| • Protected | No | - |
| • Wetland | No | - |
| • Mangrove | No | - |
| • Estuarine | No | - |
| • Buffer zone of protected area | No | - |

| | | |
|--|-----|--|
| • Special area for protecting biodiversity | No | - |
| • Bay | No | - |
| B. Potential Environmental Impacts Will the Project cause... | | |
| Sewerage | | |
| impairment of historical/cultural monuments/areas and loss/damage to these sites? | Yes | The ASI protected monuments Erumbeswarar temple is in close proximity to the nearby proposed network in Zone-3 but the networks will be laid on existing roads and will not damage to this site. Permission from ASI has been obtained |
| interference with other utilities and blocking of access to buildings; nuisance to neighboring areas due to noise, smell, and influx of insects, rodents, etc.? | Yes | Few sewage lifting and pump stations are located close to the houses, and odor may create nuisance. Necessary measures are included to prevent and control odor; no net negative impacts Envisaged |
| dislocation or involuntary resettlement of people? | No | Do not involve land acquisition or resettlement |
| disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups? | No | No such possibilities; sewerage system will cover entire population including urban poor; In fact, it will have positive health impact due to improved sanitation condition. |
| impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage? | Yes | For proposed STP adequate capacity sewage treatment facility is being development under this subproject; It is proposed to rehabilitate the existing STP, which not adequately treating the sewage. Corrective Action plan suggested to improve the compliance. |
| overflows and flooding of neighboring properties with raw sewage? | Yes | Sewerage system has been designed considering the population growth. It has been designed to accommodate sewage until design year. Design considers standard peak factors and therefore no such impact envisaged. |
| environmental pollution due to inadequate sludge disposal or industrial waste discharges illegally disposed in sewers? | Yes | - |
| noise and vibration due to blasting and other civil works? | No | Temporary nuisance/disturbance due to construction activities including controlled blasting will be minimized with appropriate mitigation measures as per applicable Indian regulations and standards. Permission has been obtained from the District Collector, Trichy and the conditions laid will be complied with. |
| risks and vulnerabilities related to occupational health and safety due to physical, chemical, and biological hazards during project construction and operation? | Yes | In appropriate handling of sludge may have occupational health hazard. All necessary safety precautions will be taken to avoid any risk. |
| discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers? | Yes | There are no sources of hazardous material that will find its way into the sewers. Wastewater other than domestic will not be discharged into the sewers. |

| | | |
|--|-----|--|
| inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances, and protect facilities? | Yes | Due to technical constraints and land availability, some lifting and pumping stations are located close to houses, however, necessary measures are included in site planning, design and operation. No net negative impacts envisaged |
| road blocking and temporary flooding due to land excavation during the rainy season? | Yes | Complete road block are not envisaged; in narrow roads, traffic may be diverted but access will be ensured for pedestrians. All necessary precautions will be taken to prevent flooding during construction; flooding is unlikely as work will be mostly be conducted during dry season. |
| noise and dust from construction activities? | yes | All the construction activities including controlled blasting in identified sections will be carried out with necessary precautionary measures to mitigate noise and Dust |
| traffic disturbances due to construction material transport and wastes? | Yes | Proper planning, such as selection of routes and scheduling to avoid peak traffic hours, will be carried out in consultation with concerned authorities |
| temporary silt runoff due to construction? | No | Earthworks will not be conducted during rains; plain topography and moderate to low rains, so no such impact envisaged |
| hazards to public health due to overflow flooding, and groundwater pollution due to failure of sewerage system? | Yes | A chance of failure of sewerage system is very remote; proper design and standard operating procedures will be followed in O&M; necessary equipment and training to workers will be provided |
| deterioration of water quality due to inadequate sludge disposal or direct discharge of untreated sewage water? | Yes | sludge management plan will be implemented |
| contamination of surface and ground waters due to sludge disposal on land? | No | Sludge will be dried in the ponds, no disposal of wet sludge on the land |
| Health and safety hazards to workers from toxic gases and hazardous materials which may be contained in confined areas, sewage flow and exposure to pathogens in untreated sewage and unsterilized sludge? | Yes | Manual cleaning of sewers and facilities will be avoided. All necessary health and safety training and necessary personal protection equipment will be given to workers and staff during operation of sewerage system |
| Large population increase during project construction and operation that causes increased burden on social infrastructure (such as sanitation system)? | No | No such impact anticipated; local communities in the vicinity of the project would be employed as much as possible. |
| Social conflicts between construction workers from other areas and community workers? | No | No such impact anticipated; local communities in the vicinity of the project would be employed as much as possible. |
| risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation? | No | Not applicable. Construction/operation will not involve use of explosives and chemicals. |
| community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible | Yes | Operational area will be clearly demarcated and access will be controlled. Only worker and project concerned members will be allowed to visit the construction sites. |

| | | |
|---|-----|----|
| to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning? | | . |
| Climate Change and Disaster Risk Questions The following questions are not for environmental categorization. They are included in this checklist to help identify potential climate and disaster risks. | Yes | No |
| Is the Project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes? | √ | |
| Could changes in temperature, precipitation, or extreme events patterns over the Project lifespan affect technical or financial sustainability (e.g., changes in rainfall patterns disrupt reliability of water supply; sea level rise creates salinity intrusion into proposed water supply source)? | | √ |
| Are there any demographic or socio-economic aspects of the Project area that are already vulnerable (e.g., high incidence of marginalized populations, rural-urban migrants, illegal settlements, ethnic minorities, women or children)? | | √ |
| Could the Project potentially increase the climate or disaster vulnerability of the surrounding area (e.g., by using water from a vulnerable source that is relied upon by many user groups, or encouraging settlement in earthquake zones)? | | √ |

Appendix 2

SALIENT FEATURES OF MAJOR LABOR LAWS APPLICABLE TO ESTABLISHMENTS ENGAGED IN CONSTRUCTION OF CIVIL WORKS

- (i) Workmen Compensation Act, 1923- The Act provides for compensation in case of injury by accident arising out of and during the course of employment.
- (ii) Payment of Gratuity Act, 1972 - Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years' service or more or on death at the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.
- (iii) Employees' PF and Miscellaneous Provisions Act, 1952 - The Act provides for monthly contributions by the employer plus workers @10 % or 8.33 %. The benefits payable under the Act are: (a) Pension or family pension on retirement or death as the case may be; (b) deposit linked insurance on the death in harness of the worker; (c) payment of PF accumulation on retirement/death, etc.
- (iv) Maternity Benefit (Amendment) Act 2017- The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage, etc.
- (v) Contract Labour (Regulation and Abolition) Act, 1970 - The Act provides for certain welfare measures to be provided by the Contractor to contract labor and in case the Contractor fails to provide, the same are required to be provided by the Principal Employer by Law. The principal employer is required to take Certificate of Registration and the Contractor is required to take a License from the designated Officer. The Act is applicable to the establishments or Contractor of principal employer if they employ 20 or more contract labor.
- (vi) Minimum Wages Act, 1948 - The employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment. Construction of Buildings, Roads, Runways are scheduled employment.
- (vii) Payment of Wages Act, 1936 - It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.
- (viii) Equal Remuneration Act, 1979 - The Act provides for payment of equal wages for work of equal nature to Male and Female workers and not for making discrimination against Female employees in the matters of transfers, training and promotions, etc.
- (ix) Payment of Bonus Act, 1965 - The Act is applicable to all establishments employing 20 or more workmen. The Act provides for payments of annual bonus subject to a minimum of 8.33 % of wages and maximum of 20 % of wages to employees drawing Rs. 3,500/- per month or less. The bonus to be paid to employees getting Rs. 2,500/- per month or above up to Rs.3,500/- per month shall be worked out by taking wages as Rs.2,500/- per month only. The Act does not apply to certain establishments. The newly set up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of the Act.
- (x) Industrial Disputes Act, 1947 - The Act lays down the machinery and procedure for resolution of industrial disputes, in what situations a strike or lock-

out becomes illegal and what are the requirements for laying off or retrenching the employees or closing the establishment.

- (xi) Industrial Employment (Standing Orders) Act, 1946 - It is applicable to all establishments employing 100 or more workmen (employment size reduced by some of the States and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the employer on matters provided in the Act and get the same certified by the designated Authority.
- (xii) Trade Unions Act, 1926 - The Act lays down the procedure for registration of trade unions of workmen and employees. The trade unions registered under the Act have been given certain immunities from civil and criminal liabilities.
- (xiii) Child Labor (Prohibition and Regulation) Act, 1986 - The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of child labor is prohibited in Building and Construction Industry.
- (xiv) Inter-State Migrant Workmen's (Regulation of Employment and Conditions of Service) Act, 1979 - The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The inter-state migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home up to the establishment and back, etc.
- (xv) The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and the Cess Act of 1996 - All the establishments who carry on any building or other construction work and employ 10 or more workers are covered under this Act. All such establishments are required to pay Cess at rate not exceeding 2% of the cost of construction as may be notified by the Government. The employer of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation for workers near the workplace, etc. The employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government.

Appendix 3
SAMPLE OUTLINE SPOILS
(CONSTRUCTION WASTE) MANAGEMENT PLAN

- The Spoil Management Plan should be site specific and be part of the monthly Construction Management Plan.
- The contractor, in consultation with the PIU, has to find out appropriate location/s for the disposal of the excess soil generated. The spoils should be deposited only at these sites.
- Further precautions need to be taken in case of the contaminated spoils
- The vehicle carrying the spoil should be covered properly.
- The spoils generating from each site should be removed on the same day or immediately after the work is complete. The site / road should be restored to the original condition.

I. SPOILS INFORMATION

The spoil information contains the details like a) The type / material, b) Potential contamination by that type, c) Expected volume (site / component specific), d) Spoil Classification etc.

II. SPOILS MANAGEMENT

The Spoil Management section gives the details of a) Transportation of spoil b) disposal site details c) Precautions taken d) Volume of contaminated spoil, if present, d) Suggested reuse of disposal of the spoil

III. DOCUMENTATION

The volume of spoil generated (site specific, date wise), site disposed, reuse / disposal details should be documented properly.

Appendix 4
PUBLIC INFORMATION NOTICE TEMPLATE

Public Announcement

Providing Underground Sewerage System TiruchirappalliCity
Tiruchirappalli City Corporation

Under this project, works are being conducted by xxxx Contractor to provide sewerage network in Tiruchirappalli

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 –

Appendix 5
SAMPLE GRIEVANCEREGISTRATION FORM

(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 clarificationandfeedback.

Shouldyouchoosetoincludeyourpersonal detailsbutwantthat information to remain confidential, please inform us by writing/typing *(CONFIDENTIAL)* above your name.

Thankyou.

| | | | | | |
|---|-----------------------|--------------|--------------------|-----|--|
| Date | Place of registration | Project Town | | | |
| | | Project: | | | |
| Contact information/personal details | | | | | |
| Name | | Gender | * Male * Female | Age | |
| Home address | | | | | |
| Place | | | | | |
| Phone no. | | | | | |
| E-mail | | | | | |
| 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: | | | | | |
| How do you want us to reach you for feedback or update on your comment/grievance? | | | | | |

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: | |

Appendix 6

SAMPLE OUTLINE TRAFFIC MANAGEMENT PLAN

A. Principles for TMP around the Water Pipes Construction Sites

1. One of the prime objectives of this TMP is to ensure the safety of all the road users along the work zone, and to address the following issues:
 - (i) The safety of pedestrians, bicyclists, and motorists travelling through the construction zone;
 - (ii) protection of work crews from hazards associated with moving traffic;
 - (iii) mitigation of the adverse impact on road capacity and delays to the road users;
 - (iv) maintenance of access to adjoining properties; and
 - (v) addressing issues that may delay the project.

B. Operating Policies for Traffic Management Plan

2. The following principles will help promote safe and efficient movement for all road users (motorists, bicyclists, and pedestrians, including persons with disabilities) through and around work zones while reasonably protecting workers and equipment.
 - (i) Make traffic safety and temporary traffic control an integral and high-priority element of project from planning through design, construction, and maintenance.
 - (ii) Inhibit traffic movement as little as possible.
 - (iii) Provide clear and positive guidance to drivers, bicyclists, and pedestrians as they approach and travel through the temporary traffic control zone.
 - (iv) Inspect traffic control elements routinely, both day and night, and make modifications when necessary.
 - (v) Pay increased attention to roadside safety in the vicinity of temporary traffic control zones.
 - (vi) Train all persons that select, place, and maintain temporary traffic control devices.
 - (vii) Keep the public well informed.
 - (viii) Make appropriate accommodation for abutting property owners, residents, businesses, emergency services, railroads, commercial vehicles, and transit operations.
3. **Figure A2 to Figure A12** illustrates the operating policy for TMP for the construction of water pipes and the sewers along various types of roads.

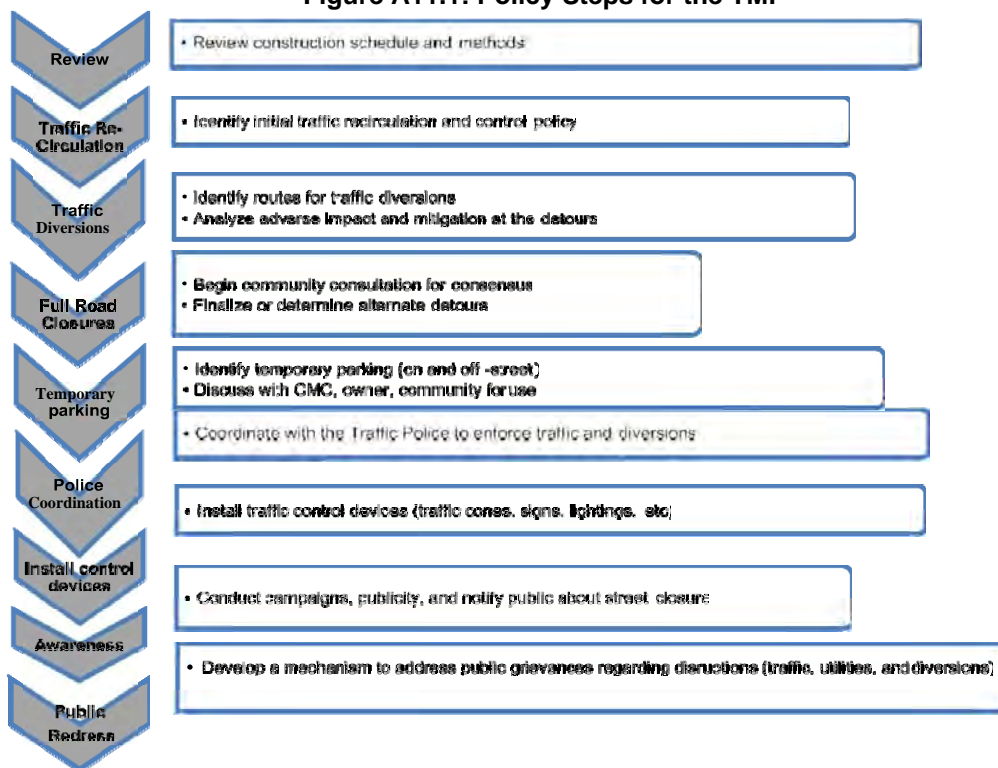
C. Analyze the impact due to street closure

Apart from the capacity analysis, a final decision to close a particular street and divert the traffic should involve the following steps:

- (i) approval from the ULB/Public Works Department (PWD) to use the local streets as detours;
- (i i) consultation with businesses, community members, traffic police, PWD, etc, regarding the mitigation measures necessary at the detours where the road is diverted during the construction;
- (i i i) determining of the maximum number of days allowed for road closure, and incorporation of such provisions into the contract documents;
- (i v) determining if additional traffic control or temporary improvements are needed along the detour route;
- (v) considering how access will be provided to the worksite

- (vi) contacting emergency service, school officials, and transit authorities to determine if there are impacts to their operations; and
- (vi i) developing a notification program to the public so that the closure is not a surprise. As part of this program, the public should be advised of alternate routes that commuters can take or will have to take as result of the traffic diversion.
- (vi i i) If full road-closure of certain streets within the area is not feasible
- (ix) To inadequate capacity of the detour street or public opposition, the full closure can be restricted to weekends with the construction commencing on Saturday night and ending on Monday morning prior to the morning peak period.

Figure A11.1: Policy Steps for the TMP



D. Public awareness and notifications

4. As per discussions in the previous sections, there will be travel delays during the constructions, as is the case with most construction projects, albeit on a reduced scale if utilities and traffic management are properly coordinated. There are additional grounds for travel delays in the area, as most of the streets lack sufficient capacity to accommodate additional traffic from diverted traffic as a result of street closures to accommodate the works.
6. The awareness campaign and the prior notification for the public will be a continuous activity which the project will carry out to compensate for the above delays and minimize public claims as result of these problems. These activities will take place sufficiently in advance of the time when the road blocks or traffic diversion take place at the particular streets. The reason for this is to allow sufficient time for the public and residents to understand the changes to their travel plans. The project will notify the public about the roadblocks and traffic diversion through public notices, ward level meetings and city level meeting with the

elected representatives.

7. The PIU will also conduct an awareness campaign to educate the public about the following issues:
 - (i) Traffic control devices in place at the work zones (signs, traffic cones, barriers, etc.);
 - (ii) defensive driving behavior along the work zones; and
 - (iii) reduced speeds enforced at the work zones and traffic diversions.
8. It may be necessary to conduct the awareness programs/campaigns on road safety during construction.
9. The campaign will cater to all types of target groups i.e. children, adults, and drivers. Therefore, these campaigns will be conducted in schools and community centers. In addition, the project will publish a brochure for public information. These brochures will be widely circulated around the area and will also be available at the PIU, and the contractor's site office. The text of the brochures should be concise to be effective, with a lot of graphics. It will serve the following purpose:
 - (i) Explain why the brochure was prepared, along with a brief description of the project;
 - (ii) advise the public to expect the unexpected;
 - (iii) educate the public about the various traffic control devices and safety measures adopted at the work zones;
 - (iv) educate the public about the safe road user behavior to emulate at the work zones;
 - (v) tell the public how to stay informed or where to inquire about road safety issues at the work zones (name, telephone, mobile number of the contact person; and indicate the office hours of relevant offices).

E. Install traffic control devices at the work zones and traffic diversion routes

10. The purpose of installing traffic control devices at the work zones is to delineate these areas to warn, inform and direct the road users about a hazard ahead and to protect them as well as the workers. As proper delineation is a key to achieve the above objective, it is important to install good traffic signs at the work zones. The following traffic control devices are used in work zones:
 - (i) Signs
 - (ii) Pavement Markings
 - (iii) Channelizing Devices
 - (iv) Arrow Panels
 - (v) Warning Lights
11. Procedures for installing traffic control devices at any work zone vary, depending on road configuration, location of the work, construction activity, duration, traffic speed and volume, and pedestrian traffic. Work will take place along major roads, and the minor internal roads. As such, the traffic volume and road geometry vary. The main roads carry considerable traffic; internal roads in the new city areas are wide but in old city roads very narrow and carry considerable traffic.

However, regardless of where the construction takes place, all the work zones should be cordoned off, and traffic shifted away at least with traffic cones, barricades, and temporary signs (temporary "STOP" and "GO").

12. **Figure A11.2 to Figure A11.6** illustrates a typical set-up for installing traffic control devices at the work zone of the area, depending on the location of work on the road way, and road geometrics:
 - (i) Work on shoulder or parking lane
 - (i i) Shoulder or parking lane closed on divided road
 - (i i i) Work in Travellane
 - (iv) Lane closure on road with low volume
 - (v) Street closure with a tour
13. The work zones should take into consideration the space required for a buffer zone between the workers and the traffic (lateral and longitudinal) and the transition space required for delineation, as applicable. For the works, a 30 cm clearance between the traffic and the temporary STOP and GO signs should be provided. In addition, at least 60 cm is necessary to install the temporary traffic signs and cones.
14. Traffic police should regulate traffic away from the work zone and enforce the traffic diversion result from full street closure in certain areas during construction. Flaggers/ personnel should be equipped with reflective jackets at all times and have traffic control batons (preferably the LED type) for regulating the traffic during nighttime.
15. In addition to the delineation devices, all the construction workers should wear fluorescent safety vests and helmets in order to be visible to the motorists at all times. There should be provision for lighting beacons and illumination for night constructions.

Figure A11.2 and A11.3: Work on shoulder or parking lane and Shoulder or parking lane closed on divided road

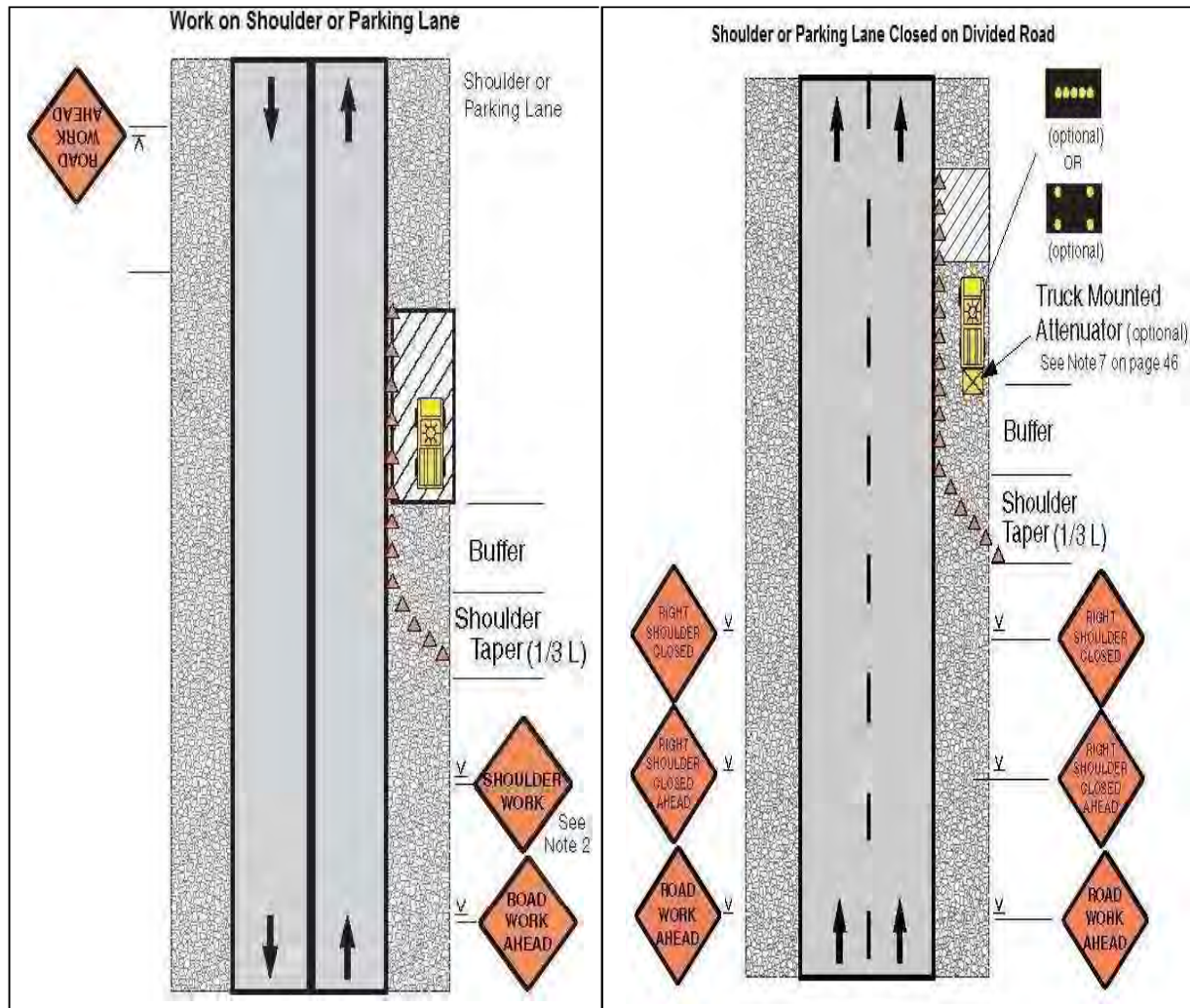
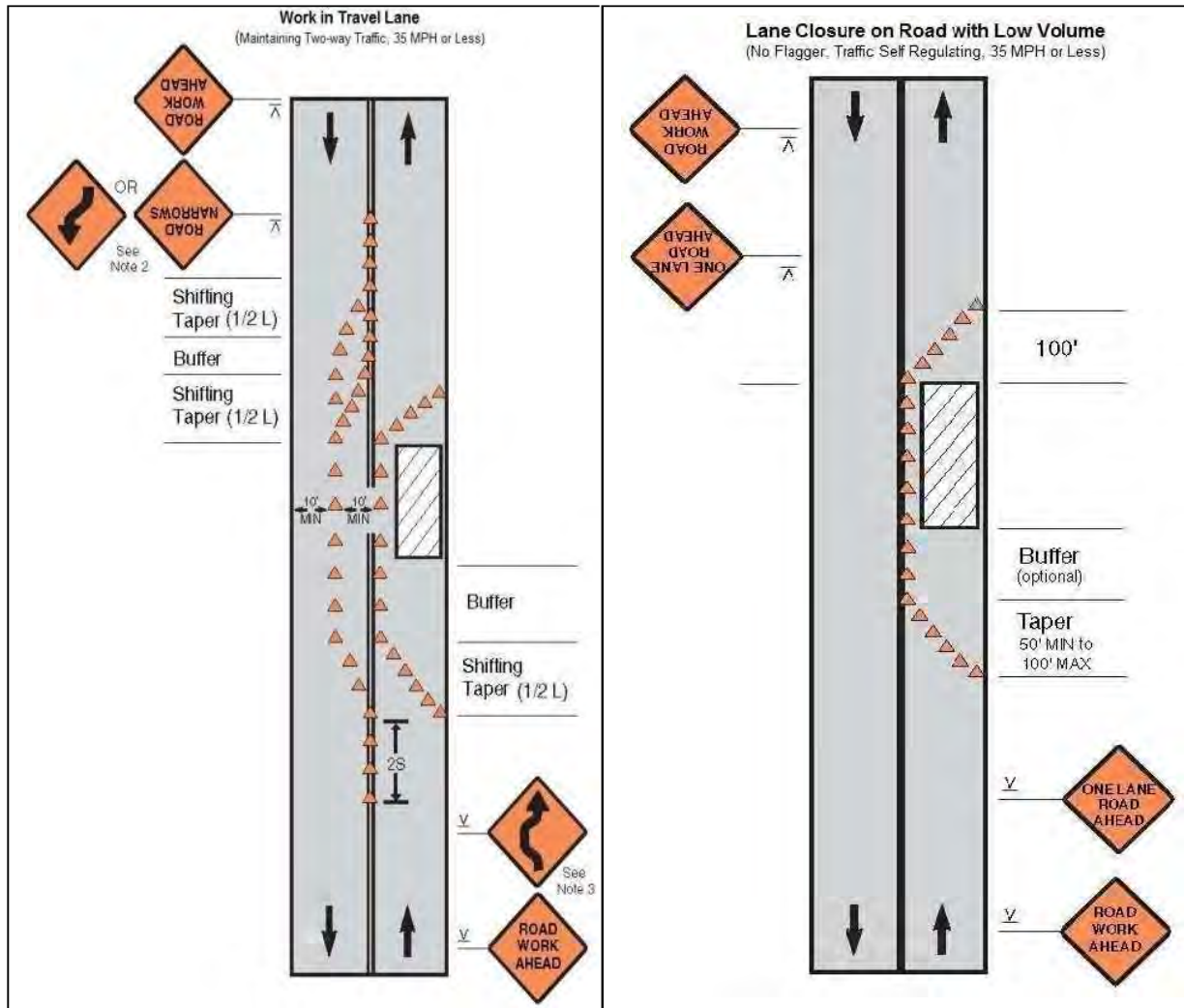


Figure A11.4 and A11.5: Work in Travel lane and Lane closure on



road with low volume

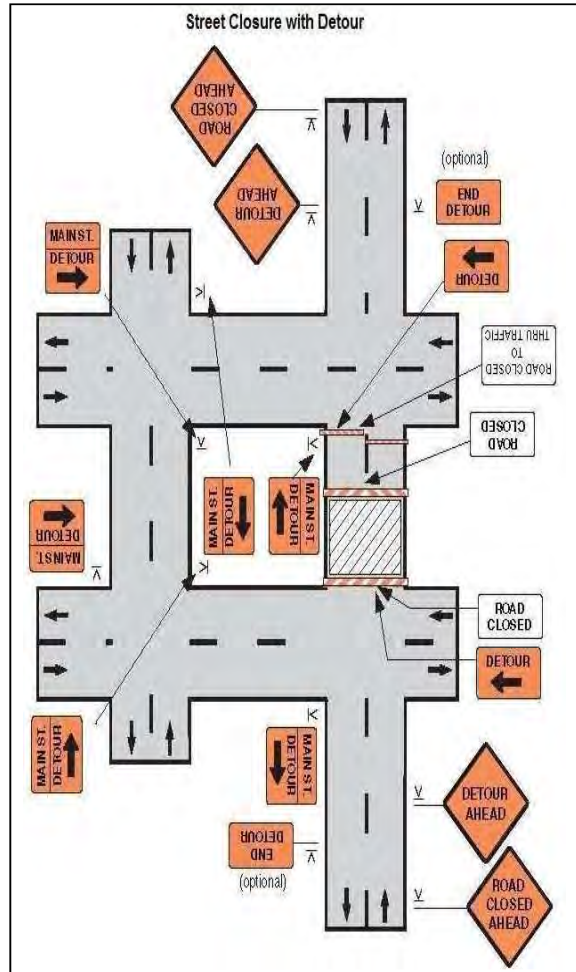


Figure A11.6: Street Closure with Detour

Appendix 7: SAMPLE ENVIRONMENTAL SITE INSPECTION REPORT

NAME: _____ DATE: _____ TITLE: _____ DMA: _____
 _____ LOCATION: _____ GROUP: _____

WEATHER:

| | | |
|------------------------------|-------------------|--|
| Project Activity Stage | Survey | |
| | Design | |
| | Implementation | |
| | Pre-Commissioning | |
| | Guarantee Period | |

| Monitoring Items | Compliance |
|--|------------|
| Compliance marked as Yes / No / Not applicable (NA) / Partially Implemented (PI) | |
| EHS supervisor appointed by contractor and available on site | |
| Construction site management plan (spoils, safety, schedule, equipment etc..) prepared | |
| Traffic management plan prepared | |
| Dust is under control | |
| Excavated soil properly placed within minimum space | |
| Construction area is confined; no traffic/pedestrian entry observed | |
| Surplus soil/debris/waste is disposed without delay | |
| Construction material (sand/gravel/aggregate) brought to site as and when required only | |
| Tarpaulins used to cover sand and other loose material when transported by vehicles | |
| After unloading, wheels and undercarriage of vehicles cleaned prior to leaving the site | |
| No AC pipes disturbed/removed during excavation | |
| No chance finds encountered during excavation | |
| Work is planned in consultation with traffic police | |
| Work is not being conducted during heavy traffic | |
| Work at a stretch is completed within a day (excavation, pipe laying and backfilling) | |
| Pipe trenches are not kept open unduly | |
| Road is not completely closed; work is conducted on edge; at least one line is kept open | |
| Road is closed; alternative route provided and public informed, information board provided | |
| Pedestrian access to houses is not blocked due to pipe laying | |
| Spaces left in between trenches for access | |
| Wooden planks/metal sheets provided across trench for pedestrian | |
| No public/unauthorized entry observed in work site | |
| Children safety measures (barricades, security) in place at works in residential areas | |
| Prior public information provided about the work, schedule and disturbances | |
| Caution/warning board provided on site | |
| Guards with red flag provided during work at busy roads | |
| Workers using appropriate PPE (boots, gloves, helmets, ear muffs) | |
| Workers conducting or near heavy noise work is provided with ear muffs | |
| Contractor is following standard and safe construction practices | |
| Deep excavation is conducted with land slip/protection measures | |
| First aid facilities are available on site and workers informed | |
| Drinking water provided at the site | |
| Toilet facility provided at the site | |

| Monitoring Items | Compliance |
|---|-------------------|
| Separate toilet facility is provided for women workers | |
| Workers camps are maintained cleanly | |
| Adequate toilet and bath facilities provided | |
| Contractor employed local workers as far as possible | |
| Workers camp set up with the permission of PIU | |
| Adequate housing provided | |
| Sufficient water provided for drinking/washing/bath | |
| No noisy work is conducted in the nights | |
| Local people informed of noisy work | |
| No blasting activity conducted | |
| Pneumatic drills or other equipment creating vibration is not used near old/risky buildings | |

Signature

Signoff

Name

Position

Name

Position

**Appendix 8:
SEMI ANNUAL ENVIRONMENTAL MONITORING PLAN TEMPLATE**

1. INTRODUCTION

- Overall project description and objectives
- Environmental category as per ADB Safeguard Policy Statement, 2009
- Environmental category of each subproject as per national laws and regulations
- Project Safeguards Team

| Name | Designation/Office | Email Address | Contact Number |
|----------------|--------------------|---------------|----------------|
| 1. PMU | | | |
| | | | |
| | | | |
| 2. PIUs | | | |
| | | | |
| | | | |
| | | | |
| 3. Consultants | | | |
| | | | |
| | | | |
| | | | |

- Overall project and sub-project progress and status
- Description of subprojects (package-wise) and status of implementation (preliminary, detailed design, on-going construction, completed, and/or O&M stage)

| Package Number | Components/List of Works | Status of Implementation (Preliminary Design/Detailed Design/On-going Construction/Completed/O&M) ⁹ | Contract Status (specify if under bidding or contract awarded) | If On-going Construction | |
|----------------|--------------------------|--|--|--------------------------|--------------------------|
| | | | | % Physical Progress | Expected Completion Date |
| | | | | | |
| | | | | | |
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2. COMPLIANCE STATUS WITH NATIONAL/STATE/LOCAL STATUTORY ENVIRONMENTAL REQUIREMENTS¹⁰

⁹ If on-going construction, include % physical progress and expected date of completion

¹⁰ All statutory clearance/s, no-objection certificates, permit/s, etc. should be obtained prior to award of contract/s.

| Package No. | Subproject Name | Statutory Environmental Requirements ¹¹ | Status of Compliance ¹² | Validity if obtained | Action Required | Specific Conditionsthat willrequire environmental monitoring as per Environment Clearance, Consent/Permit to Establish ¹³ |
|-------------|-----------------|--|------------------------------------|----------------------|-----------------|--|
| | | | | | | |
| | | | | | | |
| | | | | | | |

3. COMPLIANCE STATUS WITH ENVIRONMENTALLOANCOVENANTS

| No. (List schedule and paragraph number of LoanAgreement) | Covenant | Status of Compliance | Action Required |
|---|----------|----------------------|-----------------|
| | | | |
| | | | |
| | | | |

4. COMPLIANCE STATUS WITH THE ENVIRONMENTAL MANAGEMENT PLAN (REFER TO EMP TABLES INAPPROVEDIEE/S)

- Confirm if IEE/s require contractors to submit site-specific EMP/construction EMPs. If not, describe the methodology of monitoring each package under implementation.

Package-wise Implementation Status

| Package Number | Component | Design Status (Preliminary Design Stage/Detail ed Design Completed) | Final IEE based on Detailed Design | | | | Site-specific EMP (or Construct on EMP) approved by Project Director? (Yes/No | Remarks |
|----------------|-----------|---|---|--|---|---|---|---------|
| | | | Not yet due (detailed design not yet completed) | Submitted to ADB (Provide Date of Submission on) | Disclosed on project website (Provide Link) | Final IEE provided to Contractor r/s (Yes/No) | | |
| | | | | | | | | |
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- Identify the role/s of Safeguards Team including schedule of on-site verification of reports submitted by consultants and contractors.

Attach as appendix all clearance obtained during the reporting period. If already reported, specify in the “remarks” column.

¹¹ Specify (environmental clearance? Permit/consent to establish? Forest clearance? Etc.)

¹² Specify if obtained, submitted and awaiting approval, application not yet submitted

¹³ Example: Environmental Clearance requires ambient air quality monitoring, Forest Clearance/Tree-cutting Permit requires 2 trees for every tree, etc.

- For each package, provide name/s and contact details of contractor/s' nodal person/s for environmental safeguards.
- Include as appendix all supporting documents including **signed** monthly environmental site inspection reports prepared by consultants and/or contractors.
- With reference to approved EMP/site-specific EMP/construction EMP, complete the table below.
- Provide the monitoring results as per the parameters outlined in the approved EMP (onsite- specific EMP/construction EMP when applicable).
- In addition to the table on EMP implementation, the main text of the report should discuss in details the following items:
 - (i) **Grievance Redress Mechanism.** Provide information on establishment of grievance redress mechanism and capacity of grievance redress committee to address project-related issues/complaints. Include as appendix Notification of the GRM (town-wise if applicable).
 - (ii) **Complaints Received during the Reporting Period.** Provide information on number, nature, and resolution of complaints received during reporting period. Attach records as per GRM in the approved IEE. Identify safeguard team member/s involved in the GRM process. Attach minutes of meetings (ensure English translation is provided).
- Confirm if any dust was noted to escape the site boundaries and identify dust suppression techniques followed for site/s.
- Identify muddy water was escaping site boundaries or muddy tracks were seen on adjacent roads.
- Identify type of erosion and sediment control measures installed on site/s, condition of erosion and sediment control measures including if these were intact following heavy rain;
- Identify designated areas for concrete works, chemical storage, construction materials, and refueling. Attach photographs of each area.
- Confirm spill kits on site and site procedure for handling emergencies.
- Identify any chemical stored on site and provide information on storage condition. Attach photograph.
- Describe management of stockpiles (construction materials, excavated soils, spoils, etc.). Provide photographs.
- Describe management of solid and liquid wastes on-site (quantity generated, transport, storage and disposal). Provide photographs.
- Provide information on barricades, signages, and on-site boards. Provide photographs.
- Check if there are any activities being undertaken out of working hours and how that is being managed.

Summary of Environmental Monitoring Activities (for the Reporting Period)¹⁴

| Impacts (List from IEE) | Mitigation Measures (List from IEE) | Parameters Monitored (As a minimum those identified in the IEE should be monitored) | Method of Monitoring | Location of Monitoring | Date of Monitoring Conducted | Name of Person Who Conducted the Monitoring |
|-------------------------------|-------------------------------------|---|----------------------|------------------------|------------------------------|---|
| Design Phase | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| Pre-Construction Phase | | | | | | |
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| Construction Phase | | | | | | |
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| Operational Phase | | | | | | |
| | | | | | | |
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⁴ Attach Laboratory Results and Sampling Map/Locations

Overall Compliance with CEMP/ EMP

| No. | Sub-Project Name | EMP/ CEMP Part of Contract Documents (Y/N) | CEMP/ EMP Being Implemented (Y/N) | Status of Implementation (Excellent/ Satisfactory/ Partially Satisfactory/ Below Satisfactory) | Action Proposed and Additional Measures Required |
|-----|------------------|--|-----------------------------------|--|--|
| | | | | | |
| | | | | | |
| | | | | | |

5. APPROACH AND METHODOLOGY FOR ENVIRONMENTAL MONITORING OF THE PROJECT

- Brief description on the approach and methodology used for environmental monitoring of each sub-project

6. MONITORING OF ENVIRONMENTAL IMPACTS ON PROJECT SURROUNDINGS (AMBIENT AIR, WATER QUALITY AND NOISE LEVELS)

- Brief discussion on the basis for monitoring
- Indicate type and location of environmental parameters to be monitored
- Indicate the method of monitoring and equipment to be used
- Provide monitoring results and an analysis of results in relation to baseline data and statutory requirements

As a minimum the results should be presented as per the tables below.

Air Quality Results

| Site No. | Date of Testing | Site Location | Parameters (Government Standards) | | |
|----------|-----------------|---------------|-----------------------------------|--------------|--------------|
| | | | PM10 µg/m3 | SO2 µg/m3 | NO2 µg/m3 |
| | | | | | |
| | | | | | |

| Site No. | Date of Testing | Site Location | Parameters (Monitoring Results) | | |
|----------|-----------------|---------------|---------------------------------|--------------|--------------|
| | | | PM10 µg/m3 | SO2 µg/m3 | NO2 µg/m3 |
| | | | | | |
| | | | | | |

Water Quality Results

| Site No. | Date of Sampling | Site Location | Parameters (Government Standards) | | | | | |
|----------|------------------|---------------|-----------------------------------|-----------------------|-------------|-------------|------------|------------|
| | | | pH | Conductivity µS/cm | BOD mg/L | TSS mg/L | TN mg/L | TP mg/L |
| | | | | | | | | |
| | | | | | | | | |

| Site No. | Date of Sampling | Site Location | Parameters (Monitoring Results) | | | | | |
|----------|------------------|---------------|---------------------------------|-----------------------|-------------|-------------|------------|------------|
| | | | pH | Conductivity µS/cm | BOD mg/L | TSS mg/L | TN mg/L | TP mg/L |
| | | | | | | | | |
| | | | | | | | | |

Noise Quality Results

| Site No. | Date of Testing | Site Location | LA _{eq} (dBA) (Government Standard) | |
|----------|-----------------|---------------|--|------------|
| | | | Day Time | Night Time |
| | | | | |
| | | | | |

| Site No. | Date of Testing | Site Location | LA _{eq} (dBA) (Monitoring Results) | |
|----------|-----------------|---------------|---|------------|
| | | | Day Time | Night Time |
| | | | | |
| | | | | |

7. SUMMARY OF KEY ISSUES AND REMEDIAL ACTIONS

- Summary of follow up time-bound actions to be taken within a set timeframe.

8. APPENDIXES

- Photos
- Summary of consultations
- Copies of environmental clearances and permits
- Sample of environmental site inspection report
- Other

SAMPLE ENVIRONMENTAL SITE INSPECTION REPORT

Project Name Contract Number

NAME: _____ DATE: _____

TITLE: _____ DMA: _____

LOCATION: _____ GROUP: _____

WEATHER CONDITION:

INITIALSITECONDITION: _____

CONCLUDING SITE CONDITION:

Satisfactory _____ Unsatisfactory _____ Incident _____

Resolved _____ Unresolved _____ INCIDENT:

Nature of incident:

_____ Intervention Steps:

_____ IncidentIssues

Resolution

| | | |
|------------------------------|-------------------|--|
| Project Activity Stage | Survey | |
| | Design | |
| | Implementation | |
| | Pre-Commissioning | |
| | Guarantee Period | |

Inspection

| | |
|----------------------|-------------------------|
| Emissions | Waste Minimization |
| Air Quality | Reuse and Recycling |
| Noise pollution | Dust and Litter Control |
| Hazardous Substances | Trees and Vegetation |

SiteRestoredto Original Condition

Yes

No

Signature

Signoff

Name

Position

Name

Position

Appendix 9: DETAILS OF PUBLIC CONSULTATIONS
Details of Stakeholder Consultations was Held on November 3, 2017

Question raised and answers provided during consultations

1. V. Sellappan, Deputy President, Gandhi Salai, KailashNagar

| | Questions | Answers |
|---|---|---|
| 1 | Without disturbing the local resident, works has to be done | While execution, the traffic diversion and safety measures like keeping Barricading system will consider to minimize the disturbance of local residents. |
| 2 | Once pipe line works has over, the excavated trench in the road has to be closed. | After hydraulic test of the laid pipe line, the excavated trench will be closed immediately by contractor. Then they will go next street. |
| 3 | scheme to has to be finished within stipulated time | Corporation arranging Project Management Consultancy for this Phase –II scheme. So, Corporation and PMC will closely monitor the works and will complete within period (3Years). |

2. M. Thangamuthu, Retd, BHEL, KailashNagar

| | Questions | Answers |
|---|--|--|
| 1 | Commercials hotels sewage load has to connect the proposed scheme. | The commercial sewage and institution sewage also considered in the proposed scheme. |

3. Sellakannu, V. Sellappan, KailashNagar, Kattur

| | Questions | Answers |
|---|---|--|
| 1 | Sewage odor has to control | Wherever the sewage pumping station are located in the Resident area, the odor control device like scrapper will installed to control odor. |
| 2 | scheme to has to be finished within stipulated time | Corporation arranging Project Management Consultancy for this Phase –II scheme. So, Corporation and PMC will closely monitor the works and will complete within period (3Years). |
| 3 | Sewage Treatment Plant has to locate faraway from resident areas. | The STP is located away from the local resident area. |

4. V. JHIRUGNANSAMDAM, Lingam Nagar, Melapandamangalam, Kulumani Road

| | Questions | Answers |
|---|---|--|
| 1 | Kindly consider the Lingam Nagar also under Phase–II. | The Lingam area will be covered under Phase –III (Next Phase). |

5. S.E Rajendren, Welfare Association, Anna Salai, KailashNagar

| | Questions | Answers |
|---|--|---|
| 1 | the pipe line connection, from outlet of building to Compound wall (inside premises) has to consider under contractor. | From Phase –II scheme, inside premises pipe line also will be laid under contractor. |
| 2 | Future expansion area also has to be considered in this Phase–II. | The overall sewerage master plan including detail design has kept ready. When-ever the population density criteria will match will local population (100 Nos / hectare) , thesewage line will be laid under future phases . |

6 A. ArunaGiri, WinNagar,Kattur

| | Questions | Answers |
|---|--|--|
| 1 | The scheme board has to keep in the street. In Board, the contractor Name, phone number and respective wards official number from TCC has to mention. | Will do necessary action in this regard. |

7 P. Ramachandran,WinNagar

| | Questions | Answers |
|---|--|--|
| 1 | Sewage pumping station has to locate for way from resident area. | Most of the cases, the SPS has to proposed at Remote area only. Due to land constraint, SPS-4 only located in the Resident area, the odor control device like scrapper will be installed to control odor issues. |

8. R. Ganesan,VigneshNagar

| | Questions | Answers |
|---|---|---|
| 1 | Without disturbing the local resident, works has to be done | While execution, the traffic diversion and safety measures like keeping Barricading system will consider to minimize the disturbance of local residents. |
| 2 | Once pipe line works has over, the excavated trench in the road has to be closed. | After hydraulic test of the laid pipe line, the excavated trench will be closed immediately by contractor. Then they will go next street. |
| 3 | scheme to has to be finished within stipulated time | Corporation arranging Project Management Consultancy for this Phase –II scheme. So, Corporation and PMC will closely monitor the works and will complete within period (3Years). |
| 4 | The road restoration has to finish once works has finished and the manhole cover has to be leveled with road surface level. | Contractor will do similar way and PMC and Corporation will monitor road restoration works also. |

9. R.Rajanobili,Gandhi Nagar,Kattur

| | Questions | Answers |
|---|---|--|
| 1 | What is the execution period and operation and maintenance period | 3 years execution period and 5 years for O & M |
| 2 | The scheme board has to keep in the street. In Board, the contractor Name, phone number and respective wards official number from TCC has to mention. | Will do necessary action in this regard. |
| 3 | While road restoration, the road level should not increase with existing road level. | While doing road restoration works, the road level will be leveled with existing road level. Corporation assured to maintain road level. |

10 P. Narayanasamy , Balaji Nagar,Kattur

| | Questions | Answers |
|---|---|-----------------------------|
| 1 | Montfort school sewage has to consider in this phase. | Considered under Phase –II. |

11. V. Ramachandran, Ellaikudi ,Kattur

News Paper Clippings About Public Consultations, November 4, 2017
Newspaper -The Hindu

Phase II of underground sewer project to begin soon

Tenders for the project, estimated to cost ₹344 crore, will be called soon

SPECIAL CORRESPONDENT
Tenders for executing the second phase of the underground drainage system, to extend the sewer lines to uncovered areas in about 25 wards in the city, are expected to be called soon. The project, sanctioned at a cost of ₹344 crore, under the Atal Mission for Rejuvenation and Urban Transformation (AMRUT), would provide underground sewer lines to five wards fully and to omitted areas in 20 other wards in the city.

Commissioner-cum-Special Officer, Tiruchi Corporation, N. Ravichandran, said that tenders for the project would be called within the next 15 days. "We will shortly submit the detailed project report for the phase-II of the project, entailing an investment of about ₹450 crore, and expect it to be approved soon. Once the phase-II and phase-III of the scheme is completed, nearly 90% of the city will have underground sewer lines," Mr. Ravichandran told *The Hindu* after attending a stakeholder meeting to discuss the environmental impact of the phase-II of the project which was held on Friday.

Providing an overview of the phase-II of the project at the meeting, S. Amudhavalli, City Engineer, said the Centre will contribute 50% of the project cost, the State government 30% and the remaining 20% will be borne by Tiruchi Corporation. Since the Corporation cannot raise the resource from its own funds, it had sought financial assistance from the Asian Development Bank.

The areas to be covered under the phase-II of the project have been carefully selected to prevent pollution of water bodies, including the Cauvery river and the Lyyakondan canal. The area towards Piruvembur had the maximum number of water bodies, she observed.

The project would cover wards 28, 29, 30, 61 and 62 fully and wards 7-9, 12-15, 21, 27, 31, 46, 52-54, 57-60 and 63-65 partially. Other parts of the city without underground sewer lines will be covered under phase-III.

Under phase-II, sewer lines would be laid for a distance of 319 km and pumping mains for 22 km to provide 33,147 individual connections. Seven pumping stations and 23 lifting stations would be established. A new sewage treatment plant would be established at Keozha Kalkandarkottai with a capacity to treat about 27 million litres of sewage a day. The treated sewage could be used for agricultural purposes and there will be no adverse environmental impact due to the project, Ms. Amudhavalli said.

A section of residents, who participated in the meeting, called upon the Corporation authorities to ensure that all the five newly added wards (61 to 65) were fully provided with sewer lines and ensure that the project was completed within a specific time-frame. According to available indications, the second phase of the project is expected to be completed by 2021.



S. Amudhavalli, City Engineer, addressing a consultative meeting with stakeholders on the underground drainage system in Tiruchi on Friday. PHOTO: M. SUGATHY

Newspaper - Dina Karan

மாநகராட்சியின் அனைத்து பகுதிகளிலும் 5 ஆண்டுகளில் பாதாள சாக்கடை திட்ட பணிகள் நிறைவடையும்

சுருக்க செய்தி
கூட்டத்தில்
ஆணையர்
தலைவர்

700 ஊழியர்கள் நியமனம்

மேலும் தாயகம் கிடைப்பா திட்டத்திற்கு கிராமம், அன்பு திட்டம், கோவை கிராமத்தை நோக்கிச் செல்லும் பாதாள சாக்கடை திட்டம், ஆணையர் ரமணிசந்திரன் உடையதில் 15 மாவட்டங்களில் பாதாள சாக்கடை திட்ட பணிகள் நிறைவடையும். மேலும் தாயகம் கிடைப்பா திட்டத்திற்கு கிராமம், அன்பு திட்டம், கோவை கிராமத்தை நோக்கிச் செல்லும் பாதாள சாக்கடை திட்டம், ஆணையர் ரமணிசந்திரன் உடையதில் 15 மாவட்டங்களில் பாதாள சாக்கடை திட்ட பணிகள் நிறைவடையும்.



திருச்சி காட்டு வந்திருக்கிற மாநகராட்சி காட்டு நடுத்தர முறையான பயன்படுத்த ஆணையர் கூட்டத்தில் ஆணையர் ரமணிசந்திரன்

மாநகராட்சி தலைவர் சாக்கடை திட்ட பணிகள் நிறைவடையும். மேலும் தாயகம் கிடைப்பா திட்டத்திற்கு கிராமம், அன்பு திட்டம், கோவை கிராமத்தை நோக்கிச் செல்லும் பாதாள சாக்கடை திட்டம், ஆணையர் ரமணிசந்திரன் உடையதில் 15 மாவட்டங்களில் பாதாள சாக்கடை திட்ட பணிகள் நிறைவடையும்.

மேலும் 15 திட்டங்களில் கம்போஸ் திட்டம்

மாநகராட்சி தலைவர் சாக்கடை திட்ட பணிகள் நிறைவடையும். மேலும் தாயகம் கிடைப்பா திட்டத்திற்கு கிராமம், அன்பு திட்டம், கோவை கிராமத்தை நோக்கிச் செல்லும் பாதாள சாக்கடை திட்டம், ஆணையர் ரமணிசந்திரன் உடையதில் 15 மாவட்டங்களில் பாதாள சாக்கடை திட்ட பணிகள் நிறைவடையும்.

சுருக்க செய்தி
கூட்டத்தில்
ஆணையர்
தலைவர்

750 பேரில் 1000 நிதியை
கொண்டு வருவதில்
பரிசு

விநாயகர் பரிசுத் திருவிழா

கொட.டி.ஏ. எண்-22

List of Participant

TIRUCHIRAPPALLI CITY CORPORATION
Providing UGSS Scheme under AMRUT (Phase II)

DATE 03.11.2017

Venue: Sakthi Mahal, Kattur

| Sl.No | Name of the Officials (Thiruvallargal) | Address | Contact No. | Signature |
|-------|---|---------------------------|-------------|-------------------|
| 1 | | | | |
| 2 | | | | |
| 15 | | | | |
| 16 | R. Chandrasekaran | 4/163-C Vasanthanagar. | 9788758123 | R. Chandrasekaran |
| 17 | M. K. Kumar | Thiruvallargal 3/369 | 9487359053 | M. K. Kumar |
| 18 | M. Ramiah | 3/367 | 9443291451 | M. Ramiah |
| 19 | K. Arumugam | 192 | 9894285149 | K. Arumugam |

| | | | | |
|----|------------------------|---|------------|------------------------|
| 20 | V. Dhanrajulu | 1/55E 11th St Gandhinagar | 9003034385 | John |
| 21 | P. VENKATACHALA | " | 9443592800 | John |
| 22 | V. PALANISAMY | Amman nagar southern | 9442221024 | John |
| 23 | A. Mamickam | " | 9788072570 | John |
| 24 | A. R. SRIKULISWAR | 10A. | 9443553116 | John |
| 25 | R. Karan | B. | 9782543428 | R. Karan |
| 26 | A. Anandapalan | Plot no 8 | 9443720018 | A. Anandapalan |
| 27 | M. Anandapalan | 5/137 | 9489702162 | Anandapalan |
| 28 | S. Sivasai | 4/139 | 9790077115 | S. Sivasai |
| 29 | L. Manohar | Plot no. 204/4 | 944342220 | L. Manohar |
| 30 | R. G. Chandrashekhar | Plot-2 K. V. Nagar | 9443065608 | R. G. Chandrashekhar |
| 31 | V. Sathyaajay | Gandhinagar 20.31 | 9487154789 | V. Sathyaajay |
| 32 | B. Pushparaj | V. S. Nagar Nagar | 9443797558 | B. Pushparaj |
| 33 | P. Perumal | 4th St Pathimam | 9187019 | P. Perumal |
| 34 | K. Palanimalai | 4th St Vigneshwara Nagar | 9442134895 | K. Palanimalai |
| 35 | R. BALABRISHORAN | vignesh nagar | 9442462442 | R. Balabrishoran |
| 36 | J. C. ROBERT FERNANDEZ | Gandhinagar 38 Street #122/000100 | 9894558550 | J. C. Robert Fernandez |
| 37 | M. Anandapalan | " | " | " |
| 38 | M. Anandapalan | Plot no. 1 | 9489702162 | M. Anandapalan |
| 39 | V. VELAYUTHAM | Amman nagar | 944202884 | V. Velayutham |
| 40 | V. THANGU | Amman nagar | 9442405502 | V. Thangu |
| 41 | K. KARUPPU | Amman nagar | 944261525 | K. Karuppu |
| 42 | A. MANGALABATI | Amman nagar | 9894911161 | A. Mangalabati |



| No | Name | Address | Contact no | Signature |
|----|----------------------------------|-------------------------------------|------------|-------------------|
| 43 | M. GANESAN | H/164F Valarathana Nagar Kattur | 9894788310 | N. Ganesan |
| 44 | V. Ramamoorthy | 15, Andal Nagar East Ambikapuram | 9443312133 | V. Ramo |
| 47 | R. Karthick (Rashmi Krishnan) | கரையி அழகூர் Ammala Sengudai | 9443721940 | R. Karthick |
| 49 | M. Navaneetha kishore | Trichy - 600111 | 9442828979 | MN |
| 50 | | 21 | | |
| 51 | K. Beland | 79 | 9600489112 | K. Beland |
| 52 | A. NATARAJAN | WIN NAGAR | 9442531170 | A. Natarajan |
| 53 | S. DOSS | - do - | 9465740011 | S. Doss |
| 54 | A. ARUNAGIRI | - do - | 9502596797 | A. Arunagiri |
| 55 | V. BALAKRISHNA | KATTUR | 9442393867 | V. Balakrishna |
| 56 | S. KANNATHAN | 3/22/11 T. Nagar | 9025394117 | S. Kannathan |
| 57 | P. KARUPPANNA | Vasanthanagar fali | 971593957 | P. Karuppanna |
| 58 | M. GOVINDARAJAN | | 9787485955 | M. Govindarajan |
| 59 | A. Radhakrishnan | Kailashnagar | 9786992644 | A. Radhakrishnan |
| 60 | R. NAVANEETHAN KRISHNAN | Kailashnagar Gandhi Kalin | 9443673788 | R. Navaneethan |
| 61 | M. Thangamuthu | Kailashnagar | 9345124778 | M. Thangamuthu |
| 62 | E. C. RAJENDRAN | nos 5/16 Kailash Nagar | 9602948069 | E. C. Rajendran |
| 63 | N. BANDARAJAN | 16 KANDY NAGAR II MILK COTTAGE | 979077269 | N. Bandarajan |
| 64 | J. PATEMELALAN | 40. main Road Sageer Nagar | 9443532811 | J. Patemelalan |
| 65 | V. RAJARAJAN | 43 / 950th St, Basu Nagar | 7705041406 | V. Rajarajan |
| 67 | T. JOHN SILVARD | V. V. V. COTTAGE, VIJAYANAGAR | 9865725480 | T. John Silvard |
| 68 | A. JOHN PAUL | RAVAVENDRA NAGAR | 9842440965 | A. John Paul |
| 69 | M. Chellakannan | Kailash Nagar | 9842463607 | M. Chellakannan |
| 70 | V. B. S. S. S. S. S. | Blow Blow Blow 3 | 9865152993 | V. B. S. S. S. S. |
| 71 | C. SUTHAANATHAN | Prakash Nagar | 8838394952 | C. Suthaanathan |
| 72 | P. MOH K. L. S. | North Kattur Vayal | 7794632676 | P. Moh K. L. S. |
| 73 | P. Sreedharan | Blow Blow Blow 2 | 9790052488 | P. Sreedharan |
| 74 | M. A. FRANCES | Blow Blow Blow 1 | 9942320866 | M. A. Frances |

| Sl No | Name | Address | Contact no | Signature |
|-------|----------------------|--|-------------|-----------|
| 75 | P. Rajendran | 12, Thiruvithom St | 9443590698 | |
| 76 | V. Balakrishnan | Sengamangal | | |
| 77 | P. Anandha Vinayagam | 151, 5th Street Aimathalagar Extn | 9487467577 | |
| 78 | P. Sivakumar | Indraprastha Vajranagar | 9597780004 | |
| 79 | D. Suresh | S. N. C. Stn | 9178933389 | |
| 80 | S. Thirumalaiah | 8/2, 2nd St | 9442408000 | |
| 81 | S. Balraj | 159, K. V. Nagar | 9443302621 | |
| 82 | A. Srinivasan | 85, 2nd St | 9478719883 | |
| 83 | S. Lakshmi | 2/143, 2nd St | 9585557673 | |
| 84 | P. Anandaraman | 87, 2nd St Extn | 94421-36485 | |
| 85 | A. Subramanian | 11 | 9688238861 | |
| 86 | R. Srinivasan | 6A, 2nd St | 9442776757 | |
| 87 | R. Srinivasan | 2nd St | 9442025340 | |
| 88 | | | | |
| 89 | V. Gopalan | 10, NGHURU-ST SANGAR NAGAR Ward-7 | 9443821241 | |
| 90 | | | | |
| 91 | S. Srinivasan | 5th St | 9600491363 | |
| 92 | A. Divakaran | Cholanagar | 9442533711 | |
| 93 | V. Rajagopal | -do- | 9486122800 | |
| 94 | K. Balasubramanian | Janaki Amal | 9443765670 | |
| 95 | | | | |
| 96 | V. Ramesh Chandra | 103, 4th St | 9944530751 | |
| 97 | S. Thirumalaiah | 4/28, Vignesh Nagar | 9524436941 | |
| 98 | S. Subramanian | Vignesh Nagar | 9443688578 | |
| 99 | | | | |
| 100 | T. Devi | 4/175, Vignesh Nagar, North Kattar TR7 | 8903406180 | |
| 101 | Rangaraj | Vignesh Nagar North Kattar, TR7 - 19 | 9443766195 | |
| 102 | M. Venkatesh | No. 7, Indraprastha Nagar | 9786639900 | |

| Sl. | Name | Address | Contact No. | Pi. |
|-----|------------------------|------------------------------|-------------|-----|
| | L. Vicharanathan | 115, Diamond Comdy | 9443100342 | |
| | Obairi (Bhri Lina) | Lomaiu Mani | | |
| | | Omni Association | 9790077187 | dup |
| | M. Sivasubramanian | JAYAKAR. TR 13 | 9442502859 | M/W |
| | S. Kalyanaram | 3/226 Venugopalnagar | 9442168923 | S/O |
| | M. Gopalan | 31814 Veda Nagar | 944353374 | M/O |
| | S. Chandrasekar | Belaji Nagar | 9965211196 | S/O |
| | P. Balaji | HOTARU ROAD | 9452542395 | M/W |
| | S. Srinivasan | 7, K. B. L. Nagar | 9600293495 | S/O |
| | | 3rd cross street | | |
| | | Belaji Nagar | | |
| | | 6th cross street | | |
| | U. Balan | 3/214 Venugopalnagar | 9914156781 | L/L |
| | M. JAYARAJ | Belaji Nagar | 944376464 | |
| | V. JAYACHANDRAN | Amman Nagar. | 9442056413 | M/W |
| | P. KANDASAMY | 2/11, 1st cross street | 942606359 | M/W |
| | S. STALIN | Belaji Nagar | 9790180537 | M/W |
| | S. Xavier Jayase- | 4/13, 1st cross street | 944252652 | M/W |
| | M. William Chelladurai | Plot 24 A, 1st cross street | 9944186581 | M/W |
| | R. S. Sivanubrahman | 4/168, Venugopalnagar | | |
| | | Kattur, Trichy - 19 | 9442503127 | M/W |
| | S. S. Krishnamoorthy | Plot no 96, 1st cross street | | |
| | | Green St, Nagar, Kattur | 9443112643 | M/W |
| | | Trichy 19. | | |
| | S. Govindarajan | 2nd cross street | | |
| | | 3rd cross street | 944315357 | M/W |
| | | Kattur Trichy 19. | | |
| | | 22A, Venugopalnagar | 978755558 | M/W |
| | | 4th cross street | | |
| | R. GURUSAMY | Plot. 6 Amman Nagar | 9994079102 | M/W |
| | | 3rd ST KATTUR TRICHY - A | | |
| | C. DURAIRAJ | Belaji Nagar 8th | 9600330886 | M/W |
| | | CROSS 8th cross | | |

| Name | Address | Contact No | SM. |
|-----------------------|--|--------------------------|------------------|
| D. BAIKRISHNAN | 32/240 Tamil Vokkal Nagar, Palani, Trichy | 9765577091 | D. B. K. |
| P. MAHENDRAN | 10/11 Saimanmal Nagar Vadugai - Alathur, Madurai | 9442409100 | off |
| P. JHANSAN | 32a, 6th St. Annam Nagar (Annam Nagar Ad 30) | 9894983037 | P. Jhansan |
| S. MANIMURUGAN | 2/35th Gramapal Nagar Kattur - TR 4-19 | 9952800224 | S. Manimurugan |
| T. MOHANADASS | 4/155, 1st Vasantha Nagar North Kattur | 91442688911 | T. Mohanadas |
| M. B. S. | 201, 6th St. Palani 6th St. Palani | 99468- 47881 | M. B. S. |
| A. MANIKANDAN | H/110th Cross Olokul Nagar, Kattur | 94437 06434 | A. Manikandan |
| P. R. S. ANANDHARAJAN | Secular Shanmuga Nagar | 4894830101 | P. R. S. |
| R. Sivakumaran | president Shanmuga Nagar | 99438 79637 | R. Sivakumaran |
| V. Goundaraj | H/153 Vasantha Nagar North Kattur | V. Goundaraj 97897509 | V. Goundaraj |
| P. Palanivel | Shanmuga Nagar 5th St. Shanmuga Nagar | 9443764855 | P. Palanivel |
| A. Sheik Mubowir | Soul Serenity, Shanmuga Nagar Welfare Institute U.T. Malai, Trichy | 94437 86223 | A. Sheik Mubowir |
| S. V. Velayuthan | Trustee - Shanmuga Nagar Welfare Assocn. U.T. Malai, Trichy | 9443994189 | S. V. Velayuthan |
| M. Anbalagan | Vignesh Nagar Vignesh Nagar Welfare Institute | 9443694088 | M. Anbalagan |

| Name | Address | Contact no | Signature |
|------------------------|---|------------|-------------|
| 10) ... | 114 A 156 ... 4 th ... | 9944295242 | Hmit |
| M. ... | 4/345, ... | 990344399 | [Signature] |
| S. ... | 4/482 - ... | 9442207327 | [Signature] |
| J. ... | 4/34 ... | 9952465361 | J. ... |
| V. ... | | 9994904661 | M-A |
| M. ... | | | [Signature] |
| R.D. ... | Plot No 29 III CROSS WEST VISHVA NAGAR TNS - 8 | 9842162409 | R.D. ... |
| POXYEDMAHABOOL | 30 ... | 9524156685 | P. ... |
| P. DEENADAYALAN | | 9600499106 | [Signature] |
| S-RAJENDRAN | | 9655053575 | [Signature] |
| L Vijay Kumar. PE R | Plot No 29 ... | 944263446 | [Signature] |
| I. AMALRAJ | Plot No 29 ... | 9865248730 | [Signature] |

| Name | Address | Contact no | Sig |
|--------------------------|--|------------|-----|
| P. Arunachalam | 18 Green market North Kattu Tery | 945736698 | |
| M. Nandagopalom | 9/224 Kinnigopal Nagar Kattin Tichy M | 9788068574 | |
| S. Jayaraj | 12. KALAIYANAR NAGAR | 8978128700 | |
| K. Thangaraj | 7115 Abiraj Nagar Kattani Tichy | 9585223928 | |
| A. Muralidharan | 75. Madurai Road, Tichy | 7373207111 | |
| A. Sankar Babu Jayaraman | NO. 32 NAGANANDHAR ST EXT K. KATTAN TICHY II | 9443493659 | |
| P. SETHU | Plot 142 Prinjay Nagar Nagar East ST Katt Maha Prudal Kattin | 7094256511 | |
| K. Melandharani | 4, 18/1115 Saranyojai Prakash Nagar Ext. | 9444385927 | |
| S. John Joseph | 1/326 Philominalpuram 3rd South Kattu Tichy | 9677626635 | |
| S. Aravind | 4/3 Anna road Kattin Tichy | 9345798511 | |
| A. Arangan | 3/276 2nd Melandharani Kattin Tichy II | 9790053457 | |
| P. S. Lakshmi | 4/92 Anna road Kattin Tichy II | 9791218600 | |
| P. S. Mani | Tichy - II | 9442659585 | |
| S. Ramakrishna | 22/17 main III St | 9994314271 | |
| A. S. Srinivasan | 15/394 Anna road Kattin Tichy II | 9952154880 | |
| R. K. P. Srinivasan | 5 Anna road Kattin Tichy II | - | - |
| D. Vijayaraman | "ANGEL SC" 4/767A Anna road Kattin Tichy II | 9442502907 | |

| Name | Address | Contact No | Sig |
|---|---|-----------------|-----------|
| Pan Kaji Marudai | 76 Railnagar East Ambikoppa Trichy 4. | 81459410 -19 | |
| M. Anmol | 76, Anmol Vishal Illam Sanjeevi Nagar, South Extn, Trichy-620002 | 9003376652 | |
| K. Mungasani | 83, Sanjeevi Nagar South Extn Trichy-620002 | 9894287213 | |
| J. PARIMELUNGAN | 40 main road. Sanskrit Nud | 9443532911 | |
| | A. A. Srinivasan air | 9488610365 | |
| Jeeva Pasakaran | 3/1-70A Gandhi Street TRICHY-4 | 9443592955 | |
| J. M. Chelakshmi | 79, Railnagar | 9442181403 | T. nathar |
| K. Meenakshi | 79, Railnagar | 9790222955 | karunach |
| M. S. S. Srinivasan | | 9941720204 | |
| A. Fathima Alphon | 4/25 Gandhi Nagar 1st | 9003375282 | Jana |
| S. Udayan | 3/20 B.S. Srinivasan Chinnai | 9482769963 | S. Banu |
| T. Tharadaya Krishna | UNNAYI Bt n | 7708483539 | |
| M. GURUSAMY | 3rd cross street Chinnai | 9486290669 | |
| S. CHANDRASEKARAN MALAYALA NAGAR WELFARE ASSOCIATION. | 100, Amnest, Malayappa TRICHY-10 | 7904070600 | |
| S. U. HAYAKUMAR | 8A main road malayappa nagar Trichy | 9444773333 | |

திருச்சிராப்பள்ளி மாநகராட்சி 41



| Name | Address | Cont. No. | Sign |
|---------------------|--|-------------|---------------------|
| P. Anbalagan | 27, E. S. V. Chinnaiy III Street Annamalai | 9443131888 | P. Anbalagan |
| T. Kamranaj | Amman Nagar South Btm. | 7444556888 | T. Kamranaj |
| M. K. MURUGESAN | Amman Nagar. | 9489562120 | M. K. MURUGESAN |
| M. RAGAVENDRAN | Plot # 76, Brahasi Nagar | 7299909830 | M. RAGAVENDRAN |
| P. Sankar | Plot No # 2, Balajinagar Kallar P.O. Trichy, 19 | 9842402726 | P. Sankar |
| Dr. Looj | 9, Anna Nagar Chennai - 600011 | 944229346 | Dr. Looj |
| M. K. S. Srinivasan | 7/15, Anna Nagar Chennai - 600022 | 9865068244 | M. K. S. Srinivasan |
| M. Srinivasan | Plot No. 10, Anna Nagar Chennai - 600022 | 994218 2851 | M. Srinivasan |
| M. Srinivasan | Plot No. 10, Anna Nagar Chennai - 600022 | 9003377627 | M. Srinivasan |
| S. Srinivasan | Plot No. 10, Anna Nagar Chennai - 600022 | 9965344128 | S. Srinivasan |
| D. Srinivasan | 4/42, Anna Nagar Chennai - 600022 | 9786113748 | D. Srinivasan |

(7) திருச்சிராப்பள்ளி - 99 44530751
 No/3 ஹாஸ்டல்
 பேரையாண்டி
 மாநகர் - 63

M. சோனல் (மாநகர் அலுவலர்)
 மாநகர் அலுவலர் அலுவலகம், திருச்சிராப்பள்ளி
 பேரையாண்டி, திருச்சிராப்பள்ளி
 தொலைபேசி: 9542551376

Photographs of Stakeholder Consultations held on November 3, 2017



Notice issued to house owners regarding work.

STP Awareness program

Public Consultation during Construction Time



Environmental Onsite Training by CMSC



Public consultation on sewerage network connection



HH level awareness on sewerage line connection



HH level awareness on sewerage line connection- interaction with participant



Awareness on Project documentation on Environment and Social –Team Leader addressing the participants



Awareness on Project documentation on Environment and Social –City Engineer, Trichy City Corporation addressing the participants

Consultation at STP site and Vin Ngar and Raja Rajeswari Nagar



PUBLIC GREVANCE ADDRESSED BY Trichy Corporation AT KEELAKALKANDAR KOTTAI



CMSC Team Leader giving clarification to Public AT KEELAKALKANDAR KOTTAI



Vin Nagar , Zone-3, SPS Team visting for public consultation

Vin Nagar , Zone-3, SPS interaction with people

| | |
|---|---|
|  |  |
| <p>Vin Nagar , Zone-3, interaction session</p> | <p>Vin Nagar , Zone-3, CMSC Team Leader explaining about SPS</p> |
|  |  |
| <p>Raja Rajeswari Nagar, Zone-4, SPS, Public gathering for meeting</p> | <p>Raja Rajeswari Nagar, Zone-4, SPS, Municipality staff and Local people interaction</p> |
|  |  |
| <p>Raja Rajeswari Nagar, Zone-4, SPS, Municipality staff and Local people interaction</p> | <p>Raja Rajeswari Nagar, Zone-4, SPS, Municipality staff and Local people interaction</p> |

Minutes of the Public Consultation Conducted on 24thFebruary 2023 at Thiruchirapalli City Municipal Corporation, in Maruthi Nagar Thiruchirapalli

for the Proposed Underground Sewerage Scheme (UGSS) by Thiruchirappalli City Municipal Corporation

The Public Consultation commenced at Maruthi Nagar on 24.02.2023 at 11.00 AM with officials from Tiruchirappalli City Corporation (TCC), CMSC Team and Engineers of SCCL. The public/residents were present at the meeting based on prior public notice given in individuals about the details of the public consultation. The copy of Attendance register is attached herewith.



Officials of TCC, CMSC Team and contractor's Engineers team welcomed the gathering and outlined the procedure for Public Consultation. They described that the TCC have proposed to develop the Underground Sewerage Scheme (UGSS) for Tiruchirappalli Corporation.

The following team members were conducted the public consultation meeting

| S. No | Officials/Consultant | Designation | Organization |
|-------|----------------------|-------------------------------------|---------------------------------------|
| 2 | Jeyakumar | Junior Engineer | Tiruchirappalli Municipal Corporation |
| 3 | Jeyakumar | Team Leader | CMSC |
| 4 | Kannan | Construction Manager-Phase II & III | CMSC |
| 5 | Baskaran K | Social Safeguard Experts | CMSC |
| 6 | Raman | Support Engineer | CMSC |
| 7 | Kandasamy | Project Manager | SCCL |

The meeting was held at Maruthi Nagar and 11 residents participated (Male 8 members and Female 3 member). The Consulting team members highlighted about the importance of Underground Sewerage System, its advantages and proposed Sewerage Pumping Station in the Govt Porampoke land as a convenient location for maintenance and disposal of waste.



This was followed by description of the project in detail. The summary of the project details was also circulated to the gathering. The following details regarding the scheme were shared with the public. During this meeting, all the residents were agreed for the construction of pumping station in the Govt land end of the street. The CMSC Team tried to convince the public after explaining about the benefit of the project.

Hence portion of catchment of the Zone6 has been diverted in to another nearby zone. Due to reduction of the catchment area of the sewer network, the pumping station has been reduced to the lifting station due to reduction of the sewage quantity. It was also agreed by the TCC officials. Due to the topographical conditions of the area, the lifting station can't be avoided in the Maruthi Nagar.

All the efforts of TCC, CMSC Team to reduce the public objections were explained in detail to the public and the details about the Pumping Station has been explained in detail to the public.

The TCC Officials invited the public/residents to express their views, concerns and queries. Also, they requested the public/residents to introduce themselves before expressing their views and raising questions.

The views and questions of the public/residents and clarifications given by the Officials are detailed below

| S.No | The views and questions of the public / stake holders | Clarification given by the Officials of TMC and consultants |
|------|---|--|
| 1 | Why the Govt land of Maruthi Nagar has been selected during the implementation of UGSS | Maruthi Nagar is a low-level area and laying of sewer along the low-level gradient will reduce the cost of the project and to avoid depth of cutting, the sewers were designed to collect in the low-level area so that the depth of cutting will be reduced. Since Govt Porampoke land, TCC selected the Govt land for the construction of pumping station. |
| 2 | Why is need for the new proposal? | Portion of Catchment area of the zone 6 a small portion of the Maruthi Nagar and other area considered for pumping station because of city extended area added. Due to topographical condition of the area, one Pumping station in the street end has been proposed. |
| 3 | How do you prepared disposal Pumping station designed here why is not shifting to other areas | Based on contour level designed sewerage network |
| 4 | Pumping main will be burst, what are precaution method used incoming and outgoing pipes | Pumping main pipe 600 and 700 mm dia thickness will not affect and different type and size of the pipes are used incoming and outgoing sewerage water |
| 5 | Is there any odour problem due to lifting station? | Pumping Station is a closed structure and hence there wouldn't be any odour problem. |
| 6 | Is there any underground contamination due to construction of Pumping station? | Since the Pumping station has been constructed as concrete structure and it is water proof one, no contamination will occur. |
| 7 | How much time is required for the construction of Pumping station? | Pumping station will be constructed within three months from the date of start. |

Conclusion:

After detailed explanation by the TCC officials and CMSC Team, all the public were agreed to construct the Pumping Station in their location.

The officials of TCC and CMSC Team along with Contractor team concluded the Public Consultation meeting with vote of thanks.

Enclosures:

1. Copy of attendance of public consultation meeting is shown in Annexure 1.
2. Copy of the photographs of public consultation meeting is shown in Annexure 2.

ANNEXURE 1

ATTENDANCE OF THE PUBLIC ATTENDED THE PUBLIC CONSULTATION MEETING
ON 24.02.2023 AT MARUTHI NAGAR

| MAR 2023 | | | | |
|--------------------------------------|-------------------|----------------------|----------------------|-------------------|
| MTWTFSS | MTWTFSS | MTWTFSS | MTWTFSS | MTWTFSS |
| 1 2 3 4 5 6 | 7 8 9 10 11 12 13 | 14 15 16 17 18 19 20 | 21 22 23 24 25 26 27 | 28 29 30 31 - - - |
| Public Consultation in Maruthi Nagar | | | | |
| Attendance | | | | |
| Friday 4 | | | | |
| Name of the Person | M / F | Sign | Age | |
| ① Karthasamy | M | [Signature] | 65 | |
| ② Mhongasa | M | [Signature] | 73 | |
| ③ V. Ke Javan | M | [Signature] | 67 | |
| ④ Rathnakumar | M | [Signature] | 64 | |
| ⑤ Marine Dominic | F | [Signature] | 57 | |
| ⑥ Subayalu | M | [Signature] | 61 | |
| Saturday 5 | | | | |
| Sunday 6 | | | | |

ANNEXURE 2

Photographs taken during public consultation meeting at Maruthi Nagar on 24.02.2023



Appendix-10 - Procedure proposed for Controlled Blasting and permission from District collector

PROCEDURES INVOLVED IN CONTROLLED BLASTING

UGSS to Trichy Municipality Package I Collection System Works are under Progress. During execution, at some of the places in all the zones, hard rock strata is identified. For laying sewer pipeline in these areas, the hard rocks must be removed to the required depth. In these Identified areas the excavation of hard rocks can be done by controlled blasting mechanism. Zones 1, 2, 3, 4 and 6 have been identified as hard rock areas. The quantum of rock to be removed by Control blasting has been tentative estimated for a length of 65.6 km in all the 5 Zones of Package 1. Already we have received permission from District collector to execute the control blasting only awaiting NOC from ADB. The Step by Step procedure of carrying out Control Blasting operations is enumerated below

❖ DrillingHoles:

For carrying out the control blasting, the first step is to remove the topsoil and to drill holes on the hard rock for placing the explosive charges. The holes are drilled with the help of air compressors with 3ft rods for drilling operations. The holes driven with a depth of 2ft and 20mm dia. The distance between each hole driven is 1.5ft and maximum 10 holes will be driven for one round of controlled blasting. The holes are driven only by competent licensed explosive contractors.

❖ Placing Charge at eachhole:

After the drilling operations on the hard rock surface, the explosive charges are placed inside the drilled holes. In these step two components are mainly used, they are Electric Detonator and the Explosive charge. The explosive charge used for the controlled blasting activity is Nitrate Mixture and each nitrate mixture charge is about 125g. The amount of Nitrate mixture used in the controlled blasting activity is about 40gms i.e. one third of the total Nitrate Mixture charge. After loading the holes with the nitrate mixture, the Non electric detonator is attached to each hole i.e. one Non electric detonator for one nitrate mixture charge/hole.(In other cases where blasting is carried out like quarries the amount of nitrate mixture used is triple the times i.e. 375g). After the Nonelectric detonators are fixed to the nitrate mixtures, the wiring is done and the charges are interconnected using Nonel method of technology. The Licensed Explosive contractor has the proper license for the storage and transport of the explosive charges. The explosive contractor has a separate vehicle for the transport of the explosives. The explosives are bought and brought to the site for the required quantity only.

❖ **Detonating the charge:**

During controlled Blasting the following safety and precautionary arrangements are followed.

- Proper prior notice will be issued to the residents in the vicinity of the blasting area before commencing the blasting activity duly apprise them about how the interests of the residents is safeguarded during the operation.
- Advance information will be given to the police officials before the blasting activity.
- During Controlled Blasting, flagman will be placed at both ends of the road under operation to block the road and to give caution to Public
- Minimum Explosive quantity will be used for the Controlled blasting in the residential area by the qualified licensed Explosive personnels.
- Trenches are properly covered with sandbags and the top of the trench will be covered with MS steel plate of adequate thickness.
- Above the MS plate, a layer of shade net is covered to prevent the movement of debries from the blasting area and over which sandbags are placed.
- Before Commencing of controlled blasting Works, it will be informed to the residents about the activity of works through public addressing system.
- Adequate Signages will be placed around the site with visible warning boards and indicating the start and completion of the blasting.

After following all the necessary safety and precautionary measures the controlled blasting activity will be carried out. The wiring from the Nonelectric detonators are connected to a battery box using Nonel technology which will be operated from a safe distance. When the button is pressed in the battery box it initiates an electric charge which passes through the Non electric detonators and ends up in firing the explosive charge, thereby it leads to the cracks and breakage of rocks which will be removed by earth moving equipment.

❖ **Minimum Explosiveusage:**

Based on the past experiences of the licensed blasters and that of the Package IContractor with those blasters, Controlled blasting will be carried out inTiruchirappalli UGSS Project using advanced Non-Electric Detonators (NONEL)technologies with minimum explosive usage.

PROCEEDING OF THE DISTRICT COLLECTOR, TIRUCHIRAPPALLI

PRESENT : THIRU.S. SIVARASU, I.A.S.,

Roc.D2/25251/2019

Di: 22.10.2020

Sub: Explosive Act and Rules – Tiruchirappalli District – Tiruchirappalli City Corporation – UGSS – work of "Providing Under Ground Sewerage Scheme to Tiruchirappalli Corporation (Phase II – Package I) – Permission to conduct blasting operation for foundation excavation work at Tiruchirappalli Town - requested – Order issued.

- Ref: 1) Commissioner, Tiruchirappalli City Municipal Corporation letter Roc.No.1228/2015/E7(Main) Dt: 05.03.2020.
2) Revenue Divisional Officer, Tiruchirappalli, letter No. Roc.No.A1/1702/2020 Dt : 22.09.2020.

—xx—

ORDER :

In the reference 1st cited, the Commissioner, Tiruchirappalli City Municipal Corporation has informed that the work of "Providing Under Ground Sewerage Scheme (Collection System) to Tiruchirappalli Corporation (Phase II – Package I) awarded to the Contractor M/s. Subbaya Construction Company Limited, Chennai.

The works, as per the project such as construction of Manhole, Sewage pumping stations, Lifting Stations and laying of sewer pipeline are in progress in the designed areas.

M/s SCCL, has submitted that during the earth work excavation in the following locations, hard rock is met with at 2m below the ground level and this hard rock has to be removed by controlled blasting method only. The contractor had requested permission for conducting controlled blasting wherever hard rocks are encountered.

The area covering under Package of work are as follows.

| Sl.No. | ZONE | WARD NO |
|--------|--------|--|
| 01. | ZONE-1 | 7(p), 28(p), 29(p) & 61(p) |
| 02. | ZONE-2 | 7(p), 27(p), 29(p), 30(p) & 32(p) |
| 03. | ZONE-3 | 7(p), 28(p), 29(p), 30(p), 32(p), 61(p), 62(p), 63(p), 64(p) & 65(p) |
| 04. | ZONE-4 | 29(p), 30(p), 32(p), 61(p), 62(p) & 63(p) |
| 05. | ZONE-6 | 30(p), 31(p) & 63(p) |

The Contractor M/s. Subbaya Construction Company Limited, Chennai has informed to the Municipal Corporation, Tiruchirappalli City that the blasting operation have to be conducted through following licensed holders.

- License No.E/SC/TN/30/1060 (E56261) (Licence Valid upto : 31.03.2021)
2. Thiru.S. Pandiyan, S/o. Shanmuganalkar, Tirupur,
Licence No.E/SC/TN/30/1974(E58391)
(Licence Valid upto : 06.04.2022)

The above contractor has proposed to conduct controlled blasting with the use of Gelatin sticks alone Necessary rubber strips and sand bags will be utilized for precautionary measures. The contractor has assured to take care of all necessary precautions for traffic and public safety during the blasting operation.

Further, the Corporation Commissioner has requested to grant permission for conducting controlled blasting operations through the License holders for the above requested areas with certain condition. The Revenue Divisional Officer, Tiruchirappalli and the Assistant Director(Mines), Tiruchirappalli have jointly inspected and recommended to grant permission with certain conditions.


Accordingly, on the request of the Commissioner, City Corporation, Tiruchirappalli and the recommendation of the Revenue Divisional Officer, Tiruchirappalli, Permission is hereby accorded to Tvi, Subbaya Constructions Company Limited for controlled blasting of hard rock through valid licence holder for the above area covered in Phase II – Package I subject to the following conditions.

1. The details of purchase and usage of Gelatin sticks to the project work is to be reported with in time every week to the inspection authorities.
2. If any accident and incident may occur, the contractor is whole responsible for it.
3. The contractor has to have comprehensive insurance coverage for all those engaged for this task.
4. Blasting materials should be purchased from the valid Licensed Seller.
5. All safety measures have to be taken and the operation have to be undertaken during the day hours.
6. Rock particles has to be handed over to the Assistant Director(Mines), Tiruchirappalli.
7. All precautionary measures have to be taken and protocols to be followed regarding Covid-19.

Sd/-S. Sivasean,
District Collector,
Tiruchirappalli.

//By Order//

For District Collector

To :-
The Commissioner, 
Tiruchirappalli City Corporation,
Tiruchirappalli.

Copy to the Revenue Divisional Officer, Tiruchirappalli for necessary action.

Copy to the Assistant Director Mines and Minerals, Tiruchirappalli for necessary action.

Copy to the Tvi.Subbaya Constructions Company Limited, New No.21 (Old No.25),
Soundrapandian Street, Ashok Nagar, Chennai – 600 083.

Appendix 11:
Clearances Obtained.
Consent to establish Permission from PCB for water and air:



TAMIL NADU POLLUTION CONTROL BOARD

Category of the Industry :

RED

CONSENT ORDER NO. 2001228988767 DATED: 13/02/2020.

PROCEEDINGS NO.T1/TNPCB/F.1311TRY/RL/TRY/A/2020 DATED: 13/02/2020

SUB: TNPC Board-Consent for Establishment-M/s. TRICHY CITY CORPORATION SEWAGE TREATMENT PLANT - KEELAKALKANDARKOTTAI , S.F. No. 81, KEELAKALKANDARKOTTAI village, Thiruverumbur Taluk and Thiruchirappalli District - for the establishment or take steps to establish the industry under Section 21 of the Air(Prevention and control of Pollution)Act,1981, as amended in 1987(Central Act. 14 of 1981)-Issued -Reg.

REF: 1. OCMMS application No:28988767 dated 27/11/2019
2.IR.No - F.1311TRY/RL/AE (M)/TRY/2020 dated 29/01/2020
3.Minutes of CCC vide Item No:266-12 dated 06/02/2020

Consent to establish or take steps to establish is hereby granted under Section 21 of the Air (Prevention and control of Pollution) Act,1981, as amended in 1987 and the Rules and Orders made there under to

THE COMMISSIONER,
M/s . TRICHY CITY CORPORATION SEWAGE TREATMENT PLANT - KEELAKALKANDARKOTTAI
S.F.No.81,
KEELAKALKANDARKOTTAI Village,
Thiruverumbur Taluk,
Thiruchirappalli District.

Authorizing occupier to establish or take steps to establish the industry in the site mentioned below:
S.F No. 81,
KEELAKALKANDARKOTTAI Village,
Thiruverumbur Taluk,
Thiruchirappalli District.

This Consent to establish is valid upto **March 31, 2024**, or till the industry obtains consent to operate under Section 21 of the Air (Prevention and control of Pollution) Act, 1981, as amended in 1987 whichever is earlier subject to special and general conditions enclosed.

**For Member Secretary,
Tamil Nadu Pollution Control Board,
Chennai**

To
THE COMMISSIONER,
M/s.TRICHY CITY CORPORATION SEWAGE TREATMENT PLANT - KEELAKALKANDARKOTTAI,
TRICHY CITY CORPORATION ,
BHARATHIDSAN SALAI, TIRUCHIRAPPALLI TALUK
TIRUCHIRAPPALLI DISTRICT,Thiruchirappalli District
Pin: 620001

This is computer generated order. Signature is not required. Π

Copy to:

- 1.The Commissioner, TIRUCHIRAPPALLI-Corporation, Thiruverumbur Taluk, Thiruchirappalli District .
2. The District Environmental Engineer, Tamil Nadu Pollution Control Board, THIRUCHIRAPPALLI.
3. The JCEE-Monitoring, Tamil Nadu Pollution Control Board, Tiruchirappalli.
4. File

SPECIAL CONDITIONS

1. This consent to establish is valid for establishing the facility for the manufacture of products/byproducts (Col. 2) at the rate (Col 3) mentioned below. Any change in the product/byproduct and its quantity has to be brought to the notice of the Board and fresh consent has to be obtained.

| Sl. No. | Description | Quantity | Unit |
|------------------------|---|----------|------|
| Product Details | | | |
| 1. | Treatment and disposal of 37 MLD of sewage generated from 12 wards of Trichy city corporation and STP employees | 37.0 | MLD |

2. This consent to establish is valid for establishing the facility with the below mentioned emission/noise sources along with the control measures and/or stack .Any change in the emission source/control measures/change in stack height has to be brought to the notice of the Board and fresh consent has to be obtained if necessary.

| I Point source emission with stack : | | | | |
|---|------------------------------------|--------------------------------|-------------------------------------|-----------------------------|
| Stack No. | Point Emission Source | Air pollution Control measures | Stack height from Ground Level in m | Gaseous Discharge in Nm3/hr |
| 1 | DG500 KVA | Acoustic enclosures with stack | 6 | 1368 |
| 2 | DG500 KVA | Acoustic enclosures with stack | 6 | 1368 |
| II Fugitive/Noise emission : | | | | |
| Sl. No. | Fugitive or Noise Emission sources | Type of emission | Control measures | |

3. **Additional Conditions:**
- The unit shall provide Air Pollution control /Acoustic measures as proposed and shall satisfy the ANL/AAQ/emission standards prescribed by the Board.
 - The unit shall construct compound wall of sufficient height around the STP site.
 - The unit shall provide water sprinkling arrangement in the site to avoid dust emission during construction.
 - The construction materials shall be covered during transport and the necessary water sprinkling arrangements shall be provided for hauling roads.
 - The unit shall take necessary precautionary measures so that the agricultural field around the site shall not get affected by any means during construction and operation of the sewage treatment plant.
 - The unit shall develop green belt in and around the unit premises and shall furnish exact greenbelt area earmarked/developed as per norms in the unit premises
 - In case of revision of consent fee by the government, the unit shall remit the difference in amount within one month from the date of notification. Failing to remit the consent fee, this consent order will be withdrawn without any notice and further action will be initiated against the unit as per law.
 - The unit shall not use 'use and throwaway plastics' such as plastic sheets used for food wrapping, spreading on dining table etc., plastic plates, plastic coated tea cups, plastic tumbler, water pouches and packets, plastic straw, plastic carry bag and plastic flags irrespective of thickness, within the industry premises. Instead it shall encourage use of eco friendly alternative such as banana leaf, arecanut palm plate, stainless steel, glass, porcelain plates/cups, cloth bag, Jute bag etc.,
 - The unit shall comply with the E- waste management Rules 2016. E- Waste as listed in Schedule-I, generated by them shall be channelized through collection centre or dealer of the authorised producer or dismantler or recycler or through designated take back service provider of the producer to authorised dismantler or recycler. The unit shall maintain records of e- waste generated by them in Form and make such records available for scrutiny by the TNPCB. The unit shall file annual returns in Form-3, to the TNPCB on or before the 30th day of the June following financial years.

For Member Secretary,
Tamil Nadu Pollution Control Board,
Chennai

GENERAL CONDITIONS

1. This consent to establish cannot be construed as consent to operate and the unit shall not commence the operation without obtaining the Consent to operate.
2. The applicant shall make a request for grant of consent to operate at least thirty days, before the commissioning of trial production.
3. Any Change in the details furnished in the conditions has to be brought to the notice of the Board and got approved by the Board, before obtaining consent to operate under the said Act.
4. The unit has to comply with the provisions of Public Liability Insurance Act, 1991 to provide immediate relief in the event of any hazard to human beings, other living creatures/plants and properties while handling and storage of hazardous substances (wherever applicable).
5. Consent to operate will not be issued unless the unit complies with the conditions of consent to establish.
6. The unit shall provide adequate water sprinklers for the control of dust emission during the loading and unloading of construction material so as to minimize the dust emission.
7. The unit shall provide water sprinklers along the temporary roads inside the premises to avoid fugitive dust emission during the vehicle movements.
8. The unit shall develop green belt of adequate width around the premises.
9. In case there is any change in the management, the unit shall inform the change with relevant documents immediately.

**For Member Secretary,
Tamil Nadu Pollution Control Board,
Chennai**

** This consent order is computer generated by OCMMS of TNPCB and no signature is needed**



TAMIL NADU POLLUTION CONTROL BOARD

Category of the Industry :

RED

CONSENT ORDER NO. 2001128988767 DATED: 13/02/2020.

PROCEEDINGS NO.T1/TNPCB/F.1311TRY/RI//TRY/W/2020 DATED: 13/02/2020

SUB: TNPC Board-Consent for Establishment-M/S TRICHY CITY CORPORATION SEWAGE TREATMENT PLANT - KEELAKALKANDARKOTTAI S.F No. 81, KEELAKALKANDARKOTTAI Village, Thiruverumbur Taluk, Thiruchirappalli District - for the establishment or take steps to establish the industry under Section 25 of the Water (Prevention and control of Pollution)Act,1974, as amended in 1988(Central Act 6 of 1974)- Issued- Reg.

REF: 1. OCMMS application No:28988767 dated 27/11/2019
2.IR.No : F.1311TRY/RI/AE (M)/TRY/2020 dated 29/01/2020
3.Minutes of CCC vide Item No:266-12 dated 06/02/2020

Consent to establish or take steps to establish is hereby granted under Section 25 of the Water (Prevention and control of Pollution) Act,1974, as amended in 1988(Central Act 6 of 1974) (hereinafter referred to as 'The Act') and the Rules and Orders made there under to

THE COMMISSIONER,

TRICHY CITY CORPORATION SEWAGE TREATMENT PLANT - KEELAKALKANDARKOTTAI

Authorizing occupier to establish or take steps to establish the industry in the site mentioned below:

S.F. No.81,

KEELAKALKANDARKOTTAI Village,

Thiruverumbur Taluk,

Thiruchirappalli District.

This Consent to establish is valid upto **March 31, 2024**, or till the industry obtains consent to operate under Section 25 of the Water (Prevention and control of Pollution) Act, 1974, as amended in 1988 whichever is earlier subject to special and general conditions enclosed.

**For Member Secretary,
Tamil Nadu Pollution Control Board,
Chennai**

To

THE COMMISSIONER,

M/s.TRICHY CITY CORPORATION SEWAGE TREATMENT PLANT - KEELAKALKANDARKOTTAI,

TRICHY CITY CORPORATION ,

BHARATHIDSAN SALAI, TIRUCHIRAPPALLI TALUK

TIRUCHIRAPPALLI DISTRICT,

Pin: 620001

Copy to:

- 1.The Commissioner, TIRUCHIRAPPALLI-Corporation, Thiruverumbur Taluk, Thiruchirappalli District .
2. The District Environmental Engineer, Tamil Nadu Pollution Control Board, THIRUCHIRAPPALLI.
3. The JCEE-Monitoring, Tamil Nadu Pollution Control Board, Tiruchirappalli.
4. File

This is computer generated order. Signature is not required. 1

CTO Renewal Copy of STP-37 MLD

Category of the Industry :

RED



CONSENT ORDER NO. 2508165006082 DATED: 07/05/2025.

PROCEEDINGS NO.F.1311TRY/RL/JCEE-M/TNPCB/TRY/W/2025 DATED: 07/05/2025

SUB: Tamil Nadu Pollution Control Board - RENEWAL OF CONSENT – M/s. TIRUCHIRAPPALLI CITY CORPORATION SEWAGE TREATMENT PLANT - KEELAKALKANDARKOTTAI , S.F.No. 81, KEELAKALKANDARKOTTAI village, Thiruverumbur Taluk and Thiruchirappalli District - Renewal of Consent for the operation of the plant and discharge of sewage and/or trade effluent under Section 25 of the Water (Prevention and Control of Pollution) Act, 1974 as amended in 1988 (Central Act 6 of 1974) – Issued- Reg. (Industry User ID- R19TRY28987498)

REF: 1.&Bd's Procs No. T6/TNPCB/F.1311TRY/RL//TRY/A/2023 DATED: 22/08/2023.
2.&Unit's OCMMS RCO Application No. 65006082 dated 13.02.2025.
3.&DEE, TRY IR.No : F.1311TRY/RL/AEE/TRY/2025 dated 11/04/2025.

RENEWAL OF CONSENT is hereby granted under Section 25 of the Water (Prevention and Control of Pollution) Act, 1974 as amended in 1988 (Central Act, 6 of 1974) (hereinafter referred to as "The Act") and the rules and orders made there under to

THE COMMISSIONER
M/s . TIRUCHIRAPPALLI CITY CORPORATION SEWAGE TREATMENT PLANT -
KEELAKALKANDARKOTTAI
S.F No. 81
KEELAKALKANDARKOTTAI Village
Thiruverumbur Taluk
Thiruchirappalli District.

Authorising the occupier to make discharge of sewage and /or trade effluent.

This is subject to the provisions of the Act, the rules and the orders made there under and the terms and conditions incorporated under the Special and General conditions stipulated in the Consent Order issued earlier and subject to the special conditions annexed.

This RENEWAL OF CONSENT is valid for the period ending **March 31, 2026**

SPECIAL CONDITIONS

1. This consent to establish is valid for establishing the facility for the manufacture of products/byproducts (Col. 2) at the rate (Col 3) mentioned below. Any change in the product/byproduct and its quantity has to be brought to the notice of the Board and fresh consent has to be obtained.

| Sl. No. | Description | Quantity | Unit |
|------------------------|---|----------|------|
| Product Details | | | |
| 1. | Treatment and disposal of 37 MLD of sewage generated from 12 wards of Trichy city corporation and STP employees | 37.0 | MLD |

2. The unit shall provide Sewage Treatment Plant and /or Effluent Treatment Plant as indicated below.

| a Sewage Treatment Plant: | | | |
|--|--|--------------|----------------------|
| Treatment status: Individual STP | | | |
| SL. No. | Name of the Treatment Unit | No. of Units | Dimensions in metres |
| 1. | Receiving Chamber | 1 | 4.3M x 4.5M X 3.5M |
| 2. | Coarse Bar Screen Mechanical | 1 | 3.8 Mx1.35 M x1.5 M |
| 3. | Coarse Bar Screen Manual | 1 | 3.8Mx1.3Mx1.5M |
| 4. | Fine Bar Screen Mechanical | 1 | 3.8Mx1.3Mx1.5M |
| 5. | Fine Bar Screen Manual | 1 | 3.8Mx1.3Mx1.5M |
| 6. | Detritor | 2 | 8.5Mx8.5Mx1.3M each |
| 7. | Sequential Batch Reactor (SBR) | 4 | 36Mx30Mx5.8M each |
| 8. | Air Blower | 1 | 24Mx7Mx5M |
| 9. | Thickener feed sump | 1 | 5Mx4Mx3.5M |
| 10. | Gravity Sludge Thickener | 1 | Dia 16 M x 4.0 M H |
| 11. | Centrifuge feed sump/Thickened Sludge sump | 1 | 3.2Mx3.2Mx3.5M |
| 12. | Centrifuge unit | 1 | 7.5Mx5Mx4.5M |
| 13. | Chlorine Contact Tank | 1 | 27Mx10Mx3.5M |
| 14. | Chlorine Dosing system unit | 1 | 12Mx7.5Mx5M |
| 15. | Treated sewage water sump | 1 | 10Mx8.5Mx3.3M |
| b Effluent Treatment Plant: | | | |
| Treatment status: No trade effluent and hence does not arise | | | |
| SL. No. | Name of the Treatment Unit | No. of Units | Dimensions in metres |
| 1. | | | |
| 2. | | | |

3. This consent to establish is valid for establishing the facility with the below mentioned outlets for the discharge of sewage/trade effluent. Any change in the outlets and the quantity has to be brought to the notice of the Board and fresh consent has to be obtained.

| Outlet No. | Description of Outlet | Maximum daily discharge in KLD | Point of disposal |
|---------------------------------------|-----------------------|--------------------------------|--------------------------------------|
| Effluent Type : Sewage | | | |
| 1. | Treated Sewage | 37000.0 | Uyyankondan canal at Alathur village |
| Effluent Type : Trade Effluent | | | |

4. **Additional Conditions:**

1. The unit shall provide sewage treatment plant as proposed and shall provide RO system with Reject management System.
 2. The unit shall submit proposal for RO system with Reject management system and for the utilization of RO permeate for beneficial purpose instead of discharging in to Uyyankondan Canal within three months.
 3. The unit shall explore the possibility of providing alternate treatment system instead of Chlorination.
 4. The STP plant shall be designed to achieve the STP standards prescribed by the Hon'ble NGT(PB) in order dt. 30.04.2019 in O.A. No.1069/2018 which are as follows:
S.No. Parameter Standards
(Applicable to all mode of disposal)
 1. pH 5.5 – 9
 2. BOD 10
 3. TSS 20
 4. COD 50
 5. Nitrogen – Total 10
 6. Phosphorus-Total(for discharge into ponds, lakes) 1
 7. Fecal Coliform (FC)(Most probable Number per 100 milli litre, MPN/100 ml) Desirable – 100
Permissible - 230
- Note :
- i. All value in mg/l except for pH and Fecal Coliform
 - ii. These standards will be applicable for discharge into water bodies as well as for land disposal/applications.
 - iii. Reuse/Recycling of treated effluent shall be encouraged.
5. The unit shall provide electro magnetic flow meter at the inlet and outlet of the STP and connect the same to the WQW centre, TNPCB, Chennai.
 6. The unit shall provide online continuous effluent monitoring system for the parameters pH, TSS and BOD at the inlet and outlet of the STP and connect the same to the WQW, TNPCB, Chennai.
 7. The unit shall provide 4 Nos of CCTV camera focusing the primary, secondary and tertiary treatment and connect the same to the WQW, TNPCB, Chennai.
 8. The unit shall not invite complaints from the near by public and farmers
 9. The unit shall not dispose the untreated/ partially treated/ treated sewage into the irrigation drains, nearby land and water sources nearby.
 10. The unit shall analyze quality of ground water in and around the STP site before commissioning of the STP as baseline data to assess the ground water quality in that area.
 11. The unit shall provide monitoring wells to assess the ground water quality before and after commissioning of the project in the area.
 12. The unit shall closely monitor the conveyance system of raw sewage to avoid leakages.
 13. The unit shall submit stability certificate for the sewage treatment plant structures.

**For Member Secretary,
Tamil Nadu Pollution Control Board,
Chennai**

CTO Conditions

SPECIAL CONDITIONS

1. This renewal of consent is valid for operating the facility for the manufacture of products/byproducts (Col. 2) at the rate (Col 3) mentioned below. Any change in the product/byproduct and its quantity has to be brought to the notice of the Board and fresh consent has to be obtained.

| Sl. No. | Description | Quantity | Unit |
|------------------------|---|----------|------|
| Product Details | | | |
| 1. | Treatment and Disposal of 37 MLD of Sewage generated from 12 Wards of Trichy City Corporation | 37 | MLD |

2. This renewal of consent is valid for operating the facility with the below mentioned outlets for the discharge of sewage/trade effluent. Any change in the outlets and the quantity has to be brought to the notice of the Board and fresh consent has to be obtained.

| Outlet No. | Description of Outlet | Maximum daily discharge in KLD | Point of disposal |
|---|-----------------------|--------------------------------|-------------------------------------|
| Effluent Type : Sewage | | | |
| 1. | Treated Sewage | 37000.0 | Uyyakondan Canal at Alathur Village |
| Effluent Type : Trade Effluent - NIL | | | |

Special Additional Conditions:

The unit shall obtain No Objection Certificate (NOC) from the Tamil Nadu Bio Diversity Board /National Bio Diversity Authority if the unit is using any Biological resources or knowledge associated thereto as per the provisions of Biological Diversity Act 2002.

The industries shall take all efforts to use and popularize "Mission LiFE" logo and mascot which is available in TNPCB & MoEFCC website. They shall also request their employees to adopt "Mission LiFE" action points and document the same and furnish half yearly report to Board.

Additional Conditions:

- 1.&The Sewage Treatment Plant (STP) shall be operated efficiently and continuously for the treatment of sewage so as to bring the quality of treated sewage to achieve the discharge standards prescribed by the Board at all times before discharge into Uyyankondan Canal.
- 2.&The unit shall ensure that no flooding / stagnation of treated / untreated sewage occurs within the STP site under any circumstances.
- 3.&The unit shall ensure that mechanical cleaning of STP components is adopted at all times with all safety precautions.
- 4.&The solid waste viz bio degradable & non bio degradable, treatment sludge, etc. generated during operation of the STP shall be properly collected, segregated and disposed as per the provision of Solid Waste (Management and Handling) Rules, 2016.
- 5.&EMFMs provided at the inlet and outlet of the STP with computer recording arrangement shall be operated and maintained for measurement of sewage flow continuously.
- 6.&The unit shall ensure that the treated sewage samples are collected once in a month and analyzed through TNPCB Laboratory and furnish the report of analysis to the Board, regularly.
- 7.&The Sewage Treatment Plants shall achieve the STP standards prescribed for discharge of treated sewage into water bodies at Mega & Metropolitan Cities by the Hon'ble NGT order dated 30/04/2019 in O.A.No.1069/2018 as "pH (5.5 - 9.0), BOD (10 mg/l), TSS (20 mg/l), COD (50 mg/l), Nitrogen -Total (10 mg/l), Phosphorus -Total (1.0 mg/l), Fecal Coliform MPN/100 ml (Desirable 100, Permissible 230).
- 8.&The unit shall connect, operate and maintain the Online Continuous Effluent Monitoring System (OCEMS) provided for the treated sewage parameters such as pH, Total Suspended Solids, COD, BOD and Flow with WQW/ TNBPCB as directed by Central Pollution Control Board.
- 9.&The treated sewage shall be discharged only after proper disinfection.
- 10.&The operation of STP shall not create any adverse impact on the environment under any circumstances.
- 11.&The workers involved in the operation / maintenance/cleaning have to obtain 'work permit system' issued by competent authority and possess required educational qualification / experience in safety / protection aspects.
- 12.&The workers shall be trained periodically on the necessity to use personal protective equipment's (PPE) and take adequate safety precautions while carrying out de-sludging, dewatering, cleaning operation and other maintenance operation.
- 13.&Ground water sample in the treated sewage disposal surrounding area shall be analysed periodically and submit the report of analysis.
- 14.&It shall be ensured that the operation of STP does not attract any public complaints.
- 15.&It shall be ensured that all the units of STP are kept open to the atmosphere and not to be confined / covered.
- 16.&The stability of the STP does not falls under the purview of the TNPC Board.
- 17.&The unit shall closely monitor the conveyance system of raw sewage to avoid leakages.
- 18.&The unit shall not use "use and throwaway plastics" such as plastic sheets used for food wrapping, spreading on dining table etc., plastic plates, plastic coated tea cups, plastic tumbler, water pouches and packets, plastic straw, plastic carry bags and plastic flags irrespective of thickness, within the industry premises. Instead unit shall encourage use of eco-friendly alternative such as banana leaf, arecanut palm plate, stainless steel glass, porcelain lates/cups, cloth bag, jute bags etc.,
- 19.&In case of revision of consent fee by the Government, the unit shall remit the difference in amount within one month from the date of notification. Failing to remit the consent fee, this consent order will be withdrawn without any notice and further action will be initiated against the unit as per law.

To
THE COMMISSIONER,
M/s.TIRUCHIRAPPALLI CITY CORPORATION SEWAGE TREATMENT PLANT -
KEELAKALKANDARKOTTAI,
TIRUCHIRAPPALLI CITY CORPORATION ,
BHARATHIDSAN SALAI, TIRUCHIRAPPALLI TALUK
TIRUCHIRAPPALLI DISTRICT
Pin: 620001

Copy to:

1. The Commissioner, TIRUCHIRAPPALLI-Corporation, Thiruverumbur Taluk, Thiruchirapalli District .
 2. Copy submitted to the Member Secretary, Tamil Nadu Pollution Control Board, Chennai for favour of kind information.
 3. The District Environmental Engineer, Tamil Nadu Pollution Control Board, THIRUCHIRAPALLI for favour of kind information.
 4. File
-

Appendix- 12 Permission from ASI and PWD

Page 1 of 2

வினாவு அஞ்சல்
021856601
15/6/2020

F. No. T-19034/26/2019-M
Government of India
Archaeological Survey of India

Speed Post



To,
The Superintending Archaeologist,
Archaeological Survey of India,
Chennai Circle, Chennai

Subject:- The proposal in respect of the Commissioner, Tiruchirapalli City Corporation, Tiruchirapalli for providing Sewerage collection system in the extended area of Corporation for UGSS in Tiruchirapalli under AMASR Act- regarding

Sir,

With reference to your letter no. 1/37/Tech/NMA/2018-19-749 dated 26.03.2019 on the subject cited above, I am to communicate the approval of the Competent Authority for providing underground Sewerage system in the protected area of Shiva Temple (Erumbisvara temple) subject to following condition:-

1. The work should be executed under the close supervision of SA Chennai Circle or any official from the circle to ensure that no archaeological remain , over the ground or under the ground is damaged.
2. The excavation/digging for laying the drain pipeline shall be undertaken by traditional method without use of heavy machinery.
3. No machine shall be used for carrying out the work in protected area.
4. If any ancient structure comes across during the excavation, the work shall be stopped immediately and the proper documentation shall be done.
5. If any statue or antiquity is recovered from the construction site, the same shall be kept in safe custody of SA, Chennai Circle.
6. The execution of the work of manholes should be constructed such a manner so as to gel with the overall ambience of the monument by resorting to selection of material, texture and colour.
7. While constructing the drain adequate measures must be taken to ensure that the area immediately beyond the drain on either sides does not get any effect of dampness.
8. It should be ensured that no damage is caused to monument or ancient structure under and above the ground .
9. No blasting operation shall be carried out in the protected area.

Further , it is stated that some encroachments have been noticed in the protected area of the said monument. Therefore you are requested to initiate urgent action against the offenders/encroachers for removal of encroachments.

https://asi.eoffice.gov.in/eFile/?x=*Lx7sjLY1d80a40OpRrUBVOKGsx0eBjy

6/10/2020

Yours faithfully,
Arvin Manjul
(Arvin Manjul)
10.6.2020
Director (Monuments-II)

✓ Copy to:- The Commissioner, Tiruchirapalli City Corporation, D.No. 58, Bharathidasan Salai,
Tiruchirapalli- 620001 for information and necessary action and also with the request to
remove the encroachment from protected area of the monument before take up the work.

F. No. 2-8/1106/2018-NOC/NMA
Government of India
Ministry of Culture
National Monuments Authority

24, Tilak Marg, New Delhi-110001
Dated: 12.05.2020

(3)

To

The Competent Authority (Southern Region)
Archaeological Survey of India
Chennai Circle, Fort St. George,
Chennai-600009.

Encl



Sub.: NOC to The Commissioner, Tiruchirappalli City Corporation, The Commissioner, Tiruchirappalli City Corporation, D. no. 58, Bharathidasan Salai, Tiruchirappalli- 620001, for Providing Sewerage Collection for Underground Sewerage scheme in Tiruchirappalli Corporation.- reg.

Madam,

This is in response to your letter F. No: 1235/NMA/CA (TN) 2018/1092 dated 25.02.2020 on the subject cited above.

In this context, I am directed to enclose herewith the recommendation of the National Monuments Authority given in its 267th meeting held on 18th March, 2020, for grant of permission, in the regulated area of the "Siva Temple", Tamilnadu declared as monument of national importance under Ancient Monuments and Archaeological Sites and Remains Act, 1958. The NOC is recommended to be granted with the terms and conditions mentioned in the report of CA, Chennai.

The recommendation of the authority and grant of permission by the C.A. is subject to the applicant obtaining other required clearances/NOCs from relevant agencies.

A copy of the approved building plan with the approved area marked in Red and certified by NMA is also enclosed herewith.

Encl.: As above.

Yours faithfully,

(AMAR MUDI)
Director (Consultant)
Tel No.- 011-23004694

Copy to:

1. The Director General, Archaeological Survey of India, 24, Tilak Marg, New Delhi-110001.
2. The Superintending Archaeologist, ASI, Chennai Circle, Chennai, Fort St. George, Chennai – 600009 (Tamilnadu) ; with the request to monitor the proposed construction work on the basis of the authenticated architectural drawing as approved by NMA.
3. The Commissioner, Tiruchirappalli City Corporation, D. no. 58, Bharathidasan Salai, Tiruchirappalli- 620001, This is for information only. The sanction copy will be issued by Competent Authority.



Initial Environmental Examination

PUBLIC

February 2026

India: Tamil Nadu Urban Flagship Investment Program- Tranche 1

Subproject: Tiruchirappalli Underground Sewerage System
Part 2 of 2: Annexures

Prepared by Tiruchirappalli City Corporation for the Asian Development Bank (ADB). This is an updated version of the draft Initial Environmental Examination originally posted in May 2018 available on <https://www.adb.org/projects/documents/ind-49107-004-iee-2>.

Asian Development Bank

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Permission from PWD

PWD/WRD

FROM
R.Baskar,
Executive Engineer,PWD,
R.C.Division,
Trichy-01.

TO
The Commissioner,
Trichy City Corporation,
Trichy.

Lr.No. ~~12.44~~ 2019 / F.16074 Date. ~~2.1.2020~~
~~12.19~~

Sir,

Sub: UGSS - Tiruchirappalli City Corporation - Phase - II Package-3 Effluent discharge to Uyyakondan river - Permission from PWD Report submitted - Regarding.

Ref:

1. The Commissioner, Trichirappalli City Corporation, Trichy Roc.No.1228/2015/E7/(Main)/dated.28.8.19.
2. The Assistant Executive Engineer, PWD, R.C.Sub Division,Trichy Lr.No.F24/ 2019/AEE(Trichy)/Dt.21.10.19.
3. This office Lr.no:782M/2019/F.160C/D1/Dated. 04.11.2019
4. The Commissioner, Trichirappalli City Corporation, Trichy Roc.No.1228/2015/E7/(Main)/dated. 27.11.19.
5. The Assistant Executive Engineer, PWD, R.C.Sub Division,Trichy Lr.No.F24/ 2019/AEE(Trichy)/Dt.26.12.19.

With reference to the above subject the Commissioner, Trichy City Corporation has assured in the reference 4th cited that on completion of the sewage treatment plant project all the sewage entry points will be plugged and no raw sewage will be let into the Uyyakondan Channel in the City limit and from Palpannai to Alathur Village.

Based on the assurance of the Commissioner and the recommendation of the AEE, R.C.Sub Division, Trichy permission is granted under the following conditions for the proposed treated sewage let into the Uyyakondan channel on the LB @ LS 27/1 mile in Alathur Village of Trichy East Taluk at the rate of 37 MLD (15.10 cusecs) with the permissible parameters of the TNPCB after considering that the treated water may be utilized for irrigation.

Scanned with CamScanner

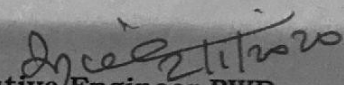
- 1) Cross masonry structures with necessary shutter arrangements should be constructed at the inlet point of the treated sewage in to the Uyyakondan Channel. All such constructions should be, got approved by the Executive Engineer, PWD, WRD, River Conservancy Division, Tiruchirappalli well in advance and constructed to the fully satisfaction of P.W.D. Officers.
- 2) The arrangements for drainage and the construction on the Canal Uyyakondan margin shall be got approved by the Executive Engineer, PWD, WRD, River Conservancy Division, Trichirappalli-01.
- 3) No damages should be caused to the bank of canal Uyyakondan (or) its distributaries jeep track during the process of laying pipe lines. If any damages are caused, it should be rectified by the Trichy City Corporation
- 4) Any law and order issues if arrises due to entering of treated effluent in to the canal should be solved by Trichy City Corporation only.
- 5) The Trichy City Corporation/Agency shall agree that they will, allow the Executive Engineer, PWD, WRD, River Conservancy Division, Tiruchirappalli-1 or his authorized representatives to inspect the said S.T.P at any time.
- 6) The report containing the amount of treated sewage effluent discharged in to the channel, and its physical, chemical and Biological properties should be furnished monthly and the samples may be collected monthly and it should be tested and certified from the Government approved laboratory. The lab reports also to be submitted monthly.
- 7) The Trichy City Corporation / Agency shall comply with the decisions and instructions of the Executive Engineer, Water ResourceDepartment, River Conservancy Division, Trichirappalli who has jurisdiction over the Canal Uyyakondan in this matter.
- 8) PWD/WRD department officials will inspect the sewage treatment plant and if found that the treated sewage effluent discharging is not within permissible limits, then the discharging treated effluent should be stopped immediately.
- 9) The City Corporation should co-operate in removal of growth of unwanted weeds and vegetation inside the channel grown due to sewage water.

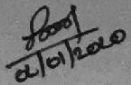
- 10) The permission is liable to be withdrawn by the PWD.WRD at any time without any previous notice to the City Corporation, without assigning any reasons there for.
- 11) The Laying of discharge pipe lines from the sewage treatment plant to the Inlet point of Uyyakondan channel should not be laid in any channel or any water bodies. The City Corporation officials should ensure the path of pipe carrying treated sewer line in this regard.
- 12) Responsibility of Operation and Maintenance of all units of Sewage Treatment plant should be given to one agency after completion of the maintenance period of present agency.
- 13) The City Corporation of Trichy may analyze the potential of the dried sludge generated from STP's as Manure and should encourage its use in agricultural land as soil conditioner.
- 14) The City Corporation of Trichy should maintained the drain leads to the Uyyakondan canal in their presence and to be kept clean and it should only allow the treated water from the STP without any obstruction.
- 15) The City Corporation would be responsible for proper operation and maintenance of this new STP. The new STP being constructed now shall ensure that they are capable of treating fecal Coliform Bacteria and also suitable for irrigation purpose.
- 16) Drains carrying sewage in any of the wards/towns forming part or segment of Phase-II would not be permitted to join the Uyyakondan channel and its tributaries. All the drains shall be tapped and the sewage from these drains should connect to this STP. The PWD/WRD concerned will block the discharge of any sewage or any untreated effluent into the channel. If any problem arises in Public due to blocking of sewage entry the City Corporation should solve the issues.
- 17) Every Officer / Engineer for this STP in the Trichy City Corporation responsible of maintaining and operating the STP would be individually responsible for any discrepancy, if the released sewage treated effluent is found to be beyond the limit of Permissible factors.
- 18) The team comprises of District Administration, PWD/WRD, TNPCB, Trichy City Corporation shall inspect the sewage treatment plant periodically (monthly) and collect the treated effluent samples at

frequent intervals and analysis may be done. The TNPCC may furnish the Parameters are found within the permissible limits.

- 19) The Trichy City Corporation will enter into the Mou (Memorandum of understanding) with the Government before proceeding with the construction of drainage treated sewage let into the Canal Uyyakondan.
- 20) INSPECTION OF RECORDS: The officers of the Public Works Department and Revenue Department not lower in rank of Assistant Engineer / Junior Engineer and Revenue Inspector respectively shall have the right to inspect the meter, pipes and accounts at any time to see whether the conditions of the Mou are kept up.
- 21) In case of any further continued violation by the City Corporation/Agency in the matter of drainage treated sewage and effective treatment and disposal of effluent, the authorities shall have the final option of instructing to cut off supply to the Canal Uyyakondan.

The Trichy City Corporation/Agency shall obtain the permission of the Water Resources Department, Revenue Department or any other concerned Government Departments for the occupation of Government lands to the extent that becomes inevitable and pay the lease amounts, rack rent etc., fixed by the authorities/department concerned.


Executive Engineer, PWD,
R.C. division, Trichy.1.


a/a/halo



Initial Environmental Examination

PUBLIC

February 2026

India: Tamil Nadu Urban Flagship Investment Program- Tranche 2

Subproject: Tiruchirappalli Underground Sewerage System

Prepared by Tiruchirappalli City Corporation for the Asian Development Bank (ADB). This is an updated version of the draft Initial Environmental Examination originally posted in July 2019 available on <https://www.adb.org/projects/documents/ind-49107-005-iee-3>.

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SFG Log: 6887

Initial Environmental Examination

Document Stage: UpdatedDraft

Project Number: 49107-005

November 2025

IND: Tamil Nadu Urban Flagship Investment Program (Tranche 2) – Underground Sewerage System in Tiruchirappalli City

Prepared by Tiruchirappalli City Corporation for the Asian Development Bank. This initial environmental examination is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, of staff and may be preliminary in nature. Your attention is directed to the "terms of use" section on ADB's website.

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CURRENCY EQUIVALENTS

(as of 4th November 2025)

| | | |
|---------------|---|------------------|
| Currency Unit | – | Indian rupee (₹) |
| ₹1.00 | – | \$0.0118 |
| \$1.00 | = | ₹ 88.7 |

ABBREVIATIONS

| | | |
|------|---|--|
| ADB | – | Asian Development Bank |
| ASI | – | Archeological Survey of India |
| CI | – | Cast Iron |
| CMSC | – | Construction Management and Supervision Consultant |
| CPCB | – | central pollution control board |
| CTE | – | Consent to establishment |
| CTO | – | consent to operation |

| | | |
|---------|---|--|
| DWC | – | double wall corrugated |
| EAC | – | expert appraisal committee |
| EHS | – | environmental health and safety |
| EIA | – | environmental impact assessment |
| EMP | – | environmental management plan |
| ESS | – | environmental and social safeguards |
| GOTN | – | Government of Tamil Nadu |
| IEE | – | initial environmental examination |
| MOEFCC | – | Ministry of Environment, Forest and Climate Change |
| NOC | – | no objection certificate |
| PIU | – | program implementation unit |
| PMU | – | program management unit |
| REA | – | rapid environmental assessment |
| ROW | – | right-of-way |
| SEIAA | – | State Environmental Impact Assessment Authority |
| SIDCO | – | Small Industries Development Corporation |
| SPS | – | Safeguard Policy Statement, 2009 |
| STP | – | sewage treatment plant |
| TCC | – | Tiruchirappalli City Corporation |
| TNPCB | – | Tamil Nadu Pollution Control Board |
| TNUFIP | – | Tamil Nadu Urban Flagship Investment Program |
| TNUIFSL | – | Tamil Nadu Urban Infrastructure Financial Services Limited |
| TWADB | – | Tamil Nadu Water and Drainage Board |
| WHO | – | World Health Organization |
| WTP | – | Water TreatmentPlant |

WEIGHTS AND MEASURES

| | | |
|-----------------|---|---------------------------|
| °C | – | degree Celsius |
| km | – | kilometer |
| lpcd | – | liters per capita per day |
| m | – | meter |
| Mgd | – | million gallons per day |
| MLD | – | million liters per day |
| mm | – | millimeter |
| km ² | – | square kilometer |

NOTE

In this report, "\$" refers to United States dollars.

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EXECUTIVE SUMMARY

On 28 September 2018, the Asian Development Bank (ADB) approved a multi tranche financing facility (MFF) for the Tamil Nadu Urban Flagship Investment Program (TNUFIP) for an amount not exceeding \$500 million. The program will develop priority water supply, sewerage, and drainage infrastructure in at least 10 cities in strategic industrial corridors in Tamil Nadu. The Municipal Administration and Water Supply Department (MAWS), acting through Tamil Nadu Urban Infrastructure Financial Services Limited (TNUIFSL), is the executing agency. Urban local bodies (ULBs) are the implementing agencies for the subprojects. Project 2 will support priority water supply and/or sewerage infrastructure in five cities (Ambur, Madurai, Tiruchirappalli, Tiruppur, Vellore) and governance improvement in 10 project ULBs.

The Subproject. The subproject on underground sewerage system (UGSS) is proposed to be implemented in Tiruchirappalli, which is one of the largest city in the state of Tamil Nadu. Under the Phase II UGSS scheme, a section of the Tiruchirappalli City is already covered under ongoing UGSS subproject in TNUFIP Tranche 1. In the remaining areas, the provision for UGSS has been proposed under the ADB-funded TNUFIP Tranche 2. These areas are located in eastern, southern and south-western part of the Tiruchirappalli City Corporation (TCC). The subproject under Phase III of UGSS of TCMC includes the following project components as per site conditions: (i) sewage collection system (300.445 kilometers [km] length of sewers and 11976 manholes), (ii) 24 lift stations, (iii) 6 pump stations, (iv) 32 km length pumping main sewers, and (vii) 37061 house service connections. Treatment facility (STP) to treat collected wastewater is already proposed and considered in Phase II UGSS scheme.

Program implementation arrangements. The MAWS of the Government of Tamilnadu acting through the TNUIFSL is the state-level executing agency. A program management unit (PMU) will be established in TNUIFSL headed by a Project Director and Deputy Project Director (senior official from Commissionerate of Municipal Administration, CMA), and comprising dedicated full-time staff from TNUIFSL for overall project and financial management. The implementing agencies are project ULBs. The TCC is the implementing agency for this subproject. A program implementation unit (PIU) is established in TCC headed by a full-time Project Manager (executive engineer or above) and comprising dedicated full-time staff of the TCC for day-to-day implementation of the subproject. PIU is assisted by Construction Management and Supervision Consultant (CMSC) in implementation. Environmental and Social Safeguards (ESS) Managers in PMU/TNUIFSL coordinates all the safeguard related activities of the subproject and ensure the compliance with the environmental management plan (EMP) and environmental assessment review framework (EARF). Environmental Specialist of the CMSC assists PIU in implementation of subproject in compliance with EMP and EARF, and carries out all necessary tasks.

Screening and assessment of potential impacts. ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS), 2009. As per the Government of India environmental impact assessment (EIA) Notification, 2006, this subproject does not require EIA study or Environmental Clearance. The potential environmental impacts of the subproject have been assessed using ADB rapid environmental assessment (REA) checklist for Sewerage. The potential negative impacts were identified in relation to pre-construction, during construction and operation phases.

Categorization. Based on results of the assessment and ADB SPS, 2009, the subproject is classified as environmental category "B", i.e., the subproject is judged to be unlikely to have significant environmental impacts and accordingly, this initial environmental examination (IEE) is prepared.

Description of the Environment. Subproject components are located in Tiruchirappalli City, an urban area surrounded by land that was converted for agricultural use many years ago. Tiruchirappalli is bound on the north by Namakkal District, northeast by Perambalur District, east by Thanjavur District, southeast by Pudukottai District, south by Sivaganga and Madurai Districts, southwest by Dindigul District and on the west by Karur District. The city is known for its educational institutions, industries, temples, commercial and tourist hub of Tamil Nadu. The most prominent landmark is the Archeological Survey of India (ASI) protected Rock Fort Temple and Erumbeeswarar Temple.

The district has a tropical climate. The normal annual rainfall over the district varies from about 730 millimeter (mm) to about 900 mm. Tiruchirappalli falls under Cauvery River Basin. The Cauvery River is the most important River in the district and the tributaries of Cauvery, i.e., Coleroon River, Koraiyar river, Ariyar, Malattar channel and Uyyakondan canal also drain in Tiruchirappalli. The river splits into two branches, the northern branch being called the Coleroon (Kollidam) and the southern branch called Cauvery River. Ponnaniar, Uppamodai and Siddhayalli reservoirs are mainly used for irrigation purposes in this region. All the channels except Cauvery are ephemeral in nature. With respective seismicity, as per the Modified Mercalli (MM) intensity scale, which measures the impact of the earthquakes on the surface of the earth, the subproject area comes under Low Damage Risk Zone II. There are no sensitive areas like forest or protected areas in the project area or nearby project area.

Potential environmental impacts and mitigation measures. The subproject is unlikely to cause significant environmental impacts because: (i) the components will involve straightforward construction and operation, so impacts will be mainly localized; (ii) there are no significant sensitive environmental features in the project sites; and (iii) predicted impacts are site-specific and likely to be associated with the construction process are produced because the process is invasive, involving excavation and earth movements and control blasting in some stretches along the alignment.

In this updated IEE, negative impacts were identified in relation to pre-construction, during construction, and operation phases. Planning principles and design considerations have been reviewed and incorporated into the site planning and design process wherever possible to minimize the environmental impacts. Sewage pumping and lifting stations are likely to generate odor. Lifting stations are comparatively small, handle low volumes of sewage, and therefore odor nuisance is limited. Although utmost care is taken to locate pumping and lifting stations away from the households, due to design considerations and land constraints, the SPS-5 at Indira Nagar, and SPS-7 at Lurdhu Nagar sites are located close to the households. A portion of the UGSS (3.8 km of sewer collection system, 550 m of pumping main, and one pumping station) will be located in the 300 m regulated zone of the ASI site.

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, which includes, odor control measures, appropriately locating sewage wells within site as far as away from the households/ residential areas, developing tree cover, closed facilities, gas collection and treatment facilities, design and operation measures to prevent odor build up, adopting standard operating procedures for operation and maintenance, imparting necessary training, safety and personal protection equipment for workers, etc. For the works within the 300 m ASI regulated zone ASI permit has been obtained and works will be implemented ensuring mitigation measures.

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) are 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, occupation health and safety aspects. Sewer works are conducted along public roads in an urban area congested with people, activities and traffic. Therefore sewer works may have adverse, but temporary 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; with some sections involving controlled blasting; especially in narrow roads, 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 that are suggested in the EMP.

Environmental Management Plan. An EMP has been developed to provide mitigation measures to reduce all negative impacts to acceptable levels, along with the delegation of responsibility to appropriate agency. Hard Rock removal through controlled blasting for excavation has been identified for some sections of the pipeline alignment and in the pumping station sites. Mitigation measures to ensure safety during the implementation have been included in the EMP. As stated above, various design related measures are already included in the project design. During construction, the EMP includes mitigation measures such as (i) selection of construction methodology near protected monuments in discussion with the ASI, having the excavation observed by person with archaeological knowledge for chance finds, etc.; (ii) proper planning of sewer works to minimize the public inconvenience; (iii) barricading, dust suppression and control measures; (iv) traffic management measures for works along the roads and for hauling activities; (v) provision of walkways and planks over trenches to ensure access will not be impeded; and (vi) finding beneficial use of excavated materials to extent possible to reduce the disposal quantity. EMP will guide the environmentally-sound construction of the subproject. EMP includes a monitoring program to measure the effectiveness of EMP implementation and include observations on- and off-site, document checks, and interviews with workers and beneficiaries.

The EMP is included in the bid and contract documents to ensure compliance with the conditions set out in this document. The contractor is to submit PIU, for review and approval, an updated EMP / site environmental management plan (SEMP) including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; and (iii) monitoring program as per EMP. No works are allowed to commence prior to approval of SEMP. A copy of the EMP/approved SEMP are kept on site during the construction period at all times.

Consultation, disclosure and grievance redress mechanism. The stakeholders were involved in developing the IEE through discussions on-site and a public consultation workshop at city level, after which views expressed were incorporated into the IEE and in the planning and development of the project. The IEE will be made available at public locations and will be disclosed to a wider audience via the ADB, TCC and TNUFSL websites. The consultation process are continued during project implementation as required. The stakeholders were involved in developing the updated IEE through on-site discussions within the limitations imposed by the district authorities during on-going corona virus disease(COVID-19) Pandemic. The consultation process will be further strengthened after relaxation of present restrictions due to COVID-19 pandemic and continued thereafter during project implementation. A grievance redress mechanism (GRM) described within the IEE has already been made fully functional to ensure quick redressal of public grievance.

Monitoring and Reporting. Contractor is submitting a monthly EMP implementation report to PIU. PIU, with the assistance of CMSC, PIU to monitor the compliance of Contractor, prepare a quarterly environmental monitoring report (QEMR) and submit to PMU. The PMU oversees the implementation and compliance, and submits Semi-Annual Monitoring Reports to ADB. ADB will

post the environmental monitoring reports on its website. Monitoring reports will also be posted on TCC and TNUIFSL websites.

Conclusions and Recommendations. Therefore, as per ADB SPS, this subproject is classified as environmental category “B” and does not require further environmental impact assessment. TCC has to obtain permission from ASI for the subproject components falling within 300 m regulated area of the Erumbeeswarar Temple, an ASI monument. Further, TCC has to carry out the Corrective Action Plan as suggested in the IEE based on the environmental audit of the existing STP, which is an associated facility for the subproject. This IEE is updated by PIU based on final design during construction stage and incorporating details of controlled blasting will be reviewed and approved by PMU. The updated IEE is submitted to ADB for concurrence and disclosure.

I. INTRODUCTION

A. Background

1. On 28 September 2018, the Asian Development Bank (ADB) approved a multitranche financing facility (MFF) for the Tamil Nadu Urban Flagship Investment Program (TNUFIP) for an amount not exceeding \$500 million. The program will develop priority water supply, sewerage, and drainage infrastructure in at least 10 cities in strategic industrial corridors in Tamil Nadu. The Municipal Administration and Water Supply Department (MAWS), acting through Tamil Nadu Urban Infrastructure Financial Services Limited (TNUIFSL), is the executing agency. Urban local bodies (ULBs) are the implementing agencies for the subprojects.

2. The Government of India is expected to submit a second periodic financing request (PFR) to ADB on 15 June 2019 for a loan amount of \$206 million. The request was planned in the country operations business plan. Project 2 will support priority water supply and/or sewerage infrastructure in five cities (Ambur, Madurai, Tiruchirappalli, Tiruppur, Vellore) and governance improvement in 10 project ULBs.

3. **Impact and outcome.** Project 2 is aligned with the following impacts of the investment program: (i) universal access to basic water and sanitation services achieved; (ii) “world-class” cities and industrial corridors across the state developed; and (iii) water security, reduced vulnerability to climate change in urban areas, achieved. The investment program will have the following outcome: livability and climate resilience in five cities (Ambur, Tiruppur, Vellore, Madurai, and Tiruchirappalli) in priority industrial corridors enhanced.

4. **Output 1: Climate-resilient sewage collection and treatment, and drainage systems developed in four cities.** Works in Tiruchirappalli, Ambur, Tiruppur, and Vellore includes: (i) 2 new sewage treatment plants (STPs) with a combined treatment capacity of 72.71 million liters per day (MLD) constructed; (ii) 1 STP (15 MLD capacity) rehabilitated; (iii) 3,000 cubic meters treated wastewater reused per day; (iv) 1,256 km of new sewage collection pipelines constructed, with 100% households connected (152,580 households); (v) 28 pumps and 44 lift stations (combined capacity of 3,690 kW) constructed; and (vi) 8 (2 in each city) all-female community water and sanitation committees formed. The breakdown by city is: (i) in Tiruchirappalli new sewage collection system constructed, (ii) in Ambur new sewage collection system and 16.71 MLD STP constructed with 3,000 cubic meters treated wastewater reused, (iii) in Tiruppur new sewage collection system with new 56 MLD STP constructed and one 15 MLD STP rehabilitated, and (iv) in Vellore new sewage collection system constructed.

5. **Output 2: Water supply systems in two cities improved with smart features.** Works in Tiruppur and Madurai include: (i) 1,260 km of new distribution pipelines commissioned with 100% households connected (188,900 households) in 66 newly established district metering areas (DMAs) with new supervisory control and data acquisition (SCADA) systems to manage and reduce nonrevenue water (NRW); (ii) 66 new storage reservoirs with combined capacity of 92 million liters constructed; (iii) 3 pump stations (combined capacity of 7,225 kW) constructed; (iv) 196 km new transmission mains and 230 km of feeder mains constructed; (v) 3 new intakes and 3 new water treatment plants of combined capacity of 321 MLD constructed; and (vi) 80% of technical staff from each implementing agency of 2 cities trained in NRW reduction including 100% women staff. The breakdown by city is: (i) in Tiruppur, 1,060 km of distribution pipelines in 29 DMAs, 29 storage reservoirs, 2 pump stations (5975 kW), 46 km of transmission mains and 121 km of feeder mains, and a new intake with 196 MLD water treatment plant; and (ii) in Madurai, 200 km of distribution pipelines in 37 DMAs, 37 storage reservoirs, 1 pump station (1250 kW), 150 km transmission mains and 109 km feeder mains, and a new intake structure with 125 MLD water treatment plant.

6. Output 3: Institutional capacity, public awareness, and urban governance strengthened. This includes a performance-based urban governance improvement program implemented for 10 project cities to (i) achieve targeted household connections for water and sewerage projects, (ii) timely completion of projects under the MFF as per the original implementation schedule, (iii) actions in fecal sludge management in areas not covered by centralized sewerage system, (iv) reuse of treated wastewater, and (v) implementation of gender action plan. Governance improvement and awareness consultants recruited under Project 1 will support output 3.

B. Purpose of this IEE Report

7. ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS), 2009. The potential environmental impacts of the subproject have been assessed using ADB rapid environmental assessment (REA) Checklist for Sewerage (Appendix 1). The potential negative impacts were then identified in relation to pre-construction, construction and operation phases of the proposed UGSS and results of the assessment show that the subproject is unlikely to cause significant adverse impacts. Thus, this initial environmental examination (IEE) has been prepared in accordance with ADB SPS's requirements for environment category B projects.

8. The prepared IEE is based on the detailed project report (DPR) prepared by Tiruchirapalli City Corporation (TCC). The IEE prepared mainly on field reconnaissance surveys and secondary sources of information. The update is to reflect the inclusion of controlled blasting as one of the construction methodologies identified for hard rock removal in some sections of the alignment and sites. No field monitoring (environmental) survey was conducted, however, the environmental monitoring program (EMP) developed as part of the EMP requires the contractor to establish the baseline environmental conditions prior to commencement of civil works. The results are reported as part of the environmental monitoring report and are the basis to ensure no degradation will happen during subproject implementation. Stakeholder consultation was an integral part of the IEE.

Report Structure

9. This Report contains the following sections including the executive summary at the beginning of the report:

- (i) Executive summary;
- (ii) Introduction;
- (iii) Description of the project;
- (iv) Policy, legal and administrative framework;
- (v) Description of the environment;
- (vi) Anticipated environmental impacts and mitigation measures;
- (vii) Public consultation and information disclosure;
- (viii) Grievance redress mechanism;
- (ix) Environmental management plan; and,
- (x) Conclusion and recommendation.

II. DESCRIPTION OF THE PROJECT

A. Project Area

10. Tiruchirappalli is one of the largest city in the state of Tamil Nadu, located on the Chennai – Dindigul National Highway (NH - 45). It is situated in the center of the state, on the banks of Cauvery River (Figure 1), which flows from west to east along the northern periphery of the city. Tiruchirappalli City, spreading over an area of 146.90 square kilometer (km²), was upgraded from Special Grade Municipality to Corporation in the year 1994. Srirangam, a small island situated in Cauvery River, and is part of the city. In 2011, the corporation limit was expanded eastwards to include adjoining local bodies (four village panchayats of Paappakurichi, Ellakudi, Aalathur and Keelkalkandar Kottai, and Thiruverumbur Town Panchayat), thus. the corporation area increased from 20.33 km² to 167.23 km². TCMC has a population of 916,674 (census 2011) and 65 municipal wards, grouped into four administrative zones namely Srirangam, Ariyamangalam, Golden Rock and K. Abishekapuram.

11. The city has prepared a sewage master plan which proposes to extend the existing underground sewage system (UGSS) to cover all the zones, through a four phase program. Phase I has already been completed and for Phase II works, contract has been awarded and the construction works are in progress. Phase III will be implemented under TNUFIP funded by ADB, which will cover recently added areas in the eastern area and remaining uncovered areas in the erstwhile core city area. Phase III has been divided into 8 sewerage zones based on contour levels and hierarchy of the drain system and their tentative locations arrived at for designing the most cost effective system. The proposed sewage collection system, to the extent possible, has been proposed to convey sewage by gravity.

B. Existing Sewerage System

12. The existing UGSS covers most of the highly populated old town areas with gravity collection and pumping to the waste stabilization ponds and STP located at Panjappur on the southern periphery of TCMC with effluent discharged to Koraiyar River and ultimately to the Cauvery River. Sewage generated from other areas (not having UGSS) within TCMC limit is discharged to open drains which ultimately discharge into the network of channels including the Uyyakondan, Koraiyar and Thirumanjana Cauvery which finally reaches the Cauvery and Coleroon Rivers. Details of sewerage schemes implemented till date in TCMC are presented below:

- (i) **Srirangam UGSS Scheme (1956).** Srirangam (erstwhile municipality) was the first area to be provided with UGSS in 1956. Gravity based UGSS with three pump stations were constructed. Sewage was conveyed to the sewage pond at Panjapparai.
- (ii) **Tiruchi UGSS Scheme (1987).** This scheme was implemented during 1987-1992 covering the highly populated areas (covering seven blocks constituting the core area) of current TCMC. Sewage was conveyed through a network of pumping stations to the main pumping station at Promenade Road and from there, to the lagoons/ STP at Panjappur, about 7 km south of city along the Tiruchirappalli – Madurai - Tuticorin Highway (NH-45B).
- (iii) **National River Action Plan (NRAP) Scheme (1995 / 1996).** Under this Government of India scheme, intervention measures for abatement of pollution of Cauvery River was implemented in Tiruchirappalli. Interceptor collectors in major open drains within the city limits were constructed and the sewage is pumped to the lagoons/STP for treatment and disposal.
- (iv) **UGSS Augmentation Scheme under National River Conservation Plan (NRCP), 2008.** Under this Government of India scheme, augmentation of the UGSS commenced in 2003 and was completed in 2008. This scheme essentially covered

old town area of Srirangam, Golden Rock zone (erstwhile Golden Rock Municipal area also known as “Ponmalai” and subsequently merged into TCMC) and areas in Tiruchirappalli. The island of Srirangam was fully covered, with a network of sub-pumping stations (5 nos.) and lift stations (6 nos.) which were needed due to sub-surface conditions, sandy with high groundwater table, which precluded laying of sewers at depths greater than 3m. Sewage from Srirangam is pumped across Cauvery River along Chennai – Dindigul National Highway (NH45) to the Golden Rock Pump Station (GRPS-1) in the city. Sewage from areas in the city is conveyed to GRPS – 2 along the National Highway 45 By-Pass Road. Sewage from both the aforementioned GRPS is conveyed through individual pumping mains to the MPS – II at Anna Stadium and ultimately to the STP at Panjappur.

- (v) There are two STP’s located at Panjapur totaling 88 MLD capacity (58 MLD + 30 MLD). The 58 MLD treatment plant which is commissioned in 2008 is in good working condition. However, the 30 MLD treatment plant has to be rehabilitated due to connectivity issues between ponds and damages of bund formation.

13. At present, about 31% of total TCC area is covered with sewerage system, which serve about 52% of the total TCC population. The city, situated on the south bank of Cauvery River, comprises a network of storm water drains and channels which convey runoff and partially treated wastewater from septic tank and sullage pit overflows to Cauvery River. City is prone to flooding during monsoon season due to flash floods in Cauvery and Coleroon Rivers. Increasing urbanization from regional industrial growth and expansion of city limits by inclusion of adjoining sub-urban and rural local bodies has further increased the demand for proper UGSS service. The zones which require UGSS coverage are as follows: (i) East Zone – Ariyamangalam east ii) Thiruverumbur, north-east of the core town area, (iii) West Zone – K. Abhisekapuram west and south of the core town area, and (iv) South Zone – Ponmalai to south and south-east of core town area.

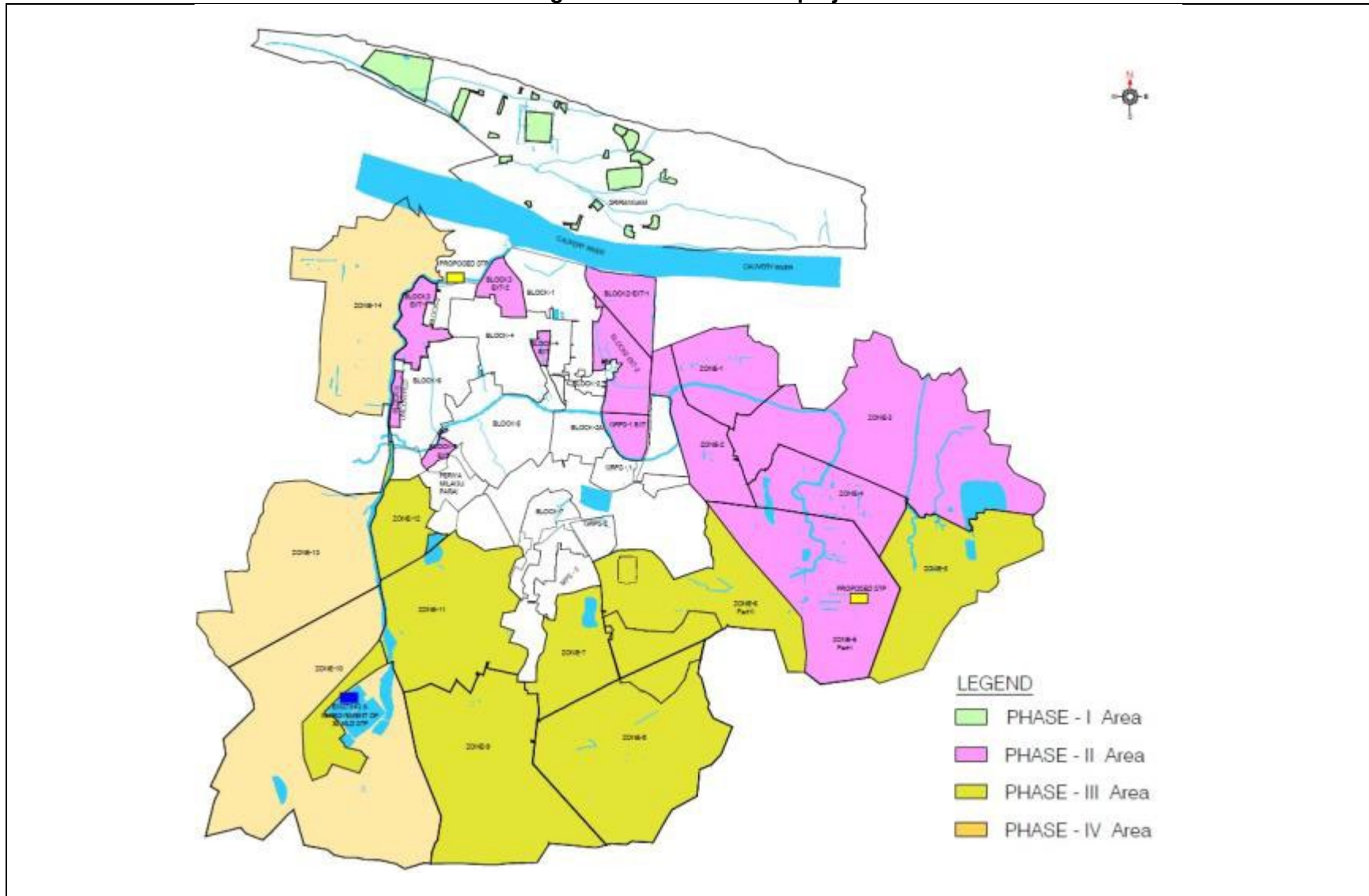
14. The Sewage Master Plan of TCC includes three remaining phases for UGSS expansion as follows: Phase II – East Zone and left-out area in core area ; Phase III – South Zone and South-East zone and Phase IV – Eastern and South-western Zone. It is proposed that Phase II and III will be implemented under TNUFIP, with Phase II and III implemented under Tranches 1 and 2, respectively. Phase IV is expected to be implemented subsequently. This subproject therefore focuses on Phase III, presently uncovered areas in the old city, and extended areas in the eastern part of the city. The overall coverage, in terms of population, by Phase III completion will be about 75%. The balance will be covered under Phases IV.

15. Under Phase II, totally four zones (zones 1 to 4) and part of zone 6 is considered at eastern zones and 8 number of left-out pockets (areas) are also considered in the core area. The sewage flow from Zones 1 to 4 and part of Zone flow will go to the proposed (under Phase II scheme) 37 MLD capacity STP at Keelakalkandarkottai (out of 37 MLD, 28 MLD will come under Phase II and remaining 9 MLD, from remaining part of Zone 6 and Zone 5, will come under Phase III scheme). Similarly, sewage flow from the eight left-out pockets (areas) will reach the proposed 100 MLD STP at Panjapur. The following components are part of Phase II scheme: (i) sewage collection system (285.77 km length of sewers); (ii) 37 sewage lift stations; (iii) 6 new sewage pumping station; (iv) pumping main sewers; (v) 11076 manholes (285.77km length); (vi) construction of a new STP (37 MLD) at Keelakalkandhar kottai(vii) the treated wastewater disposal into Uyyakondan canal, flowing at 2.7 km from the STP (Keelakalkandhar kottai) site; and (viii) 33592 house service connections. It overs Eastern zones of Trichy and sewerage left-out areas in the core area.

16. Phase I scheme has been recently commissioned. Phase II scheme has been split into three contract packages, two packages comprising collection network, pumping stations and lifting stations, and the third package comprising STP under design, build, operate and transfer (DBOT) mode. All the three packages have been awarded and the construction works are in progress.

17. **Existing situation in subproject area (South Zone and Southeast).** At present in South Zone and Southeast zone, sanitation is based on septic tanks and sullage/ soak pits. During the monsoon season the capacity of these on site facilities is exceeded causing sullage and septic tank overflow to enter open drains that discharge into the Uyyakondan canal, Koraiyar and water bodies. This major storm water drain traverses the entire width of TCC towards the eastern boundary and ultimately reaches Cauvery River. Additionally, low-lying high density areas in the city town area also discharge untreated sewage to Koraiyar River. Therefore, TCC has identified the wards in the southern zone (Ponamalai), south-western zone (K. Abishekapuram) and Thiruverumbur area of Eastern part of city as high priority areas to be covered by UGSS through this Phase III scheme in order to abate pollution of major channels, such as Uyyakondan Channel, Koraiyar River and Cauvery River.

Figure 1: Location of Subproject



C. Proposed Project

18. This subproject shall provide underground sewerage system in areas within ULB limits, tagged as Phase III scheme areas located south and southeast of Phase II scheme areas. Under Phase III it is proposed to cover all areas in Ponmalai and K. Abishekapuram Zones and Thiruverumbur area within ULB limits. Collection system for Phase-III has been divided into eight sewer subzones, 6 to 9 are in the Ponmalai Zone, 10 to 12 are in the K. Abishekapuram Zone and Sewer subzone 5 is in parts of Ponmalai and Ariyamangalam Zones. Sewer sub-zoning is done for design of the collection system to maximize gravity flow. Collection/command area of the sewer sub-one is designed to be collected at a sewage pumping station (SPS) where gravity collection is not feasible. Intermediate pumping to avoid significant depth of excavation or to provide sewerage in low-lying or counter-sloped areas has been achieved using lift stations. System is designed as a separate underground system catering only to domestic wastewater. Storm water will be carried by existing open drains and dispose into natural streams/ water bodies. Industrial wastewater will not be disposed into sewers. System is designed for 110 liters per capital per day, based on sewage generation rate of 80% of water supply and considering infiltration per Central Public Health and Environmental Engineering Organization norms.

19. Proposed subproject (Phase III) includes (i) sewage collection system (300.445km), (ii) 24 sewage lift stations, (iii) 6 sewage pumping station, (iv) pumping main for 32 km length, (v) 11976manholes, and (vii) 37061 house service connections.

20. Connecting to STPs: No new or augmentation work in STPs is proposed under this Phase-III subproject. The flow of zone -5 and part of zone-6 (9 MLD) will reach 37 MLD Keelakalkandar kottai STP (these two zonal flows area already considered in proposed STP design capacity at Keelakalkandar Kottai) and the sewage flow of zone 7 to zone 12 (28 MLD) will flow to the existing 88 MLD STP at Panjappur. The nature and size of the various components of the subproject is shows in Table 1. Location of subproject components and conceptual layout plans are shown in Figure 3 to Figure 10.

21. The treated waste water will be carried by the Uyyakondan Canal, which is an irrigation feeder from River Cauvery. The canal starts from Pettavaithali and it travels 18 km inside Corporation boundary. Finally it leads to Vzhavandhankottai Tank at Thuvakudi. The design flow of Canal is about 498 Cumecs. The treated water from the STP, Keelakalkandar kottai is about 37 MLD. The carrying capacity of the canal has been checked and confirmed to accommodate the additional flow of treated water from STP. The calculation details and drawings are as follows:

Figure 2: Google Earth Image showing sewage treatment plant location and Uyyakondan Canal



Design calculation of Uyyakondan Capacity Analysis:

| | | | |
|--|---|----------------|--------|
| Total design flow from the feeder canal of River Cauvery | = | 450.000 | Cumecs |
| Total flow from the STP | = | 37.000 | MLD |
| | = | 0.428 | Cumecs |
| Total flow into the Surplus canal including flow from STP (Qi) | = | 450.428 | Cumecs |

Capacity calculations for the surplus canal:

| | | | | | | | |
|--------------------------------|---|----------|--|----------------|--------|--------|---------|
| Minimum Breadth of the channel | B | = | 30 | M | III. | IV. | V. |
| Minimum Depth of the channel | D | = | 2.5 | M | VI. | VII. | VIII. |
| Area | A | B x d = | 75 | m ² | IX. | X. | XI. |
| Perimeter | P | B + 2d = | 35 | M | XII. | XIII. | XIV. |
| Hydraulic radius = (A/P) | R | = | 2.14 | M | XV. | XVI. | XVII. |
| Average Slope | S | = | 1 in 400 | XVIII. | XIX. | XX. | XXI. |
| Rugosity coefficient | N | = | 0.013 | XXII. | XXIII. | XXIV. | XXV. |
| Velocity | V | = | (1/n)*R^{2/3} * S^{1/2} | | XXVI. | XXVII. | XXVIII. |
| | | = | 6.39 | m/s | | | |

Discharge $Q=AV$ Q_c = **479.457** m^3/s **XXIX.** **XXX.** **XXXI.**

Since $Q_c > Q_i$, Hence Safe

D. Implementation Schedule

22. Contract for phase-III was awarded on 15.04.2020 because of COVID-19 construction work started on 01.08.2020. The work will take about 36 months to complete and it will be completed on 01.08.2023. But due to incomplete work, extension is approved up to 31.12.2025.

The scope of work is revised due to the following reasons:

During the preparation of the Detailed Project Report (DPR), the total length of the street was considered for the sewer line. However, during execution, the actual length of the sewer line was measured after accounting for the dimensions of manholes, resulting in a reduction in the length of the sewer line. Consequently, the number of manholes and HSC were also adjusted according to the actual site conditions.

During the execution of SPS 8 and SPS 9, the site locations were changed due to public objections. Additionally, the STP site at Panjapur was relocated away from the proposed site due to the construction of a new bus stand. As a result of these changes, the length of the pumping main for SPS 8, SPS 9, SPS 10, and SPS 11 has increased and hence total length of pumping main is increased.

Table -II-1:Proposed Subproject Components

| Infrastructure | Function | Description | Location | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|--|---|---------------|-------------|-------------|---|--------|------|--------|-------|--------|------|-------|------|--------|-------|-----|--------|------|-----|--------|-----------|------|-----|--------|------|-----|--------|------|-----|--------|------|-----|--------|------|-----|--------|--|------|-----|--------|--|-----|-----|--------------|--|----------------|------------|
| Sewer network | Collect wastewater from houses and convey by a combination of gravity and pressure pumping to the STP | 300.445km 200-800 mm diameter sewers | Sewers will be laid underground in the roads and internal streets in the project area comprising 8 sewerage sub-zones (Ponmalai Zone – 4; and K.Abishekapuram - 3 and part of Ponmalai and Ariyamangalam zones – 1) Sewer lines will be laid in the center of road by cutting black top, within the road right of way. In wider roads, like SH, NH, divided 2-way roads etc., sewers will be laid in the service roads, and where service roads are unavailable, will be laid along the edge of the road, but mostly within the black top portion. For the roads where adequate land in the road shoulder is available along the blacktop and is clear of any structures or activities, pipes will be laid in this earthen shoulder. Large diameter pipes will be laid mostly on main roads (300–700 mm), while the tertiary sewers of small size (200 mm to 300 mm dia) that collect wastewater through house sewer connections will be laid in all streets in the subproject area. Trench size to bury the sewer will be of 0.8 m to 1.6 m wide and 1.2 m to 5 m deep (6 m in small terminal stretches near pump stations) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | <table border="1"> <thead> <tr> <th>Pipe Diameter</th> <th>Materials</th> <th>Length in m</th> <th>%</th> </tr> </thead> <tbody> <tr> <td>200 mm</td> <td>uPVC</td> <td>232360</td> <td>77.34</td> </tr> <tr> <td>200 mm</td> <td rowspan="3">DWCP</td> <td>23236</td> <td>7.73</td> </tr> <tr> <td>250 mm</td> <td>16280</td> <td>5.4</td> </tr> <tr> <td>300 mm</td> <td>3848</td> <td>1.2</td> </tr> <tr> <td>350 mm</td> <td rowspan="5">Cast Iron</td> <td>2072</td> <td>0.7</td> </tr> <tr> <td>400 mm</td> <td>5032</td> <td>1.7</td> </tr> <tr> <td>450 mm</td> <td>1184</td> <td>0.4</td> </tr> <tr> <td>500 mm</td> <td>2664</td> <td>0.9</td> </tr> <tr> <td>600 mm</td> <td>7104</td> <td>2.4</td> </tr> <tr> <td>700 mm</td> <td></td> <td>1776</td> <td>0.6</td> </tr> <tr> <td>800 mm</td> <td></td> <td>592</td> <td>0.2</td> </tr> <tr> <td colspan="2">Total</td> <td>300.445</td> <td>100</td> </tr> </tbody> </table> | | Pipe Diameter | Materials | Length in m | % | 200 mm | uPVC | 232360 | 77.34 | 200 mm | DWCP | 23236 | 7.73 | 250 mm | 16280 | 5.4 | 300 mm | 3848 | 1.2 | 350 mm | Cast Iron | 2072 | 0.7 | 400 mm | 5032 | 1.7 | 450 mm | 1184 | 0.4 | 500 mm | 2664 | 0.9 | 600 mm | 7104 | 2.4 | 700 mm | | 1776 | 0.6 | 800 mm | | 592 | 0.2 | Total | | 300.445 | 100 |
| | | Pipe Diameter | | Materials | Length in m | % | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 200 mm | | uPVC | 232360 | 77.34 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 200 mm | | DWCP | 23236 | 7.73 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 250 mm | | | 16280 | 5.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 300 mm | | | 3848 | 1.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 350 mm | | Cast Iron | 2072 | 0.7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 400 mm | | | 5032 | 1.7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 450 mm | | | 1184 | 0.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 500 mm | | | 2664 | 0.9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 600 mm | | | 7104 | 2.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 700 mm | | | 1776 | 0.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 800 mm | | | 592 | 0.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total | | 300.445 | 100 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>mm = millimeter</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>m = meter</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Manholes | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11976 nos. (brickwork & reinforced cement concrete) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Minimum distance between manholes of 30 m is adopted for sewer size up to 400 mm and larger spacing up to 100 m for large diameter sewers. Manholes type and sizes are as follows: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Infrastructure | Function | Description | Location | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------|--|---|--|---|-------|-------------------------------|---|-------|------------------------------|---|-------|---------------------------|---|-------|--------------------------|---|-------|------------------------------|---|-------|------------------------------|---|-------|----------------------------|---|-------|-----------------------------------|---|-------|--------------------------------|----|-------|--------------------------|----|-------|--------------------------------------|----|--------|------------------------------|----|--------|-----------------------------|----|--------|-----------------------------|----|--------|-----------------------------------|----|--------|---|----|--------|-----------------------------|----|--------|-------------------------------|----|--------|----------------------------|----|--------|---|
| | | <p>For depths up to 2.5 m (Rectangular)</p> <ul style="list-style-type: none"> Up to 1.50 m depth – 90 m x 1.20 m Up to 2.5 m depth – 1.20 m x 1.50 m <p>For depths above 2.5 m (Circular)</p> <ul style="list-style-type: none"> Up to 6.0 m depth – 1.5 m diameter | <p>For manholes, an area of 1.5 mx1.5m to 2.5 m x 2.5 m will be excavated</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sewage lift stations (LS) | <p>Lifting station is a small pumping station to lift the sewage to higher level and discharge into a ridge manhole for transporting to the pumping station. Lifting station has a collection well with submersible pumps accommodated inside. The screen arrangement is provided in the previous manhole to the lift station.</p> | <p>24 nos. <i>Components of LS</i></p> <ul style="list-style-type: none"> Lift well (circular) Non-clog submersible pump sets Control panel box <p><i>Lift stations are essentially proposed as enlarged manholes (either road-side on available land or on road center by enlarging a collection system manhole) fitted with two sewage pumps (small capacity) and a curb or road-side wall mounted Pump Control Panel.</i></p> | <p>Lift well will be constructed on the road (similar to manholes) where the sewer terminates into the lift well. Pumps will be installed in the well, and a control panel box will be installed near the well. Lift stations are under progress at following locations:</p> <table border="1"> <tbody> <tr><td>1</td><td>LS 5a</td><td>Bagavathypuram along the Road</td></tr> <tr><td>2</td><td>LS 5b</td><td>Kamaraj Nagar along the Road</td></tr> <tr><td>3</td><td>LS 5c</td><td>Cholapuram along the Road</td></tr> <tr><td>4</td><td>LS 5d</td><td>VOC Nagar along the Road</td></tr> <tr><td>5</td><td>LS 5e</td><td>Kakkan Colony along the Road</td></tr> <tr><td>6</td><td>LS 6a</td><td>Kailash Nagar along the Road</td></tr> <tr><td>7</td><td>LS 6B</td><td>Ambal Nagar along the Road</td></tr> <tr><td>8</td><td>LS 7a</td><td>Thirumurugan nagar along the Road</td></tr> <tr><td>9</td><td>LS 7b</td><td>Wireless Road, Pandiyan Street</td></tr> <tr><td>10</td><td>LS 8a</td><td>Sai Nagar along the Road</td></tr> <tr><td>11</td><td>LS 9a</td><td>Muthukumarasamy Nagar along the Road</td></tr> <tr><td>12</td><td>LS 11b</td><td>Ayyappa Nagar along the Road</td></tr> <tr><td>13</td><td>LS 11c</td><td>Dhobi Colony along the Road</td></tr> <tr><td>14</td><td>LS 11d</td><td>Krishnapuram along the Road</td></tr> <tr><td>15</td><td>LS 11e</td><td>Rajiv Gandhi Nagar along the Road</td></tr> <tr><td>16</td><td>LS 11f</td><td>Near pillayar police station- Anbu Nagar,</td></tr> <tr><td>17</td><td>LS 11g</td><td>Arasu Colony along the Road</td></tr> <tr><td>18</td><td>LS 11h</td><td>Bharathi Nagar along the Road</td></tr> <tr><td>19</td><td>LS 11i</td><td>Kollankulam along the Road</td></tr> <tr><td>20</td><td>LS 11j</td><td>Nethaji Street -Ayyappa Nagar along the</td></tr> </tbody> </table> | 1 | LS 5a | Bagavathypuram along the Road | 2 | LS 5b | Kamaraj Nagar along the Road | 3 | LS 5c | Cholapuram along the Road | 4 | LS 5d | VOC Nagar along the Road | 5 | LS 5e | Kakkan Colony along the Road | 6 | LS 6a | Kailash Nagar along the Road | 7 | LS 6B | Ambal Nagar along the Road | 8 | LS 7a | Thirumurugan nagar along the Road | 9 | LS 7b | Wireless Road, Pandiyan Street | 10 | LS 8a | Sai Nagar along the Road | 11 | LS 9a | Muthukumarasamy Nagar along the Road | 12 | LS 11b | Ayyappa Nagar along the Road | 13 | LS 11c | Dhobi Colony along the Road | 14 | LS 11d | Krishnapuram along the Road | 15 | LS 11e | Rajiv Gandhi Nagar along the Road | 16 | LS 11f | Near pillayar police station- Anbu Nagar, | 17 | LS 11g | Arasu Colony along the Road | 18 | LS 11h | Bharathi Nagar along the Road | 19 | LS 11i | Kollankulam along the Road | 20 | LS 11j | Nethaji Street -Ayyappa Nagar along the |
| 1 | LS 5a | Bagavathypuram along the Road | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | LS 5b | Kamaraj Nagar along the Road | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | LS 5c | Cholapuram along the Road | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | LS 5d | VOC Nagar along the Road | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | LS 5e | Kakkan Colony along the Road | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | LS 6a | Kailash Nagar along the Road | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | LS 6B | Ambal Nagar along the Road | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | LS 7a | Thirumurugan nagar along the Road | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | LS 7b | Wireless Road, Pandiyan Street | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | LS 8a | Sai Nagar along the Road | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | LS 9a | Muthukumarasamy Nagar along the Road | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | LS 11b | Ayyappa Nagar along the Road | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | LS 11c | Dhobi Colony along the Road | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | LS 11d | Krishnapuram along the Road | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | LS 11e | Rajiv Gandhi Nagar along the Road | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16 | LS 11f | Near pillayar police station- Anbu Nagar, | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 17 | LS 11g | Arasu Colony along the Road | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | LS 11h | Bharathi Nagar along the Road | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 19 | LS 11i | Kollankulam along the Road | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 20 | LS 11j | Nethaji Street -Ayyappa Nagar along the | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Infrastructure | Function | Description | Location | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|--|--|-----------|--------------------------------|--------|---------------|---------|--------------|---------|-----------------------------------|---------|---------------------------|---------|--------------------------|----------|----------|----------|---|----|------|-------|--------|----|------|-------|--------|----|-------|-------|--------|------|------|------|--------------|--|--------------|---------------|---|--|--|
| | | | 21 | LS 11k | Rock fort Nagar along the Road | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 22 | LS 12a | Adhil Nagar along the Road | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 23 | LS12b | Arokiya Madha Avenue Road | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 24 | LS 12c | Ashok Nagar along the Road | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sewage pumping stations (SPS) | Collect sewage and pump to main pumping stations | 6 nos. (1 main and sub) Components of SPS <ul style="list-style-type: none"> • Inlet chamber • Screen chamber • Grit well • Suction well • Pump room (3 x 2 m²) • Non-clog submersible pump sets | Sewage pump stations are under progress at following locations: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>SPS No</th> <th>Location Name</th> </tr> </thead> <tbody> <tr> <td>SPS - 5</td> <td>Indira Nagar</td> </tr> <tr> <td>SPS - 7</td> <td>Lurdhu Nagar (JK nagar Extension)</td> </tr> <tr> <td>SPS - 8</td> <td>Pasumai Nagar, Kottapattu</td> </tr> <tr> <td>SPS - 9</td> <td>Kalinga Nagar K.Sathanur</td> </tr> <tr> <td>SPS - 10</td> <td>Panjapur</td> </tr> <tr> <td>SPS - 11</td> <td>Karumandapam Crematorium campus, Karumandapam</td> </tr> </tbody> </table> | | | SPS No | Location Name | SPS - 5 | Indira Nagar | SPS - 7 | Lurdhu Nagar (JK nagar Extension) | SPS - 8 | Pasumai Nagar, Kottapattu | SPS - 9 | Kalinga Nagar K.Sathanur | SPS - 10 | Panjapur | SPS - 11 | Karumandapam Crematorium campus, Karumandapam | | | | | | | | | | | | | | | | | | | | | | |
| SPS No | Location Name | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SPS - 5 | Indira Nagar | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SPS - 7 | Lurdhu Nagar (JK nagar Extension) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SPS - 8 | Pasumai Nagar, Kottapattu | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SPS - 9 | Kalinga Nagar K.Sathanur | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SPS - 10 | Panjapur | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SPS - 11 | Karumandapam Crematorium campus, Karumandapam | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pumping main sewers | Transfer sewage from SPS to another SPS or to STP | 32000m 100-500 mm diameter CI sewers <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th>Pipe Diameter</th> <th>Materials</th> <th>Length in m</th> <th>%</th> </tr> </thead> <tbody> <tr> <td>100 mm</td> <td>CI</td> <td>933</td> <td>2.92</td> </tr> <tr> <td>150 mm</td> <td>CI</td> <td>2511</td> <td>7.84</td> </tr> <tr> <td>200 mm</td> <td>CI</td> <td>3725</td> <td>11.64</td> </tr> <tr> <td>300 mm</td> <td>CI</td> <td>6121</td> <td>19.13</td> </tr> <tr> <td>400 mm</td> <td>CI</td> <td>4650</td> <td>14.53</td> </tr> <tr> <td>500 mm</td> <td>CI</td> <td>11460</td> <td>35.81</td> </tr> <tr> <td>630 mm</td> <td>HDPE</td> <td>2600</td> <td>8.13</td> </tr> <tr> <td style="text-align: center;">Total</td> <td></td> <td>32000</td> <td>100.00</td> </tr> </tbody> </table> | Pipe Diameter | Materials | Length in m | % | 100 mm | CI | 933 | 2.92 | 150 mm | CI | 2511 | 7.84 | 200 mm | CI | 3725 | 11.64 | 300 mm | CI | 6121 | 19.13 | 400 mm | CI | 4650 | 14.53 | 500 mm | CI | 11460 | 35.81 | 630 mm | HDPE | 2600 | 8.13 | Total | | 32000 | 100.00 | Pumping main will be laid along the main roads, and the internal roads connecting sewage pumping stations and STP. Sewers will be laid underground in the road carriage way. Pumping mains include: main sewers from one main SPS to proposed STP at Panjapur and one SPS (at Zone 5) will pump to proposed STP at keelakalkandhar kottai via SPS-4 ; from sub-SPS and Lift Stations to main SPS and STPs; and from Lift Stations (13 nos.) within collection system to proposed MPS/ SPS . | | |
| Pipe Diameter | Materials | Length in m | % | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 100 mm | CI | 933 | 2.92 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 150 mm | CI | 2511 | 7.84 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 200 mm | CI | 3725 | 11.64 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 300 mm | CI | 6121 | 19.13 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 400 mm | CI | 4650 | 14.53 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 500 mm | CI | 11460 | 35.81 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 630 mm | HDPE | 2600 | 8.13 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total | | 32000 | 100.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pipe Carrying Bridge (PCB) | Transfer sewage from SPS-9 to existing STP | –A Pipe Carrying Bridge is proposed across Koraiyar River for carrying sewage from SPS-9 (Kalinga nagar) to new STP . The length of PCB is about 160 m (having 16 No of Pillars) and the vertical clearance from HFL is 1.50 m. | Koraiyar River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Connecting to Sewage Treatment Plants (STP) | Treatment of collected wastewater | 29. | The flow of zone -5 (by pumping main length of 2.01 km) and part of zone-6 (9 MLD) by gravity main will reach 37 MLD Keelakalkandar kottai STP (these two zones flows already considered in STP at Keelakalkandar Kottai) and | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Infrastructure | Function | Description | Location |
|---------------------------|---|--|---|
| | ater to comply with disposal standards | | <p>the sewage flow of zone 7 to zone 12 (28 MLD) will flow to new STP(100 MLD) Panjapur (adequate treatment capacity available).</p> <p>The following pumping mains (3 nos.) linked to proposed STP.</p> <ol style="list-style-type: none"> 1. From SPS- 10(Panjapur) to STP around 60 m pumping main 2. From SPS-9(Kalinga Nagar) to STP around 5.60km pumping main 3. From SPS-11(Karumandapam) to STP around 5.70 km pumping main. <p>Note: Only interconnection of flow from newly covered areas under the proposed Phase-III Scheme is covered under Tranche 2 subproject. New STP (37 MLD cap.) at Keelakanlkandhar kottai</p> |
| House service connections | Collect sewage from individual houses and convey into network | <ul style="list-style-type: none"> • 36120 nos. (domestic and non-domestic) | At each household, connected to wastewater outlet drain |

DWCP = double wall corrugated pipe, MLD = million liters per day, NH = national highway, SH = state highway, uPVC = unplasticized polyvinyl chloride.

Figure 3: Layout Plan on Revenue Map for Sewage pumping station 5

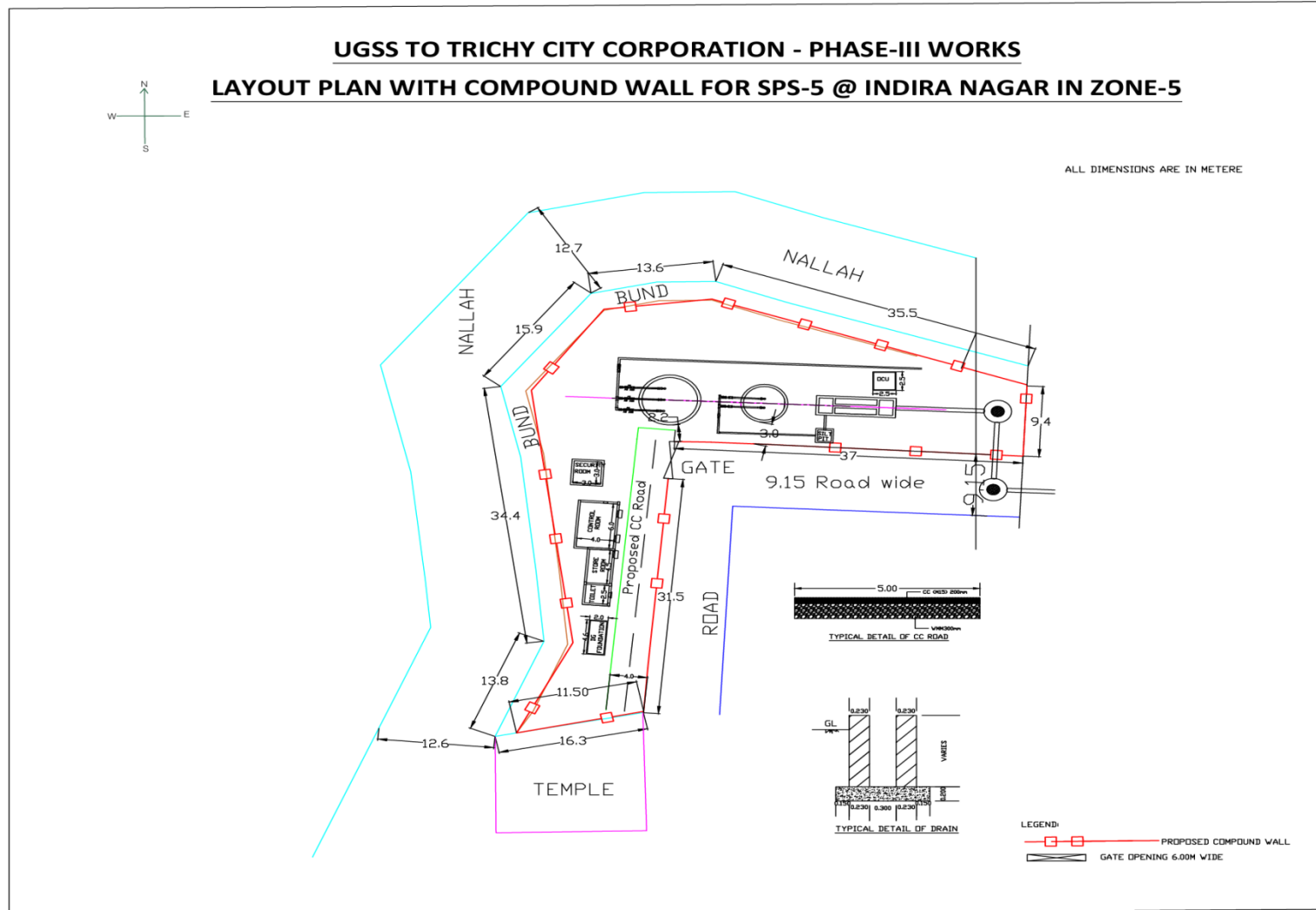


Figure 4: Layout Plan on revenue map for Sewage pumping stations7

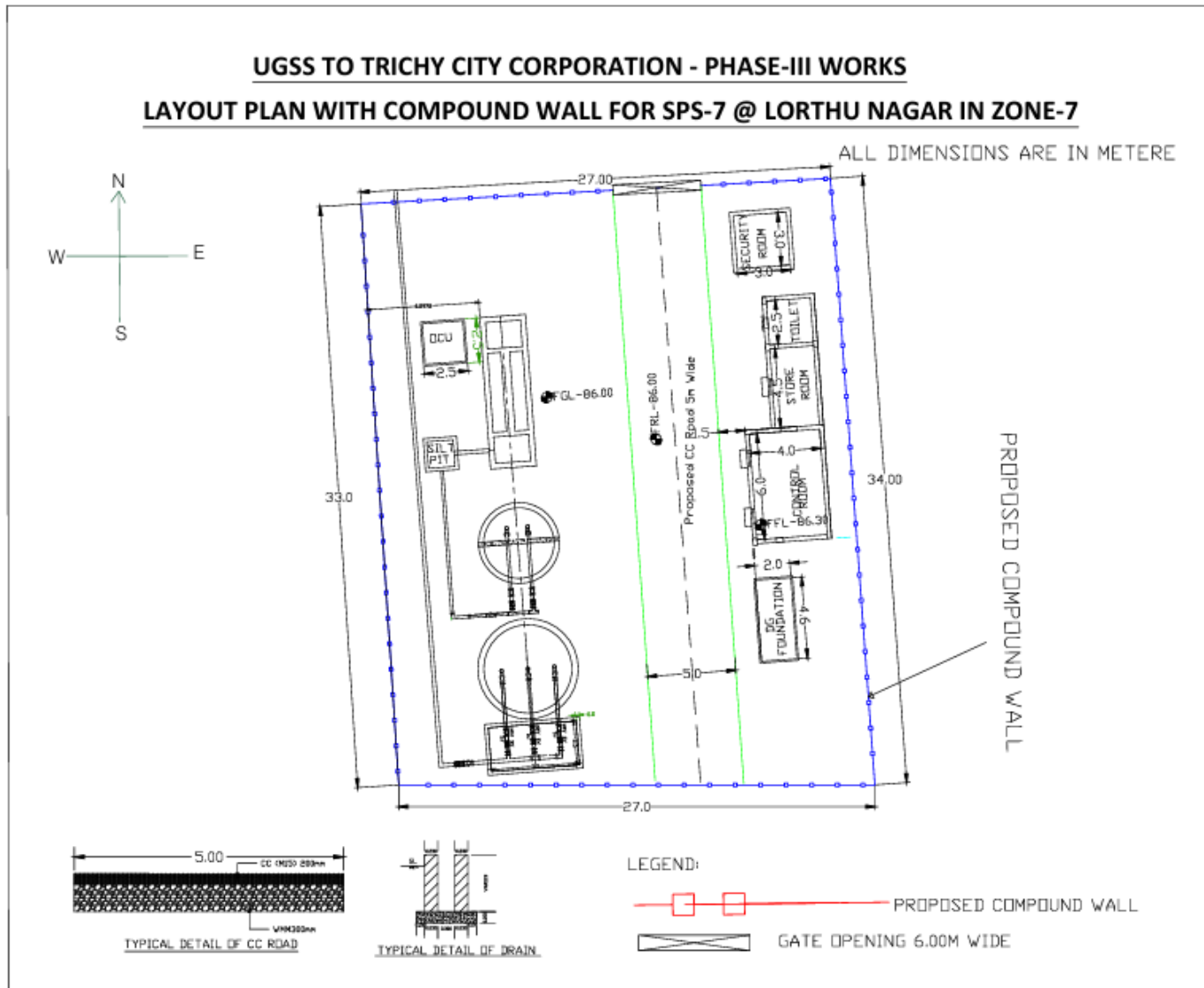


Figure 5: Layout Plan on Revenue Map for Sewage pumping stations8

Zone-8, Sub Pumping Station-8 Pasumai Nagar

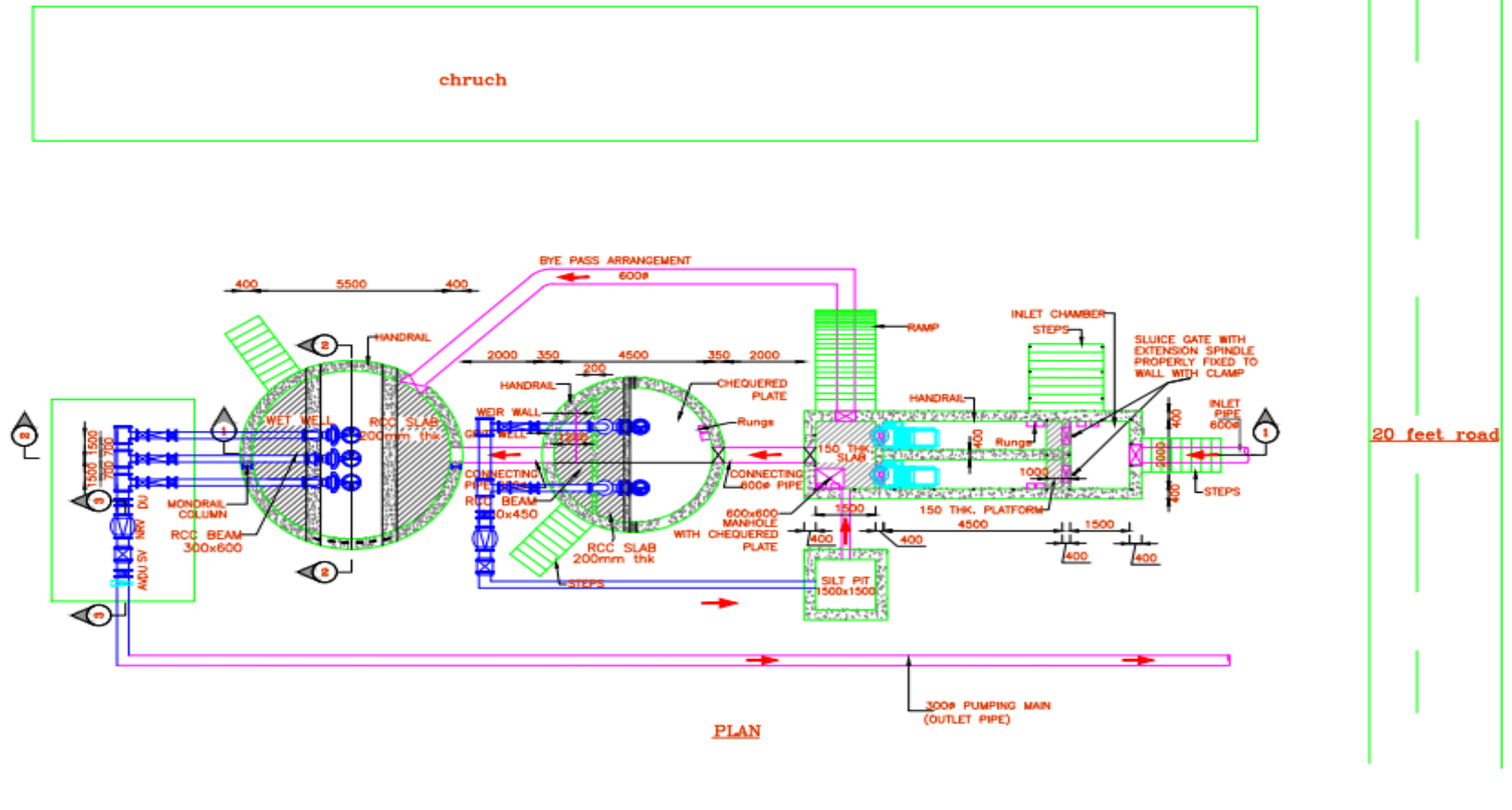


Figure 6: Layout Plan on Revenue Map for Sewage pumping stations9

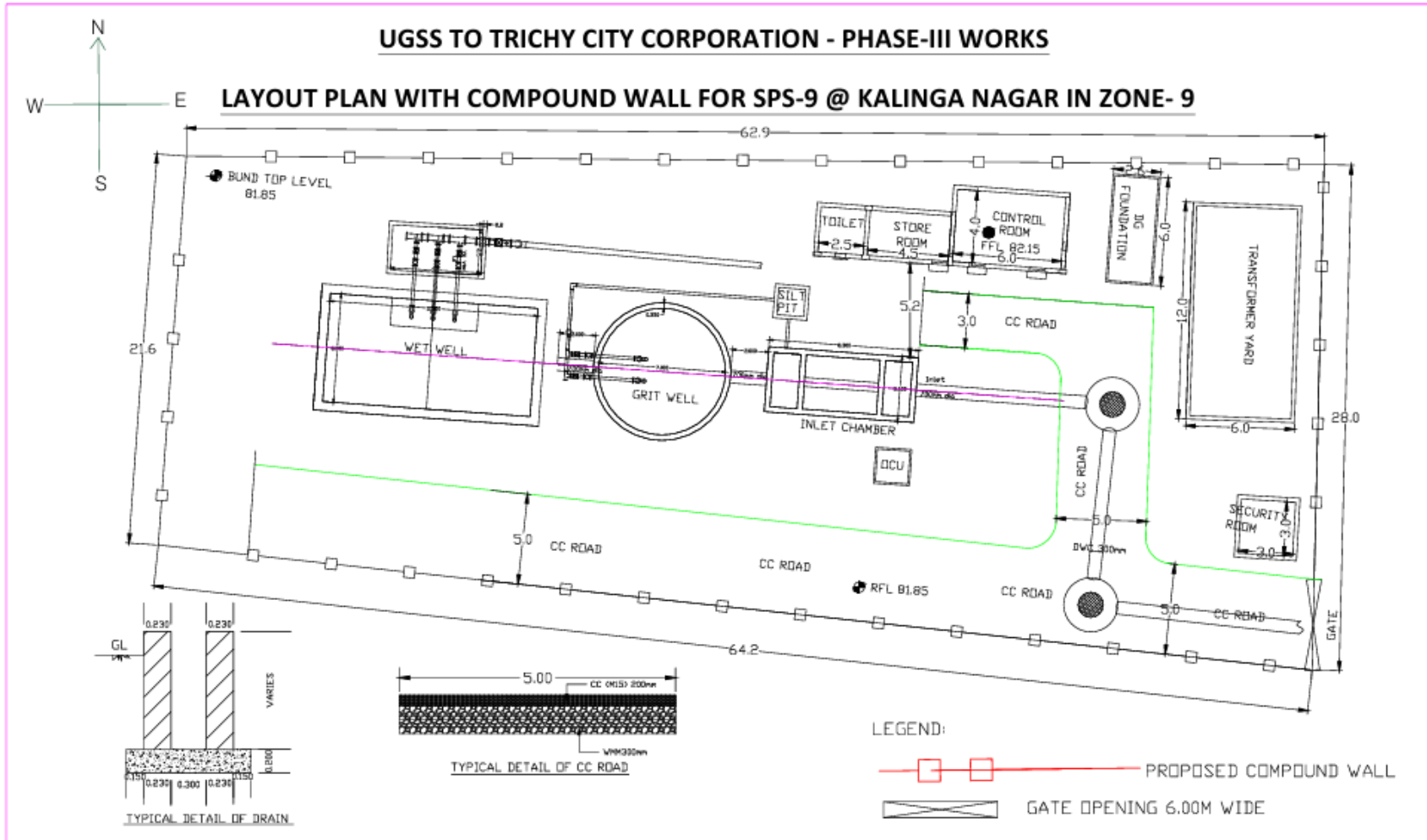


Figure 7: Layout Plan on Revenue Map for Sewage pumping stations 10

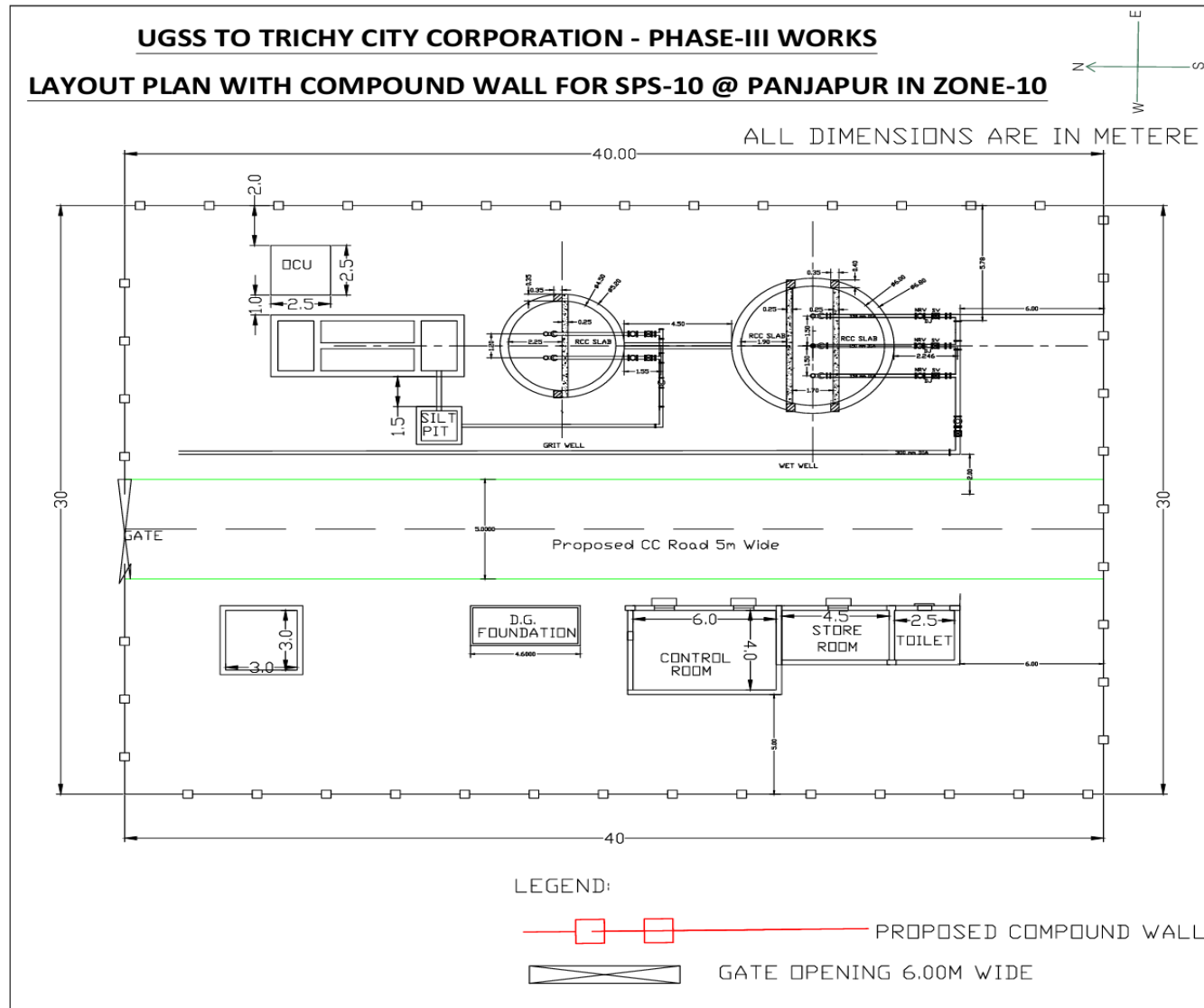


Figure 8: Layout Plan on Revenue Map for Sewage pumping stations 11

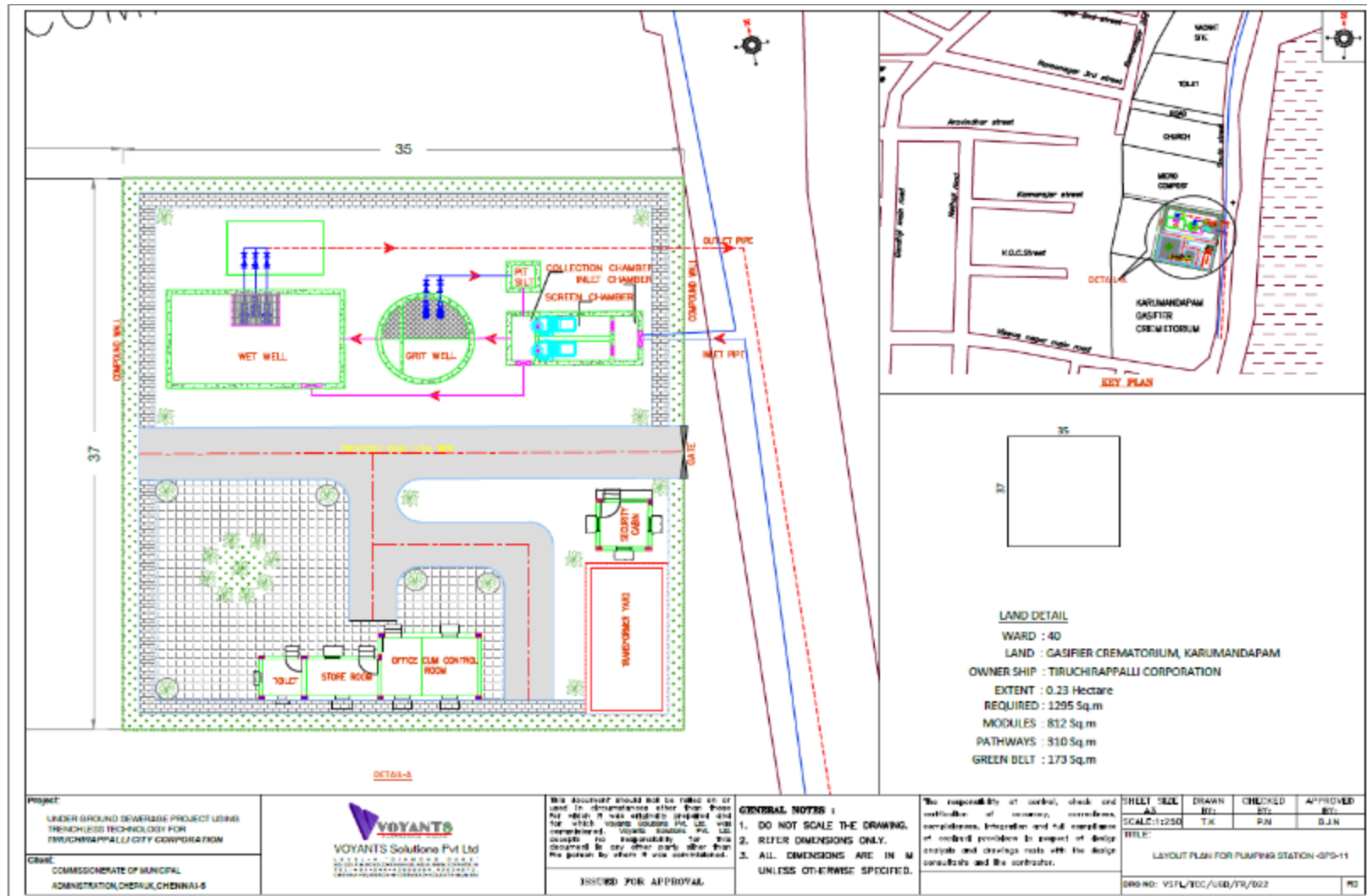
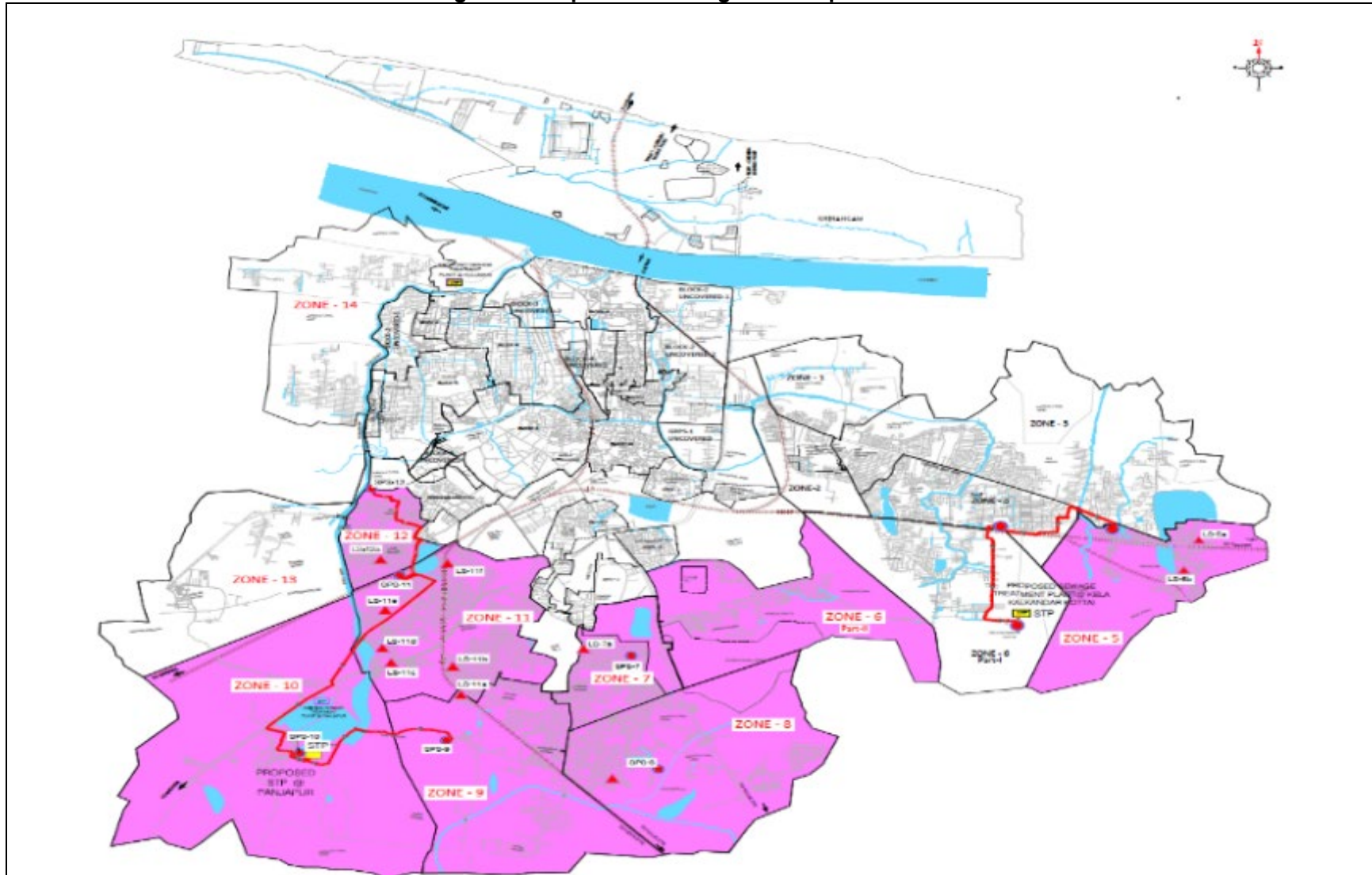


Figure 9: Proposed sewerage master plan Phase III



XXXII. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. ADB Policy

23. ADB requires the consideration of environmental issues in all aspects of ADB's operations, and the requirements for environmental assessment are described in ADB SPS, 2009. This states that ADB requires environmental assessment of all ADB investments.

24. **Screening and categorization.** The nature of the environmental assessment required for a project depends on the significance of its environmental impacts, which are related to the type and location of the project; the sensitivity, scale, nature, and magnitude of its potential impacts; and the availability of cost-effective mitigation measures. Projects are screened for their expected environmental impacts, and are assigned to one of the following four categories:

- (i) **Category A.** Projects could have significant adverse environmental impacts. An environmental impact assessment (EIA) is required to address significant impacts.
- (ii) **Category B.** Projects could have some adverse environmental impacts, but of lesser degree or significance than those in category A. An IEE is required to determine whether significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report.
- (iii) **Category C.** Projects are unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are reviewed.
- (iv) **Category FI.** Projects involve a credit line through a financial intermediary or an equity investment in a financial intermediary. The financial intermediary must apply an environmental management system, unless all projects will result in insignificant impacts.

25. **Environmental management plan.** An EMP, which addresses the potential impacts and risks identified by the environmental assessment, shall be prepared. The level of detail and complexity of the EMP and the priority of the identified measures and actions are commensurate with the project's impact and risks.

26. **Public disclosure.** ADB will post the safeguard documents on its website as well as disclose relevant information in accessible manner in local communities:

- (i) for environmental category A projects, draft EIA report at least 120 days before Board consideration;
- (ii) final or updated EIA and/or IEE upon receipt; and
- (iii) environmental monitoring reports submitted by the implementing agency during project implementation upon receipt.

B. National Environmental Laws

27. **Environmental assessment.** The Government of India EIA Notification of 2006 (replacing the EIA Notification of 1994), sets out the requirement for Environmental Assessment in India. This states that environmental clearance is required for specified activities/projects, and this must be obtained before any construction work or land preparation (except land acquisition) may commence. Projects are categorized as A or B depending on the scale of the project and the nature of its impacts.

28. Category A projects require environmental clearance from the central Ministry of Environment, Forests and Climate Change (MOEFCC). The proponent is required to provide preliminary details of the project in the prescribed manner with all requisite details, after which an Expert Appraisal Committee (EAC) of the MOEFCC prepares comprehensive Terms of Reference

(TOR) for the EIA study. On completion of the study and review of the report by the EAC, MOEFCC considers the recommendation of the EAC and provides the environmental clearance if appropriate.

29. Category B projects require environmental clearance from the State Environment Impact Assessment Authority (SEIAA). The State level EAC categorizes the project as either B1 (requiring EIA study) or B2 (no EIA study), and prepares TOR for B1 projects within 60 days. On completion of the study and review of the report by the EAC, the SEIAA issues the environmental clearance based on the EAC recommendation. The Notification also provides that any project or activity classified as category B will be treated as category A if it is located in whole or in part within 10 km from the boundary of protected areas, notified areas or inter-state or international boundaries.

30. None of the components of this underground sewerage system subproject falls under the ambit of the EIA Notification 2006, and, therefore EIA Study or environmental clearance is not required for the subproject.

31. **Applicable environmental regulations.** Besides EIA Notification 2006, there are various other acts, rules, policies and regulations currently in force in India that deal with environmental health and occupational safety issues that could apply to infrastructure development. Some of the specific regulatory compliance requirements of the subproject are shown in Table 2.

Table -2:Applicable Environmental Regulations

| Law | Description | Requirement |
|--|--|--|
| Water (Prevention and Control of Pollution) Act of 1974, Rules of 1975, and amendments | Act was enacted to provide for the prevention and control of water pollution and the maintaining or restoring of wholesomeness of water. Control of water pollution is achieved through administering conditions imposed in consent issued under to this Act. All pollution potential activities will require Consent to Establish (CTE) from Tamil Nadu Pollution Control Board (TNPCB) before starting implementation and Consent to Operate (CTO) before commissioning. | Subproject components do not require consent, however the discharge standards will be applicable for disposal of Effluent from the STPs (new and rehabilitation proposed under phase -II). |
| Environment (Protection) Act, 1986 and CPCB Environmental Standards. | Emissions and discharges from the facilities to be created or refurbished or augmented shall comply with the notified standards | To comply with applicable notified standards for emissions and discharges from the facilities. |
| Noise Pollution (Regulation and Control) Rules, 2000 amended up to 2010. | Rule 3 of the Act specifies ambient air quality standards in respect of noise for different areas/zones. | To comply with the noise standards. |
| Air (Prevention and Control of Pollution) Act, 1981, amended 1987 and its Rules, 1982. | - Applicable for equipment and machinery's potential to emit air pollution (including but not limited to diesel generators and vehicles); - CTE and CTO from TNPCB; - Compliance to conditions and emissions standards stipulated in the CTE and CTO. | CTE and CTO from TNPCB is required for hot mix plants, wet mix plants, stone crushers, etc. if installed for construction purposes. |

| Law | Description | Requirement |
|--|--|---|
| Solid Wastes Management Rules, 2016 | Rules to manage municipal solid waste generated; provides rules for segregation, storage, collection, processing and disposal. | Solid waste generated at proposed facilities shall be managed and disposed in accordance with the SWM Rules |
| Coastal Zone Regulation (CRZ), 2019 | The main objectives of this notification are to ensure livelihood security to the fishing communities and other local communities living in the coastal areas; to conserve and protect coastal stretches and; to promote development in a sustainable manner based on scientific principles, taking into account the dangers of natural hazards in the coastal areas and sea level rise due to global warming. The CRZ Notification, clearly lists out the areas that fall within the categories of I, II, III and IV of CRZ and the permissible and non-permissible activities in each zone. 30. | Projects attracting this notification shall obtain CRZ clearance for implementation from the authority as required. |
| Construction and Demolition Waste Management Rules, 2016 | Rules to manage construction and to waste resulting from construction, remodeling, repair and demolition of any civil structure. Rules define C and D waste as waste comprising of building materials, debris resulting from construction, remodeling, repair and demolition of any civil structure. | <u>Appendix-4 sample outline spoils management plan given.</u> Construction and demolition waste generated from the project construction shall be managed and disposed as per the rules |
| Labor Laws | The contractor shall not make employment decisions based upon personal characteristics unrelated to job requirements. The contractor shall base the employment relationship upon equal opportunity and fair treatment, and shall not discriminate with respect to aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment or retirement, and discipline. The contractor shall provide equal wages and benefits to men and women for work of equal value or type. | Appendix 2 provides applicable labor laws including amendments issued from time to time applicable to establishments engaged in construction of civil works. |

| Law | Description | Requirement |
|--|---|--|
| The Ancient Monument and Archaeological Sites and Remains (Amendment and Validation) Act 2010 | <p>The Rules designate areas within a radius of 100 m and 300 m from the “protected property/monument/ area” as “prohibited area” and “regulated area” respectively.</p> <p>Henceforth, 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</p> <p>In respect of regulated area, the Competent Authority may grant permission for construction, reconstruction, repair and renovation on the basis of 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 area</p> | For the proposed sewer network in Zone-5 within 300 m of the Erumbeeswarar Temple (an ASI protected monument) NOC has been received and is provided in Appendix-11 |
| <p>The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013(LARR)</p> <p>The Act shall come into force on 1January 2014 as notified by the Central Government.</p> | Private land acquisition is guided by the provisions and procedures under this Act. Before the acquisition of any land, the Government is required to consult the concerned Panchayat or Municipal Corporation and carry out a Social Impact Assessment in consultation with them. The Act provides a transparent process for land acquisition for industrialization, development of essential infrastructural facilities and urbanization by giving adequate financial compensation to the affected people. | Land acquisition is not required for this subproject. All the subproject components are proposed in the government land belonging to TCMC (PIU). |

ASI = Archeological Survey of India, PIU = program implementation unit, STP = sewage treatment plant, SWM = Solid Waste Management.

32. **Clearances / permissions to be obtained by Contractor.** Following Table shows the list of clearances/permissions required for project construction. This list is indicative and the contractor should ascertain the requirements prior to start of the construction, and obtain all necessary clearances/permission prior to start of construction.

Table -3:Clearances and permissions required for Construction

| S. No | Construction Activity | Statutory Authority | Statute under which Clearance is Required | Implementation | Supervision |
|-------|--|---|---|----------------|-------------|
| 1 | Tree Cutting | Department of Forest and District Collector | Tamil Nadu Timber Transit Rules, 1968 or latest. | PIU/ CMSC | PIU |
| 2 | Hot mix plants, Crushers and Batching plants | TNPCB | Consent to establish and consent to operate under Air Act, 1981 | Contractor | PIU |
| 4 | Storage, handling and transport of | TNPCB | Hazardous Wastes (Management and Handling) Rules. 1989 | Contractor | PIU |

| S. No | Construction Activity | Statutory Authority | Statute under which Clearance is Required | Implementation | Supervision |
|-------|--|--|---|----------------|-------------|
| | hazardous materials | | Manufacturing, Storage and Import of Hazardous Chemicals Rules, 1989 | | |
| 5 | Sand mining, quarries and borrow areas | Department of Geology and mining, GOTN | Tamil Nadu Minor Mineral Concession Rules, 1959 (corrected up to 31 March 2001) | Contractor | PIU |
| 6 | New quarries and borrow areas | MOEFCC | Environmental clearance under EIA Notification 2006 | Contractor | PIU |
| 7 | Groundwater extraction | Public Works Department | Tamil Nadu Groundwater Development and Management Act 2000 | Contractor | PIU |
| 8 | Disposal of bituminous wastes | Tamil Nadu State Pollution Control Board | Hazardous Wastes (Management and Handling) Rules. 1989 | Contractor | PIU |
| 9 | Temporary traffic diversion measures | - | MORTH 112 SP 55 of IRC codes | Contractor | PIU |
| 10 | Controlled Blasting for excavation | District Collector, Trichy | Explosives Rules, 2008 | Contractor | PIU |

CMSC = Construction Management and Supervision Consultant, EIA = environmental impact assessment, GOTN = Government of India, MOEFCC = Ministry of Environment, Forest and Climate Change, MORTH = Ministry of Road Transport and Highways, PIU = program implementation unit, TNPCB = Tamil Nadu Pollution Control Board, WTP = water treatment plant.

33. **ADB SPS Requirements.** During the design, construction, and operation of the project the program management unit (PMU) and program implementation units (PIUs) will apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines (www.ifc.org/ehsguidelines). These standards contain performance levels and measures that are normally acceptable and applicable to projects. When Government of India regulations differ from these levels and measures, the PMU and PIUs will achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the PMU and PIUs will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS, 2009.

Table 4: Applicable Ambient Air Quality Standards for India Projects

| Parameter | Location ^a | National Ambient Air Quality Standards ^b | WHO Air Quality Guidelines ($\mu\text{g}/\text{m}^3$) | | Applicable Per ADB SPS ^c ($\mu\text{g}/\text{m}^3$) |
|--|--|---|---|-----------------------------------|--|
| | | | Global Update ^d 2005 | Second Edition ^e 2000 | |
| Particulate Matter PM ₁₀ ($\mu\text{g}/\text{m}^3$) | Industrial Residential, Rural and Other Areas | 60 (Annual) 100 (24-hr) | 20 (Annual) 50 (24-hr) | - | 20 (Annual) 50 (24-hr) |
| | Sensitive Area | 60 (Annual) 100 (24-hr) | 20 (Annual) 50 (24-hr) | - | 20 (Annual) 50 (24-hr) |
| Particulate Matter PM ₂₅ ($\mu\text{g}/\text{m}^3$) | Industrial Residential, Rural and Other Areas | 40 (Annual) 60 (24-hr) | 10 (Annual) 25 (24-hr) | - | 10 (Annual) 25 (24-hr) |
| | Sensitive Area | 40 (Annual) 60 (24-hr) | 10 (Annual) 25 (24-hr) | - | 10 (Annual) 25 (24-hr) |
| Sulfur Dioxide SO ₂ ($\mu\text{g}/\text{m}^3$) | Industrial Residential, Rural and Other Areas | 50 (Annual) 80 (24-hr) | 20 (24-hr) 500 (10-min) | - | 20 (Annual) 800 (24-hr) 500 (10-min) |
| | Sensitive Area | 20 (Annual) 80 (24-hr) | 20 (24-hr) 500 (10-min) | - | 20 (Annual) 20 (24-hr) 500 (10-min) |
| Nitrogen Dioxide NO ₂ ($\mu\text{g}/\text{m}^3$) | Industrial Residential, Rural and Other Areas | 40 (Annual) 80 (24-hr) | 40 (Annual) 200 (1-hr) | - | 40 (Annual) 80 (24-hr) 200 (1-hr) |
| | Sensitive Area | 30 (Annual) 80 (24-hr) | 40 (Annual) 200 (1-hr) | - | 30 (Annual) 80 (24-hr) 200 (1-hr) |
| Carbon Monoxide CO ($\mu\text{g}/\text{m}^3$) | Industrial Residential, Rural and Other Areas | 2,000 (8-hr) 4,000 (1-hr) | - | 10,000 (8-hr) 100,000 (15-min) | 2,000 (8-hr) 4,000 (1-hr) 100,000 (15-min) |
| | Sensitive Area | 2,000 (8-hr) 4,000 (1-hr) | - | 10,000 (8-hr) 100,000 (15-min) | 2,000 (8-hr) 4,000 (1-hr) 100,000 (15-min) |
| Ozone (O ₃) ($\mu\text{g}/\text{m}^3$) | Industrial Residential, Rural and Other Areas | 100 (8-hr) 180 (1-hr) | 100 (8-hr) | - | 100 (8-hr) 180 (1-hr) |
| | Sensitive Area | 100 (8-hr) 180 (1-hr) | 100 (8-hr) | - | 100 (8-hr) 180 (1-hr) |
| Lead (Pb) ($\mu\text{g}/\text{m}^3$) | Industrial, Residential, Rural and Other Areas | 0.5 (Annual) 1.0 (24-hr) | - | 0.5 (Annual) | 0.5 (Annual) 1.0 (24-hr) |
| | Sensitive Area | 0.5 (Annual) 1.0 (24-hr) | - | 0.5 (Annual) | 0.5 (Annual) 1.0 (24-hr) |
| Ammonia (NH ₃) ($\mu\text{g}/\text{m}^3$) | Industrial Residential, Rural and Other Areas | 100 (Annual) 400 (24-hr) | - | - | 100 (Annual) 400 (24-hr) |
| | Sensitive Area | 100 (Annual) 400 (24-hr) | - | - | 100 (Annual) 400 (24-hr) |
| Benzene (C ₆ H ₆) | Industrial Residential, Rural | 5 (Annual) | - | - | 5 (Annual) |

| Parameter | Location ^a | National Ambient Air Quality Standards ^b | WHO Air Quality Guidelines ($\mu\text{g}/\text{m}^3$) | | Applicable Per ADB SPS ^c ($\mu\text{g}/\text{m}^3$) |
|--|---|---|---|----------------------------------|--|
| | | | Global Update ^d 2005 | Second Edition ^e 2000 | |
| ($\mu\text{g}/\text{m}^3$) | and Other Areas | | | | |
| | Sensitive Area | 5 (Annual) | - | - | 5 (Annual) |
| Benzo(o) pyrene (BaP) (ng/m^3) | Industrial Residential, Rural and Other Areas | 1 (Annual) | - | - | 1 (Annual) |
| | Sensitive Area | 1 (Annual) | - | - | 1 (Annual) |
| Arsenic (As) (ng/m^3) | Industrial Residential, Rural and Other Areas | 6 (Annual) | - | - | 6 (Annual) |
| | Sensitive Area | 6 (Annual) | - | - | 6 (Annual) |
| Nickel (Ni) (ng/m^3) | Industrial Residential, Rural and Other Areas | 20 (Annual) | - | - | 20 (Annual) |
| | Sensitive Area | 20 (Annual) | - | - | 20 (Annual) |

^a Sensitive area refers to such areas notified by the India Central Government.

^b[http://cpcb.nic.in/uploads/National Ambient Air Quality Standards.pdf](http://cpcb.nic.in/uploads/National_Ambient_Air_Quality_Standards.pdf)

^cAs per ADB SPS, the government shall achieve whichever of the ambient air quality standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency of the government will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

^d WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide. *Global update 2005*. WHO. 2006.

^eAir Quality Guidelines for Europe Second Edition. WHO 2000.

Table 5: Applicable Ambient Noise Level Standards for India Projects

| Receptor/ Source | Noise Level Standards ^a (dBA) | | WHO Guidelines Value For Noise Levels Measured Out of Doors ^b (One Hour L_{Aeq} in dBA) | | Applicable Per ADB SPS ^c (dBA) | |
|------------------|--|-------|--|---------------|---|------------|
| | Day | Night | 07:00 – 22:00 | 22:00 – 07:00 | Day time | Night time |
| Industrial area | 75 | 70 | 70 | 70 | 70 | 70 |
| Commercial area | 65 | 55 | | | 65 | 55 |
| Residential Area | 55 | 45 | 55 | 45 | 55 | 45 |
| Silent Zone | 50 | 40 | | | 50 | 40 |

^a Noise Pollution (Regulation and Control) Rules, 2002 as amended up to 2010 (<http://cpcb.nic.in/displaypdf.php?id=Tm9pc2UtU3RhbmRhcmRzL25vaXNlX3J1bGVzXzlwMDAucGRm>).

^b Guidelines for Community Noise. WHO. 1999.

^c As per ADB SPS, the Executing Agency shall achieve whichever of the ambient air quality standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency of the government will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS, 2009.

Table 6: Applicable Drinking Water Quality Standards^a for India Projects

| Group | National Standards for Drinking Water ^b | | | WHO Guidelines for Drinking-Water Quality, 4th Edition, 2011 ^c | Applicable Per ADB SPS ^{de} |
|----------------|--|-------------|--------------------------|---|---|
| | Parameter | Unit | Max. Concentration Limit | | |
| Physical | Turbidity | NTU | 1 (5) | - | 1 (5) |
| | Ph | | 6.5 – 8.5 | None | 6.5 – 8.5 |
| | Color | Hazen units | 5 (15) | None | 5 (15) |
| | Taste and Odor | | Agreeable | - | Agreeable |
| | TDS | mg/l | 500 (2,000) | - | 500 (2,000) |
| | Iron | mg/l | 0.3 | - | 0.3 |
| | Manganese | mg/l | 0.1 (0.3) | - | 0.1 (0.3) |
| | Arsenic | mg/l | 0.01 (0.05) | 0.01 | 0.01 |
| | Cadmium | mg/l | 0.003 | 0.003 | 0.003 |
| | Chromium | mg/l | 0.05 | 0.05 | 0.05 |
| | Cyanide | mg/l | 0.05 | None | 0.05 |
| | Fluoride | mg/l | 1 (1.5) | 1.5 | 1 (1.5) |
| | Lead | mg/l | 0.01 | 0.01 | 0.01 |
| | Ammonia | mg/l | 0.5 | none established | 0.5 |
| Chemical | Chloride | mg/l | 250 (1,000) | none established | 250 (1,000) |
| | Barium | mg/l | 0.7 | None | 0.7 |
| | Sulphate | mg/l | 200 (400) | None | 200 (400) |
| | Nitrate | mg/l | 45 | 50 | 45 |
| | Copper | mg/l | 0.05 (1.5) | 2 | 0.05 (1.5) |
| | Total Hardness | mg/l | 200 (600) | - | 200 (600) |
| | Calcium | mg/l | 75 (200) | - | 75 (200) |
| | Zinc | mg/l | 5 (15) | none established | 5 (15) |
| | Mercury | mg/l | 0.001 | 0.006 | 0.001 |
| | Aluminum | mg/l | 0.1 (0.3) | none established | 0.1 (0.3) |
| | Anionic detergents | mg/l | 0.2 (1.0) | None | 0.2 (1.0) |
| | Phenolic compounds | mg/l | 0.001(0.002) | None | 0.001(0.002) |
| | Residual Chlorine | mg/l | 0.2 | 5 | 0.2 |
| | Microbial indicator | E-coli | MPN/100ml | Must not be detectable in any 100 ml sample | Must not be detectable in any 100 ml sample |
| Total Coliform | | MPN/100ml | | | |

^a<http://cgwb.gov.in/Documents/WQ-standards.pdf>.^bBureau of India Standard 10500: 2012 (Indian Standard, Drinking Water — Specification (Second Revision)).^cHealth-based guideline values.^dAs per ADB SPS, the government shall achieve whichever of the drinking quality standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency of the government will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS, 2009.^eFigures in parenthesis are maximum limits allowed in the absence of alternate source.

Table 7: General Standards for Discharge of Environmental Pollutants^a
Part- A: Effluents (SCHEDULE – V)

| Sl. no | Parameter | Inland surface water | Public sewers | Land for irrigation | Marine/ coastal areas |
|--------|---|--|---------------|---------------------|---|
| 1 | Suspended solids mg/l, max. | 100 | 600 | 200 | (a) For process waste water (b) For cooling water effluent 10 % above total suspended matter of influent |
| 2 | Particle size of suspended solids | shall pass 850 micron IS Sieve | - | - | (a) Floatable solids, solid s max. 3 mm (b) Settleable solids, max 856 microns |
| 3 | pH value | 5.5 to 9.0 | 5.5 to 9.0 | 5.5 to 9.0 | 5.5 to 9.0 |
| 4 | Temperature | shall not exceed 5°C above the receiving water temperature | - | - | shall not exceed 5°C above the receiving water temperature |
| 5 | Oil and grease, mg/l max | 10 | 20 | 10 | 20 |
| 6 | Total residual chlorine, mg/l max | 1 | - | - | 1 |
| 7 | Ammonical nitrogen (N), mg/l, max | 50 | 50 | - | 50 |
| 8 | Total kjeldahl nitrogen (N) mg/l, max | 100 | - | - | 100 |
| 9 | Free ammonia (NH ₃), mg/l, max. | 5 | - | - | 5 |
| 10 | Biochemical Oxygen Demand (3 days at 27°C), mg/l, max | 30 | 350 | 100 | 100 |
| 11 | Chemical Oxygen Demand, mg/l, max | 250 | - | - | 250 |
| 12 | Arsenic (As) mg/l, max. | 0.2 | 0.2 | 0.2 | 0.2 |
| 13 | Mercury (Hg), mg/l, max. | 0.01 | 0.01 | - | 0.01 |
| 14 | Lead (Pb) mg/l, max | 0.1 | 1 | - | 2 |
| 15 | Cadmium (Cd) mg/l, max | 2 | 1 | - | 2 |
| 16 | Hexavalent chromium (Cr +6), mg/l, max. | 0.1 | 2 | - | 1 |
| 17 | Total Chromium (Cr) mg/l, max. | 2 | 2 | - | 2 |

| Sl. no | Parameter | Inland surface water | Public sewers | Land for irrigation | Marine/ coastal areas |
|------------|--|--|--|--|--|
| 18 | Copper (Cu) mg/l, max. | 3 | 3 | - | 3 |
| 19 | Zinc (Zn) mg/l, max | 5 | 15 | - | 15 |
| 20 | Selenium (Se) mg/l, max | 0.05 | 0.05 | - | 0.05 |
| 21 | Nickel (Ni) mg/l, max. | 3 | 3 | - | 5 |
| 22 | Cyanide (CN) mg/l, max | 0.2 | 2 | 0.2 | 0.2 |
| 23 | Fluoride (F) mg/l, max. | 2 | 15 | - | 15 |
| 24 | Dissolved phosphates (P) , mg/l, max | 5 | - | - | - |
| 25 | Sulphide (S) mg/l, max. | 2 | - | - | 5 |
| 26 | Phenolic compounds (C ₆ H ₅ OH) mg/l, max. | 1 | 5 | - | 5 |
| 27 | Radioactive materials: | | | | |
| | (a) Alpha emitters micro curie mg/l, max. | 10 ⁻⁷ | 10 ⁻⁷ | 10 ⁻⁸ | 10 ⁻⁷ |
| XXX | (b) Beta emitters micro curie mg/l | 10 ⁻⁶ | 10 ⁻⁶ | 10 ⁻⁷ | 10 ⁻⁶ |
| 28 | Bio-assay test | 90% survival of fish after 96 hours in 100% effluent | 90% survival of fish after 96 hours in 100% effluent | 90% survival of fish after 96 hours in 100% effluent | 90% survival of fish after 96 hours in 100% effluent |
| 29 | Manganese | 2 mg/l | 2 mg/l | - | 2 mg/l |
| 30 | Iron (Fe) | 3mg/l | 3mg/l | - | 3mg/l |
| 31 | Vanadium (V) | 0.2mg/l | 0.2mg/l | - | 0.2mg/l |
| 32 | Nitrate Nitrogen | 10 mg/l | - | - | 20 mg/l |

^a <http://cpcb.nic.in/industry-effluent-standards/>

XXXIV. DESCRIPTION OF THE ENVIRONMENT

A. Methodology Used for Baseline Study

34. **Data collection and stakeholder consultations.** Data for this study has been primarily collected through comprehensive literature survey, discussion with stakeholder agencies, and field visits to the proposed subproject sites.
35. The literature survey broadly covered the following:
- (i) Project details, reports, maps, and other documents prepared by detailed project report (DPR) technical consultants and TCMC;
 - (ii) Discussions with Technical experts of the PPTA team, TNUIFSL, implementing agency and DPR technical consultants other relevant government agencies;
 - (iii) Secondary data from previous project reports and published articles; and
 - (iv) Literature on land use, soil, geology, hydrology, climate, socioeconomic profiles, and other planning documents collected from Government agencies and websites.
36. **Ocular inspection.** Several visits to the project sites were made during IEE preparation period in 2018 to assess the existing environment (physical, biological, and socioeconomic) and gather information with regard to the proposed sites and scale of the proposed project. A separate socio-economic study was conducted to determine the demographic information, existing service levels, stakeholder needs and priorities.

B. Physical Resources

1. Location, Area and Connectivity

37. Tiruchirappalli is one of the largest city in the state of Tamil Nadu. Geographically, it is situated in the center of the state, on the banks of the Cauvery River. Tiruchirappalli City spreading over an area of 146.90 km² was upgraded from Special Grade Municipality to Corporation in the year 1994. During the year 2011, the adjacent local bodies including Paappakurichi Village Panchayat, Ellakudi Village Panchayat, Aalathur Village Panchayat, Keelkalkandar Kottai Village Panchayat and Thiruverumbur Town Panchayat measuring 20.33 km² were added with the Corporation. Thus the total area of TCMC became 167.23 km² and it is divided into 65 wards with a population of 9.16 lakhs (as per census 2011).

38. Tiruchirappalli is well connected with major cities in Tamil Nadu by road network (connected by 4 National Highways, 2 State Highways and several District Roads with other major towns of the state). By virtue of its location, Tiruchirappalli city serves as an important link from north to south and east to west across the state. Tiruchirappalli town, Srirangam and Golden rock are part of Tiruchirappalli urban agglomeration and also developing as a regional metropolis, extending its influence over the entire Tiruchirappalli and Thanjavur districts. The influence of Tiruchirappalli extends up to Cuddalore, Villupuram, Vellore, Salem, Erode, Dindigul and Pudukottai Districts.

39. Tiruchirappalli is an important Divisional Headquarters of Southern Railways. Tiruchirappalli is well connected by rail to Chennai, Kanyakumari, Madurai, Thanjavur, Rameswaram, Coimbatore and Bangalore. Tiruchirappalli junction is the main station for passengers as well as goods movement. Tiruchirappalli has an International Airport located on the Pudukottai road at a distance of 6 km. City is connected by air with Chennai, Madurai, Thiruvananthapuram, Sri Lanka, Singapore and middle east countries.

40. Tiruchirappalli is bound on the north by Namakkal District, Northeast by Perambalur District, East by Thanjavur District, southeast by Pudukottai District, south by Sivaganga and Madurai

Districts, Southwest by Dindigul District and on the West by Karur District. It is a city known for its educational institutions, industries, and temples. Tiruchirappalli, is a commercial and tourist hub of Tamil Nadu. The most prominent landmark is ASI protected Rock Fort Temple, a spectacular monument perched on a massive rocky outcrop which rises abruptly from the plains to tower over the old city.

2. Topography, Soils and Geology

41. Tiruchirappalli lies between 10°10' and 11° 20' of the northern latitude and 78°10' and 79° 0' of eastern latitude. The general slope of the city is towards east. Pachamalai Hill is an important peak rising up to 1,015 m, located at Sengattupatti Reserve Forest. Prominent geomorphic units identified in Tiruchirappalli are alluvial plains, shallow and deep buried sediments, valley fills and structural hills.

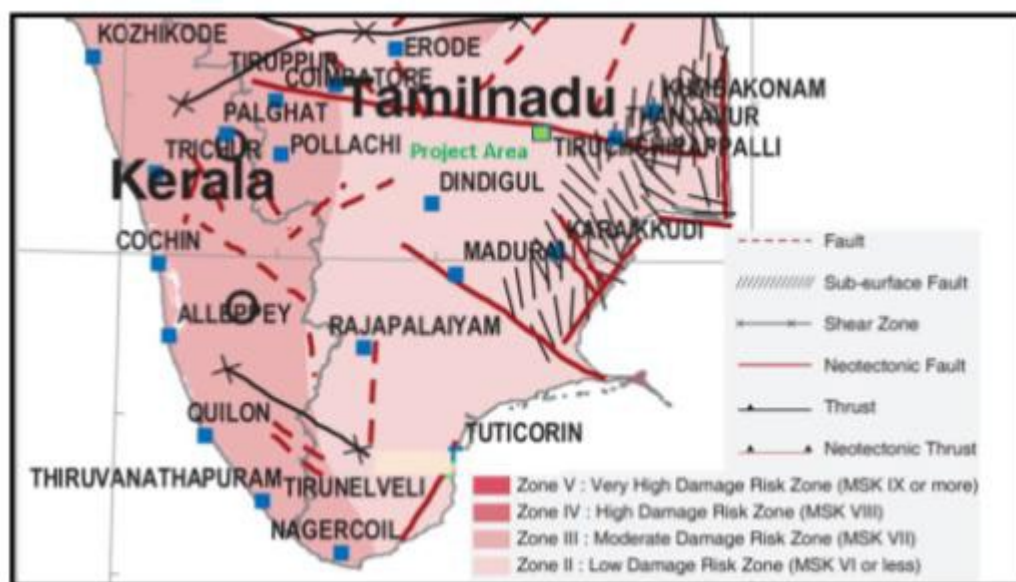
42. Geologically, Tiruchirappalli is underlain by formations ranging in age from Achaean to recent formation. Crystalline rocks comprising Charnockites, gneiss occupy a major part of the district. Alluvial deposits are restricted to major drainage courses and foothill zones. The geology of Tiruchirappalli is mainly hard rock, mostly Charnockites and mixed gneiss with river alluvium. The cretaceous formations consisting of limestone, calcareous shale, clay, argillaceous sandstones etc. occur in parts of Tiruchirappalli. There is no incidence of land subsidence in and around project area. The hydro-geology of the city is represented by hard rock aquifers along the northern and north-western part.

43. The important aquifer systems in Tiruchirappalli are constituted by weathered and fractured crystalline rocks. Groundwater occurs under pre-tertiary conditions in the weathered residuum and under semi-confined to confined conditions in deeper fracture zones. Recent alluvial deposits and semi-consolidated formations are found to form localized, discontinuous aquifers with low to moderate field potentials.

3. Seismology

44. Bureau of Indian Standards, based on the past seismic history, grouped the country into four seismic zones, viz. Zone II, III, IV and V. Of these, Zone V is the most seismically active region, while zone II is the least. As per the Modified Mercalli (MM) intensity scale, which measures the impact of the earthquakes on the surface of the earth, the subproject area comes under Low Damage Risk Zone II.

Figure 10: Seismic Zone of Project Area



Source: BMTPC.

4. Climatic Conditions

45. The district has a tropical climate. The region experiences four main seasons: Winter Season (December to February), Summer Season (March to May), Windy Season (June to August) and, Monsoon (September to November). The period from April to June is generally hot and dry. The weather is pleasant during the period from November to January. Usually mornings are more humid than afternoons. The relative humidity varies between 50% and 85% in the mornings while in the afternoon it varies between 70% and 92%.

46. The normal annual rainfall over the district varies from about 730 mm to about 900 mm. The minimum rainfall was recorded at Musiri (731.9 mm) in the western part of the district. The rainfall intensity gradually increases towards north, east and south and reaches a maximum of 908.5 mm at Manapparai.

Table 8: Annual Rainfall in Tiruchirappalli

| Year | 2011 | 2012 | 2013 | 2014 | 2015 | Normal Rainfall |
|----------------|--------|--------|--------|--------|-------|-----------------|
| Rainfall in mm | 806.90 | 626.90 | 522.90 | 535.70 | 862.0 | 818.0 |

Source : IMD Chennai.

5. Surface Water

47. Tiruchirappalli falls under Cauvery River Basin. The Cauvery River is the most important River in the district and the tributaries of Cauvery, i.e., Coleroon River, Koraiyar river, Ariyar, Malattar channel and Uyyakondan canal also drain in Tiruchirappalli. The river splits into two branches, the northern branch being called the Coleroon (Kollidam) and the southern branch called Cauvery River. Ponnaniar, Uppamodai and Siddhayalli reservoirs are mainly used for irrigation purposes in this region. All the channels except Cauvery are ephemeral in nature.

48. Water quality monitoring in Cauvery River is conducted at various locations regularly by Central Pollution Control Board (CPCB) in the upstream and downstream of Tiruchirappalli town. According to the water quality data of 2014 (Table 9), Cauvery River water quality is classified as B;

pH of water ranged between 7.4 and 8.4 and biochemical oxygen demand (BOD) ranged between 0.2 and 18 mg/l. The presence of the Coliforms in water quality indicates the contamination due to the inlet of sewage water into the Cauvery River.

49. There are several channels/streams crisscross the city. These include Uyyakondan, Koraiyar and Thirumanjana Cauvery which finally merges into the Cauvery and Coleroon Rivers. With exemption to Uyyakondan channel, the water quality data is not available for rest of the channels/streams, The water quality information collected for Uyyakondan channel during the IEE assessment is furnished in Table 10. The outcome of the analysis reveals that the surface water is contaminated with higher number of E.coli/ coliforms. The recorded BOD values are also high indicating the strong presence of organic pollution.

Table 9: Water Quality of Cauvery River near Tiruchirappalli

| Locations | D.=O (mg/l) | | | pH | | | Conductivity (µmhos/cm) | | | BOD (mg/l) | | | Nitrate- N+ Nitrite-N (mg/l) | | | Fecal Coliform (MPN/100ml) | | | Total Coliform (MPN/100ml) | | |
|---|-------------|------|------|---------|-----|------|-------------------------|------|------|------------|-----|------|------------------------------|------|------|----------------------------|----------|--------|----------------------------|------------|-----------|
| | Min | Max | Mean | Min | Max | Mean | Min | Max | Mean | Min | Max | Mean | Min | Max | Mean | Min | Max | Mean | Min | Max | Mean |
| Water Quality Criteria | > 4 mg/l | | | 6.5-8.5 | | | | | | < 3 mg/l | | | | | | < 2500 MPN/100ml | | | < 5000 MPN/100ml | | |
| Cauvery At Pettaivaithalai, Tiruchirappalli | 6.4 | 10.8 | 8.6 | 7.9 | 8.8 | 8.3 | 287 | 812 | 575 | 0.5 | 3.7 | 1.3 | 0 | 0.5 | 0.2 | 260 | 170000 | 24822 | 320 | 350,000 | 54,768 |
| Cauvery At Tiruchirappalli U/S | 5.9 | 9.7 | 8.1 | 7.9 | 8.7 | 8.4 | 236 | 686 | 489 | 0.2 | 7.2 | 1.8 | 0.03 | 0.37 | 0.2 | 220 | 170000 | 23957 | 330 | 280,000 | 57,494 |
| Cauvery At Tiruchirappalli D/S | 1.2 | 8.4 | 5.5 | 7.4 | 8.6 | 8 | 279 | 1438 | 829 | 0.7 | 18 | 5.5 | 0 | 6.14 | 0.7 | 320 | 11000000 | 975610 | 390 | 22,000,000 | 1,939,974 |
| Cauvery At Tiruchirappalli, Grand Anaicut | 3.7 | 10.2 | 6.5 | 7.8 | 8.8 | 8.2 | 274 | 1323 | 728 | 0.8 | 12 | 3.7 | 0.05 | 0.48 | 0.2 | 320 | 540000 | 73607 | 390 | 920,000 | 127,304 |

BOD = Bio-Chemical Oxygen demand, mg/l = milligrams per liter, MPN = most probable number.

Source: cpcbenviis.nic.in

Table 10: Baseline water quality at Uyyakondan Channel

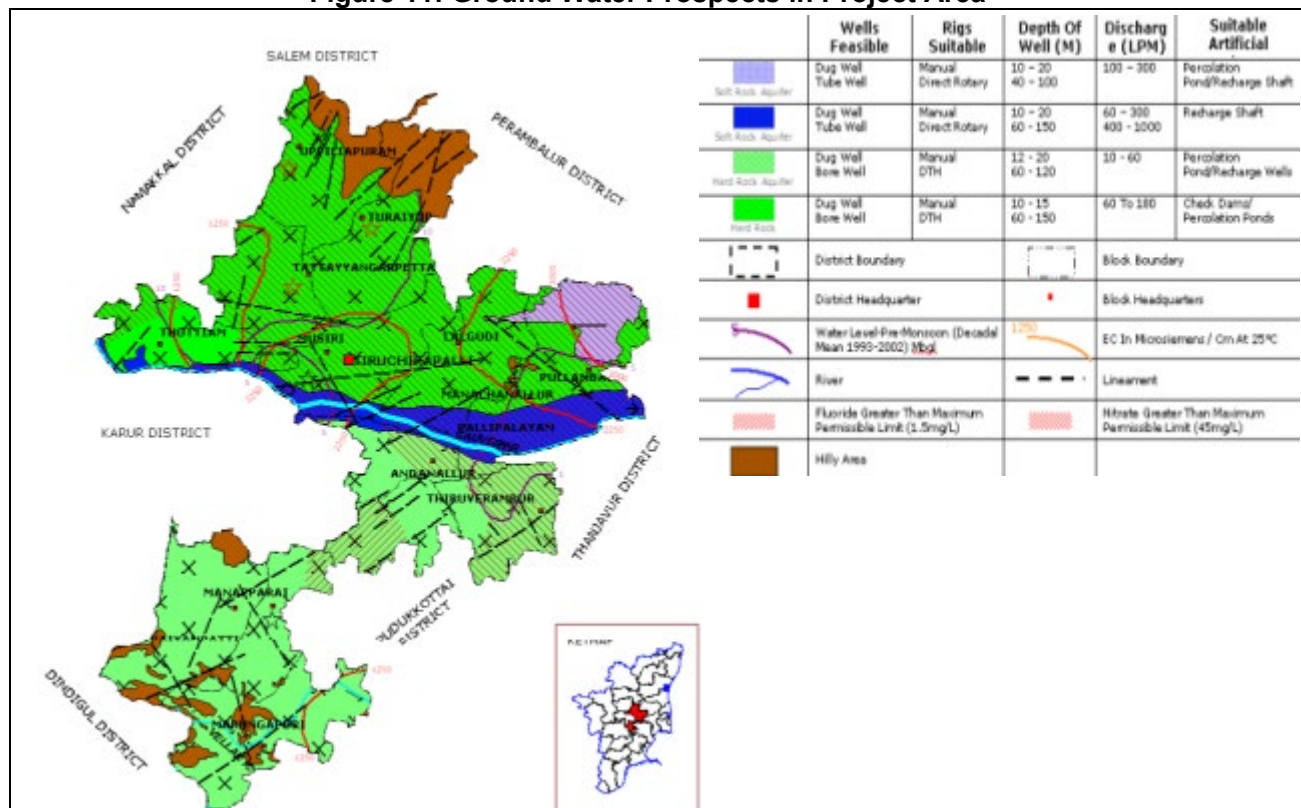
| S. No | Parameters | Results River Cauvery's Tributary ,Uyyakondan Channel |
|-------|---|--|
| 1 | Color | Slightly Yellowish |
| 2 | Odor | Agreeable |
| 3 | pH | 7.3 |
| 4 | Electrical conductivity (EC) (Reciprocal mehn ohms Cm ³ at 20°C) | 670 |
| 5 | Turbidity as NTU | 10 |
| 6 | Ammoniacal Nitrogen as N (mg/l) | 6.16 |
| 7 | Nitrite- Nitrogen as NO ₂ (mg/l) | Trace |
| 8 | Nitrite Nitrogen as NO ₃ (mg/l) | 0.5 |
| 9 | Dissolved Phosphate as PO ₄ (mg/l) | 0.123 |
| 10 | Oxidisable Organic matter (Tidy' s) (mg/l) | 1.84 |
| 11 | Dissolved Oxygen (D.O) (mg/l) | 5.8 |
| 12 | Bio-Chemical Oxygen demand (BOD) (5th day at 20° c) (mg/l) | 3.2 |
| 13 | Chemical Oxygen Demand (COD) (mg/l) | 69.0 |
| 14 | Sodium as Na (mg/l) | 32.0 |
| 15 | Potassium as K (mg/l) | 9.9 |
| 16 | Calcium as Ca (mg/l) | 40.0 |
| 17 | Magnesium as Mg (mg/l) | 22.0 |
| 18 | Total dissolved Solids (mg/l) | 470.00 |
| 19 | Total Hardness as Ca Co ₃ (mg/l) | 192.00 |
| 20 | Alkanity CaCo ₃ (mg/l) | 180.00 |
| 21 | Phenolphthalein Alkalinity (mg/l) | 0 |
| 22 | HCO ₃ Alkalinity (mg/l) | 0 |
| 23 | Chloride as Cl (mg/l) | 85.0 |
| 24 | Sulphate as SO ₄ (mg/l) | 80.0 |
| 25 | Fluride as F (mg/l) | 0.40 |
| 26 | Total Iron as Fe (mg/l) | 0.1 |
| 27 | Boran as B (mg/l) | Nil |
| 28 | Arsenic as As (mg/l) | Nil |
| 29 | Cadmium as Cd (mg/l) | Nil |
| 30 | Mercury as Mg (mg/l) | Nil |
| 31 | Zinc as Zn (mg/l) | Nil |
| 32 | Chromium as Cr (total) (mg/l) | Nil |
| 33 | Lead as Pb (mg/l) | Nil |
| 34 | Nickel as Ni (mg/l) | Nil |
| 35 | Phenolic Compound as C ₆ H ₅ OH (mg/l) | Nil |
| | Bacteriological examination | |
| 36 | Total Colonies per ml on agar at 37 °C | 60 X 10 ² /ml |
| 37 | MPN of coliform bacteria per 100 ml | 3450 / 100 ml |
| 38 | Fecal coliform bacteria isolated | E-coli |
| 39 | Microscopical Examination | Monas,Coleps,Anacystis,Actinophyrus,Pe destrum,Paramecium,scenesmus,Coelast rum, Epiphases , Selenastrum |

mg/l = milligrams per liter.

6. Groundwater

50. The estimation of groundwater resources for the district has shown that out of 14 blocks, 4 blocks are categorized as over exploited, one block as 'critical' and rest are 'safe'.

Figure 11: Ground Water Prospects in Project Area



Source: CGWB.

51. **Groundwater Quality.** Groundwater in phreatic aquifers in Tiruchchirappalli district, in general, is colorless, odorless and slightly alkaline in nature. The electrical conductivity of ground water in phreatic zone (in microsiemens at 25°C) during May 2006 was in the range of 570 to 4550 $\mu\text{S}/\text{cm}$ and major parts of the district are having the electrical conductivity above 1,700 $\mu\text{S}/\text{cm}$. In general the groundwater is suitable for drinking and domestic uses. However, the concentration of fluoride (in comparison with BIS permissible limit) is observed to be high at Siruganallur (1.85 mg/L). Table 10A clearly depicts of ground water analysis at different project locations during pre-construction stage, All of the physico chemical parameters of ground water falls within permissible limits of Standards of Drinking water specification IS:10500. Bacteriological analysis clearly indicates that both the location shows present that indicates the ground water is contaminated with bacteriological pollution.

Table 10A: Ground water Quality in Project Area

| S.No. | Parameters | Units | Borewell Water (Store Yard) | Borewell Water RS Puram |
|-------|------------------------|-------|-----------------------------|-------------------------|
| 1 | Calcium as Ca | mg/l | 93 | 94 |
| 2 | Chlorides as Cl | mg/l | 224 | 291 |
| 3 | Colour | mg/l | <1.0 | <0.1 |
| 4 | Fluoride (as F) | mg/l | 1.3 | 1.3 |
| 5 | Free Residual Chlorine | mg/l | <0.1 | <0.1 |

| | | | | |
|-----------------------------------|---------------------------------------|-------|-----------|-----------|
| 6 | Iron as Fe | mg/l | <0.05 | <0.05 |
| 7 | Magnesium as Mg | mg/l | 4.1 | 14 |
| 8 | Odour | - | Agreeable | Agreeable |
| 9 | pH @25°C | - | 7.3 | 6.8 |
| 10 | Phenolic Compounds | mg/l | <0.001 | <0.001 |
| 11 | Specific Conductance @25°C | µS/cm | 1242 | 1620 |
| 12 | Sulphate as SO ₄ | mg/l | 135 | 175 |
| 13 | Total Alkalinity as CaCO ₃ | mg/l | 334 | 301 |
| 14 | Total Dissolved Solids | mg/l | 807 | 1053 |
| 15 | Total Hardness as CaCO ₃ | mg/l | 250 | 293 |
| 16 | Total Suspended Solids | mg/l | <5.0 | 33 |
| 17 | Turbidity | NTU | <0.1 | 169 |
| 18 | Zinc | mg/l | <0.05 | <0.05 |
| Microbiological Parameters | | | | |
| 18 | Coliform Bacteria in 100ml | -- | Present | Present |
| 19 | E.Coli in 100ml | -- | Present | Present |

(Source: Lab Reports)

52. **Ambient Air and Noise Quality.** No regular ambient air or noise quality monitoring is conducted by Tamil Nadu Pollution Control Board (TNPCB) in Tiruchirappalli. However, random monitoring has been conducted for 24 hours by TNCPB/CPCB. The ambient air quality recorded in 2014 shows the concentration of oxides of Sulphur and nitrogen is well below the stipulated ambient air quality standards, however, the concentration of particulate matter is above the standard. Of the 5 monitoring locations, particulate matter recorded in the two locations are well within the limits, one location has slightly above the limits, and at the remaining two locations, particulate matter is much higher than the limits. Dry weather conditions and traffic contributes to the high particulate matter to the ambient air. Ambient air quality conducted during pre-construction stage and result given in table 11A clearly depicts that value of all parameter of ambient air quality falls within permissible limits of standards throughout all sites as per NAAQS, 2009. Ambient air was conducted during 27.10.2020.

Table 11: Ambient Air Quality in Tiruchirappalli

| Sl. No | Monitoring day | Concentrations of Air Pollutants (24 hours) in µg/m ³ | | |
|------------------------|------------------------------------|--|-----------------|------|
| | | SO ₂ | NO ₂ | RSPM |
| 1 | Gandhi Nagar | 12 | 17 | 92 |
| 2 | Main guard gate | 11 | 17 | 68 |
| 3 | Bishop heber college | 9 | 14 | 40 |
| 4 | Golden Rock | 10 | 15 | 48 |
| 5 | Central bus Stand, Tiruchirappalli | 13 | 19 | 113 |
| NAAQ standard (24 hrs) | | 50 | 40 | 60 |

NAAQ = National Ambient Air Quality, RSPM = respirable suspended particulate matter, µg/m³ = micrograms per cubic meter of air.

Source: Air pollution data base in Tamil Nadu ENVIS Center GOTN-2014.

Table 11A: Ambient Air Quality in Project Area

| Sl. No | Location | Concentrations of Air Pollutants (24 hours) in | | | | |
|------------------------|--------------------------|--|----------------------------|--------------------------|--------------------------|-------------------------|
| | | PM10 µg/m ³ | PM2.5 µg/m ³ | SO2 µg/m ³ | NO2 µg/m ³ | CO µg/m ³ |
| 1 | Store Yard | 63.3 | 32.5 | 11.7 | 23.6 | <1.2 |
| 2 | Pumping Station RS Puram | 89.9 | 45.2 | 8.8 | 16.3 | <1.2 |
| NAAQ standard (24 hrs) | | 100 | 60 | 80 | 80 | 2 |

(Source: Lab reports)

Ambient Noise Quality: During pre-construction stage, ambient Noise level monitoring was conducted at different location as given in table 11B and from table it is clear that value of ambient noise level found within permissible limits of standards of industrial. Ambient noise level was conducted on 27.10.2020 at different locations.

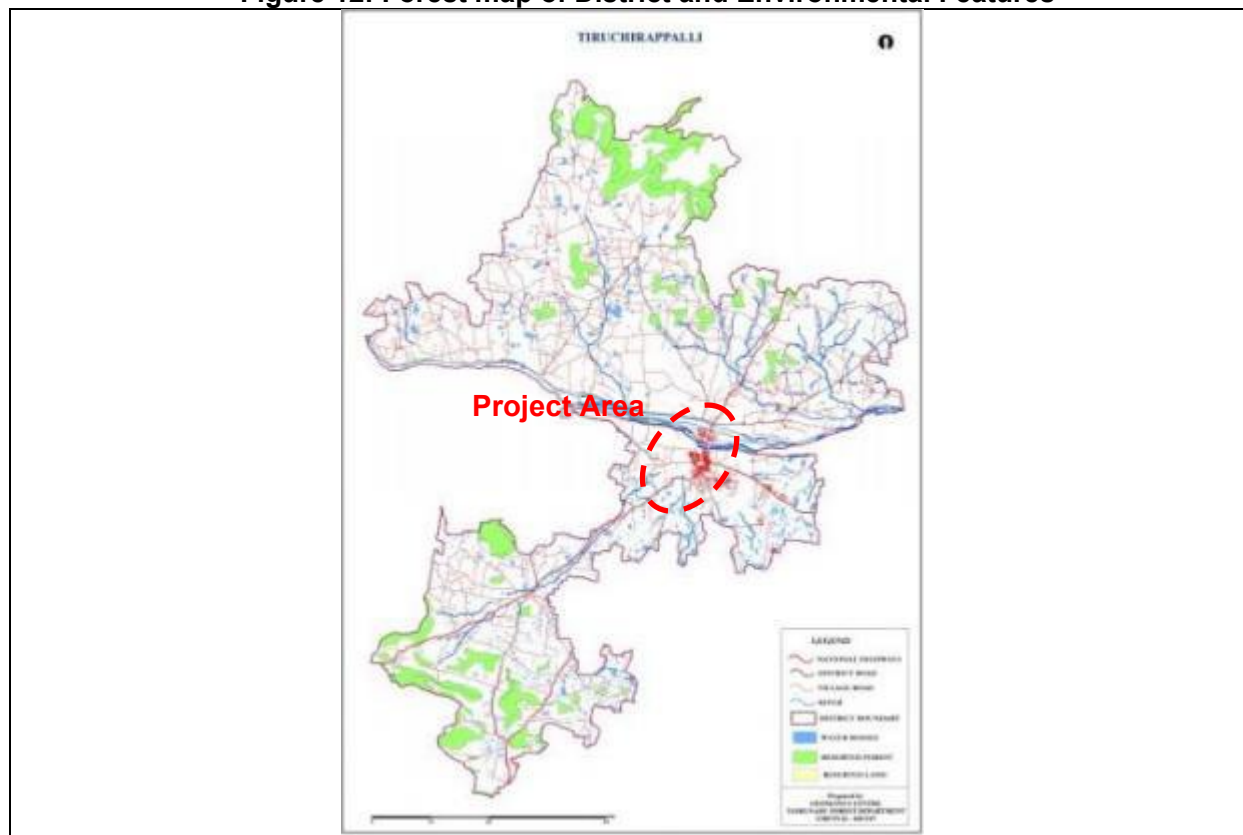
Table 11B: Ambient Noise Quality in Project Area

| S.No. | Location | Day Time (6.00 AM to 10.00 PM) | | |
|-------|-----------------------------------|--------------------------------|---------|--------------|
| | | Minimum | Maximum | L Equivalent |
| 1 | Pipeline Zone -11 (Iyyar Thottam) | 63.9 | 70.6 | 67.6 |
| 2 | Pipeline Zone -7 (K.K. Nagar) | 59.8 | 69.0 | 66.0 |
| 3 | Pumping Station (RS Puram) | 65.4 | 74.6 | 71.6 |
| 4 | Store Yard | 63.4 | 72.0 | 69.0 |

(Source: Lab reports)

C. Ecological Resources

53. Project area, Tiruchirappalli town, is an urban area surrounded by land that was converted for agricultural use many years ago. Tiruchirappalli city is surrounded by vast agricultural lands. There is no remaining natural habitat in the town, and the flora is limited to artificially planted trees and shrubs, and the fauna comprises domesticated animals (cows, goats, pigs and chickens), plus other species able to live close to man (urban birds, rodents and some insects). There are no sensitive areas like forest or protected areas in the project area or nearby project area.

Figure 12: Forest map of District and Environmental Features

D. Economic Development

1. Land use

54. The total geographical area of Tiruchirappalli is 33,988 hectares, of which net Land put to non- agriculture occupied 13,059 hectares and this accounted for 38.42% of the total area in the district. Area under net cultivable area accounted for 28.13% of the total land, i.e. 9,560 hectares (Table 12).

Table 12: Land Use Pattern in Tiruchirappalli (Area in Ha)

| Land use | 2005 | |
|--------------------------------------|--------------|-------|
| | Area (in ha) | % |
| XXXV. | | |
| Forest | 234 | 0.69 |
| Barron and uncultivated land | 1134 | 3.34 |
| Land put to non- agriculture | 13059 | 38.42 |
| Cultivable waste | 1850 | 5.44 |
| Permanent pasture | 54 | 0.16 |
| Area under not included in cultivate | 1174 | 3.45 |
| Current Fallows | 926 | 2.72 |
| Other Fallows | 5997 | 17.64 |

| Land use | 2005 | |
|---------------------|--------------|---------------|
| | Area (in ha) | % |
| XXXV. | | |
| Net cultivable area | 9560 | 28.13 |
| Total | 33988 | 100.00 |

Source: Records of Office of Joint Director of Agriculture, Tiruchirappalli.

2. Industry and Agriculture

55. The Bharath Heavy Electricals Limited (BHEL) established one of its manufacturing units in Tiruchirappalli for producing high pressure boilers in 1961 and envisaged creation of ancillary units in the private sector, in and around Tiruchirappalli to off load items of low and medium Technology. As a result in the last three decades a phenomenal growth of small scale industries numbering as on date to 400 units have been set up by entrepreneurs in Thuvakkudi, Ariyamangalam, Thiruverumbur industrial. Estates. The Industrial units are giving gainful and consistent employment to nearly 18,000 people.

56. Other public sector undertakings and a Railway Workshop at Ponmalai are part of industrial growth of the District. Large numbers of micro, small and medium scale enterprises (MSMEs) have been established in textile and apparels and engineering units. Majority of the investments in this district have taken place in non-electrical machinery. Large part of the investments has also taken place in metals and metal products.

Table 13: Small Industries Development Corporation Industrial Estates in Tiruchirappalli District

| Name of Estate | Area (acres) |
|--------------------------|--------------|
| Ariyamangalam | 17.64 |
| Thuvakudi | 478.84 |
| Thiruverumbur | 74.54 |
| Thuvakudi (WCR) | 14.24 |
| Vazhavanthankotti –WIP | 86.00 |
| Vazhavanthankotti - P I | 56.00 |
| Vazhavanthankotti – P II | 38.00 |
| Kumbakudi | 87.50 |

SIDCO = Small Industries Development Corporation.

57. **Agriculture.** The Cauvery River irrigates about 51,000 ha in Tiruchirappalli, Lalgudi and Musiri Divisions. Variety of crops are grown in this district and agriculture is the main occupation for most of the people in the district. Rice, millets, cereals, pulses, sugarcane, groundnut, cotton and banana are most common crops cultivated in the district.

58. **Education.** About 33 engineering colleges have come up in and around Tiruchirappalli, that includes the well-known National Institute of Technology, Tiruchirappalli. The city also has a prestigious management institution, the Bharathidasan Institute of Management. Among the many arts and science colleges, St. Joseph's College is the oldest. This city has given great Tamil scholars whose contributions to Tamil literature have been very significant.

3. Infrastructure

59. **Water Supply.** Cauvery River is the major source of water supply in Tiruchirappalli City. The protected water supply scheme to erstwhile Tiruchirappalli Municipality was implemented in 1895 with the head works located on the banks of Cauvery river at Kambarasanpettai, which is 3 km from the city. Under the comprehensive water supply system, the ULB has provided 96,075 individual connections i.e., 76,686 (80%) metered and 19,389 (20%) unmetered. In terms of population, individual service connections cover 46% of the total population. 4,037 public fountains at various locations cover 35% of the city's population. Bore wells with hand pumps cover another 5% and rest 13% are uncovered by the existing system (localized sources).

60. Water supply improvement scheme for TCMC is currently under implementation at a project cost of ₹2,214 million with assistance from JICA (Japan International Cooperation Agency) fund through TNUIFSL. This scheme aims to provide equitable water supply in all parts of the city ensuring 135 lpcd norms.

61. **Sewerage.** TCMC is equipped with a partially implemented UGSS. Sewage generated from the areas having UGSS within the corporation limits are collected through the existing collection system and conveyed by gravity to existing lift stations and sub-pumping stations, and then pumped through the main sewage pump stations to the STPs. Sewage generated from areas not having the UGSS is presently discharged through open drains and channels which ultimately drain into the network of channels such as Uyyakondan, Koraiyar, Thirumanjana Cauvery etc., which finally reaches into the Cauvery and Coleroon Rivers. The existing STPs comprises of oxidation ponds. Wastewater from the Panjappur STP is discharged into Koraiyar River in the south. The existing UGSS in TCMC covers 42,666 residential and 557 commercial assessments (as of 2015 status).

62. **Solid Waste Management.** Solid waste management in the city is handled by TCMC. About 400 tons of solid waste is collected from the city, mostly by door-to-door collection system. From households waste is transferred to transfer stations, and from there to composting and dumping yards located in the city outskirts. A composting and dumping yard is located in Ariyamangalam in the subproject area. TCMC has also procured two plastic shredding machines and training imparted to the women self-help group members as well as to the sanitary workers. Shredded plastics is in progress and it is being used for road laying works.

63. **Transportation.** Tiruchirappalli is situated at the middle of Tamil Nadu, connected by 4 National Highways, 2 State Highways and several district roads with other major towns of the state. Tiruchirappalli is an important divisional headquarters of Southern Railways. Tiruchirappalli is well connected by rail to Chennai, Kanyakumari, Madurai, Thanjavur, Rameswaram, Coimbatore and Bangalore. Tiruchirappalli junction is the main station for passengers as well as goods movement. Tiruchirappalli has an International Airport located on the Pudukottai road at a distance of 6 km. City is connected by air with Chennai, Madurai, Thiruvananthapuram, Sri Lanka, Singapore and middle east countries.

E. Socio Cultural Resources

1. Demography

64. As per Census 2011, Tiruchirappalli city population was 847,387 of which 418,400 are males while 428,987 are females. Total households are 214,529. Population of children less than 6 year is 79,723 which is 9.41% of total population. Sex ratio is 1,025 against state average of 996. Child sex ratio is 960 compared to Tamil Nadu state average of 943. Literacy rate is 91.38 % higher than state average of 80.09 %; male and female literacy rates are 94.85% and 88.01% respectively.

Table 14: Demographic Characteristics of Tiruchirappalli District (Census)

| Description | 2011 | 2001 |
|-------------------------------------|-----------|-----------|
| Actual Population | 2,722,290 | 2,418,366 |
| Male | 1,352,284 | 1,208,534 |
| Female | 1,370,006 | 1,209,832 |
| Population Growth | 12.57% | 10.10% |
| Area km ² | 4,509 | 4,509 |
| Density/ km ² | 604 | 536 |
| Proportion to Tamil Nadu Population | 3.77% | 3.88% |
| Sex Ratio (Per 1000) | 1013 | 1001 |
| Child Sex Ratio (0-6 Age) | 947 | 955 |
| Average Literacy | 83.23 | 77.90 |
| Male Literacy | 89.72 | 86.55 |
| Female Literacy | 76.87 | 69.31 |
| Total Child Population (0-6 Age) | 272,456 | 270,043 |
| Male Population (0-6 Age) | 139,946 | 138,162 |
| Female Population (0-6 Age) | 132,510 | 131,881 |
| Literates | 2,038,981 | 1,673,478 |
| Male Literates | 1,087,765 | 926,354 |
| Female Literates | 951,216 | 747,124 |

km² = square kilometer.

2. History, Culture and Tourism

65. Woraiyur , a part of present day Tiruchirappalli, was the capital city of Cholas from 300 BC onwards. This is supported by archaeological evidences and ancient literatures. There are also literary sources which tell that Woraiyur continued to be under the control of Cholas even during the days of Kalabhra interregnum (A.D. 300 - 575). Later, Woraiyur along with the present day Tiruchirappalli and its neighboring areas came under the control of Mahendra Varma Pallava I, who ascended the throne in AD 590. Till AD 880, according to the inscriptions, this region was under the hegemony of either the Pallvas or the Pandyas. It was in AD880, Aditya Chola brought a downfall to the Pallava dynasty. From that time onwards Tiruchirappalli and its region became a part of Greater

Cholas. In AD 1225 the area was occupied by the Hoysalas. Afterwards, it came under the rule of later Pandyas till the advent of Mughal rule.

66. Tiruchirappalli was for some time under the Mughal rule, which was put to an end by the Vijayanagar rulers. The Nayaks, the Governors of Vijayanagar empire, ruled this area till AD 1736. It was Viswanatha Nayaka who built the present day Teppakulam and the Fort. The Nayak dynasty came to an end during the days of Meenakshi.

67. The Muslims ruled this region again with the aid of either the French or the English armies. For some years, Tiruchirappalli was under the rule of Chanda Sahib and Mohamed Ali. Finally the English brought Tiruchirappalli and other areas under their control. Soon after the area was ceded to East India Company as per the agreement at the eve of the Kanatic war, Tiruchirappalli district was formed under the Collectorship of Mr. John (Junior) Wallace in 1801. District was then under the hegemony of British for about 150 years till India's independence.

Figure 13: Google Earth Imagery showing Archeological Survey of India monument (Erumbeeswarar Temple)



68. **Culture and Tourism.** Owing to its rich history and culture, Tiruchirappalli has various archeological and religious places of prominence. Following two monuments are notified as nationally important monuments by ASI, and one monument (Erumbeeshwarar Temple)⁶ is located within the subproject area. The subproject sewer network proposed for the surrounding residential areas in sewerage zone -5 in Ponmalai Zone of TCMC falling within 300 m from the boundary of the monument, require prior permission from ASI to conduct works which has been obtained and the works will be carried out following the conditions stipulated.

69. Other prominent places of interest in Tiruchirappalli are:

- (i) Rock Fort Temple: Rock Fort Temple (well-known Uchipillayar Temple), the landmark of the city, is on the shores of Cauvery River. It is perched on a massive rocky outcrop at an altitude of 83 m above the mean sea level. The Thayumanaswamy Temple, dedicated to Lord Shiva, is situated halfway to the top. It

⁶ It is a Hindu temple dedicated to the deity Shiva. Built on a 60-foot (18 m) tall hill. The temple's main shrines and its two prakarams (outer courtyards) are on top of the hill, while a hall and the temple tank are located at the foothills. The temple is one in a series built by Aditya Chola (871-907 CE) along the banks of Cauvery river, to commemorate his victory in the Tirupurambiyam Battle. It has several inscriptions from the Chola Empire dating back to the 10th century.



- has a 100-pillar hall and a vimana covered with gold. On the southern face of the rock are several beautifully carved rock-cut cave temples of the Pallava period;
- (ii) Srirangam: The Sri Ranganathaswamy Temple at Srirangam, situated 6 km north of the city, is among the most revered shrines dedicated to Lord Vishnu in South India, and is the largest temple complex in the world. Shrouded in a haze of coconut palms away to the north, the temple is built on an island in the middle of Cauvery and covers an area of 2.5 km². Enclosed by seven rectangular walled courtyards, this temple has 21 spires (“gopurams”), the largest of which was completed in 1987 and measures 73 m in height. Srirangam is connected to the mainland by a bridge. The temple is replete with excellent carvings and numerous shrines dedicated to various gods;
 - (iii) Thiruvanaikaval: The Jambukeswara Temple, dedicated to Lord Shiva, is situated just 2 km east of Srirangam and houses five concentric walls and seven gopurams. Legend has it that an elephant once worshipped the Lord under the holy Jambu tree, and hence the name Jambukeswara. The principal deity is the Shiva lingam, almost submerged in water, which flows from the subterranean spring in the sanctum sanctorum;
 - (iv) Samayapuram: The Samayapuram Mariamman Temple is located 12 km north of the City at the junction of the National Highway connecting Tiruchirappalli and Chennai. The Mariamman Temple is one of the most visited shrines in Tamil Nadu, dedicated to Mariamman, a manifestation of the primeval energy Shakti as the mother Goddess. Samayapuram was a local capital of the Vijayanagar rulers in the vicinity of Tiruchirappalli, and was known as Vikramapuram; and
 - (v) Natharvali Dargah: It is an ancient Dargah, which is more than 1,000 years old with marvelous architecture with the doom being made up of shining marbles giving a great look to the Dargah. It is situated in the heart of Tiruchirappalli City.



70. The other temples in and around the city include Thiruvallarai Vishnu Temple, Uraiyur Nachiyaar Temple, Uraiyur Vekkali Amman Temple, Thiruppaigeeli Siva Temple, Brahma temple at Thirupattur and Thirupparaithurai Shiva temple. Kollam pond in Crawford lies along the Tiruchirappalli-Madurai Railway line. This pond is home to different types of bird varieties including common crane, ducks and the kingfisher.



F. Subproject Site Environmental Features


71. Features of the selected subproject sites are presented in the following table.

Table 15:Site Environmental Features

| Infrastructure | Location and Environmental Features | Site Photograph |
|---|---|--|
| <p>Sewage pumping stations – 5 Under progress</p> | <p>SPS – 5 at Indira Nagar, Ponmalai</p> <p>SPS -5 site is located in ward no 65 near kilivaikal on vacant land owned by TCC. The site is surrounded by sparse development . Site is covered with shrubs and bushes, and couple of trees, which needs to removed. There are about 5 houses located at a distance of 10 m from SPS unit. This site will require design based measure for odor control. Land owner is the corporation and total land aera is 2000 sq.m Residences and existing road are found on south of the site which is about 10m, In Northern side is Kilivaikal. EMP has provisions for buffer zones and odour control technology will be adopted. 2.5m from the well on the North side, 38.91m on the west side, 6.86m on the south side and 10.65m on the Eastern side.</p> <p>This site falls within the 300 m regulated boundary of Erumbeswarar Temple which is ASI protected monument and permission has been obtained for carrying out the works.</p> |  |
| <p>Sewage pumping stations – 7 Under progress</p> | <p>SPS – 7 at Lurdhu Nagar (JK Nagar Extension)</p> <p>SPS-7 site is located in JK Nagar Extension . Sufficient vacant land is available to accommodate SPS. The land is owned by TCC. There are about 5 houses located at a distance of 50 m from SPS boundary. This site will require design based measure for odor control.</p> <p>Residences are found on North and west side of the site which is about 50m , 27m respectively. In South and east side is vacant land. Total land area 18.93 Hectare. EMP has Provisions for buffer zones and odour control Technology will be adopted. 21.43m from the well on the North side,4.65m on the west side, 2.50m on the south side and 14.58m on the Eastern side.</p> |  |

| Infrastructure | Location and Environmental Features | Site Photograph |
|--|---|--|
| <p>Sewage pumping stations – 10 Under progress</p> | <p>SPS – 10 at Panjapur</p> <p>SPS -10 is located in the existing STP campus at Panjapur village. The land is owned by TCC. There are no residential areas/ settlements surrounding the site and hence odor control measures are not required. Land belongs to corporation and total area is 794 Sq.m.</p> |  |
| <p>Sewage pumping stations – 11 Under progress</p> | <p>SPS – 11 Karumandapam Crematorium Campus, Karumandapam</p> <p>Site for SPS-11</p> <p>The site identified for SPS-11 is located within the premises of gasifier crematorium in Karumandapam. The land belongs to Trichy Corporation and spread over 0.23 hectares. SPS-11 requires total area of around 1,295 m² and adequate land is available for the construction.</p> <p>There are about 4 houses located at a distance of 20 m from the SPS boundary. This site will require design based measure for odor control.</p> <p>Land belongs to corporation and total area is 0.23 Hectare.</p> <p>Residences are found on Western side about 50m and Eastern side is Existing road. EMP Has provisions for buffer zones and odour control technology will be adopted. In the Northern side is Micro compost yard, In the Southern side is gasifier crematorium.</p> |  |

| Infrastructure | Location and Environmental Features | Site Photograph |
|--|---|--|
| <p>Sewage pumping station – 12 (Deleted)converted as Lifting station in Arokiya madha avenue</p> | <p>SPS – 12 at Natchatra nagar (Karumandapam) deleted and converted as Lifting station in Arokiya Madha Avenue) because of public objections in Natchatra Nagar</p> <p>The proposed –Lifting Station is located in the Arokiya Madha Avenue along the road at Karumandapam. The land is owned by TCC. There is about 1 house located at a distance of 60m from the proposed lifting Station.</p> <p>Public consultation meeting was conducted in Arokiya Madha Avenue area in Thiruchirapalli, Tamilnadu on 26th February 2022 for seeking the residents’ willingness and opinion for construction of lifting station and laying underground sewerage system in the existing road. The public accepted after explaining about the project and precautionary measures to avoid odour problem. The IEE Report is updated accordingly. (Minutes of the meeting attached in the Appendix)</p> |  |
| <p>Sewage lift stations (LS)</p> | <p>Road Side Lifting station is a small pumping station to lift the sewage to higher level and to discharge into ridge manhole for transporting to the pumping station.</p> <p>Lifting station has a collection well with submersible pumpsaccommodated inside.</p> <p>Lift stations are essentially proposed as enlarged manholes (either road-side on available land or on road center by enlarging a collection system manhole) fitted with two sewage pumps (small capacity) and a curb or road-side wall mounted Pump Control Panel. Where lifting stations are proposed along the roads, there is no buffer land for trees and high compound available, at such places other design and operation related measures are included in the project design.</p> |  |

| Infrastructure | Location and Environmental Features | Site Photograph |
|----------------|---|---|
| | <p>On 16th December 2021, Public consultation meeting was conducted in Muthu Kumarasamy Nagar area in Tiruchirappalli, Tamilnadu for seeking the residents' willingness and opinion for laying underground sewerage system in the existing road. The Corporation of Tiruchirappalli has proposed to construct of lifting station along the road. The public agreed for the construction of LS after explaining about the projects and precautions taken to avoid odour problem. (Minutes of the meeting attached in the Appendix)</p> | |
| Sewer network | <p>Sewer lines will be laid in the center of road by cutting open the surface. In wider roads, like NH, divided 2-way roads etc., sewers will be laid along the edge of the road, but mostly within the carriageway. In the outskirts where adequate land in the road shoulder is available along the blacktop and is clear of any structures or activities, sewers will be laid in the earthen shoulder.</p> <p>Large diameter sewers will be laid on main roads (300 – 700 mm), while the tertiary sewers of small size (150 mm to 300 mm dia) that collect wastewater from each house will be laid in all streets in the subproject area.</p> <p>Trench size to bury the sewer will be of 0.8 m to 1.5 m wide and 1 m to 6 m deep.</p> <p>Most of the roads in central part of the town (old town area) are narrow and congested with traffic, pedestrians and activities.</p> <p>Sewers will also be laid in the road located within 300m of Erumbeswarar Temple (ASI monument) to provide the sewerage system to the areas around the temple. Prior permission from ASI to conduct works has been</p> |  |

| Infrastructure | Location and Environmental Features | Site Photograph |
|----------------|--|-----------------|
| | <p>obtained and the works will be carried out following the conditions stipulated.</p> <p>Some sections of the Sewer line alignment (65 km) and 2PS and 2LS sites are identified to involve removal of hard rock for excavation during construction. During construction alternatives like drilling construction and Chiseling, Controlled blasting etc. will be examined and suitable technology shall be finalized depending upon the site conditions, following safety measures. Permission for Control blasting in appendix-13</p> | |

ASI = Archeological Survey of India, m = meter, NH = National Highway, SPS = Sewage Pumping Station, TCC = Thiruchirapalli City Corporation.

XXXVI. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

72. Potential environmental impacts 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.

73. Screening of potential environmental 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 include loss of on-site biophysical array and encroachment either directly or indirectly on adjacent environments. It also includes impacts on people who will lose their livelihood 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 and workers. Construction site impacts include erosion, dust, noise, traffic congestion and waste production.
- (iv) **Operation and Maintenance (O&M) impacts** include impacts arising from the operation and maintenance activities of the infrastructure facility. These include routine management of operational waste streams, and occupational health and safety issues.

74. Screening of environmental impacts has been based on the impact magnitude (negligible/moderate/severe – in the order of increasing degree) and impact duration (temporary/permanent).

75. This section of the IEE reviews possible project-related impacts, in order to identify issues requiring further attention and screen out issues of no relevance. ADB SPS, 2009 require that impacts and risks will be analyzed during pre-construction, construction, and operational stages in the context of the project's area of influence.

76. The ADB Rapid Environmental Assessment Checklist in http://www.adb.org/documents/guidelines/environmental_assessment/eaguidelines002.aspx has been used to screen the project for environmental impacts and to determine the scope of the IEE.

77. In the case of this project (i) most of the individual elements involve straightforward construction and operation, techniques except for the controlled blasting activities proposed for sections of sewerage alignment and pumping stations, so impacts will be mainly localized and not significant; (ii) negative impacts associated with sewage facilities such as odor are already considered in the design and siting; (iii) 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 (iv) being mostly located in an urban area, will not cause direct impact on biodiversity values. The blasting proposed in "controlled blasting" following necessary precautionary measures including usage of appropriate quantities of explosives hence that the nearby structures and properties are unlikely to be affected and impacts related to controlled blasting such as dust generation, increased noise levels, and vibrations would be mitigated. The project will be in properties held by the local government and access to the project location is through public rights-of-way (ROW) and existing roads hence, land acquisition and encroachment on private property will not occur.

A. Pre-Construction Impacts – Design and Location

78. **Design of the Proposed Components.** Technical design of the (i) sewage pumping and lifting stations; and (ii) sewer network including manholes and house connections, follows the relevant national planning and design guidelines, focusing on providing a robust system which is easy to operate, sustainable, efficient and economically viable.

79. **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, from where the sewage is pumped to the STP. To maximize the benefits as intended, TCC 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.

80. 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:

- (i) selection of construction methodology near protected monuments in discussion with the ASI, having the excavation observed by person with archaeological knowledge for chance finds, etc.;
- (ii) Limit the sewer depth where possible;
- (iii) Sewers shall be laid away from water supply lines and drains (at least 1 m, wherever possible);
- (iv) 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);
- (v) In unavoidable cases, where sewers are to be laid close to storm water drains, appropriate pipe material shall be selected (stoneware pipes shall be avoided);
- (vi) For shallower sewers and especially in narrow roads, use small inspection chambers in lieu of manholes;
- (vii) Design manhole covers to withstand anticipated loads and ensure that the covers can be readily replaced if broken to minimize silt/garbage entry; and
- (viii) Ensure sufficient hydraulic capacity to accommodate peak flows and adequate slope in gravity mains to prevent buildup of solids and hydrogen sulfide generation

81. **Sewage Pumping stations and lift stations.** It is proposed to construct 11 sewage lift stations, 7 new sewage pumping stations. These will receive sewage from the catchment area via the sewer network and pump to higher level manholes or pumping stations or to STP as per the design. Lift stations are necessitated where in the design the depth of sewer exceeds the downstream interlinking manhole invert levels. Therefore, in such situations, the feasible and practical solution was to opt for a low capacity lift station with submersible pumps to lift and convey the collected sewage from peripheral areas to the downstream system through a bell-mouth chamber.

82. Lift stations will cater to small area, and will be located at lowest point where the sewage from catchment area will be collected, and then pumped to a higher level manhole for further gravity flow or to a pumping station, from where it is ultimately pumped to the STP. Lift station will consist of a sewage sump or suction well, below the ground, to receive sewage, submersible pumps in the sump to pump out, and an electrical panel board for operation of pumps above the ground. A generator set will also be provided at each lift station. Controlled blasting related activities may have to be undertaken at some locations for the presence of hard rock anticipated.

83. **Sewage pump stations** 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. Components of the proposed sewage pumping stations include:

- (i) Inlet Chamber;
- (ii) Screen well;
- (iii) Grit well;
- (iv) Collection well;
- (v) DG set platform; and
- (vi) Pump room.

84. At the 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 the 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.

85. **Odor from pump and lift 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 sulfide (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 households. 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. Design considerations are included to minimize the both as much as possible. Pumping stations cater to large area and will have high capacity of suction wells and pump sets, while lift stations are small with lower capacity of suction wells and pumps sets. The retention time is kept to its lowest possible so that there is no stagnation of sewage for long time which could create anaerobic conditions.

86. Pumping stations are to be located at technically feasible locations (e.g., lowest point to where sewage can be conveyed from households by gravity) within or close to the residential areas which are being served by respective pumping station. Given the very limited land availability in urban areas like the project area, that too of government owned lands, locating the pumping stations ideally about 50-100 m away from the houses is not practical. The sites for pumping stations were identified based on the technical suitability and availability of government owned land parcels to avoid land acquisition. Given the comparatively higher potential of odor generation, priority has been given to accommodate pumping stations at more suitable locations away from houses, however sites which are located close have been selected only in cases where there are no other alternative lands available. There are no standards notified by Government of India or Government of Tamil Nadu for odor. However, Central Pollution Control Board (CPCB) has stipulated Guidelines on Odor Pollution and its Control which deal with the basics of odor pollution, its sources and measurement, technologies for its control etc., but do not specify any threshold limits for odor-causing pollutants. Therefore, as part of mitigation, provision for odor control measures has been made in the sewage pumping stations for all UGSS subprojects. However, in case of STPs, the odor-causing processing units will be located far off to the extent possible within the premises so as to mitigate the odor nuisance. Further, the technology for treating sewage plays a vital role since release of gases like H_2S cannot be avoided in the process involving anaerobic decomposition whereas release of H_2S

will almost be nil in case of aerobic treatment. PIU and design engineers have not specified any odor standards adopted elsewhere in the preliminary design as not to limit the technology that can be considered by the bidders in the treatment of domestic sewage. Sufficient mitigation measures have been taken for all sewage pumping stations.

87. **Measures for pumping stations**

- (i) Maintain buffer distance from nearest residences;
- (ii) Locate pumping station as far as away from the road;
- (iii) 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 odor and also act as visual shield, and improve aesthetical appearance;
- (iv) Proposed wells to be closed using reinforced cement concrete (RCC) slabs. Design of RCC slab to consider both superimposed loads (human and equipment loads) and severe corrosion risk from sewer gas from within wells;
- (v) RCC Slab to be designed and fixed in a modular manner such that access to pumps / appurtenances and other equipment can be provided for maintenance / replacement / renewal purposes;
- (vi) 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&M purposes;
- (vii) 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;
- (viii) Height of vent to be provided appropriately and a minimum 2 m above the lintel level (top level) of window(s) / passageways / doors in the nearby adjoining buildings;
- (ix) Provision of odor control / mitigation system as per site conditions / requirements. Suitable granular activated carbon filter with bird-screen fitted at the vent outlet to control odor. Size of granular activated carbon (GAC) (including material size) should be selected based on the vent diameter and expelled air flow rate expected;
- (x) 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;
- (xi) 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;
- (xii) Diesel Generators shall be provided for all pump stations and in cases of lift stations with space for control room. In cases of lift manholes (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;
- (xiii) Develop standard operating procedures / operational manual for operation and maintenance of lifting and pump stations; this shall include measures for emerge situations;
- (xiv) Provide training to the staff in SOPs and emergency procedures; and
- (xv) Periodic monitoring of H₂S levels at sewage pumping and lifting stations using handheld H₂S meters.

88. **Lifting stations** are also to be located at technically feasible locations (lowest point to where sewage can be conveyed from households by gravity) within or close to the residential areas which are being served by respective lifting station. Given very limited land availability in urban areas

like the project area, that too of government owned lands, locating the lifting stations away from the houses is not practical in Tiruchirappalli, sites for lifting stations were identified based on the technical suitability and availability of government owned land parcels to avoid land acquisition. Odor nuisance from lifting stations is very limited compared to pumping stations. Lift stations are essentially proposed as enlarged manholes (either road-side on available land or on road center by enlarging a collection system manhole) fitted with two sewage pumps (small capacity) and a curb or road-side wall mounted Pump Control Panel. Following odor control and mitigation measures are considered:

- (i) Provide closed wells fitted with necessary ventilation wherever required;
- (ii) Provide greenbelt (tree cover) around the lift stations, wherever possible; and
- (iii) a suitable arrangement such to capture the gaseous emissions from the wells and treat via scrubber/activated carbon filter before letting out into the ambient air; such system should be designed appropriately to meet the likely emissions/flow rate of respective lifting stations.

89. Noise from pumping operations. Operation of pumps and motors and diesel generators is a major source of noise. Six of the seven pumping stations (i.e., except Panjapur) are located very close to the houses/ residential plots Hence noise generated from lifting/pump stations can have continuous negative impacts on the surrounding population. High inside noise levels can affect the health of operators and staff at the facilities, and therefore, noise levels needs to be maintained within and outside the plant at acceptable levels. Internal noise level in a room measured at a distance of 1m from these pump sources typically will be in the range from 70 dB(A) to 100 dB(A).

- (i) 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;⁷
- (ii) Use appropriate building materials and construction techniques for pump houses which can absorb sound rather than reflect noise;
- (iii) Use acoustic enclosures – manufacturer specified, for all pumps, motors;
- (iv) Procure only CPCB approved generators⁸ with low emission and low noise fitted with acoustic enclosures;
- (v) Provide sound mufflers for ventilators in the plant rooms; and sound proof doors
- (vi) Provide ear plugs to workers;
- (vii) Consult the ASI and local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals; and
- (viii) Excavation and construction methodology to be used near the monuments

⁷ Indian Standards require to maintain the noise level of 70 dBA or less during night time. However, in case of STPs/WTPs/Water Supply Headworks, where heavy duty pump sets are to be installed and the noise levels may even exceed 80 decibels at 1 m distance, noise level will be measured at the time of commissioning the units and necessary mitigation measures such as noise barriers will be installed if required.

⁸CPCB has published Genset notifications, which includes specification for emission limits for new Diesel Engines (up to 800 kW) and Noise limits for Generator sets which run with Diesel as Fuel type

Emission limits for DG's

| Power Category | Emission Limits (g/kW-hr) | | | Smoke Limit (light absorption coefficient, m ⁻¹) |
|-----------------------------|------------------------------|-------|-------|---|
| | NOx+HC | CO | PM | |
| Upto 19 KW | ≤ 7.5 | ≤ 3.5 | ≤ 0.3 | ≤ 0.7 |
| More than 19 KW upto 75 KW | ≤ 4.7 | ≤ 3.5 | ≤ 0.3 | ≤ 0.7 |
| More than 75 KW upto 800 KW | ≤ 4.0 | ≤ 3.5 | ≤ 0.2 | ≤ 0.7 |

Noise limit shall not exceed 75 dB(A) at 1 m distance.

The generators that are in line with the specifications shall be procured. The requirement for the same is specified in the BoQ that are to be monitored to ensure that generation of noise and potential deterioration of ambient air quality will be avoided.

(within the regulated area of 300 m of any monument) shall be finalized in consultation with ASI; no equipment causing vibration and heavy noise should be used.

90. **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 on the outskirts of the city. 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 manhole on the higher elevation, from there it can flow by again by gravity, rather than pumping directly to a pumping station. This optimized the energy consumption.

91. 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 shall be considered and incorporated into the subproject designs:

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

92. **Tree cutting at selected project sites.** Detailed engineering design including final alignments has been completed prior to start of works. Tree survey and assessment has been conducted and included in updated IEE (see annex-14 . ULBs, having the overall responsibility as determined by statutory clearances, will determine the locations for replantation/afforestation and maintenance of the trees prior to any cutting and during implementation of replantation program. The list of trees available at SPS locations and our plan to move the trees away from the construction site, are listed below.

| S. No | Location of SPS | Local Name of the Tree | Botanical Name | Number of Tree | Proposal adopted for moving the trees from the construction area |
|-------|-----------------------|------------------------|--------------------|----------------|--|
| 1. | SPS 5 at Indira Nagar | Neem Tree | Azadirachta Indica | 5 | The above trees will be transplanted in the same location away from the construction area. |
| 2. | SPS 5 at Indira Nagar | Indian Tulip Tree | Thespesia Populnea | 2 | The above trees will be transplanted in the same location away from the construction area. |
| 3 | SPS 5 at Indira Nagar | Dead Coconut Tree | Coconut Tree | 6 | Since the above trees are dead trees, they can't be replanted and has to be removed from the construction sites. |

It is also planned to plant new trees 130 Nos as per Commissioner , Trichirapalli City Corporation , Trichy permission Lr No. Roc No.4824/2018/E7(main) dt 09.06.2021 and 11.06.2021 in the ratio of 1: 10 (one moved trees to 10 newly planted trees). Other than SPS 5, there are no trees available in all other sites of SPS.

93. **Utilities.** Telephone lines, electric poles and wires, water lines, drains, if exists within the proposed project locations may require to be shifted. All the selected project sites are vacant and unused government lands, there are no notable existing utilities. Sewer lines are proposed within the road way, where there are no utilities. In the outer areas where there is adequate earthen shoulder along the road carriage way, sewer lines can be accommodated in the shoulder. 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 Tiruchirappalli City Municipal Corporation will:

- (i) identify the locations and operators of these utilities to prevent unnecessary disruption of services during construction phase; and
- (ii) instruct construction contractors to prepare a contingency plan to include actions to be done in case of unintentional interruption of services.

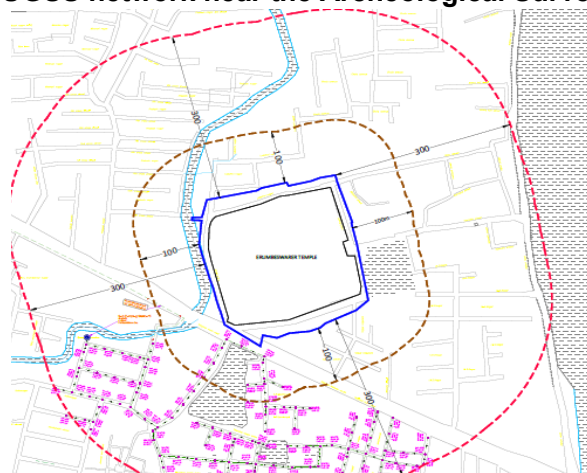
94. **Site selection of construction work camps, stockpile areas, storage areas, and disposal areas.** Priority is to locate these near the project location. However, if it is deemed necessary to locate elsewhere, sites to be considered will not promote instability and result in destruction of property, 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 and dust, and noise, and to prevent social conflicts, shortages of amenities, and crime). Extreme care will be taken to avoid disposals near forest areas, water bodies, or in areas.

95. **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 quarries permitted/licensed by Department of Geology and Mining. Contractor should, to the maximum extent possible, procure material from existing quarries, and creation of new quarry areas should be avoid as far as possible. If new quarries are required then the contractor will be responsible for obtaining all permissions and clearances, including environmental clearance for mining. Contractor should factor in the time required for obtaining clearances including conduct of EIA if required under the law. It will be the construction 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.

96. **Social and Cultural Resources – Chance Finds.** No works are proposed within the protected monument (Erumbeswarar Temple, see figure) located in the subproject area. However, as this monument is located inside the city surrounded by residential areas, some works (sewer lines) are required to be laid within the regulated area (i.e., up to 300 m from the monument boundary). No direct interference with the monuments anticipated., For all works within 300 m of monument, NOC permission has been received from ASI.

97. Necessary precautionary measures, as listed below, including if any measures suggested by ASI, to be followed. Any work involving ground disturbance can uncover and damage archaeological and historical remains. For this subproject, excavation will occur, laying pipelines, and for construction of a pumping station.

Figure 14: Proposed UGSS network near the Archeological Survey of India Monument



98. Details of network within 300 m of the regulated boundary of Erumbeswarar temple:
- Location: Ponmalai Zone of TCC – Sewerage Zone -5
 - a) Subproject components: Collection network, pumping main, 1 no. of sub Pumping station (SPS-5 at Indira Nagar).
99. Measures for works in the regulated zone (300 m) of the ASI monument:
- (i) Obtain prior permission from ASI for the works to be conducted within the regulated zone of monument; submit detailed construction drawings clearly indicating the details of proposed works, use of equipment and machinery, etc., to ASI for their review; incorporate any suggestions/recommendations of ASI in project design and implementation;
 - (ii) Consult ASI and local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals;
 - (iii) Excavation and construction methodology to be used within the regulated area of 300 m of any monument shall be in line with the ASI recommendations;
 - (iv) No equipment causing vibration (e.g., pneumatic drills, excavators etc.), and heavy noise should be used; works shall be conducted manually;
 - (v) Dust control measures shall be put in place; all work areas to be barricaded and enclosed with dust screens;
 - (vi) Conduct air quality and noise monitoring weekly throughout construction phase in the 300 m regulated area; and
 - (vii) Appoint an archaeological expert to assess impacts and supervise works.
100. **Measures for Chance finds.**⁹Construction contractors to follow these measures in conducting any excavation work:
- (i) Create awareness among the workers, supervisors and engineers about the chance finds during excavation work;
 - (ii) Stop work immediately to allow further investigation if any finds are suspected; and
 - (iii) Inform State Archaeological Department if a find is suspected, and taking any action they require to ensure its removal or protection in site.
101. **Sewage treatment Plant.** The new STP at Keela Kalkandhar Kottai is implemented under Phase II of TNUFIP Tranche 1. The sewage discharged this current subproject will be linked to these

⁹<http://asichennai.gov.in/downloads/indian-treasure-trove-act-1878.pdf> (amended 1st September 1949).

two STPs for treatment. The flow of zone 5 and part of zone 6 (9.12 MLD) will be treated in 37 MLD STP at Keelakalkandhar kottai and the flow of zone 7 to zone -12 will be treated in 100 MLD (2 WSP modules of 58 MLD and 42 MLD capacity) STP at Panjapur.

102. 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.) would accrue only with a proper functioning of the existing STP. Therefore, the existing STP is an associated facility as per the ADB SPS, 2009. Associated facilities need to be in compliance with safeguard policy, and ADB SPS requires conduct of environmental audit of associated facilities. Environmental audit of the existing STPs being improved under TNUFIP has been included as Appendix 3. This audit identifies the improvements required for the STP, which are to be carried out as part of TNUFIP Tranche 1 and will be revisited prior to the start of operation of subproject. Corrective action plan based on the environmental audit is provided in Table 16.

Table 16: Corrective Action Plan for Environmental Compliance of Existing Sewage Treatment Plant at Panjappur

| Item | Compliance | Action Required / Proposed for compliance | Timeline | Responsible Agency and funding source |
|--|---|--|--|---------------------------------------|
| Compliance with Applicable National and State Laws, Rules, and Regulations | Non-compliance: CTO is to be obtained for STP | Obtain CTO from TNPCB | 31 September 2019 | TCC with own funds |
| Treated wastewater (STP) effluent quality to meet following disposal standards stipulated by Proceeding No. Ministry of Environment, Forest and Climate Change Notification New Delhi, the 13 October, 2017 and CPCB file No :A-19014/43/06-Mon t:21.4.2015. pH – 6.5- 9.0 BOD – 30 mg/l COD- 50 mg/l TSS -100 mg/l Ammoniacal Nitrogen - 5 mg/l Total Nitrogen -10 mg/l | Current effluent quality is not meeting the parameters stipulated by TNPCB. However, revised standards have recently been notified. | The existing STP performance will be monitored closely by TCMC and any improvement if required will be taken up prior to commissioning of this subproject. (The sewage flow from areas covered under UGSS phase III is about 28 MLD will come 100 MLD STP and STP of 100 MLD construction is under progress at Panjapur not constructed under this project) | Prior to commissioning of this subproject. | TCC with own funds |

| Item | Compliance | Action Required / Proposed for compliance | Timeline | Responsible Agency and funding source |
|-----------------|--|--|--|---------------------------------------|
| Sludge disposal | No sludge handling, drying or storing facilities | Prepare and implement sludge management plan for safe collection, treatment and disposal of sludge, including periodic monitoring and safe reuse application | Prior to commissioning of this subproject. | TCC with own funds |

CTO = Consent to Operate, MLD = million liters per day, STP = sewage treatment plant, TCCM = Tiruchirapalli City Corporation.

B. Construction Impacts

103. Main civil works in the subproject include laying of sewer lines and construction of sewage pumping and lifting stations at the identified sites and the excavation by controlled blasting technique for sewer lines in some specific areas.

104. 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 pump station, facilities, etc., may be constructed from brick work, in which case this work will be done using standard house-building techniques.

105. In works confined to the boundary of identified sites like pumping stations, 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, labor camps etc., will have negative impacts, which needs to be avoided or mitigated properly.

106. Subproject also include linear works (laying of 327 km of tertiary sewers, and 20.93 km of pumping mains along the roads). This covers entire area (including areas not covered under UGSS and newly extended/ added area) of Tiruchirappalli City. Sewers will be laid along almost all the roads. Small sewers (tertiary sewers) that collect sewage from households 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. Sewers will be laid by open cut method and Pipe Jacking method will be used for NH, Rail and Canal Crossing.

107. 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. Proposed pipes for tertiary sewers are double wall corrugated (DWC) pipes and uPVC pipes and trunk sewers and conveying mains (pumping mains) are of cast iron (CI). The diameter of gravity sewer ranges from 200 mm to 700 mm, of which nearly 92% of the sewers are of size between 200 mm and 250 mm. The size of pumping main ranges from 150 mm to 500 mm. According to the design the sewers will be laid at a depth of 1 to 6.5 m. The width of the trench excavation along the roads will vary from 0.8 m to 1.4 m, and the depth varies from a minimum of 1 m to 6.5 m. Nearly 92% length of sewers will be laid in trench of depth 3 m or less, and only about 3% of sewers will be laid deeper between 5 m and 6.5 m. The design is optimized to minimize the sewer depth to the extent possible with an optimal combination of sewer depth and pumping requirements. Details of sewer construction are provided in the following Table 17.

Table 17: Sewer Construction

| Proposed depth of sewers | Total length of sewers to be laid (in m) | % of length |
|--------------------------|--|-------------|
| Up to 2 m | 225,468 | 69% |
| 2 m – 4 m | 78,424 | 24% |
| 4 m – 6.5 m | 22,874 | 7% |

m = meter.

108. Earthwork 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 backhoe excavators. As trenches are deep (up to 6.5 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 trenches of more than 1.2 m deep. 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. Total earthwork excavation will be nearly 523,495 m³, of which nearly 98% will be reused, and the remaining 10, 472 m³ of excess soil needs to be disposed safely. Some sections of the alignment and the pumping stations are identified to involve hard rock and hence controlled blasting is proposed at such locations for excavation after obtaining statutory permits for undertaking controlled blasting and following necessary precautions to prevent safety risk to both public and nearby structures as provisioned in the prevailing Indian regulations and standards.

109. Although sewer laying work involves quite simple techniques of civil work except the stretches where controlled blasting is proposed, 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. Controlled blasting would be undertaken in some stretches where hard rock is encountered based on the site conditions. ; For the safety of humans and the structures within the area influenced by the blasting, the vibrations related impacts would be addressed by designing the blast charge by complying with the provisions elaborated in the applicable Indian regulations and standards. All records shall be maintained by the Contractors and PIU. Training related to controlled blasting activity will be included in the overall safeguards training programme meant for PIUs and Contractors.

110. Comprising old town area of Tiruchirappalli, project area is mostly characterized by high density residential areas and very narrow streets and roads. Outer areas are comparatively less dense, however, erstwhile village areas which are added to corporation, and which are part of subproject area, are also having dense habitations in the core village areas. Outer areas are mainly a mix of old village habitations with narrow streets, and few well planned newly developed / developing residential layouts in the lands previously under agricultural use. Old and new developments are intercepted with agricultural and vacant lands.

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

112. **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. New quarries are subject to a rigorous process of environmental assessment to ensure appropriate siting and adequate environmental controls on the operation. It will therefore be important to ensure that construction materials for this project are obtained from government approved licensed quarries only, to ensure these controls are in place. In Tiruchirappalli,

construction sand is obtained from Public works department, GOTN's authorized mining areas, gravel and aggregate is available Kuttimalai locally in Tiruchirappalli district (about 10 km from the city). Contractor should avoid new borrow pits / quarries as far as possible, if necessary, all the permissions, including conduct of environmental assessment, and environmental clearance as necessary shall be obtained prior to start of quarrying activity. The contractor should also make a concerted effort to re-use as much excavated material from this project as possible. The construction contractor will be required to:

- (i) Obtain construction materials only from government approved quarries with prior approval of PIU;
- (ii) PIU to review, and ensure that proposed quarry sources have all necessary clearances/ permissions in place prior to approval;
- (iii) Contractor to submit to PIU on a monthly basis documentation on material obtained from each sources (quarry/ borrow pit); and
- (iv) Avoid creation of new borrow areas, quarries etc., for the project; if unavoidable, contractor to obtain all clearances and permissions as required under law, including environmental clearance prior to approval by PIU.

113. **Air Quality.** Construction work, especially from earthwork activities including controlled blasting works, coupled with dry and windy working conditions, material and debris transport, and works along the public roads carrying significant traffic, have high potential to generate dust. Significant quantities of earthwork will be conducted in the subproject, spread all over the project area. Nearly 523,495 m³ of earthwork is anticipated from the subproject, and 98% of which will be reused for filling the trenches. 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. While pumping and lifting stations are located within residential neighborhoods, 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:

1. For all construction works

- (i) Provide a dust screen around the construction sites of pumping and lifting stations;
- (ii) Damp down the soil and any stockpiled material on site by water sprinkling;
- (iii) Stabilize surface soils where loaders, support equipment and vehicles will operate by using water and maintain surface soils in a stabilized condition;
- (iv) Apply water prior to levelling or any other earth moving activity to keep the soil moist throughout the process;
- (v) Cover the soil stocked at the sites with tarpaulins;
- (vi) Control access to work area, prevent unnecessary movement of vehicle, public trespassing into work areas; limiting soil disturbance will minimize dust generation;
- (vii) Use tarpaulins to cover the loose material (soil, sand, aggregate etc.,) when transported by open trucks;
- (viii) Control dust generation while unloading the loose material (particularly aggregate, sand, soil) at the site by sprinkling water and unloading inside the barricaded area;
- (ix) Clean wheels and undercarriage of haul trucks prior to leaving construction site; and

- (x) Ensure that all the construction equipment, machinery are fitted with pollution control devices, which are operating correctly, and have a valid pollution under control (PUC) certificate.

2. For sewer works

- (i) Inform the residents likely to be affected by the works in the locality about the upcoming sewer laying works well in advance so that necessary arrangements are planned by the residents with reduced inconvenience.
- (ii) For sections where the controlled blasting is proposed, the residents are provided with the schedule of blasting at least three days in advance and the residents are explained about the preventive, precautionary, mitigation and emergency response measures being taken to address their concerns.
- (iii) The project staff from the PIU, consultants and contractors would undertake a survey of structures (including videography and/or photography) lying within the area of influence of blasting from the vibrations related impacts (preferably in the presence of the owners of the said structures) during pre- and post-blasting situations to assess and/or ascertain regarding the damages, if any, caused to the structures because of blasting activities.
- (iv) Barricade the construction area using hard barricades (of 2 m height) on both sides;
- (v) Initiate site clearance and excavation work only after barricading of the site is done;
- (vi) Confine all the material, excavated soil, debris, equipment, machinery (excavators, cranes etc.), to the barricaded area;
- (vii) Limit the stocking of excavated material at the site; remove the excess soil from the site immediately to the designated disposal area;
- (viii) Undertake the work section wise: a 500 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;
- (ix) The section proposed for blasting shall be supervised by properly trained staff to ensure no movement of pedestrians, motorized or non-motorized vehicles, and residents takes place during blasting within the area of influence.
- (x) For sections involving controlled blasting, ensure that dust curtains of adequate height are provided to the trenches to prevent emission of dust during drilling for charge holes and controlled blasting.
- (xi) Ensure that the excavated soil and debris along the section identified for blasting is sprinkled with adequate water prior to blasting to reduce dust emissions upon explosion of charge placed for breaking the hard rock;
- (xii) Ensure that adequate precautions are taken to avoid flying debris post blasting (such as covering the trench with sturdy metallic sheets having sufficient weights to absorb the blast waves);
- (xiii) 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;
- (xiv) 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; and
- (xv) 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.

114. **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 be 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.

115. 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.

116. **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. Periyakulam (a big lake) and Vathiyar kulam lake are located within the project area, and Koraiyar river flows in the west of the project area, The Uyyakondan canal also flows through the project area besides, there are canals and other small water bodies in and around the project area. Project area mostly drains into these water bodies. It is important that runoff from the construction areas, which may contain silt and chemical traces do not enter these water bodies. Impact will be temporary, and but needs to be mitigated. Construction contractor will be required to:

- (i) All earthworks be conducted during the dry season to prevent the problem of soil/silt run-off during rains
- (ii) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets;
- (iii) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, only designated disposal areas shall be used;
- (iv) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies;
- (v) Place storage areas for fuels and lubricants away from any drainage leading to water bodies;
- (vi) Store fuel, construction chemicals etc., on an impervious floor, also avoid spillage by careful handling; provide spill collection sets for effective spill management
- (vii) Dispose any wastes generated by construction activities in designated sites; and
- (viii) Conduct surface quality inspection according to the EMP.

117. Construction of pipe carrying bridges across canals/streams to cross over sewers will have negative impact on water quality of canals/streams. Following measures to be implemented:

- (i) Conduct works in the water body (especially foundation work) only during no-flow season;
- (ii) Select a construction method which is less disruptive (e.g., precast type);
- (iii) Do not spill construction chemicals, fuels, lubricants in the water body; and
- (iv) Clean up the site immediately after construction is complete; construction debris, materials, etc., shall be cleared and pre project condition restored or improved.

118. **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 much deeper than the anticipated excavation depth and therefore this impact is not envisaged. However during the rains, water will be

collected in open pits and trenches. The water collected in excavated pits will contain silt and disposal of this in drainage channels lead to silting. To avoid this the contractor needs to be implement the following measures:

- (i) 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;
- (ii) 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; and
- (iii) Consider safety aspects related to pit collapse due to accumulation of water.

119. **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 and other similar items. Domestic solid wastes may also be generated from the workers' camp. Improper waste management could cause odor and vermin problems, pollution and flow obstruction of nearby watercourses and could negatively impact the landscape. Total earthwork excavation will be nearly 523,495 m³, of which nearly 98% will be reused, and the remaining 10,472 m³ of excess soil needs to be disposed safely. The following mitigation measures to minimize impacts from waste generation shall be implemented by the contractor:

- (i) Prepare and implement a Construction Waste (Spoils) Management Plan (format is given in Appendix 4);
- (ii) 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.;
- (iii) Avoid stockpiling any excess spoils at the site for long time. Excess excavated soils should be disposed of to approved designated areas immediately;
- (iv) If disposal is required, the site shall be selected preferably from barren, infertile lands; sites should located away from residential areas, forests, water bodies and any other sensitive land uses;
- (v) 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 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;
- (vi) Residual waste and hazardous waste will be managed by Tiruchirapalli City Corporation (TCC), who is a pioneer in handling SWM and hazardous waste management in Tamil Nadu;
- (vii) Prohibit burning of construction and/or domestic waste;
- (viii) 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; and
- (ix) 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.

120. **Noise and Vibration Levels.** Except a new pumping station site located near Panjapur STP, all other subproject components including pumping stations, lifting stations and sewers are located within the Tiruchirappalli city. 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 and controlled blasting for hard rocks along the alignment 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 explosives for controlled blasting and 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. The construction contractor will be required to:

- (i) Plan activities in consultation with PIU so that activities with the greatest potential to generate noise and vibrations such as controlled blasting are conducted during periods of the day which will result in least disturbance;
- (ii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and use portable street barriers to minimise sound impact to surrounding sensitive receptor;
- (iii) Maintain maximum sound levels within the limits as prescribed by the prevailing Indian regulations and standards;
- (iv) Ensure to conduct a pre-blasting survey through videography and photography of residential properties and other structures falling along the sewerage alignment to ascertain the prevailing conditions of the structures likely to be impacted by the controlled blasting and take adequate measures to minimise such impacts.
- (v) Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach; and
- (vi) Consult local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals.
- (vii) All the controlled blasting, shall be done by an approved and licensed Explosive contractor after submitting a blasting plan to PIU.

121. Besides the above, works in the regulated buffer zone of protected monuments requires special precautions to avoid any potential disturbance / damage to the monuments. Noise, dust and vibration emanating from the works, if not properly planned or executed may disturb / damage the monument. Following measures are to be implemented:

- (i) Obtain prior permission from ASI for the works to be conducted within the regulated zone of monument; submit detailed construction drawings clearly indicating the details of proposed excavations and works, use of equipment and machinery, etc., to ASI for their review; incorporate any suggestions/recommendations of ASI in project design and implementation;
- (ii) Excavation and construction methodology to be used within the regulated area of 300 m of any monument shall be in line with the ASI recommendations;
- (iii) No equipment causing vibration (e.g. pneumatic drills, excavators etc.), and heavy noise should be used; works shall be conducted manually;
- (iv) Dust control measures shall be put in place; all work areas to be barricaded and enclosed with dust screens;
- (v) Conduct air quality and noise monitoring weekly throughout construction phase in the 300 m regulated area; and
- (vi) Appoint an archaeological expert to assess impacts and supervise works.

Prior permission from ASI to conduct works has been obtained and the works will be carried out following the conditions stipulated.

122. **Accessibility and Traffic Disruptions.** Excavation along the roads for laying of sewers, (especially controlled blasting), hauling of construction materials and operation of equipment on-site will cause traffic problems. There are several roads (National and State Highways, and other major roads providing regional connectivity) in the project area that carry considerable traffic. These roads also centers of commercial activities. Internal roads in the project area are narrow, except in the newly developing residential layout which comparatively have wide roads. In old city area, roads are very narrow and congested with activities, traffic and pedestrians. 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.

123. 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.

124. 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 inconvenience the local community and road users. Potential impact is negative but short term and reversible by mitigation measures. The construction contractor will be required to:

1. Sewer works

- (i) Prepare a sewer work implementation plan in each zone separately 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;
- (ii) Plan the sewer work in coordination with the traffic police; provide temporary diversions, where necessary and effectively communicate with general public;
- (iii) 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;
- (iv) Undertake the work section wise: a 500 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;
- (v) 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 – immediately removed from site/ or brought to the as and when required;
- (vi) 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;
- (vii) 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;
- (viii) Provide pedestrian access in all the locations; provide wooden/metal planks over the open trenches at each house to maintain the access.
- (ix) Inform the affected local population 1-week in advance about the work schedule;
- (x) Plan and execute the work in such a way that the period of disturbance/ loss of access is minimum;
- (xi) Keep the site free from all unnecessary obstructions;
- (xii) Notify affected public by public 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 TV services; and
- (xiii) At work site, public information/caution boards shall be provided including contact for public complaints.
- (xiv) For sections where the controlled blasting is proposed, the residents are provided with the schedule of blasting at least three days in advance and the residents are explained about the

preventive, precautionary, mitigation and emergency response measures being taken to address their concerns.

- (xv) The contractor in coordination with the urban local body officials would conduct pre- blasting physical surveys through videography and photography of the adjacent residential properties and other structures along the sewerage alignment and take adequate measures to minimise such impacts.

2. Hauling (material, waste/debris and equipment) activities

- (i) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites;
- (ii) Schedule transport and hauling activities during non-peak hours;
- (iii) Locate entry and exit points in areas where there is low potential for traffic congestion;
- (iv) Drive vehicles in a considerate manner; and
- (v) Notify affected public by public information notices, providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.
- (vi) For controlled blasting, required quantity of explosives shall be transported to the blasting site only through suitable explosive vehicle. After blasting is over, the balance explosives shall be returned to the licensed storage.

125. **Socio-Economic – Income.** 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, no notable 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. Resettlement and social issues are being studied in a parallel resettlement planning study of this subproject.

- (i) Inform all businesses and residents about the nature and duration of any work well in advance so that they can make necessary preparations;
- (ii) Do not block any access; 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;
- (iii) 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;
- (iv) Control dust generation;
- (v) 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;
- (vi) 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;
- (vii) Consult businesses and institutions regarding operating hours and factoring this in work schedules; and
- (viii) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.

126. **Socio-Economic – Employment.** Manpower will be required during the 24-months construction stage. This can result in generation of temporary employment and increase in local

revenue. Thus potential impact is positive and long-term. The construction contractor shall require to Employ local labor force as far as possible

127. **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, controlled blasting etc. Potential impacts are negative and long-term but reversible by mitigation measures. The construction contractor will be required to:

- (i) Follow all national, state and local labor laws (indicative list is in Appendix 2);
- (ii) Develop and implement site-specific occupational health and safety (OH&S) Plan which shall include measures such as: (a) safe and documented construction procedures to be followed for all site activities; (b) ensuring all workers are provided with and use personal protective equipment; (c) OHS Training¹⁰ for all site personnel, (d) excluding public from the work sites; and (e) documentation of work-related accidents; Follow International Standards such as the World Bank Group's Environment, Health and Safety Guidelines;¹¹
- (iii) Ensure that qualified first-aid is provided at all times. Equipped first-aid stations shall be easily accessible throughout the sites;
- (iv) Secure all installations from unauthorized intrusion and accident risks;
- (v) Provide Health and Safety (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;
- (vi) 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;
- (vii) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;
- (viii) Ensure moving equipment is outfitted with audible back-up alarms;
- (ix) 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;
- (x) Disallow worker exposure to noise level greater than 85dBA for duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively;
- (xi) Provide supplies of potable drinking water; and
- (xii) Provide clean eating areas where workers are not exposed to hazardous or noxious substances.

128. **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

¹⁰ Some of the key areas that may be covered during training as they relate to the primary causes of accidents include (i) slips, trips and falls; (ii) personal protective equipment; (iii) ergonomics, repetitive motion, and manual handling; (iv) workplace transport; and (v) legislation and responsibilities. Training can provide the foundations of competence but it does not necessarily result in a competent worker. Therefore, it is essential to assess staff competence to ensure that the training provided is relevant and effective. Supervision and monitoring arrangements shall be in place to ensure that training has been effective and the worker is competent at their job. The level of supervision and monitoring required is a management decision that shall be based on the risks associated with the job, the level of competence required, the experience of the individual and whether the worker works as part of a team or is a lone worker.

¹¹ <http://www.ifc.org/wps/wcm/connect/a99ab8804365b27aa60fb6d3e9bda932/EHS-Guidelines+101-Webinar.pdf?MOD=AJPERES>

vehicle collision with pedestrians. Potential impact is negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

- (i) Confine work areas; prevent public access to all areas where construction works are on-going through the use of barricading and security personnel;
- (ii) Attach warning signs, blinkers to the barricading to caution the public about the hazards associated with the works, and presence of deep excavation;
- (iii) 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;
- (iv) Control dust pollution – implement dust control measures as suggested under air quality section;
- (v) Ensure appropriate and safe passage for pedestrians along the work sites;
- (vi) Provide road signs and flag persons to warn of on-going trenching activities;
- (vii) Restrict construction vehicle movements to defined access roads and demarcated working areas (unless in the event of an emergency);
- (viii) Enforce strict speed limit (20-30 kmph) for plying on unpaved roads, construction tracks;
- (ix) Provide temporary traffic control (e.g., flagmen) and signs where necessary to improve safety and smooth traffic flow;
- (x) 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;
- (xi) At sensitive locations particularly where there are schools and markets close to the road, awareness of safety issues will be raised through neighbourhood awareness meetings;
- (xii) All drivers and equipment operators will undergo safety training; and
- (xiii) Maintain regularly the construction equipment and vehicles; use manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.

Safety Measures for Controlled blasting during excavation: Presence of sub-surface rock (at a depth of 2 m whereas the sewer depth is in the range of 2- 6 m) in the alignment has been identified in few locations i Trichy Corporation at Zone-6,,7,8,9,11,and 12. During excavation, alternatives like drilling and chiselling, controlled blasting etc have been examined and the suitable technology has been identified depending upon the site conditions. Wherever controlled blasting is proposed, the following measures shall be carried out for execution in a safe manner.

- (i) Carryout controlled blasting in consultation with PIU so that blasting activities with generating least vibration are conducted during periods of the day which will result in least disturbance; especially near schools and other sensitive receptors
- (ii) The contractor shall submit a blasting plan in advance to PIU; and implement in accordance to the plan.
- (iii) Permission has been obtained from The District Collector for controlled blasting for excavation and the conditions issued shall be complied with during implementation. For the initial stretches proposed totalling to about 64 km permission is obtained from The District Collector of Trichy.
- (iv) Blasting shall be done through an licensed Explosive Contractor only.
- (v) For controlled blasting, explosives including blasting caps, shall be transported to the blasting site only through exclusive vehicle in safe manner in accordance with the requirements of the blasting license. After blasting is over, the balance explosives shall be returned to the licensed storage.
- (vi) Cost for implementation of mitigation measures and liability are the responsibility of contractor.
- (vii) Proper prior notice will be issued to the Residents before Commencing UGSS activity works Schedule
- (viii) Prior information will be given to Police Officials

- (ix) Workers (Flagman) shall be stationed on both end of roads to warn people before firing any blasts and not to permit the traffic.
- (x) When blasting, ample warning shall be given to all persons within the vicinity prior to blasting. Warning signs shall be erected a minimum of 24 hours prior to the blast time. The warning signs will state the time and date of each blast.
- (xi) Contractor shall ensure necessary precautions / protection (like excavated earth, sand-filled bags, etc) to reduce dust emissions, noise levels and vibrations. Sites shall be provided with necessary shields all around.
- (xii) Minimum explosive will be used for Control Blasting around residential areas.
- (xiii) After a blast has been fired, the Blast Control Specialist shall make a careful inspection to determine that all charges have exploded before employees are allowed to return to the operation..
- (xiv) The contractor shall be responsible for any and all damages to property or injury to persons resulting from blasting or accidental or premature explosions that may occur in connection with use of explosives. The contractor shall do the activities after obtaining the blasting permission from District Collector,Trichy.
For the diversion of traffic in the blasting area, the contractor shall prepare a traffic management plan and obtain permission from Tiruchy corporation and traffic police.

129. **Construction Camps.** Contractor may require to set up construction camps – for temporary storage of construction material (sewer, 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:

- (i) Consult PIU before locating project offices, sheds, and construction plants;
- (ii) Select a camp site away from residential areas (at least 100 m buffer shall be maintained) or locate the camp site within the existing facilities of Tiruchirappalli City Corporation;
- (iii) Avoid tree cutting for setting up camp facilities;
- (iv) Provide a proper fencing/compound wall for camp sites;
- (v) 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;
- (vi) Separate the workers living areas and material storage areas clearly with a fencing and separate entry and exit;
- (vii) Ensure conditions of liveability 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;
- (viii) Camp shall be provided with proper drainage, there shall not be any water accumulation;
- (ix) Provide drinking water, water for other uses, and sanitation facilities for employees;
- (x) Prohibit employees from cutting of trees for firewood; contractor should provide cooking fuel (cooking gas); fire wood not allowed;
- (xi) Train employees in the storage and handling of materials which can potentially cause soil contamination;
- (xii) 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;
- (xiii) Recover used oil and lubricants and reuse or remove from the site;

- (xiv) 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;
- (xv) Remove all wreckage, rubbish, or temporary structures which are no longer required; and
- (xvi) 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.

C. Operation and Maintenance Impacts

130. Operation and maintenance of the sewerage system will be carried out by TCC. Operation will involve collection and conveyance of wastewater from houses to nearest lifting / pumping stations and operation of lifting/pumping stations to pump accumulated sewage.

131. **Quality of Raw Sewage.** The subproject does not involve construction of STP, however the sewage collected from the proposed collection network will be treated in the STPs (i.e., constructed / rehabilitated under Phase II of the Trichy UGSS). As discussed previously, 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. Tiruchirappalli houses various small and medium scale units; food, cotton, textiles, wood, paper, plastic, chemical, engineering, electrical units are established.. Although proposed sewer network will not cater to industrial wastewater, It is important to ensure that no wastewater from industries enters the sewer network with strict monitoring and enforcement. Following measures are to be implemented:

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

132. **Odor and Noise from Sewage lifting and pumping stations.** Various measures are included in the design of these facilities giving utmost importance to odor and noise. Therefore it is anticipated there will not be any significant generation of odor or noise that will impact the surrounding households. Following measures are to be implemented during the operation:

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

133. **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.

134. 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 where necessary. There is an occupation health risk to workers engaged in sewer maintenance activities. Following measures should be followed:

- (i) Establish regular maintenance program, including:
 - 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 manhole; 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 overflow is currently occurring or for urgent problems that may cause an imminent overflow (e.g. pump station failures, sewer line ruptures, or sewer line blockages);
- (ii) 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;
- (iii) 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;
- (iv) 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;
- (v) Develop an Emergency Response System for the sewerage system leaks, burst and overflows, etc.;
- (vi) Provide necessary health and safety training to the staff in sewer cleaning and maintenance;
- (vii) Provide all necessary personnel protection equipment; and
- (viii) 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.

XXXVII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Overview

135. The active participation of stakeholders including local community, NGOs/CBOs, etc., in all stages of project preparation and implementation is essential for successful implementation of the project. It will ensure that the subprojects are designed, constructed, and operated with utmost consideration to local needs, ensures community acceptance, and will bring maximum benefits to the people. Public consultation and information disclosure is a must as per the ADB policy.

136. Most of the main stakeholders have already been identified and consulted during preparation of this IEE, and any others that are identified during project implementation will be brought into the process in the future. Primary stakeholders of the subproject are: residents, shopkeepers and businesspeople who live and work near sites where facilities will be built (sewer network and pumping/lifting stations), government and utility agencies responsible for provision of various services in project area. Secondary stakeholder are NGOs and CBOs working in the area, community representatives, beneficiary community in general, government agencies, TNUFSL, Government of Tamil Nadu and the ADB.

B. Public Consultation

1. Consultation during Project Preparation

137. The subproject proposal is formulated by Tiruchirappalli city corporation in consultation with the public representatives bodies in the project area to suit their requirements.

138. Focus-group discussions with affected persons and other stakeholders were conducted to learn their views and concerns. A socio economic household survey has been conducted in the project area, covering sample households, to understand the household characteristics, health status, and the infrastructure service levels, and also the demand for infrastructure services. General public and the people residing including women along the project activity areas were also consulted. A project area level consultation workshop is conducted in Tiruchirappalli with the public representatives and prominent citizens, NGOs etc. A formal consultations were held on 21 January 2018 (details are provided in Appendix 10). Subsequently, another consultation with nearby residents was conducted on 08 January 2019 for the SPS-11, Arasu colony during which residents objected to the proposed site. Hence alternate site for locating SPS-11 was identified in Karumandapam (Vacant area in Crematorium belonging to TCMC).

139. It was observed that people are willing to extend their cooperation as the proposed project will provide sewerage system, enhance basic infrastructure service levels and overall living standard of the public. The public expressed their concern regarding the nuisance and disturbance (dust, road closure and traffic management activities) during the construction stage which can have impact on their day to day activities. Construction on narrow roads is seen as biggest hindrance. Public demanded for advance notice before construction and proper warning signs along the construction area to avoid accidents and inconvenience. Public opined that an appropriate operation and maintenance system should be in place for sewerage system for its best functioning and to have the maximum health and aesthetic benefits. Issue of bad odors from lifting and pumping stations located close to the houses is also raised. Project team explained proposed EMP to manage the negative impacts, including odor prevention and control measures included in the design and operation.

2. Consultation during construction Period

140. Prior to start of construction, PIU will conduct information dissemination sessions at various places and solicit the help of the local community, leaders/prominent for the project work. Focus group meetings will be conducted to discuss and plan construction work (mainly pipeline work) with local communities to reduce disturbance and other impacts and also regarding the project grievance redress mechanism. Project information and construction schedule will be provided to the public via mass media (newspapers, television, ULB websites etc.). A constant communication will be established with the affected communities to redress the environmental issues likely to surface during construction phase. Contractor will provide prior public information (in Tamil and English) about the construction work in the area, once 7 days prior to the start of work and again a day before the start of work via pamphlets (a sample public information template is provided in Appendix 10). At the work sites, public information boards will also be provided to disseminate project related information.

The Public Consultation at Munthukumarasamy Nagar

The Public Consultation commenced at Muthukumarasamy Nagar on 16.12.2021 at 4.00 PM with officials from Tiruchirappalli City Corporation (TCC), CMSC Team and Engineers of L&T. The public/residents of the area and the residential association members were present at the meeting based on prior public notice given in individuals about the details of the public consultation. The copy of Attendance register is attached herewith.



Officials of TCC, CMSC Team and contractor's Engineers team welcomed the gathering and outlined the procedure for Public Consultation. They described that the TCC have proposed to develop the Underground Sewerage Scheme (UGSS) for Tiruchirappalli Corporation.

The meeting was held at the Road junction of Muthukumarasamy Nagar and 12 residents participated (Male 11 members and Female 1 member). The Consulting team members highlighted about the importance of Underground Sewerage System, its advantages and proposed Sewerage Lifting Station in the existing road end of the street as a convenient location for maintenance and disposal of waste.

This was followed by description of the project in detail. The summary of the project details was also circulated to the gathering. The following details regarding the scheme were shared with the public. Previous consultations meeting held on 20.2.2021. During the previous meeting, all the residents were objected for the construction of pumping station in the park land, since they want park as a recreation place. The CMSC Team tried to convince the public after explaining about the benefit of the project. But the public were adamant and continued to object the construction of pumping station at the park land. Hence alternate arrangement has been deeply analyzed to change the scope of the pumping station or to change the location of the pumping station.

Hence portion of catchment of the Zone 9 has been diverted in to another nearby zone. Due to reduction of the catchment area of the sewer network, the pumping station has been reduced to the lifting station due to reduction of the sewage quantity. It was also agreed by the TCC officials. Due to the topographical conditions of the area, the lifting station can't be avoided in the Muthukumaraswamy Nagar.

Conclusion

After detailed explanation by the TCC officials and CMSC Team, all the public were agreed to construct the lifting station in their location.

The Public Consultation at Arokiya Madha Avenue

The Public Consultation at Arokiya Madha Avenue commenced on 26.02.2022 at 4.00 PM with officials from Tiruchirappalli City Corporation (TCC), CMSC Team and Project Manager of L& T and their team members, to get public concurrence for constructing the Lifting station at Arokiya Madha Avenue as per the directions of ADB in the presence of elected councilor of the area. Prior intimation has been issued to all the public about the meeting. The public/residents of the area were present at the meeting on 26.02.2022 based on prior public notice given to the individuals about the details of the public consultation. The copy of notice to public and Attendance register is attached herewith.



Officials of TCC, CMSC team and Contractor's Team welcomed the gathering and outlined the procedure for Public Consultation. They described that the TCC have proposed to develop the Underground Sewerage Scheme (UGSS) for Tiruchirappalli Corporation under phase III and the work is under progress.

Earlier it was proposed to construct the sewage pumping station 12 at the park land located at Natchatra Nagar and initiated lifting station land belongs to Trichy Corporation. During the Previous consultations meeting held on 15th December 2021, all the residents were objected the construction of SPS and lifting station in the Natchatra Nagar. TCC and CMSC Team explained about the project and its advantages, the public didn't agree to construct the SPS and lifting station at Natchatra Nagar. Hence alternate feasibility of changing the scope/site has been explored. Hence portion of catchment of the Zone 12 has been diverted in to another nearby area of Arokiya Madha Avenue and the proposed lifting station at Natchatra nagar has been shifted to Aorkiya Madha Avenue. Hence fresh consultation meeting among the public of Arokiya Madha Afenuue has been organized and conducted on 26.02.2021 (see Annexure)

Conclusion

After detailed explanation by the TCC officials and CMSC Team, all the public were agreed to construct the lifting station in their location.

C. Information Disclosure

141. Executive summary of the IEE will be translated in Tamil and made available at the office of TCC and also displayed on their notice boards. Hard copies of the IEE will be accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. Electronic version of the IEE in English and Executive Summary in Tamil will be placed in the official website of the TNUIFSL and TCC after approval of the IEE by ADB. Stakeholders will also be made aware of grievance register and redress mechanism.

142. Public information campaigns to explain the project details to a wider population will be conducted. Public disclosure meetings will be conducted at key project stages to inform the public of

progress and future plans. Prior to start of construction, the PIU will issue Notification on the start date of implementation in local newspapers A board showing the details of the project will be displayed at the construction sites for the information of general public.

143. Local communities will be continuously consulted regarding location of construction camps, access and hauling routes and other likely disturbances during construction. The road closure together with the proposed detours will be communicated via advertising, pamphlets, radio broadcasts, road signage, etc.

XXXVIII. GRIEVANCE REDRESS MECHANISM

144. A common GRM will be in place to redress social, environmental or any other project related grievances. The GRM described below has been developed in consultation with stakeholders. Public awareness campaign will be conducted to ensure that awareness on the project and its grievance redress procedures is generated. The campaign will ensure that the poor, vulnerable and others are made aware of grievance redress procedures and entitlements per project entitlement matrix, and program management unit (PMU) and concerned program implementation unit (PIU) will ensure that their grievances are addressed.

145. Affected persons will have the flexibility of conveying grievances/suggestions by dropping grievance redress/suggestion forms in complaints/suggestion boxes or through telephone hotlines at accessible locations, by e-mail, by post, or by writing in a complaints register in PIU offices. PIU Safeguards officer will have the responsibility for timely grievance redress on safeguards and gender issues and for registration of grievances, related disclosure, and communication with the aggrieved party.

146. GRM provides an accessible, inclusive, gender-sensitive and culturally appropriate platform for receiving and facilitating resolution of affected persons' grievances related to the project. A two-tier grievance redress mechanism is conceived, one, at project level and another, beyond project level. For the project level GRM, a Grievance Redress Cell (GRC) will be established in PIUs; Safeguards officer, supported by the social, gender and environmental safeguards specialist of CMSC will be responsible for creating awareness among affected communities and help them through the process of grievance redress, recording and registering grievances of non-literate affected persons.

147. GRM aims to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the project. All grievances – major or minor, will be registered. Documentation of the name of the complainant, date of receipt of the complaint, address/contact details of the person, location of the problem area, and how the problem was resolved will be undertaken. PIU will also be responsible for follow-through for each grievance, periodic information dissemination to complainants on the status of their grievance and recording their feedback (satisfaction/dissatisfaction and suggestions).

148. In case of grievances that are immediate and urgent in the perception of the complainant, the contractor, and supervision personnel of the CMSC and PIU will resolve the issue on site, and any issue that is not resolved at this level will be dealt at PIU head level for immediate resolution. Should the PIU fail to resolve any grievance within the stipulated time period, the unresolved grievances will be taken up at ULB level. In the event that certain grievances cannot be resolved even at ULB level, particularly in matters related to land purchase/acquisition, payment of compensation, environmental pollution etc., they will be referred to the district level Grievance Redress Committee (GRC) headed by the District Collector. Any issue which requires higher than district level inter-departmental coordination or grievance redress, will be referred to the state level Steering Committee.

149. GRC will meet every month (if there are pending, registered grievances), determine the merit of each grievance, and resolve grievances within specified time upon receiving the complaint-failing which the grievance will be addressed by the state-level steering committee. The steering committee will resolve escalated/unresolved grievances received.

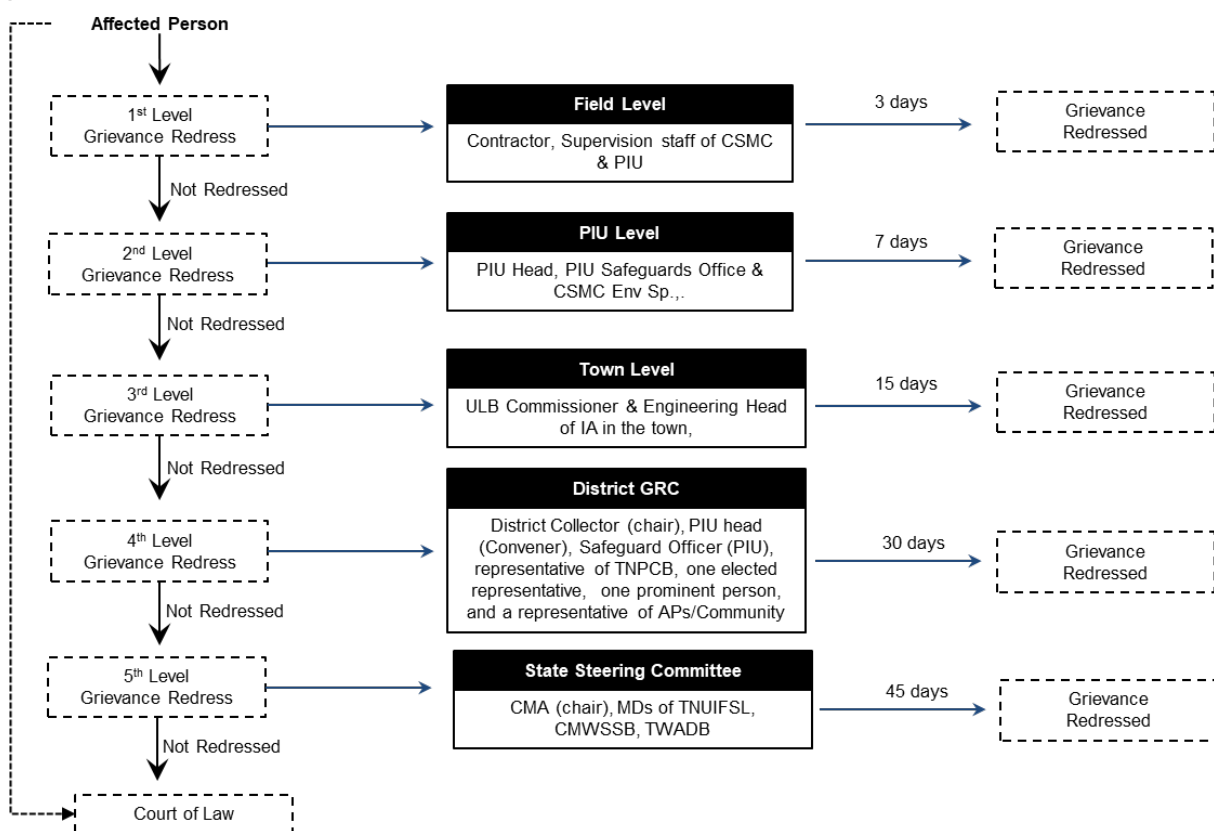
150. **Composition of GRC.** GRC will be headed by the District Collector, and members include: PIU head, Safeguards Officer of PIU, representative of TNPCB, one elected representative / prominent citizen from the area, and a representative of affected community. GRC must have a women member.

151. **State level steering committee** will include Commissioner of Municipal Administration as chair, member include managing directors of TNUIFSL, CMWSSB, TWAD Board and others as necessary.

152. **Areas of Jurisdiction.** The areas of jurisdiction of the GRC, headed by the District Collector will be (i) all locations or sites within the district where subproject facilities are proposed, or (ii) their areas of influence within the District. The SC will have jurisdictional authority across the state (i.e., areas of influence of subproject facilities beyond district boundaries, if any).

153. The multi-tier GRM for the project is outlined below (Figure 16), each tier having time-bound schedules and with responsible persons identified to address grievances and seek appropriate persons' advice at each stage, as required. The GRC will continue to function throughout the project duration. The implementing agencies/ULBs shall issue notifications to establish the respective PIU level grievance redress cells, with details of composition, process of grievance redress to be followed, and time limit for grievance redress at each level.

Figure 15: Proposed TNUFIP Grievance Redress Mechanism



AP = affected person, CMSC = Construction Management and Supervision Consultant, IA = implementing agency, PIU = program implementation unit; ULB = urban local body; TNPCB = Tamil Nadu Pollution Control Board.

154. **Recordkeeping.** Records of all grievances received, including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions and

the date these were effected and final outcome will be kept by PIU (with the support of CMSC) and submitted to PMU.

155. **Information dissemination methods of the GRM.** The PIU, assisted by CMSC will be responsible for information dissemination to affected persons and general public in the project area on grievance redress mechanism. Public awareness campaign will be conducted to ensure that awareness on the project and its grievance redress procedures is generated. The campaign will ensure that the poor, vulnerable and others are made aware of grievance redress procedures and entitlements per agreed entitlement matrix including. whom to contact and when, where/ how to register grievance, various stages of grievance redress process, time likely to be taken for redress of minor and major grievances, etc. Grievances received and responses provided will be documented and reported back to the affected persons. The number of grievances recorded and resolved and the outcomes will be displayed/disclosed in the PIU, offices, ULB notice boards and on the web, as well as reported in the semi-annual environmental and social monitoring reports to be submitted to ADB. A Sample Grievance Registration Form has been attached in Appendix 5.

156. **Periodic review and documentation of lessons learned.** The PMU will periodically review the functioning of the GRM and record information on the effectiveness of the mechanism, especially on the PIU's ability to prevent and address grievances.

157. **Costs.** All costs involved in resolving the complaints (meetings, consultations, communication and reporting/information dissemination) will be borne by the respective PIU. Cost estimates for grievance redress are included in resettlement cost estimates.

158. **Country legal procedure.** An aggrieved person shall have access to the country's legal system at any stage, and accessing the country's legal system can run parallel to accessing the GRM and is not dependent on the negative outcome of the GRM.

159. **ADB's Accountability Mechanism.** In the event that the established GRM is not in a position to resolve the issue, the affected person also can use the ADB Accountability Mechanism through directly contacting (in writing) the Complaint Receiving Officer (CRO) at ADB headquarters or the ADB India Resident Mission. The complaint can be submitted in any of the official languages of ADB's developing member countries. Before submitting a complaint to the Accountability Mechanism, it is recommended that affected people make a good faith effort to resolve their problems by working with the concerned ADB operations department (in this case, the resident mission). Only after doing that, and if they are still dissatisfied, they could approach the Accountability Mechanism. The ADB Accountability Mechanism information will be included in the project-relevant information to be distributed to the affected communities, as part of the project GRM.

XXXIX. ENVIRONMENTAL MANAGEMENT PLAN

A. Environmental Management Plan

160. An environmental management plan (EMP) has been developed to provide mitigation measures to reduce all negative impacts to acceptable levels.

161. The EMP will guide the environmentally-sound construction of the subproject and ensure efficient lines of communication between TNUIFSL, PMU, Implementing agency, PIU, consultants and contractors. The EMP will (i) ensure that the activities are undertaken in a responsible non-detrimental manner; (i) provide a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on site; (ii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iii) detail specific actions deemed necessary to assist in mitigating the environmental impact of the subproject; and (iv) ensure that safety recommendations are complied with. The EMP includes a monitoring program to measure the environmental condition and effectiveness of implementation of the mitigation measures. It will include observations on- and off-site, document checks, and interviews with workers and beneficiaries.

162. The contractor will be required to submit to PIU, for review and approval, a site environmental management plan (SEMP) including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; and (iii) monitoring program as per SEP. No works are allowed to commence prior to approval of SEMP.

163. A copy of the EMP/approved SEMP will be kept on site during the construction period at all times. The EMP included in the bid and contract documents to ensure compliance to the conditions set out in this document.

164. For civil works, the contractor will be required to (i) carry out all of the mitigation and monitoring measures set forth in the approved SEP; and (ii) implement any corrective or preventative actions set out in safeguards monitoring reports that the employer will prepare from time to time to monitor implementation of this IEE and SEMP. The contractor shall allocate budget for compliance with these SEMP measures, requirements and actions.

165. The following tables show the potential environmental impacts, proposed mitigation measures and responsible agencies for implementation and monitoring.

Table 18: Design Stage Environmental Impacts and Mitigation Measures (included in DPR)

| Field | Anticipated Impact | Mitigation Measures | Responsibility of Mitigation | Cost and Source of Funds |
|--|--|---|------------------------------|--------------------------|
| Sewer network | Nuisance due to leaks, overflows, contamination of water supplies, occupation health and safety of workers, etc. | <ul style="list-style-type: none"> (i) Limit the sewer depth where possible (ii) Sewers shall be laid away from water supply lines and drains (at least 1 m, wherever possible); (iii) 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) (iv) In unavoidable cases, where sewers are to be laid close to storm water drains, appropriate pipe material shall be selected (stoneware pipes shall be avoided) (v) For shallower sewers and especially in narrow roads, use small inspection chambers in lieu of manholes; (vi) Design manhole covers to withstand anticipated loads and ensure that the covers can be readily replaced if broken to minimize silt/garbage entry <p>Ensure sufficient hydraulic capacity to accommodate peak flows and adequate slope in gravity mains to prevent buildup of solids and hydrogen sulfide generation.</p> <p>Ensure to conduct a pre-blasting survey through videography and photography of residential properties and other structures falling along the sewerage alignment to ascertain the prevailing conditions of the structures likely to be impacted by the controlled blasting and take adequate measures to minimize such impacts.</p> | PIU/TCC | Project Costs |
| Construction works in the regulated buffer zone of ASI monument (Erumbeeswarar Temple) | Disturbance / damage to monument | <ul style="list-style-type: none"> (i) Obtain prior permission from ASI for the works to be conducted within the regulated zone of monument; submit detailed construction drawings clearly indicating the details of proposed excavations and works, use of equipment and machinery, etc., to ASI for their review; incorporate any suggestions/recommendations of ASI in project design and implementation (ii) Consult ASI) and local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals. (iii) Excavation and construction methodology to be used within the regulated area of 300 m of any monument shall be in | PIU/TCC | Project Costs |

| Field | Anticipated Impact | Mitigation Measures | Responsibility of Mitigation | Cost and Source of Funds |
|-------------------------|--------------------|---|------------------------------|--------------------------|
| | | <p>line with the ASI recommendations and have the excavation observed by person with archaeological knowledge for chance finds</p> <p>(iv) No equipment causing vibration (e.g., pneumatic drills, excavators etc.) and heavy noise should be used; works shall be conducted manually</p> <p>(v) Dust control measures shall be put in place; all work areas to be barricaded and enclosed with dust screens</p> <p>(vi) Conduct periodical air quality and noise monitoring throughout construction phase in the 300 m regulated area</p> <p>(vii) Appoint a archaeological expert to assess impacts and supervise works</p> | | |
| Sewage pumping stations | Odor nuisance | <p>Measures specific (additional) to New Pumping Station near household area</p> <p>(i) Maintain maximum buffer distance from the nearest residences to the pumping station wells;</p> <p>(ii) Locate pumping station as far as away from the road</p> <p>(iii) 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 odor and also act as visual shield, and improve aesthetical appearance</p> <p>Design measures for all pumping stations</p> <p>(i) Proposed wells to be closed using RCC slabs. Design of RCC slab to consider both superimposed loads (human and equipment loads) and severe corrosion risk from sewer gas from within wells.</p> <p>(ii) RCC Slab to be designed and fixed in a modular manner such that access to pumps / appurtenances and other equipment can be provided for maintenance / replacement / renewal purposes.</p> <p>(iii) 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&M purposes.</p> <p>(iv) Provision of passive gas ventilation arrangement by</p> | PIU/TCC | Project Costs |

| Field | Anticipated Impact | Mitigation Measures | Responsibility of Mitigation | Cost and Source of Funds |
|-------|--------------------|---|------------------------------|--------------------------|
| | | <p>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.</p> <p>(v) Height of vent to be provided appropriately and a minimum 2 m above the lintel level (top level) of window(s) / passageways / doors in the nearby adjoining buildings.</p> <p>(vi) Provision of odor control / mitigation system as per site conditions / requirements. Suitable granular activated carbon filter with bird-screen fitted at the vent outlet to control odor. Size of GAC (including material size) should be selected based on the vent diameter and expelled air flow rate expected.</p> <p>(vii) 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.</p> <p>(viii) 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.</p> <p>(ix) Diesel Generators shall be provided for all pump stations and in cases of lift stations with space for control room. In cases of lift manholes (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.</p> <p>(x) Develop standard operating procedures / operational manual for operation and maintenance of lifting and pump stations; this shall include measures for emerge situations</p> <p>(xi) Provide training to the staff in SOPs and emergency procedures</p> <p>(xii) Conduct periodic H₂S monitoring</p> | | |

| Field | Anticipated Impact | Mitigation Measures | Responsibility of Mitigation | Cost and Source of Funds |
|-------------------------------------|--------------------|---|------------------------------|--------------------------|
| Sewage lifting stations | Odor nuisance | (i) Provide closed wells fitted with necessary ventilation and odor abatement systems such as GAC air filters fitted to the ventilation shaft outlet(s). (ii) Provide greenbelt (tree cover) around the lift stations, wherever possible | PIU/TCC | Project costs |
| Sewage pumping and lifting stations | Noise | (i) 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 (ii) Use appropriate building materials and construction techniques for pump houses which can absorb sound rather than reflect noise (iii) Use acoustic enclosures – manufacturer specified, for all pumps, motors (iv) Procure only CPCB approved generators with low emission and low noise fitted with acoustic enclosures (v) Provide sound mufflers for ventilators in the plant rooms; and sound proof doors (vi) Provide ear plugs to workers. Ensure to conduct a pre-blasting survey through videography and photography of residential properties and other structures falling along the sewerage alignment to ascertain the prevailing conditions of the structures likely to be impacted by the controlled blasting and take adequate measures to minimize such impacts. (vii) Consult the ASI and the local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals. (viii) Excavation and construction methodology to be used near the monuments (within the regulated area of 300 m of any monument) shall be finalized in consultation with ASI; have the excavation observed by person with archaeological knowledge for chance finds; no equipment causing vibration and heavy noise should be used | PIU/TCC | Project costs |
| Sewage pumping and lifting stations | Energy consumption | (i) Using low-noise and energy efficient pumping systems (ii) Efficient Pumping system operation | PIU/TCMC | Project Costs |

| Field | Anticipated Impact | Mitigation Measures | Responsibility of Mitigation | Cost and Source of Funds |
|---------------------|--|---|------------------------------|--------------------------|
| Controlled blasting | Ground vibrations Noise (airblast) Flying debris Dust | <p>(iii) Installation of Variable Frequency Drives (VFDs)</p> <p>For the safety of humans and the structures within the area influenced by the blasting, the vibrations related impacts would be addressed by designing the blast charge by complying with the provisions elaborated in the applicable Indian regulations and standards.</p> <p>3.</p> <p>All records shall be maintained by the Contractors and PIU.</p> <p>4.</p> <p>An emergency response system shall be developed at the site level to address the situations emerging due to accidents or any other unfortunate incidents pertaining to human and structure safety. Training related to controlled blasting activity will be included in the overall safeguards training programme meant for PIUs and Contractors.</p> <p>5.</p> <p>The project staff from the PIU, consultants and contractors would undertake a pre-blasting survey of structures (including videography and/or photography) lying within the area of influence of blasting from the vibrations related impacts (preferably in the presence of the owners of the said structures) to assess and/or ascertain regarding the prevailing conditions of the structures prior to blasting activities. Based on the assessment, the Project staff would consider necessary measures to avoid, minimize or mitigate such impacts..</p> | Contractor and PIU | Contractor costs |

ASI = Archeological Survey of India, CPCB = Central Pollution Control Board, O&M = operation and maintenance, PIU = program implementation unit, SOP = Standard operating procedure, TCC = Tiruchirapalli City Corporation.

Table 19: Pre Construction Stage Environmental Impacts and Mitigation Measures

| Field | Anticipated Impact | Mitigation Measures | Responsible for Implementation | Cost and Source of Funds |
|--|--|---|---|--------------------------|
| Submission of updated EMP / SEMP; EMP implementation and reporting | Unsatisfactory compliance to EMP | (i) Appoint EHS Supervisor to ensure EMP implementation (ii) Submission of updated EMP/ SEMP (ii) Timely submission monthly of monitoring reports including documentary evidence on EMP implementation such as photographs | Contractor and CMSC | Contractor cost |
| Utilities | Telephone lines, electric poles and wires, water lines within proposed project area | (i) Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase; and (ii) Require construction contractors to prepare a contingency plan to include actions to be taken in case of unintentional interruption of services. | Contractor in coordination with CMSC/PIU | Contractor cost |
| Construction work camps, stockpile areas, storage areas, and disposal areas. | Conflicts with local community; disruption to traffic flow and sensitive receptors | (i) Prioritize areas within or nearest possible vacant space in the project location; (ii) If it is deemed necessary to locate elsewhere, consider sites that will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems; (iii) Do not consider residential areas; (iv) Take extreme care in selecting sites to avoid direct disposal to water body which will inconvenience the community. (v) For excess spoil disposal, ensure (a) site shall be selected preferably from barren, infertile lands. In case agricultural land needs to be selected, written consent from landowners (not lessees) will be obtained; (b) debris disposal site shall be at least 200 m away from surface water bodies; (c) no residential areas shall be located within 50 m downwind side of the site; and (d) site is minimum 250 m away from sensitive locations like settlements, ponds/lakes or other water bodies. | Contractor to finalize locations in consultation with CMSC/PIU | Contractor cost |
| Sources of Materials | Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, | (i) Obtain construction materials only from government approved quarries with prior approval of PIU (ii) PIU to review, and ensure that proposed quarry sources have all necessary clearances/ permissions in place prior to approval (iii) Contractor to submit to PIU on a monthly basis documentation on material obtained from each sources (quarry/ borrow pit) (iv) Avoid creation of new borrow areas, quarries etc., for the project; if unavoidable, contractor to obtain all clearances and permissions as | Contractor to prepare list of approved quarry sites and sources of materials with the approval of PIU | Contractor cost |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Implementation | Cost and Source of Funds |
|---|---|--|--------------------------------|--|
| | disturbance in natural drainage patterns, ponding and water logging, and water pollution. | required under law, including Environmental Clearance (EC) prior to approval by PIU | | |
| Consents, permits, clearances, NOCs, etc. | Failure to obtain necessary consents, permits, NOCs, etc. can result to design revisions and/or stoppage of works | (i) Obtain all necessary consents, permits, clearance, NOCs, etc. prior to award of civil works. (ii) Ensure that all necessary approvals for construction to be obtained by contractor are in place before start of construction (iii) Acknowledge in writing and provide report on compliance all obtained consents, permits, clearance, NOCs, etc. 6. | Contractor ,CMSC and PIU | Cost of obtaining all consents, permits, clearance, NOCs, etc. prior to start of civil works is the responsibility of PIU. |
| Chance finds | Damage / disturbance to artifacts | (i) Construction contractors to follow these measures in conducting any excavation work (ii) Create awareness among the workers, supervisors and engineers about the chance finds during excavation work (iii) Stop work immediately to allow further investigation if any finds are suspected; (iv) Inform State Archaeological Department if a find is suspected, and taking any action they require to ensure its removal or protection in situ. | Contractor, CMSC and PIU | Contractor cost |

CMSC = Construction Management and Supervision Consultant, EMP = environmental management plan, m = meter, NOC = no objection certificate, PIU= Program Implementation Unit, SEMP = site environmental management plan.

Table 20: Construction Stage Environmental Impacts and Mitigation Measures

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|-----------------------------|--|--|----------------------------|--------------------------|
| EMP Implementation Training | Irreversible impact to the environment, workers, and community | Project manager and all key workers will be required to undergo training on EMP implementation including spoils/waste management, Standard operating procedures (SOP) for construction works; occupational health and safety (OHS), core labor laws, applicable environmental laws, etc. | Contractor and CMSC | Contractor cost |
| Air Quality | Dust, emissions from construction | For all construction works (i) Provide a dust screen around the construction sites of pumping | Contractor | Contractor cost |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|-------|--|--|----------------------------|--------------------------|
| | vehicles, equipment, and machinery used for installation of pipelines resulting to dusts and increase in concentration of vehicle-related pollutants such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons. | <p>and lifting stations</p> <p>(ii) Damp down the soil and any stockpiled material on site by water sprinkling;</p> <p>(iii) Stabilize surface soils where loaders, support equipment and vehicles will operate by using water and maintain surface soils in a stabilized condition</p> <p>(iv) Apply water prior to levelling or any other earth moving activity to keep the soil moist throughout the process</p> <p>(v) Cover the soil stocked at the sites with tarpaulins</p> <p>(vi) Control access to work area, prevent unnecessary movement of vehicle, public trespassing into work areas; limiting soil disturbance will minimize dust generation</p> <p>(vii) Use tarpaulins to cover the loose material (soil, sand, aggregate etc.), when transported by open trucks;</p> <p>(viii) Control dust generation while unloading the loose material (particularly aggregate, sand, soil) at the site by sprinkling water and unloading inside the barricaded area</p> <p>(ix) Clean wheels and undercarriage of haul trucks prior to leaving construction site</p> <p>(x) Ensure that all the construction equipment, machinery are fitted with pollution control devices, which are operating correctly, and have a valid pollution under control (PUC) certificate.</p> <p>7.</p> <p>For sewer works</p> <p>(i) Barricade the construction area using hard barricades (of 2 m height) on both sides</p> <p>(ii) Initiate site clearance and excavation work only after barricading of the site is done</p> <p>(iii) Confine all the material, excavated soil, debris, equipment, machinery (excavators, cranes etc.), to the barricaded area</p> <p>(vii) (iv) Ensure that adequate cover is provided to the trenches to prevent emission of dust during controlled blasting.</p> <p>Limit the stocking of excavated material at the site; remove the excess soil from the site immediately to the designated disposal</p> | | |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|---------------|--------------------|---|----------------------------|--------------------------|
| | | <p>area</p> <p>(v) Undertake the work section wise: a 500 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</p> <p>(vi) 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.</p> <p>(vii) 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.</p> <p>(viii) 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.</p> <p>(viii) 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.</p> <p>(ix) For sections involving controlled blasting, ensure that dust curtains of adequate height are provided to the trenches to prevent emission of dust during drilling for charge holes and controlled blasting.</p> <p>(x) Ensure that the excavated soil and debris along the section identified for blasting is sprinkled with adequate water prior to blasting to reduce dust emissions upon explosion of charge placed for breaking the hard rock;</p> <p>(xi)</p> | | |
| Surface water | Mobilization of | (i) All earthworks be conducted during the dry season to prevent the | Contractor | Contractor cost |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|--|---|--|----------------------------|--------------------------|
| quality | settled silt materials, and chemical contamination from fuels and lubricants during construction can contaminate nearby surface water quality. 8. Ponding of water in the pits / foundation excavations | problem of soil/silt run-off during rains (ii) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets; (iii) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, only designated disposal areas shall be used; (iv) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies; (v) Place storage areas for fuels and lubricants away from any drainage leading to water bodies; (vi) Store fuel, construction chemicals etc., on an impervious floor, also avoid spillage by careful handling; provide spill collection sets for effective spill management (vii) Dispose any wastes generated by construction activities in designated sites; (viii) Conduct surface quality inspection according to the Environmental Management Plan (EMP). | | |
| Pipe bridge construction across streams and canals | Degradation of water quality / silting of water body | (i) Conduct works in the water body (especially foundation work) only during no-flow season (ii) Select a construction method which is less disruptive (eg, precast type) (iii) Do no spill construction chemicals, fuels, lubricants in the water body (iv) Clean up the site immediately after construction is complete; construction debris, materials, etc., shall be cleared and pre project condition restored or improved | Contractor | Contractor cost |
| 9. | Water accumulation in trenches/pits | (i) 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 (ii) 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 (iii) Consider safety aspects related to pit collapse due to accumulation of water | Contractor | Contractor cost |
| Noise and | Increase in noise | (i) Plan activities in consultation with CMSC/PIU so that activities | Contractor | Contractor cost |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|------------------------|--|---|----------------------------|----------------------------|
| vibration Levels | level due to earth-moving and excavation equipment, and the transportation of equipment, materials, and people | <p>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</p> <p>(ii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and use portable street barriers to minimize sound impact to surrounding sensitive receptor; and</p> <p>(iii) Maintain maximum sound levels not exceeding 70 decibels (dBA) when measured at a distance of 10 m or more from the vehicle/s.</p> <p>(iv) 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</p> <p>(v) Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach;</p> <p>(vi) Consult local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as night times, religious and cultural festivals.</p> <p>10.</p> <p>Works near the ASI monument</p> <p>(i) Excavation and construction methodology to be used near the monuments (within the regulated area of 300 m of any monument) shall be in line with the ASI recommendations</p> <p>(ii) No equipment causing vibration (e.g., pneumatic drills, excavators etc.) and heavy noise should be used; works shall be conducted manually</p> <p>(iii) Dust control measures shall be put in place; all work areas to be barricaded and enclosed with dust screens</p> <p>(vi) Conduct periodical air quality and noise monitoring throughout construction phase in the 300 m regulated area</p> | | |
| Removal of rock during | Increase in vibration due to the | (i) During excavation for sewer works, wherever removal of rock is identified, alternatives like drilling and chiselling, controlled | Construction Contractor | Cost for implementation of |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|----------------------------|---|--|----------------------------|---|
| excavation for sewer works | controlled blasting and associated activities | <p>blasting etc will be examined and the suitable technology shall be finalised depending upon the site conditions. Following measures for ensuring safety shall be ensured during controlled blasting.</p> <p>(ii) Carryout controlled blasting in consultation with PIU so that blasting activities with the least potential to generate vibration are conducted during periods of the day which will result in least disturbance; especially near schools and other sensitive receptors.</p> <p>(iii) Permission has been obtained from The District Collector for controlled blasting for excavation. For the initial stretches proposed for about 64km permission is obtained from The District Collector of Trichy. Conditions stipulated in the permission issued by the District Collector shall be complied with during implementation.</p> <p>(iv) The contractor shall submit a blasting plan in advance to PIU; and implement in accordance to the plan.</p> <p>(v) Blasting shall be done through an licensed Explosive Contractor only</p> <p>(vi) For controlled blasting, explosives including blasting caps, shall be transported to the blasting site only through exclusive vehicle in safe manner in accordance with the requirements of the blasting license. After blasting is over, the balance explosives shall be returned to the licensed storage.</p> <p>(vii) Cost for implementation of mitigation measures and liability are the responsibility of contractor.</p> <p>(viii) Proper prior notice will be issued to the Residents before Commencing UGSS activity works Schedule</p> <p>(ix) Proper information will be Given to Police Officials</p> <p>(x) Workers (Flagman) shall be stationed on both end of roads to warn people before firing any blasts and not to permit the traffic.</p> <p>(xi) When blasting, ample warning shall be given to all persons within the vicinity prior to blasting. Warning signs shall be erected a minimum of 24 hours prior to the blast time. The warning signs will state the time and date of each blast.</p> <p>(xii) Contractor shall ensure necessary precautions / protection (like</p> | | mitigation measures responsibility of contractor. |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|---|--|--|----------------------------|--------------------------|
| | | <p>excavated earth, sand-filled bags, etc) to reduce Ground Vibrations, Reduce noise levels, , etc., Sites shall be provided with necessary shields all around.</p> <p>(xiii) Minimum Explosive will be used for Control Blasting for Residential areas</p> <p>(xiv) After a blast has been fired, the Blast Control Specialist shall make a careful inspection to determine that all charges have exploded before employees are allowed to return to the operation.</p> <p>(xv)The contractor shall be responsible for any and all damage to property or injury to persons resulting from blasting or accidental or premature explosions that may occur in connection with his use of explosives.</p> <p>(xvi) The contractor shall do the activities after obtaining the blasting permission from District Collector, Trichy.</p> <p>(xvii) For the diversion of traffic in the blasting area, the contractor shall prepare a traffic management plan and obtain permission from Trichy Corporation and traffic police.</p> <p>Ensure to conduct a pre-blasting survey through videography and photography of residential properties and other structures falling along the sewerage alignment to ascertain the prevailing conditions of the structures likely to be impacted by the controlled blasting and take adequate measures to minimize such impacts.</p> <p>11.</p> | | |
| Landscape and aesthetics – waste generation | Impacts due to excess excavated earth, excess construction materials, and solid waste such as removed concrete, wood, packaging materials, empty containers, spoils, | <p>(i) Prepare and implement a Construction Waste Management Plan (refer Appendix 4)</p> <p>(ii)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.,</p> <p>(iii) Avoid stockpiling any excess spoils at the site for long time. Excess excavated soils should be disposed of to approved designated areas immediately</p> <p>(iv)If disposal is required, the site shall be selected preferably from barren, infertile lands; sites should located away from residential areas, forests, water bodies and any other sensitive land uses</p> | Contractor | Contractor cost |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|---------------------------------------|---|---|----------------------------|--------------------------|
| | oils, lubricants, and other similar items. | <p>(v) 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 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</p> <p>(vi) Residual and hazardous wastes such as oils, fuels, and lubricants shall be disposed off in disposal sites managed by the TCC, who is a pioneer in handling SWM and hazardous waste in Tamil Nadu;</p> <p>(vii) Prohibit burning of construction and/or domestic waste;</p> <p>(viii) 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.</p> <p>(ix) 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</p> | | |
| Accessibility and traffic disruptions | Traffic problems and conflicts near project locations and haul road | <p>Sewer works</p> <p>(i) Prepare a sewer work implementation plan in each zone separately 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; prepare traffic management plans for each section (refer sample in Appendix 7)</p> <p>(ii) Plan the sewer work in coordination with the traffic police; provide temporary diversions, where necessary and effectively communicate with general public</p> <p>(iii) 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</p> <p>(iv) Undertake the work section wise: a 500 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</p> | Contractor | Contractor cost |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|-------|--------------------|--|----------------------------|--------------------------|
| | | <p>(v) 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 – immediately removed from site/ or brought to the as and when required</p> <p>(vi) 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</p> <p>(vii) 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</p> <p>(viii) Provide pedestrian access in all the locations; provide wooden/metal planks over the open trenches at each house to maintain the access.</p> <p>(ix) Inform the affected local population 1-week in advance about the work schedule</p> <p>(x) Plan and execute the work in such a way that the period of disturbance/ loss of access is minimum.</p> <p>(xi) Keep the site free from all unnecessary obstructions;</p> <p>(xii) Notify affected public by public 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</p> <p>(xiii) At work site, public information/caution boards shall be provided including contact for public complaints</p> <p>Controlled blasting</p> <p>(xviii) The contractor shall submit a blasting plan in advance to PIU; and implement in accordance to the plan.</p> <p>(xix) Proper prior notice will be issued to the Residents before</p> | | |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|---------------------|--|--|----------------------------|--------------------------|
| | | <p>Commencing UGSS activity works Schedule</p> <p>(xx) Proper information will be Given to Police Officials</p> <p>(xxi) Workers (Flagman) shall be stationed on both end of roads to warn people before firing any blasts and not to permit the traffic.</p> <p>(xxii) When blasting, ample warning shall be given to all persons within the vicinity prior to blasting. Warning signs shall be erected a minimum of 24 hours prior to the blast time. The warning signs will state the time and date of each blast.</p> <p>(xxiii) For the diversion of traffic in the blasting area, the contractor shall prepare a traffic management plan and obtain permission from Trichy Corporation and traffic police.</p> <p>12.</p> <p>Hauling (material, waste/debris and equipment) activities</p> <p>(i) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites</p> <p>(ii) Schedule transport and hauling activities during non-peak hours;</p> <p>(iii) Locate entry and exit points in areas where there is low potential for traffic congestion;</p> <p>(iv) Drive vehicles in a considerate manner</p> <p>(v) Notify affected public by public information notices, providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.</p> | | |
| Controlled blasting | Ground vibrations Noise (airblast) Flying debris Dust | <p>Carryout controlled blasting in consultation with PIU so that blasting activities are conducted during periods of the day which will result in least disturbance; especially near schools and other sensitive receptors.</p> <p>13.</p> <p>The contractor shall submit a blasting plan in advance to PIU for approval; and implement in accordance to the plan once approved.</p> <p>14.</p> <p>The controlled blasting at identified locations shall be permitted only</p> | Contractor and PIU | Contractor Costs |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|-------|--------------------|---|----------------------------|--------------------------|
| | | <p>after the requisite statutory permissions from regulatory authorities are obtained. The contractor shall comply with all terms and conditions stipulated in such permissions. The controlled blasting would be monitored by following the necessary requirements to prevent safety risk to both public and nearby structures as provisioned in the prevailing Indian regulations and standards. For the initial stretches proposed totalling to about 64 km permission has been obtained from The District Collector of Tiruchy.</p> <p>15.</p> <p>Blasting shall be carried out through a licensed Explosive Contractor only.</p> <p>16.</p> <p>For controlled blasting, explosives including blasting caps, shall be transported to the blasting site only through exclusive vehicle in safe manner in accordance with the requirements of the blasting license. After blasting is over, the balance explosives shall be returned to the licensed storage.</p> <p>17.</p> <p>Cost for implementation of mitigation measures and liability are the responsibility of contractor.</p> <p>18.</p> <p>Proper prior notice will be issued to the residents before commencing blasting activity works. Inform the residents likely to be affected by the works in the locality about the upcoming blasting works well in advance so that necessary arrangements are planned by the residents with reduced inconvenience.</p> <p>19.</p> <p>For sections where the controlled blasting is proposed, the residents shall be provided with the schedule of blasting at least three days in advance and the residents are explained about the preventive, precautionary, mitigation and emergency response</p> | | |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|-------|--------------------|---|----------------------------|--------------------------|
| | | <p>measures being taken to address their concerns. 20.</p> <p>Prior information will be given to Police Officials 21.</p> <p>Workers (Flagman) shall be stationed on both end of roads to warn people before firing any blasts and not to permit the traffic. The section proposed for blasting shall be supervised by properly trained staff to ensure no movement of pedestrians, motorized or nonmotorized vehicles, and residents takes place during blasting within the area of influence. For the diversion of traffic in the blasting area, the contractor shall prepare a traffic management plan and obtain permission from Trichy Corporation and traffic police. 22.</p> <p>When blasting, ample warning shall be given to all persons within the vicinity prior to blasting. Warning signs shall be erected a minimum of 24 hours prior to the blast time. The warning signs will state the time and date of each blast. 23.</p> <p>Sites shall be provided with necessary shields all around. 24.</p> <p>Minimum explosive will be used for Controlled Blasting specifically within residential areas. 25.</p> <p>After a blast has been fired, the Blast Control Specialist shall make a careful inspection to determine that all charges have exploded before employees are allowed to return to the operation, and subsequently the movement of residents /pedestrians and vehicles is permitted.</p> | | |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|-------|--------------------|--|----------------------------|--------------------------|
| | | <p>26.</p> <p>Ensure appropriate measures are taken to maintain maximum ambient noise levels within the limits as permitted by the prevailing Indian regulations and standards. The ambient noise levels would be monitored to ascertain the efficacy of acoustic measures thus implemented and compliance with associated regulatory permissions.</p> <p>27.</p> <p>Ensure that adequate precautions are taken to avoid flying debris post blasting (such as covering the trench with sturdy metallic sheets with sand filled bags to absorb the blast waves);</p> <p>28.</p> <p>For sections involving controlled blasting, ensure that dust curtains of adequate height are provided to the trenches to prevent emission of dust during drilling for charge holes and controlled blasting.</p> <p>29.</p> <p>Ensure that the excavated soil and debris along the section identified for blasting is sprinkled with adequate water prior to blasting to reduce dust emissions upon explosion of charge placed for breaking the hard rock.</p> <p>30.</p> <p>The project staff from the PIU, consultants and contractors would undertake a post-blasting survey of structures (including videography and/or photography) lying within the area of influence of blasting from the vibrations related impacts (preferably in the presence of the owners of the said structures) to assess and/or ascertain regarding the damages, if any, caused to the structures because of blasting activities.</p> <p>The contractor shall be responsible for any and all damages to property or injury to persons resulting from blasting or accidental or</p> | | |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|---|--------------------|--|----------------------------|--------------------------|
| | | <p>premature explosions that may occur in connection with use of explosives. The log of such events would be properly maintained. The contractor shall provide immediate support and relief measures commensurate with the damages.</p> <p>31.</p> <p>Training related to controlled blasting activity will be included in the overall safeguards training programme meant for PIUs and Contractors.</p> <p>32.</p> | | |
| Socio-Economic Loss of access to houses and business | Loss of income | <ul style="list-style-type: none"> (i) Inform all businesses and residents about the nature and duration of any work well in advance so that they can make necessary preparations; (ii) Do not block any access; 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 (iii) 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 (iv) Control dust generation (v) 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. (vi) 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; (vii) Consult businesses and institutions regarding operating hours and factoring this in work schedules; and (viii) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints. | Contractor | Contractor cost |
| Socio- | Generation of | (i) Employ local labor force as far as possible | Contractor | Contractor cost |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|--------------------------------|--|--|----------------------------|--------------------------|
| Economic – Employment | temporary employment and increase in local revenue | (ii) Comply with labor laws | | |
| Occupational Health and Safety | Occupational hazards which can arise during work | <p>(i) Follow all national, state and local labor laws (indicative list is in Appendix 2);</p> <p>(ii) Develop and implement site-specific occupational health and safety (OHS) Plan which shall include measures such as: (a) safe and documented construction procedures to be followed for all site activities; (b) ensuring all workers are provided with and use personal protective equipment; (c) OHS Training^a for all site personnel, (d) excluding public from the work sites; and (e) documentation of work-related accidents; Follow International Standards such as the World Bank Group's Environment, Health and Safety Guidelines.^b</p> <p>For controlled blasting activity, identify the risks involved for the labourers and public and include measures in the OHS plan. Provide necessary training and PPEs to the labourers to ensure safety during implementation.</p> <p>(iii) Ensure that qualified first-aid is provided at all times. Equipped first-aid stations shall be easily accessible throughout the sites;</p> <p>(iv) Secure all installations from unauthorized intrusion and accident risks</p> <p>(v) 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;</p> <p>(vi) 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;</p> <p>(vii) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;</p> <p>(viii) Ensure moving equipment is outfitted with audible back-up alarms;</p> | Contractor | Contractor cost |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|------------------------------|---|---|----------------------------|--------------------------|
| | | <ul style="list-style-type: none"> (ix) 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; and (x) Disallow worker exposure to noise level greater than 70 dBA for duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively. (xi) Provide supplies of potable drinking water; (xii) Provide clean eating areas where workers are not exposed to hazardous or noxious substances | | |
| Community Health and Safety. | Traffic accidents and vehicle collision with pedestrians during material and waste transportation | <ul style="list-style-type: none"> (i) Consult PIU before locating project offices, sheds, and construction plants; (ii) Select a camp site away from residential areas (at least 100 m buffer shall be maintained) or locate the camp site within the existing facilities of City Corporation (iii) Avoid tree cutting for setting up camp facilities (iv) Provide a proper fencing/compound wall for camp sites (v) 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 (vi) Separate the workers living areas and material storage areas clearly with a fencing and separate entry and exit (vii) 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 (viii) Camp shall be provided with proper drainage, there shall not be any water accumulation (ix) Provide drinking water, water for other uses, and sanitation facilities for employees | Contractor | Contractor cost |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|--------------------------|--|--|----------------------------|--------------------------|
| | | <ul style="list-style-type: none"> (x) Prohibit employees from cutting of trees for firewood; contractor should provide cooking fuel (cooking gas); fire wood not allowed (xi) Train employees in the storage and handling of materials which can potentially cause soil contamination (xii) 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 (xiii) Recover used oil and lubricants and reuse or remove from the site; (xiv) 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 (xv) Remove all wreckage, rubbish, or temporary structures which are no longer required; and (xvi) 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. | | |
| Work Camps and worksites | <p>Temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants</p> <p>33.</p> <p>Unsanitary and poor living conditions for workers</p> | <ul style="list-style-type: none"> (i) As far as possible located the camp site within the work sites (at STP or large pumping station sites); if any camp to be established outside these, then select a camp site away from residential areas (at least 100 m buffer shall be maintained) (ii) Avoid tree cutting for setting up camp facilities (iii) Ensure that a proper compound wall is provided, and erect a wind/dust screen around (iv) 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 (v) Separate the workers living areas and material storage areas clearly with a fencing and separate entry and exit (vi) Provide proper temporary accommodation with proper materials, adequate lighting and ventilation, appropriate facilities for winters and summers; ensure conditions of livability at work camps are maintained at the highest standards possible at all | Contractor | Contractor cost |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|----------------------------|---|--|----------------------------|--------------------------|
| | | <p>times;</p> <p>(vii) Consult PIU before locating project offices, sheds, and construction plants;</p> <p>(viii) Minimize removal of vegetation and disallow cutting of trees</p> <p>(ix) 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 allowed as accommodation for workers</p> <p>(x) Camp shall be provided with proper drainage, there shall not be any water accumulation</p> <p>(xi) Provide drinking water, water for other uses, and sanitation facilities for employees</p> <p>(xii) Prohibit employees from cutting of trees for firewood; contractor should be provide proper facilities including cooking fuel (oil or gas; fire wood not allowed)</p> <p>(xiii) Train employees in the storage and handling of materials which can potentially cause soil contamination</p> <p>(xiv) Recover used oil and lubricants and reuse or remove from the site</p> <p>(xv) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; provide a compost pit for biodegradable waste, and non-biodegradable / recyclable waste shall be collected and sold in local market</p> <p>(xvi) Remove all wreckage, rubbish, or temporary structures which are no longer required</p> <p>(xvii) 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.</p> | | |
| Post-construction clean-up | Damage due to debris, spoils, excess construction | <p>(i) Remove all spoils wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required; and</p> <p>(ii) All excavated roads shall be reinstated to original condition.</p> | Contractor | Contractor cost |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|-------|--------------------|---|----------------------------|--------------------------|
| | materials | (iii) All disrupted utilities restored (iv) All affected structures rehabilitated/compensated (v) 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. (vi) All hardened surfaces within the construction camp area shall be ripped, all imported materials removed, and the area shall be top soiled and regrassed using the guidelines set out in the revegetation specification that forms part of this document. (vii) The contractor must arrange the cancellation of all temporary services. (viii) Request PIU to report in writing that worksites and camps have been vacated and restored to pre-project conditions before acceptance of work. | | |

ASI = Archeological Survey of India, CMSC = Construction Management and Supervision Consultant, EMP = environmental management plan, PIU = program implementation unit, SWM = Solid Waste Management.

^a Some of the key areas that may be covered during training as they relate to the primary causes of accidents include (i) slips, trips and falls; (ii) personal protective equipment; (iii) ergonomics, repetitive motion, and manual handling; (iv) workplace transport; and (v) legislation and responsibilities. Training can provide the foundations of competence but it does not necessarily result in a competent worker. Therefore, it is essential to assess staff competence to ensure that the training provided is relevant and effective. Supervision and monitoring arrangements shall be in place to ensure that training has been effective and the worker is competent at their job. The level of supervision and monitoring required is a management decision that shall be based on the risks associated with the job, the level of competence required, the experience of the individual and whether the worker works as part of a team or is a lone worker.

^b <http://www.ifc.org/wps/wcm/connect/a99ab8804365b27aa60fb6d3e9bda932/EHS-Guidelines+101-Webinar.pdf?MOD=AJPERES>

Table 21: Operation Stage Environmental Impacts and Mitigation Measures

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|--|--------------------|--|----------------------------|--------------------------|
| Operation of sewage lifting and pumping stations | Odor nuisance | (i) Strictly follow standard operating procedures / operational manual for operation and maintenance of lifting and pump stations (ii) Ensure that operating staff is properly trained, and have clear understanding of odor issues vis a vis its relation with operational practices (iii) Ensure that pumping cycles are properly followed; and there is no buildup of sewage beyond design volume in the wells (iv) Conduct H ₂ S monitoring periodically | PIU and TCC | Operating costs |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|--|---|--|----------------------------|--------------------------|
| Operation and maintenance of sewerage system | Blocks, overflows, system malfunction, occupational health and safety | <p>(i) Establish regular maintenance program, including:</p> <ul style="list-style-type: none"> • 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 manhole; frequent line blockages; lines that generally flow at or near capacity; and suspected infiltration or exfiltration; and • 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 overflow is currently occurring or for urgent problems that may cause an imminent overflow (e.g. pump station failures, sewer line ruptures, or sewer line blockages); <p>(ii) 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;</p> <p>(iii) 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.</p> <p>(iv) 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</p> <p>(v) Develop an Emergency Response System for the sewerage system leaks, burst and overflows, etc.</p> <p>(vi) Provide necessary health and safety training to the staff in sewer cleaning and maintenance</p> <p>(vii) Provide all necessary personnel protection equipment</p> <p>(viii) Do not conduct manual cleaning of sewers; for personnel engaged sewer maintenance work, there is a risk due to oxygen deficiency and harmful</p> | PIU and TCC | Operating costs |

| Field | Anticipated Impact | Mitigation Measures | Responsible for Mitigation | Cost and Source of Funds |
|-------|--------------------|--|----------------------------|--------------------------|
| | | gaseous emissions (hydrogen sulfide, methane, etc.); provide for adequate equipment (including oxygen masks) for emergency use | | |

PIU= Program Implementation Unit, TCC = Tiruchirapalli City Corporation.

Table 22:Pre-construction & Construction Stage Environmental Monitoring Plan

| Monitoring field | Monitoring location | Monitoring parameters | Frequency | Responsibility | Cost and Source of Funds |
|---|---|--|---|--|--|
| Construction phase | 34. | 35. | 36. | 37. | 38. |
| Construction disturbances, nuisances, public and worker safety, | All work sites | Implementation of construction stage EMP including dust control, noise control, traffic management, and safety measures. Safety during controlled blasting Site inspection checklist to review implementation is appended at Appendix8 | Weekly during construction | Supervising staff and safeguards specialists of CMSC | Staff and consultant costs are part of incremental administration costs |
| Ambient air quality | 5 locations (locations 50 m downwind direction near sewer and pumping / lifting station work sites in the city); 39. | <ul style="list-style-type: none"> PM₁₀, PM_{2.5}, NO₂, SO₂, CO | Once before start of construction Quarterly (yearly 4-times) during construction (3 year period considered) 40. | Construction Contractor | Cost for implementation of monitoring measures responsibility of contractor (65 samples x 5000 per sample = 325,000) |
| Ambient noise | 5 locations (locations near sewer and pumping / lifting station work | <ul style="list-style-type: none"> Day time and night time noise levels | Once before start of construction Quarterly | Construction Contractor | Cost for implementation of monitoring measures responsibility of contractor |

| Monitoring field | Monitoring location | Monitoring parameters | Frequency | Responsibility | Cost and Source of Funds |
|-----------------------|--|---|--|-------------------------|---|
| | sites in the city); | | (yearly 4-times) during construction (3 year period considered) 41. | | (65 samples x 1500 per sample = 97,500) |
| Surface water quality | 3 locations (2 points in River Koraiyar and 1 point in Uyyakondan canal near pipe carrying bridge) | <ul style="list-style-type: none"> pH, Oil and grease, Cl, F, NO₃, TC, FC, Hardness, Turbidity BOD, COD, DO, E-coli, Total Alkalinity ,heavy metals and pesticides. | Once before start of construction Half yearly during construction (3 year construction period considered) 42. | Construction Contractor | Cost for implementation of monitoring measures responsibility of contractor (21 samples x 4000 per sample = 84,000) |

CMSC = Construction Management and Supervision Consultant.

Table 23: Operation Stage Environmental Monitoring Plan

| Monitoring field | Monitoring location | Monitoring parameters | Frequency | Responsibility | Cost and Source of Funds |
|-------------------------------------|--|-------------------------------------|---|----------------|--|
| Odor monitoring at pumping stations | 7 points (downwind direction) at all pumping stations: near suction well; outside the pumping station and at nearest house | Hydrogen sulfide (H ₂ S) | Periodical (throughout the operation phase) | TCC | Handheld H ₂ S meters to be procured as part of the project and operated by operating staff |
| Odor monitoring at lifting stations | 6 points (downwind direction) at all lifting stations: near suction well and at nearest house | Hydrogen sulfide (H ₂ S) | Periodical (throughout the operation phase) | TCC | Handheld H ₂ S meters to be procured as part of the project and operated by operating staff |

TCC = Tiruchirapalli City Corporation.

B. Implementation Arrangements

166. The Municipal Administration and Water Supply Department (MAWS) of GOTN acting through the Tamil Nadu Urban Infrastructure Financial Services Ltd. (TNUIFSL) is the state-level executing agency. A project management unit (PMU) will be established in TNUIFSL headed by a Project Director and Deputy Project Director (senior official from Commissionerate of Municipal Administration, CMA), and comprising dedicated full-time staff from TNUIFSL for overall project and financial management. A Project Steering Committee, headed by Principal Secretary, MA and WS, and members include managing directors of TNUIFSL, CMA, and Chennai Metro Water Supply and Sewerage Board (CMWSSB) will be established.

167. The implementing agency for this subproject is TCC. A Project Implementation Unit (PIU) will be established in TCC headed by full-time a Project Manager (a senior official of TCC) and comprising dedicated full-time staff from engineering and other departments of TCC. PIU under the TCC will be responsible for planning, implementation, monitoring and supervision, and coordination of all activities of subproject. A Construction, Management and Supervision Consultant (CMSC) will be appointed to assist PIU in day-to-day implementation of the subproject.

168. **Safeguards Compliance Responsibilities.** Environmental and social safeguards (ESS) managers in the PMU, TNUIFSL will have overall responsibility of safeguard compliance with ADB SPS, 2009. ESS Managers report to Head, project division. At PIU level, a safeguards officer will be appointed, who will coordinate monitoring and implementation of safeguards on behalf of TCC. Experts available at CMSC will monitor implementation of safeguards.

169. **PMU Safeguard Responsibilities.** Key tasks and responsibilities of the ESS Manager (Environment), for this subproject include the following:

1. DPR finalization and Bidding stage:

- (i) Ensure that all design related measures of the EMP are included designs;
- (ii) Ensure that EMP is included in bidding documents and civil works contracts including requirement for EHS supervisor with the contractor;
- (iii) Ensure that the bid/contract documents include specific provisions requiring contractors to comply with all applicable labor laws and core labor standards;
- (iv) Ensure that staff required for implementation of EMP (EHS officer) is included in the bid requirements;
- (v) Ensure that EMP cost is included in the project cost; and
- (vi) Prior to invitation of bids and prior to award of contract ensure that all clearance/permissions as required for implementation of subproject are in place to the extent possible.

2. Construction stage:

- (i) Prior to start of construction:
 - Ensure that all necessary clearances/permissions/licences, including that of contractor's are in place prior to start of construction;
 - provide oversight on environmental management aspects of subprojects and ensure EMPs are implemented by PIUs and contractors;
- (ii) Oversee and provide guidance to the PIU to properly carry out the environmental monitoring as per the EMP;
- (iii) Oversee grievance redress mechanism to address any grievances brought about in a timely manner; ensure that records are properly maintained;
- (iv) Consolidate quarterly environmental monitoring reports from PIU and submit semi-annual monitoring reports to ADB; and

- (v) Oversee site closures to ensure that all work / facility sites are restored properly prior to issuing work completion certificate to the contractor.

3. Operation stage: Ensure that all clearances as required for operation of project are in place prior to operation, such as consent to operate (CTO) from TNPCB for STPs which will treat the sewage contributed from this subproject

170. **PIU Safeguard Responsibilities.** Key tasks and responsibilities of the PIU assisted by CMSC for this subproject include the following:

1. DPR finalization and Bidding stage:

- (i) Include design related measures of the EMP in the project design and DPR;
- (ii) Include EMP in the bidding documents and civil works contracts, including requirement of staff (EHS supervisor) with contractor for EMP implementation;
- (iii) Provide necessary budget in the project as IEE for EMP Implementation;
- (iv) Ensure that the bid/contract documents include specific provisions requiring contractors to comply with all applicable labor laws and core labor standards including:
 - (a) Labor welfare measures and provision of amenities
 - (b) prohibition of child labor as defined in national legislation for construction and maintenance activities;
 - (c) equal pay for equal work of equal value regardless of gender, ethnicity, or caste;
 - (d) elimination of forced labor;
 - (e) the requirement to disseminate information on sexually transmitted diseases, including HIV/AIDS, to employees and local communities surrounding the project sites;
- (v) In the pre-bid meeting, provide insight into EMP measures, and overall compliance requirements to the bidders; and
- (vi) Obtain all clearance/permissions as required for implementation of subproject, prior to invitation of bids and/or prior to award of contract as appropriate.

2. Construction stage:

- (i) Identify regulatory clearance requirements and obtain all necessary clearances prior to start of construction; ensure construction work by contractor is conducted in compliance with all government rules and regulations including pollution control, labor welfare and safety etc.;
- (ii) Obtain CTE from TNPCB and NMA permission for works within 300 m regulated boundary of ASI monument as applicable prior to construction;
- (iii) Prior to start of construction organize an induction course for the training of contractors, preparing them on EMP implementation, environmental monitoring, and on taking immediate action to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation;
- (iv) Ensure contractor compliance with staff resources as per the IEE/EMP/Bid Document;
- (v) Guide contractor on updating EMP / preparing Site Specific Environmental Plan at the start of the project;
- (vi) Update IEE and EMP; ensure that IEE reflects the final design being implemented by contractor;
- (vii) Conduct public consultation and information disclosure as necessary;

- (viii) Take necessary action for obtaining rights of way;
- (ix) Supervise day-to-day EMP implementation on site by contractor, including the environmental monitoring plan;
- (x) Supervise ambient environmental monitoring by contractors;
- (xi) Take corrective actions when necessary to ensure no environmental impacts;
- (xii) Conduct continuous public consultation and awareness;
- (xiii) Address any grievances brought about through the grievance redress mechanism in a timely manner as per the EMP;
- (xiv) Monitor Contractor's compliance with the measures set forth in the EMP and any corrective or preventative actions set forth in a safeguards monitoring report that the PMU will prepare from time to time;
- (xv) Implement corrective or preventative actions in case of non-compliance or new/unanticipated impacts;
- (xvi) Inform PMU promptly in case if any significant impacts surfaces, which were not identified in the IEE and develop necessary corrective actions as necessary and ensure implementation by the contractors; include all such impacts and suggested actions in the Quarterly Environmental Monitoring Reports;
- (xvii) Implementation grievance redress system, and undertake appropriate actions to redress the complaints; ensure that complaints/grievances are addressed in a timely manner and resolutions are properly documented;
- (xviii) Review and approve monthly progress reports submitted by Contractor on EMP compliance;
- (xix) Prepare quarterly environmental monitoring reports and submit to PMU / TNUIFSL; and
- (xx) Provide any assistance in environmental safeguard related tasks as required by PMU to ensure compliance and reporting to ADB.

2. Operation stage:

- (i) Ensure that all clearances as required for operation of project are in place prior to operation, such as consent to operate (CTO) from TNPCB for STPs which will treat the sewage contributed from this subproject; and
- (ii) Conduct environmental management and monitoring activities as per the EMP.

171. Contractor's Responsibilities:

1. Bidding stage:

- (i) Understand the EMP requirements and allocate necessary resources (budget, staff, etc.);
- (ii) Understand the regulatory compliance requirements related to labor welfare, safety, environment, etc.

2. Construction stage:

- (i) Mobilize EHS Supervisor prior to start of work;
- (ii) Prepare SEMP and submit to PIU;
- (iii) Ensure that all regulatory clearances (both project related and contractor related) are in place prior start of the construction work;
- (iv) Confirm with PIU availability of rights of way at all project sites prior to start of work;
- (v) Prepare and submit:

- (a) Construction waste management (CWM) plan (sample is in Appendix 4);
- (b) Traffic management plan (TMP) (sample is Appendix 7);
- (vi) Implement the mitigation measures as per the EMP including CWM and TMPs;
- (vii) Follow the EMP measures/guidelines for establishment of temporary construction camps, construction waste disposal sites, and material borrow areas, etc.;
- (viii) Implement EMP and ensure compliance with all the mitigation and enhancement measures;
- (ix) Conduct environmental monitoring (air, noise, water etc.,) as per the EMP
- (x) Undertake immediate action as suggested by PIU to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation;
- (xi) Submit monthly progress reports on EMP implementation to PIU;
- (xii) Act promptly on public complaints and grievances related to construction work and redress in a timely manner in coordination with PIU and CMSC; and
- (xiii) Comply with applicable government rules and regulations.

C. Training Needs

172. Table 24 presents the outline of capacity building program to ensure EMP implementation. These capacity building and trainings will be conducted at the offices of PMU and PIU by the environmental safeguards specialist of PMU/PIU and their consultants, which are part of project implementation set-up, and therefore no separate or additional costs are envisaged. Adequate costs are already considered in project's capacity building program. The detailed program and specific modules will be customized for the available skill set after assessing the capabilities of the target participants and the requirements of the project by the PMU.

Table 24: Outline Capacity Building Program on environmental management plan Implementation

| Description | Target Participants and Venue | Cost and Source of Funds |
|--|--|--|
| 1. Introduction and Sensitization to Environmental Issues (1 day) <ul style="list-style-type: none"> - ADB Safeguards Policy Statement - Government of India and Tamil Nadu applicable safeguard laws, regulations and policies including but not limited to core labor standards, OHS, etc. - Incorporation of EMP into the project design and contracts - Monitoring, reporting and corrective action planning | All staff and consultants involved in the project At PMU (combined program for all PIU) | Included in the overall program cost |
| 2. EMP implementation (1/2 day) <ul style="list-style-type: none"> - EMP mitigation and monitoring measures - Roles and responsibilities - Public relations, - Consultations - Grievance redress - Monitoring and corrective action planning - Reporting and disclosure - Construction site standard operating | All PIU staff, contractor staff and consultants involved in the subproject At PIU | To be conducted by CMSC at the PIU office; part of project implementation cost |

| Description | Target Participants and Venue | Cost and Source of Funds |
|--|---|--|
| procedures (SOP) -- Chance find (archeological) protocol - Work near ASI monuments - AC pipe protocol - Traffic management plan - Waste management plan - Site clean-up and restoration Controlled blasting | | |
| 3. Contractors Orientation to Workers (1/2 day) - Environment, health and safety in project construction Health & safety measures during coronavirus disease (COVID-19) pandemic | Once before start of work, and thereafter regular briefing every month once. Daily briefing on safety prior to start of work All workers (including unskilled laborers) Awareness & on-site training for workers and staff on sludge handling and disposal in existing STP repair work | Contractors' EHS officer to conduct program, with guidance of CMSC |

ADB = Asian Development Bank, CMSC = Construction Management and Supervision Consultant, EHS = environmental Health and Safety, EMP = environmental management plan, OHS = occupational health and safety, PMU = program management unit, PIU = program implementation unit, SOP = standard operating procedures.

D. Monitoring and Reporting

173. Immediately after mobilization and prior to commencement of the works, the contractor will submit a compliance report to PIU that all identified pre-construction mitigation measures as detailed in the EMP are undertaken. Baseline Environmental monitoring as indicated in the construction stage environmental monitoring plan should be conducted and the analysis outcome should be shared in the compliance report. Contractor should confirm that the staff for EMP implementation (EHS supervisor) is mobilized. PIU will review, and approve the report and permit commencement of works.

174. During construction, results from internal monitoring by the contractor will be reflected in their monthly EMP implementation reports to the PIU. CMSC will monitor, review and advise contractors for corrective actions if necessary. Quarterly Environmental Monitoring Report summarizing compliance and corrective measures, if any, taken will be prepared by CMSC team at PIU and submitted to PMU (Report format is at Appendix 9). During operation, PIU will conduct management and monitoring actions as per the operation stage EMP, and submit to PMU an annual report.

175. Based on PIU Quarterly Environmental Monitoring Reports and oversight visits to subproject work sites, PMU will submit semi-annual Environmental Monitoring Report (EMR). Once concurrence from the ADB is received the report will be disclosed on TNUIFSL, PMU and TCC websites.

176. ADB will review project performance against the TNUFIP commitments as agreed in the legal documents (loan and project agreements etc.). The extent of ADB's monitoring and supervision activities will be commensurate with the project's risks and impacts. Monitoring and supervising of social and environmental safeguards will be integrated into the project performance management system

E. Environmental Management Plan Implementation Cost

177. Most of the mitigation measures require the contractors to adopt good site practices, which should be part of their normal procedures already, so there are unlikely to be major costs associated with compliance. The costs which are specific to EMP implementation and are not covered elsewhere in the projects are given below.

Table 25: Cost Estimates to Implement the Environmental Management Plan

| | Particulars | Stages | Unit | Total Number | Rate (₹) | Cost (₹) | Costs Covered By |
|-----------|---|------------------|------------|--------------|----------|-------------------|--|
| A. | Mitigation Measures | | | | | | |
| 1 | Providing odor control system sewage pumping & lifting stations (gas capturing & treatment at required stations) and handheld H ₂ S meters for monitoring | Design | per Number | - | - | 4,000,000 | Civil work contract |
| 2 | Provision for tree cutting and compensatory plantation measures (1:10 ratio replantation) | Construction | Per tree | 90 | 1,000 | 90,000 | Project costs (PIU) |
| 3 | Preparation of plans traffic management plan, waste (spoils) management plan etc.), traffic management at work sites (Pavement Markings, Channelizing Devices, Arrow Panels and Warning Lights) | Construction | Lump sum | - | - | 300,000 | Civil works contract |
| 4 | Safety barricading | Construction | Lump sum | Lump sum | - | 20,000,000 | Civil works contract |
| | Subtotal (A) | | | | | 243,90,000 | F. |
| B. | Monitoring Measures | | | | | | |
| 1 | Air quality monitoring | Construction | per sample | 60 | 5,000 | 300,000 | Civil works contract |
| 2 | Noise levels monitoring | Construction | Per sample | 60 | 1,500 | 90,000 | Civil work contract |
| 3 | Surface water monitoring | Construction | Per sample | 25 | 4,000 | 100,000 | Civil work contract |
| | Subtotal (B) | | | | | 4,90,000 | G. |
| C. | Capacity Building | | | | | | |
| 1. | Training on EMP implementation | Pre-construction | | | | - | Part of PIU and PMU , consultant tasks |
| 2. | Contractors Orientation to | Prior | | | | - | Civil works |

| | Particulars | Stage s | Unit | Total Number | Rate (₹) | Cost (₹) | Costs Covered By |
|--|-------------------------------|---------------------------------------|-------------|-------------------------|---------------------|---------------------|---------------------------------|
| | Workers on EMP implementation | to dispat ch to worksit e | | | | | contractor cost |
| | Subtotal (C) | | | | | | |
| | Total (A+B+C) | | | | ₹ | 2,48,80,000 | |
| | Contractor Cost | | | | ₹ | 24,390,000 | |
| | PIU Cost | | | | ₹ | 4,090,000 | |
| | Total | | | | ₹ | 2,84,80,000 | |

EMP = environmental management plan, PMU = program management unit, PIU = program implementation unit.

XL. CONCLUSION AND RECOMMENDATIONS

178. The process described in this document has assessed the environmental impacts of all elements of the proposed underground sewerage subproject covering municipal area (Ponmalai, K. Abishekapuram Zones and part of Ariyamangalam) of Tiruchirappalli. All potential impacts were identified in relation to pre-construction, construction, and operation phases. Planning principles and design considerations have been reviewed and incorporated into the site planning and design process wherever possible; thus, environmental impacts as being due to the project design or location were not significant. 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. This means that the number of impacts and their significance has already been reduced by amending the design. Various design related measures suggested for odor control at pumping stations, uninterrupted power supply provision; standard operating procedures for operation and maintenance; and imparting necessary training for TCC staff; providing necessary safety, no manual cleaning of sewers, and personal protection equipment for workers (protection against oxygen deficiency, harmful gaseous emissions)

179. Sewage and pumping stations sites, which collect sewage from the sewer network and pump to higher level to convey to sewage to STP for safe treatment and disposal, are located within or near residential areas, which it will serve. These facilities may generate odor and may cause nuisance to nearby households. Site selection is done with utmost care to located as far as away from the houses, however, given design considerations and land constraints, some of the sites identified are close to the household. New sewage pumping stations (6 nos.) are located within or close to residential areas. The distance between SPS units and residents / receptors are mentioned in Table.13. Various site planning, green buffer and design related measures are included in the project to prevent and control odor generation. These include appropriately locating sewage wells within site maintaining maximum distance from the nearby houses; developing tree cover; closed facilities; design and operation measures to prevent odor; and, providing gas collection and treatment facilities. Erumbeeswarar temple, a protected monument, is located within the subproject areas surrounded by residential areas. Proposed provision of sewer network in this area also falls under the 300 m regulated buffer zone of monument. No impacts are envisaged as the works are not located within the monument, and also that works within 300 m area of the monument will be conducted with the prior permission of competent authority.

180. proposed lifting and pumping station sites are situated on government owned vacant land parcels, and sewers will be laid on the public roads. Therefore subproject do not involve any private land acquisition.

181. Except sewer works, all other construction activities will be confined to the selected sites, and the interference with the general public and community around is minimal. There will be temporary negative impacts, arising mainly from construction dust and noise, hauling of construction material, waste and equipment on local roads (traffic, dust, safety etc.), mining of construction material, occupation health and safety aspects. Sewer line works will be conducted along public roads in an urban area congested with people, activities and traffic, subproject is likely to significant impacts during construction. Impacts mainly arise from the construction dust and noise; from the disturbance of residents, businesses, traffic by the construction work, safety risk to workers, public and nearby buildings due to deep trench excavations, especially in narrow roads, dust, access impediment to houses and business, disposal of large quantities of construction waste, etc. Some sections of the proposed alignment may have to opt for controlled blasting as the construction methodology for excavation owing to presence of hard rock. These are all general impacts of construction in urban areas and there are well developed methods of mitigation that are suggested in the EMP.

182. Once the new system is operating, the facilities will operate with routine maintenance, which should not affect the environment. Improved system operation will comply with the Operation and Maintenance manual and standard operating procedures to be developed for all the activities.

183. Mitigation will be assured by a program of environmental monitoring conducted during construction and operation to ensure that all measures are implemented, and to determine whether the environment is protected as intended. This will include observations on- and off-site, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported to the PMU.

184. Stakeholders were involved in developing the IEE through face-to-face discussions, on site meetings, and a city level consultation workshop, which was conducted for larger public participation in the project. Views expressed by the stakeholders were incorporated into the IEE and the planning and development of the project. The IEE will be made available at public locations and will be disclosed to a wider audience via the PMU, TCC and ADB websites. The consultation process will be continued during project implementation to ensure that stakeholders are engaged in the project and have the opportunity to participate in its development and implementation.

185. The project's grievance redress mechanism will provide the citizens with a platform for redress their grievances, and describes the informal and formal channels, time frame, and mechanisms for resolving complaints about environmental performance.

186. The EMP will assist the project agencies and contractor in mitigating the environmental impacts, and guide them in the environmentally sound execution of the proposed project. A copy of the updated EMP/ SEMP shall be kept on-site during the construction period at all times. The EMP shall be made binding on all contractors operating on the site, and will be included in the contractual clauses to ensure compliance to the conditions set out in this document.

187. The citizens of the Tiruchirappalli City will be the major beneficiaries of this subproject. The new sewerage system will remove the human waste from those areas served by the network rapidly and treated to an acceptable standard, and treated wastewater is utilized beneficial purposes. In addition to improved environmental conditions, the subproject will improve the over-all public health in the project area. Diseases of poor sanitation, such as diarrhea and dysentery, should be reduced, so people should spend less on healthcare and lose fewer working days due to illness, so their economic status should also improve, as well as their overall health.

188. Therefore, as per ADB SPS, this subproject is classified as environmental category B and does not require further environmental impact assessment. For the project components located within the regulated zone of protected monument, prior permission of ASI shall be obtained prior to construction. Further, TCC has to carry out the Corrective Action plan as suggested in the IEE based on the environmental audit of the existing STP, which is an associated facility for the subproject. This IEE is prepared based on the Detailed Project Report, and shall be updated by PIU during implementation phase to reflect final project design and will be reviewed and approved by PMU. The updated IEE will be submitted to ADB for concurrence and disclosure.

APPENDIX - 1

Sewerage

RAPID ENVIRONMENTAL ASSESSMENT CHECKLIST

Instructions:

- ❑ This checklist is to be prepared to support the environmental classification of a project. It is to be attached to the environmental categorization form that is to be prepared and submitted to the Chief Compliance Officer of the Sustainable Development and Climate Change Department.
- ❑ This checklist is to be completed with the assistance of an Environment Specialist in a Regional Department.
- ❑ This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on (i) involuntary resettlement, (ii) indigenous peoples planning, (iii) poverty reduction, (iv) participation, and (v) gender and development.
- ❑ Answer the questions assuming the “without mitigation” case. The purpose is to identify potential impacts. Use the “remarks” section to discuss any anticipated mitigation measures.

Country/Project Title: India / Tamil Nadu Urban Flagship Investment Program – Supplying, laying, testing and commissioning of sewer network in the extended area and erstwhile area of Tiruchirappalli including lifting station, pumping station and pumping main

Sector Division: Urban Development

| Screening Questions | Yes | No | Remarks |
|--|-----|----------------|--|
| A. Project Siting Is the project area... | 43. | 44. | 45. |
| ➤ Densely populated? | ✓ | XL I. | Subproject activities are located in Tiruchirappalli City, a rapidly developing urban area in the state of Tamil Nadu. Subproject area includes old town area of Tiruchirappalli, which is very densely populated. |
| ➤ Heavy with development activities? | ✓ | XL II. | It is a developing area; urban expansion is considerable. |
| ➤ Adjacent to or within any environmentally sensitive areas? | 46. | ✓ | - |
| ➤ Cultural heritage site | ✓ | XL III. | The proposed sewer alignment (Collection network 3.3km, pumping main 549m and a pumping station (SPS 5) at Indira nagar) will pass through regulated areas of the protected monument (Erumbeshwarar Temple) of the Archaeological Society of India (ASI). Potential impacts from civil works will be avoided by (i) consulting with and obtaining permission from ASI, and (ii) appointing an archaeological expert to assess the impacts and supervise construction. During operation phase, environmental impacts are not envisaged. |
| ➤ Protected Area | 47. | ✓ | In Tamil Nadu State, there are 5 national parks, 15 wildlife sanctuaries (including four tiger reserves), 15 bird sanctuaries, and two conservation reserves. The ADB Mission team confirmed during pre- and |

| Screening Questions | Yes | No | Remarks |
|---|------------|--------------|--|
| | | | fact-finding missions that Tranche 2 locations are not in these protected areas. |
| ➤ Wetland | 48. | ✓ | XLIV. |
| ➤ Mangrove | 49. | ✓ | XLV. |
| ➤ Estuarine | 50. | ✓ | XLVI. |
| ➤ Buffer zone of protected area | 51. | ✓ | There are 3 biosphere reserves in Tamil Nadu. Biosphere reserves have vast areas and may cover urban and developing areas. The ADB Mission team confirmed during pre- and fact-finding missions that Tranche 2 locations are components are/will be in the biosphere core zones. |
| ➤ Special area for protecting biodiversity | 52. | ✓ | XLVII. |
| ➤ Bay | 53. | ✓ | XLVIII. |
| B. Potential Environmental Impacts Will the Project cause... | 54. | 55. | 56. |
| ▪ impairment of historical/cultural monuments/areas and loss/damage to these sites? | ✓ | XLIX. | L. The proposed sewer network (including collection network 3.3km, pumping main 549m and a pumping station (SPS 5) at Indira nagar) falls within the regulatory zone of the ASI monument (Erumbeshwarar Temple). Works will be implemented following the conditions stipulated by ASI while issuing the NOC to carryout works. Hence the proposed sewer network shall not have any damage to the ASI site. |
| ▪ interference with other utilities and blocking of access to buildings; nuisance to neighboring areas due to noise, smell, and influx of insects, rodents, etc.? | ✓ | LI. | Anticipated during operations but can be avoided and mitigated. STP, sewage lifting, and pump stations are in urban areas and odor may create nuisance to communities. Appropriate odor standards will be applied, and necessary odor control measures are included in the designs and EMPs. |
| ▪ dislocation or involuntary resettlement of people? | ✓ | LII. | Anticipated but can be managed. Any involuntary resettlement impact is addressed in the resettlement plan prepared per ADB SPS. |
| ▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups? | | ✓ | Not anticipated. The contractor will be encouraged to hire workers from the local labor force. |
| ▪ impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage? | | ✓ | Not anticipated. Sewage will be treated in the proposed STPs. The designs and operation of the STPs will consider on assimilative capacity of receiving body of water and effluents will comply with discharge standards. |

| Screening Questions | Yes | No | Remarks |
|--|-----|--------------|---|
| <ul style="list-style-type: none"> overflows and flooding of neighboring properties with raw sewage? | | ✓ | Not anticipated. Risks, climate change factors, and 30 years population projects have been considered in identifying the capacity and design of the sewerage systems. The design engineers confirmed no risk of overflow. |
| <ul style="list-style-type: none"> environmental pollution due to inadequate sludge disposal or industrial waste discharges illegally disposed in sewers? | | ✓ | Not anticipated. STP designs will include sludge collection, treatment and disposal process. The sewerage collection systems will only allow flow domestic sewage by direct connections to households. The designs ensure no industrial effluent will be allowed into the sewer network. |
| <ul style="list-style-type: none"> noise and vibration due to blasting and other civil works? | ✓ | LIII. | Anticipated but temporary, site-specific and can be mitigated. All the construction activities including controlled blasting in identified sections will be carried out with necessary precautionary measures to mitigate noise and DustNuisance/disturbance due to elevated noise may be experienced by sensitive receptors during construction. Noise will be minimized with mitigation measures specified in the EMPs. During operations, noise may be experienced by sensitive receptors due to STP operations. This will be avoided by including noise barriers and enclosure of noise-producing components to meet IFC EHS' WHO guideline values and/or national standards, whichever is more stringent. |
| <ul style="list-style-type: none"> risks and vulnerabilities related to occupational health and safety due to physical, chemical, and biological hazards during project construction and operation? | ✓ | LIV. | Anticipated but temporary, site-specific and can be mitigated. EMPs and contract provisions include requirement for contractors' Health and Safety (H&S) plan. The contractors' H&S plans will be reviewed and cleared by PIUs prior to commencement of works. |
| <ul style="list-style-type: none"> discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers? | | ✓ | Not anticipated. The sewerage collection systems are designed to only allow flow of domestic sewage by direct connections to households. The designs ensure no industrial effluent will be allowed into the sewer network. |
| <ul style="list-style-type: none"> inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances, and protect facilities? | | ✓ | Note anticipated. STP, pump and lifting stations will include buffer zones as required and condition in the Consent to Establish by the Tamil Nadu State Pollution Control Board. |
| <ul style="list-style-type: none"> road blocking and temporary flooding due to land excavation during the rainy season? | ✓ | LV. | Anticipated during construction but temporary, site-specific and can be mitigated. Complete road blocks are not envisaged. In narrow roads, traffic may be diverted but access will be ensured for pedestrians. Works will be conducted during dry season. Contractors are required to submit traffic management plan as part of site-specific EMP. |
| <ul style="list-style-type: none"> noise and dust from construction activities? | ✓ | LVI. | Anticipated during construction but temporary, site-specific and can be mitigated. As the sewers will be laid on the road surface, cutting open of road |

| Screening Questions | Yes | No | Remarks |
|--|-----|--------|---|
| | | | surface using pneumatic drills will produce noise and dust. Temporary nuisance/disturbance due to noise and dust may be experienced by sensitive receptors. These impacts will be minimized with mitigation measures specified in the EMPs and The impact will be avoided by including noise barriers and enclosure of noise-producing components. |
| <ul style="list-style-type: none"> traffic disturbances due to construction material transport and wastes? | ✓ | LVII. | Anticipated during construction but temporary, site-specific and can be mitigated. EMPs and contract provisions include requirement for contractors' Traffic Management Plan which will be reviewed and cleared by PIUs prior to commencement of works. |
| <ul style="list-style-type: none"> temporary silt runoff due to construction? | ✓ | LVIII. | Anticipated during construction but temporary, site-specific and can be mitigated. EMPs and contract provisions include requirement for contractors to provide silt control measures. |
| <ul style="list-style-type: none"> hazards to public health due to overflow flooding, and groundwater pollution due to failure of sewerage system? | | ✓ | Not anticipated. O&M Manuals will be developed as part of the contracts. Necessary equipment and training to workers will be provided under TNUIFP. The ULBs will be trained on standard operating procedures and maintenance to ensure facilities are functioning according to the designs. |
| <ul style="list-style-type: none"> deterioration of water quality due to inadequate sludge disposal or direct discharge of untreated sewage water? | | ✓ | Not anticipated. The STP designs include sludge handling and treatment facilities. Necessary equipment and training to ULBs/workers on sludge handling and effluent monitoring will be provided under TNUIFP. |
| <ul style="list-style-type: none"> contamination of surface and ground waters due to sludge disposal on land? | | ✓ | Not anticipated. The STP designs include sludge handling and treatment facilities. O&M Manual will include testing procedures, parameters and restriction on re-use of treated sludge. Only if it meets the Government of India standards for soil conditioner and fertilizer then will be allowed for re-use and strictly for non-food crops only. |
| <ul style="list-style-type: none"> Health and safety hazards to workers from toxic gases and hazardous materials which may be contained in confined areas, sewage flow and exposure to pathogens in untreated sewage and unstabilized sludge? | ✓ | LIX. | Anticipated during operation but temporary, site-specific and can be mitigated. Workers may be exposed during cleaning of blockages in sewerage network. However, O&M Manuals will include standard operating procedures. All necessary health and safety training and personal protection equipment will be given to workers and staff during operation of sewerage system. Implementation of contractors' H&S will be strictly enforced by the PIUs. |
| <ul style="list-style-type: none"> Large population increase during project construction and operation that causes increased burden on social infrastructure (such as sanitation system)? | | ✓ | Not anticipated. |

| Screening Questions | Yes | No | Remarks |
|---|-----|------------|--|
| <ul style="list-style-type: none"> ▪ Social conflicts between construction workers from other areas and community workers? | | ✓ | Not anticipated. The contractor will be encouraged to hire workers from the local labor force. |
| <ul style="list-style-type: none"> ▪ Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation? | ✓ | LX. | Anticipated but can be mitigated. Construction will not involve use of explosives and chemicals. During operations, chemicals such as pH adjusters, flocculants, or coagulants may be used. The complete list of chemicals, quantities, and requirements for safe use and storage will be included in the Updated/Final IEE for the STPs (these are design-build-operate packages). The EMPs in the current IEEs already include measures and monitoring requirements conforming with IFC EHS Guidelines. O&M Manuals will include health and safety requirements for managing chemicals. |
| <ul style="list-style-type: none"> ▪ Community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning? | | ✓ | Not anticipated. Work area will be clearly demarcated. STPs will have compound walls and security personnel. Pump houses and lifting stations will be secured and locked. Only workers and project-concerned members will be allowed to enter the sites. PIUs, in coordination with water and sanitation committees, will disseminate information on community health and safety. |

CHECKLIST FOR PRELIMINARY CLIMATE RISK SCREENING

| Screening Questions | Score | Remarks ^a |
|---|-------|---|
| Location and Design of project Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather-related events such as floods, droughts, storms, landslides? | 1 | Some project locations may experience flooding during heavy rains. No components will be sited in river flood plains, drainage channels, etc. Locations may however be in low-lying areas. Adequate measures will be included in the designs to safeguard facilities from extreme events. |
| Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc.)? | 1 | Intakes and other structures (e.g., pumping stations, STPs) located in or close to rivers/water bodies, low lying flat lands, etc., to be designed with proper hydro-meteorological parameters |
| Materials and Maintenance Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot | 0 | No significant effect |

| | | | |
|---------------------------------------|---|---|-----------------------|
| | summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)? | | |
| | Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s)? | 0 | No significant effect |
| Performance of project outputs | Would weather/climate conditions and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time? | 0 | No significant effect |

If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

Options for answers and corresponding score are provided below:

| Response | Score |
|-----------------|--------------|
| Not Likely | 0 |
| Likely | 1 |
| Very Likely | 2 |

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response will be categorized as high risk project.

Result of Initial Screening (Low, Medium, High): Medium Risk

APPENDIX - 2
SALIENT FEATURES OF MAJOR LABOR LAWS APPLICABLE TO ESTABLISHMENTS
ENGAGED IN CONSTRUCTION OF CIVIL WORKS

- (i) Workmen Compensation Act, 1923 - The Act provides for compensation in case of injury by accident arising out of and during the course of employment.
- (ii) Payment of Gratuity Act, 1972 - Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years' service or more or on death at the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.
- (iii) Employees' PF and Miscellaneous Provisions Act, 1952 - The Act provides for monthly contributions by the employer plus workers at 10 % or 8.33 %. The benefits payable under the Act are: (a) Pension or family pension on retirement or death as the case may be; (b) deposit linked insurance on the death in harness of the worker; (c) payment of PF accumulation on retirement/death etc.
- (iv) Maternity Benefit (Amendment) Act 2017- The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.
- (v) Contract Labor (Regulation and Abolition) Act, 1970 - The Act provides for certain welfare measures to be provided by the Contractor to contract labor and in case the Contractor fails to provide, the same are required to be provided by the Principal Employer by Law. The principal employer is required to take Certificate of Registration and the Contractor is required to take a License from the designated Officer. The Act is applicable to the establishments or Contractor of principal employer if they employ 20 or more contract labor.
- (vi) Minimum Wages Act, 1948 - The employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment. Construction of Buildings, Roads, Runways are scheduled employment.
- (vii) Payment of Wages Act, 1936 - It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.
- (viii) Equal Remuneration Act, 1979 - The Act provides for payment of equal wages for work of equal nature to Male and Female workers and not for making discrimination against Female employees in the matters of transfers, training and promotions etc.
- (ix) Payment of Bonus Act, 1965 - The Act is applicable to all establishments employing 20 or more workmen. The Act provides for payments of annual bonus subject to a minimum of 8.33 % of wages and maximum of 20 % of wages to employees drawing Rs. 3,500/- per month or less. The bonus to be paid to employees getting Rs. 2,500/- per month or above up to Rs.3,500/- per month shall be worked out by taking wages as Rs.2,500/- per month only. The Act does not apply to certain establishments. The newly set up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of the Act.
- (x) Industrial Disputes Act, 1947 - The Act lays down the machinery and procedure for resolution of industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.

(xi) Industrial Employment (Standing Orders) Act, 1946 - It is applicable to all establishments employing 100 or more workmen (employment size reduced by some of the States and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the employer on matters provided in the Act and get the same certified by the designated Authority.

(xii) Trade Unions Act, 1926 - The Act lays down the procedure for registration of trade unions of workmen and employees. The trade unions registered under the Act have been given certain immunities from civil and criminal liabilities.

(xiii) Child Labor (Prohibition and Regulation) Act, 1986 - The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of child labor is prohibited in Building and Construction Industry.

(xiv) Inter-State Migrant Workmen's (Regulation of Employment and Conditions of Service) Act, 1979 - The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The inter-state migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home up to the establishment and back, etc.

(xv) The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and the Cess Act of 1996 - All the establishments who carry on any building or other construction work and employ 10 or more workers are covered under this Act. All such establishments are required to pay Cess at rate not exceeding 2% of the cost of construction as may be notified by the Government. The employer of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation for workers near the workplace etc. The employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government.

APPENDIX 3

ENVIRONMENTAL AUDIT OF EXISTING SEWAGE TREATMENT PLANT IN TIRUCHIRAPPALLI

I. Introduction

1. Under the ADB funded Tamil Nadu Urban Flagship Investment Program (TNUFIP), it is proposed to develop sewer system (sewer collection and conveyance infrastructure) in Tiruchirappalli City.

2. The subproject under Phase III shall provide sewerage system in south zone, southwest (Phase III) which covers all areas in Ponmalai and K.Abishekapuram Zone and Thiruverumbur area in city area of TCC. The components are: (i) sewage collection system (300.445 km length of sewers); (ii) 24 sewage lift stations; (iii) 6 new sewage pumping station; (iv) pumping main sewers 32.00 km length); (v) 11976 manholes; (vi) 37061 house service connections; and (vii) Connecting to STPs: The flow of zone 5 and part of zone 6 (9 MLD) will reach 37 MLD Keelakal kandar kottai STP (these two zones flows already considered in STP at Keelakalkandar Kottai) and the sewage flow of zone 7 to zone 12 (28 MLD) will flow to 88 MLD Panjapur.

3. 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.,) would accrue only with a properly functioning treatment facility. Therefore the existing STP is an associated facility as per the ADB Safeguard Policy Statement, 2009. Compliance with the environmental safeguards will ensure the subproject sustainability, and therefore, ADB SPS, 2009 requires conduct of environmental audit of associated facilities.

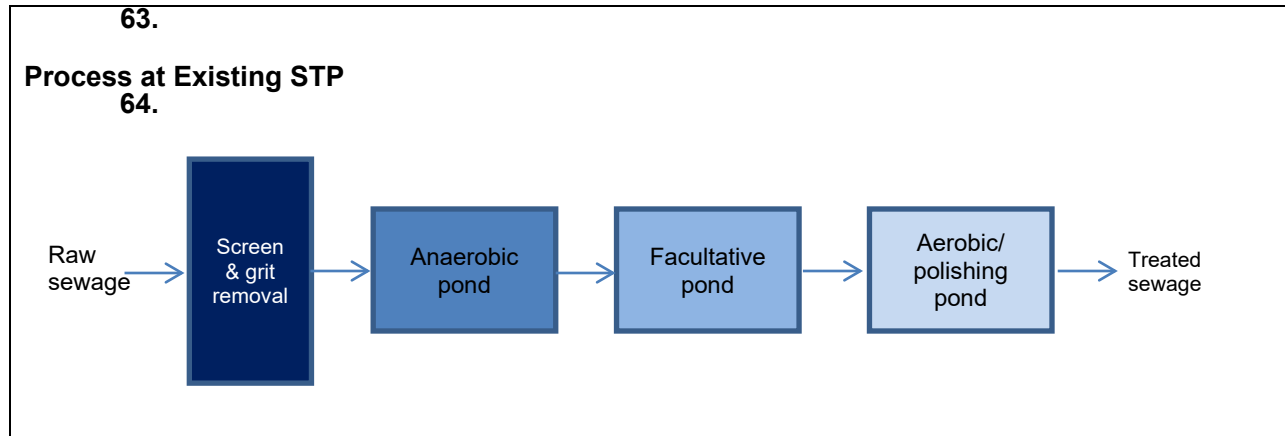
4. The objectives of this environmental audit are to (i) assess the compliance of the existing sewage treatment plant (STP) with country's environmental regulatory framework; (ii) improve environmental performance, as required, through monitoring the effectiveness of the management system; and (iii) increase the TCC's knowledge of its activities, thus increasing its ability to continually improve and minimize future potential liabilities.

5. The methodology adopted for this audit was to initially review existing plans and technical information and list various activities being carried out in the STP. Due diligence was carried out to physically check whether environmental performance, health and safety, etc., were in compliance with national and state prescribed standards and guidelines. The audit process involved visit to the STP to observed operations, Meetings and discussions with key personnel and review of various documentations regarding the operational aspects.

II. Description of the existing STP under phase III

| | |
|--------------------------------|--|
| Location | Panjapur ,Tiruchirappalli City 57. |
| Start of operation (year) | 1987 |
| Owned by | Tiruchirappalli City Corporation (TCC) |
| Contact person and designation | City Engineer, TCC |
| Capacity | 88 million liters per day (MLD) |
| Sewage treatment process | Waste stabilization pond based sewage treatment plant. Facility has the following components: (i) Manual screening, (ii) Manual grit removal, (iii) Flow division system to different treatment units, (iv) Anaerobic ponds, (v) Facultative ponds, and (vi) Maturation ponds. Technical details of STP units are as follows: |

| 58. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|--------------------------|--------------------------|--|-----------------|---|------|-------------------|---|------|------------------------------|---|------|-------------------|--------|-------|--|-------|-------|---|-------|-------|---|--------|-------|-----------------------------|----------------|--|--------------------------|-------------------------|--|
| 59. | <table border="1"> <thead> <tr> <th>Treatment Technology</th> <th>Waste Stabilization Pond</th> <th></th> </tr> </thead> <tbody> <tr> <td>Anaerobic Ponds</td> <td>2</td> <td>nos.</td> </tr> <tr> <td>Facultative Ponds</td> <td>2</td> <td>nos.</td> </tr> <tr> <td>Polishing (Maturation) Ponds</td> <td>2</td> <td>nos.</td> </tr> <tr> <td>Area of STP (new)</td> <td>160.00</td> <td>acres</td> </tr> <tr> <td>Area of STP (Old – Facultative Ponds only)</td> <td>75.00</td> <td>acres</td> </tr> <tr> <td>Area of AL (additional provided through NRAP)</td> <td>12.50</td> <td>acres</td> </tr> <tr> <td>Total Area of Sewage Treatment Plant(s)</td> <td>247.50</td> <td>acres</td> </tr> <tr> <td>Treated Wastewater Disposal</td> <td colspan="2">Koraiyar River</td> </tr> <tr> <td>Treatment Quality/ Level</td> <td colspan="2">Effluent BOD of 20 mg/l</td> </tr> </tbody> </table> | Treatment Technology | Waste Stabilization Pond | | Anaerobic Ponds | 2 | nos. | Facultative Ponds | 2 | nos. | Polishing (Maturation) Ponds | 2 | nos. | Area of STP (new) | 160.00 | acres | Area of STP (Old – Facultative Ponds only) | 75.00 | acres | Area of AL (additional provided through NRAP) | 12.50 | acres | Total Area of Sewage Treatment Plant(s) | 247.50 | acres | Treated Wastewater Disposal | Koraiyar River | | Treatment Quality/ Level | Effluent BOD of 20 mg/l | |
| | Treatment Technology | Waste Stabilization Pond | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Anaerobic Ponds | 2 | nos. | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Facultative Ponds | 2 | nos. | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Polishing (Maturation) Ponds | 2 | nos. | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Area of STP (new) | 160.00 | acres | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Area of STP (Old – Facultative Ponds only) | 75.00 | acres | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Area of AL (additional provided through NRAP) | 12.50 | acres | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Total Area of Sewage Treatment Plant(s) | 247.50 | acres | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Treated Wastewater Disposal | Koraiyar River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Treatment Quality/ Level | Effluent BOD of 20 mg/l | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Treatment Process at STP: Waste stabilization pond (WSP) based treatment process, which treats the sewage/domestic wastewater in are large man-made water bodies by natural occurring processes and the influence of solar light, wind, microorganisms and algae, has been adopted in the existing STP at Tiruchirappalli. WSP based treatment process consists of large basins in which sewage / domestic wastewater is treated and treated water is normally used for irrigation or land disposal. For effective treatment, Tiruchirappalli WSP based STP is developed with a series of ponds comprising first of anaerobic ponds, then facultative ponds, and finally the aerobic ponds (polishing ponds). 60.</p> <p>Raw sewage after passing through a manual screen and grid chamber enters the anaerobic ponds, where primary treatment occurs and reduces organic load in the wastewater. The depth of this basin is 3 m, and in entire depth it acts as anaerobic pond. Due to sedimentation, sludge accumulates in the bottom, that aids removal of solid and BOD through anaerobic digestion. Retention time in anaerobic pond if 1 day. 61.</p> <p>From anaerobic ponds, the effluent enters facultative pond of 1.5 m deep. The top layer of the pond receives oxygen naturally, while the lower layer becomes anaerobic in the absence of oxygen. Settle solid accumulate in the bottom and are digested. Both the aerobic and anaerobic process reduces the BOD further. Retention time in facultative pond is 4 days. 62.</p> <p>Finally from the facultative ponds, the effluent enters aerobic/polishing ponds that primarily aid removal of pathogens and is the last step in WSP treatment process. Depth of pond is 1.5 m, and retention time is 5 days. Due to shallow depth, sunlight penetrates into full depth and aids photosynthesis. Photosynthetic algae release oxygen into the water and at the same time consume carbon dioxide produced by the respiration of bacteria.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



| | |
|---|--|
| Treatment efficiency | Normally about 60% treatment efficiency (BOD removal) is expected in anaerobic ponds, while it is about 75% in facultative ponds. So the overall efficiency of treatment can be expected from WSP process at a minimum of 90%. However, in Tiruchirappalli, the inlet and outlet effluent quality data from the STP indicate that treatment process is efficiency reducing the value of BOD and TSS to satisfactory level but the COD is above the prescribed level of TNPCB. |
| Sludge management | At the WSP based STP, sewage sludge settled at the bottom of the ponds will need to be removed periodically (as per the design, which normally range from three to five years). Ponds are allowed to dry out naturally and the solid sludge is removed by manual digging. The treatment and drying processes kill enteric bacteria and pathogens, and because of its high content of nitrates, phosphates and other plant nutrients the sludge is an excellent organic fertilizer. No records available on the removal of sludge. No laboratory tests were conducted on the sludge to check its quality prior to its disposal. 65. |
| Treated wastewater (effluent disposal) | No reuse plan for treated water was available for review . In the current situation, wastewater from the polishing pond is let into a natural stream. |

III. Compliance with Applicable National and State Laws, Rules, and Regulations

| Law, Rules, and Regulations | Description and Requirement | STP at Tiruchirappalli |
|--|---|---|
| LXI. | LXII. | <p><i>Y = compliant (if applicable, specify expiration date of permit/clearance)</i> <i>N = non-compliant^a</i> <i>N/A = not applicable (state justification)</i></p> |
| EIA Notification | The EIA Notification of 2006 states that environmental clearance is required for certain defined activities/projects. | <p>N/A 66.</p> <p>Environmental clearance is not required as STPs are not listed in the EIA Notification's "Schedule of Projects Requiring Prior Environmental Clearance"</p> |
| Manufacture, Storage, and Import of Hazardous Chemical Rules, 1989 | Storage of chlorine (threshold quantity greater than 10 tons but less than 25 tons) in STP s will require clearance from Tamil Nadu Pollution Control Board (TNPCB). | <p>N/A No chlorine used or stored in the STP</p> |
| Water (Prevention and Control of Pollution) Act of 1974, Rules of 1975, and amendments | Consent to operate from TNPCB | <p>Consent to establish was obtained in 2005 for construction of STP. Subsequent to construction and prior to start of operation consent to operate (CTO) under process . CTO is to be obtained (renewal) annual from the CTO. 67.</p> |
| Air (Prevention and Control of Pollution) Act of 1981, Rules of 1982 and amendments. | Consent to operate from TNPCB | <p>Record for DG Set (available on site) was not maintained. LXIII. LXIV.</p> |
| Environment (Protection) Act, 1986 and CPCB Environmental Standards | Emissions and discharges from the facilities to be created, refurbished, or augmented shall comply with the notified standards. a. Wastewater disposal standards | <p>As per the CTO issued by TNPCB, STP effluent shall meet the following disposal standards: BOD: <20 mg/l and TSS: < 30 mg/l. Available laboratory reports indicate that STP effluent is meeting the stipulated disposal standards for BOD but not for other parameters.</p> |
| Noise Pollution (Regulation and Control) Rules, 2002 amended up to 2010 | Applicable ambient noise standards with respect to noise for different areas/zones | <p>Record for DG Set (available on site) was not maintained. 68.</p> |
| National Institute of Occupational Safety and Health (NIOSH) Publication No. 2002-149 | Compliance with NIOSH Guidance for Controlling Potential Risks to Workers Exposed to Class B Biosolids | Training and proper PPEs are required |
| Forest (Conservation) Act, 1980 and Forest Conservation Rules, 2003 as amended | As per Rule 6, every user agency, who wants to use any forest land for non-forest purposes shall seek approval of the central government. | <p>N/A 69.</p> |
| Ancient Monuments and Archaeological Sites and Remains Rules of 1959 | No development activity is permitted in the "protected area," and all development activities likely to damage the protected property are not permitted in the "controlled area" without prior permission of the Archaeological Survey of India (ASI). | <p>N/A</p> |

| Law, Rules, and Regulations | Description and Requirement | STP at Tiruchirappalli |
|--|---|--|
| LXI. | LXII. | Y = compliant (if applicable, specify expiration date of permit/clearance) N = non-compliant ^a N/A = not applicable (state justification) |
| | Protected property includes the site, remains, and monuments protected by ASI or the State Department of Archaeology. | |
| The Child Labor (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 are present. | STP is operated by TCC staff and proper PPEs are required. No children are engaged. |

^a Compliant = There is sufficient and appropriate evidence to demonstrate that the particular regulatory requirement has been complied with; non-compliant = clear evidence has been collected to demonstrate the particular regulatory requirement has not been complied with.

IV. Institutional Arrangement

| Parameter | STP |
|---|---|
| Operations | Continuous operation; involves no mechanical or electrical operation; Except manual operation for removal of debris from the screen, and removal of collected grit from grit chamber, no interference is required in operation of STP. |
| Manager per shift | Personnel at STP are available in one shift (day shift 9 AM to 6 PM) |
| Sewerage/public health engineer on-site | |
| Estimated number of technical employees on-site per shift | Assistant Executive Engineer (AEE), Ponmalai Zone, Tiruchirappalli City Corporation, is in-charge of STP operation. There are total 8 persons engaged in STP operation include a chemist in lab |
| Estimated number of laborers on-site per shift | |
| Estimated number of employees in charge of environmental management and monitoring | Nil |
| Frequency of waste water quality monitoring (raw) | Monthly |
| Frequency of wastewater quality monitoring (treated) | Monthly |
| Frequency of sludge quality monitoring | not conducted |
| In-house laboratory for water quality analyses (Yes/None). If none, provide name of third-party laboratory. | In-house laboratory is available at the STP; apparatus to conduct pH, BOD, COD and TSS available Laboratories of Tamil Nadu Water and Drainage Board and TNPCB, both located in Tiruchirappalli. |

APPENDIX – 4
SAMPLE OUTLINE SPOILS (CONSTRUCTION WASTE) MANAGEMENT PLAN

- The Spoil Management Plan should be site specific and be part of the monthly Construction Management Plan.
- The contractor, in consultation with the PIU, has to find out appropriate location/s for the disposal of the excess soil generated. The spoils should be deposited only at these sites.
- Further precautions need to be taken in case of the contaminated spoils
- The vehicle carrying the spoil should be covered properly.
- The spoils generating from each site should be removed on the same day or immediately after the work is complete. The site / road should be restored to the original condition.

I. Spoils information

The spoil information contains the details like a) The type / material, b) Potential contamination by that type, c) Expected volume (site / component specific), d) Spoil Classification etc.

II. Spoils management

The Spoil Management section gives the details of a) Transportation of spoil b) disposal site details c) Precautions taken d) Volume of contaminated spoil, if present, d) Suggested reuse of disposal of the spoil

III. Documentation

The volume of spoil generated (site specific, date wise), site disposed, reuse / disposal details should be documented properly.

APPENDIX – 5
Public Information Notice Template

Public Announcement
Providing Underground Sewerage System Tiruchirappalli City
Tiruchirappalli City Municipal Corporation

Under this project, works are being conducted by xxxx Contractor to provide sewerage network in Tiruchirappalli

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.

APPENDIX – 6
SAMPLE GRIEVANCE REGISTRATION FORM
 (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.

| | | | | | |
|--|-----------------------|---------------------|--------------------|-----|---|
| Date | Place of registration | Project Town 70. | | | |
| Project: | | | | | |
| Contact information/personal details | | | | | |
| Name | 71. | Gender | * Male * Female | Age | 7 |
| Home address | 73. | | | | |
| Place | 74. | | | | |
| Phone no. | 75. | | | | |
| E-mail | 76. | | | | |
| Complaint/suggestion/comment/question Please provide the details (who, what, where, and how) of your grievance below: 77. | | | | | |
| 78. | | | | | |
| If included as attachment/note/letter, please tick here: | | | | | |
| How do you want us to reach you for feedback or update on your comment/grievance? 79. | | | | | |

FOR OFFICIAL USE ONLY

| |
|--|
| Registered by: (Name of official registering grievance) 80. |
| 81. |
| 82. |
| Mode of communication: Note/letter E-mail Verbal/telephonic |
| Reviewed by: (Names/positions of officials reviewing grievance) 83. |
| Action taken: |

| | |
|--|-----------|
| 84. | |
| 85. | |
| 86. | |
| Whether action taken disclosed: 87. | Yes No |
| Means of disclosure: 88. | |
| 89. | |

APPENDIX – 7 SAMPLE OUTLINE TRAFFIC MANAGEMENT PLAN

A. Principles for TMP around the Water Pipes Construction Sites

1. One of the prime objectives of this TMP is to ensure the safety of all the road users along the work zone, and to address the following issues:
 - (i) the safety of pedestrians, bicyclists, and motorists travelling through the construction zone;
 - (ii) protection of work crews from hazards associated with moving traffic;
 - (iii) mitigation of the adverse impact on road capacity and delays to the road users;
 - (iv) maintenance of access to adjoining properties; and
 - (v) addressing issues that may delay the project.

B. Operating Policies for TMP

2. The following principles will help promote safe and efficient movement for all road users (motorists, bicyclists, and pedestrians, including persons with disabilities) through and around work zones while reasonably protecting workers and equipment.
 - (i) Make traffic safety and temporary traffic control an integral and high-priority element of project from planning through design, construction, and maintenance.
 - (ii) Inhibit traffic movement as little as possible.
 - (iii) Provide clear and positive guidance to drivers, bicyclists, and pedestrians as they approach and travel through the temporary traffic control zone.
 - (iv) Inspect traffic control elements routinely, both day and night, and make modifications when necessary.
 - (v) Pay increased attention to roadside safety in the vicinity of temporary traffic control zones.
 - (vi) Train all persons that select, place, and maintain temporary traffic control devices.
 - (vii) Keep the public well informed.
 - (viii) Make appropriate accommodation for abutting property owners, residents, businesses, emergency services, railroads, commercial vehicles, and transit operations.
3. **Figure A7.1** illustrates the operating policy for TMP for the construction of water pipes and the sewers along various types of roads.

C. Analyze the impact due to street closure

4. Apart from the capacity analysis, a final decision to close a particular street and divert the traffic should involve the following steps:
 - (i) approval from the ULB/Public Works Department (PWD) to use the local streets as detours;
 - (ii) consultation with businesses, community members, traffic police, PWD, etc., regarding the mitigation measures necessary at the detours where the road is diverted during the construction;
 - (iii) determining of the maximum number of days allowed for road closure, and incorporation of such provisions into the contract documents;
 - (iv) determining if additional traffic control or temporary improvements are needed along the detour route;
 - (v) considering how access will be provided to the worksite;

- (vi) contacting emergency service, school officials, and transit authorities to determine if there are impacts to their operations; and
- (vii) developing a notification program to the public so that the closure is not a surprise. As part of this program, the public should be advised of alternate routes that commuters can take or will have to take as result of the traffic diversion.

5. If full road-closure of certain streets within the area is not feasible due to inadequate capacity of the detour street or public opposition, the full closure can be restricted to weekends with the construction commencing on Saturday night and ending on Monday morning prior to the morning peak period.

Figure A7.1: Policy Steps for the TMP

| | |
|--------------------------------|---|
| Review | <ul style="list-style-type: none"> • Review construction schedule and methods |
| Traffic Re-Circulation | <ul style="list-style-type: none"> • Identify initial traffic recirculation and control policy |
| Traffic Diversions | <ul style="list-style-type: none"> • Identify routes for traffic diversions • Analyse adverse impact and mitigation at the detours |
| Full Road Closures | <ul style="list-style-type: none"> • Begin community consultation for consensus • Finalise or determine alternate detours |
| Temporary parking | <ul style="list-style-type: none"> • Identify temporary parking (on and off -street) • Discuss with CMC, owner, community for use |
| Police Coordination | <ul style="list-style-type: none"> • Coordinate with the Traffic Police to enforce traffic and diversions |
| Install control devices | <ul style="list-style-type: none"> • Install traffic control devices (traffic cones, signs, lightings, etc) |
| Awareness | <ul style="list-style-type: none"> • Conduct campaigns, publicity, and notify public about street closure |
| Public Redress | <ul style="list-style-type: none"> • Develop a mechanism to address public grievances regarding disruptions (traffic, utilities, and diversions) |

D. Public awareness and notifications

6. As per discussions in the previous sections, there will be travel delays during the constructions, as is the case with most construction projects, albeit on a reduced scale if utilities and traffic management are properly coordinated. There are additional grounds for travel delays in the area, as most of the streets lack sufficient capacity to accommodate additional traffic from diverted traffic as a result of street closures to accommodate the works.

7. The awareness campaign and the prior notification for the public will be a continuous activity which the project will carry out to compensate for the above delays and minimize public claims as result of these problems. These activities will take place sufficiently in advance of the time when the roadblocks or traffic diversions take place at the particular streets. The reason for this is to allow

sufficient time for the public and residents to understand the changes to their travel plans. The project will notify the public about the roadblocks and traffic diversion through public notices, ward level meetings and city level meeting with the elected representatives.

8. The PIU will also conduct an awareness campaign to educate the public about the following issues:

- (i) traffic control devices in place at the work zones (signs, traffic cones, barriers, etc.);
- (ii) defensive driving behaviour along the work zones; and
- (iii) reduced speeds enforced at the work zones and traffic diversions.

9. It may be necessary to conduct the awareness programs/campaigns on road safety during construction.

10. The campaign will cater to all types of target groups i.e. children, adults, and drivers. Therefore, these campaigns will be conducted in schools and community centers. In addition, the project will publish a brochure for public information. These brochures will be widely circulated around the area and will also be available at the PIU, and the contractor's site office. The text of the brochure should be concise to be effective, with a lot of graphics. It will serve the following purpose:

- (i) explain why the brochure was prepared, along with a brief description of the project;
- (ii) advise the public to expect the unexpected;
- (iii) educate the public about the various traffic control devices and safety measures adopted at the work zones;
- (iv) educate the public about the safe road user behaviour to emulate at the work zones;
- (v) tell the public how to stay informed or where to inquire about road safety issues at the work zones (name, telephone, mobile number of the contact person; and
- (vi) indicate the office hours of relevant offices.

E. Install traffic control devices at the work zones and traffic diversion routes

11. The purpose of installing traffic control devices at the work zones is to delineate these areas to warn, inform, and direct the road users about a hazard ahead, and to protect them as well as the workers. As proper delineation is a key to achieve the above objective, it is important to install good traffic signs at the work zones. The following traffic control devices are used in work zones:

- Signs
- Pavement Markings
- Channelizing Devices
- Arrow Panels
- Warning Lights

12. Procedures for installing traffic control devices at any work zone vary, depending on road configuration, location of the work, construction activity, duration, traffic speed and volume, and pedestrian traffic. Work will take place along major roads, and the minor internal roads. As such, the traffic volume and road geometry vary. The main roads carry considerable traffic; internal roads in the new city areas are wide but in old city roads very narrow and carry considerable traffic. However, regardless of where the construction takes place, all the work zones should be cordoned off, and traffic shifted away at least with traffic cones, barricades, and temporary signs (temporary "STOP" and "GO").

13. **Figure A 7.2 to Figure A 7.6** illustrates a typical set-up for installing traffic control devices at the work zone of the area, depending on the location of work on the road way, and road geometrics:

- Work on shoulder or parking lane
- Shoulder or parking lane closed on divided road
- Work in Travel lane
- Lane closure on road with low volume
- Street closure with detour

14. The work zone should take into consideration the space required for a buffer zone between the workers and the traffic (lateral and longitudinal) and the transition space required for delineation, as applicable. For the works, a 30 cm clearance between the traffic and the temporary STOP and GO signs should be provided. In addition, at least 60 cm is necessary to install the temporary traffic signs and cones.

15. Traffic police should regulate traffic away from the work zone and enforce the traffic diversion result from full street closure in certain areas during construction. Flaggers/ personnel should be equipped with reflective jackets at all times and have traffic control batons (preferably the LED type) for regulating the traffic during night time.

16. In addition to the delineation devices, all the construction workers should wear fluorescent safety vests and helmets in order to be visible to the motorists at all times. There should be provision for lighting beacons and illumination for night constructions.

Figure A7.2 and A7.3: Work on shoulder or parking lane and Shoulder or parking lane closed on divided road

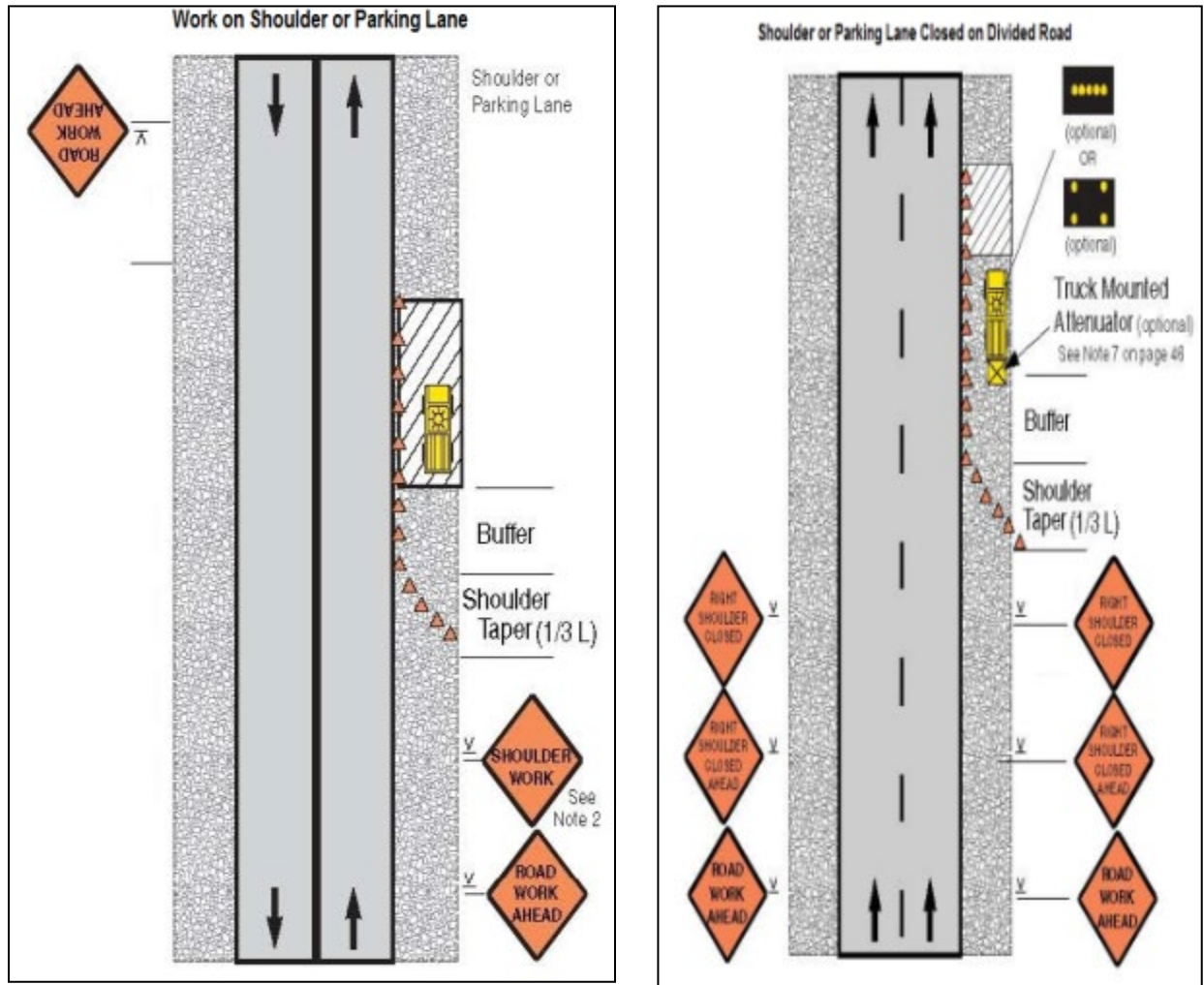
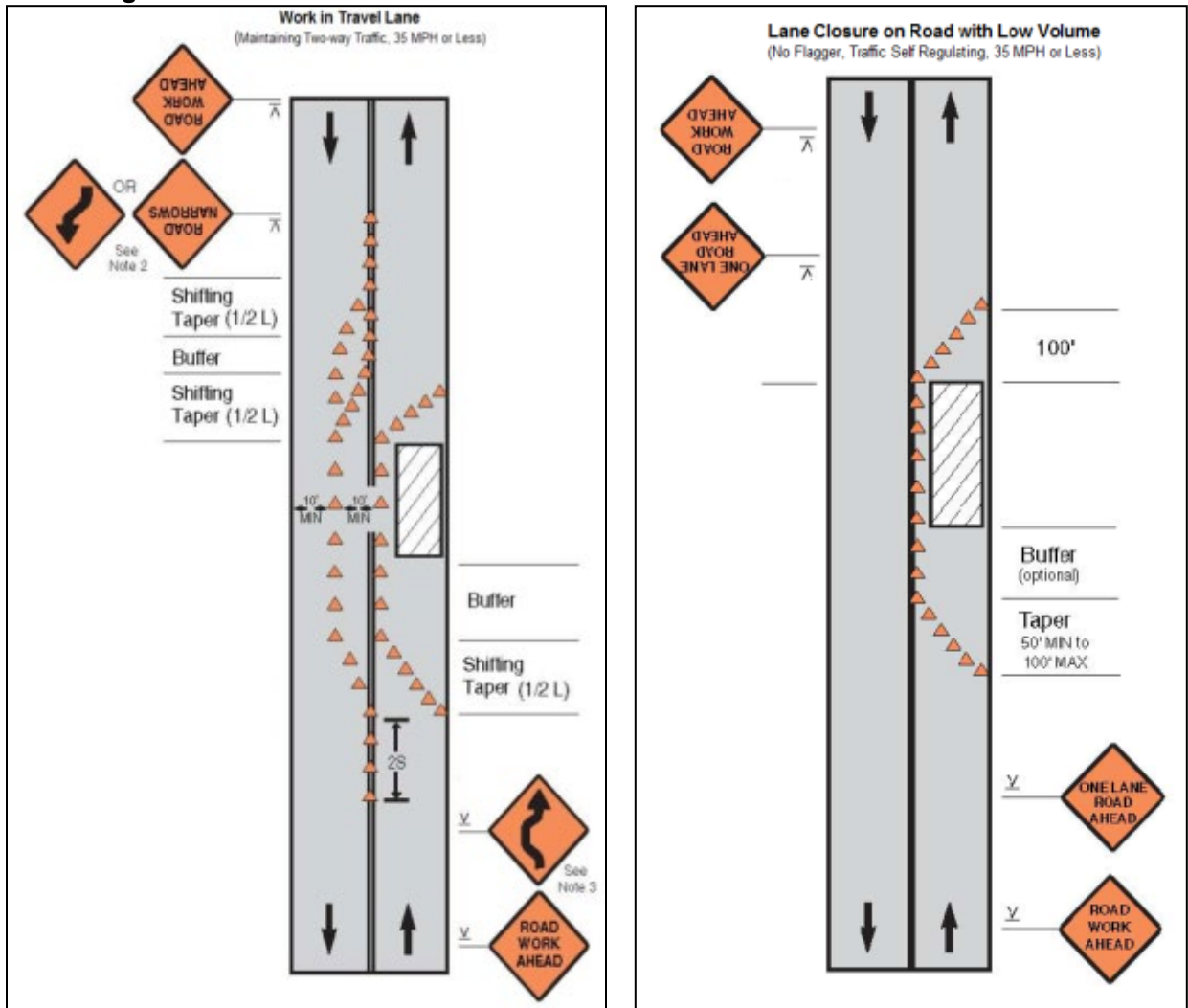


Figure A 7.4 and A 7.5: Work in Travel lane and Lane closure on road with low volume



**APPENDIX – 8
SAMPLE ENVIRONMENTAL SITE INSPECTION REPORT**

Project Name _____
Contract Number _____

NAME: _____ DATE: _____
TITLE: _____ DMA: _____
LOCATION: _____ GROUP: _____

WEATHER: _____

| | | |
|------------------------------|-------------------|-----|
| Project Activity Stage | Survey | 90. |
| | Design | 91. |
| | Implementation | 92. |
| | Pre-Commissioning | 93. |
| | Guarantee Period | 94. |

| Monitoring Items | Compliance |
|--|-------------|
| Compliance marked as Yes / No / Not applicable (NA) / Partially Implemented (PI) | LXV. |
| EHS supervisor appointed by contractor and available on site | 95. |
| Construction site management plan (spoils, safety, schedule, equipment etc.) prepared | 96. |
| Traffic management plan prepared | 97. |
| Dust is under control | 98. |
| Excavated soil properly placed within minimum space | |
| Construction area is confined; no traffic/pedestrian entry observed | |
| Surplus soil/debris/waste is disposed without delay | |
| Construction material (sand/gravel/aggregate) brought to site as and when required only | |
| Tarpaulins used to cover sand and other loose material when transported by vehicles | |
| After unloading , wheels and undercarriage of vehicles cleaned prior to leaving the site | |
| No AC pipes disturbed/removed during excavation | |
| No chance finds encountered during excavation | |
| Work is planned in consultation with traffic police | |
| Work is not being conducted during heavy traffic | |
| Work at a stretch is completed within a day (excavation, pipe laying and backfilling) | |
| Pipe trenches are not kept open unduly | |
| Road is not completely closed; work is conducted on edge; at least one line is kept open | |
| Road is closed; alternative route provided and public informed, information board provided | |

| | |
|---|--|
| Pedestrian access to houses is not blocked due to pipe laying | |
| Spaces left in between trenches for access | |
| Wooden planks/metal sheets provided across trench for pedestrian | |
| No public/unauthorized entry observed in work site | |
| Children safety measures (barricades, security) in place at works in residential areas | |
| Prior public information provided about the work, schedule and disturbances | |
| Caution/warning board provided on site | |
| Guards with red flag provided during work at busy roads | |
| Workers using appropriate PPE (boots, gloves, helmets, ear muffs etc) | |
| Workers conducting or near heavy noise work is provided with ear muffs | |
| Contractor is following standard and safe construction practices | |
| Deep excavation is conducted with land slip/protection measures | |
| First aid facilities are available on site and workers informed | |
| Drinking water provided at the site | |
| Toilet facility provided at the site | |
| Separate toilet facility is provided for women workers | |
| Workers camps are maintained cleanly | |
| Adequate toilet and bath facilities provided | |
| Contractor employed local workers as far as possible | |
| Workers camp set up with the permission of PIU | |
| Adequate housing provided | |
| Sufficient water provided for drinking/washing/bath | |
| No noisy work is conducted in the nights | |
| Local people informed of noisy work | |
| No blasting activity conducted | |
| Pneumatic drills or other equipment creating vibration is not used near old/risky buildings | |

Signature

Sign off

Name
Position

Name
Position

APPENDIX – 9
SEMI ANNUAL ENVIRONMENTAL MONITORING PLAN TEMPLATE

I. Introduction

- Overall project description and objectives
- Environmental category as per ADB Safeguard Policy Statement, 2009
- Environmental category of each subproject as per national laws and regulations
- Project Safeguards Team

| Name | Designation/Office | Email Address | Contact Number |
|----------------|---------------------------|----------------------|-----------------------|
| 1. PMU | 99. | 100. | 101. |
| | | | |
| 102. | 103. | 104. | 105. |
| 106. | 107. | 108. | 109. |
| 110. | 111. | 112. | 113. |
| 2. PIUs | 114. | 115. | 116. |
| | | | |
| 117. | 118. | 119. | 120. |
| 121. | 122. | 123. | 124. |
| 125. | 126. | 127. | 128. |
| 129. | 130. | 131. | 132. |
| 3. Consultants | 133. | 134. | 135. |
| | | | |
| 136. | 137. | 138. | 139. |
| 140. | 141. | 142. | 143. |
| 144. | 145. | 146. | 147. |
| 148. | 149. | 150. | 151. |

- Overall project and subproject progress and status
- Description of subprojects (package-wise) and status of implementation (preliminary, detailed design, on-going construction, completed, and/or O&M stage)

| Package | Components/List of Works | Status of Implementation (Preliminary Design/Detailed) | Contract Status | If On-going Construction |
|----------------|---------------------------------|---|------------------------|---------------------------------|
|----------------|---------------------------------|---|------------------------|---------------------------------|

| | | | | %Physical Progress | Expected Completion Date |
|------------|-------------|-------------|-------------|---------------------------|---------------------------------|
| | | . | | | |
| | . | . | | . | I. |
| II. | . | | . | I. | II. |
| V. | V. | VI. | VII. | VIII. | X. |
| | | | | | |
| | | . | | | |
| | | | | | |
| | | | | . | |
| | | | . | . | . |
| I. | II. | III. | IV. | V. | VI. |
| II. | III. | IV. | V. | VI. | VII. |

^a If on-going construction, include %physical progress and expected date of completion.

II. Compliance status with national/state/local statutory environmental requirements^a

| Package No. | Subproject Name | Statutory Environmental Requirements ^b | Status of Compliance ^c | Validity if obtained | Action Required | Specific Conditions that will require environmental monitoring as per Environment Clearance, Consent/Permit to Establish ^d |
|-------------|-----------------|---|-----------------------------------|----------------------|-----------------|---|
| CXXXVIII | CXXXIX. | CXL. | CXLI. | CXLII. | CXLIII. | CXLIV. |
| CXLV. | CXLVI. | CXLVII. | CXLVIII. | CXLIX. | CL. | CLI. |
| CLII. | CLIII. | CLIV. | CLV. | CLVI. | CLVII. | CLVIII. |

^aAll statutory clearance/s, no-objection certificates, permit/s, etc. should be obtained prior to award of contract/s. Attach as appendix all clearance obtained during the reporting period. If already reported, specify in the "remarks" column.

^bSpecify (environmental clearance? Permit/consent to establish? Forest clearance? Etc.)

^cSpecify if obtained, submitted and awaiting approval, application not yet submitted

^d*Example: Environmental Clearance requires ambient air quality monitoring, Forest Clearance/Tree-cutting Permit requires 2 trees for every tree, etc.*

III. Compliance status with environmental loan covenants

| No. (List schedule and paragraph number of Loan Agreement) | Covenant | Status of Compliance | Action Required |
|--|----------|----------------------|-----------------|
| CLIX. | CLX. | CLXI. | CLXII. |
| CLXIII. | CLXIV. | CLXV. | CLXVI. |
| CLXVII. | CLXVIII. | CLXIX. | CLXX. |

IV. Compliance status with the environmental management plan (refer to EMP tables in approved IEE/s)

- Confirm if IEE/s require contractors to submit site-specific EMP/construction EMPs. If not, describe the methodology of monitoring each package under implementation.

Package-wise Implementation Status

| Package Number | Components | Design Status (Preliminary Design Stage/Detailed Design Completed) | Final IEE based on Detailed Design | | | | Site-specific EMP (or Construction EMP) approved by Project Director? (Yes/No) | Remarks |
|----------------|------------|--|---|---|---|---|--|---------|
| | | | Not yet due (detailed design not yet completed) | Submitted to ADB (Provide Date of Submission) | Disclosed on project website (Provide Link) | Final IEE provided to Contractor/s (Yes/No) | | |
| I. | II. | IV. | V. | VI. | VII. | VIII. | IX. | X. |
| XI. | XII. | XIII. | XIV. | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

- Identify the role/s of Safeguards Team including schedule of on-site verification of reports submitted by consultants and contractors.
- For each package, provide name/s and contact details of contractor/s' nodal person/s for environmental safeguards.
- Include as appendix all supporting documents including **signed** monthly environmental site inspection reports prepared by consultants and/or contractors.
- With reference to approved EMP/site-specific EMP/construction EMP, complete the table below
- Provide the monitoring results as per the parameters outlined in the approved EMP (or site-specific EMP/construction EMP when applicable).
- In addition to the table on EMP implementation, the main text of the report should discuss in details the following items:
 - (i) **Grievance Redress Mechanism.** Provide information on establishment of grievance redress mechanism and capacity of grievance redress committee to address project-related issues/complaints. Include as appendix Notification of the GRM (town-wise if applicable).
 - (ii) **Complaints Received during the Reporting Period.** Provide information on number, nature, and resolution of complaints received during reporting period. Attach records as per GRM in the approved IEE. Identify safeguards team member/s involved in the GRM process. Attach minutes of meetings (ensure English translation is provided).
 - Confirm if any dust was noted to escape the site boundaries and identify dust suppression techniques followed for site/s.
 - Identify muddy water was escaping site boundaries or muddy tracks were seen on adjacent roads.
 - Identify type of erosion and sediment control measures installed on site/s, condition of erosion and sediment control measures including if these were intact following heavy rain;
 - Identify designated areas for concrete works, chemical storage, construction materials, and refueling. Attach photographs of each area.

- Confirm spill kits on site and site procedure for handling emergencies.
- Identify any chemical stored on site and provide information on storage condition. Attach photograph.
- Describe management of stockpiles (construction materials, excavated soils, spoils, etc.). Provide photographs.
- Describe management of solid and liquid wastes on-site (quantity generated, transport, storage and disposal). Provide photographs.
- Provide information on barricades, signages, and on-site boards. Provide photographs.
- Provide information on
- Checking if there are any activities being under taken out of working hours and how that is being managed.

Summary of Environmental Monitoring Activities (for the Reporting Period)^a

| Impacts (List from IEE) | Mitigation Measures (List from IEE) | Parameters Monitored (As a minimum those identified in the IEE should be monitored) | Method of Monitoring | Location of Monitoring | Date of Monitoring Conducted | Name of Person Who Conducted the Monitoring |
|--|--|--|---------------------------------|---------------------------------------|---|--|
| Design Phase | | | | | | |
| 152 | 153. | 154. | 155. | 156. | 157. | 158. |
| 159 | 160. | 161. | 162. | 163. | 164. | 165. |
| 166 | 167. | 168. | 169. | 170. | 171. | 172. |
| 173 | 174. | 175. | 176. | 177. | 178. | 179. |
| Pre-Construction Phase | | | | | | |
| 180 | 181. | 182. | 183. | 184. | 185. | 186. |
| 187 | 188. | 189. | 190. | 191. | 192. | 193. |
| 194 | 195. | 196. | 197. | 198. | 199. | 200. |
| 201 | 202. | 203. | 204. | 205. | 206. | 207. |
| Construction Phase | | | | | | |
| 208 | 209. | 210. | 211. | 212. | 213. | 214. |
| 215 | 216. | 217. | 218. | 219. | 220. | 221. |
| 222 | 223. | 224. | 225. | 226. | 227. | 228. |
| 229 | 230. | 231. | 232. | 233. | 234. | 235. |
| Operational Phase | | | | | | |
| 236 | 237. | 238. | 239. | 240. | 241. | 242. |
| 243 | 244. | 245. | 246. | 247. | 248. | 249. |
| 250 | 251. | 252. | 253. | 254. | 255. | 256. |
| 257 | 258. | 259. | 260. | 261. | 262. | 263. |

^a Attach Laboratory Results and Sampling Map/Locations.

Overall Compliance with CEMP/ EMP

| No. | Subproject Name | EMP/ CEMP Part of Contract Documents (Y/N) | CEMP/ EMP Being Implemented (Y/N) | Status of Implementation (Excellent/ Satisfactory/ Partially Satisfactory/ Below Satisfactory) | Action Proposed and Additional Measures Required |
|-----|-----------------|--|-----------------------------------|--|--|
| CLX | CLXXXVI. | CLXXXVII. | CLXXXVIII. | CLXXXIX. | CXC. |
| CXC | CXCII. | CXCIII. | CXCIV. | CXCV. | CXCVI. |
| CXC | CXCVIII. | CXCIX. | CC. | CCI. | CCII. |

V. Approach and methodology for environmental monitoring of the project

- Brief description on the approach and methodology used for environmental monitoring of each subproject

VI. Monitoring of environmental IMPACTS on PROJECT SURROUNDINGS (ambient air, water quality and noise levels)

- Brief discussion on the basis for monitoring
- Indicate type and location of environmental parameters to be monitored
- Indicate the method of monitoring and equipment to be used
- Provide monitoring results and an analysis of results in relation to baseline data and statutory requirements

As a minimum the results should be presented as per the tables below.

Air Quality Results

| Site No. | Date of Testing | Site Location | Parameters (Government Standards) | | |
|----------|-----------------|---------------|-----------------------------------|--------------------------------------|--------------------------------------|
| | | | PM10 µg/m ³ | SO ₂ µg/m ³ | NO ₂ µg/m ³ |
| CCIII. | CCIV. | CCV. | CCVI. | CCVII. | CCVIII. |
| CCIX. | CCX. | CCXI. | CCXII. | CCXIII. | CCXIV. |
| CCXV. | CCXVI. | CCXVII. | CCXVIII. | CCXIX. | CCXX. |

| Site No. | Date of Testing | Site Location | Parameters (Monitoring Results) | | |
|-----------|-----------------|---------------|---------------------------------|--------------------------------------|--------------------------------------|
| | | | PM10 µg/m ³ | SO ₂ µg/m ³ | NO ₂ µg/m ³ |
| CCXXI. | CCXXII. | CCXXIII. | CCXXIV. | CCXXV. | CCXXVI. |
| CCXXVII. | CCXXVIII. | CCXXIX. | CCXXX. | CCXXXI. | CCXXXII. |
| CCXXXIII. | CCXXXIV. | CCXXXV. | CCXXXVI. | CCXXXVII. | CCXXXVIII. |

Water Quality Results

| Site No. | Date of Sampling | Site Location | Parameters (Government Standards) | | | | | |
|----------|------------------|---------------|-----------------------------------|--------------------------------------|----------|----------|---------|---------|
| | | | pH | Conductivity $\mu\text{S}/\text{cm}$ | BOD mg/L | TSS mg/L | TN mg/L | TP mg/L |
| CCXXXI | CCXL. | CCXLI. | CCXL | CCXLIII. | CCXL | CCXL | CCXL | CCXL |
| CCXLVIII | CCXLIX. | CCL. | CCL | CCLII. | CCLIII | CCLIV | CCLV | CCLV |
| CCLVII. | CCLVIII. | CCLIX. | CCL | CCLXI. | CCLX | CCLX | CCLX | CCLX |

| Site No. | Date of Sampling | Site Location | Parameters (Monitoring Results) | | | | | |
|----------|------------------|---------------|---------------------------------|--------------------------------------|----------|----------|---------|---------|
| | | | pH | Conductivity $\mu\text{S}/\text{cm}$ | BOD mg/L | TSS mg/L | TN mg/L | TP mg/L |
| CCLXVI. | CCLXVII. | CCLXVIII. | CCL | CCLXX. | CCLX | CCLX | CCLX | CCLX |
| CCLXXV | CCLXXVI. | CCLXXVII. | CCL | CCLXXIX. | CCLX | CCLX | CCLX | CCLX |
| CCLXXX | CCLXXXV. | CCLXXXVI. | CCL | CCLXXXVII | CCLX | CCXC | CCXC | CCXC |

Noise Quality Results

| Site No. | Date of Testing | Site Location | LA _{eq} (dBA) (Government Standard) | |
|-----------|-----------------|---------------|--|------------|
| | | | Day Time | Night Time |
| CCXCIII. | CCXCIV. | CCXCV. | CCXCVI. | CCXCVII. |
| CCXCVIII. | CCXCIX. | CCC. | CCCI. | CCCII. |

| Site No. | Date of Testing | Site Location | LA _{eq} (dBA) (Monitoring Results) | |
|----------|-----------------|---------------|---|------------|
| | | | Day Time | Night Time |
| CCCIII. | CCCIV. | CCCV. | CCCVI. | CCCVII. |
| CCCVIII. | CCCIX. | CCCX. | CCCXI. | CCCXII. |

VII. SUMMARY OF KEY ISSUES AND REMEDIAL ACTIONS

- Summary of follow up time-bound actions to be taken within a set timeframe.

VIII. APPENDIXES

- Photos
- Summary of consultations
- Copies of environmental clearances and permits
- Sample of environmental site inspection report
- Other

**APPENDIX – 10
SAMPLE ENVIRONMENTAL SITE INSPECTION REPORT FORM**

Project Name _____
Contract Number _____

NAME: _____

DATE: _____

TITLE: _____

DMA: _____

LOCATION: _____

GROUP: _____

WEATHER CONDITION: _____

INITIAL _____

SITE _____

CONDITION: _____

CONCLUDING SITE CONDITION:

Satisfactory _____ Unsatisfactory _____ Incident _____ Resolved _____
Unresolved _____

INCIDENT:

Nature of incident: _____

Intervention Steps: _____

Incident Issues

Resolution

| | | |
|------------------------------|-------------------|--|
| Project Activity Stage | Survey | |
| | Design | |
| | Implementation | |
| | Pre-Commissioning | |
| | Guarantee Period | |

Inspection

| | |
|----------------------|-------------------------|
| Emissions | Waste Minimization |
| Air Quality | Reuse and Recycling |
| Noise pollution | Dust and Litter Control |
| Hazardous Substances | Trees and Vegetation |

Site Restored to Original Condition Yes No

Signature

Sign off



Name
Position

Name
Position

APPENDIX - 11
DETAILS OF PUBLIC CONSULTATIONS

Details of stakeholder consultations was held on 21 January, 2018
Venue : Kajamalai community hall, Kajamalai OHT, Trichy

Question raised and answers provided during consultations

1. Jeya Raj.N,Teacher ,KK.Nagar

| S.No | Questions | Answers |
|------|---|---|
| 1 | scheme to has to be finished within stipulated time | Corporation will institute a Project Management Consultancy for this Phase –III scheme. So Corporation and PMC will closely monitor the works and will complete the works within stipulated period. (3 Years). |

2. J.Pathmavadhi,Arasu Colony.

| S.No | Questions | Answers |
|------|---|--|
| 1 | Awaiting for this sewerage scheme for the long periods and kindly finish the works at the earliest and reduce disturbance of local residents while executing the works. | While execution of works , the traffic diversion and safety measures (i.e) keeping Barricading system will be considered to minimize the disturbance to local residents. |

3. A.Abdul Mohamed, Rajiv Gandhi Nagar, Edamalai Patty pudur,

| S.No | Questions | Answers |
|------|---|---|
| 1 | During construction period, kindly consider the water supply line. Without disturbing the utility like water supply, telephone cable , execute the works. | Before starting the works , the contractor will do trial pits to assess the existing utilities (i.e.,) water supply line, telephone cables etc., Accordingly contractor will shift the utilities. |

4. P.Andhoni samy,Vasanth Nagar , Karumandapam,Trichy

| S.No | Questions | Answers |
|------|---|--|
| 1 | Kindly restore the road, once execution of works gets over. | After hydraulic test of the laid pipe line, the excavated trench will be closed immediately by contractor. |
| 2 | During construction period, kindly consider the water supply line. Without disturbing the utility like water supply, telephone cable , execute the works. | Before starting the works , the contractor will do trial pits to assess the existing utilities (i.e.,) water supply line, telephone cables etc. Accordingly contractor will shift the utilities. |

5. Dr.G.Gurumoorthy , President ,Anbu Nagar, Crawford

| S.No | Questions | Answers |
|------|--|---|
| 1 | New roads have to be laid after the drainage scheme. | After hydraulic test of the laid pipe line, the excavated trench will be closed immediately by contractor. And the cutting portion of the road will be restored by CC road. |

6. Ku.Kannan, Associate professor, KK Nagar

| S.No | Questions | Answers |
|------|---|---|
| 1 | scheme to has to be finished within stipulated time | Corporation will institute a Project Management Consultancy for this Phase –III scheme. So Corporation and PMC will closely monitor the works and will complete the works within stipulated period. (3 Years). |

7. A.Thangavelu,Anbu Nagar, Kirapatti

| S.No | Questions | Answers |
|------|--|---|
| 1 | Please confirm whether Anbu nagar has included under UGSS phase -III scheme. | Yes . Anbu nagar area is included in this scheme. |
| 2 | Our area is low lying area, so rainy season the sewage water and rain will be stagnated. So kindly resolve the problems. | Once scheme executed the works, the sewage will be diverted into pumping station at Arasu Colony and will pump to STP by rely pumping station. In other scheme, the road side drain will be constructed by the corporation to divert the rain water to the existing channel or water bodies. |

8. PV. Dhanraj, United welfare association, Karumandapam

| S.No | Questions | Answers |
|------|--|------------------------------------|
| 1 | Please confirm whether Vasanth Nagar,Jeya nagar extension has included under UGSS phase -III scheme. | Yes it is included in this scheme. |

9. M. Anbazgan,JK nagar

| S.No | Questions | Answers |
|------|---|---|
| 1 | scheme to has to be finished within stipulated time | Corporation will institute a Project Management Consultancy for this Phase –III scheme. So Corporation and PMC will closely monitor the works and will complete the works within stipulated period. (3 Years). |
| 2 | Sewage Treatment Plant has to locate faraway from resident areas. | The STP is located away from the local resident area and which is already considered in Phase -II. |

10. K . Vijayakumar , sakthi Nagar, Karumandapam

| S.No | Questions | Answers |
|------|---|---|
| 1 | the pipe line connection , from outlet of building to Compound wall (inside premises) has to consider under contract. | In Phase –III scheme also, inside premises pipe line (HSC) will be laid by the contractor . 264. |
| 2 | Future expansion area also has to be considered in this Phase –III. | The overall sewerage master plan including detail design is kept ready . When-ever the population density criteria will match will local population (100 Nos/hectare), the sewage line will be laid |

11 P. Pudhiyanayagam, Renga Nagar

| S.No | Questions | Answers |
|------|--|--|
| 1 | The scheme board has to keep in the street . In Board , the contractor Name , phone number and respective wards official number from TCC has to mention. | Will do necessary action in this regard. |
| 2 | Sewage pumping station has to locate faraway from resident area. | Most of the cases , the SPS is proposed at remote areas only. Due to land constraint, SPS -11 and 12 only located in the Resident area, the odor control device will be installed to control odor issues . 265. |

12 S. Chin ayan, Stalin Nagar, E.Pudur

| S.No | Questions | Answers |
|------|---|--|
| 1 | Without disturbing the local resident , works has to be done | While execution , the traffic diversion and safety measures like keeping Barricading system will consider to minimize the disturbance of local residents. 266. |
| 2 | Once pipe line works has over, the excavated trench in the road has to be closed. | After hydraulic test of the laid pipe line, the excavated trench will be closed immediately by contractor. |
| 3 | scheme to has to be finished within stipulated time | Corporation arranging Project Management Consultancy for this Phase –III scheme. So Corporation and PMC will closely monitor the works and will complete within period (3 Years). |
| 4 | The road restoration has to finish once works has finished and the manhole cover has to be leveled with road surface level. | Contractor will do similar way and PMC and Corporation will monitor road restoration works also. |

14. Hari hararaju.S , TSN avenue ,KK Nagar

| S.No | Questions | Answers |
|------|---|--|
| 1 | What is the execution period and operation and maintenance period | The execution period is 3 years. 267. |
| 2 | The scheme board has to keep in the street. In Board, the contractor Name, phone number and respective wards official number from TCC has to mention. | Will do necessary action in this regard. |
| 3 | While road restoration, the road level should not increase with existing road level. | While doing road restoration works , the road level will be leveled with existing road level. Corporation and PMC will monitor the works |

15 Jeyabalan, Renga Nagar

| S.No | Questions | Answers |
|------|--|---|
| 1 | After construction of manholes, the top of the cover to be leveled with existing road level. | Noted . Always manhole cover top level will be leveled with existing road level . 268. |

16 G. Meenachi sundram, Viswas Nagar ,Karumandapam

| S.No | Questions | Answers |
|------|---|--|
| 1 | Our area is low lying area, so rainy season the sewage water and rain used to stagnate. So kindly resolve the problems. | If it is low lying area, the lifting station is proposed to pump the collected sewage into ridge manhole or pumping station by pumping main . so sewage stagnation will not be there in the low-lying areas. |

17 S.Kalimuthu, JK nagar, Kajamalai

| S.No | Questions | Answers |
|------|--|------------------------------------|
| 1 | Please confirm whether JK nagar, -I and II ,Thirumurugan, Lurdhu Nagar, Mohamed Nagar has included under UGSS phase -III scheme. | Yes it is included in this scheme. |

18 A. Kalainesan, JK nagar, Kajamalai

| S.No | Questions | Answers |
|------|--|---|
| 1 | Wherever the SPSs are located near to residential areas, . the odor should not come-out from the sewage pumping station. | Odor control device has proposed to control the odor |
| 2 | Kindly select qualified contractor. The contractor should not give sub-contract. | Both experience-wise and financial-wise qualified contractor only will consider for this works. 269. |

News Paper clippings of 22 January 2018 about public consultations

திருச்சி. 22.1.2018

16 வார்டுகளில் 32 ஆயிரம் வீடுகளுக்கு புதை சாக்கடை குழாய் இணைப்புகள்

திருச்சி. ஜன. 21: திருச்சி மாநகராட்சிக்கு உட்பட்ட 16 வார்டுகளில் ரூ.264.12 கோடி மதிப்பில் செயல்படுத்தப்படும் புதை சாக்கடைத் திட்டம் பகுதி-3 இன் கீழ், 32 ஆயிரம் வீடுகளுக்கு புதை சாக்கடை குழாய் இணைப்புகள் வழங்கப்படும் என மாநகராட்சி ஆணையர் ந.ரவிச்சந்திரன் தெரிவித்தார்.

மாநகராட்சியின் 16 வார்டுகளில் விடுபட்ட பகுதிகளுக்கு புதை சாக்கடைத் திட்டம் (பகுதி-3) கற்றுச்சுழல் தாக்க மதிப்பீடு தொடர்பான பொதுமக்கள் மற்றும் குடியிருப்பு நலச்சங்கத்தினருடனான கலந்தாய்வுக் கூட்டம், காஜாமலை சமுதாயக் கூட்டத்தில் ஞாயிற்றுக்கிழமை நடைபெற்றது. இக்கூட்டத்துக்கு தலைமை வகித்து, மாநகராட்சி ஆணையர் மேலும் பேசியது:

திருச்சி மாநகராட்சி வார்டு எண்கள் 31,32,35,36, 38,42,43,45, 52,53,60,63 ஆகியவற்றில் பகுதியாகவும், வார்டு எண்கள் 37,39, 40,41-இல் முழுமையாகவும் புதை வடிகால் திட்டம் அமைக்கப்படவுள்ளது.

மத்திய பொது சுகாதார மற்றும் சுற்றுச்சூழல் பொறியியல் நிறுவன விதிமுறைகளின்படி புதை வடிகால் திட்டம் ரூ.264.12 கோடியில் தயா

திருச்சி மாநகராட்சி ஆணையர் தகவல்



பொதுமக்களுடனான கலந்தாய்வுக் கூட்டத்தில் பேசிய திருச்சி மாநகராட்சி ஆணையர் ந.ரவிச்சந்திரன்.

ரிக்கப்பட்டு, தமிழ்நாடு நகர்ப்புற நிதி மற்றும் உள் சுட்டமைப்புமேம்பாட்டுக் கழகம், தமிழ்நாடு நகர்ப்புற உள்சுட்டமைப்பு நிதி சேவைகள் விமீடெட், ஆசிய வளர்ச்சி வங்கி ஆகியவற்றின் நிதியுதவி மற்றும் மாநகராட்சி பங்களிப்புடன் அம்ருத் திட்டத்தில் இத்திட்டம் செயல்படுத்தப்பட உள்ளது.

கழிவுநீர்க் குழாயின் நீளம் 331 கி.மீ. இதில் 7 இடங்களில் நீர் உந்தும் நிலையங்கள் அமைக்கப்படும்.

11 இடங்களில் லிப்டுங் நிலையம் அமைக்கப்படும். 32,000 வீடுகளுக்கு புதை சாக்கடைக் குழாய் இணைப்புகள் வழங்கப்படும் என்றார்.

இக்கூட்டத்தில், செயற்பொறியாளர்கள் எஸ்.கண்ணன், பி. செல்வம், உதவி ஆணையர்கள் தயாநிதி, பிரபாகரன், உதவிச் செயற்பொறியாளர்கள், குடியிருப்பு நலச்சங்க நிர்வாகிகள் உட்பட பலர் கலந்து கொண்டனர்.

Summary of Translation: Information on UGSS subproject and announcement for public consultations

THE TIMES OF INDIA - 22.1.2018

Corporation gets nod for phase-3 UGD works

HURDLES CLEARED

Administrative sanction is expected in 15 days

UGD Phase-2 | Phase-3

- > Wards covered in full | 5 | 4
- > Wards covered partially | 20 | 12
- > Length of UGD pipes | 319 km | 331 km
- > Pumping stations | 7 | 7
- > Houses covered | 43,417 | 32,000
- > Project cost | 344 crore | 265 crore
- > Work to begin by | June | July



A resident speaking at public hearing

Estimated deposit fee for households/commercial establishments in Phase-3 | 6,000- 10,000

TIMES NEWS NETWORK

Trichy: All preliminary hurdles to implement phase-3 of the under-ground drainage system (UGD) covering 16 wards of the civic body, mostly remote wards, have been cleared by the Trichy Corporation. This phase is considered to be the longest among the three phases of in terms of area covered.

Addressing a public hearing meeting on Sunday at Khajamalai, held ahead of commencing works, Trichy Corporation officials informed residents that administrative sanction for commencing phase-3 is expected to be obtained in 15 days, following which the ground works have been scheduled to commence by July 2018.

Evacuating drainage and sewage has been a chronic trouble for the city despite being coveted as the cleanest city in the state. Pollution in the delta's lifeline Cauvery river and its distributaries have been going on with or without the knowledge of the district administration for which absence of UGD was cited as reason.

As part of addressing the issue, in 2013, parts of Srirangam was provided with UGD in phase-1 as part of a pan city project covering the entire city with efficient drainage system in a phased manner. Subsequently, in November 2017, in phase-2, 25 wards including

20 wards will be partially covered, for which work is expected to commence by June 2018.

Even before the commencement of works for phase-2, at an estimated cost of ₹344 crore, phase-3 has been given approval by the Commissionerate of Municipal Administration at an estimated outlay of ₹265 crore. Ahead of implementing the project, the corporation conducted a public meeting with residents of the 16 wards covering Khajamalai, Sundarraj Nagar, K Pudur and Panchapur.

Welcoming the phase-3, S Ganapathy, a resident of ward 39, said, "We were assured that the UGD works in our area would commence by early 2017, but the assurance was not kept. We expect the under-ground drainage works to commence without delay this time."

The 331km-long pipeline for phase-3 would cover 32,000 households with seven pumping stations pushing the drainage to the Panchapur waste water treatment plant. "Within a short span, Trichy Corporation has managed to get approval for implementing phase-2 and phase-3 of UGD. Households have been selected based on population density."

The Corporation sought public cooperation to implement the project by paying the deposit for UGD which will be announced shortly.

சுனகராண் - 22.1.2018

மாநகராட்சியில் விடுபட்ட 16 வார்டுகளில்

ரூ.264.12 கோடியில் பாதாள சாக்கடை திட்டம்

32,000 வீடுகள் பயன்பெறும்

திருச்சி, ஜன.22: மாநகராட்சியில் ரூ.264.12 கோடி மதிப்பீட்டில் 16 வார்டுகளில் புதிய பாதாள சாக்கடை திட்டம் செயல்படுத்துவது தொடர்பாக பொதுமக்களுடன் கலந்தாய்வு கூட்டம் நடந்தது.

திருச்சி மாநகராட்சிக்குட்பட்ட பகுதிகளில் ரூ.264.12 கோடி மதிப்பீட்டில் 16 வார்டுகளில் விடுபட்ட பகுதிகளுக்கு புதிதாக பாதாள சாக்கடை (பகுதி 3) திட்டத்தின் சுற்றுச்சூழல் தாக்க மதிப்பீடு தொடர்பான பொதுமக்கள் மற்றும் நலச்சங்கத்தினர்களுடன் கலந்தாய்வு கூட்டம் காஜாமலை சமுதாய கூடத்தில் நேற்று நடந்தது. மாநகராட்சி ஆணையர் ரவிச்சந்திரன் தலைமை வகித்து தெரிவித்ததாவது:

திருச்சி மாநகராட்சிக்குட்பட்ட பகுதிகளில் பாதாள சாக்கடை பகுதி-3 திட்டம் விடுபட்ட பகுதிகளான வார்டு எண் 31, 32, 35, 36, 38, 42, 43, 45, 52, 53, 60, 63, 37, 39, 40, 41 ஆகிய 16 வார்டு பகுதிகளுக்கு புதைவடிகால் அமைக்க வழிவகை செய்யப்பட்டுள்ளது. மத்திய பொதுக்காரமற்றும் சுற்றுச்சூழல் பொறியியல் நிறுவன விதிமுறைகளின் படி புதைவடிகால் திட்டம் ரூ. 264.12 கோடி மதிப்பீட்டில் திட்டம் தயாரிக்கப்பட்டு தமிழ்நாடு நகர்ப்புற நிதி மற்றும் உட்கட்டமைப்பு மேம்பாட்டு கழகம், தமிழ்நாடு நகர்ப்புற உட்கட்டமைப்பு நிதி சேவைகள் லிமிடெட், ஆசிய வளர்ச்சி நிதி வங்கி ஆகிய நிறுவனங்களின் நிதி

உதவியின்றி மாநகராட்சி பங்களிப்புடன் அம்சுத்திட்டத்தின் நடைமுறைப்படுத்தப்படவுள்ளது. அதன் படி பாதாள சாக்கடை திட்டத்தில் கழிவுநீர் குழாயின் நீளம் 331 கி.மீ, பிரதான கழிவு நீர் உந்துக் குழாய் நீளம் 21.50 கி.மீ, பம்பிங் ஸ்டேஷன் 7, லிப்டிங் ஸ்டேஷன் 11, இணைப்புகள் வழங்கப்படும் வீடுகளின் எண்ணிக்கை 32,000 ஆகும். இந்த திட்டத்திற்கு பஞ்சப்பூர் கழிவுநீர் சுத்திகரிப்பு நிலையத்தை மேம்படுத்தி பயன்படுத்தும் வகையில் வழிவகை செய்யப்பட்டுள்ளது. இவ்வாறு அவர் பேசினார்.

மாநகராட்சி உதவி ஆணையர் தயாநிதி, குடியிருப்பு நலசங்கம் உறுப்பினர்கள் மற்றும் பொதுமக்கள் கலந்து கொண்டனர்.

Summary of Translation: Information on UGSS Subproject and announcement for public consultations

சூனா லைன். 22.1.2018

32 ஆயிரம் வீடுகளுக்கு பாதாள சாக்கடை இணைப்பு

புதிதாக தருகிறது மாநகராட்சி

திருச்சி. ஜன. 22-

திருச்சி மாநகராட்சிப் பகுதிகளில் 32 ஆயிரம் வீடுகளுக்கு ரூ.264.12 கோடி மதிப்பில் பாதாள சாக்கடை இணைப்புகள் வழங்கப்பட உள்ளன.

திருச்சி மாநகராட்சியில் 16 வார்டுகளில் விடுபட்ட பகுதிகளுக்கு பாதாள சாக்கடை

கடை திட்டம்-3 சுற்றுச்சூழல் தாக்கமதிப்பீடு தொடர்பான பொதுமக்கள் மற்றும் நல சங்கத்தினருடன் கலந்தாய்வு கூட்டம் காணாமலை சமுதாய கூட்டத்தில் நேற்று நடந்தது.

கூட்டத்தில் கமிஷனர் ரவிச்சந்திரன் கலந்து கொண்டு பேசியதாவது:

"திருச்சி மாநகராட்சியில்

விடுபட்ட பகுதிகளில் பாதாள சாக்கடை திட்டம் செயல்படுத்த முடிவு செய்யப்பட்டு 16 வார்டுகளில் பணிகள் துவக்கப்பட்ட உள்ளது. மத்திய பொது ககாதார மற்றும் சுற்றுச்சூழல் பொறியியல் நிறுவன விதிகளின்படி பாதாள சாக்கடை திட்டம் ரூ.264.12 கோடி மதிப்பீட்டில் தயாரிக்கப்பட்டு தமிழ்நாடு நகர்ப்புற உட்கட்டமைப்பு நிதி சேவைகள் லிமிடெட், ஆசிய

நிதி வளர்ச்சி வங்கி ஆகிய நிறுவனங்களின் உதவியின் கீழ் மாநகராட்சி பங்களிப்புடன் அம்சூத் திட்டத்தில் செயல்படுத்தப்பட உள்ளது.

இத்திட்டத்தில் கழிவுநீர் குழாயின் நீளம் 831 கி.மீ., பிரதான கழிவுநீர் உந்து குழாயின் நீளம் 21.50 கி.மீ., பம்பிங்ஸ்டேஷன், லிப்டிங் ஸ்டேஷன்-11, 32 ஆயிரம் வீடுகளுக்கு இணைப்புகள் வழங்கப்பட உள்ளது. இந்த திட்டத்துக்காக பஞ்சப்பூர்

கழிவுநீர் சுத்திகரிப்பு நிலையத்தை மேம்படுத்தி பயன்படுத்தும் வகையில் ஏற்பாடு செய்யப்பட்டுள்ளது" என்றார்.

கூட்டத்தில் குடியிருப்போர் சங்க நிர்வாகிகள், பொதுமக்கள் கருத்துக்களை தெரிவித்தனர். செயற்பொறியாளர்கள் கண்ணன், செல்வம், உதவி கமிஷனர்கள் தயாநிதி, பிரபாகரன் மற்றும் பலர் கலந்து கொண்டனர்.

Summary of Translation: Information on UGSS subproject and announcement for public consultations

Work on third phase of UG drainage project to begin by July

C. JAISANKAR
TIRUCHI

The administrative sanction for the third phase of the underground drainage system to extend to areas in 16 wards here is expected within 15 days, according to N. Ravichandran, Special Officer-cum-Commissioner, Tiruchi Corporation.

The project, sanctioned at a cost of ₹264.12 crore under the Atal Mission for Rejuvenation and Urban Transformation (AMRUT), will be extended to four wards fully and uncovered areas in 12 wards.

Participating in a public hearing to assess the environmental impact of the phase-III of the project held at Khajamalai here on Sunday, Mr. Ravichandran said that share of the Central and State governments for the



Residents airing their opinion at a public hearing in Tiruchi on Sunday. • PHOTO: B.VELANKANNI RAJ

project would be ₹153 crore and ₹52 crore respectively.

The scheme would be implemented with the financial assistance of Tamil Nadu Urban Infrastructure Financial Services Limited (TNUIFSL), Tamil Nadu Urban Financial Infrastructure Development Corporation (TUFIDCO) and the Asian Development Bank

(ADB).

The State government was expected to issue administrative order shortly. Tenders for executing the project would be floated within a few

weeks. Execution of the project would begin in July.

He said that tender for executing the second phase of the underground drainage system had already been

floated. The project aimed at providing underground sewer lines to five wards fully and omitted areas in 20 other wards in the city would begin in June. Both the phases would be implemented simultaneously.

Formation of sewage line for 331 km and construction of pumping mains for 21.50 km were part of the phase-III of the project.

The project would have seven pumping stations at Indira Nagar, Lurdu Nagar, Kulavaipatti, Muthukumarasamy Nagar, Panjapur, Arasu Colony and Natchathira Nagar. There would be seven lifting stations.

Four wards - 37, 39, 40 and 41- would be fully covered in phase-III. Twelve wards - 31, 32, 35, 36, 38, 42, 43, 45, 52, 53, 60 and 63 would be partially covered.

CIVIC SCENE

List of Participant

TIRUCHIRAPPALLI CITY CORPORATION
 PROVIDING UNDER GROUND SEWERAGE SCHEME UNDER
 AMRUT (PHASE III)
 ENVIRONMENTAL IMPACT ASSESSMENT WITH STAKE HOLDER'S

DATE: 21.01.2018
 DAY: SUNDAY

VENUE: KAJAMALAI COMMUNITY HALL,
 KAJAMALAI, TRICHY

| S.No. | NAME OF THE PARTICIPANT | ADDRESS | PHONE NO. | SIGNATURE |
|-------|-------------------------|---|--------------|------------|
| 1 | S. Srinivasan | 6, P. S. Ganapathi Street, B. Ramji Nagar, 3825-01 | 0431 2459118 | |
| 2 | M. Thirugana Sanyal | Plot 10, North Avenue Kamraj Ward 41 | 9443105283 | |
| 3 | M. Anand | No. 91, Melakollai Street, Kajamalai Trichy - 23 | 9443733510 | |
| 4 | R. JAYARAJAN | 22, Third Main St, Bengalajar Trichy - 620021 | 9443188007 | R. Jayaraj |
| 5 | M. Mohan | 14B, Koroliveri Area North Avenue, Kishinoor Society No. 1 Trichy - 21 | 9994047100 | M. M. |
| 6 | M. Ganapathy | Secretary Bharathi Municipality Ward 39 | 9187049137 | |
| 7 | A. Mohd. Mazhar | No. 7, Basanthi Minnagar, Budan ward 39 | 9443502569 | |
| 8 | C. PANDYAN | Plot no. 90 CKP Garden Polaniyapur main Road, K. K. Nagar | 9448157005 | C. Pandyan |
| 9 | S. N. MUTHUSUBRAMANIAM | Plot no. 3. CKP Garden Older Road K. K. Nagar Trichy. | 9448166184 | |
| 10 | K. Dharmodhan | 14, Reddy Nagar Madhav Pattiy. K. K. Nagar Trichy - 21 | 9362606172 | |



| S.NO. | NAME OF THE PARTICIPANT | ADDRESS | PHONE NO. | SIGNATURE |
|-------|---|---|---------------|-----------------|
| 11. | R. Basker | 185 C K p Garden olayeri via, E.B. Colony opposite Trichy - 21 | 9498156006 | R. Basker |
| 12. | Dr. Pulisainayagam | 25, III Main Road Ranga Nagar Trichy - 21 | 9443544506 | Dr. P. ... |
| 13. | M. Anurag | 119/1, Kailashanagar Nagar | 215866 | M. Anurag |
| 14. | M. S. ... | J. K. NAGAR - Nalu Sangam. | 9443016210 | M. S. ... |
| 15. | A. NEELAMATHULA | J. K. NAGAR A. ... | 9003577265 | A. Neelamathula |
| 16. | B. ... | 20, Alwar Nagar Sub Kannamudam Ward-60 | 9486265156 | B. ... |
| 17. | T. SUBRAMANIAM | 59 uoc sheet. Kishoremondi Nagar Trichy - 620029 | 9443668370 | T. Subramaniam |
| 18. | S. ... | 60 Voc. St. Kishoremondi Nagar Trichy 21. | 7708525332 | S. ... |
| 19. | S. ASATHAMBI. Advisor J.K. Nagar Welfare Assocn. | 152, J.K. Nagar Trichy - 21 | 72 00 96 0071 | S. Asathambi |
| 20. | A. KALANESAN | 101, J.K. Nagar Trichy 23 | 9944548973 | A. Kalanesan |
| 21. | S. R. Narasimha | 15/9, 13th Cross 2nd St., Sunder Nagar Trichy - 21 | 9597798417 | S. R. Narasimha |

56 திருச்சிராப்பள்ளி மாநகராட்சி



| Sl. No. | NAME OF THE PARTICIPANT | ADDRESS | PHONE NO. | SIGNATURE |
|---------|-------------------------|--|------------|-----------------|
| 22. | J. Syed Riaz Basha | No. 22, J. M. E. S. C. Colony, North Ex. 2nd Street. Trichy-21 | 9944457912 | |
| 23 | M. ABDULLA SAMI | No: 64 E. B. Colony Vazhappan Nagar, Airport | 9443672744 | M. A. Sami |
| 24. | P. MARIAPILLAI | Plot. No. 101 J. K. Phase J. K. Water (B. S. W.) | 9486060220 | |
| 25 | M. Sheikh Afroz Khan | No. 215, J. K. Nagar, Trichy - 23 Trichy - 23 | 9865216451 | |
| 26. | M. Sathya Sai | 5K Mari | 9345110488 | M. Sathya Sai |
| 27. | T. MANI | No. 4, Striram Nagar S. B. I. A. School, Airport | 9842836869 | T. Mani |
| 28 | J. GNANASEKAR | No. 206, Karunyanagar Ponnalai, Trichy-23 Ward - 31 | 9442725454 | |
| 29 | G. RAJASEKARAN | 2, Srinivasa Muttu Main Road Gurnash Nagar | 0788979910 | |
| 30 | J. John Victor | 208, Karunyanagar, Ponnalai | 9663072882 | J. |
| 31 | G. PARAMESWARAN | 121, Karunyanagar Ponnalai - 31 | 809883140 | G. Parameswaran |

திருச்சிராப்பள்ளி



மாநகராட்சி

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| S.No. | NAME OF THE PARTICIPANT | ADDRESS | PHONE NO. | SIGNATURE |
|-------|--|---|-------------|--------------------|
| 32 | N. JEYARAJ | B.A. PERIYAR HANDI NAGAR K.C. NAGAR TRICITY | 94441 04777 | <i>[Signature]</i> |
| 33 | B. Balaji | Plot no 51 J.K. Nagar | 94874 56503 | <i>[Signature]</i> |
| 34 | D. RENGARAO | Plot No: 124, VAIGAI ST, J.K. NAGAR, ESTN | 99947 97559 | <i>[Signature]</i> |
| 35 | Ku. Kannan | 7/2 Amman Nagar K.K. Nagar Tn-21 | 94439 52460 | <i>[Signature]</i> |
| 36 | D. Adhimoolam | 1, Ashwathi St, Amman Nagar Tn-21 | 94435 78106 | <i>[Signature]</i> |
| 37 | D. Madhavan | No. 60. S.R.M. Avenue West Etn K.K. Kottai, Tricity | 96885 52223 | <i>[Signature]</i> |
| 38 | C. Balakrishnan Advocate/Secy | 11/1 Stalinagar welfare Assn. | 94425 49926 | <i>[Signature]</i> |
| 39 | S. Chinnayam yoga guru 10 Stalinagar | sto - | 89034 24733 | <i>[Signature]</i> |

58 திருச்சிராப்பள்ளி மாநகராட்சி



| S.No | NAME OF THE PARTICIPANT | ADDRESS | PHONE NO. | SIGNATURE |
|----------|-------------------------|---|----------------|-------------------------|
| 40 | R. PRABHAKARAN | 107, D.K. Nagar, TRY | 9444651370 | <i>R. Prabakaran</i> |
| 41 | A.P. Rajendran | 105 J.K. Nagar II | 9443765817 | <i>A.P. Rajendran</i> |
| 42 | M. SATHYAJESLAV | 106 - J.K. Nagar II | 9578522806 | <i>M. Sathya</i> |
| 43 | P. Anbarasan | No. 103 J.K. Nagar | 9894553042 | <i>P. Anbarasan</i> |
| 44 | T.S. Sureshraj | No. 148 Anna Nagar | 75 98 27 25 20 | <i>T.S. Sureshraj</i> |
| 45 46 | N. Chinnadurai | No. 19 Anna Nagar | 94866 92931 | <i>N. Chinnadurai</i> |
| 46 | K. Adam | No. 34 Anna Nagar | 9965108766 | <i>K. Adam</i> |
| 47 | S. BHAVUDDIN | 9/21 - 3rd Range Nagar | 9443834131 | <i>S. Bhavuddin</i> |
| 48 | M. AHMAD IBRAHIM | 9/21 - 3rd Range Nagar | 9443531133 | <i>M. Ahmad Ibrahim</i> |
| 49 | S. Kalimuthu | 120, J.K. Nagar I | 8820002152 | <i>S. Kalimuthu</i> |
| 50 | R. Victor | 291, Venkateswara Nagar | 9786514832 | <i>R. Victor</i> |
| 51 | K. Ponnusamy | 159, Indira Nagar | - | <i>K. Ponnusamy</i> |
| 52 | G. SARAVAKIRANAN | President welfare 188th 5 Sri Ram Nagar Kannur Nagar Tamil - 600 | 9894716235 | <i>G. Saravakiran</i> |
| 53 | P. V. Dharmaraj | General Secretary United Welfare Society, Kannur Nagar | 9442248138 | <i>P. V. Dharmaraj</i> |
| 54 | K. VIJAYA KUMAR | 70/1, SAKTHANAGAR WARD 45 MADRAS KANNUR NAGAR TRY 1 | 9789769657 | <i>K. Vijaya Kumar</i> |



| S.No. | NAME OF THE PARTICIPANT | ADDRESS | PHONE No. | SIGNATURE. |
|-------|--------------------------|---|--------------|-------------------|
| 55 | Dr. G. Gurumohan | President, Andhra Sahitya Akademi, Mr. Crawford, RICHY-12 | 98946 80368 | |
| 56 | A. R. Anandaraman, P. n. | யுனிடென்ட் காலேஜ், திருச்சிராப்பள்ளி | 9791439067 | A. R. n. |
| 57 | B. Sasidharan | Francena colony Welfar. Sangam C. Puda | 9790747566 | B. Sa |
| 58 | Donnamis. D. Rajendran | D-12, Dimple Nagar, Sundar Nagar | 9486265335 | |
| 59 | J. சிந்திரசென் | D-13, Dimple Nagar, Sundar Nagar | 9788788526 | |
| 60 | A. CELESTINE | 9 RAJA RASAN NAGAR RICHY 21 | 9042915390 | A. Celestine |
| 61 | A. D. DAYALAN | 10 T CROSS Sundar Nagar | 9894 9894 22 | |
| 62 | J. Vijayalakshmi | சுந்தரநகர் 21.455 | 99924797797 | J. Vijayalakshmi |
| 63 | A. VETANAVARU | Andhra Nagar. | 9443483262 | |
| 64 | M. TANJULI | Andhra Nagar, Colpal | 9412772222 | |
| 65 | M. Antony Stephen | Rani meiammai ry | 9486425837 | M. Antony Stephen |
| 66 | R. J. Rajalaxmi | T. h. n. 693, Rani meiammai | 98655 96000 | |
| 67 | D. Ambudra | Devulapeta Nagar | 9486752082 | |
| 68 | G. MAJALI | R. G. NAGAR | 9756526734 | |
| 69 | A. B. SHAFIQ HUSSAIN | Rajiv Gandhi | 9443038544 | |
| 70 | A. Abdulmalik | Rajiv Gandhi | 9822668344 | |

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திருச்சிராப்பள்ளி



மாநகராட்சி

| Sr No | NAME OF THE PARTICIPANT | ADDRESS | PHONE NO | Signature |
|-------|-------------------------|---|------------|------------------|
| 72 | HARI HARARAJUS | Plot no 54, TSN Avenue, W. 35 | 9345100104 | S. Ulaganathan |
| 73 | I. MAHALINGAM | 13A - Mullaivasu Kshetrangal, Kammur | 9443124822 | Devi |
| | R Chandrasekaran | 4, Gopichandran Colony, 23 Karamnadi, Trichy | 9840097996 | Devi |
| 74 | சி. சுவாமி | 5/9 கோமுகி காலனி, R.P.F. 2906, திச்சி - 23 | 9865642674 | Devi |
| 75 | S. சத்திராஜன் | 10, பி.கே.சி. 930, அழகிநகர் - 6, திச்சி - 21 | 9945120706 | R. K. Srinivasan |
| 76 | M. சண்முகம் | 11-10, பி.கே.சி. 1109, லிபா, திச்சி - 23 | 9563551376 | M. Srinivasan |
| 77 | S. சந்திரசேகரன் | 6/1, பி.கே.சி. 602, பி.கே.சி. 602, திச்சி - 21 | 9448071111 | Devi |
| 78 | P. RAMASAMI | 5, Sathir Padakota, K.K. Nagar, Trichy - 21. | 9677391924 | P. M. Srinivasan |
| 80 | R. PUSHPARAJ. | Nehru Nagar, Kammur | 9944009715 | Devi |
| 81 | C. Shanmugavel | 2, Sathir Nagar, Widiyapur, Thiruvannamalai, Kammur | 944562583 | Devi |
| 82 | M. Prabhakaran | 43, Suresh Colony, E. Puthur | 9994318899 | M. Prabhakaran |

Photographs of Stakeholder consultations held on 21 January 2018



Details of Public consultations

Details of stakeholder consultations was held on 08 January, 2019
Venue : Edaimalaipatti Pudur Government higher secondary school, Edaimalaipatti
Pudur Trichy

Question raised and answers provided during consultations

1. Mr.Soundararajan, Arasu Colony

| S.No | Questions | Answers |
|------|--|--|
| 1 | This area is completely residential area, hence do not construct the sewage pumping stations at this location. | While constructing the pumping station, the environmental remediation measures i.e odor control , planting greeneries all-around compound wall etc will be considered. |

2. Mr. Santhana packiam, Arasu Colony

| S.No | Questions | Answers |
|------|--|--|
| 1 | Parks has to construct at this location. | After detailed study of design and site visits ,the technical consultants and corporation engineering officials has decided and concluded that locating pumping station at this location is appropriate and collecting more areas coverage sewage into this pumping station. |

3. Mr. Saveri Muthu , Arasu Colony

| S.No | Questions | Answers |
|------|---|---|
| 1 | DTCP has approved this plot for constructing /developing park . Hence, change the location of pumping station from this location. | Due to technical reasons, this location has selected for locating pumping stations . moreover the land was handed over to Corporation . |

4. Johnson, Arasu Colony

| S.No | Questions | Answers |
|------|--|---|
| 1 | The width of road is very narrow in this locations, hence construction vehicles movement is not easy to move inside streets. | construction purpose, heavy vehicle may not required to come at this site. Light weight vehicles can easily enter into this areas streets roads. |

5. Mr. Martin , Arasu Colony

| S.No | Questions | Answers |
|------|--|--|
| 1 | Kindy change the location of pumping station from this location. | Alternative site is under feasible studies. But that land also coming near to pond , hence searching other land. |

6. Mrs. Padmavathi, Arasu colony

| S.No | Questions | Answers |
|------|--|--|
| 1 | Kindy change the location of pumping station from this location. | Alternative site is under feasible study. But that land also coming near to pond , hence searching other land. |

7. Mr. Muthu Selvam , Ex. Councilor, Arasu colony

| S.No | Questions | Answers |
|------|-----------|---------|
|------|-----------|---------|

VASS - Phase - 3 - Rs. 314.12 a.
SPS-11 (Arasa Colony)

புது காவிரி கட்டி கால்வாய்

Attendance sheet.

| S.No. | Name | Address with Mobile no. | Signature |
|-------|--|----------------------------------|----------------------|
| 1 | P. சரீசுமாரி | பு. சரீசுமாரி வீடு 9655167751 | P. Sarisumari |
| 2 | P. Rajaiswari | | P. Rajaiswari |
| 3 | J. பத்மா வர்தி | | J. Padma Varthi |
| 4 | R. Usha | | R. Usha (9358952974) |
| 5 | J. Renuka | | Reza 9942770807 |
| 6 | S. Sebastyanika | | S. Sebastyanika |
| 7 | J. Josephine | | J. Josephine |
| 8 | M. Jothi | | M. Jothi |
| 9 | D. RAJASEKAR | | D. Rajasekar |
| 10 | D. Marthi - 2c - Porras | | D. Marthi |
| 11 | B. Sasitharam | | B. Sasitharam |
| 12 | S. சந்திரா | | S. Chandira |
| 13 | S. Dinakaran (புது காவிரி கால்வாய்) - 10-5-60 புது காவிரி கால்வாய் கட்டிடம் | | S. Dinakaran |
| 14 | V. Harihara Sathan | | V. Harihara Sathan |
| 15 | P. Balachandrase | | P. Balachandrase |
| 16 | K. ராஜ் | | K. Raj |
| 17 | K. ராஜ் | | K. Raj |
| 18 | R. Vasantha | | R. Vasantha |
| 19 | S. சந்திரா காவிரி | | S. Chandira |

| S no | Name & Address with Mobile no. | Signature |
|------|--|-----------------------|
| 21 | S. Jaganmohan Reddy | S. Jaganmohan Reddy |
| 22 | K. P. Jagan | K. P. Jagan |
| 23 | M. Neelgagan | M. Neelgagan |
| 24 | M. Siddhathan | M. Siddhathan |
| 25 | K. Nanthakumar | K. Nanthakumar |
| 26 | B. Dhakeshina Neerthy | B. Dhakeshina Neerthy |
| 27 | S. Rajagopal | S. Rajagopal |
| 28 | A. T. Jagan | A. T. Jagan |
| 29 | A. Kalim Khan | A. Kalim Khan |
| 30 | A. V. Vasan | A. V. Vasan |
| 31 | A. ELANGO | A. ELANGO |
| 32 | M. Ganapathy | M. Ganapathy |
| 33 | J. Barunathi | J. Barunathi |
| 34 | LA. KANNAN BJP 9443143197 | LA. KANNAN |
| 35 | S. Devarajam 1378 9894697337 | S. Devarajam |
| 36 | K. Palanikumar 9789182164 | K. Palanikumar |
| 37 | A. T. Fernando | A. T. Fernando |
| 38 | Z. Masim Jagan 944374088 | Z. Masim Jagan |
| 39 | G. M. C. S. S. S. S. 9444722608 | G. M. C. S. S. S. S. |
| 40 | M. Vainayapuram 9443733497 | M. Vainayapuram |
| 41 | M. MOHAMED FAROOK - Congress - 98426-56184 | M. MOHAMED FAROOK |
| 42 | J. S. S. S. S. S. S. 944284091 | J. S. S. S. S. S. S. |

Photographs of Stakeholder consultations held on 8 January 2019



AGENDA

முதலகட்டம் திட்டம் AMRUT (Phase III) திட்டத்தின் கீழ் ரூ.312.14.00 கோடி மதிப்பீட்டில் செயல்படுத்த அரசு ஆணை எண். 05 நகராட்சி நிர்வாக மற்றும் குடிநீர் வழங்கல் துறை (MC 2) நளர். 22.01.2018 ல் நிர்வாக அனுமதி ஒப்புதல் அளிக்கப்பட்டதுமேலும் திட்டத்திற்கு அளவளவில் நிதி ஆதாரம் விவரம் கீழ்வருமாறு

| Rs in Crores | | | | | |
|-------------------------|-----------|-----------|-----------|--------------------|------------|
| Sanctioned Project Cost | GOI Share | GTN Share | ULB Share | ADB / TNUFISL Loan | O & M Cost |
| 312.14 | 132.06 | 52.82 | 31.21 | .96.05 | - |

அடல் நகரிய சீர்திருத்தம் மற்றும் வளர்ச்சி இயக்கம் திட்டத்தின் திருச்சிநகர்ப்பள்ளி மாநகராட்சியின் பகுதி 3 முதலகட்டம் திட்டத்திற்காக மேலும் நிதி ஆதாரம் நிர்வாக அனுமதி பெறப்பட்டு பணிகள் மேற்கொள்ளப்பட உள்ளது. இத்திட்டத்தில் அடல்மும் அரசு காலனி பகுதியில் வழிவழி உந்து நினைவம் அளவீட்டு தொடர்பாக பொதுமக்களிடையே கருத்து கேட்பு கூட்டம் இன்று 08.01.2019 குற்பகல் 11.00 மணி அளவில் எய்தவெட்டிய புரூர் அரசு உயர்நிலைப் பள்ளி வளாகத்தில் நகர்ப்பொறியாளர், உதவி செயற்பொறியாளர், உதவி பொறியாளர் மற்றும் இயநிலைப் பொறியாளர் ஆகியோர் முன்னிலையில் நடைபெற்றது.

அரசு காலனி குடியிருப்போர் நலச்செயல் பிரதிநிதிகள் மற்றும் அந்த பகுதியில் வாழும் மக்கள், பிரதேசிகள காலனி பொதுமக்கள், காலியப்பர் கோவில் தெரு, பிள்ளையார் கோவில் தெரு, வடக்கு மற்றும் தெற்கு மேட்டு தெரு, கோல்மங்கலம் ஆகிய பகுதிகளில் வசிக்கும் மக்கள் பிரதிநிதிகள் மற்றும் அரசியல் சார்த்த முன்னணி மாற்ற உறுப்பினர்கள் என பொத்தம் 42 நபர்கள் கருத்து கோண்டனர்.

| | | |
|----|---|--|
| I | 1 | முதலகட்டம் திட்டம் (AMRUT) கோள்வெருக்கு திருச்சிநகர்ப்பள்ளி மாநகராட்சியிலிருந்து திட்ட விவரம் வழிவழி |
| | 1 | S.Amudavalli, BE, City Engineer(i/c),- Tiruchirappalli City Corporation. |
| II | | முதலகட்டம் திட்டப் பகுதிகளில் உள்ள ஆக்கிரமிப்பு பற்றிய கோள்வெரு பதில் வழங்கியவர்கள் |
| | 1 | S.Amudavalli, BE, City Engineer(i/c),- Tiruchirappalli City Corporation. |
| | 2 | K.S.Balasubramanian Assistant Executive Engineer, K-abishekapuram Zone |

| !!! | வருகை தந்த மக்கள் நல முக்கிய பிரமுகர்கள் |
|-----|---|
| 1 | Thiru. Santhanapakkiam, Arasu Colony Mobile No. 9655167751 |
| 2 | Thiru.B.Harhara Sudhan, Arasu Colony, Mobile No. 9944151002 |
| 3 | Tmt.R.Usha, Arasu Colony, 7358952974 |
| 4 | Tmt.T.Renuka, Arasu Colony, 994277080 |
| 5 | Thiru.M.Jeeva Arasu Colony 9364113503 |
| 6 | Thiru.Kannan, Arasu Colony, 94431 43197 |
| 7 | Thri.Devandhran, ARasu Colony, 98946 97337 |
| 8 | Thiru.K.Palanisamy Arasu Colony, 9789182164 |
| 9 | Thiru.Jeasu Raj, Arasu Colony, 94447 22603 |
| 10 | Thiru.Vaiyapuri, Arasu Colony, 94436 33497 |
| 11 | Thiru.Mohamed Farrok, ARasu Colony, 98426 56184 |
| 12 | Thiru.J.Iruthiyaraj ARasu Colony, 94421 84291 |
| 13 | Thiru.R.Palaniyandi, ARasu colony, 81100 13339 |
| 14 | Thiru.D.Palaniyandi, Arasu Colony 9655949527 |

| !!! | வருகை தந்த மக்கள் நல முக்கிய பிரமுகர்கள் |
|-----|---|
| 1 | Thiru. Santhanapakkiam, Arasu Colony Mobile No. 9655167751 |
| 2 | Thiru.B.Harhara Sudhan, Arasu Colony, Mobile No. 9944151002 |
| 3 | Tmt.R.Usha, Arasu Colony, 7358952974 |
| 4 | Tmt.T.Renuka, Arasu Colony, 994277080 |
| 5 | Thiru.M.Jeeva Arasu Colony 9364113503 |
| 6 | Thiru.Kannan, Arasu Colony, 94431 43197 |
| 7 | Thri.Devandhran, ARasu Colony, 98946 97337 |
| 8 | Thiru.K.Palanisamy Arasu Colony, 9789182164 |
| 9 | Thiru.Jeasu Raj, Arasu Colony, 94447 22603 |
| 10 | Thiru.Vaiyapuri, Arasu Colony, 94436 33497 |
| 11 | Thiru.Mohamed Farrok, ARasu Colony, 98426 56184 |
| 12 | Thiru.J.Iruthiyaraj ARasu Colony, 94421 84291 |
| 13 | Thiru.R.Palaniyandi, ARasu colony, 81100 13339 |
| 14 | Thiru. D Palaniyandi, Arasu Colony 9655949527 |

ஆலோசனை விளக்கம் விபரம் :

1. திரு. செளந்திராஜன், அரசு காலனி

| S.No | Questions | Answers |
|------|--|---|
| 1 | சூடியிருப்பு பகுதி அதிகமாக இருப்பதால் அப்பகுதியில் கழிவுநீர் உந்துநிலையம் அமைக்க வேண்டாம். | அப்பகுதியில் வசிக்கும் மக்களுக்கு எந்தவிதமான கற்றுப்புற சூழ்நிலை பாதிப்பு ஏற்படாமலும், பொதுமக்களுக்கு பாதிப்பு ஏற்படாத வகையில் கழிவுநீர் உந்துநிலையம் செயல்படுத்தப்படும். |

2. திரு. சந்திராண பாக்சியம் அரசு காலனி

| S.No | Questions | Answers |
|------|---|---|
| 1 | இந்த பகுதியில் பூங்காவாக அமைத்து தர வேண்டும். | கலந்தறிதற்குரியர் மற்றும் மாநகராட்சி பொறியாளர்களால் தள ஆய்வு செய்ததில், இந்த பகுதியில் கழிவுநீர் உந்து நிலையம் அமைத்தால் கழிவுநீர் Gravity மூலமாக வந்து சேரும். |

3. திரு. சுவாமிமுத்து, அரசு காலனி.

| S.No | Questions | Answers |
|------|---|--|
| 1 | DTCP lay out பார் அமைப்பதற்காக ஒதுக்கப்பட்ட இடம், எனவே, இப்பகுதியில் கழிவு நீர் உந்துநிலையம் அமைக்க வேண்டாம். | தொழில் நட்ப ரீதியாக, பாதாள சாக்கடை திட்ட சேகரிப்பு கிணறு அமைக்க இவ்விடம் ஏதுவாக இருந்ததால் இடம் தேர்வு செய்யப்பட்டது. மாநகராட்சிக்கு ஒப்படைக்கப்பட்ட இடமாகும். |

4. திரு. ஜான்சன், அரசு காலனி

| S.No | Questions | Answers |
|------|---|--|
| 1 | இப்பகுதியில் சாலை அகலம் மிகவும் குறைவாக இருப்பதால், போக்குவரத்துக்கு மிகவும் இடைஞ்சலாக இருக்கும், | களரக வாகனங்கள் செல்லும் அளவியம் இல்லை. |

5. திரு. மாநிஷன், அரசு காலனி

| S.No | Questions | Answers |
|------|---|---|
| 1 | கழிவுநீர் உந்துநிலையம் மாற்று பகுதியில் அமைத்ததல் தொடர்பாக. | மாற்று இடம் ஆலோசிக்கப்பட்டு வருகிறது. அருகாமையில் குளம் பகுதியாக இருப்பதால் தேர்வு செய்ய இயலவில்லை. |

6. திருமதி. பத்மாவதி, அரசு காலனி

| S.No | Questions | Answers |
|------|---|---------|
| 1 | கழிவுநீர் உந்துநிலையம் மாற்று பகுதியில் அமைத்ததல் தொடர்பாக. | |

7. திரு. முத்துச்செல்வம், முன்னாள் மாமன்ற உறுப்பினர்

| S.No | Questions | Answers |
|------|---|---|
| 1 | பொதுமக்கள் அணைவரும் இந்த பகுதியில் கழிவுநீர் உந்து நிலையம் வருவதை விரும்பாத காரணத்தால், வேறு இடத்தில் மாற்றி அமைக்கும்படி கேட்டுக்கொள்கிறேன். | மாற்று இடம் ஆலோசிக்கப்பட்டு வருகிறது. அருகாமையில் குளம் பகுதியாக இருப்பதால் தேர்வு செய்ய இயலவில்லை. |



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8/1/19
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ASST. EXE. ENGINEER
Tiruchirappalli City Corporation

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8/1/19
CITY ENGINEER
Tiruchirappalli City Corporation
8.1.09

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10/1/19
10/1/19

English Translation of Public Consultation held on 8-01-2019

Government Order No. to implement the Sewerage Project under AMRUT (Phase III) Scheme at a cost of Rs.31214.00 Crores. 05 Municipal Administration and Drinking Water Supply Department (MC 2) Day. Administrative approval was granted on 22.01.2018. Details of sources of funds for the above project are as follows in the Ordinance.

| Rs in crores | | | | | |
|-------------------------|-----------|-----------|-----------|--------------------|----------|
| Sanctioned project cost | GOI share | GTN share | ULB share | ADB / TNUIFSL loan | O&M cost |
| 312.14 | 132.06 | 52.82 | 31.21 | 96.05 | |

Administrative approval has been obtained for the Tiruchirappalli Municipal Corporation's Part 3 Burial Drainage Project of the Atal Urban Reform and Development Movement Project and the works are to be carried out under the above funding source. Public consultation meeting was held today 08.01.2019 at 11.00 a.m. in Edamalaipatti Putur Government High School campus in the presence of City Engineer, Assistant Executive Engineer, Assistant Engineer and Junior Engineer.

A total of 42 people participated as representatives of Government Colony Residents' Welfare Association and people living in that area, residents of Francina Colony, Kaliyamman Kovil Street, Pilliyar Kovil Street, North and South Mettu Street, Kollankulam and members of the political party.

| | | |
|-----|---|--|
| I | 1 | Project explanation from Tiruchirappalli Corporation for AMRUT queries |
| | | S.Amudavalli, BE, City Engineer (i/c). Tiruchirappalli City Corporation. |
| II | | Respondents on encroachment in landfill project areas |
| | 1 | S.Amudavalli, BE, City Engineer (i/c). Tiruchirappalli City Corporation. |
| | 2 | K.S.Balasubramanian, Assistant Executive Engineer, K.Abishekapuram Zone |
| III | | Prominent personalities of public welfare visited |
| | 1 | Thiru. Santhanapakkiam, Arasu Colony Mobile No. 9655167751 |
| | 2 | Thiru.B.Harhara Sudhan, Arasu Colony, Mobile No. 9944151002 |
| | 3 | Tmt.R.Usha, Arasu Colony, |

Advice Explanation Details

1. Mr. Soundirajan, Arasu Colony

| Sl.No | Questions | Answers |
|-------|--|--|
| 1 | Do not set up sewage pumping station in the area due to high residential area. | The sewage pumping station will be implemented in such a way that the people living in the area are not affected by any environmental conditions and the public is not affected. |

2. Mr. Chandana Bhakym, Arasu Colony

| Sl.No | Questions | Answers |
|-------|--------------------------------------|---|
| 1 | This area should be set up as a park | According to the site survey by Kalantarithurigar and the Corporation Engineers, if a sewage pumping station is set up in this area, the sewage will arrive by gravity. |

3. Mr. Savarimuthu, Arasu Colony.

| Sl.No | Questions | Answers |
|-------|--|---|
| 1 | DTCP lay out for setting up Park The allocated space, therefore, is the sewage pumping station in the area Do not set. | Technically, the site was chosen because it was suitable for constructing a collection well for the underground sewerage project. It is a place entrusted to the Corporation. |

4. Mr. Johnson, Arasu Colony

| Sl.No | Questions | Answers |
|-------|---|-----------------------------|
| 1 | The road width in this area is very less which will hamper the traffic. | No need for heavy vehicles. |

5. Mr. Martin, Arasu Colony

| Sl.No | Questions | Answers |
|-------|---|--|
| 1 | Regarding construction of Sewage Pumping Station in alternate area. | An alternative location is being discussed. Couldn't choose because it's near the pool area. |

6. Mrs. Padmavati, Arasu Colony

| Sl.No | Questions | Answers |
|-------|---|---------|
| 1 | Regarding construction of Sewage Pumping Station in alternate area. | |

7. Mr. Muthuchelvam, Councillor

| Sl.No | Questions | Answers |
|-------|--|--|
| 1 | As the public does not want the sewage pumping station to come in this area, I request it to be changed elsewhere. | An alternative location is being discussed. Couldn't choose because it's near the pool area. |

| | |
|----|--|
| | 7358952974 |
| 4 | Tmt.T.Renuka, Arasu Colony. 994277080 |
| 5 | Thiru.M. Jeeva Arasu Colony 9364113503 |
| 6 | Thiru.Kannan, Arasu Colony. 94431 43197 |
| 7 | Thri. Devandhran, Arasu Colony, 98946 97337 |
| 8 | Thiru.K.Palanisamy Arasu Colony, 9789182164 |
| 9 | Thiru. Jeasu Raj. Arasu Colony, 94447 22603 |
| 10 | Thiru. Vaiyapuri, Arasu Colony, 94436 33497 |
| 11 | Thiru. Mohamed Farrok, Arasu Colony, 98426 56184 |
| 12 | Thiru.J.Iruthiyaraj Arasu Colony. 94421 84291 |
| 13 | Thiru. R.Palaniyandi, Arasu colony, 81100 13339 |
| 14 | Thiru.D.Palaniyandi, Arasu Colony 9655949527 |

Public consultation during construction

SPS at Muthukumarasamy Nagar- Consultation 1 – 20.02.2021

Muthukumarasamy Nagar SPS public consultation meeting on 20th February 2021

On 20th February 2021, Public consultation meeting was conducted in K. Sathunaur area in Thiruchirapalli, Tamilnadu with the local residents. The purpose Public consultation meeting why objection among the public on Underground sewage system in the park . The corporation choose a local Park in that area as a venue to plant the **Sewage Pumping Station-SPS** so this meeting was conducted to collect the opinion about this project among the local residents.

| | |
|-------------------------|--------------------|
| Zone | 09 |
| Ward No | 38 |
| Name of the area | K. sathanur |
| SPs | 09 |

It was conducted by the following consultation members.

| S.No | Person attended for consultation |
|-------------|---|
| 1 | Mr. Bala Shanmugam , Team Leader |
| 2 | Mr. Raghavan , Construction Manager for Phase –II |
| 3 | Mr. Kannan, Construction Manager for Phase – III |
| 4 | Mr. S.L. Ramesh Babu, Social safe guard |

About the meeting

It was held in Mr. Leo's residence by 4.30 p.m. totally 7 members participated from the community level from that area (Male 4 members and Female 3 members). The Team explained in detailed about the projects to be taken up and the benefits of the project. Further the components proposed in the SPS were explained to the public. The public raised their doubts about the possibility of ground water contamination due to handling of the waste water and the unwanted odour generated from the waste water. It was clarified that the structure are RCC and are water tight sturctres and there will not be any possibility of ground water contamination. Further it was informed that the odour control device shall be installed in the location to arrest the unwanted odour.



Fig 1: Meeting with Local People

Outcomes of the meeting.

- Even after detailed clarification about the prevention of underground water contamination by proposing the RCC water tight structures and proposing the installation of odour control device to arrest the unwanted odour, the public didn't allow the construction activity in the specified location.



Figure 2: Discussion with Local People



Fig 3: SPS Site

Public consultation meeting was conducted in Natchatra Nagar On 29th April 2021,

| S.no | H. Date | Component / location | Topic | No of participants | Remarks |
|------|-----------------------------|--------------------------|--|--------------------|---|
| 1 | 29 th April 2021 | SPS 12 / Natchatra Nagar | Public objection on Sewage Pumping station in Park | 45 | Explained about the project details and components coming under SPS 12 and cleared the doubts raised by the public. |

On 29th April 2021, Public consultation meeting was conducted in Natchatr Nagar area in Thiruchirapalli, Tamilnadu for seeking the residents' willingness and opinion for laying underground sewerage system in the existing park. The Corporation of Thiruchirapalli has proposed to construct of Sewerage Pumping Station for processing of waste.

| | |
|-------------------------|-----------------|
| Zone | 12 |
| Ward No | 45 |
| Name of the area | Natchatra Nagar |
| SPs | 12 |

The consultation team members participated in the meeting were Mr.Bala Shanmugam, Team Leader, Mr.Kannan, Construction Manager, III Phase and Mr. Periyasamy, Junior Engineer of Tiruchirappalli city corporation and Mr. Umesh Kumar Project Manager of L& T and other staff of CMSC and L& T.

•

DETAILS OF PUMPING STATION SPS:

The proposed sewage pumping station 12 is located at Natchatra Nagar, Karumandapam and land belongs to Trichy Corporation (Ward No: 45, Block No: 1, TS No: 33-5, 35-4, 39-3). The site is classified as park land and properly fenced on all sides. sewage pumping site-12 requires a total area of 916 m² and adequate land is available for the construction. The details were also mentioned in the Resettlement Plan which was prepared during preparation of DPR. Total extent of land available is 1230 sq.m. out of which 916sq.m will be utilized for SPS12.

Outcome of the meeting

The meeting was held at the Road Junction of Natchatra Nagar and 45 residents participated (Male 30 members and Female 15 members). The Consulting team members highlighted about the importance of Underground Sewerage System, its advantages and proposed Sewerage Pumping Station in the existing park as a convenient location for maintenance and disposal of waste.



The residents expressed the following objections and views

- The local residents were of the opinion that the ground water quality, which is only source would be affected due to UGSS.
- The plant will create environmental hazard due to odour and indiscriminate disposal of waste
- The residents requested to utilise park for recreation purpose and to sustain environment from any pollution.

Outcomes of the meeting.

- As requested by the public, all the component coming under SPS 12 has been explained and the dimensions of the components are also informed to them
- Since the proposed component is a pumping station and RCC structures are proposed in the system, there will not be any possibility of the mixing the waste water with the underground water. Hence it was assured that the underground water will not be affected to the pumping station.
- In the proposal, Odour control devices will be installed in the pumping station to arrest the odour. The people will not get any problem of environmental harard due to odour due to installation of odour control device.
- Since the park area is a Corporation area, the corporation will use the portion of the area alone. The balance land shall be continued to be used as park as requested by the public.
- But the public didn't allow for the construction activity even after detailed clarification to clear their doubts by the Team.

SPS at Muthukumarasamy Nagar- Consultation 3

Minutes of the Public Consultation Conducted on 16th December 2021 at Thiruchirapalli City Municipal Corporation, in Muthukumarasamy Nagar Thiruchirapalli for the Proposed Underground Sewerage Scheme (UGSS) by Thiruchirapalli City Municipal Corporation

The Public Consultation commenced at Muthukumarasamy Nagar on 16.12.2021 at 4.00 PM with officials from Tiruchirappalli City Corporation (TCC), CMSC Team and Engineers of L&T. The public/residents of the area and the residential association members were present at the meeting based on prior public notice given in individuals about the details of the public consultation. The copy of Attendance register is attached herewith.



Officials of TCC, CMSC Team and contractor's Engineers team welcomed the gathering and outlined the procedure for Public Consultation. They described that the TCC have proposed to develop the Underground Sewerage Scheme (UGSS) for Tiruchirappalli Corporation.

The following team members were conducted the public consultation meeting

| S. No | Officials/Consultant | Designation | Organization |
|-------|----------------------|--------------------------------|---------------------------------------|
| 1 | Balasubramaniam | Assistant Executive Engineer | Tiruchirappalli Municipal Corporation |
| 2 | Velmurugan | Junior Engineer | Tiruchirappalli Municipal Corporation |
| 3 | S.P.A. Balashanmugam | Team Leader | CMSC |
| 4 | Raghavan | Construction Manager-Phase II | CMSC |
| 5 | Kannan | Construction Manager-Phase III | CMSC |

| | | | |
|---|----------------|--------------------------|------|
| 6 | Baskaran K | Social Safeguard Experts | CMSC |
| 7 | Kathikeyan S | Support Engineer | CMSC |
| 8 | Sathayamoorthy | Construction Manager | L&T |
| 9 | Sundar | Construction Manager | L&T |

The meeting was held at the Road junction of Muthukumarasamy Nagar and 12 residents participated (Male 11 members and Female 1 member). The Consulting team members highlighted about the importance of Underground Sewerage System, its advantages and proposed Sewerage Lifting Station in the existing road end of the street as a convenient location for maintenance and disposal of waste.

This was followed by description of the project in detail. The summary of the project details was also circulated to the gathering. The following details regarding the scheme were shared with the public. Previous consultations meeting held on 20.2.2021. During the previous meeting, all the residents were objected for the construction of pumping station in the park land, since they want park as a recreation place. The CMSC Team tried to convince the public after explaining about the benefit of the project. But the public were adamant and continued to object the construction of pumping station at the park land.

Hence alternate arrangement has been deeply analyzed to change the scope of the pumping station or to change the location of the pumping station.

Hence portion of catchment of the Zone 9 has been diverted in to another nearby zone. Due to reduction of the catchment area of the sewer network, the pumping station has been reduced to the lifting station due to reduction of the sewage quantity. It was also agreed by the TCC officials. Due to the topographical conditions of the area, the lifting station can't be avoided in the Muthukumaraswamy Nagar.

All the efforts of TCC, CMSC Team to reduce the public objections were explained in detail to the public and the details about the lifting station has been explained in detail to the public.

The TCC Officials invited the public/residents to express their views, concerns and queries. Also, they requested the public/residents to introduce themselves before expressing their views and raising questions.

The views and questions of the public/residents and clarifications given by the Officials are detailed below

| S.No | The views and questions of the public / stake holders | Clarification given by the Officials of TMC and consultants |
|------|---|--|
| 1 | What is the original proposal as per DPR at Muthukumarasamy Nagar? | As per DPR, pumping station has been proposed with wet well, grit well, screen well, control room and transformer yard etc. |
| 2 | Why the park land of Muthukumarasamy Nagar has been selected during preparation of the DPR? | Muthukumaraswamy Nagar is a low-level area and laying of sewer along the low-level gradient will reduce the cost of the project and to avoid depth of cutting, the sewers were designed to collect in the low-level area so that the depth of cutting will be reduced. Since park is Corporation land, TCC selected the park land for the construction of pumping station. |
| 3 | What changes has been made in the new proposal? | Portion of Catchment area of the zone 9 has been diverted to another zone and only a small portion of the Muthukumarasamy Nagar alone considered for lifting station. Due to topographical condition of the area, one |

| | | |
|---|--|--|
| | | lifting station in the road junction has been proposed instead of pumping station. |
| 4 | Is there any odour problem due to lifting station? | Lifting station is a closed structure and hence there wouldn't be any odour problem. |
| 4 | Is there any underground contamination due to construction of lifting station? | Since the lifting station has been constructed as concrete structure and it is water proof one, no contamination will occur. |
| 5 | How much time is required for the construction of lifting station? | Lifting station will be constructed within three months from the date of start. |
| 6 | Is it possible for vehicle movement during construction? | Yes. Portion of the road can be used for the vehicle movement. |

Conclusion:

After detailed explanation by the TCC officials and CMSC Team, all the public were agreed to construct the lifting station in their location.

The officials of TCC and CMSC Team along with Contractor team concluded the Public Consultation meeting with vote of thanks.

Enclosures: below the annexure

1. Copy of attendance of public consultation meeting is shown in Annexure 1.
2. Copy of acknowledgement for issue of notice is shown in Annexure 2.
3. Copy of the notice in Tamil is shown in Annexure 3.
4. Copy of Notice in English is shown in Annexure 4
5. Copy of the photographs of public consultation meeting is shown in Annexure 5.

ANNEXURE 1

ATTENDANCE OF THE PUBLIC ATTENDED THE PUBLIC CONSULTATION MEETING ON
16.12.2021 AT MUTHUKUMARASWAMY NAGAR

சிவகாமியாண்டு லாபத்திற்கு
 மதுகாமரஸ்வாமி நகரில்
 திட்டம்: லாபத்திற்கு லாபத்திற்கு நகரில்

Date: 16/12/2021
 Page:

| Sl. No. | Name | Age | Address/Contact No | Signature |
|---------|-----------------|-----|--------------------|-------------|
| 1 | K. Ramali | 51 | 42, Plot no. | [Signature] |
| 2 | MA. Hari Dinesh | 27 | 33, Plot No. | [Signature] |
| 3 | R. Lakshmi | 30 | 1. | [Signature] |
| 4 | G. Arjunan | 63 | K. Sathnaman. | [Signature] |
| 5 | | | 63 Plot No | G. Arjunan |
| 6 | V. Venkatesh | 72 | 13. | [Signature] |
| 7 | V. Sivalingam | 64 | 42 W Plot no | [Signature] |
| 8 | R. Aravindan | 41 | No 3 muthukumarasa | [Signature] |
| 9 | T. Sankaran | 43 | 30 | [Signature] |
| 10 | L. Kulanda-Raj | 44 | 43. Plot no | [Signature] |
| 11 | M. Karthik | 21 | 32 | [Signature] |
| 12 | S. Siva | 20 | 7/A | [Signature] |

ANNEXURE 2
ACKNOWLEDGEMENT FROM PUBLIC FOR THE INTIMATION OF NOTICE OF PUBLIC
CONSULTATION FOR MUTHUKUMARASAMY NAGAR

| PUBLIC NOTICE INTIMATION 16.12.2021 | | | | |
|--|----------------|------------------------|------------|-------------|
| K. Sathanur - Muthukumarasamy Nagar - public Meeting | | | | |
| P.No Name | Name | Address | Mobile No | Sign |
| 1 | L. Islanadaraj | 47, Kumbakonam Highway | 9487192687 | [Signature] |
| 2 | S. Anandaraman | K. Sathanur | 9889401579 | [Signature] |
| 3 | S. Murali | 1/2, Chidambaram | 9994712626 | [Signature] |
| 4 | T. Sumanth | 30, | 9003839233 | [Signature] |
| 5 | N. Karthik | 32, | 9942444745 | [Signature] |
| 6 | S. Sharanmohan | 32, | 7598014045 | [Signature] |
| 7 | V. Sivalingam | 42 W | 9043682048 | [Signature] |
| 8 | V. Kannimath | 13- | 9790574860 | [Signature] |
| 9 | BALA | 8 | 8778375200 | [Signature] |
| 10 | M. Indhu | 44 | 9498156802 | [Signature] |
| | D. Srinivasan | 34 | 9095978803 | [Signature] |
| 12 | M. Srinivasan | 39 | 9976906307 | [Signature] |
| | G. Arjunan | 63 | 6285422077 | [Signature] |

ANNEXURE 3

NOTICE ISSUED TO THE PUBLIC ABOUT THE PUBLIC CONSULTATION MEETING



திருச்சிராப்பள்ளி மாநகராட்சி

கலந்தாலோசனை கூட்டம்

திருச்சி மாநகராட்சி புதிய பாதாள சாக்கடை திட்டம் - பகுதி III - தொடர்பாக

இடம் : முத்து குமாரசாமி நகர்

தேதி : 16.12.2021

பொது மக்களுக்கு ஒரு அறிவிப்பு

நமது திருச்சி மாநகரத்தில் புதிய பாதாள சாக்கடை திட்ட பணிகள் நடைபெற்று கொண்டிருப்பது அனைவரும் அறிந்ததே. இந்த திட்டத்தின் மூலம் கழிவு நீரேற்று நிலையம் (Pumping station) மற்றும் கழிவு நீருந்தும் நிலையம் (Lifting station) அமைப்பது தொடர்பாக பொதுமக்களிடம் கருத்து கேட்பு கூட்டம் நடத்துவது என மாநகராட்சி அதிகாரிகளால் முடிவு செய்யப்பட்டு 16.12.2021 அன்று மாலை 4.00 மணி அளவில் முத்து குமாரசாமி நகரில் நடைபெற உள்ளதால் பொதுமக்கள் அனைவரும் கலந்து கொண்டு தங்களது ஆதரவு மற்றும் கருத்துக்களை தெரிவிக்குமாறும் திட்டத்தினை நிறைவேற்றிட தங்களது ஒத்துழைப்பை நல்குமாறும் வேண்டுகிறோம்.

இப்படிக்கு

திருச்சிராப்பள்ளி மாநகராட்சி

Annexure 4
NOTICE ISSUED TO THE PUBLIC ABOUT THE PUBLIC CONSULTATION MEETING
TRANSLATED IN ENGLISH



Tiruchirappalli city Corporation

ANNOUNCEMENT OF PUBLIC CONSULTATION MEETING
UGSS TO TIRUCHIRAPPALLI CITY CORPORATION UNDER PHASE III –
CONSTRUCTION OF LIFTING STATION - REG

Place: Muthukumaraswamy Nagar

Date: 16.12.2021

NOTICE TO THE PUBLIC

Every one may know about the Underground sewerage Project executed in the extended area of Tiruchirappalli City Corporation under phase III. With the concurrence of the city corporation, a public consultation meeting at Muthukumaraswamy Nagar has been called for on 16.12.2021 at 4.00 PM, to know the opinion of public for the construction of pumping station/lifting station at Muthukumaraswamy Nagar. We request all the public to participate in the meeting and render their opinion and support for the construction of lift station for the early completion of the project.

Tiruchirappalli city Corporation

Annexure 5

Photographs taken during public consultation meeting at Muthukumarasamy Nagar on 16.12.2021



Consultation during construction -2

Minutes of the Public Consultation Conducted on 15th December 2021 at Thiruchirapalli City Municipal Corporation, in Natshatra Nagar Thiruchirapalli for the Proposed Underground Sewerage Scheme (UGSS) by Thiruchirapalli City Municipal Corporation

The Public Consultation at Natchatra Nagar commenced on 15.12.2021 at 4.00 PM with officials from Tiruchirappalli City Corporation (TCC), CMSC Team and Project Manager of L& T and their team members, to get public concurrence for constructing the Lifting station at Natchatra Nagar as per the directions of ADB. Prior intimation has been issued to all the public and residential association members about the meeting. The public/residents of the area and the residential association members were present at the meeting on 15.12.2021 based on prior public notice given to the individuals about the details of the public consultation. The copy of notice to public and Attendance register is attached herewith.



Officials of TCC, CMSC team and Contractor's Team welcomed the gathering and outlined the procedure for Public Consultation. They described that the TCC have proposed to develop the Underground Sewerage Scheme (UGSS) for Tiruchirappalli Corporation under phase III and the work is under progress.

The following team members were conducted the public consultation meeting

| S. No | Officials/Consultant | Designation | Organization |
|-------|----------------------|--------------------------|--|
| 1 | Periya samy | Junior Engineer | Tiruchirappalli City Corporation |
| 2 | S.P.A Balashanmugam | Team Leader | CMSC |
| 3 | R.Kannan | Construction Manager | CMSC |
| 4 | Baskaran K | Social Safeguard Experts | CMSC |
| 5 | Umesh Kumar | Project Manager | L& T |
| 6 | Anand | President | Resident Welfare Association Natchatra Nagar |

The meeting was held on 15.12.2021 at 4.00 PM at the Road Junction of Natchatra Nagar and 25 residents were participated (Male 24 members and Female 1 member) in the meeting. The CMSC team members highlighted about the importance of Underground Sewerage System, its advantages and purpose of the proposed Sewerage Listing Station in the existing road end of the street as an alternate arrangement of Pumping station in the proposed location.

This was followed by description of the project in detail. The summary of the project details was also narrated to the gathering. The following details regarding the scheme were shared with the public. Earlier it was proposed to construct the sewage pumping station 12 at the park land located at Natchatra Nagar and land belongs to Trichy Corporation (Ward No: 45, Block No: 1, TS No: 33-5, 35-4, 39- 3). The site is classified as park land and properly fenced on all sides. During the Previous consultations meeting held on 29.4.2021, all the residents were objected the construction of SPS at

the park land at the Natchatra Nagar, since the public wants the park place for their use. During previous consultation the meeting, TCC and CMSC Team explained about the project and the public didn't agree to construct the SPS at the park Land.

Hence alternate feasibility of changing the scope/site has been explored. Hence portion of catchment of the Zone 12 has been diverted in to another nearby zone. Due to reduction of the catchment area of the sewer network, the pumping station has been reduced to the lifting station due to reduction of the sewage quantity. It was also agreed by the TCC officials. Due to the topographical conditions of the area, the lifting station can't be avoided in the Natchatra Nagar. All the efforts of TCC, CMSC Team to reduce the public objections were explained in detail to the public.

The TCC Officials invited the public/residents to express their views, concerns and queries. Also, they requested the public/residents to introduce themselves before expressing their views and raising questions.

The views and questions of the public/residents and clarifications given by the Officials are detailed below

Public Quarries and Replies to the Queries

| S.No | The views and questions of the public / stake holders | Clarification given by the Officials of TCC and CMSC Team |
|------|---|--|
| 1 | What is the project period and how the future sewage generations have been accounted for? | Total project scope will be up to 30 years i.e up to the year 2050. Based on the population forecast, the population for intermediate year i.e for 2035 and the population for the ultimate year i.e for 2050 has been arrived as per the CEPHEEO norms. Based on the project population, the sewage generations have been calculated with the correlation with water supply given to the area for the present, intermediate and ultimate stage years. |
| 2 | Time period of the project i.e. start and end time of the project | The project was taken up under AMRUT and ADB fund during April 2020. Time for completion will be three years and it will be completed by April 2023. |
| 3 | What is the original proposal made in Natchatra Nagar as per DPR?. | Pumping station with screen well, Grit well and Wet well has been proposed. Along with the control room, Transformer yard, etc were also proposed. |
| 4 | What is the revised proposal now formulated? | Due to public objection, alternate arrangement has been explored. Now the zone 12 boundary has been redefined and the portion of area comes under Natchatra Nagar has been diverted to nearby area, thereby reducing the capacity of the pumping station. Due to reduction of the capacity of the pumping station, the pumping station has been converted as lifting station. Now only one lift Manhole has been proposed, which is also closed structure. Only small pump room for placing the panel board will be provided. |
| 5 | Is there any odour problem exist due to lifting station? | There will not be any odour problem in the lifting station as the lifting station is closed one. |
| 6 | Is there any ground water contamination due to lifting station? | Since the structure for the lifting station will be constructed in concrete, there wouldn't be any underground water contamination. |
| 7 | How the collected sewage will | Collected sewage from the lifting station will be |

| S.No | The views and questions of the public / stake holders | Clarification given by the Officials of TCC and CMSC Team |
|------|---|--|
| | be conveyed to other place from the lifting station? | conveyed through CI pumping main to the nearby pumping station. |
| 8 | Is the pumping main and gravity main will be laid in the same trench? | No. They will be laid separately. Gravity main will be laid between the manholes at the center of the road and proper gradient will be given for gravity flow. But the pumping main will be laid in the edge of the road. The top level of the pumping main pipe will be 1.00 m from the ground level. |
| 9 | How the pumping main will be maintained in future? | CI pipes are used for pumping main. The CI pipes are durable in nature and it is maintenance free pipe. However, care will be taken during the maintenance period. |
| 10 | Who will maintain the project after completion? | Tiruchirappalli City Corporation will maintain the underground sewerage project in future. Separate team will be engaged for maintenance of the project. |
| 11 | How do you proposed the lifting station at Natchatra Nagar and is there any possibility of shifting the lifting station to some other area? | Natchatra Nagar is a low-level area. Based on contour level of the zone, the location where the depth of cutting exceeds the 6 m depth, lifting station /pumping station has to be proposed depending upon the quantity of sewage, it is holding. Due to contour nature, alternate locations are not feasible for lifting station. |
| 12 | Whether the project covers the disposal of rain water also? | No, the rain water collection is not in the project scope. The project is meant for the sewage generated from house holds only. Separate drainage facility will be made by TCC in future for disposal of rain water. |
| 13 | Whether kitchen waste water and bathroom waste water will be connected to the sewer system | Yes. Kitchen and bath room waste water will be connected to the system. |
| 14 | How the sewage will be pumped during the power cut time? | Generator will be provided and will be operated during power cut time. |
| 15 | Whether the lifting station will be upgraded to pumping station in future? | No. Already one portion of the zone has been connected to another zone and the lifting station is designed for 30 years capacity and hence in future, the lifting station will not be upgraded as pumping station. |

Conclusion:

After detailed explanation by the TCC officials and CMSC Team, all the public were not agreed to construct the lifting station in their location. The TCC have decided to change the location in Arokiya Madha Avenue.

The officials of TCC and CMSC Team along with Contractor team concluded the Public Consultation meeting with vote of thanks.

Enclosures:

1. Copy of attendance of public consultation meeting is shown in Annexure 1.
2. Copy of acknowledgement for issue of notice is shown in Annexure 2.
3. Copy of the notice in Tamil is shown in Annexure 3.
4. Copy of Notice in English is shown in Annexure 4
5. Copy of the photographs of public consultation meeting is shown in Annexure 5.

Annexure 1

Attendance of the public consultation meeting held at Natchatra Nagar on 15.12.2021

சிவகாமியாம்பலம் டீர்மென்ட்
 சிவகாமியாம்பலம் டீர்மென்ட்
 திகதி: 15/12/21 4:00 PM

| S.No. | NAME | AGE | ADDRESS / CONTACT NO. | SIGNATURE |
|-------|----------------------|-----|--------------------------|---------------|
| 1 | P. Rajasekar | 52 | P-I, 51 / 984305963 | [Signature] |
| 2 | K.S. Balasubramanian | 63 | P-II, 11 / 94887923 | [Signature] |
| 3 | D. DHANAPAL | 39 | Plot no. 22 - Phase II. | [Signature] |
| 4 | V. Nagesh | 47 | Phase - 2 | [Signature] |
| 5 | N. Mathivaram | 55 | 67, Phase - 2 | N. Mathivaram |
| 6 | J. Hashim | 68 | 16 / Phase 2 | [Signature] |
| 7 | R. Revathi | 38 | 11 / phase - I | [Signature] |
| 8 | P.N. Joseph | 34 | 58 / phase - II | [Signature] |
| 9 | R. Amirtharaj | 43 | Plot no. 64 Phase II | [Signature] |
| 10 | M.A. Ziauddin | 32 | Plot - 12, Phase II | [Signature] |
| 11 | A. Paul | 40 | plot # 20, phase II | [Signature] |
| 12 | N. Krishnaprabhu | 48 | plot # 32, phase II | N. Krish. |
| 13 | Baskaran Arndraj | 42 | plot # 55, phase I | [Signature] |
| 14 | J. Keki Varada | 75 | I Phase | [Signature] |
| 15 | [Crossed out] | 15 | [Crossed out] | [Crossed out] |
| 16 | J. Ganesh | 59 | 9345045457 | [Signature] |
| 17 | Mani lowo | 61 | 99407 23243 | [Signature] |
| 18 | S.S. Benigar | 53 | 40, Ph. I, 9486203250 | [Signature] |
| 19 | D. Joshua | 53 | 34, Ph I, 9443184926 | [Signature] |
| 20 | D. M. MALI | 47 | 25, phase II, 7594256002 | [Signature] |
| 21 | J. Annickan | 48 | 13, ph - 2 866+196362 | [Signature] |
| 22 | Dr. B. N. DEEBAW | 33 | 458335 1800 | [Signature] |
| 23 | A. Varudharaju | 36 | 9848253680 | A. Varu. |
| 24 | M. Dinesh | 44 | " | [Signature] |

Annexure 2

Acknowledgement received from public for the notice of public consultation meeting

MEETING CONTINUATION

**Providing UGSS to added areas of Tiruchirappalli city Corporation
(wards fully covered-37,39,40,41 and wards partially covered-31,35, 36, 38, 42, 43, 45, 52, 53, 60, 63) - Phase-III**

Place & ward no. : Nakshehakra nagar/Phase - II Date: 14.12.2011

| S. No | Name of contacted person | Door number | Smart card no./Rashan card no. | Name of the owner | Mobile no | Signature |
|-------|--------------------------|-------------|--------------------------------|-------------------|-------------|-----------|
| 1 | S. Alfred | 5 | | | | |
| 2 | C. M. S. Logan | 6 | | | | |
| 3 | S. SHUNMUGAM | 8 | | | | |
| 4 | S. ANILKANTH | 10 | | | | |
| 5 | Balasubramaniam | 11 | | | | |
| 6 | D. Rajalakshmi | 13 | | | | |
| 7 | T. V. Lakshmi | 17 | | | | |
| 8 | A. Anand | 20 | 11. Anand | | | |
| 9 | D. DHANAPPA | 22 | 7 | | 981637630 | |
| 10 | R. Baswar | 41 | | | 9787171157 | |
| 11 | S. Anand | 26 | | | 9943521480 | |
| 12 | Krishna prabhu | 32 | | | | |
| 13 | M. Prabhakar | 46 | | | 99945262 | |
| 14 | A. Vasudhasaji | 45 | | | 984225980 | |
| 15 | K. Anshu | 59 | | | | |
| 16 | P. N. Joseph | 34 | | | 98449703 | |
| 17 | D. Ignatius | 59 | | | | |
| 18 | Mano | 61 | | | | |
| 19 | A. Senthosh Kumar | 64 | | | | |
| 20 | N. Mathivanan | 67 | | | 91442707476 | |
| 21 | A. Chellaiab | 66 | | | 9344678125 | |

Annexure 3
Notice issued to the public regarding the public consultation meeting



திருச்சிராப்பள்ளி மாநகராட்சி

கலத்தாலோசனை கூட்டம்

திருச்சிராப்பள்ளி புதிய பாதாள சாக்கடை திட்டம் - பகுதி III - தொடர்பாக

இடம்: நட்சத்திரா நகர்

தேதி : 15.12.2021

பொது மக்களுக்கு ஒரு அறிவிப்பு

நமது திருச்சிராப்பள்ளி மாநகரத்தில் புதிய பாதாள சாக்கடை திட்ட பணிகள் நடைபெற்று கொண்டிருப்பது அனைவரும் அறிந்ததே இந்த திட்டத்தின் மூலம் கழிவு நீரேற்று நிலையம் (Pumping station) மற்றும் கழிவு நீருந்தும் நிலையம் (Lifting station) அமைப்பது தொடர்பாக பொதுமக்களிடம் கருத்து கேட்பு கூட்டம் நடத்துவது என மாநகராட்சி அதிகாரிகளால் முடிவு செய்யப்பட்டு 15.12.2021 அன்று மாலை 4.00 மணி அளவில் நட்சத்திரா நகரில் நடைபெற உள்ளதால் பொதுமக்கள் அனைவரும் கலந்து கொண்டு தங்களது ஆதரவு மற்றும் கருத்துக்களை தெரிவிக்குமாறும் திட்டத்தினை நிறைவேற்றிட தங்களது ஒத்துழைப்பை நல்குமாறும் வேண்டுகிறோம்.

இப்படிக்கு

திருச்சிராப்பள்ளி மாநகராட்சி

Annexure 4

**Notice issued to the public regarding the public consultation meeting
Translated in English****Tiruchirappalli city Corporation****ANNOUNCEMENT OF PUBLIC CONSULTATION MEETING****UGSS TO TIRUCHIRAPPALLI CITY CORPORATION UNDER PHASE III –****CONSTRUCTION OF LIFTING STATION - REG****Place: Natchatra Nagar****Date: 15.12.2021****NOTICE TO THE PUBLIC**

Every one may know about the Underground sewerage Project executed in the extended area of Tiruchirappalli City Corporation under phase III. With the concurrence of the city corporation, a public consultation meeting at Natchatra Nagar has been called for on 15.12.2021 at 4.00 PM, to know the opinion of public for the construction of pumping station/lifting station at Natchatra Nagar. We request all the public to participate in the meeting and render their opinion and support for the construction of lift station for the early completion of the project.

Tiruchirappalli city Corporation

Annexure 5

Photographs taken during the Public consultation meeting held on 15.12.2021 at Natchatra Nagar



Public Consultation Conducted on 26th February 2022 at Thiruchirapalli City Municipal Corporation, in Arokiya Madha Avenue Thiruchirapalli for the Proposed Underground Sewerage Scheme (UGSS) by Thiruchirapalli City Municipal Corporation

The Public Consultation at Arokiya Madha Avenue commenced on 26.02.2022 at 4.00 PM with officials from Tiruchirappalli City Corporation (TCC), CMSC Team and Project Manager of L& T and their team members, to get public concurrence for constructing the Lifting station at Arokiya Madha Avenue as per the directions of ADB in the presence of elected councilor of the area.. Prior intimation has been issued to all the public about the meeting. The public/residents of the area were present at the meeting on 26.02.2022 based on prior public notice given to the individuals about the details of the public consultation. The copy of notice to public and Attendance register is attached herewith.



Officials of TCC, CMSC team and Contractor's Team welcomed the gathering and outlined the procedure for Public Consultation. They described that the TCC have proposed to develop the Underground Sewerage Scheme (UGSS) for Tiruchirappalli Corporation under phase III and the work is under progress.

The following team members were conducted the public consultation meeting

| S. No | Officials/Consultant | Designation | Organization |
|-------|----------------------|--------------------------------|--------------|
| 1 | Rajperiyasamy | Junior Engineer | TCC |
| 2 | S.P.A. Balashanmugam | Team Leader | CMSC |
| 3 | V. Kannan | Construction Manager-Phase III | CMSC |
| 4 | K. Baskaran | Social Safeguard Experts | CMSC |
| 5 | R. Dinesh | Support Engineer | CMSC |
| 6 | P. Karthikeyan | Construction Manager | L&T |
| 7 | R. Sathayamoorthy | Asst Construction Manager | L&T |
| 8 | V. Ramadas | Elected councilor of TCC | TCC |

The meeting was held on 26.02.2022 at 4.00 PM at the Road Junction of Arokiya Madha Avenue and 16 residents were participated (Male 13 members and Female 3 member) in the meeting. The CMSC team members highlighted about the importance of Underground Sewerage System and its advantages and the purpose of the proposed Sewerage Lifting Station in the existing road end of the street of Arokiya Madha Avenue

Earlier it was proposed to construct the sewage pumping station 12 at the park land located at Natchatra Nagar and initiated lifting station land belongs to Trichy Corporation. During the Previous consultations meeting held on 15th December 2021, all the residents were



objected the construction of SPS and lifting station in the Natchatra Nagar. TCC and CMSC Team explained about the project and its advantages, the public didn't agree to construct the SPS and lifting station at Natchatra Nagar. Hence alternate feasibility of changing the scope/site has been explored. Hence portion of catchment of the Zone 12 has been diverted in to another nearby area of Arokiya Madha Avenue and the proposed lifting station at Natchatra nagar has been shifted to Aorkiya Madha Avenue. Hence fresh consultation meeting among the public of Arokiya Madha Afenue has been organized and conducted on 26.02.2021

- The meeting started with introduction of team members and welcome address. This was followed by description of the project in detail. The summary of the project details was also narrated to the gathering. The details regarding the scheme were shared with the public.
- The TCC Officials invited the public/residents to express their views, concerns and queries. Also, they requested the public/residents to introduce themselves before expressing their views and raising questions.
- The views and questions of the public/residents and clarifications given by the Officials are detailed below

Public Quarries and Replies to the Queries

| S.No | The views and questions of the public / stake holders | Clarification given by the Officials of TCC and CMSC Team |
|------|---|--|
| 1 | Time period of the project i.e. start and end time of the project | The project was taken up under AMRUT and ADB fund during April 2020. Time for completion will be three years and it will be completed by April 2023. |
| 2 | Is there any odour problem exist due to lifting station? | There will not be any odour problem in the lifting station as the lifting station is closed one. |
| 3 | Is there any ground water contamination due to lifting station? | Since the structure for the lifting station will be constructed in concrete, there wouldn't be any underground water contamination. |
| 4 | How the collected sewage will be conveyed to other place from the lifting station? What is the size of the pipe used and increase the pipe size | Collected sewage from the lifting station will be conveyed through 200 mm dia CI pumping main to the nearby pumping station. 200 mm dia CI Pipe has been designed to carry the ultimate load for the year 2050. Hence proposed diameter of the pipe is sufficient till the ultimate stage of the project |
| 5 | How the pumping main will be maintained in future? | The CI pipes are durable in nature and it is maintenance free pipe. However, care will be taken during the maintenance period. |

| S.No | The views and questions of the public / stake holders | Clarification given by the Officials of TCC and CMSC Team |
|------|--|--|
| 6 | Who will maintain the project after completion? | Tiruchirappalli City Corporation will maintain the underground sewerage project in future. Separate team will be engaged for maintenance of the project. |
| 7 | Whether kitchen waste water and bathroom waste water will be connected to the sewer system | Yes. Kitchen and bath room waste water will be connected to the sewage system. Non clock submersible Pumpsets will dispose the water with pressure. |
| 8 | If the solid waste is come to lifting station how it will be disposed without stagnation? | Sewer system is designed to carry the night soils and waste alone. However the sewage non clog submersible pump can able to pump the solids along with the waste water. It is advised to avoid dumping of solid waste in the system and public should also cooperate for the efficient functioning of the system. |
| 9 | How the sewage will be pumped during the power cut time? | Generator will be provided and will be operated during power cut time. |
| 10 | How much time is required for the construction of lifting station? | Lifting station will be constructed within three months from the date of start. |
| 11 | Is it possible for vehicle movement after construction? | Yes. Lifting station is similar to manhole with enlarged size. The top cover slab will be provided and after construction, the road will be used for vehicle movement. |

Conclusion:

After detailed explanation by the TCC officials and CMSC Team, all the public were agreed to construct the lifting station in their location.

The officials of TCC and CMSC Team along with Contractor team concluded the Public Consultation meeting with vote of thanks

Attendance of the public consultation meeting held at Arokiya Madha Avenue on 26.02.2022

தலைநகரம்
 சிவகாமியம்
 சிவகாமியம்
 சிவகாமியம்

Date 26/02/2022
 Page

சிவகாமியம்
 சிவகாமியம்
 சிவகாமியம்

| ச.நா | பெயர் | வயது | Address/Contact NO | Signature |
|------|--------------------|------|--------------------|-----------------|
| 1. | L.J. CHAARLAS | 62 | 98425 31077 | [Signature] |
| 2. | ILAMVAZHOTHI | 49 | 9361 485681 | [Signature] |
| 3. | A. EBIMANI ARICKAN | 43 | 811 000 50 88 | [Signature] |
| 4. | K. B. S. S. S. S. | 81 | 94426 25250 | [Signature] |
| 5. | Rm. Kurranappan | 58 | 984 23 62 110 | [Signature] |
| 6. | Anvi Meri | 67/F | 9865278356 | S. Aruldas |
| 7. | R. S. S. S. | 38/F | 8098467298 | R. S. S. |
| 8. | P. BHUVANESWAR | 46/F | 9360709911 | [Signature] |
| 9. | AROCKIA MARY | 33 | 9841498577 | [Signature] |
| 10. | Leakath Ali | 54 | 984 24 87013 | [Signature] |
| 11. | Muram | 31 | 9578952081 | [Signature] |
| 12. | K. Natarajan | 29 | 8056603740 | K. Natarajan |
| 13. | L. ARAFATH KHAN | 28 | 8870885596 | L. Arafath Khan |
| 14. | DR. S. S. S. | 52 | 9443494707 | [Signature] |
| 15. | M. S. S. S. | 51 | 9449345622 | [Signature] |
| 16. | S. Antony Somy | 53 | 9629870651 | [Signature] |

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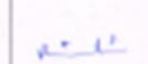



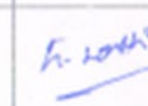
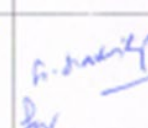
Acknowledgement received from public for the notice of public consultation meeting

இருச்சி மாநகராட்சி புதிய பாதாள சாக்கடை இட்டம் - பகுதி III

கலத்தாலோசனை கூட்ட அறிவிப்பு

இடம் : ஆரோக்கிய மாதா அலுவலகம்

தேதி : 26.02.2022

| வ. எண் | பெயர் | ஆண்/பெண் | முகவரி | கையொப்பம் |
|--------|------------------------------|----------|--|---|
| 1) | EM. AKILA | பெண் | 55, Arachya Madha Avenue, Jayaragar Extn., Konumardagan, Tiruchy - 620001. |  |
| 2 | S. Anand Masay | பெண் | 58-A " | S. Paulchand |
| 3) | RESUSRAN | ஆண் | 58 " |  |
| 4) | Dayakar | ஆண் | Arachya madha Avenue, Jayaragar Extn., Konumardagan EC.No: 2675 |  |
| 5) | KARAYARAYAN | MALE | 52, Arachya madha Avenue, Jayaragar Extn., Konumardagan, Tiruchy - 620001 |  |
| 6) | Padma Paulah | Female | No:63 Arachya madha Avenue Jayaragar Extn., Konumardagan, Tiruchy |  |
| 7) | A. Ananthapriya 81. Anand | Male | 81, Ananthapriya Street, Helenicus Street |  |
| 8) | Vasanthi | Female | 64, -do - |  |

மருச்சி மாநகராட்சி புதிய பாதாள சாக்கடை இட்டம் - பகுதி III

கலந்தாவோசனை கூட்ட அறிவிப்பு

இடம் : ஆரோக்கிய மாதா அலுவலகம்

தேதி : 26.02.2022

| வ. எண் | பெயர் | ஆண்/பெண் | முகவரி | கையொப்பம் |
|--------|------------------------------|----------------|---|-----------------|
| 9 | A. Elumalai | Male | No. 14 25, 26, 27 NO. 27 25, 26, 27 | A. Elumalai |
| 10 | A. Lakshmi Devi | Female | No. 25, 26, 27 T. Chinnai, T. Chinnai, T. Chinnai | A. Lakshmi Devi |
| 11 | R. Raghavani | Female | 11 | R. Raghavani |
| 12 | R. Rohini | Female | சென்னை 19 கி. ரோஹினி கி. ரோஹினி கி. ரோஹினி | R. Rohini |
| 13 | N. Maheswari P.V. Venkat. | Female Male | G, Arokiya madha Avenue, Jeyanagar East, Kannurmandalam, Trichy. | N. Maheswari |
| 14 | M. John Silvan | Male | No. 8 Arokiya madha Ave Jeyanagar Exterior Kannurmandalam Trichy. | M. John Silvan |
| 15 | M. Mahesh | Male | No. 13, Arokiya madha Avenue, Jeyanagar East, Kannurmandalam, Trichy. | M. Mahesh |
| 16 | LJ. Karunan | Male | 2, Arokiya madha Avenue, Kannurmandalam Trichy. | LJ. Karunan |

നമ്മുടെ
 വിദ്യാഭ്യാസ
 മൂല്യം/മുഹൂർത്തം
 എന്തിനാണ്
 ഒരു മൂല്യമുണ്ട്

അതുകൊണ്ട്
 കർമ്മങ്ങൾ
 നീക്കം -

91

Notice issued to the public regarding the public consultation meeting



திருச்சிராப்பள்ளி மாநகராட்சி

கலந்தாலோசனை கூட்டம்

திருச்சி மாநகராட்சி புதிய பாதாள சாக்கடை திட்டம் - பகுதி III - தொடர்பாக

இடம் : ஆரோக்கிய மாதா அவென்யூ

தேதி : 26.02.2022

பொது மக்களுக்கு ஒரு அறிவிப்பு

நமது திருச்சி மாநகரத்தில் புதிய பாதாள சாக்கடை திட்ட பணிகள் நடைபெற்று கொண்டிருப்பது அனைவரும் அறிந்ததே. இந்த திட்டத்தின் மூலம் கழிவுநீர் குழாய் அமைக்கும் பணி மற்றும் கழிவு நீருந்தும் நிலையம் (Lifting station) அமைப்பது தொடர்பாக பொதுமக்களிடம் கருத்து கேட்பு கூட்டம் நடத்துவது என மாநகராட்சி அதிகாரிகளால் முடிவு செய்யப்பட்டு 26.02.2022 அன்று மாலை 4.00 மணி அளவில் ஆரோக்கிய மாதா அவென்யூவில் நடைபெற உள்ளதால் பொதுமக்கள் அனைவரும் கலந்து கொண்டு தங்களது ஆதரவு மற்றும் கருத்துக்களை தெரிவிக்குமாறும் திட்டத்தினை நிறைவேற்றிட தங்களது ஒத்துழைப்பை நல்குமாறும் வேண்டுகிறோம்.

இப்படிக்கு

திருச்சிராப்பள்ளி மாநகராட்சி

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Public consultation Photos





APPENDIX – 12
Permission from ASI

GOVERNMENT OF INDIA
NATIONAL MONUMENTS AUTHORITY
COMPETENT AUTHORITY (TAMILNADU)

Ph: 044-2567 0348

E-Mail: compauthority,tn@gmail.com

Fort St. George,
Chennai – 600 009

F. No. 1235/NMA/CA(TN)/2018 / 737

Date: 12.12.2018

To,

The Member Secretary,
National Monuments Authority,
#24, Tilak Marg,
New Delhi-110 001.

Sub: NOC to The Commissioner, Tiruchirappalli City Corporation, D. No. 58, Bharathidasan Salai, Tiruchirappalli – 620 001, for construction of Under Ground Sewerage for Public (Providing Sewerage Collection System in the extended areas of Corporation for UGSS in Tiruchirappalli Corporation) – Regarding.

Sir,

With reference to the above mentioned subject, I am to enclose herewith the proposal of The Commissioner, Tiruchirappalli City Corporation, D. No. 58, Bharathidasan Salai, Tiruchirappalli – 620 001, seeking NOC for construction of Under Ground Sewerage for Public (Providing Sewerage Collection System in the extended areas of Corporation for UGSS in Tiruchirappalli Corporation) under AMASR (Framing of Heritage Bye-laws and other functions of the Competent Authority) Rules 2011, along with following documents in triplicate:

- 1) Form – II
- 2) Inspection Report
- 3) Duly filled Form-I
- 4) Photos nearby site & site
- 5) Site plan
- 6) Google map
- 7) Detailed Project Report
- 8) Detailed Plan (5 Sheets)

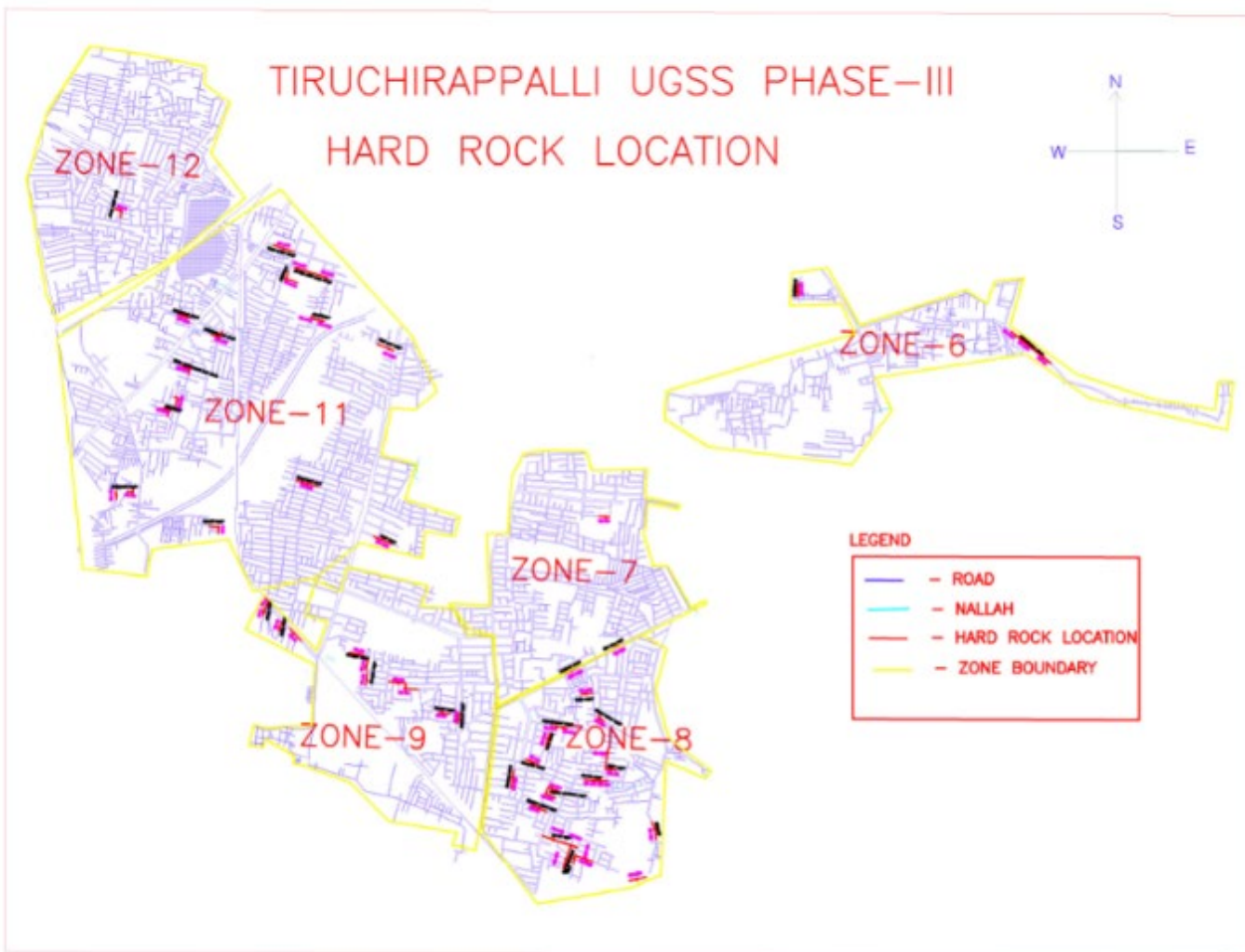
There is no Court Case pending with reference to the site. It is requested to intimate the decision of the Authority at the earliest.

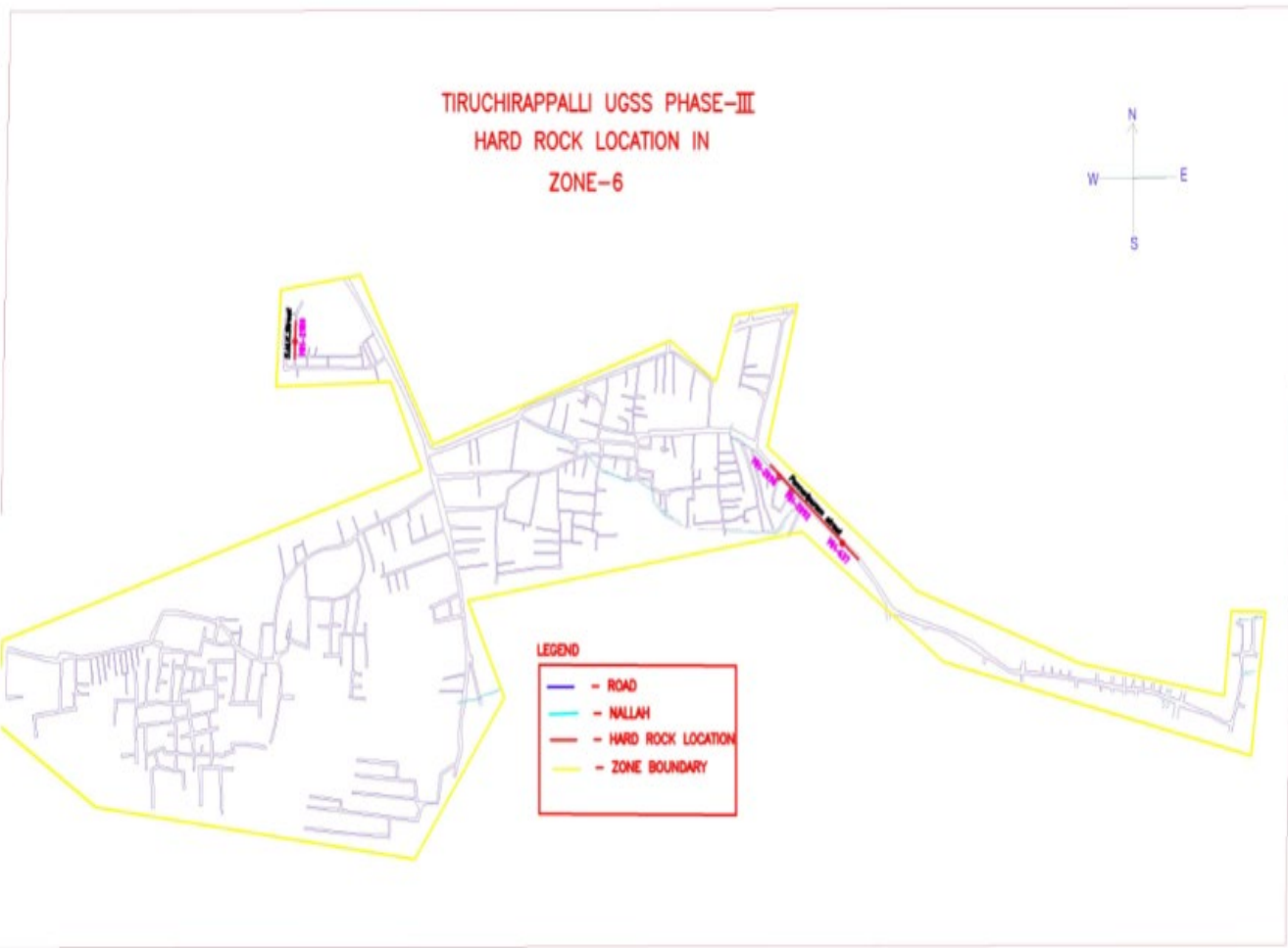
Yours faithfully,

M. Narasimhan
Competent Authority (Tamilnadu)

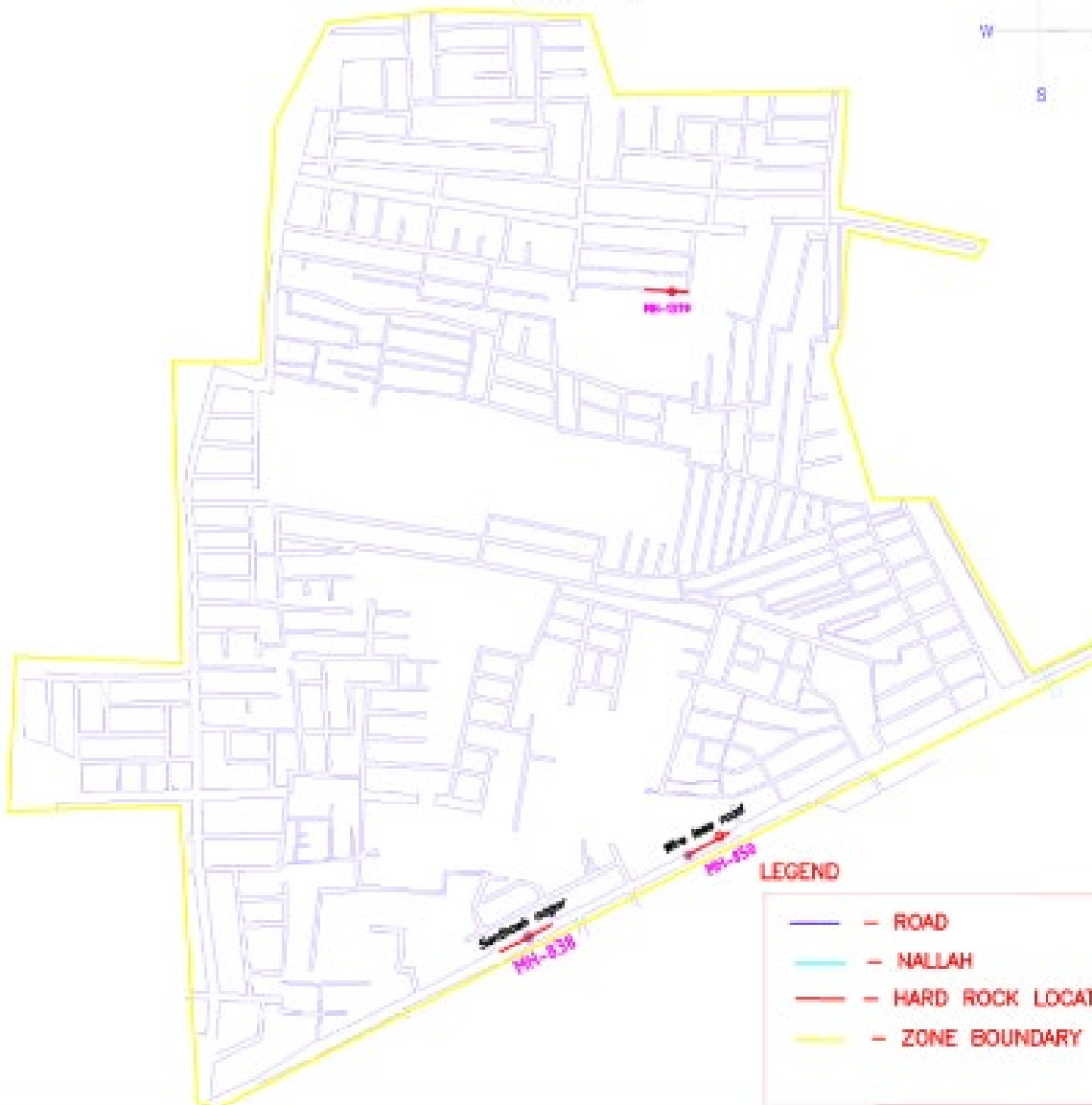
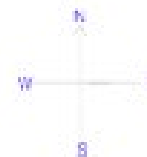
Copy to: The Commissioner, Tiruchirappalli City Corporation, D. No. 58, Bharathidasan Salai, Tiruchirappalli – 620 001, for information.

APPENDIX – 13
Procedure involved in Control Blasting and Location Map

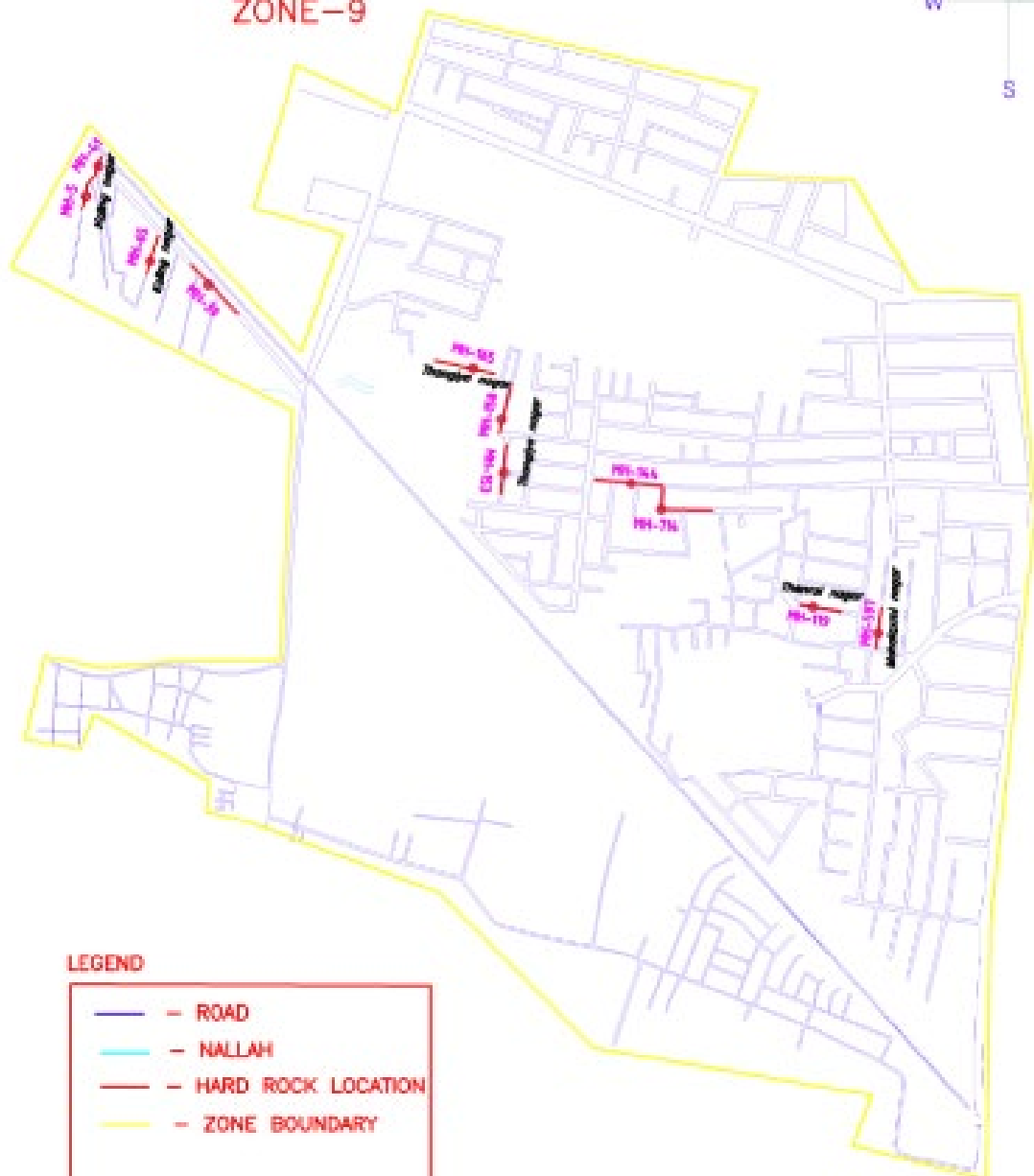
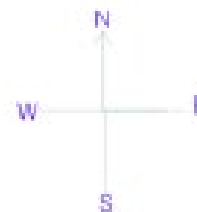




TIRUCHIRAPPALLI UGSS PHASE-III HARD ROCK LOCATION IN ZONE-7



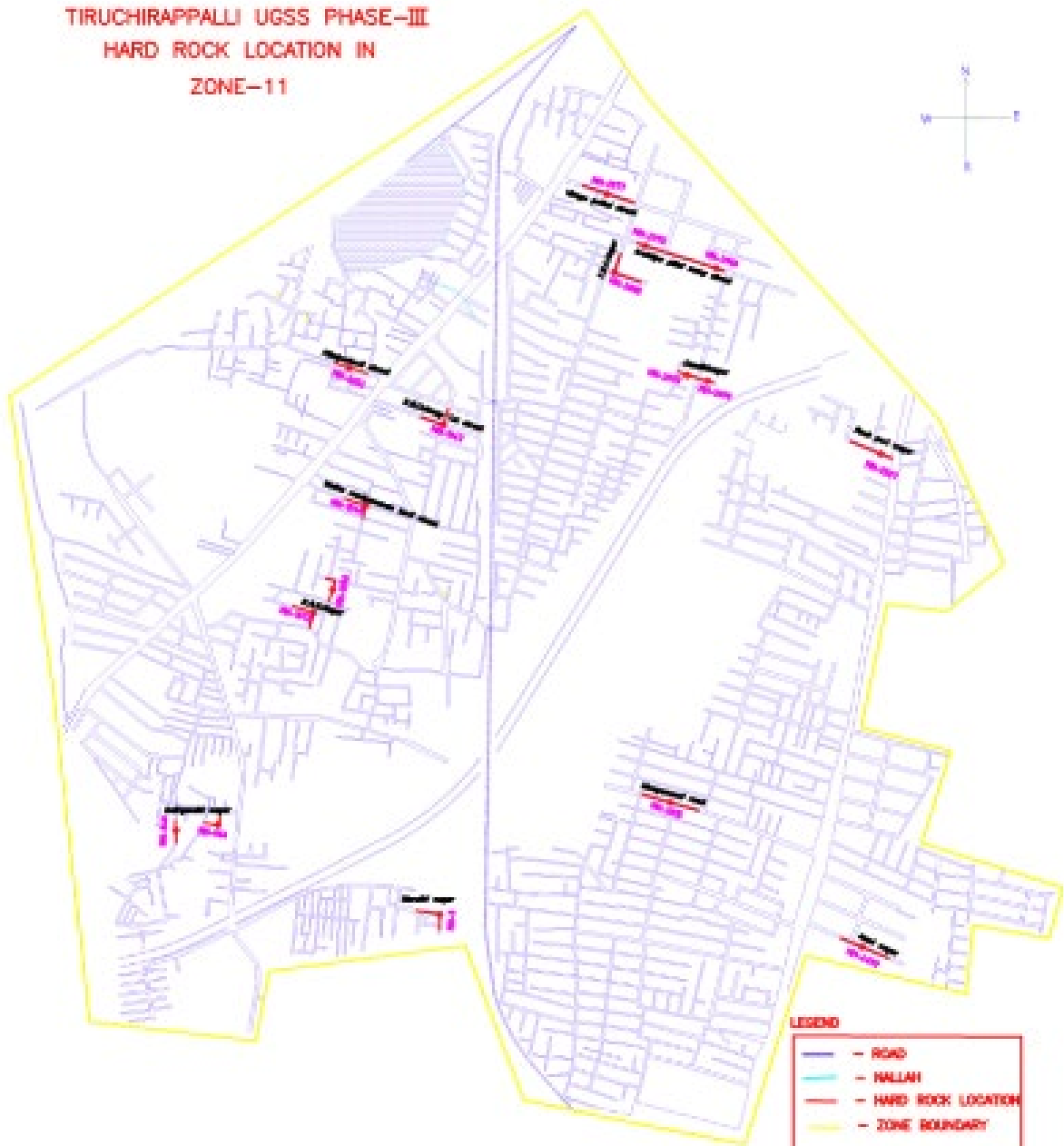
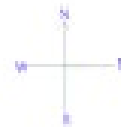
TIRUCHIRAPPALLI UGSS PHASE-III
HARD ROCK LOCATION IN
ZONE-9



LEGEND

| | |
|---|----------------------|
|  | - ROAD |
|  | - NALLAH |
|  | - HARD ROCK LOCATION |
|  | - ZONE BOUNDARY |

TIRUCHIRAPPALLI UGSS PHASE-III
HARD ROCK LOCATION IN
ZONE-11



TIRUCHIRAPPALLI UGSS PHASE-III
HARD ROCK LOCATION IN
ZONE-11

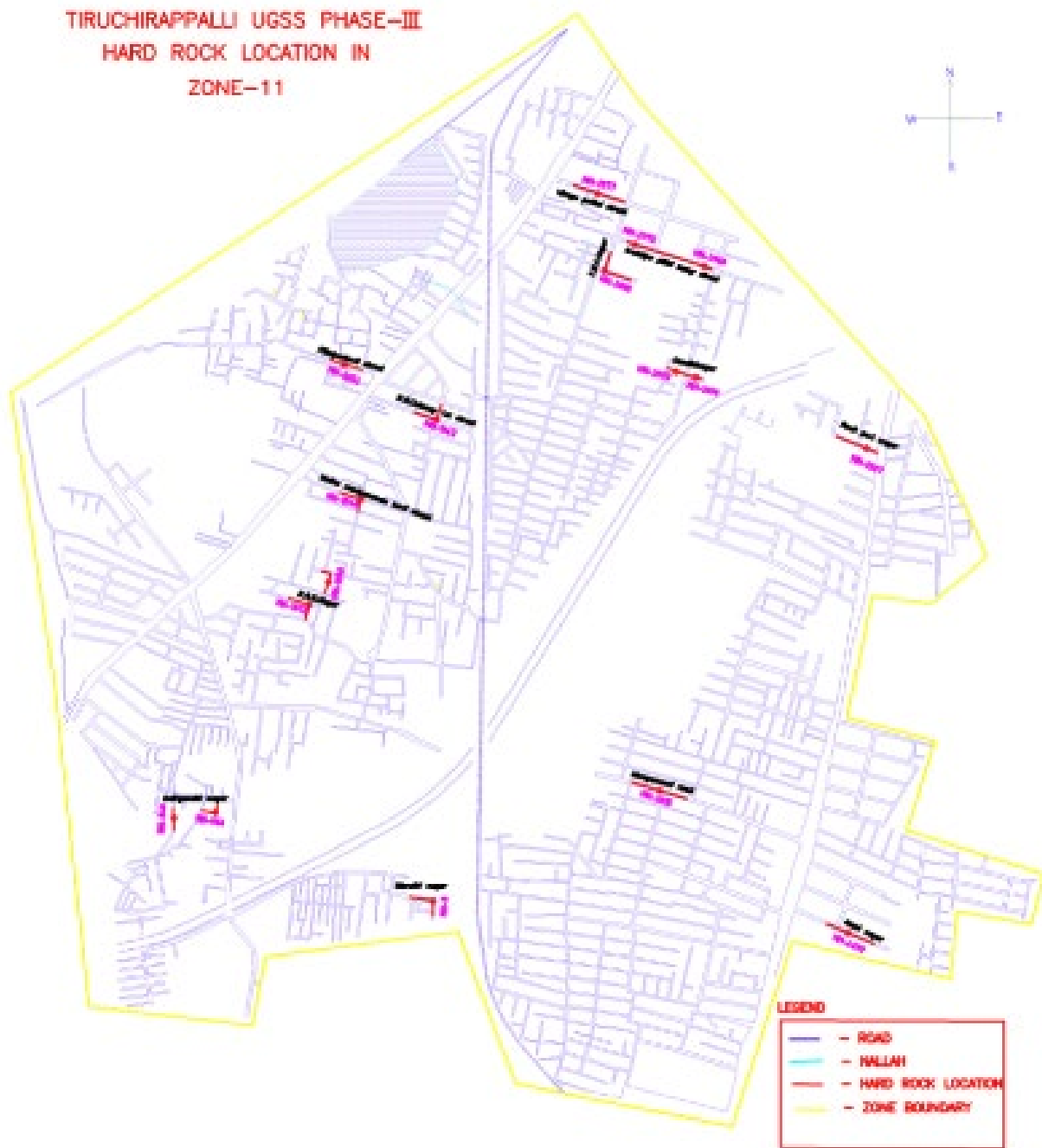


Table 14 Permission for Control Blasting by District Collector

PROCEEDING OF THE DISTRICT COLLECTOR, TIRUCHIRAPPALLI

PRESENT : THIRU.S. SIVARASU, I.A.S.,

Roc.D2/23850/2021

Dt : 15.03.2021

Sub : Explosive Act and Rules – Tiruchirappalli District – Tiruchirappalli City Corporation – UQSS – work of "Providing Under Ground Sewerage Scheme to Tiruchirappalli Corporation (Phase III) – Permission to conduct blasting operation for foundation excavation work at Tiruchirappalli Town - requested – Order issued.

Ref : 1) Commissioner, Tiruchirappalli City Municipal Corporation letter Roc.No.4944/2020/E7(Main) Dt: 12.10.2020.
2) Revenue Divisional Officer, Tiruchirappalli, letter No. K.Dis.A1/4652/2020 Dt : 12.10.2020.

–xx–

ORDER :

In the reference 1st cited, the Commissioner, Tiruchirappalli City Municipal Corporation has informed that the work of "Providing Under Ground Sewerage Scheme (Collection System) to Tiruchirappalli Corporation (Phase III) awarded to the Contractor L & T.

The works, as per the project such as construction of Manhole, Sewage pumping stations, Lifting Stations and laying of sewer pipeline are in progress in the designed areas.

The contractor L&T, has submitted that during the earth work excavation in certain locations, hard rock is met with at 0-2m below the ground level and this hard rock to be removed by controlled blasting method only. L&T has requested permission for conducting controlled blasting wherever hard rocks are encountered.

The area covering under Package of work are as follows.

| Sl. No. | ZONE | WARD NO |
|---------|---------|-----------------|
| 01. | ZONE-5 | 63 |
| 02. | ZONE-6 | 31 |
| 03. | ZONE-7 | 35 |
| 04. | ZONE-8 | 37 |
| 05. | ZONE-9 | 38 |
| 06. | ZONE-11 | 39, 40, 41 & 42 |
| 07. | ZONE-12 | 45 |

The Contractor L&T has informed to the Municipal Corporation, Tiruchirappalli City that, the blasting operation have to be conducted through following licensed holders.

-2-

1. Thiru.S. Balusamy, S/o.K. Subramanian, Namakkal
Licence No.E/SC/TN/30/1260/(E73429)
2. Thiru.K. Sekar, S/o.N. Kaliyannan, Namakkal
Licence No. E/SC/TN/30/1261/(E73431)
3. Shri Muthu Explosives, Tiruchirappalli
Licence No. E/SC/TN/22/54/(E40825)
4. M/s. Sujee Explosives, Tiruchirappalli
Licence No. E/SC/TN/22/1261/(E10202)

The above contractor has proposed to conduct controlled blasting with the use of Jellatin sticks alone and necessary rubber strips and sand bags will be utilized for precautionary measures. The contractor has assured to take care of all necessary precautions in respect of management traffic and public safety during the blasting operation.

Further, the Corporation Commissioner has requested to grant permission for conducting controlled blasting operations through the License holders in the above requested areas with certain conditions. The Revenue Divisional Officer, Tiruchirappalli and the Assistant Director(Mines), Tiruchirappalli have jointly inspected and recommended to grant permission with certain conditions.

Accordingly, on the request of the Commissioner, City Corporation, Tiruchirappalli and on the recommendation of the Revenue Divisional Officer, Tiruchirappalli and Assistant Director (Mines and Mineral), Tiruchirappalli. Permission is hereby accorded to L&T Company for controlled blasting of hard rock through valid licence holder on the above area covered in Phase III subject to the following conditions.

1. The details of purchase and usage of Gelatin sticks in the project work is to be reported within the prescribed time every week to the inspection authorities.
2. If any accident or unwanted incident occurs, the contractor alone is solely whole responsible for it.
3. The contractor has to have comprehensive insurance coverage for all those who engage to the task.
4. Blasting materials should be purchased from the valid Licensed Seller only.
5. All safety measures have to be taken and the operation have to be undertaken during the day hours only.
6. Rock particles have to be handed over to the Assistant Director(Mines), Tiruchirappalli.
7. All precautionary measures have to be taken and protocol should be followed regarding Covid-19.

Sd/-S. Sivasu,
District Collector,
Tiruchirappalli.

For District Collector

//By Order//

To :-

The Commissioner,
Tiruchirappalli City Corporation,
Tiruchirappalli.

Copy to the Revenue Divisional Officer, Tiruchirappalli for necessary action.

Copy to the Assistant Director Mines and Minerals, Tiruchirappalli for necessary action.

15/11/2021

APPENDIX – 15
Permission for tree removal and cutting

Municipal Administration and Water Supply Department

From
S. Sivasubramanian.,B.Sc.,B.L.,
Special Officer & Commissioner,
 Tiruchirappalli City Corporation
 Tiruchirappalli – 620 001



To
M/s Larson & Tourbo Ltd.
 Waste water Business Unit,
 Waste Water & Effluent Treatment,
 P.B.979, Mount Ponnammallee,Road,
 Manapakkam,Chennai-600089.

Roc No: 4824/ 2018/ E7 (Main) Dt. 07.06.2021

Sir,

Sub : Tiruchirappalli City Corporation – UGSS under phase III – Removing and replanting of trees in S.P.S 5 site – Permission – Reg.

Ref : 1.Agreement No 01/2020-21 dt 15.04.2020

2.Lr No : LTCD/TRICHY UGSS P-III/WET/WW/UK/2021-22/151
 dt 07.06.2021

With reference to the letter 2nd cited , your request for permission to remove and replanting the following trees at SPS 5 is hereby approved.

| S.No | Type of Trees | Direction | No.of Tree | Approx. Age |
|------|---|------------|------------|-------------|
| 1 | Indian Tulip Tree (Thespesia populnea) | North west | 2 | 3 years |
| 2 | Necm Tree (Azadirachta indica) | North west | 5 | 3 years |

In this connection, it is to be stated that as section 8 particular condition of the contract, the mitigation measures to be taken for removing and replanting the trees nearby and maintain 10 trees for each trees that is removed. Hence it is permitted to remove and replant the trees by following the above said conditions.

S. Sivasubramanian
 9/6/2021
 For Commissioner,

Tiruchirappalli City Corporation.

S. Sivasubramanian
 9/6/2021

Municipal Administration and Water Supply Department

From
S. Sivasubramanian,,B.Sc.,B.L.,
Special Officer & Commissioner,
Tiruchirappalli City Corporation
Tiruchirappalli – 620 001



To
M/s Larson & Turbo Ltd.
Waste water Business Unit,
Waste Water & Effluent Treatment,
P.B.979, Mount Ponnammallee,Road,
Manapakkam,Chennai-600089.

Roc No: 4824/ 2018/ E7 (Main) Dt. 11 . 06 .2021

Sir,

Sub : Tiruchirappalli City Corporation – UGSS under phase III – Removal
of dead trees at S.P.S 5 – Reg.

Ref : I.Agreement No 01/2020-21 dt 15.04.2020

2.Lr No : LTCD/TRICHY UGSS P-III/WET/WW/UK/2021-22/155

Dt 10.06.2021

With reference to the letter 2nd cited, your request for permission to cut and remove
the following dead trees at SPS 5 at Indira Nagar is hereby approved.

| S.No | Type of Trees | Direction | No of tree | Approx. age |
|------|--------------------|---------------|------------|-------------|
| 1 | Dead coconut trees | North west | 6 | 10 years |

The above trees can't be replanted and it has to be removed from construction area.

Hence,it is permitted to cut and remove 6 nos of dead coconut trees in S.P.S - 5 site
with the condition that 10 new trees will be planted near by the area for each tree

S. Sivasubramanian
11/6/2021
For Commissioner,

Tiruchirappalli City Corporation.

S. Sivasubramanian
11/6/2021

APPENDIX - 15
Work order letter for Klainganagar and Muthukumarasamy Nagar

Municipal Administration and Water Supply Department

From
P.M.N. Mujibur Rahuman, B.sc,
Special Officer & Commissioner,
Tiruchirappalli City Corporation
Tiruchirappalli – 620 001.



To
M/S. Larsen & Toubro Limited,
Wastewater Business Unit,
Water & Effluent Treatment,
P.B No.979, Mount Ponnammallee Road,
Manapakkam, Chennai-600 089

Roc No: 4944/ 2020/ E7 (Main) Dt. 25.10.2021

Sir,

- Sub : Underground sewerage scheme to extended areas of Tiruchirappalli City Corporation under phase III – change of SPS – 9 site from Muththukumarasamy nagar to Kalinga nagar and change of lifting station site from Kalinga nagar to Muththu kumarasamy nagar in Zone - 9 Approval requested –Reg.
- Ref : 1. Contract Agreement No: 01/2020-21 dt 15.4.2020
2. TL/CMSC/Trichy Lr. No : STC/CMSC/L&T/2021/14,dt:18.10.2021

It was informed by CMSC Team sewer network is under progress as per the agreement cited in the reference. The work of construction of SPS 9 have been started on 08.02.2021. Due to public objection, the work have been stopped and alternative site have been identified near Kalinga nagar in Zone 9.

Based on the recommendation of CMSC Team, changing the location of SPS 9 site and changing the location of lifting station 9A site is approved as follows.

- (i) Changing the location of SPS 9 site from Muththukumarasamy* nagar to Kalinga nagar.
- (ii) Changing the location of lifting station 9A from Kalinga nagar to Muththukumarasamy nagar.

The contractor is instructed to construct the SPS 9 and lifting station 9A in the above changed location.

Encl:

1. Drawing showing the change of location SPS 9 and lifting station 9A site.

Arundhathi
25/10/2021

For Commissioner,
Tiruchirappalli City Corporation.

Arundhathi
25/10/2021

Copy to the Team Leader, CMSC, STC Trichy for information and follow up action.