Initial Environmental Examination

PUBLIC

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India: Tamil Nadu Urban Flagship Investment Program- Tranche 2

Subproject: Water Supply System for Corporation Areas of Tiruppur City Municipal Corporation

Prepared by Tiruppur City Municipal 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-2.

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Initial Environmental Examination

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IND: Tamil Nadu Urban Flagship Investment Program (Tranche 2) –Water Supply System for Corporation Areas of Tiruppur City Municipal Corporation

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CURRENCY EQUIVALENTS

(as of 4July 2019)

Currency Unit	–	Indian rupee (₹)
₹1.00	–	$0.0145
$1.00	=	₹68.7685

ABBREVIATIONS

ADB	–	Asian Development Bank
ASI	–	Archeological Survey of India
CPCB	–	Central Pollution Control Board
CTE	–	consent to establish
CTO	–	consent to operation
DI	–	ductile iron
EAC	–	Expert Appraisal Committee
EARF	–	environmental assessment and review framework
EHS	–	environmental health andsafety
EIA	–	environmental impact assessment
EMP	–	environmental management plan
ESS	–	environmental and social safeguards
GOTN	–	Government of Tamil Nadu
GRM	–	grievance redress mechanism
IEE	–	initial environmental examination
MLD	–	million liters per day
MOEFCC	–	Ministry of Environment, Forest and Climate Change
NOC	–	no objection certificate
NTADCL	–	New Tiruppur Area Development Corporation Limited
PIU	–	programimplementation unit
PMU	–	programmanagement unit
PPTA	–	project preparatory technical assistance
REA	–	rapid environmental assessment checklist
ROW	–	right-of-way
SEIAA	–	State Environmental Impact Assessment Authority
SPS	–	Safeguard Policy Statement
STP	–	sewage treatment plant
TCMC	–	Tiruppur City Municipal Corporation
TNPCB	–	Tamil Nadu Pollution Control Board
TNUFIP	–	Tamil Nadu Urban Flagship Investment Program
TNUIFSL	–	Tamil Nadu Urban Infrastructure Financial Services Limited
TWAD	–	Tamil Nadu Water and Drainage Board
WHO	–	World Health Organization
WTP	–	water treatment plant

WEIGHTS AND MEASURES

cm	–	centimeter
m^3	–	cubic meter
dbA	–	decibels
dia	–	diameter
ha	–	hectare
kg	–	kilogram
km	–	kilometer
l	–	liter
m	–	meter
mg/l	–	milligrams per liter
ml	–	milliliter
MLD	–	million liters per day
Mm	–	millimeter
km^2	–	squarekilometers
m^2	–	squaremeters
$\mu g/m^3$	–	micrograms per cubicmeter

NOTE

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

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APPENDIXES

EXECUTIVE SUMMARY

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.

The Subproject.Tiruppur City Municipal Corporation (TCMC) will be the executing agency. TCMC has been expanded by including adjoining local bodies such as Nallur and Velampalayam (municipalities), Andipalayam, Chettipalayam, Mannarai, Murugampalayam, Muthanampalayam, Nerupherichal, Thottipalayam, Veerapandi, (village panchayats). The extended corporation area is effective from 25October 2011.In this subproject to be implemented under the ADB-funded TNUFIP, it is proposed to implement improvements to the water supply system in the corporation area of TCMC. The subproject includes the following civil works components: (i) raw water intake well in River Bhavani at Mettupalayamand pump house (to house 6 nos. of pumpsets with associated electrical and instrumentation equipment), (ii) Construction of Check Dam of 1.52 meters (m) height across River Bhavani, (iii) raw water transmission main for a length of 19.27 kilometers (km)for conveying raw water from intake works to the water treatment plant (WTP), (iv) construction of proposed WTP for 196 million liters per day (MLD) for the intermediate stage and expandable to 270 MLD for the ultimate stage, (v) laying clear water transmission main for a length of 37.53 km and laying of feeder mains to proposed overhead tanks (OHTs) for a total length of 110.776 km (total length of 148.306km), (vi) construction of 29 nos. OHTs, (vii) providing distribution system to1,062.429 km, (viii) construction of 14 pipe carrying bridges,and (ix) 117,436 house service connections inclusive of water meter.

Project implementation arrangements. The Municipal Administration and Water Supply Department (MAWS) of Government of Tamil Nadu (GOTN) acting through theTNUIFSL 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 TCMCis the implementing agencyfor this subproject. A programimplementation unit (PIU) will be established in TCMC headed by a full-time project manager (Executive Engineer or above) and comprising dedicated full-time staff of the TCMC for day-to-day implementation of the subproject. The PIU is assisted by New Tirupur Area Development Corporation Limited (NTADCL) in implementation.The environmental specialist of the NTADCL will assist PIU in implementation of subproject in compliance with the environmental management plan (EMP) and environmental assessment and review framework (EARF) and will carry 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 therequirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS), 2009. As per the Government of India'senvironmental 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 water supply. The potential negative impacts were identified in relation to pre-construction, 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. Tiruppur is a city in the Kongu Nadu region of the Indian state of Tamil Nadu and located at 11.1075°N, 77.3398°E on the banks of the Noyyal River. It has an average elevation of 295 meters (967 feet) and covers an area of159.6 square kilometers (km^2). Tiruppur is the administrative headquarters of Tiruppur District and the fifth largest urban agglomeration in Tamil Nadu. It is situated at the center of the South Indian Peninsula, about 450 km southwest of the state capital Chennai and about 50 km east of Coimbatore.The climate is tropical with the mean maximum and minimum temperatures varying between 35 degrees Celsius (°C) to 22°C (95°F to 72°F). Tiruppur receives rainfall mainly due to northwest and southwest monsoon and it receives an average annual rainfall of 700 millimeters. Major portion of Tiruppur district is constituted by red gravel, clay loamy soils. Tiruppur falls under seismic zone — III (Moderate Damage Risk Zone). The southern part of the Tiruppur district is covered by hill ranges of Western Ghats and the rest of the district consists of undulating plain sloping gradually from West to East.The Noyyal, Amaravati, Palar,Nallar and ChinnarRiversflow through the district. There are two major dams in the district namelyThirumoorthy dam (across Palar River) and Amaravathi dam (across Amaravathy River).The Subproject components include raw water intake well, check dam, raw water transmission main, water treatment plant, are located in outskirt of the city. Within the project area or in the vicinity of the project area, there are no eco-sensitive areas like forest or protected areas or nationally important/protected monuments.

Potential environmental impacts and mitigation measures. The subproject is unlikely to cause significant impacts that are irreversible, diverse or unprecedented 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 sitehowever,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 processand are produced because the process is invasive, involving excavation and earth movements and controlled blasting in some stretches along the alignment.

Source Sustainability. The proposed subproject is to augment and improve the water supply system in Tiruppur City Municipal Corporation in Tiruppur District from River Bhavani as water source. Water Utilisation Committee unanimously approved this water supply proposal for a quantum of 156.36 MLD from downstream of Bhavani Barrage I at Samayapuram at the location of existing Headworks with a provision that the Tiruppur City Municipal Corporation can approach the Government for sanction of the ultimate water requirement (231.19 MLD) for this scheme. In addition to the approved quantity, Tiruppur Corporation is presently drawing a total quantity of 40 MLD through Scheme I & II which will be abandoned, and this quantity will be drawn by the new scheme.

Presently there are about 19 combined water supply schemes existing in River Bhavani between Pillur Dam and Bhavani Sagar Dam and the total required quantity of these existing schemes is 5.7mcft. The average of minimum monthly inflow into the Bhavanisagar reservoir during the period from the year 2000 to 2017 as per the PWD record is 1087 mcft/month whereas, the cumulative Water supply requirement including Coimbatore WSS and Tiruppur WSS is 525 mcft/month. Hence the required quantity of water will be available generally throughout the year for all the existing as well as proposed Water supply schemes.

Providing comprehensive water supply scheme will ensure adequate supply of clean and good quality of treated water for the entire community thereby enhancing the quality of life of the residents in the subproject area. Hence, the subproject is likely to have numerous positive impacts on the environment and public health. In this IEE, negative 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. Various measures suggested includesbuffer around the WTP, imparting necessary training; safety and personal protection equipment for workers, etc.

Potential impacts during construction are considered significant but temporary, and are common impacts of construction in corporation areas, and there are well developed methods to mitigate the same. Except laying of transmissionmain and distribution main, remaining construction activities will be confined to the selected sites, and the interference with the general public and community around is minimal. In these works, the temporary negative impacts arise mainly from construction dust and noise, hauling of construction material, waste and equipment on local roads (traffic, dust, safety, etc.), mining of construction material from the existing government licensed mining areas, occupation health and safety aspects. Laying of pipeline will be conducted along the edge of public roads in the urban area congested with settlements, commercial activities and moving traffic. Therefore, water pipe laying will have significant impacts arising mainly from the disturbance of residents, businesses and traffic due to construction work; safety risk to workers, public and nearby buildings due to trench excavations in the road; access impediment to houses and business, disposal of large quantities of construction waste, etc. These are all general impacts of construction in densely populated 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. As stated above, various design related measures are already included in the project design. During construction, the EMP includes mitigation measures such as (i) proper planning of pipe laying works to minimize the public inconvenience; (ii) barricading, dust suppression and control measures; (iii) traffic management measures for works along the roads and for hauling activities; (iv) provision of walkways and planks over trenches to ensure access will not be impeded; and (v) finding beneficial use of excavated materials to extent possible to reduce the disposal quantityHard 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 the EMP.EMP will guide the environmentally-sound construction of the subproject. EMP includes a monitoring program tomeasure 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 to the conditions set out in this document.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 EMP. No works are allowed to commence prior to approval of SEMP. A copy of the EMP/approved SEMP will be 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 project area 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, Tiruppur City Municipal Corporation and TNUIFSL websites. The consultation process will be continued during project implementation. A grievance redress mechanism (GRM) is described within the IEE to ensure any public grievances are addressed quickly.

Monitoring and Reporting. Contractor will submit a monthly EMP implementation report to PIU. PIU with the assistance of NTADCL will monitor the compliance of Contractor, prepare a Quarterly Environmental Monitoring Report and submit to PMU. The PMU will oversee the implementation and compliance and will submit semi-annual monitoring reports to ADB. ADB will post the environmental monitoring reports on its website. Monitoring reports will also be posted on Tiruppur City Municipal Corporation and TNUIFSL websites.

Conclusions and Recommendations. Therefore, as per ADB SPS, the project is classified asenvironmental category ‘B’ and does not require further environmental impact assessment. The water sourced from River Bhavani will be treated to meet the drinking water standards (IS: 10500) at the proposed water treatment plant and be supplied. The most noticeable long-term benefits due to the subproject are: (i) increased access to treated water supply, (ii) reduction in time and cost of collecting water, and (iii) reduction in vulnerability to water borne diseases. This IEE shall be updated by TCMC during the implementation phase to reflect any changes, amendments and will be reviewed and approved by PMU.

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.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.

2. **Impact and outcome.** Tranche 2 is aligned with the following impacts of TNUFIP: (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 at least five cities in priority industrial corridors enhanced.

3. **Outputs.** Tranche 2 will support the development of water supply and sewerage facilities in five cities (Ambur, Madurai, Tiruchirappalli, Tiruppur and Vellore). There are six subprojects (four sewerage, two water supply) proposed. It will support improvement of urban governance in all project ULBs under the MFF. A summary description of the outputs is described below.

4. **Output 1: Climate-resilient sewage collection and treatment, and drainage systems developed in four cities.** Works in Tiruchirappalli, Ambur, Tiruppur, and Vellore include:

(i) construction of two new sewage treatment plants (STPs) with a combined treatment capacity of 72 million liters per day (MLD);
(ii) rehabilitation of one STP (15 MLD capacity);
(iii) reuse of 3,000 cubic meters treated wastewater per day;
(iv) construction of 1,256 kilometers (km) of new sewage collection pipelines, with 100% households connected (152,580 households);
(v) construction 28 pump and 44 lift stations;
(vi) formation of eight (two in each city) all-female community water and sanitation committees.

5. The breakdown by city is:(i)construction of new sewage collection system in Tiruchirappalli, (ii) construction of new sewage collection system and 16.71 MLD STP in Ambur, (iii) construction of new sewage collection system with new 56 MLD STP and rehabilitation of one 15 MLD STP in Tiruppur, and (iv) construction of new sewage collection system in Vellore.

6. **Output 2: Water supply systems in two cities improved with smart features.** Works in Tiruppur and Madurai include:

(i) construction of 1,260 km of new distribution pipelines with 100% households connected (188,900 households) in 66 newly established district metered areas (DMAs) with new Supervisory Control and Data Acquisition (SCADA) systems to manage and reduce nonrevenue water (NRW);
(ii) construction of 66 new storage reservoirs with combined capacity of 92 million

liters;
(iii) construction of 3 pump stations;
(iv) construction of 196 km new transmission mains and 230 km of feeder mains;
(v) construction of three new intakes and three new water treatment plants of combined capacity of 321 MLD; and
(vi) 80% of technical staff from each implementing agency of two cities trained in NRW reduction including 100% women staff.

7. The breakdown by city is: (i) construction of 1,060 km of distribution pipelines in 29 district metering areas (DMAs), 29 storage reservoirs, 2 pump stations, 46 km of transmission mains and 121 km of feeder mains, and a new intake with 196 MLD WTP in Tiruppur;and (ii) construction of 200 km of distribution pipelines in 37 DMAs, 37 storage reservoirs, 1 pump station, 150 km transmission mains and 109 km feeder mains, and a new intake structure with 125 MLD WTP in Madurai.

8. **Output 3: Institutional capacity, public awareness, and urban governance strengthened.** Governance improvement and awareness consultants recruited under Tranche 1 will support output 3. 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) initiatives on reuse of treated wastewater (in all 10 program cities and in cities outside the program with functioning wastewater treatment systems), and
(v) implementation of gender action plan.

B. Purpose of this IEE Report

9. 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 negative impacts were identified in relation to pre-construction, construction and operation phase of the improved infrastructure, and the outcome of the assessment shows 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.

10. The preparedIEE is based on the detailed project report (DPR) prepared by Tiruppur City Municipal Corporation through DPR Consultant.The IEE was basedmainly on field reconnaissance surveys and secondary sources of information. No fieldmonitoring (environmental) survey was conducted; however, the environmental monitoring program developed as part of the Environmental Management Plan (EMP) will require the contractors to establish the baseline environmental conditions prior to commencement of civil works. The results will be reported as part of the environmental monitoring report and will be the basis to ensure no degradation will happen during subproject implementation. Stakeholder consultation was an integral part of the IEE.

C. Report Structure

11. 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 subproject;
(iv) Policy, legal and administrative framework;
(v) Description of the environment;
(vi) Anticipated environmental impacts and mitigation measures;
(vii) Grievance redress mechanism;
(viii) Public consultation and information disclosure;
(ix) Environmental management plan;
(x) Institutional arrangements;
(xi) Findings and recommendation; and
(xii) Conclusion.

II. DESCRIPTION OFSUBPROJECT

A. Project Area

12. Project area is located in Tiruppur, located in Tamil Nadu at about 450 km southwest of State capital Chennai and about 50 km east of Coimbatore. Tiruppur Municipality has been upgraded into Tiruppur City Municipal Corporation effective 1 January 2008. Tirupur City Municipal Corporation was formed by annexing adjoining other local bodiestwo municipalities (Nallur and Velampalayam) and eightvillage panchayats (Andipalayam, Chettipalayam, Mannarai, Murugampalayam,Muthanampalayam, Nerupherichal, Thottipalayam and Veerapandi). The total area of the corporation is 159.35 square kilometers (km^2). The extended corporation area is effective from 25October 2011. The population as per 2011 census is 877,778 and is divided into 60 administrative wards.

B. Existing WaterSupply System

13. TirupurCity Municipal Corporation receives water from three water supply schemes. Twoschemes (Scheme 1 and Scheme 2) fromRiver Bhavani as source and thirdscheme(Scheme 3 - NTADCL Project) fromRiver Cauvery as source. Scheme 1 wascommissioned in 1965 and it is owned and operated by TiruppurCity Municipal Corporation, Scheme 2 was commissioned in 1993, which is a Combined Water Supply Scheme operated and maintainedby TWAD Board and Tiruppur City Municipal Corporation. Scheme 3 wascommissioned in 2005 and it is owned, operated maintained by the New Tiruppur Area Development Corporation Limited (NTADCL). Salient detailsof the water supply Schemes are given in Table 1below:

Table 1: Salient Details of Existing Water Supply Schemes

S. No.	Description	Scheme 1	Scheme 2	Scheme 3
1.	Year of commissioning	1965	1993	2005
2.	Ultimate design year	1991	2011	2030
3.	Source	River Bhavani	River Bhavani	River Cauvery
4.	Intake	On the bank of River Bhavani atMettupalayam	On the bank of RiverBhavani atMettupalayam	On the bank of RiverCauvery atAnainasuvampalyamVillage –Erode
5.	WTP	Mettupalayam	Mettupalayam	Suriampalayam Village – Erode
6.	Designed Capacity (Total)	7.15 MLD	46.10 MLD	185.00 MLD expandable to 250 MLD
7.	Allocation to TCMC	5.450 MLD	30.113 MLD	38.957 MLD
8.	Maintained by	TCMC	TWAD Board and TCMC	NTADCL

MLD = million liters per day, NTADCL =New Tiruppur Area Development Corporation Limited, TCMC = Tiruppur City Municipal Corporation, TWAD = Tamil Nadu Water Supply and Drainage;WTP = water treatment plant.
Source: Tiruppur City Municipal Corporation.

14. The water allocation for the TCMCfrom the three schemes is 74.52 MLD. At present, 50 MLD of additional water being received from NTADCL on temporary basis to meet the total requirement of the Corporation.The availability of the water from all the schemes (73.4 MLD) areinadequate with respect to present demand of around 150 MLD. Most of the treatment plants are also old and damaged due to which they are running much below their actual capacity. Various components are not functioning and as a result both quantity and quality are not being

assured. Intake systems are old and rusted needing immediate repair and replacement. The proposed project will add 88 MLD.

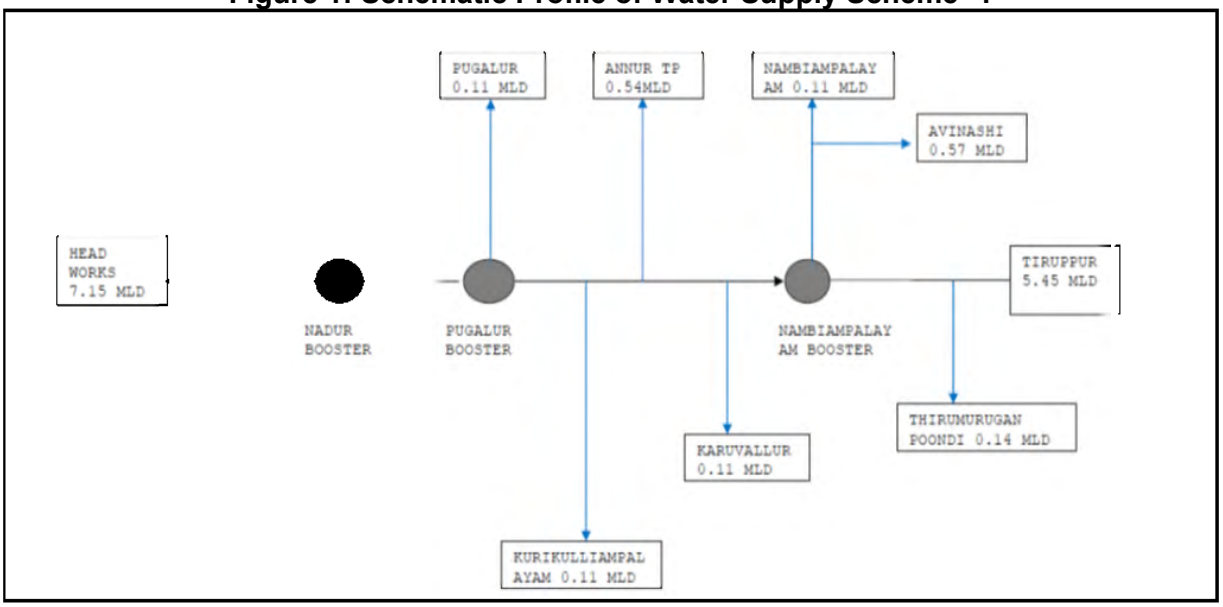
1. Salient features of Scheme 1 - Owned and maintained by Tiruppur City Municipal Corporation

15. An intake structure, 3.65 m diameter was constructed on the river bank with 18-inch diameter inlet pipes at different levels, viz 289 m, 292m, and 295 m. Each inlet pipe is provided with450 mm sluice valve at the discharge to control the flow.

16. A raw water pump-house is constructed 15 m away from the intake well. It consists of three centrifugal pump sets having a duty of 6,200 liters per minute (lpm) against a head of 20m (two numbers working and one standby). The pump capacity and pumping main of 350 mm diameter and 106 m long have been designed so as to deliver raw water to flash mixer at about 4 m to 4.5 m above the ground level to overcome the losses in the treatment plant.The treatment plant has been designed, with the following components to give a dailyoutput of 7.15 MLD:

(i) Flash Mixer;
(ii) Flocculator;
(iii) Clarifier;
(iv) Filter Beds -2 (21 ft. x 20 ft.);
(v) Chemical House and Dosing Equipment;
(vi) Clear water pumps -6,000 lpm 51 m head – 100 HP (two working onestandby); and
(vii) Clear water reservoir – 10 lakh liters (LL).

Figure 1: Schematic Profile of Water Supply Scheme -1



17. The total length of transmission main is 53.87 km, of which initial reach of 18.64 km up to the ridge point at Annur is pumping main and remaining 35.23 km is gravity main. There are three Booster Stations located at Nadur, Pugalur and Nambiampalayam. The transmission main is 400 mm CI for a length of 20.52 km and 350 mm CI pipe for a length of 33.34 km.

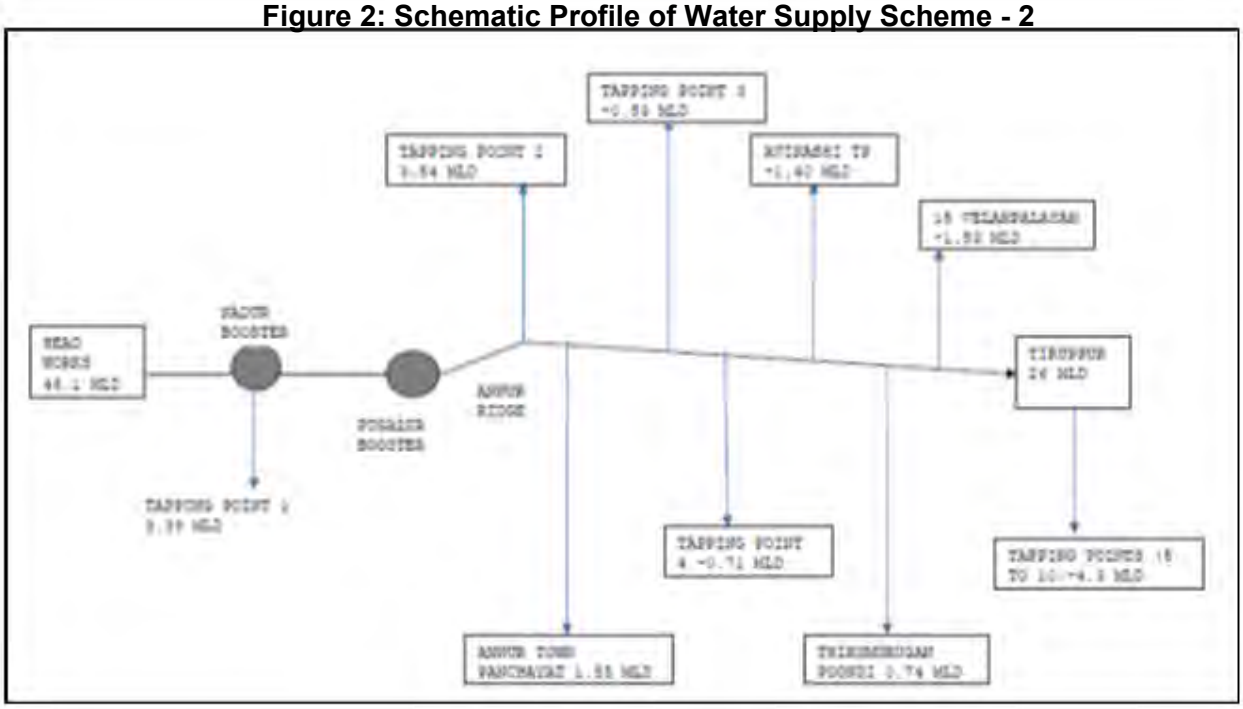
2. Salient features of Scheme 2 - Combined Water Supply Scheme Maintained by Tamil Nadu Water Supply and Drainage Board

18. The Intake well of 6 m diameter with three inlet pipes at three different levels 290.50 m, 293.50 m and 296.50 m was constructed on the bank of River Bhavani just upstream of the intake for Scheme 1.

19. The watertreatment plant is for 46.1 MLD with conventional process consisting of the following processes aeration (cascade), pre-chlorination, sedimentation, filtration and disinfection. Clear water sump is for a capacity of 18 LL and is provided with 400 HP pumps with a duty of 30,186 lpm against a head of 50 m (1 working and I stand by).

20. The total length of transmission main is 54.135 km, of which, the initial reach from head works to Annur Ridge point is 18.66 km of 800 mm diameter PSC pumping main. From Annur ridge point to Tirupur (35.475 km), the transmission main is through 700 mm PSC gravity main.

Figure 2: Schematic Profile of Water Supply Scheme - 2



3. Salient features of Scheme 3 - New Tiruppur Area Development Corporation Limited Water Supply Scheme

21. The main components of the project scheme are as follows:

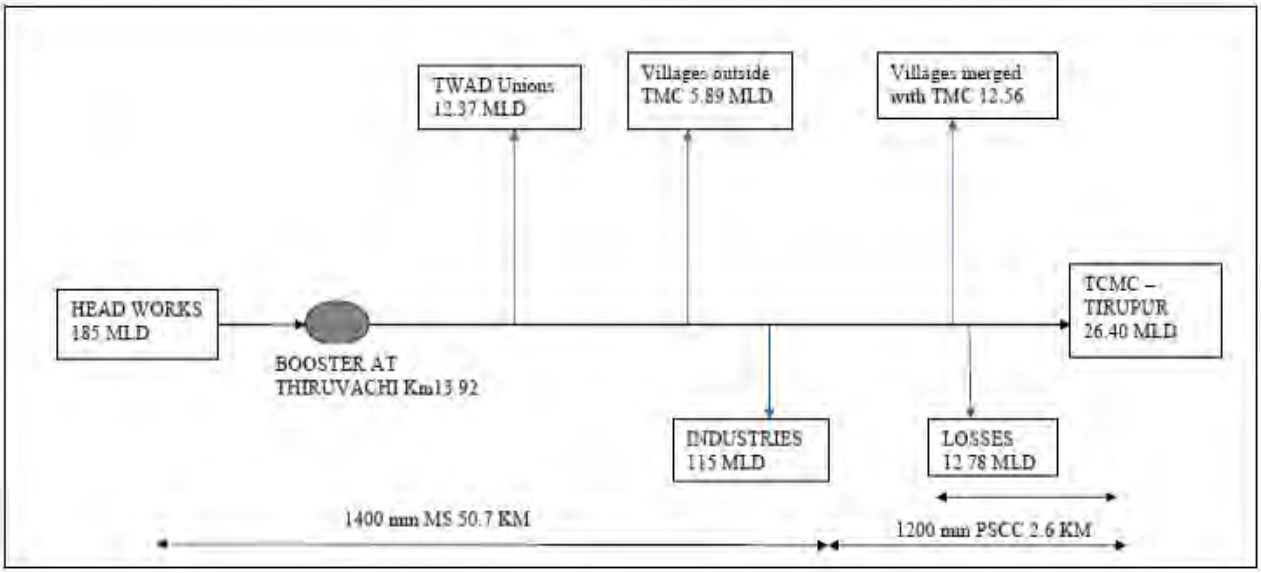
(i) River Intake located downstream of confluence point of River Bhavani with River Cauvery having capacity of 185MLD expandable to 250MLD with 3 nos.variable speed pumps 3,852 cum/hr x35.2m head;
(ii) Raw Water Main: 1400mm MS pipe of length 1,400 meters;
(iii) Water Treatment Plant of capacity of 185MLD expandable to 250 MLD having zero waste discharge with use of sludge thickener and centrifuge and recycling of waste to plant inlet;
(iv) Clear Water Pumping Station having sump of capacity 4,600cum and 3 nos. pumps 3758.4 cum/hr x 108.2m;
(v) Clear Water Transmission Main of size 1400/1200mm MS/PSC pipes having total length of 53.5km;
(vi) Booster pumping Station having 3 nos. variable speed online pumps 3,697.2 cum/hr x 120 m head;
(vii) Master Balancing Reservoir (MBR) of capacity 23,000cum;
(viii) MBR Pumping Station with variable speed pumps;
(ix) FM1 - 3 nos.pumps 1,080cum/hr x 25m head;
(x) FM2 - 3 nos.pumps 2,023.20cum/hr x 43m head; and
(xi) FM3 - 3 nos.pumps 612cum/hr x 53m head.

22. **Supervisory Control and Data Acquisition, PLC, and Radio Telemetry to monitor the system from source to Master Balancing Reservoirand water distribution stations.** The entire scheme, which includes the water off take point (intake), water treatment plant, booster pumping station, MBR pumping station and the water distribution stations (WDSs) spread around 80km radius from the central control room is connected and programmed in such a way that it operates automatically under the SCADA system. It has a network of 36 WDS,

which are the supply junctions. The SCADA system is a unique feature in this scheme and this is said to be the first water project in the country to have it. All functions at the local stations, such as water inflow, opening & closing of valves and water pumping, are automatically controlled through electronic instrumentation.

23. **Three Feeder Mains of MS and DI of length about 93km having diameter from 100mm to 1,200mm.**The WDS – (i)36 Ground Level Storage Reservoirs (GLSRs) of capacities 10 cubic meters (m^3)to 6,500$m^3$with pumping stations having pumps capacity from 40 cubic meters per hour (m^3/hr) to 1,000m^3/hr and (ii) 29 ELSRs of capacity 10cum to 450cum with staging height from 12m to 22m. Distribution Network (DI and high-density polyethylene[HDPE]) of 217 km length having diameters 100mm to 700mm.

Figure 3: Schematic Profile of Water Supply Scheme-3



4. Water Supply Infrastructure available in Tiruppur City Municipal Corporation

24. **Storage reservoirs.**The storage reservoirs (ground level and elevated) constructed under the three water supply schemes are given in Table 2.

Table 2: Details of Storage Reservoirs with capacity in Lakh Liters

Sl.No	Location	Ground Level Reservoir (LL)	Elevated Service Reservoir (LL)
I. Constructed as part of scheme 1 & 2			
1	Avinashi Road –OHT		5.90
2	Avinashi Road -OHT		18.00
3	Avinashi Road	20.00	
4	Bharathi Complex		26.00
5	Royapuram		10.00
6	Puchkaddu		10.00
7	Thenampalayam[a]		5.00
8	Perichipalayam		4.00
9	Vinobaji Nagar[b]		4.00

Sl.No	Location	Ground Level Reservoir (LL)	Elevated Service Reservoir (LL)
10	Dharapuram Road		1.75
11	Dharapuram Road		5.00
	Sub-Total	20.00	89.65
II. Constructed as part of Scheme 3 by NTADCL			
1	Bishop school	25.00	
2	Ramakrishnapuram	27.00	9.00
3	Bharathiyar complex	65.00	
4	Rayapuram	25.00	
5	Puchakadu	35.00	
6	Thennampalayam	9.00	
7	Perichipalayam	50.00	
8	Dharapuram Road		
9	Vinobaji Nagar	15.00	4.00
	Sub-Total	**251.00**	**13.00**

LL = lakh liters; NTADCL = New Tirupur Area Development Corporation Limited.
[a]since demolished.
[b]Demolished and constructed new under Scheme 3.

25. Details of OHTs having minimum storage capacity with low staging height available in Tiruppur City Municipal Corporation are given in Table 3.

Table 3: Details of Overhead Tanks

Sl.No	Area	Overhead Tanks	
		Nos.	Capacity LL
1	Tirupur	10	89.65
2	Nallur	24	14.90
3	Velampalayam	6	12.50
4	Chettipalayam	62	23.75
5	Mannarai	18	8.60
6	Thottipalayam	30	16.56
7	Andipalayam	21	8.70
8	Veerapandi	28	13.50
9	Murugampalayam	20	9.40
10	Nerupherichal	45	19.55
11	Muthanampalayam	52	12.35
	Total	**316**	**233.46**

LL = lakh liters.

26. Details of pumps installed under Scheme3 for pumping water from Ground Level Reservoirs to Elevated Service Reservoir are given in following table.

Table 4: Details of pumps in the distribution system (Ground Level Reservoirs)

Sl. No.	Location	Pump status	Pump Capacity (m^3/hr)	Pump Head in MWC	Pump Type
1.	Bishop school	1W + 1S	900	25	VT
2.	R.K.Puram	1W + 1S	900	25	VT

Sl. No.	Location	Pump status	Pump Capacity (m^3/hr)	Pump Head in MWC	Pump Type
3.	Bharathiyar complex	2W + 1S	600	25	VT
4.	Rayapuram	1W + 1S	500	25	VT
5.	Puchakadu	1W + 1S	600	25	VT
6.	Thennampalayam	1W + 1S	200	25	VT
7.	Perichipalayam	1W + 1S	350	25	VT
8.	Dharapuram Road	1W + 1S	450	40	VT
9.	WDS 7 to WDS 8(Booster)	1W + 1S	100	25	ESBP
10.	Vinobaji Nagar	1W + 1S	250	25	VT

ESBP = End Suction Back Pull out pump, MWC = meter water column, VT = Vertical Turbine.

5. Distribution System

27. About 50 km of pipeline was laid as part of Scheme 1. The distribution network comprises of 90 mm to 300 mm diameter CI, AC and PVC pipes. Under Scheme 2, a length of 250 kmdistribution pipeline was laid and under scheme 3, a length of 54.63 km of additional distribution pipeline were laid on considering the corporation extended limits. About 38,000 house service connections (HSC) were provided with Miraj Medium Density Polyethylene (MDPE) pipes as part of these schemes. Due to frequent chocking and deformations in distribution lines, the pipelines for the length of 32 km were replaced with new pipes.

6. Water Supply Scheme to Tiruppur City Municipal Corporation

28. Under this scheme it is proposed to augment and improve the water supply distribution system to cover the entire area of the corporation limits. The total water availability from the existing source is 69.07 MLD (Scheme2: 30.11 MLD, Scheme3: 38.96 MLD). The design period of scheme 2 ends in the 2023 and the transmission mains are PSC pipes which have frequent bursts and water is being wasted, therefore scheme2 will not be continued in 2023. But Scheme 3 will be continued. After 2023, the proposed water supply scheme will be in operation, so water requirement under scheme2 is considered in this present proposal.

29. The water requirement from the new source for the ultimate design period (2050) is 271.86 MLD (worked out by adding for transmission losses at 1.50%, water treatment losses at 3% and losses at raw water main as 0.5%). The water demand calculation during Intermediate and Ultimate stages is furnished in following table.

Table 5: Water demand calculation during Intermediate and Ultimate stages

Sl. No	Description	Present 2020	Intermediate 2035	Ultimate 2050
1	Population (in Lakhs)	10.80	14.80	19.50
2	Rate of Supply (in LPCD)	135	135	135
3	Requirement (in MLD)	145.80	199.80	263.25
4	Fire Demand (in MLD)	3.29	3.85	4.42
5	Total Demand (in MLD)	149.09	203.65	267.67
6	**Total Requirement with 10% Loss in Distribution System**	**165.65**	**226.27**	**297.41**
7	Available Water (in MLD)			
	(a) Scheme 3 (NTADCL)	38.96	38.96	38.96

Sl. No	Description	Present 2020	Intermediate 2035	Ultimate 2050
8	Balance Requirement (in MLD)	126.69	187.31	258.45
9	Total Clear Water requirement with 1.5% Loss in Transmission Main at the outlet of WTP	128.62	190.17	262.38
10	Total Raw Water requirement with 3% Loss inWTPbackwash recirculation	132.60	196.05	270.50
11	**Total Raw Water requirement** with 0.5% Loss in Raw Water Main at the intake	**133.27**	**197.03**	**271.86**

LPCD = liters per capita per day, MLD = million liters per day, NTADCL = New Tirupur Area Development Corporation Limited, WTP = water treatment plant.
Source: Tiruppur City Municipal Corporation.

30. The River Bhavani will be the source for the new water supply scheme and the new river intake is proposed at Mettupalayam at the head works site of scheme 1 & 2. Adequate area is available at this site will be utilized for locating new intake, raw water pumping station and related works such as surge tank, etc. Though River Cauvery source is more reliable than River Bhavani, based on the quality of water, distance, alignment, pump head required, etc. River Bhavani will be source for new water supply scheme.

31. Raw water will be pumped to the WTP at Annur and fed by gravity to all the Over Head Tanks (OHT's). The entire corporation area will be divided into sub-zones. Each zone will be provided with elevated level service reservoir. Totally 70 OHT are required as storage reservoirs (existing OHTs are 15, proposed OHTs are 55). Out of 55 proposed OHTs, 26 OHTs are being constructed under the AMRUT scheme by TWAD Board. Remaining 29 new OHTs will be constructed under this subproject.Feeder main from Scheme3 (NTADCL Project) will continue to feed the 26 reservoirs(constructed under AMRUT scheme by TWAD board).

32. Transmission main from Scheme1&2 directly feeds the overhead reservoirs. The water from Scheme3 is received in ground level reservoirs and pumped to overhead tanks. The available storage is 36.47 milliliters (ml) (GLSR: 27.50 ml and ELSR: 8.97 ml).

33. Except for Velampalayam, none of the other areas in the expanded corporation has OHTs of capacity more than 2.5 LL and with 12 m staging height. Velampalayam has two OHTs with more than 2.5 LL capacity and 12m staging, one at Velamalayam and other at Anupparpalayam. So, it is proposed to construct new OHTs in each distribution zone with 5 LL to 20 LL capacity and 16m staging to meet the one-third storage capacity. Water from Scheme 2 and from the New Proposed Scheme will be received directly to the OHTs.

Figure 4: Location Plan of Tiruppur District

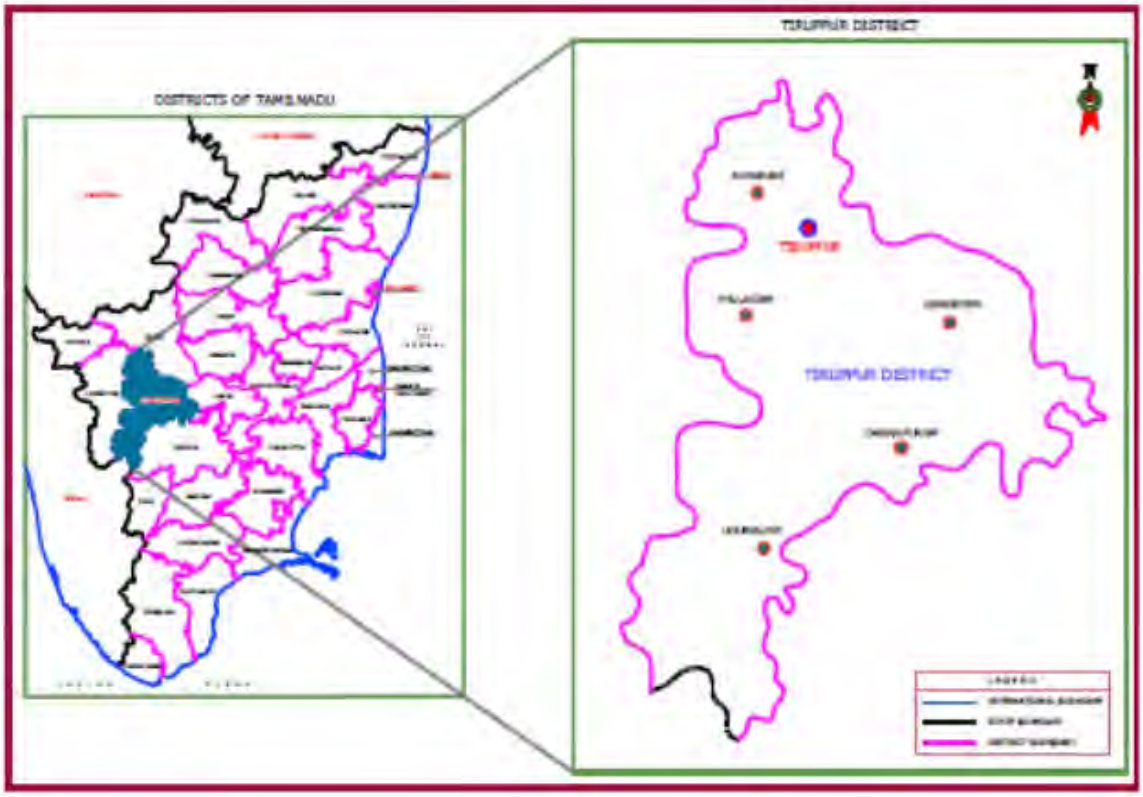


Figure 5: Tiruppur Corporation

Figure 6: Google map showing Proposed Overhead Tank locations

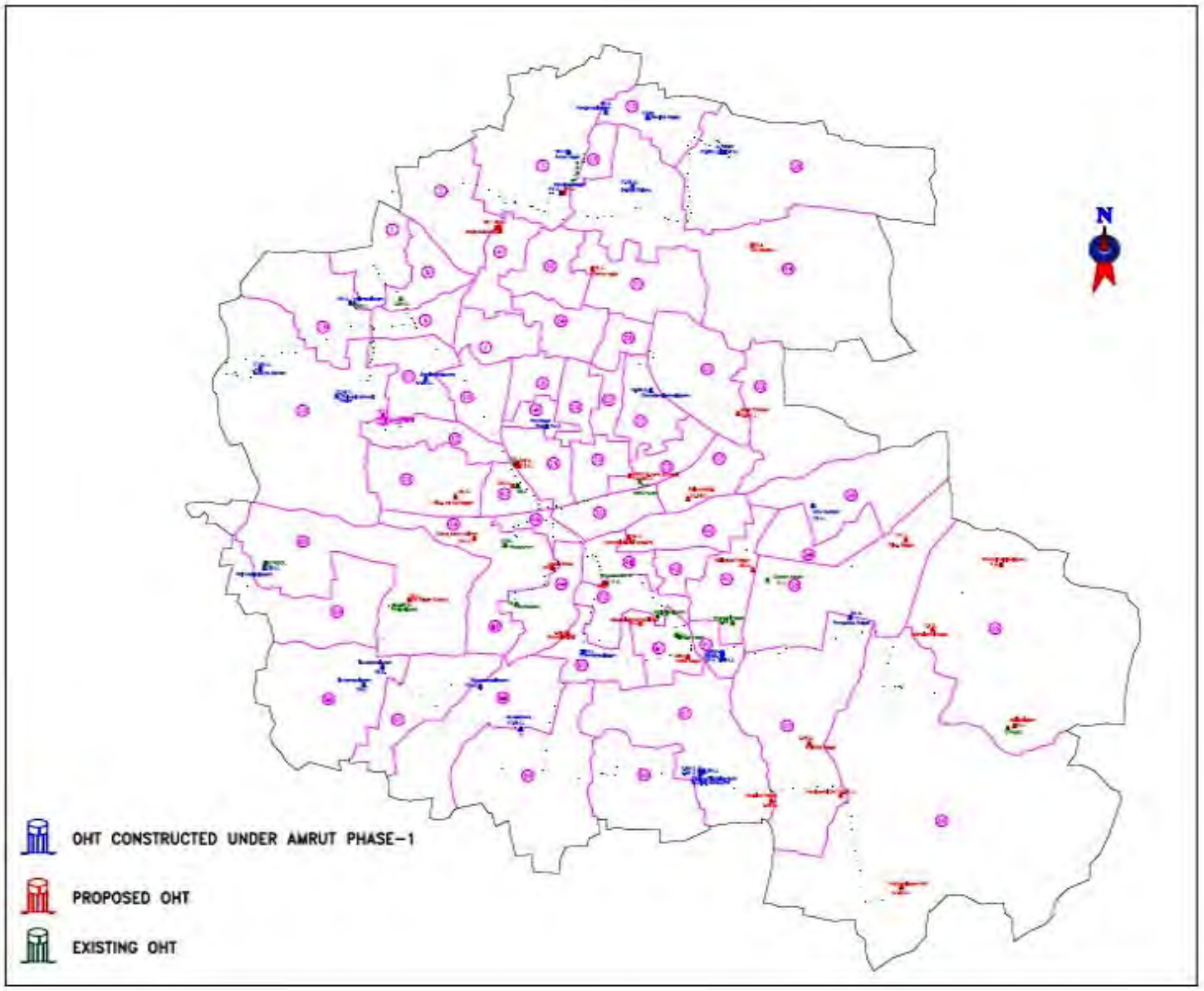


Figure 7: Proposed Raw water Intake and pumping Station location

Figure 8: Layout of Proposed Water Treatment Plant at Ridge Point in Ottarpalayam Village near Annur

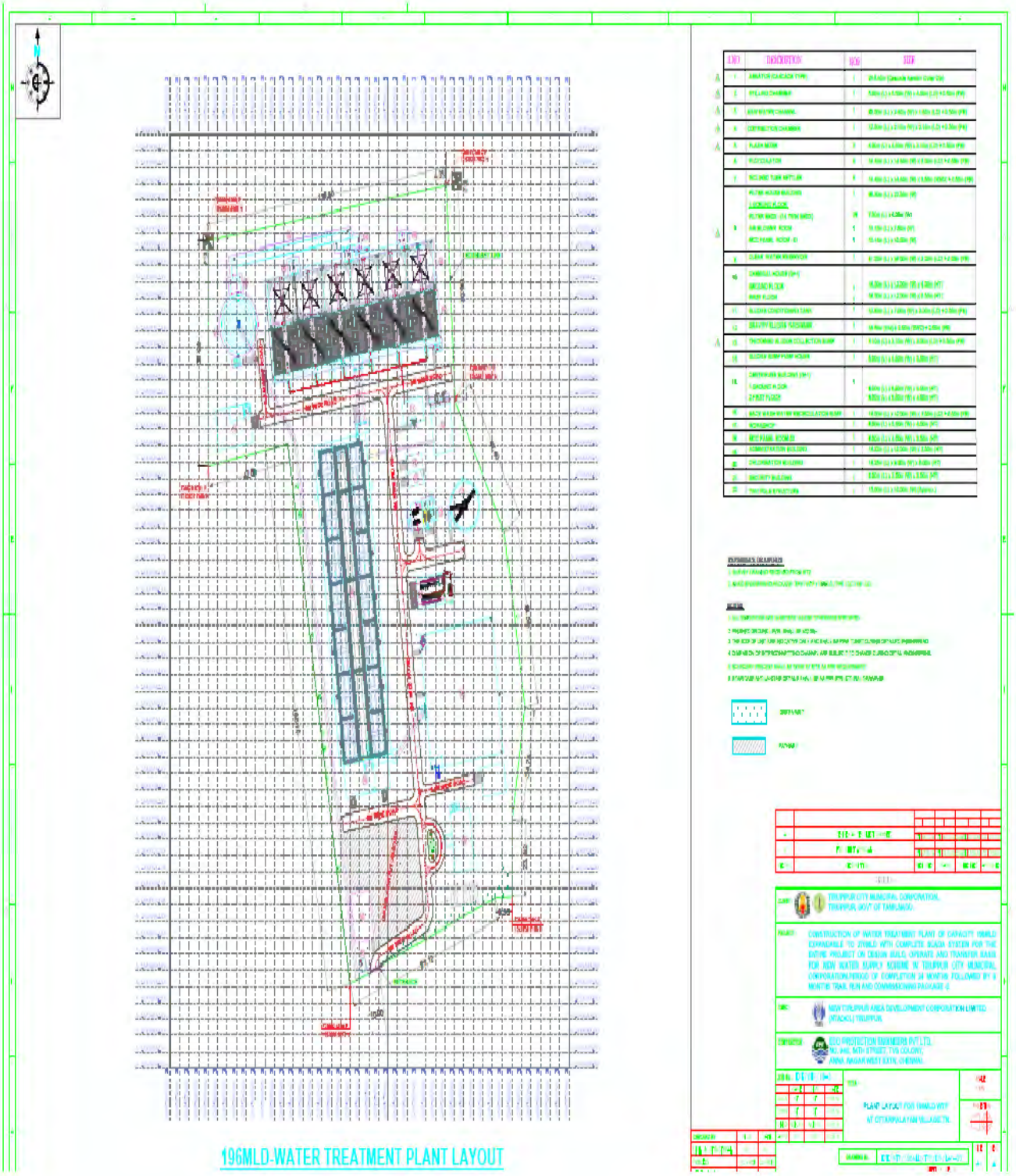


Figure 8: Layout of Proposed Water Treatment Plant at Ridge Point in Ottarpalayam Village near Annur

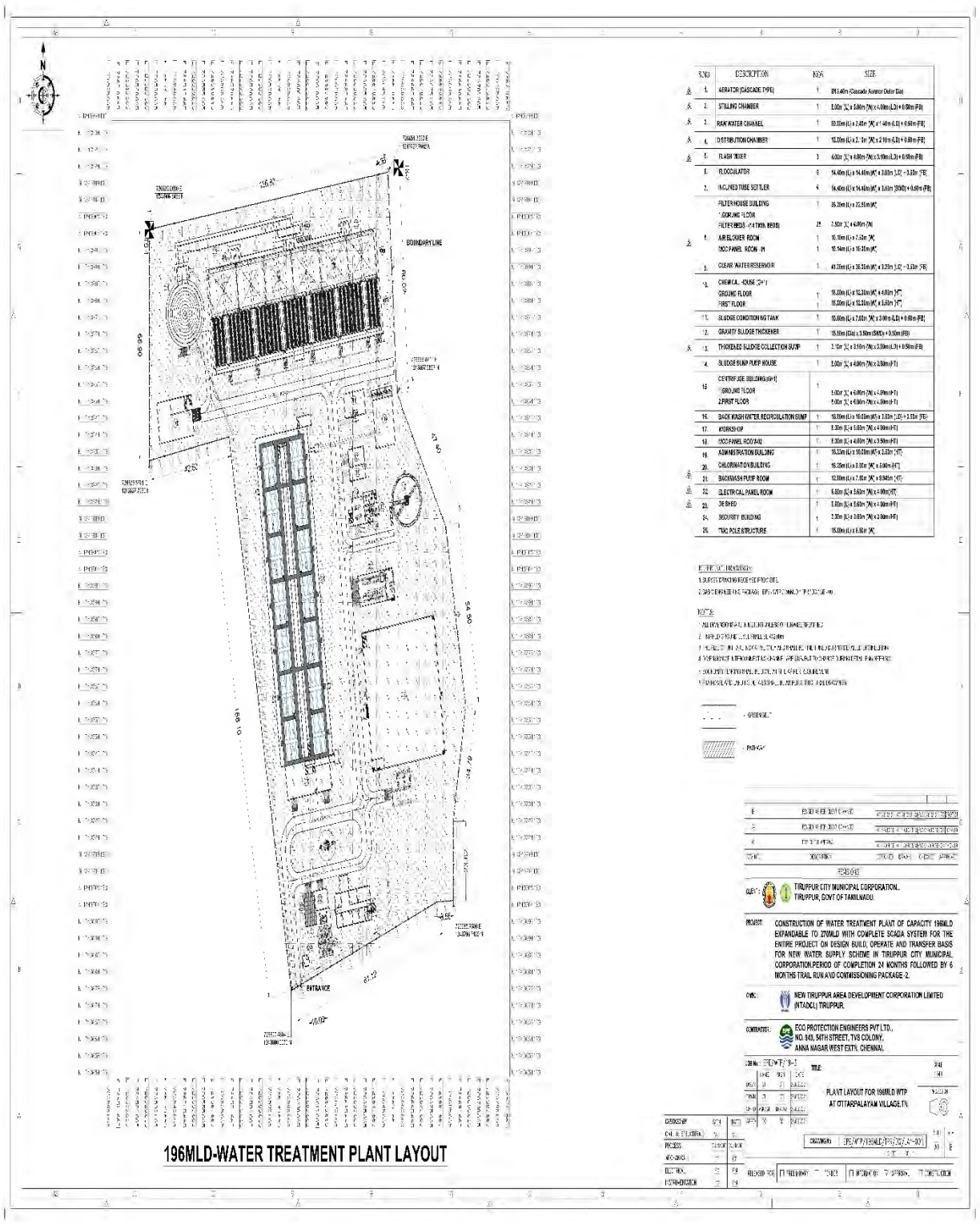


Figure 9:Alignment showingproposed Intake well, Water Treatment Plant & Raw Water Transmission Main

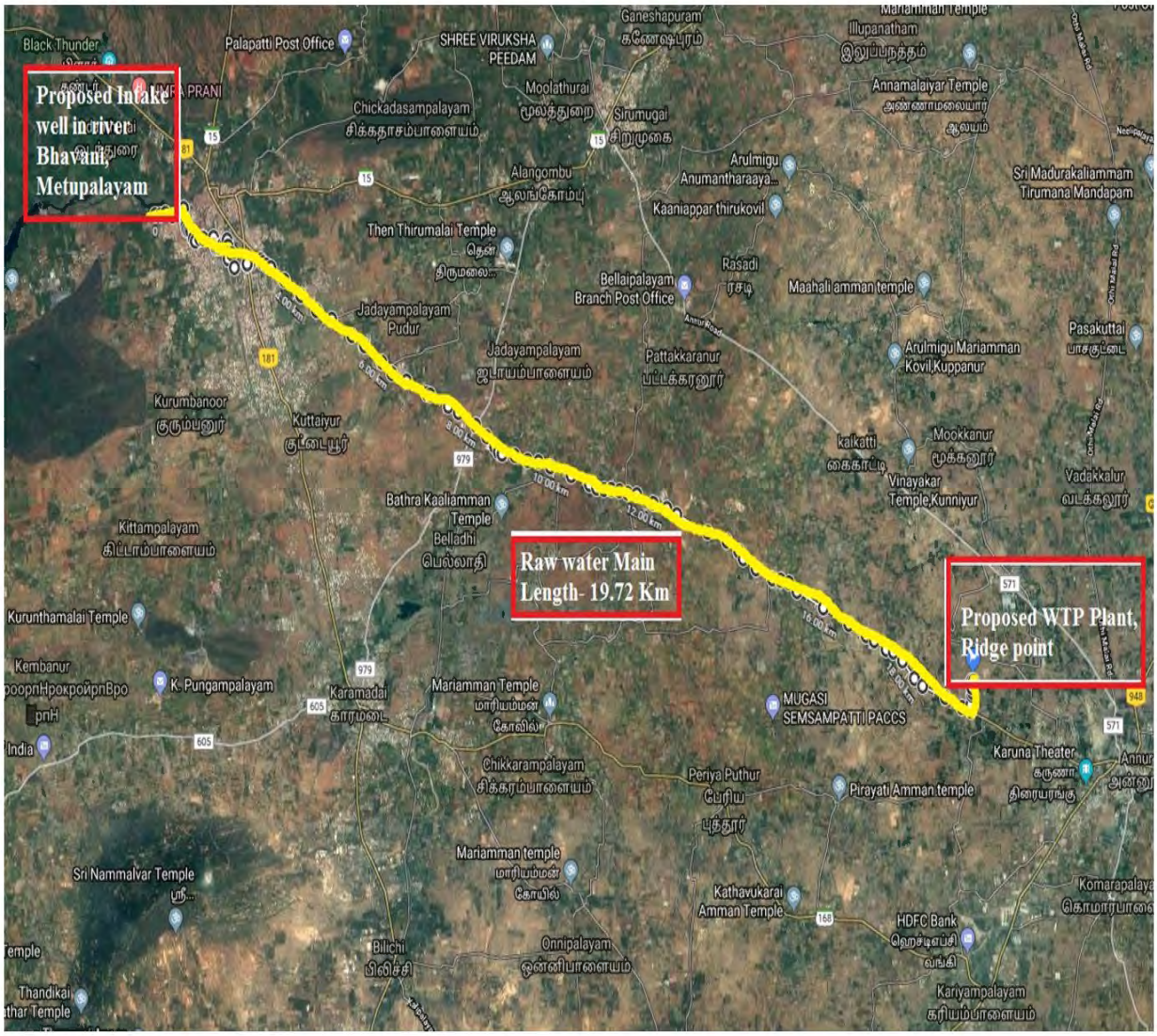
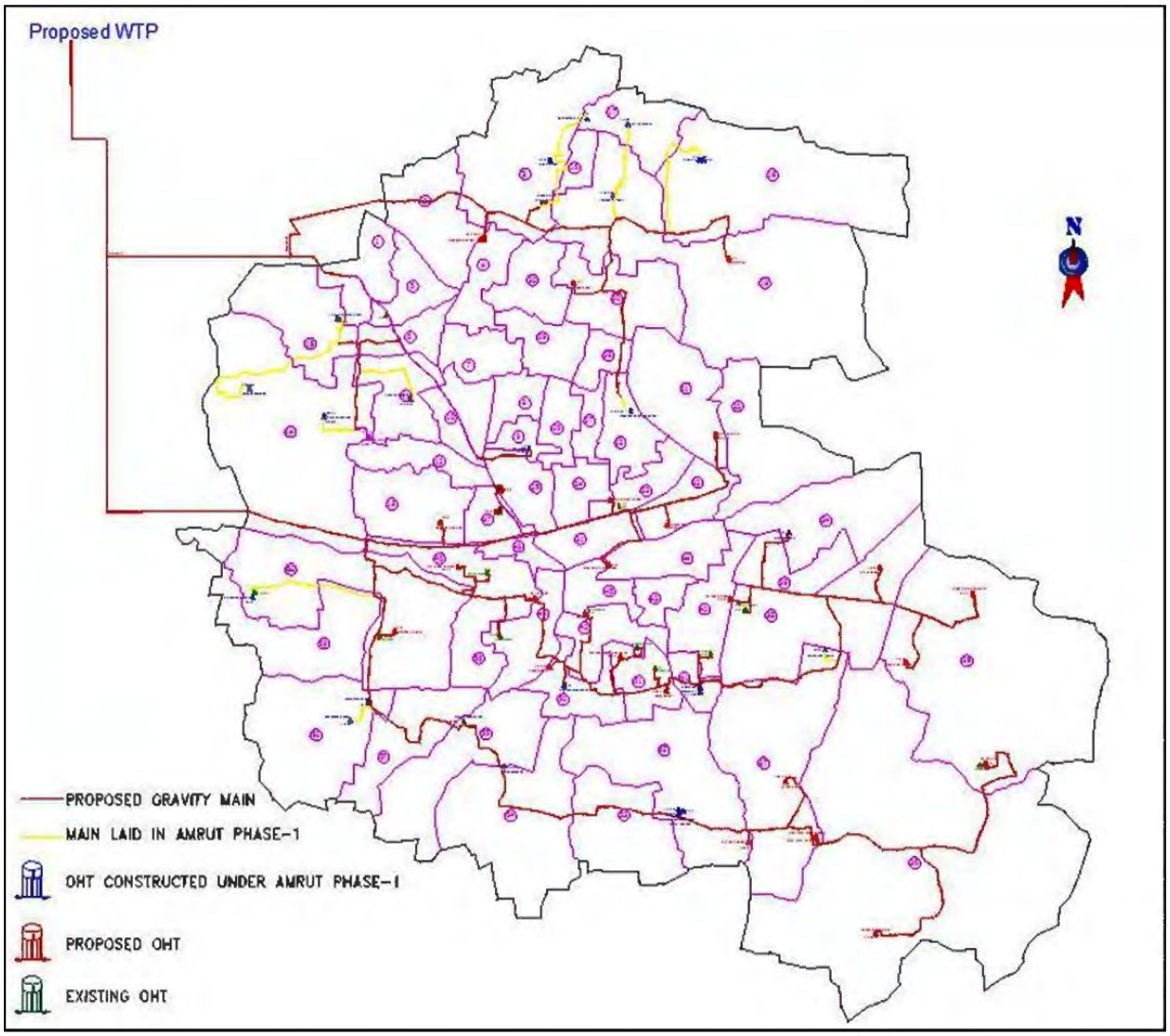


Figure 10:Gravity main from ridge point to Overhead Tanks of proposed water supply scheme



C. Components of proposed water supply scheme

34. **Raw water Intake**. The head works consisting of check dam, River Intake, and Raw water pumping station, is proposed to be located adjacent to the existing head works for scheme-1 at the bank of River Bhavani in Mettupalayam. The Raw water drawal arrangement will be through an intake well-constructed over reinforced cement concrete (RCC) framed structure. The size of the pump house has been fixed to house eight pumps (6 working &2 stand-by) at ultimate stage. The hydraulic details are shown in Table 6.

Table 6: The hydraulic level details at intake

Sl.No	Description	Level in m
1	River Bed Level	288.310
2	LWL of River Bhavani at intake location	290.310
3	MWL of River Bhavani at intake location	299.710

Sl.No	Description	Level in m
4	GL at WTP – Ridge Point	402.000
5	Lip of Cascade Aerator	407.000
6	LWL in Clear Water Sump	402.000
7	MWL in Clear Water Sump	399.000

GL = ground level, LWL = lowest water level, MWL = maximum water level, WTP = water treatment plant.
Source: Tiruppur City Municipal Corporation.

35. **Raw water pump set**. The pump sets are designed for the requirements at intermediate stage (year 2035). It is proposed to install six vertical turbine pump sets (each 1335 HP), each of duty 35,696 lpm against a head of 143 m, four working and two standby with a total pumping capacity of 1,42,784 lpm to meet the intermediate stage demand. The design is based on 23 hours pumping rate.

36. **Raw water transmission main.**As sufficient land is not available near the existing scheme-1 for treatment plant site, it is proposed to pump the raw water up to the ridge point where treatment plant has been proposed. The raw water pumping main is proposed for a length of about 19,270 m for conveying raw water from intake well, located at the bank of the River Bhavani, to the proposed treatment plant to deliver 197.03 and 271.86 MLD of raw water for Year 2035 and 2050 respectively. The materials for pipelines will selected as per the guidelines and pipe policy issued by TWAD Board or GOTN pipe policy. The pipeline is designed for ultimate demand.

37. **Water Treatment Plant**. The proposed Water Treatment Plant will be constructed in 6-acre land proposed at ridge point in Ottarpalayam Village near Annur. The treatment plant layout has to be planned to treat 270 MLD of raw water (Ultimate stage requirement). The land required for WTP was donated by Tiruppur Export Association (TEA) Foundation to Tiruppur City Municipal Corporation the ridge point at Ottarpalayam Village, Annur at free of cost. (The 6 acres of land was now registered on Tiruppur Export Association and will be handed over to Tiruppur City Municipal Corporation within one month of time period. The registration document shows that land belongs to Tirupur Export Association and it is annexed as Appendix 10).The proposed WTP will be based on conventional treatment process involving coagulation, flocculation, sedimentation, filtration process, disinfection etc.The Construction of WTP is proposed under Design and Build basis as per the process specified to suit the available site. Since the raw water is not suitable for the drinking purpose, the water treatment plant is proposed to treat raw water to meet the drinking water standards and supplied to consumers.

38. **Clear water gravity main.**The treated water from the clear water reservoir will be conveyed by gravity to the existing OHTs within the erstwhile Municipal area and also to the proposed OHTs within the added areas of TCMC. The total length of gravity clear water main and feeder mains from the WTP to various OHTs is 148.310 km with diameters varying from 1800 mm to 150 mm. The clear water main proposed is to be laid along the SH from Annur to Avinashi. After crossing NH 544 the alignment will be along state Highways and local roads.

39. **Storage reservoirs.**The entire Tirupur City Municipality Corporation area is presently divided into seventy water distribution zones based on the elevation of the city. These zones will have OHT which will directly receive water from Proposed Water Supply Scheme. Totally 70 OHT are required as storage reservoirs (existing OHTs = 15, proposed OHTs = 55). Out of

these 55 proposed OHTs, 26 OHTs are being constructed under the AMRUT scheme by TWAD Board. The balance of 29 new OHTs will be constructed under this subproject.

40. **Distribution system.**The entire corporation area is divided into 70 water supply distribution zones. Zoning is done based on the topography. Each water supply zone is provided with one Over Head Tank and water distribution system. The distribution system and the staging height of the OHTs are designed to have a minimum residual pressure of 7 m at the consumer end.

Table 7: Details of Distribution system

S. No.	Diameter in mm	Material	Length (km)
1	110	HDPE	606.544
2	160	HDPE	61.683
3	225	HDPE	6.743
4	200	DI	112.245
5	250	DI	21.838
6	300	DI	97.524
7	350	DI	19.047
8	400	DI	67.239
9	450	DI	2.999
10	500	DI	52.867
11	600	DI	13.368
12	700	DI	0.332
	Total		**1,062.429**

DI = ductile iron, HDPE = high-density polyethylene, km = kilometer, mm = millimeter.
Source: Tiruppur City Municipal Corporation.

41. **House Service Connection.**About 117,436house service connections are proposed in the new distribution system. The proposed new house service connection to be given in future will be Blue PN 16 (SDR 9) MDPE pipes conforming to ISO 4427:1996 manufactured from virgin resin PE 80 and will be connected to ferrule to be fix in pipes confirming to IS 2692 – 1989 with analog water meter. The strategies followed for shiftingHSC from old pipe to New system/replacement pipe line is as follows, the replacement of distribution network is proposed at some locations, the shifting charges for all the existing HSC that are to be shifted to the new system/replacement line will be borne by the corporation as the initial installation of existing HSC expense were already incurred by the individual households and the ownership of the HSC lies with Individual household.The replacement of distribution network will be carried out in the parallel manner without affecting the existing system. Also, in narrow streets where parallel work is not possible will be isolated from the remaining areas and the replacement will be carried out in fast track mode.

Table 8: Proposed Water Supply Scheme project Components

Infrastructure	Function	Description	Location
Intake Well and Sump Cum Pump House	An Arrangement to collect raw Water from river Bhavani and pump the water to WTP	• The raw water drawal arrangement into a sump cum pumphouse will be through a RCC intake well of size 6.00 m x 6.00 m . • The size of the pump house has been fixed to house six pumps (4 working & 2 standby) at Intermediate	The new head works (Intake well + Sump cum pumphouse) is proposed adjacent to the existing head works for Scheme 1 at the bank of River Bhavani in Mettupalayam

Infrastructure	Function	Description	Location
		stage	
Water treatment Plant	To treat Raw Water	New WTP with capacity of 196 MLD (Intermediate stage) requirement is proposed under this scheme to treat the raw waterThe WTP has been based as DBOT tender with ten years of Operation & Maintenance. The WTPconsists of • Aerator 15.4, • Stilling chamber 5*5*4 m(LD)+0.5 (FB), • Raw water Channel 63m*2.4m*1.4m(LD)+0.5FB, • Distribution chamber 12m*2.1m*2.1m(LD)+0.5FB, • Flash mixer(3nos) 4m*4m*3.1m(LD)+0.5 FB, • Flocculator (6nos) 14.4*14.4*3.0(LD)+0.5FB, • inclined Plate setter 6nos 14.4*14.4*3.5(LD)+0.5FB, • Filter 96.3m*22.5, Air blower 10.10*7.5m, Mcc panel room 10.14*10m, • Clear water reservoir 41.2*38*3.2m LLD+0.5 FB, Chemical houseG.F 18*12*4m ht F.F 18*12*5.5m ht • Gravity sludge thickener 15.5m*3.5m+0.5 FB, Centrifuge building GF 8*6*4m ht FF 8*6*4m ht • administrative building 18.23*10m*3.5m ht, • Chlorination building 18.25*9m*5m ht. Treated water characteristics PH = 6.5 – 8.5 Color = <5 Hazen units Turbidity = <1 NTU Coliform = NIL Expandable 196mld to 270 mld: Flash mixer, Filter level, Plate settler are designed to for 196 mld but can be expandable to 270 mld addition	The 6 acres of land available at ridge point in Ottarpalayam Village near Annur and this will be used to construct proposed water treatment plant.

Infrastructure	Function	Description	Location
		filter units, Plate settler and flash mixer units. Sludge disposal; Sludge in the solid form will be disposed in the dumpsite of Tiruppur Corporation.	
Clear Water Transmission system	Conveys clear water to OHTs	• The treated water from the clear water reservoir (WTP area) will be conveyed by gravity to the existing OHTs within the erstwhile Municipal area and also to the proposed OHTs within the added areas of TCMC. • The laying of gravity clear water transmission main for a length of 37.53 km and gravity feeder mains to proposed OHTs for a total length of 110.776 km (total length of 148.306 km) is proposed.	The clear water main proposed is along the SH from Annur to Avinashi. After crossing NHAI the alignment will be along state Highways and local roads.
Service Reservoir (OHTs)	Water Storage for Supply	• 29 nos of Over Head Tanks (OHTs) with capacity varying from 5 lakh liters to 20 lakh liters are proposed under this scheme to supply water in each zone. • The staging height of the OHT's have been designed to have a residual pressure of 7 m at the consumer end in the tail-end service connections of the distribution system network.	Over Head Tanks are proposed at following locations: 1. Pandian Nagar 2. MatheswaranKovil (2 nos.) 3. ThiruveKa Nagar Park 4. G.N. Garden 5. Boyampalayam (Sneha Nagar) 6. NRK Puram 7. Kumar Nagar(2 nos) 8. Bharathiyar Complex 9. Palayakadu 10. Gate Thottam 11. Mahalaxmi Nagar 12. Kalipalayam 13. Chennimalaipalayam 14. Karthik Nagar 15. Pudhupalayam AD colony 16. KovilVazhi 17. Krishna Nagar 18. Kaliyappa Nagar 19. Thirunagar 20. Noyyal Burial Ground 21. Dharapuram road 22. State Bank Colony 23. Cattle shed 24. Santhapettai 25. TskMaragaathammal L/O 26. MasaniyammanKovil 27. Andipalayam (SR

<table>
<tr><th>Infrastructure</th><th>Function</th><th>Description</th><th>Location</th></tr>
<tr><td></td><td></td><td></td><td>Nagar South)</td></tr>
<tr><td>Distribution System</td><td>Distributes clear water to houses in each zone</td><td>The entire corporation area has been divided into 70 water supply distribution zones. Each water supply zone is provided with one OHTs and water distribution system with individual house service connections.

Details of Distribution system
<table>
<tr><th>S. No.</th><th>Dia inm m</th><th>Material</th><th>Length (km)</th></tr>
<tr><td>1</td><td>110</td><td>HDPE</td><td>606.544</td></tr>
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<tr><td>11</td><td>600</td><td>DI</td><td>13.368</td></tr>
<tr><td>12</td><td>700</td><td>DI</td><td>0.332</td></tr>
<tr><td colspan="3">Total</td><td>1062.429</td></tr>
</table></td><td>Distribution pipes will be laid along the roads, within the road right of way in Tiruppur City Municipal corporation Area</td></tr>
<tr><td>House Service Connections (HSC)</td><td>Individual Houses will get clear water after HSC</td><td>The 1,17,436 nos. of HSC are proposed in the new distribution system.
The proposed new HSC to be given in future will be Blue PN 16 (SDR 9) MDPE pipes conforming to ISO 4427:1996 manufactured from virgin resin PE 80 and will be connected to ferrule to be fix in pipes confirming to IS 2692 – 1989 with analog water meter.</td><td>In all households in areas covered bythis subproject in Tiruppur City Municipal Corporation(TCMC).</td></tr>
</table>

DBOT = design, build, operate and transfer, MDPE = Miraj Medium Density Polyethylene,RCC = reinforced cement concrete, WTP = water treatment plant.

D. Implementation Schedule

42. The works involving various components have been grouped under different packages as below for quick execution.

(i) **Package I**. Raw water intake, pumping station, pump sets, surge protection tank, raw water pumping main,valves, appurtenances and all associated electrical, instrumentation and mechanical works;The contractor is Keyem Engineering enterprises, Chennai.

(ii) **Package II**. Water Treatment Plant under design, build, operate and transfer (DBOT) basis as per the process specified to suit the available site and SCADA system for the entire subproject; The contractor is Eco Protection Engineers Pvt Ltd

(iii) **Package III**. Clear water gravity main from WTP and feeder mains to OHTs; The contractor is Koya & Company Construction Limited

(iv) **Package IV**. Construction of new ELSRs 12 nos.and providing distribution system with house service connections to 12 zones; and

The contractor is R P P Infra Projects Ltd JV with &Annai Infra Developers limited **Package V**. Construction of new ELSRs 17 nos.and providing distribution system with house service connections to 17 zones.The contractor is R P P Infra Projects Ltd JV with M/S Annai Infra Developers limited

43. Packages I, III, IV and V shall be on a works (item rate) contract basis as per the designed bill of quantities, specifications and drawings. Package II shall be under DBOT basis with annual O&M for a period of 10 years.The works will take about 36 months to complete. Detailed implementation schedule (including design/pre-construction, construction, commissioning, and operation phases) will be provided in the updated IEE per detailed design.

III. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. ADB Policy

44. 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.

45. **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 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; and
(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.

46. **Environmental management plan.** An environmental management plan(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 will be commensurate with the project's impact and risks.

47. **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

48. **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.

49. **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 MOEFCCprepares 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.

50. **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.

51. 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.

52. **Applicable environmental regulations.** Besides EIA Notification 2006, there are various other acts, rules, policies and regulations currently in force in India that deal with environmentalhealth and occupational safety issues that could apply to infrastructure development. The specific regulatory compliance requirements of the subproject are shown in Table 9.

Table 9: 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 proposed WTP requires CTE and CTO from TNPCB before starting of construction and before commissioning of WTP respectively. Application has to be submitted online at http://tnocmms.nic.in/OCMMS/
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
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	- Applicable for equipment and	Generators will require CTE and

Law	Description	Requirement
Control of Pollution) Act, 1981, amended 1987 and its Rules, 1982.	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.	CTO from TNPCB Generators to comply with emission standards
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
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.	Appendix2provides applicable labor laws including amendments issued from time to time applicable to establishments engaged in construction of civil works.
Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989 (MSIHC Rules, 1989)	These rules aim at providing control for the generation, storageand Import of hazardous chemicals. According to these rules, theuser of hazardous chemicals has to follow procedures as stipulatedin the rules to prevent and control hazards from such chemicalsand to ensure safety and permission has to be obtained from theauthority concerned for such activity.The list of chemicals and threshold limits of handling falling underthe purview of these rules is provided in the schedule to the rules.Chlorine used for disinfection of water is categorized as hazardouschemical as according these rules and usage of these chemicalsabove 10 tons per year attracts the provisions of these rules.	The usage of chlorine is above 10 tons per year, so permission has to be obtained from theauthority concerned for usage of chemicals.

SWM = Solid Waste Management, WTP = water treatment plant.

53. **Clearances/permissions to be obtained by Contractor.** Following Table 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 10: Clearances and permissions required for construction

S. No	Construction Activity	Statutory Authority	Statute under which Clearanceis Required	Implementation	Supervision
1	Construction of WTP	TNPCB	Consent to establish andconsent to operate underWater Act, 1974 and under Air Act, 1981	Contractor & PIU	PIU
2	Tree Cutting	Department of Forest and District Collector	Clearances from the authorities as per the TamilNadu Timber TransitRules, 1968 or latest.	PIU	Implementing agencies and PIU
3	Hot mix plants, Crushers andBatching plants	TNPCB	Consent to establish and consent to operate under Air Act, 1981	Contractor	PIU
4	Discharges from Constructionactivities	TNPCB	Consent to establish and Consent to operate underWater Act, 1974	Contractor	PIU
5	Storage, handling and transport ofhazardous materials	TNPCB	Hazardous Wastes(Management and Handling)Rules, 1989Manufacturing, Storage andImport of Hazardous Chemicals Rules, 1989	Contractor	PIU
6	Sand mining, quarries and borrowareas	Department of Geology andmining, GOTN	TamilNadu Minor Mineral Concession Rules, 1959(corrected up to 31 March 2001)	Contractor	PIU
7	New quarries and borrow areas	MOEFCC	Environmental clearance under EIA Notification 2006	Contractor	PIU
8	Groundwaterextraction	Public WorksDepartment	(Groundwater) TamilNadu GroundwaterDevelopment andManagement Act 2000	Contractor	PIU
9	Disposal ofbituminous wastes	Tamil Nadu StatePollution ControlBoard	Hazardous Wastes (Management and Handling)Rules. 1989	Contractor	PIU
10	Temporary trafficdiversion measures	-	MoRTH 112 SP 55of IRC codes	Contractor	PIU
11	Withdrawal of Surface water fromRiver Bhavani	Public Works Department	Water Utilization committee	PIU	PIU

S. No	Construction Activity	Statutory Authority	Statute under which Clearanceis Required	Implementation	Supervision
12	NOC for Controlled Blasting for excavation	District Collector, Tiruppur	Explosives Rules, 2008	Contractor	PIU

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, PMU = program management unit,TNPCB = Tamil Nadu Pollution Control Board, WTP = water treatment plant.

54. **ADB SPS Requirements.** During the design, construction, and operation of the project the PMU and 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. 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 11: Applicable Ambient Air Quality Standards for India Projects

Parameter	Location[a]	National Ambient Air Quality Standards[b]	WHO Air Quality Guidelines ($\mu g/m^3$)		Applicable Per ADB SPS[c] ($\mu g/m^3$)
			Global Update[d] 2005	Second Edition[e] 2000	
Particulate Matter PM_{10} ($\mu g/m^3$)	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} ($\mu g/m^3$)	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 ($\mu g/m^3$)	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 ($\mu g/m^3$)	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 ($\mu g/m^3$)	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)

Parameter	Location[a]	National Ambient Air Quality Standards[b]	WHO Air Quality Guidelines ($\mu g/m^3$)		Applicable Per ADB SPS[c]($\mu g/m^3$)
			Global Update[d]2005	Second Edition[e] 2000	
					100,000 (15-min)
Ozone (O_3) ($\mu g/m^3$)	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) ($\mu g/m^3$)	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) ($\mu g/m^3$)	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_6H_6) ($\mu g/m^3$)	Industrial Residential, Rural and Other Areas	5 (Annual)	-	-	5 (Annual)
	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

[c]As 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.

[e]Air Quality Guidelines for Europe Second Edition. WHO 2000.

Table 12: 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 LA_{eq} 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

dBA = decibels.

[a]Noise Pollution (Regulation and Control) Rules, 2002 as amended up to 2010. (http://cpcb.nic.in/displaypdf.php?id=Tm9pc2UtU3RhbmRhcmRzL25vaXNlX3J1bGVzXzIwMDAucGRm)

[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 13: 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[d,e]
	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	Must not be detectable in any 100 ml sample
	Total Coliform	MPN/100ml			

[a] http://cgwb.gov.in/Documents/WQ-standards.pdf

[b] Bureau of India Standard 10500: 2012 (Indian Standard, Drinking Water — Specification (Second Revision).

[c] Health-based guideline values

[d] As 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.

[e] Figures in parenthesis are maximum limits allowed in the absence of alternate source.

Table 14: 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 wastewater (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, solids max. 3 mm (b) Settleable so lids, 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 5ºC above the receiving water temperature	-	-	shall not exceed 5ºC 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 27ºC), 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
18	Copper (Cu) mg/l, max.	3	3	-	3
19	Zinc (Zn) mg/l, max	5	15	-	15

Sl. no	Parameter	Inland surface water	Public sewers	Land for irrigation	Marine/ coastal areas
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_6H_50H) 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}
	(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/

IV. DESCRIPTION OF THE ENVIRONMENT

A. Methodology Used for Baseline Study

55. **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.

56. The literature survey broadly covered the following:
- (i) Project details, reports, maps, and other documents prepared by technical consultants, TCMC, etc.;
- (ii) Discussions with Technical experts of the PPTA team, TNUIFSL, Implementing Agency (TCMC), 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, socioeconomic profiles, and other planning documents collected from government agencies and websites.

57. **Ocular inspection**. Several visits to the project sites were made during IEE preparation period in 2018to 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 socioeconomic study was conducted to determine the demographic information, existing service levels, stakeholder needs and priorities.

B. PhysicalFeatures

1. Location

58. Tiruppur is a city in the Kongu Nadu region of the Indian state of Tamil Nadu and located at 11.1075°N, 77.3398°E on the banks of the NoyyalRiver. It has an average elevation of 295 meters (967 feet) and covers an area of159.6 km^2 (61.6 squaremiles [mi^2]). Tiruppur is the administrative headquarters of Tiruppur district and the fifth largest urban agglomeration in Tamil Nadu. It has been ruled at different times, by the Early Pandyas, Medieval Cholas, Later Cholas, Vijayanagar Empire, Madurai Nayaks, Mysore Kingdom and the British. It is situated at the center of the South Indian Peninsula, about 450 kilometers (280 mi) southwest of the state capital Chennai and about 50 kilometers (31 mi) east of Coimbatore.

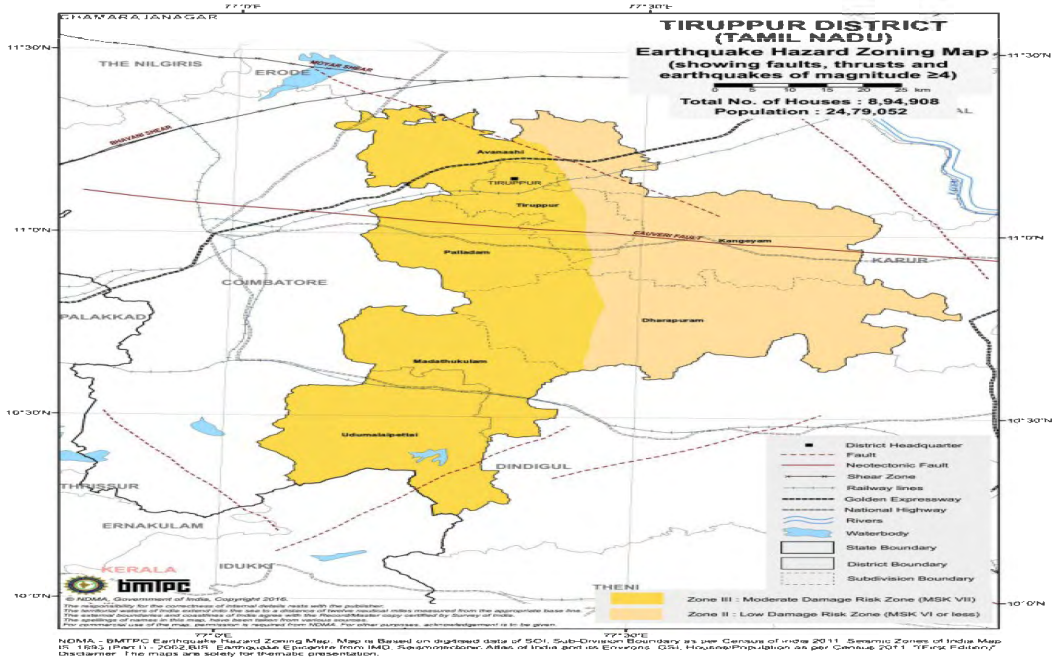
2. Topography

59. Tiruppur is located at 11.11°N latitude and 77.34°E longitude it has an average elevation of 295 meters (967 feet) and covers an area of 159.6 km^2. The average slope varies from zero degree to 18°. The natural topography of the city guides flow of the rain water towards NoyyalRivers.

3. Geology andSeismicity

60. Tiruppur area is mainly associated with metamorphic rocks and is considered to belong to the middle Dharwars of southern peninsular shield, with the following succession of rocks Basic Dykes, Chiefly dolerites, Felsites and porphyry dykes, Charnockites, Norite dykes.

Figure 11: The Seismic map of Tiruppur District



NDMA - BMTPC Earthquake Hazard Zoning Map. Map is Based on digitised data of SOI, Sub-Division Boundary as per Census of India 2011, Seismic Zones of India Map IS 1893 (Part 1) : 2002,BIS, Earthquake Epicentre from IMD, Seismotectonic Atlas of India and its Environs GSI, Houses/Population as per Census 2011 "First Edition" Disclaimer : The maps are solely for thematic presentation.

61. Although the sediments of the middle Dharwars were altered due to regional metamorphism the limestone remained as remnants undergoing recrystallisation and thus are interbedded with Calc-granulites and garnetiferous gneiss and have been subjected to structural disturbances.

62. The area has huge deposits of Limestone. The crystalline limestone deposits of TamilNadu occurring in and around Tirunelveli, Ramanathaparam, Madurai, Coimbatore, Salem and North Arcot District are associated with Calc-granulate, Calc Silicate and Calciphyre. It shows a concordant association with Calc silicate in Sankaridurg area and Quartzities in southern TamilNadu. Country rock is garnet feroussillimanite schist in most of the places, at places the limestone also occurs in association with Charnockite and Calc gneiss.

63. Tiruppur falls under seismic zone — III. (Source: IS 1893 (Part I): 2002 – Indian standard criteria for earthquake resistant design of structures). Structural design of infrastructure elements will be done with due consideration to relevant codes.

4. Climate

64. The climate in Tiruppur is tropical with the mean maximum and minimum temperatures varying between 35°C to 22°C (95°F to 72°F). The summer season startsfrom the month of March, April and May during this period the weather remains hot and dry. The maximum temperature during the summer months will be around 35°C (95°F) and the minimum temperature will be around 29°C (84°F). The monsoon season starts from the month of June, July and August. During the monsoon season, mild showers and a reduced temperature is observed. The post monsoon or winter months are from September to January. The winter season generally have a cool climate and temperatures rarely rise beyond a maximum of around 29°C (84°F). The minimum temperature during this season will be around 24°C (75°F).

65. Due to the presence of the Palghat gap, the city receives rainfall from the South-west monsoon (June to August). After a humid September, the North-east monsoon brings rains, which starts from October and lasts till early November. The average annual rainfall is around 700 mm (28 in) with the North East and the South West monsoons contributing to 47% and 28% respectively to the total rainfall. Major portion of Tiruppur district is constituted by red gravel, clay loamy soils.

5. Surface Water

66. River Bhavani originates from Western Ghats, Nilgiri district and second largest river in Tamil Nadu and passing through Mettupalayam and Sirumugai to the distance of 217 km before merging with the River Cauvery. ThisPerennial River is fed by the southwest monsoon season(June to August), followed by North East monsoon season (September to December). Its watershed drains an area of 6,200 km² spread over Tamil Nadu (87%), Kerala (9%) and Karnataka (4%). The main river courses through entire of the North-Western Erode district of Tamil Nadu. Pillur dam located on Bhavani River, 88 m high dam has a catchment area of 1,191 km^2; the dam is 357 m long and the mean annual flow to the dam is 685 MCM. The reservoir has a live storage capacity of 28 MCM at FRL 427 m and the MDDL is at 396 m. The physio-chemical characteristics of the river Bhavani at Mettupalayam during the 2007 - 2008 is as follows:

Table 15: Physio-chemical characteristics of the River Bhavani at Mettupalayam

Month	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Temperature (°C)	26.5	28.5	28.5	25.0	23.0	24.0	24.0	25.5	26.6	28.6	28.5	28.0
Color	B	B	B	B	B	B	C	C	C	C	C	C
Turbidity (N.T.U)	20.5	20.3	20.1	22.2	20.1	20.2	20.0	20.1	20.6	20.1	20.2	20.0
Electrical Cond (mMho)	920	980	970	910	920	910	900	900	930	990	990	960
Suspended Solids (Mg/l)	2050	2040	2040	2000	2300	2000	2100	2110	2060	2045	2040	2034
Dissolved Solids (Mg/l)	1230	1235	1235	1540	1250	1545	1160	1165	1235	1240	1240	1240
Total Solids (Mg/l)	3280	3275	3275	3540	3550	3545	3260	3275	3295	3285	3280	3265
pH	7.5	7.8	7.7	7.9	7.6	7.8	7.5	7.6	7.8	7.9	7.6	7.4
D.O (Mg/l)	6.9	6.6	6.6	6.7	6.8	6.8	6.6	6.7	6.6	6.5	6.6	6.8
B.O.D	1.7	1.7	1.8	3.2	4.1	3.1	4.0	3.9	1.6	1.8	1.8	1.8
HCO3 (Mg/l)	2.5	2.6	5.1	7.0	8.0	6.8	7.9	7.5	2.6	2.7	5.2	5.0
Total Hardness (Mg/l)	32.2	32.8	28.6	56.7	50.2	56.7	65.3	68.1	33.5	32.4	32.4	28.4
*B-Brownish, C- colorless												

67. Noyyal River is located at a distance of about 8.5 km south direction from the proposed site and Cauvery River is at a distance of more than 25 km away from the proposed site.Noyyal River, a small river and tributary of River Cauvery, passes through Coimbatore city. Prior to 2011, it formed part of southern boundary of the municipal corporation limit. It rises in Vellingiri hills in the Western Ghats in Tamil Nadu, close to Kerala border. This rain fed River flows from west to east, and travels a distance of 180 km through five districts of Coimbatore, Tirupur, Erode, Karur, and Trichy. Coimbatore and Tirupur are two main cities along its course. It finally joins River Cauvery at Noyyal, a village in Karur District. The river's basin is 180 km long and 25 km wide and covers a total area of 3,500 km^2. Project area lies within the watershed expanse of the Noyyal River Basin and consists of a network of tanks and canals apart from lakes. The list of surface water bodies in the subproject alignment are furnished in the below table.

Table 16: Surface water bodies in the subproject alignment

S.No	Chainage	Type of structure	Proposed Span length in meter	Water body	Type of river
1	0.20 km - Odai Crossing Near Head Works (Badrakaliamman Koil Road)	Pipe Carrying bridge	Length – 56.00 m – 1400mm dia MS Pipe	Stream	-
2	4.46 km - Odai Crossing at Nadur (Gokul Timber & Furniture)	Pipe Carrying bridge	Length – 48.00 m – 1400mm dia MS Pipe	Stream	-
3	9.63 km - Odai Crossing at Therampalayam Village west side	Pipe Carrying bridge	Length – 80.00 m – 1400mm dia MS Pipe	Stream	-
4	12.40 km – Odai Crossing at Belladhi Village west side	Pipe Carrying bridge	Length – 56.00 m – 1400mm dia MS Pipe	Stream	-
5	Corporation - Nallaru river at Poondi	Pipe Carrying bridge	Length – 88.00 m – 1100mm dia MS Pipe	River	Non Perennial
6	Corporation - Nallaru River Crossing at Kanjampalayam	Pipe Carrying bridge	Length – 16.00 m – 300mm dia DI Pipe	River	Non Perennial
7	Corporation - Noyyal River Crossing at College Road Anaipalayam to Mangalam Road	Pipe Carrying bridge	Length – 72.00 m – 1600mm dia MS Pipe	River	Perennial

S.No	Chainage	Type of structure	Proposed Span length in meter	Water body	Type of river
8	Corporation - Noyyal Crossing at North Thottom to Vinayagapuram	Pipe Carrying bridge	Length – 64.00 m – 350mm dia DI Pipe	River	Perennial
9	Corporation - Noyyal Crossing at Valam Briidge opp to Electric crematorium	Pipe Carrying bridge	Length – 96.00 m – 250mm dia DI Pipe	River	Perennial
10	Corporation - Jammanai Crossing at Thennampalayam Uzhavar Sandai	Pipe Carrying bridge	Length – 24.00 m – 700mm dia MS Pipe	Stream	-
11	Corporation - Sangilipallam Odai crossing at Muthaiyan Koil	Pipe Carrying bridge	Length – 24.00 m – 600mm dia MS Pipe	Stream	-
12	Corporation - Jammanai Crossing at Murugampalayam Petrol bunk	Pipe Carrying bridge	Length – 40.00 m – 800mm dia MS Pipe	Stream	-
13	Corporation - Jammanai Crossing at Murugampalayam School	Pipe Carrying bridge	Length – 40.00 m – 800mm dia MS Pipe	Stream	-
14	Corporation - Sangilipallam Odai crossing at Veerapandy Pazhavanjipalayam Ring Road	Pipe Carrying bridge	Length – 32.00 m – 800mm dia MS Pipe	Stream	-

Source: reconnaissance survey.

6. Groundwater

68. The study area experiences shortage for water resources. Even the annual rainfall is very less and is vagrant. Water catchment tanks in the area are only seasonal and they remain dry during most of the seasons. As perennial water resources are remote, the agricultural activities in this area are mainly dependent upon the rainfall, where the average is only about 574.3 mm per year. Studies show that almost 90% of the available groundwater resources in the district have already been tapped for drinking, irrigation and industrial uses and there is immediate necessity for improving the groundwater recharge conditions for this area.

69. The groundwater in the area in general occurs under phreatic conditions, in the weathered mantle rocks under semi-confined conditions and in the fractured zones. Generally, the aquifers in the formations are heterogeneous in nature. These rocks are devoid of primary porosity, but are rendered porous and permeable with the development of secondary openings by fracturing and weathering and their inter connections. The shallow aquifers in the major part of the district occur within the depth of 30m, while in the other parts it is more than 30m. Here the groundwater is developed by means of dug wells and bore wells and the groundwater occurs in phreatic conditions in shallow aquifers, which occurs to depth ranging 35 to 60 m. The hydrographic prepared for this area by the Central Ground Water Board (CGWB), reveals that the rainfall is the principal source of recharge for groundwater and the water level fluctuations are in response to recharge for groundwater. Raise in water table takes place mainly during July to August and October to November, coinciding with southwest monsoon and northeast monsoon periods. A raise in water table is more pronounced during southwest monsoon period. But the main rainfall for the district is northeast monsoon, which forms the main recharge to groundwater.

7. Air Quality

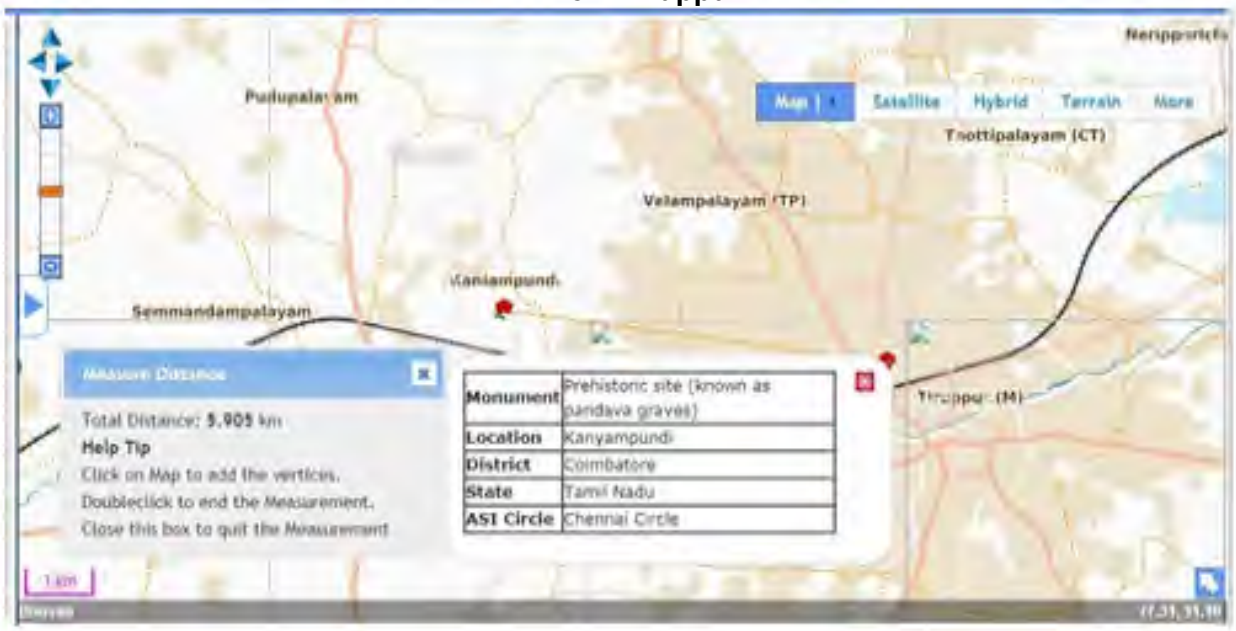
70. Based on the secondary information, the ambient air quality in the subproject area is observed to be within the permissible limits stipulated by CPCB –NAAQ Standards. The particulate matter (PM_{10}) was in the range between 50 to 70 µg/m^3, the oxides of sulphate (SOx) was in the range between 13 and 27 µg/m^3, the oxides of nitrogen (NOx) was in the range 25 and 30 µg/m^3. Thus, the air quality index of the subproject area is found to be Satisfactory. (Source:https://www.cpcb.nic.in/openpdffile.php?id=UmVwb3J0RmlsZXMvNjE1XzE1MTczOTcyNjBfbWVkaWFwaG90bzE2MzkxLnBkZg).

C. EcologicalFeatures

71. Common flora found in the Tiruppur City Municipal Corporation are *Adhatoda zeylanica, Agave sisalana Perinne, Ailanthus akeli Roxb., Aloe vera,* Cocos nucifera L, *Indigofera soo, Moringa olifera Lam., Pongamia pinnata L., Artocarpus integrifolia, Borassus flabellifer, Cocos nucifera, Mangifera indica, Moringa oleifera, Phoenix sps.Oryza sativa, Lycopersicum esculentam, Sorghum bicolor, Piper betle, etc.*The common fish species found in River Bhavani are *Labeo Rohita, Indian Carp, Cirrhinus cirrhosus, Mahseer, Cichlid Fish*and *Pink perch.* The fish species are identified as Least Concern (LC) as per the IUCN category.

72. Common fauna found in the Tiruppur City Municipal Corporation are Common crowGrass yellow, Dragon fly, Grasshopper, Common Indian Toad, Common Garden lizard, Pond Heron, Small Egret, Spotted Dove, Rose Ringed Parakeet, Pied Crested Cuckoo, House Sparrow, Indian Palm squirrel, Indian pipistrella. Based on the assessment, there are no Vulnerable, Endangered, Critically endangered species are available in the subproject area. Also, there is no eco-sensitive areas (Forest areas, Bio reserves, National parks, Sanctuaries, Wetland or nationally important/protected monuments) found in the subproject area. Source :(https://www.iucn.org/regions/washington-dc-office/our-work/ibat-business).The nearest monument as per Archaeological Survey of India (ASI) is Prehistoric site (known as Pandava graves) present in kanyampudi, Coimbatore at a distance of 5.69 km from Tiruppur.

Figure 12: Nearest Archeological Survey of IndiaMonument located at distance of 5.69 km from Tiruppur



D. SocialandCulturalFeatures

73. Tiruppur District stands 12th rank in terms of population size among the 32 districts. The district population density is 478 persons per km^2, lower than the State population density of 555 persons per km^2. The district population and decadal change during 2001- 2011 is 1%, the third highest among districts. The district population share in urban areas of 61.36% is higher than the State population share in urban areas. The district sex ratio of 989 is marginally lower than the State sex ratio of 996. The district literacy rate (78.7%) is marginally lower than the State literacy rate (80.1%).

74. Tiruppur is administered by Municipal Corporation which was established in 2008 and the total area of the corporation is 159.6 km^2divided into 60 wards. The total population of the city as per the 2011 census is 444,352. Tiruppur is a part of the Tiruppur constituency that elects its member of parliament.Town wise details on area and population are given in following tables.

Table 17: Tiruppur Corporation Area and Population Details

Sl. No	Name of ULB	Area km^2	Population				Persons/ km^2 2011
			1981	1991	2001	2011	
1	Andipalayam	9.00	3590	5563	11350	25095	2788
2	Chettipalayam	9.49	5652	9254	20184	34309	3615
3	Mannarai	5.74	2340	3039	8496	17267	3008
4	Murugampalayam	9.20	4694	6800	14440	26739	2906
5	Muthanampalayam	20.67	4738	6166	9548	24765	1198
6	Nallur	24.87	6872	13421	29495	70025	2816
7	Nerupherichal	19.67	6031	10902	16372	55822	2838
8	Thottipalayam	5.79	3695	8383	26818	41063	7092
9	Tirupur	28.25	165223	235661	344543	444543	15736
10	Veerapandi	11.81	6112	8515	21848	50968	4316
11	Velampalayam	14.86	16571	26248	45679	87182	5867
	Total	**159.35**	**225,518**	**333,952**	**548,773**	**877,778**	

km^2 = square kilometer.
Source: Census 2011.

Table 18:Area and Population Details Ward Wise (Tiruppur Corporation)

Ward No.	Area km^2	Census Population 2011	Person/km^2
1	1.30	14080	10831
2	1.63	6176	3789
3	3.99	9950	2494
4	2.33	7548	3239
5	1.08	15578	14424
6	0.97	10908	11245
7	1.54	10635	6906
8	0.82	15097	18411
9	0.50	11859	23718
10	1.27	14968	11786
11	1.57	18887	12030

Ward No.	Area km^2	Census Population 2011	Person/km^2
12	0.49	26915	54929
13	0.35	23866	68189
14	7.58	15968	2107
15	2.36	11761	4983
16	0.49	15833	32312
17	1.58	8398	5315
18	6.73	11138	1655
19	10.87	20453	1882
20	2.81	11087	3946
21	2.77	11019	3978
22	0.57	25228	44260
23	1.42	25480	17944
24	1.42	17949	12640
25	0.83	16020	19301
26	1.18	17345	14699
27	0.52	21435	41221
28	0.79	9855	12475
29	0.76	10676	14047
30	1.38	9445	6844
31	1.59	8103	5096
32	1.84	17378	9445
33	2.97	6248	2104
34	4.22	10021	2375
35	11.54	9771	847
36	15.79	13140	832
37	4.88	11625	2382
38	5.10	16510	3237
39	1.58	11077	7011
40	1.85	9289	5021
41	0.58	13357	23029
42	1.43	21955	15353
43	1.36	15015	11040
44	0.58	21655	37336
45	2.40	17319	7216
46	1.29	17840	13829
47	4.26	9681	2273
48	0.65	10311	15863
49	1.65	24553	14881
50	0.70	20931	29901
51	0.16	16814	105088
52	4.56	15101	3312
53	2.58	14271	5531
54	4.67	21596	4624
55	3.30	7486	2268
56	0.97	26826	27656
57	2.02	8290	4104
58	3.88	10963	2826
59	3.06	16564	5413
60	5.94	8531	1436
Total	**159.30**	**877,778**	

Source: Census 2011.

75. Households having Scooter/Motor Cycle rose from 23.2% (2011 Census) to 45%, which is highest among the districts. Scheduled castes population in the district constitutes 16.0%of its total population. Tiruppur is a major textile and knit wear hub contributing to 90% of total cotton knit wear exports from India. The textile industry provides employment to over six lakh people and contributed to exports worth 200 billion (US$3.1 billion) in 2014-2015.

76. Major temples in Tiruppurwere built during the reign Cholas and Pandyas.Sukreeswarar Temple is a 10th-century temple situated at the outskirts of Tiruppuris considered one of the four 'SirpaSthalangal' in Kongu region. An epigraphic study conducted studies at the temple reported that though the temple was builtby Pandya's, different inscriptions state that the place was used by tribals to offerpoojas to 'Shivalingam' as early as 5th century.The Town Hall, new railway over-bridge, Tiruppur Kumaran memorial, corporation memorial pillar are some of the landmarks in the Tiruppur city. Someof the common tourist locations outside the city are Sivanmalai, Nanjarayan Tank,Koolipalayam wetlands, Konganagiri hill hock temple,Andipalayamlake,Thirumuruganpoondi, TiruppurTirupathi temple, Avinashiappar temple andVazhaiThottathuAyyankovil.

E. Economic Development

77. **Tourism**.Major temples in Tiruppur were built during the reign Cholas and Pandyas. Sukreeswarar Temple is a 10th-century temple situated at the outskirts of Tiruppur is considered one of the four 'Sirpa Sthalangal' in Kongu region. The Town Hall, new railway over-bridge, Tiruppur Kumaran memorial, and corporation memorial pillar are some of the landmarks in the Tiruppur city. The tourist interest places in Tiruppur districtare Nanjarayan Tank, Koolipalayam wetlands, Konganagiri hill hock temple, Andipalayam Tank, Thirumurugan poondi, Tiruppur Tirupathi temple, Avinashiappar temple and Vazhai Thottathu Ayyankovil.

78. **Agriculture.**Tiruppur, though an industrial district, plays important role in agriculture. In Tiruppur, more than 80% of farmers belong to small and marginal category and they play a key role in overall development in Agriculture. The total area of cultivation is around 228,556 hectare comprising primarily food and commercial crops. The chief food crops are paddy, millets and pulses. The non-food or commercial crops in the district are cotton, oil seeds and coconut.Depending on the rainfall and assured irrigation, the total cultivable area may exceed the cultivable area benchmark by up to 150% of the aforementioned.

79. **Health Profile.**Tiruppur district having 10 government hospital with total bed strength of 1238 at Taluk level, around 51 primary health center in rural and urban areas. The indicators contained within this health profile will support Tiruppur City Municipal Corporation to focus on and prioritise health improvement initiatives, particularly among young children and vulnerable adults. In 2017, the number of peoples affected by vector borne diseases (Dengue, Malaria) is 254; however, no peoples were affected by water borne diseases and the morbidity rate was 0.032.

80. **School.**Education is an important component in the process of human development. The state has a policy objective of universal elementary education through the enrollment and retention of all children in the age group of 6-14 years. The district administration taking all effort to enroll all children who completed 5 years in the network of schools across the district.

(i) No. of elementary school: 86
(ii) No. of middle school: 77
(iii) Government high school: 3
(iv) Government Hr. sec school: 7

(v) Municipal High school: 4
(vi) Municipal Higher Sec. School: 4

81. **Industry.**Tiruppur is a major textile and knit wear hub contributing to 90% of total cotton knit wear exports from India. The textile industry provides employment to over six lakh people and contributed to exports worth 200 billion (US$3.1 billion) in 2014-2015. Tirupur is known for cluster activity development. Each activity of garment making is outsourced on a cluster basis to knitting units, dyeing and bleaching units, fabric printing, garmenting, embroidery, compacting and calendaring and other ancillary units.

82. As of 2010-2011, Tiruppur district had the seventh largest gross districtdomestic product (GDDP) in Tamil Nadu at Rs18,202 crore (4.5% of thegross state domestic product at constant prices). In terms of per capita income though, it ranked 2nd amongst all the districts at Rs83,776 when compared withthe state average of Rs59,967. The district economy is pre-dominantly servicebased with service sector's share in GDDP at 51% in 2010–2011. This isfollowed by secondary sector at 42% and primary sector at 7%.

Table 19: Industrial Area in Tiruppur District

Area	**Land acquired** (In hectare)	**Land developed** (In hectare)	**No of allotted plots**	**No. of Units in Production**
Ganapathipalayam	7	7	53	77
Gudimangalam	3	3	1	31
Tiruppur	4	4	5	45
SIDCO Industrial Estate, RasathiValasu, Kangeyam	21	21	51	N/A

83. **Roads.**There are four major types of road network in the district such as NationalHighway, State Highways, Panchayat Union road and Village Panchayat roads depending on the Vehicular traffic. Three National highways pass through the district are NH-4(Avinashi), NH-67 (Kangeyam Palladam) and NH-209 (Udumalpet). The major state highways connecting Tiruppur are SH-19 (Palladam-Tiruppur-Avinashi), SH-37 : (Tiruppur-Dharapuram), SH-196 / SH-
81 (Tiruppur-Gobichettipalayam), SH-169 (Tiruppur-Somanur), SH-172 (Tiruppur-Kangeyam). The pumping and the gravity transmission main passes through the National Highways, State Highways, etc. The distance in meters, ownership of the road, diameter of the carrying main are as follows:

Table 20: Raw Water Pumping Main

Sl. No	From	To	From	to	Distance	Ownership	Dia
			m	m	m		mm
1	Headworks	Badrakaliamman Road	0	350	350	Thekkampatty Panchayat	1422.0
2	Badrakaliamman Road	Railway track	350	850	500	Mettupalayam Municipality	1422.0
3	Railway Crossing		850	920	70	Southern Railways	1422.0
4	Railway Crossing	NH181	920	1320	400	Mettupalayam Municipality	1422.0
5	Highway	Bus Stand	1320	2520	1200	Southern Railways	1422.0
6	Bus Stand	WTP Site	2520	19270	16750	State Highways	1422.0

Table 21: Clear Water Transmission Main (section 1)

Sl. No	From	To	From	To	Distance	Ownership	Dia
			m	m	m		mm
1	AlameluMangapuramPirivu	Annur Bus Stand	0	4090	4090	State Highways Annur Circle	1776.6
2	Annur Bus Stand	Annur - Sathy Road Pirivu	4090	4310	220	National Highways	1776.6
3	Annur - Sathy Road Pirivu	Maruthur Road Pirivu	4310	16030	11720	State Highways Annur Circle	1776.6
4	Maruthur Road Pirivu	Aatayampalayam	16030	22810	6780	State Highways Avinashi Circle	1776.6
5	Aatayampalayam - SH Crossing		22810	22850	40	State Highways Avinashi Circle	1776.6

Table 22:Clear Water Transmission Main (section 2)

Sl. No	From	To	From	To	Distance	Ownership	Dia
			m	m	m		mm
1	Aatayampalayam	NHAI	0	2830	2830	District Rural Roads	1776.6
2	NHAI Crossing		2830	2890	60	NHAI	1776.6
3	Along NHAI	Avinashi-Mangalam Road	2890	3920	1030	District Rural Roads	1776.6
4	Avinashi-Mangalam Road	UmayanchettipalayamPirivu	3920	4150	230	State Highways Avinashi Circle	1776.6

Table 23: Clear Water Transmission Main (section 3)

Sl. No	From	To	From	To	Distance	Ownership	Dia
			m	m	m		mm
1	UmayanchettipalayamPirivu	Vanjipalayam	0	3170	3170	State Highways Avinashi Circle	1573.6
2	Vanjipalayam	Anaipalayam RUB (N/s)	3170	10570	7400	MDR Road - Tiruppur	1573.6

Table 24:Clear Water Transmission Main (section 4)

Sl. No	From	To	From	To	Distance	Ownership	Dia
			m	m	m		mm
1	Anaipalayam Railway Crossing		0	100	100	Southern Railways	1573.6
2	Anaipalayam Railway Crossing	Anaipalayam RUB (S/s)	100	680	580	MDR Road - Tiruppur	1573.6
3	Noyyal River Crossing		680	770	90	River PWD	1573.6
4	Noyyal River Crossing	Anaipalayam-AndipalayamJn	770	1330	560	MDR Road - Tiruppur	773.0
5	Anaipalayam-AndipalayamJn	Andipalayam-MariammanKovilJn	1330	2220	890	MDR Road - Tiruppur	773.0
6	Andipalayam-MariammanKovilJn	IduvampalayamJn	2220	3580	1360	MDR Road - Tiruppur	773.0
7	IduvampalayamJn	Murugampalayam	3580	5980	2400	MDR Road - Tiruppur	773.0
8	Murugampalayam	Sundamedu	5980	7260	1280	MDR Road - Tiruppur	773.0
9	Sundamedu	Palavanjipalayam Burial Ground	7260	11400	4140	MDR Road - Tiruppur	773.0
10	Palavanjipalayam Burial Ground	Kovilvazhi	11400	14200	2800	Rural Road Tiruppur	573.4
11	Kovilvazhi	Kalipalayam OHT	14200	20320	6120	Other District Roads	300.0

LL = Lakh liter, m= meter, MLD = million liters per day, OHT = overhead tank, m^2= square meter.

Table 25: Site Environmental Features

Infrastructure	Location and Environmental Features	Site Photograph
Intake and pumping house (11.306892° N, 76.921599° E) Mettupalayam	About 2 Acres of land owned by corporation in Bhavani River bank at mettupalayam which willbe used to construct the intake and pumping house**.** The site is located between existing scheme-II intake and mettupalayam intake well. The size of the pump house has been fixed to house eight pumps (6 working & 2 stand-by) at ultimate stage	

The intake well is proposed under this scheme for drawal of 270 MLD water (ultimate requirement).
The existing Scheme – II intake well (45MLD drawal) is located in upstream at a distance of 135 meter and existing metupalayam intake well (15 MLD) is located in downstreat at a distance of 110 meter from the proposed intake well.
The check dam is proposed in the downstream, next to the metupalayam intake well, therefore the proposed intake well and check dam will not affect the existing schemes.The nearest residential unit lies at distance of 210 m from the project site.

Infrastructure	Location and Environmental Features	Site Photograph
Water Treatment Plant Ottarpalayam village, Annur (11.242571° N, 77.072172° E)	The 6 acres of land available atridge point in Ottarpalayam Village near Annur and this willbe used to construct proposed water treatment plant. This land was gifted to corporation by public. The proposed water treatment plant capacity is 270 MLD (Ultimate stage requirement). Site is vacant & covered with shrubs, bushes, and the nearest residential unit lies at distance of 105 m from the project site. The site is large and green buffer will be developed surrounding the site.	
Water Distribution Station –Over Head Tank: Water by gravity will fed to all the Overhead tanks from the proposed Water Treatment Plant at Annur.		
Over Head Tank: OHT-1 Pandian Nagar Zone 2 (11.163036° N, 77.342796° E)	The OHT -1 is proposed at Pandian Nagar in the corporation land (extend of 5,750 m^2 comprise S.F.No.128 (Neruperichel). The land areaof530 m^2 is adequate to construct the proposed OHT. The site is vacant and surrounded by residential property on one side and road on other sides. The nearest housing unit is located at30 m from the project site. OHT-1 Capacity:10 LL	
Over Head Tank: OHT-2& OHT-3 MatheswaranKovil Zone 3 & Zone 4 (11.155321° N, 77.333188° E)	About 8,093 m^2 of Government Porromboke land comprises S.F. No. 219 (Chettipalayam) is availableinmadheswarankovil which willbe used to construct OHT-2 and OHT-3. Zone 3 &4 area will receive water supply from OHT-2 & OHT-3 respectively. The required land area to construct the proposed OHT 2 & 3 is 2,050 m^2. The site is vacant at present, the nearest residential units is located about 150 m from the site. OHT-2 Capacity is:20 LL	

Infrastructure	Location and Environmental Features	Site Photograph
	OHT-3 Capacity is:20 LL	
Over Head Tank: OHT-4 ThiruVeKa Nagar Park Zone 8 (11.111384° N, 77.325376° E)	The OHT-4 is proposed at ThiruVeKa Nagar Parking area.The land xbelongs to corporation about 3,080 m^2 comprising of T.S. No. 9/1A (Chettipalayam). The land areaof 530 m^2 is adequate to construct the proposed OHT.The land is vacant and surrounded by the residential property (30 m) and road on one side. OHT-4 Capacity is 10 LL	
Over Head Tank: OHT-5 G.N. Garden Zone 22 (11.153796° N, 77.374195° E)	The OHT -5 is proposed at G.N. Garden in the tharisu land extent of 3,200 m^2 comprise S.F.No. 538 (Nerupperichal). The land areaof 290 m^2 is adequate to construct the proposed OHT. Site is vacant with shrubs and bushes, the residential property is located about 100 m from the site. OHT-5 Capacity is 5 LL	
Over Head Tank: OHT-6 Boyampalayam (Sneha Nagar) Zone 23 (11.149836° N, 77.347970° E)	About 647 m^2 of corporation land comprises S.F. No. 259 (Thottipalayam) is availableinSneha Nagar which willbe used to construct OHT-6. The land extend of 530 m^2 is adequate to construct the proposed OHT. Site is vacant and few trees are present at peripheral of the site. The nearest house property is located about 80 m from the site. OHT-6 Capacity is 10 LL	

Infrastructure	Location and Environmental Features	Site Photograph
Over Head Tank: OHT-7 NRK Puram (School Campus) Zone 26 (11.113700° N, 77.355059° E)	The OHT -is proposedat NRK Puramin the corporation land extend of 1,020 m^2 comprise T.S. No. 152 (Tiruppur town). The required land extend to construct the proposed OHT is 625 m^2. The site is located within the NRK Puram corporation middle school. The site large enough to construct the OHT and green buffer will be developed all around the site. The nearest housing property is lies at a distance of 28 m from the project site. OHT-7 Capacity is12.5 LL	
Over Head Tank: OHT-8 & OHT-9 Kumar Nagar Zone 28 & Zone 29 (11.117667° N, 77.334369° E)	About 2,500 m^2 of Corporation land comprises T.S. No. 39 (Tiruppur town)is availableinKumar nagar which can be used to construct OHT-8 and9. Zone 28 & 29 area will receive water supply from OHT-8 & OHT-9 respectively. The land extend of 1,555 m^2 is adequate to construct the proposed OHT 8 and 9. Existing GLSR and OHT,electrical room has to be demolished apart from removing 14 nos. of trees to facilitate construction. The site is vacant with existing OHT, which was constructed under scheme-I. The site is surrounded by residential units on three sides and highway road on one side(Avinashi-Tiruppur road). The nearest housing unit is located about 25 m from the site. OHT-8 Capacity is 10 LL OHT-9 Capacity is 20 LL	

Infrastructure	Location and Environmental Features	Site Photograph
Over Head Tank: OHT-10 Bharathiyar Complex Zone 30 (11.114393° N, 77.334827° E)	The OHT -10 is proposedat Bharathiyar Complex in the corporation land extend of 1,500 m^2 comprise T.S. No. 79 (Tiruppur town). The land extend of 1,025 m^2 is sufficient to construct the proposed OHT. The peripheral of the site consist of few trees and also existing OHT is present. The commercial complex is located adjacent to the site. The nearest housing property is located about 45 m from the project site. 12 trees are removed to facilitate construction. One damaged hostel building has been demolished OHT-10 Capacity is20 LL	
Over Head Tank: OHT-11 Palayakadu Zone 31 (11.110492° N, 77.363689° E)	About 4,200 m^2 of corporation land comprises T.S. No. 9/1 (Tiruppur town) is availableinPalayakadu which can be used to construct OHT-11 (Capacity is 15 LL). At present the site is vacant parcel land, the residential units are located about 60m from the site.Required land area to construct proposed OHT is 785 m^2	
Over Head Tank: OHT-12 Gate Thottam Zone 32 (11.124949° N, 77.371645° E)	The OHT -12 is proposed at Gate Thottam in the corporation land extend of 825 m^2 comprise S.F. No. 131 (mannarai). The OHT-12 of capacity of 5 LL is proposed in the site by clearing the existing OHT tank. The site is surrounded by vacant land and nearest residential area lies at a distance of 95 meter from the project site. OHT-12 Capacity is 5 LL. Required land area to construct proposed OHT is 290 m^2	

Infrastructure	Location and Environmental Features	Site Photograph
Over Head Tank : OHT-13 Mahalaxmi Nagar (Vijayapuram) Zone 34 (11. 091287° N, 77. 407943° E) SF - 276	The area extend of 1780m^2 comprises T.S. No. 571 (Nallur) availablein Mahalaxmi Nagar which will be used to construct OHT-13 (Capacity is 7.5 LL).The required land extend to construct the proposed OHT is 400 m^2. At present site is vacant and surrounded by road on one side and the vacant parcel land on other sides. The nearest house property is located about 80 m from the project site on one side.	
Over Head Tank: OHT-14 Kalipalayam Zone 35 (11.071369° N, 77.416693° E)	The OHT -14 is proposed at Kalipalayam in the Government Porromboke land extend of 1400 m^2 comprise S.F. No. 424/2B1 (Nallur). Site is vacant with shrubs and bushes. The nearest house property is located at 50 m from the site. OHT-14 Capacity is 5 LL. Required land extend to construct proposed OHT is 290 m^2	
Over Head Tank: OHT-15 Chennimalaipalayam Zone 36 (11.099042° N, 77.415027° E)	The area extend of 940m^2 natham land comprises T.S. No. 330/1A (Nallur) availableinChennimalaipalayamwhich can be used to construct OHT-15.The nearest housing property is located about 60m from the site. Few trees are present in the peripheral of the site.The OHT-15 of capacity of 5 LL is proposed by clearing the existing OHT tank in the project site.The required land area to construct proposed OHT is 290 m^2	
Over Head Tank: OHT-16 Karthiknagar Zone 37 (11.059275° N, 77.376820° E)	The OHT -16 is proposed at Karthiknagar in the natham land extend of 9768 m^2 comprise T.S. No. 44/5B (Muthanampalayam).Site is vacant and away from the residential area. The nearest housing property is located about 150 m from the site. OHT-16 Capacity is 7.5 LL. Required land area to construct	

Infrastructure	Location and Environmental Features	Site Photograph
	proposed OHT is 400 m^2	
Over Head Tank: OHT-17 Pudhupalayam AD Colony Zone 38 ((11.04098° N, 77.396878° E)	About 1,435 m^2 of Government Porromboke land (Burial ground) comprises S.F. No. 149 (Muthanampalayam) is availableinPudhupalayam AD Colony which can be used to construct OHT-17 (Capacity is 12.5 LL). Required land area to construct proposed OHT is 625 m^2 Actually site is the burial ground; it is vacant with the shrubs and bushes. The nearest residential units are located about 70 m from the site.The compound wall is proposed to provide around the site with separate entry without affecting the burial ground.	
Over Head Tank: OHT-18 KovilVazhi Zone 39 (11.061198° N, 77.388359° E)	The OHT -18 is proposed atKovilVazhiin the corporation land extend of 19,650 m^2 comprise T.S. No. 54 (Muthanampalayam).Site is surrounded by the vacant parcel land. At present site is vacant with shrubs and bushes. The nearest housing property is lies at a distance of 104m from the project site. OHT-18 Capacity is 5 LL. Required land area to constructproposed OHT is 290 m^2	
Over Head Tank: OHT-19 Krishna nagar Zone 40 (11.069567° N, 77.383055° E)	The OHT -19 is proposed at Krishna nagarin the kuttai land extend of 1240 m^2 comprise T.S. No. 370 (Muthanampalayam). The land extend of 400 m^2 is sufficient to construct the proposed OHT. Site is vacant and away from the residential area. The nearest housing property is located about 150 m from the site. OHT-19 Capacity is 7.5LL.	

Infrastructure	Location and Environmental Features	Site Photograph
Over Head Tank: OHT-20 Kaliyappa Nagar Zone 42 (11.098727° N, 77.373846° E)	The OHT -20 is proposed at Kaliyappa Nagarin the Government Porrombokelandextend of 1648 m^2 comprise T.S. No. 663/1B (Nallur).Site is vacant and surrounded by residential area (20 m from the site). The required land extend to construct proposed OHT is 1025 m^2. OHT-20 Capacity is20 LL. Existing small temple to be removed.	
Over Head Tank: OHT-21 Thirunagar Zone 43 (11.103498° N, 77.399299° E)	The area extend of 2,034 m^2corporation land comprises T.S. No.425/4B (Muthanampalayam) available in Thiru Nagar which can be used to construct OHT-21. The land extend of 785 m^2 is adequate to construct the proposed OHT. At present site is vacant, located adjacent to the road. The nearest house property is located about 30 m from the site.OHT-21 Capacity is15 LL.	
Over Head Tank: OHT-22 Noyyal Burial Ground Zone 48 (11.104452° N, 77.353764° E)	The OHT -22 is proposed at Noyyal Burial Ground landextend of 1100 m^2 comprise T.S. No. 1,2,3,4,5 (Tiruppur). The OHT-22 of capacity of 10 LL is proposed in the burial ground. The nearest residential unit lies at a distance of 20 m from the project site.. The compound wall is proposed to provide around the site with separate access without affecting the burial ground. The land extend of 530 m^2 is adequate to construct the proposed 10 LL capacity OHT tank.	
Over Head Tank: OHT-23 Dharapuram road Zone 50 (11.096938° N, 77.349978° E)	The Proposed OHT -23 was located at Dharapuram road in the corporation land extend of 1200 m^2 comprise T.S. No. 30 (Tiruppur). At present, site has one OHT tank (existing) within the project site.The old tank has been demolished and about 12 nos. of trees has been cut to facilitate construction The site is surrounded by the residential area. The land extend of 50 m^2 is adequate to construct the proposed	

Infrastructure	Location and Environmental Features	Site Photograph
	OHT. OHT-23 Capacity: 10 LL. .	
Over Head Tank: OHT-24 State Bank Colony Zone 52 (11.104275° N, 77.327958°E)	The OHT -24 is proposed at State bank colony in the burial groundextend of 3,360 m^2 comprise T.S. No. 55/1 (Tiruppur). OHT-24 of capacity of 15 LL is proposed in the burial ground. The required land extend to construct the OHT is 785 m^2. Only small parcel area of the burial ground is used to construct the proposed OHT. The nearest housing property located at a distance of 28 m from the project site. The compound wall is proposed around the project site with separate entry without affecting burial ground activity.	
Over Head Tank: OHT-25 Cattle Shed Zone 54 (11.099453° N, 77.340886° E)	The OHT -25 is proposed at Cattle shed in the corporation land extend of 1360 m^2 comprise T.S. No. 86 (Tiruppur). The land area of 530 m^2 is adequate to construct the proposed OHT. At present, Site is vacant and surrounded by residential and commercial area. The nearest housing unit located at a distance of 28 m from the site. OHT-25 Capacity is 10 LL.	
Over Head Tank: OHT-26 Santhapettai Zone 56 (11.088480° N, 77.344132° E)	Proposed OHT -26 was located atSanthapettaiin the corporation land extend of 1,050 m^2 comprise T.S. No. 18/1 (Tiruppur).The site is vacant at present, ammaunavagam (hotel), slaughter house are located near to the site. The nearest house property is located about 200 m from the site. OHT-26 Capacity: 7.5LL. The required Land extend for construction of OHT is 400 m^2.	

Infrastructure	Location and Environmental Features	Site Photograph
Over Head Tank: OHT-27 Tsk Maragathammal L/O Zone 57 (11.084230° N, 77.363150° E)	The area extend of 1,420 m^2 comprises S.F. No. 283/2 (Tiruppur) available in Tsk Maragathammal which can be used to construct OHT-27. The required Land extend for construction of OHT is 400 m^2. At present site is vacant and surrounded by the residential area.The nearest housing units lies at distance of 26 m from the site. OHT-27 Capacity is 7.5LL.	
Over Head Tank: OHT-28 MasaniyammanKoil Zone 60 (11.089404° N, 77.355655° E)	Proposed OHT -28 was located at Masaniyamman koil in the Burial ground land extend of 203 m^2 comprise T.S. No. 11 (Tiruppur). The required Land extend for construction of OHT is 785 m^2 The site is vacant and small hindu temple (MasaniyammanKoil) is located near to the site. The nearest residential property lies at a distance of 110 m from the site.The compound wall is proposed around the project site with separate entry without affecting burial ground activity OHT-28 Capacity is 15 LL.	
Over Head Tank: OHT-29 Andipalayam (SR Nagar South) Zone 70 (11.093689° N, 77.317327° E)	Proposed OHT-29 was located atAndipalayam (SR Nagar South) in the Government Porromboke land land extend of 1,168 m^2comprise S.F. No. 39pt, 43pt, 51pt (Andipalayam). The required Land extend for construction of proposed OHTis 785 m^2. The site is vacant with shrubs and bushes. The nearest house property is located about 200 m from the site.OHT-29 Capacity is reduced to 12.5 LL	

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATIONMEASURES

84 This section of the IEE reviews possible subproject-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 subproject's area of influence. As defined previously, the primary impact areas are (i)waterintake,WTP,waterreservoirsanddistributionnetworksites;(ii) main routes/intersections which will be traversed by construction vehicles; and (iii) quarries and borrow pits as sources of construction materials. The secondary impact areas are: (i) entire Tiruppur City Municipal Corporation area outside of the delineated primary impact area; and (ii) entire Tiruppur district in terms of over-all environmental improvement.

85 The ADB Rapid Environmental Assessment Checklist for Water Supply was used to screen the subproject for environmental impacts and to determine the scope of the IEE investigation. The completed Checklist is found in Appendix 1. All the proposed subproject components will interact physically with the environment.

86 In the case of this subproject (i) most of the individual elements are relatively small and involve straightforward construction and operation, so impacts will be mainly localized and not greatly significant; (ii) most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving excavation and earth movements. The subproject area governed by Tiruppur City Municipality Corporation and access to the subproject locations is through existing public roads.

A. Pre-construction: Location and Design

87 **Design of the Proposed Components**. The Central Public Health and Environment Engineering Organization (CPHEEO) manual suggests a design period of 15/30 years. The water supply components were designed following the recommendations of the CPHEEO Manual for WaterSupply and Treatment.

88 Impacts arise from the design of the project including the technology used, scale of operation/throughput, waste production, discharge specification, pollution sources and ancillary services.

89 Impacts associated with the planning mainly depend on the site selection. Location impacts include on-site biophysical array and encroachment / impact either directly or indirectly on adjacent environments. It also includes the impacts on the people who might lose their propertiesor livelihoods due to the development of the proposedsite.

90 Construction works in the Tiruppur city area, the pipelines are to be laid on or along the roads in the unused vacant land adjacent to the roads within the project area. In the narrow roads (where there is no vacant land adjoining road), pipeline will be buried within the road right of way. However, considering the narrow and busy lanes, temporary impacts are likely during constructionstage.

91 **Site selection of sources of materials.** Approximately, 1,420 m^3 of sand, 820 m^3 of gravel, and 940 m^3 of aggregatewill be required for this project, which will be sourced from quarries (licensed stone quarries are located at 63-Velapalayam with lead of 17 km and sand quarry are located at karur with lead of 77 km). Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage

patterns, ponding and water logging, and water pollution. To mitigate the potential environmental impacts, locations of quarry site/s and borrow pit/s (for loose material other than stones) would be included in the design specifications and on plan drawings. Priority would be sites already permitted by Mining Department. If other sites are necessary, these would be located away from population centers, drinking water intakes and streams, cultivable lands, and natural drainage systems; and in structurally stable areas even if some distance from construction activities. It will be the construction contractor's responsibility to verify the suitability of all material sources and to obtain the approval of the TCMC. If additional quarries will be required after construction is started, then the Construction Contractor shall use the mentioned criteria to select new quarry sites, with written approval ofTCMC.

B. ConstructionImpacts

92 Construction and operation are the two activities in which the project interacts physically with the environment, so they are the two activities during which the environmental impacts occur. Construction impacts are associated with site cleaning, earth works, physical construction related materials movements and works, machinery, vehicles and workers. It also includes the erosion, dust, noise, traffic congestion and waste production associated with the constructionactivities.

ConstructionMethod

93 About 19.27 km of raw water main, 148.3 km of clear water main including feeder main upto OHTs and 1062.429 km of distribution pipeline are proposed under this subproject. Pipelines that are traversing private properties/built-up areas will be aligned adjacent to the roads in the unused vacant land. In narrower roads where there is no land available, the trenches will be dug into the edge of the road. The distribution pipelines laid on or along the road will be buried underground. The pipeline laid underground will be provided a clear cover of 1 m.

94 The trenches will be excavated using heavy equipment such as backhoes and bulldozers. Excavation in hard surfaces like cement concrete roads will be supplemented by pneumatic drill. Excavated soil will be placed nearby and a bed of sand or gravel - obtained from local quarries, will be placed at the bottom of the trench. Pipes (brought to site on trucks and stored on nearby unused land) will be placed in the trench over the clean soil or sand bedding using a small rig. Pipes will be joined by suitable machinery implements and /or, by hand depending on diameter and application type in the sub-project, after which excavated soil will be replaced around and on top of the pipe manually. Screened excavated soil will be used for backfilling purposes. Surplus material after refilling and surface compaction for road restoration will be disposed of per norms and as directed by the Client Engineer.

95 **Sources of Materials.** Significant amount of gravel, sand, and cement will be required for this subproject. The construction contractor will be requiredto:

(i) Use material sources permitted bygovernment;
(ii) Verify suitability of all material sources and obtain approval of TCMC;and
(iii) Submit to TCMC on a monthly basis documentation of sources ofmaterials.

96 **Air Quality.** Emissions from construction vehicles, equipment, and machinery used for excavation and construction will induce impacts on the air quality in the construction sites. Anticipated impacts include dusts and increase in concentration of vehicle-related pollutants such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons)

but temporary and during construction activities only. To mitigate the impacts, construction contractors will be required to:

(i) Consult with TCMC on the designated areas for stockpiling of clay, soils, gravel, and other constructionmaterials;
(ii) Excavate the water reservoirs foundations at the same time as the access roads (if needed) are built so that dug material is used immediately, avoiding the need to stockpile onsite;
(iii) Damp down exposed soil and any stockpiled on site by spraying with water when necessary during dryweather;
(iv) Use tarpaulins to cover sand and other loose material when transported by trucks;and
(v) Fit all heavy equipment and machinery with air pollution control devices which are operatingcorrectly.

97 **Surface Water Quality.** Tiruppur City receives scanty rainfall during monsoons and there are a number of natural and man-made drainage channels crossing the city to carry the runoff safely. Runoff from the excavated areas and material and waste soil stocks likely to contain silt, and this silt runoff will deteriorate the water bodies by silting. Large-scale silting is likely to lead to flooding. This impact will however be considered only during rainy season. These potential impacts are temporary and short-term duration only and to ensure these are mitigated, construction contractor will be requiredto:

(i) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plasticsheets;
(ii) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with TCMC on designated disposalareas;
(iii) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies;
(iv) Place storage areas for fuels and lubricants away from any drainage leading to water bodies; and
(v) Dispose any wastes generated by construction activities in designated sites;and
(vi) Conduct surface quality inspection according to the EMP.

98 **Aquatic Environment.**As per the secondary information, it was observed that the location's proposed for intake well and the check dam will not have any direct or indirect impact, as there are no fish breeding ground or endangered fish species/ aquatic animals found in the river. Hence the proposed construction works of intake well in river bank will not have any impact on the aquatic environment. However, care shall be taken to avoid deposition/ disposal of construction waste / accidental spillage of construction material in to the river and also construction works shall be restricted during the monsoon season. The check dam construction activities will physically disturb the water quality for a short period and may cause significant impact on aquatic life. But these effects will be temporary in nature. To mitigate these impacts, construction contractors will be required to:

(i) Disposal of waste or spoil into water bodies will be strictly prohibited, and workers will be restricted from fishing; and
(ii) Coffer dams provided for construction of head work and check dam without anydisturbance of river water flow. After completion of construction work, the coffer dam and other construction debris will be removed ensuring restoration of river bed.

99 Minimum 1.5 m depth of water head is required in the river.To ensure the minimum 1.5 m water is achieved all throughout the year, a check dam will be constructed across the River

Mullai Periyar.The check dam for this subproject will have sluice gates (upstream and downstream of the shutters) and smooth concrete bed apron to ensure free water flow occurseven during lean flow season thus ecological flow in the river will be maintained. The PWD authorities will manage and supervise the construction of the check dam.

100 **Source Sustainability**. The proposed subproject is to augment and improve the Water Supply system in Tiruppur City Municipal Corporation in Tiruppur district from River Bhavani as water source. Design capacity of the proposed scheme is as below.

Stage	Year	Qty in MLD
Present	2020	133.02
Intermediate	2035	197.00
Ultimate	2050	271.86

MLD = million liters per day.

101 Water Utilisation Committee unanimously approved this water supply proposal for a quantum of 156.36 MLD from downstream of Bhavani Barrage I at Samayapuram at the location of existing Headworks with a provision that the Tirupur City Municipal Corporation can approach the Government for sanction of the ultimate water requirement (231.19 MLD) for this scheme. In addition to the approved quantity, Tiruppur Corporation is presently drawing a total quantity of 40MLD through Scheme I & II mentioned in serial number 6 and 7 of the Table below. Scheme I and II will be abandoned and this quantity will be drawn by the new scheme.

102 Presently there are about 19 combined water supply schemes existing in River Bhavani between Pillur Dam and Bhavani Sagar Dam and the total required quantity for these existing schemes is 5.7mcft. The average of minimum monthly inflow into the Bhavanisagar reservoir during the period from the year 2000 to 2017 as per the PWD record is 1087 mcft/ month whereas the cumulative Water supply requirement including Coimbatore WSIS and Tiruppur WSIS is 525 mcft/month. Hence the required quantity of water will be available generally throughout the year for all the existing as well as proposed Water supply schemes.

Table 26: Details of Drawl of Water from River Bhavani (Pillur Dam to Bhavani Sagar Dam)

Sl. No.	Name of the WSS/CWSS	HW Location	Maintained by	Designed Quantity in MLD
1	CWSS to Nellithurai Panchayat and other habitations	Nellithurai	Local Body	0.09
2	Kavundampalayam Municipalty and Vadavalli T.P	Thekkampatty	TWAD Board	23
3	Karamadai Town Panchayat WSS	Thekkampatty	Local Body	6.9
4	Thekkampatti village Panchayat WSS and WSIS	Near Bhatrakaliamman koil	Local Body	2.72
5	Odenthurai WSS	Near Mampatty	Local Body	0.25
6	CWSS to Tirupur Municipality, 4 TPs and 412 habitations in Coimbatore Dt and Tirupur Dt.	Mettupalayam Samanna nagar	TWAD Board	46
7	Tiruppur Municipality -- I scheme	Mettupalayam Samanna nagar	Local Body	9.05

Sl. No.	Name of the WSS/CWSS	HW Location	Maintained by	Designed Quantity in MLD
8	Mettupalayam Municipality I scheme	Mettupalayam Samanna nagar	Local Body	2.16
9	WSIS to Mettupalayam Municipality -II scheme	Mettupalayam Samanna nagar	Local Body	6.3
10	CWSS to Mettupalayam Municipality,Karamadai and Govt. of India press colony.	Mettupalayam Samanna nagar	Local Body	5.5
11	CWSS to Sikkadasampalayam pt.	Near Karattumedu	Local Body	0.8
12	CWSS to 249 rural habitations in Annur-Avinashi Union	Vedar colony(Sirumugai)	TWAD Board	11.44
13	Sirumugai WSS	Vachinam palayam	Local Body	2.8
14	Sirumugai . WSIS	Vachinam palayam	Local Body	2.5
15	Mothepalayam CWSS	Kutheripalayam	Local Body	0.4
16	Jadayampalayam	Alankombu	Local Body	0.263
17	Chikkarampalayam	Alankombu	Local Body	0.292
18	CWSS to Karamadai union 185 Hab	Moolathurai	TWAD	4.0
19	CWSS to Annur Mooperipalayam Avinasi TP and Sulur AFS	Vachinam palayam	Under Execution	36.51
20	**Proposed Coimbatore WSIS**	Bhavani Barrage I	GOTN sanctioned	**178.3**
21	**Proposed Tiruppur WSIS**	Mettupalayam Samanna nagar	GOTN sanctioned	**156.36**
	Total Requirement			**495.635**
				or 17.5 mcft/day or 525 mcft /month

CWSS = combined water supply scheme,GOTN = Government of Tamil Nadu, mcft = million cubic feet, MLD = million liters per day, WSIS = water supply improvement scheme.

Table 27: Monthly Inflow Details in L.B.P. Dam at Bhavanisagar from 2000-2018

Quantity in million cubic feet

Sl. No	Year	Month											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2000	1502	2214	2438	1672	2107	5222	5820	10389	6682	5108	6497	4686
2	2001	2328	1943	2188	3980	1954	5609	7973	5520	3157	5649	6590	2994
3	2002	1699	1520	1441	1151	1018	2934	1387	5402	953	5333	6044	1208
4	2003	839	1189	1875	652	1273	1296	2286	1919	516	2622	2056	807
5	2004	901	960	415	1008	3926	7656	3972	8704	4434	7338	9103	2942
6	2005	2104	1694	2108	3059	3353	4035	15152	12215	8650	8780	10718	5194
7	2006	2659	2157	2588	1821	4282	7659	10820	6215	6880	8758	13501	3878
8	2007	2530	1622	2165	1498	1833	8521	19206	18157	10484	8887	6955	3749

9	2008	1838	3531	5359	3996	2547	3830	6643	7875	4289	8915	3510	2117
10	2009	925	924	1318	791	1143	1976	16183	4285	6042	7203	16917	4128
11	2010	2673	2769	2240	2003	1747	3550	5569	5394	4626	5489	12427	4871
12	2011	2179	2530	3849	2462	1289	8151	5057	5039	8420	6736	8121	3115
13	2012	2154	1530	1367	1793	2376	1244	1317	2986	2937	6073	2563	338
14	2013	1107	1049	1847	1516	483	6947	9450	10892	5922	5027	4656	2249
15	2014	868	1290	2444	1461	2213	1670	9674	8646	7670	11477	6441	4132
16	2015	2357	1964	2707	2167	4312	10512	4044	2776	3250	3450	9390	4773
17	2016	2339	1761	1064	1229	1359	2726	3815	1010	388	1359	677	625
18	2017	126	58	705	417	778	1003	2658	3330	9564	3441	2760	4414
19	2018	1350	557	1549	1848								

Source: Public Works Department**.**

Table 28: Pillur Dam Storage Details

PILLUR DAM STORAGE DETAILS FOR THE PAST 12 YEARS

Sl.No.	Year	Maximum			Minimum		
		Month & Date	Water level In ft.	Storage in MCft.	Month & Date	Water level In ft.	Storage in MCft.
1	2004	13-Jun	1399.8	1549.3	28-Apr	1366.5	922.5
2	2005	25-Jul	1398.8	1534.3	15-Jun	1370.5	984
3	2006	28-May	1399	1543	28-Feb	1384.3	1274.8
4	2007	22-Jun	1399	1543	1-Nov	1373.8	1034.3
5	2008	25-Oct	1399	1543	3-Feb	1365.3	903.75
6	2009	4-Oct	1400	1568	21-Dec	1365	900
7	2010	30-Aug	1390.3	1345	16-Mar	1365	900
8	2011	18-Jun	1399	1543	7-Jun	1365	900
9	2012	17-Sep	1391	1361	20-Apr	1361	847
10	2013	20-Jul	1398.8	1536.8	7-Jun	1364	886
11	2014	22-Jul	1398	1518	18-Jun	1363.3	875
12	2015	6-Feb	1378.5	1115	14-Feb	1365	900

Source: Public Works Department.

103 **River Water Quality**. There are no major pollution sources like industries in the upstreamside of the intake. Although there is no such disposal point in the proximity of intake. The raw water will be treated to drinking water standards and supplied to the consumers.

104 **Water Treatment Plant**. The proposed WTP will be constructed in 6-acre land proposed at ridge point in Ottarpalayam Village near Annur. The treatment plant layout has to be planned

to treat 270 MLD of raw water (Ultimate stage requirement).The proposed WTP will be based on conventional treatment process involving coagulation,flocculation, sedimentation, filtration process, disinfectionetc.The construction of WTP is proposed under Design and Build basis as per the process specified to suit the available site. Since the raw water is not suitable for the drinking purpose, the water treatment plant is proposed to treat raw water to meet the drinking water standards and supplied to consumers.

105 The back wash water from proposed WTP will be stored within the premises for further recirculation. It helps to minimize the raw water demand. For reuse and recirculation of the back wash water, proper recirculation system will be installed in the proposed WTP.The minimal sludge will be generated from the WTP. The dried sludge will be collected stored in separate place in plant and disposed into city landfill (periodically) or nearby abandoned quarries after obtaining permission from the Tiruppur Corporation or in the area identified by the Tiruppur City Municipal Corporation at maximum distance of 25 km from the WTP site.

106 There is invariably a safety risk when considerable quantities of chlorine are handled atthe WTP.To avoid any risk to workers and public, the chlorination facility at the WTP will be provided with all appropriate safety features and equipment to meet withany accidental eventuality, which may include:

(i) Chlorine neutralization pit with a lime slurry feeder;
(ii) Proper ventilation, lighting, entry and exit facilities;
(iii) Facility for isolation in the event of major chlorine leakage;
(iv) Personal protection and safety equipment for the operators in the chlorine plant;
(v) Laboratory facility shall not be housed within the chlorination facility;
(vi) Provide training to the staff in safe handling and application of chlorine; this shallbe included in the contract of Chlorinator supplier;
(vii) Visibleand audible alarmfacilitiestoalert chlorinegasleak;
(viii) Supplier of Chlorinator equipment shall provide standard operating manual forsafe operation and as well as maintenance and repairs; preferably these shall beprovided both in English and Tamil Languages; and
(ix) If the chlorine storage will be within 100m of any sensitive receptor, the projectwill involve them in the emergency response planning.

107 **Noise Levels.** There are no health facilities, historical and archaeological, paleontological, or architectural sites near the construction sites. There is no majorconstruction works proposed near the settlements, schools, and areas with small-scale businesses. The sensitive receptors are the general population in the subproject area. Increase in noise level may be caused by excavation equipment, and the transportation of equipment, materials, and people. Impact is negative, short-term, and reversible by adopting mitigation measures. The construction contractor will be requiredto:

(i) Plan activities in consultation with TCMC so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance;
(ii) Require horns not be used unless it is necessary to warn other road users or animals of the vehicle’s approach; and
(iii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitivereceptor.
(iv) Maintain maximum sound levels within the limits as prescribed by the prevailing Indian regulations and standards;

(v) 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.
(vi) Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach;
(vii) 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.
(viii) All the controlled blasting, shall be done by an approved and licensed Explosive contractor after submitting a blasting plan to PIU.

108 **Tree cutting at selected project sites.**The project area has been carefully selected and designed to avoid or minimize the tree cutting. The head works are proposed within the existing facilities, however, during the construction of the pump house, nearly 20 trees have to be cut/ removed.
The WTP site is a vacant land and covered with shrubs, bushes and therefore it involves no tree cutting. Pipelines are proposed along the highways and urban roads, at some places there are trees, however, construction shall be done in such a way to avoid/ minimize tree cutting. In OHT site at Bharathiar complex (Zone 30) 12 trees are cut and at Kumar Nagar OHT site (Zone 28&29) 14 trees are cut after getting proper permission from revenue authorities. In Dharapuram road tank (Zone 50) 12 Nos of trees to be cut. In order to compensate, tree plantation has been suggested in the ratio of 1:10 (10 trees shall be planted for the loss of one). Following measures needs to be implemented during preconstruction phase to minimize and/or compensate for the loss of tree cover if any:

(i) Minimize removal of trees by adopting suitable design measures
(ii) Obtain prior permission for tree cutting;and
(iii) Plant and maintain 10 trees for the loss of one tree
(iv) Total compensation is 440 trees

109 **Greenbelt development plan**. Totally 200 numbers of native species trees are proposed to be planted in the subproject area and cost of plantation including the maintenance is included in EMP estimate. It is proposed to plant 100 nos. of trees in Intake point (headworks), 40 nos. of trees in WTP site, 40 nos. of trees along the alignment of raw water main alignment and 20 nos. of trees along clear water main alignment within available right-of-way (ROW). The tree plantation will be proposed within the ROW along the alignment (based on the space availability), soil condition and topography. However, the maximum number of tree plantation will be achieved along the alignment. It is suggested that the components be designed in such a way to provide for planting of trees at least for a width of 15 m along the boundary of the WTP site trees in multi-rows. Trees shall be interspaced by around 7m within and between two trees. It is also recommended that tree plantation in the project site will be completed within commissioning stage of project. Adequate protection for the plants, necessary care and monitoring should be carried out to ensure their growth. Table below presents a list of some of the tree species that are suitable for plantation at the project sites.

Table 29: List of Trees suggested for Plantation at Project Sites

S.No	Common Names	Botanical Names
1	Jamun tree	*Syzygium cumini*
2	Big Jamun tree	*Syzygium jambolana*

3	Pongamaram	*Pongamia pinnata*
4	Mahogany	*Swietenia mahogany*
5	Alexandrian Laurel	*Calophyllum inophyllum*
6	India Kino Tree	*Pterocarpus marsupium*
7	Puvarasumaram	*Thespesia populhea*
8	Neem Tree	*Azadirachta indica*
9	Almond tree	*Terminalia catapa*
10	Vagai	*Albizia lebbeck*
11	Kadamba Tree	*Neolamarkia cadamba*
12	Pink Trumpet Tree	*Tabebvia rosea*
13	Yellow Flame Tree	*Peltophorum pterocarpum*
14	Rain tree	*Samaneasaman*
15	Arjun tree	*Terminalia-arjun*

110 Maintenance and monitoring arrangement shall be made for watering and protection of the plants. Monitoring of survival of the plants shall be done once every three months and the dead plants shall be replaced with new plants. Records would be maintained for the status of greenbelt. The proposed green belt in the headworks and WTP site will be maintained by O&M Contractor and in remaining sites will be maintained by Tiruppur City Municipal Corporation.

111 **Existing infrastructure and facilities.** Excavation works can damage existing infrastructure/utilities located alongside roads. It is therefore important that construction contractors will be required to:

(i) Obtain from TCMC the list of affected utilities andoperators;
(ii) Prepare a contingency plan to include actions to be done in case of unintentional interruption of services

112 **Landscape and Aesthetics.** The construction works will produce excess excavated, excess construction materials, and solid waste such as removed concrete, wood, trees and plants, packaging materials, empty containers, spoils, oils, lubricants, and other similar items. These impacts are negative but short-term and reversible by mitigation measures. The construction contractor will be requiredto:

(i) Prepare and implement Waste ManagementList;
(ii) Avoid stockpiling of excess excavated soils;
(iii) Coordinate with TCMC for beneficial uses of excess excavated soils or immediately dispose to designatedareas;
(iv) Recover used oil and lubricants and reuse or remove from thesites;
(v) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designatedareas;
(vi) Remove all wreckage, rubbish, or temporary structures which are no longer required;and
(vii) Request TCMC to report in writing that the necessary environmental restoration work has been adequately performed before acceptance ofwork.

113 **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. To ensure that water will not pond in pits and voids near subproject location, the construction contractor will be required to conduct excavation works on non-monsoonseason.

114 **Accessibility.** Some of the roads in the subproject sites are narrow thus excavation and trenching works along right on the ways, hauling of construction materials and operation of equipment on- site can cause traffic problems. Potential impact is negative but short term and reversible by mitigation measures. The construction contractor will be requiredto:

(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-peakhours; Locate entry and exit points in areas where there is low potential for traffic congestion;
(iii) Keep the site free from all unnecessaryobstructions;
(iv) Drive vehicles in a consideratemanner;
(v) Coordinate with Tiruppur Traffic Office for temporary road diversions and with for provision of traffic aids if transportation activities cannot be avoided during peak hours;
(vi) Notify affected sensitive receptors by providing sign boards informing nature and duration ofconstruction works and contact numbers forconcerns/complaints;
(vii) Provide planks across trenches in front of businesses, and ensure works are completed quickly to avoiddisruption; and
(viii) Avoid full streetclosure.

115 **Socio-Economic – Income.** Construction works will impede the access of residents and businesses to specific sites. The potential impacts are negative and moderate but short-term and temporary. The construction contractor will be requiredto:

(i) Leave spaces for access between mounds ofsoil;
(ii) Provide walkways and metal sheets where required to maintain access across for people andvehicles;
(iii) Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, andschools;
(iv) Consult businesses and institutions regarding operating hours and factoring this in work schedules;and
(v) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers forconcerns/complaints.

116 **Socio-Economic – Employment.** Manpower will be required during the 36 months construction stage. This can result to generation of contractual employment and increase in local revenue. Thus, potential impact is positive and long-term. The construction contractor will be requiredto:

(i) Employ majority of the labor force, or to the maximum extent, local persons within the 2km immediate area if manpower is available;and
(ii) If available, secure construction materials from localmarket.

117 **Occupational Health and Safety.** Workers need to be mindful of the occupational hazards which can arise from working in height and excavation works. Potential impacts are negative and long-term but reversible by mitigation measures. The construction contractor will be requiredto:

(i) Develop and implement site-specific Health and Safety (H&S) Planinformed by OHS risk assessment seeking to avoid, minimise and mitigate risk, including controlled blasting activity which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use Personal Protective Equipment; (c) H&S Training for all site personnel; (d) documented

procedures to be followed for all site activities; and (e) documentation of work-relatedaccidents;

(ii) Ensure that qualified first-aid trained professional can be deployedat all times. Equipped first-aid stations shall be easily accessible throughout thesite;

(iii) Provide medical insurance coverage forworkers;

(iv) Secure all installations from unauthorized intrusion and accidentrisks;

(v) Provide supplies of potable drinking water;Provide clean eating areas where workers are not exposed to hazardous or noxious substances;

(vi) 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 fellowworkers;

(vii) 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;

(viii) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operatingareas;

(ix) Ensure moving equipment is outfitted with audible back-upalarms;

(x) 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

(xi) Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforcedactively.

Hard rock will be removed by controlled blasting by drilling holes on the hard rock and filling the hole with chemical specified for this purpose. After a day fissures will get developed and withthe help of breakers the rocks will be removed. The same procedure is repeated for any number of times till the required excavation depth is reached.

118 **Community Health and Safety.** Hazards posed to the public, specifically in high-pedestrian areas may include traffic accidents and vehicle collision with pedestrians. In most of the cases location of project sites at isolated area, hence health and safety risk to community is minimum. Potential impact is negative but short-term and reversible by mitigation measures. The construction contractor will be requiredto:

(i) Plan routes to avoid times of peak-pedestrianactivities;

(ii) Liaise with TCMC in identifying risk areas on routecards/maps;

(iii) Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or prematurefailure;

(iv) Provide road signs and flag persons to warn of dangerous conditions, in case of location near theroad; and

(v) Provide protective fencing around open trenches, and cover any open trench with metal planks during non-constructionhours.

Safety Measures for Controlled blasting during excavation: Presence of sub-surface rock (at a depth of 2 m whereas the pipeline depth is in the range of 2-3.50 m) in the alignment has been identified in few locations in Tiruppur Municipality. During excavation, alternatives like drilling and chiselling, controlled blasting etc will be examined and the suitable technology will be 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 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 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 for 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, Tirupur.
(xv) For the diversion of traffic in the blasting area, the contractor shall prepare a traffic management plan and obtain permission from Tirupur Corporation and traffic police.

119 **Work Camps.** Operation of work camps can cause temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants. Potential impacts are negative but short-term and reversible by mitigation measures. Consultation with TCMC revealed that it is unlikely that work camps are required for this subproject. In the case that it will be needed, the construction contractor will be requiredto:

(i) Consult with TCMC before locating project offices, sheds, and constructionplants;
(ii) Minimize removal of vegetation and disallow cutting oftrees;
(iii) Provide water and sanitation facilities foremployees;
(iv) Prohibit employees from cutting of trees forfirewood;
(v) Train employees in the storage and handling of materials which can potentially cause soil contamination;
(vi) Recover used oil and lubricants and reuse or remove from thesite;

(vii) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designatedareas;Remove all wreckage, rubbish, or temporary structures which are no longer required;and

(viii) Request TCMC to report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.

120 **Social and Cultural Resources.** There are no archeologically or historically recognized sites or places close/ vicinity to the project sites or within the project area. Nevertheless, the construction contractor will be required to:

(i) Stop work immediately to allow further investigation if any errors aresuspected;

(ii) Inform TCMC if an error is suspected, and take any action they require ensuring its removal or protection insite; and

(iii) Request TCMC or any authorized person with archaeological/historical field training to observeexcavation.

C. Operation and Maintenance Impacts

121 Operation of pumps and motors and diesel generators are major sources of noise. The WTP plant and Pumping station are major source for generation of noise during operation. However, the residential units are located away from the WTP and pumping station, noise generated from pump house can have continuous negative impacts on the surrounding. 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. To eliminate the issue, it is proposed to provide:

(i) Procure good quality latest technology pumps that guarantee controlled noise at alevel of around 80 dB(A) at a distance of 1m;[1]

(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 DG sets, pumps, motors;

(iv) Procure only CPCB approved generators[2] to meet air emission and noise level requirements;

(v) Provide sound mufflers for ventilators in the plant rooms; and sound proof doors; and

(vi) Provide ear plugs designated for noise reduction to workers working within

[1] 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 dBAat 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.

[2]CPCB has published Genset notifications, which includes specification for emission limits for new Diesel Engines (upto 800 kW) and Noise limits for Generator sets which runs with Diesel as Fuel type

Emission limits for DG's

POWER RANGE	HC+ NO_X	CO	PM	SMOKE
	g/kWh			m^{-1}
Up to 19 kW	7.5	3.5	0.3	0.7
>19 kW Up to 75 kW	4.7	3.5	0.3	0.7
>75 kW Up to 800 kW	4.0	3.5	0.2	0.7

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

the pumphouse where the noise level will be within 80dB(A). Noise level will belimited to 45 dB(A) outside the pumphouseand at the boundary.

122 The main O&M activities of the refurbished infrastructure will be detection and repair of leaks and pipe bursts. These are, however, likely to be minimal as proper design and selection of good quality pipe material should mean that leaks are minimal. Leak repair work will be similar to the pipe laying work as earlier explained. Trenches will be dug to reveal the leaking area and the faulty connection will be re-fitted, or the pipe will be removed and replaced if necessary.

123 Recurrence of blockage and leakage problems**.** Although impact is likely to be minimal due to new and well-designed efficient system, it should be ensured that leak detection and restoration time is minimized to the extentpossible.

D. Cumulative Impact Assessment

1. The cumulativeimpactassessment (CIA) examined the interaction between the subproject's residual effects (i.e., those effects that remain after mitigation measures have been applied) and those associated with other past, existing and reasonably foreseeable future projects or activities. The interaction of residual effects associated with multiple projects and/or activities can result in cumulative impacts, both positive and negative. The subproject's potential cumulative effects were considered with respect to Valued Components (VCs) in the categories of environmental, socio-economic, and heritage resources in fourareas:

(i) Of any potential residual project effects that may occur incrementally overtime;
(ii) Consideration of other known relevant projects or activities within the specified study area boundaries, even if not directly related to thesubproject;
(iii) Potential overlapping impacts that may occur due to other developments, even if not directly related to the proposed project;and
(iv) Future developments that is reasonably foreseeable and sufficiently certain to proceed.

124 The subproject IEE has identified the VCs as air quality, water (surface and groundwater) quality, noise, geophysical (hydrogeological), traffic management, social-economic and socio-community and human health. There are no foreseeable projects that will overlap with the subproject. The spatial boundary of the subproject is the area along the alignment. The temporal boundary can be considered as the whole corporation area of Tiruppur City Municipal Corporation.

125 Giventhe water supply requirement in TCMCwill be met and the source from River Bhavani is considered adequate, there are no significant cumulative impacts expected on the future watersupply.

126 Air quality effects will occur during construction. Consequently, although emissions of common air contaminants (CAC) and fugitive dust may be elevated in proximity to active work sites, this impact will be short-term and localized to the immediate vicinity of the alignment. Greenhouse Gas (GHG) emissions may increase as a result of project activities (i.e., vehicle and equipment operation, concrete production, disposal of excavated material, landfilling of residual wastes). Given the subproject's relatively minor contribution to CAC and GHG emissions during construction, the overall significance rating of both these potential residual effects is considered to be negligible duringconstruction.

127 During construction noise levels in the immediate proximity of most work sites are expected to increase. The duration of this exposure will be relatively brief. This exposure represents a temporary, localized, adverse residual effect of low to moderate significance for affected receptors. While building damage due to ground vibrations is unlikely, there may annoyance to spatially located receptors during construction. Noise levels associated with the project operations will be largely imperceptible as the service reservoirs are located in relatively small sites within the cityproper.

128 Land use/traffic management concerns will occur spatially during construction. During construction, site-specific mitigation measures will be implemented to address temporary disruptions to land use and access in the vicinity of the alignment such as road and sidewalk closures, traffic delays and detours, parking modifications, and increased volumes of construction–related traffic. There should be improved traffic movement along the alignment once construction is completed. Since the subproject will be built in undeveloped land earmarked for service reservoirs purposes, it will not conflict with existing or planned land use. However, following improvement in infrastructures and services, added residential developments, commercial and business facilities and increased densities are expected to develop and enhance the subproject area. This can be considered a long-term cumulative benefit of thesubproject.

129 Adverse impacts such as localized disruption of vehicle traffic and pedestrian movements in areas along the alignment, and elevated CAC and fugitive dust emissions in proximity to work sites, elevated noise and vibration levels and visual impacts will occur during construction. These short-term effects will be mitigated by providing alternate travel routes or alternating traffic movements and, where possible, access to businesses, schools and residences. However, upon completion of construction the socio-community will benefit from improved water supply system. This is considered a long-term cumulativebenefit.

130 Development at the intake, WTP, and service reservoir (OHT's) sites and in the vicinity of the subproject may result in similar impacts relative to water quality and soils, but each impact is independent of one another and are mitigated on a site-specific basis. Further, while water quality impacts have the ability to compound when taking into account regional water basins into consideration, the subproject will be required to adhere to the mandatory state and local laws, ordinances, regulations, and water quality standards. Regional geologic impacts do not generally compound and are limited to the site at which theyoccur.

131 The subproject, when considered with other projects in the same watershed, may result in cumulative impacts to surface and groundwater quality from increased surface impermeability and resultant runoff. Construction projects could result in increased erosion from exposed soil areas, which could contribute sediments into local drainage courses and other waterways. However, it is reasonably assumed that new construction associated with future projects will be required to meet national, state, and local construction and operation standards at least as rigorous as those required at present. Therefore, the potential for cumulative impacts to water quality and soils is deemed to be less thansignificant.

132 No adverse residual effects to human health will occur as a result of subproject construction or operation. While exposure to elevated noise levels and fugitive dust and CAC emissions will occur in proximity to subproject work sites during construction, due to their short-term, localized nature, these effects are expected to be minor and insignificant with no measurable effects on human health. The subproject operations will benefit the general public

by contributing to the long-term improvement of water supply system and community livability in TCMC.

VI. GRIEVANCE REDRESS MECHANISM

133 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 PMU and concerned PIU will ensure that their grievances are addressed.

134 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 implementing agency 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.

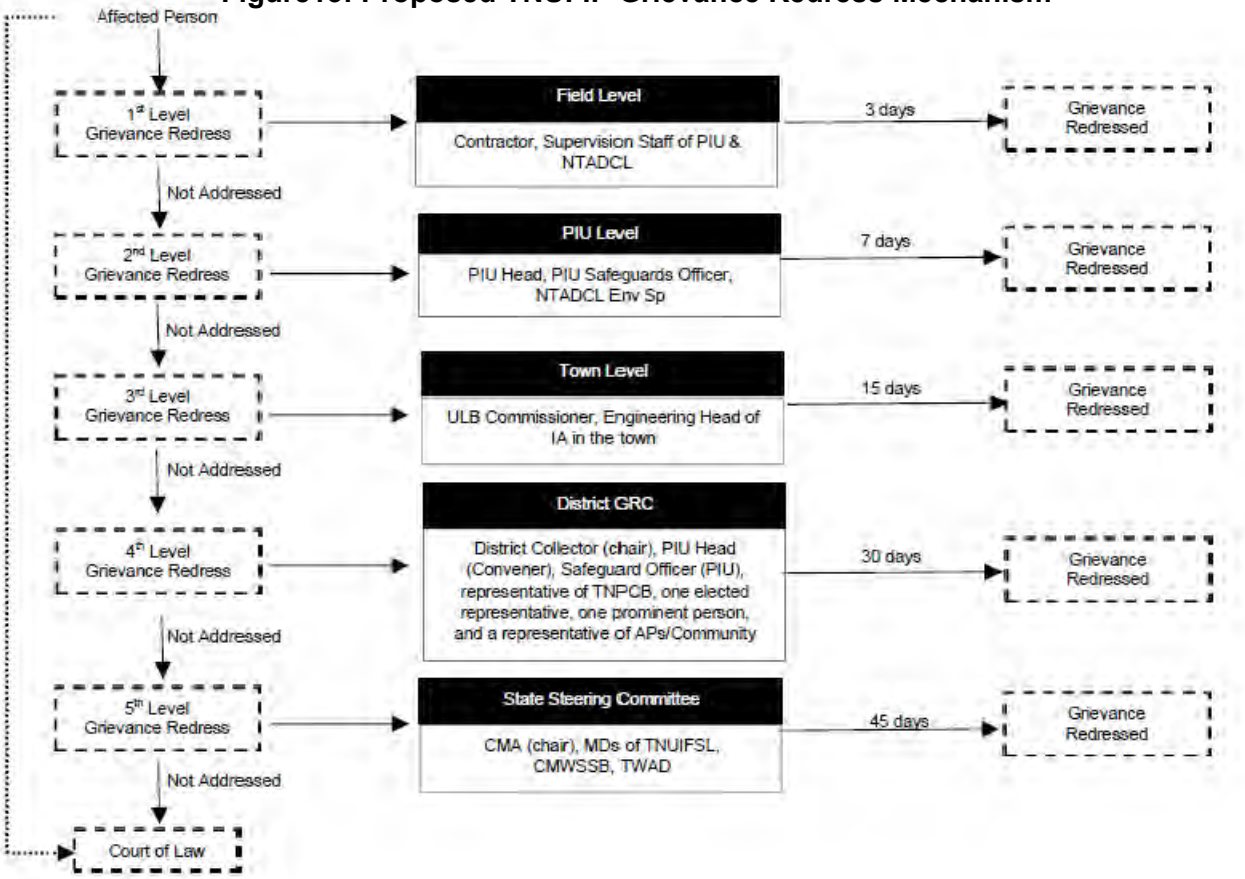
135 GRM provides an accessible, inclusive, gender-sensitive and culturally appropriate platform for receiving and facilitating resolution of affected persons' grievances related to the project. A two-tier grievance redress mechanism is conceived, one, at project level and another, beyond project level. 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 NTADCL 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.

136 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).

137 In case of grievances that are immediate and urgent in the perception of the complainant, the contractor, and supervision personnel of the NTADCL 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.

138 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.

Figure13: Proposed TNUFIP Grievance Redress Mechanism



CMA = Commissionerate of Municipal Administration; CMWSSB = Chennai Metro Water Supply and Sewerage Board; NTADCL = New Tirupur Area Development Corporation Limited, PIU = program implementation unit; ULB = urban local body; TNPCB = Tamil Nadu Pollution Control Board; TNUIFS = Tamil Nadu Urban Infrastructure Financial Services Ltd.; TWADB = Tamil Nadu Water and Drainage Board.

139 **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.

140 **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.

141 **Areas of Jurisdiction**. The areas of jurisdiction of the GRC, headed by the DistrictCollector 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).

142 The multi-tier GRM for the project is outlined below (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.

143 **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 NTADCL) and submitted to PMU.

144 **Information dissemination methods of the GRM**. The PIU, assisted by NTADCL 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 attachedin Appendix 5.

145 **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.

146 **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.

147 **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.

148 **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.

VI. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Overview

149 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.

150 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 (overhead tanks), 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

151 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

152 The subproject proposal is formulated by TiruppurCity Municipal Corporationin consultation with the public representative bodies in the project area to suit their requirements.

153 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 alsothe demand for infrastructure services.General public and the people residing along the project activity areas were consulted through a project area level consultation workshop, which was conducted in Tiruppur on 24 January 2018. The report on Public Hearing is enclosed as Appendix 9.

154 It was observed that people are willing to extend their cooperation as the proposed project will provide water supply 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 water supply system for its best functioning and to have the maximum health and aesthetic benefits. Project team explained proposed EMP to manage the negative impacts, including planning of temporary traffic arrangements and storage of construction materials included in the design and operation.

2. Consultation during construction

155 Prior to start of construction, PIUwill 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 impactsand 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 4). At the work sites, public information boards will also be provided to disseminate project related information.

C. Information Disclosure

156 Executive summary of the IEE will be translated in Tamiland made available at the offices of PMU, PIU, and Tiruppur City MunicipalCorporationand 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 Tamilwill be placed in the official website of the TNUIFSL and TiruppurCity Municipal Corporation after approval of the IEE by ADB. Stakeholders will also be made aware of grievance register and redress mechanism.

157 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.

158 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. ENVIRONMENTAL MANAGEMENT PLAN

A. Environmental Management Plan

159 An EMP has been developed to provide mitigation measures to reduce all negative impacts to acceptable levels.

160 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.

161 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 EMP. No works are allowed to commence prior to approval of SEMP.

162 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. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

163 For civil works, the contractor will be 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 and SEMP. The contractor shall allocate budget for compliance with these SEMP measures, requirements and actions.

164 The following tables show the potential environmental impacts, proposed mitigation measures and responsible agencies for implementation and monitoring.

Table30:Design Stage Environmental Impacts and Mitigation Measures

Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
Design of water treatment plant (WTP)	Deficient treatment due to substandard operation / system malfunction	(i) Design process to meet the Indian Standards for Drinking Water - Specification (BIS 10500: 2012). Ensuring continuous uninterrupted power supply, including a back-up facility (such as generator) (ii)Providing operating manual with all Standardoperating procedures (SOP) for construction works; occupational healthand safety (OHS), core labor laws, applicable environmental laws, etc; (iii)Necessary training to ULB staff dealing with WTP. (iv) 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	PIU/TCMC	Project Costs
	Disposal of sludge	After drying, the sludge should be stored in separate within the WTP premises and same should be disposed periodically into nearby city landfill or nearby by abandoned quarries after obtaining permission from the Tiruppur corporation or in the area identified by the Tiruppur City Municipal Corporation at maximum distance of 25 km from the WTP site.	PIU/TCMC	Project Costs
	Storage of chemicals and other hazardous materials	(i) Separate place in the WTP site should be identified for the safe storage and handling of chemicals and other hazardous materials with proper display of requirements and marking as protected area. (ii) Providing specific appliances for safe working of personnel in critical areas like chlorination plant shall be ensured.	PIU/TCMC	Project Costs
	Reuse of Back wash water	The back wash water from proposed WTP should be stored within the premises for further recirculation. It helps to minimize the raw water demand. For reuse and recirculation of the back wash water, proper recirculation system should be installed in WTP.	PIU/TCMC	Project Costs
Distribution network	Nuisance due to leaks, overflows, contamination of water, occupation health and safety of workers, etc.	(i) Limit the depth where possible (ii) In unavoidable cases, where networks are to be laid close to storm water drains, appropriate pipe material shall be selected (stoneware pipes shall be avoided) (iii) For shallow depth and especially in narrow roads, use small inspection chambers ;	PIU/TCMC	Project Costs

Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
Over Head Tanks	Energy consumption	(i) Using low-noise and energy efficient pumping systems (ii) EfficientPumping system operation (iii) Installation of Variable Frequency Drives (VFDs)	PIU/TCMC	Project Costs
Trees on Project Sites	Tree cutting	(i) Minimize removal of trees by adopting to site condition and with appropriate layout design/alignment; (ii) Obtain prior permission for tree cutting; and (iii) Plant and maintain 10 trees for each tree that is removed.	PIU/TCMC	Project Costs
Controlled blasting	Ground vibrations Noise (air blast) Flying debris Dust	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. 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. 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	Contractor and PIU	Contractor costs

O&M = operation and maintenance, PIU = program implementation unit, TCMC = Tiruppur City Municipal Corporation, ULB = Urban local bodies.

Table31:Pre Construction and Construction Stage Environmental Impacts and Mitigation Measures

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
Construction of Check dam and Head works	Change of stream course due to diversion channels to construct intake structures and Check dam	(i) No appreciable change to the river course shall occur due to diversion channel and intake structures & check dam should be constructed accordingly. (ii)The coffer dam will be provided for construction of check dam and head work without any disturbance of river water flow.	Construction Contractorin coordination with PIU/PWD	Project Costs
	Impact on the aquatic environment/ ecology	(i) The check dam shouldbe provided with Sluice gates (upstream and downstream of the shutters, smooth concrete bed apron should be provided to ensure that free flow occurs) through which the ecological flow in the river has to be maintained during the lean season. (ii) The sluice should act as a path for aquatic species including phytoplankton, zooplankton, fish species and reptiles	Contractor / Program implementation unit (PIU)	Project Costs
	Protection of Top soil	Top soil from the Head works site should be stored in stock piles and that can be used for gardening purposes at Head works site which will be an environmental enhancing measure	Construction Contractor/PIU	Project Costs
	Disposal of construction debris and excavated materials.	The contractor should make use of the excavated material and dispose of safely into low lying areas in consultation with PIU Engineer	Construction Contractor/PIU / PWD	Project Costs
	Downstream users (Impacts arising due to coffer dams, etc.)	Ensure that the river is not obstructed, affecting the downstream users due to coffer dams, etc.	Construction Contractor/PIU / /PWD	Project Costs
	Water quality in the source / water bodies	Establish the baseline water quality prior to initiation of construction and to be periodically monitored and report	Construction Contractor/PIU / /PWD	Project Costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
		sent to the PIU Engineer.		
	Restoring river bed / water source	After completion of work, ensure the restoring of river bed to its natural shape free from any debris or construction junk material that may obstruct the flow.	Construction Contractor/PIU / /PWD	Project Costs
	Safety measures	i) Barricading of construction site at all times in a day with adequate signage. ii) Where loose soil is met with, shoring and strutting shall be provided to avoid collapse of soil. iii) The contractor shall supply all necessary safety appliances such as safety goggles, helmets, safety belts, ear plugs, mask etc., to workers and staff.	Construction Contractor/PIU / /PWD	Project Costs
Construction of transmission lines including OHTs, WTP	Compensatory plantation of trees	Compensatory plantation of atleast ten the number trees felled should be done in line with competent authority guidelines	Construction Contractor in coordination with PIU	Project Costs
	Disposal of construction debris and excavated materials.	The Contractor shall identify the sites for debris disposal and should be finalized prior to start of the earthworks; taking into account the following (a) The dumping does not impact natural drainage courses (b) no endangered / rare flora is impacted by such dumping (c) Settlement area located at least 1.0 km away from the site. (d) Should be located in nonresidential areas located in the downwind side (e) Located at least 100m from the designated forest land. (f) Avoid disposal on productive land. (g) Minimize the construction debris by balancing the cut and fill requirements.	Construction Contractor in coordination with PIU	Project Costs
	Protection of top soil	(i) The top soil to be protected and compacted after completion of work, where the pipelines run, including open lands and agricultural lands. (ii) Top soil from the WTP and	Construction Contractor	Project Costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
		OHTs sites will be stored in stock piles and that can be used for gardening purposes at WTP and OHTs site which will be an environmental enhancing measure.		
	Safety Aspects	(i) Adequate precautions shall be taken to prevent the accidents and from the machineries. All machines used shall confirm to the relevant Indian standards Code and shall be regularly inspected by the PIU. (ii) Adequate precautions shall be taken while carrying out excavation, laying pipelines, operation of machinery near the power transmission towers and lines. Safety clearance requirements shall be met with. (iii) Laborers shall be periodically trained for the safety precautions for working near the power transmission lines. (iv) Emergency contact numbers shall be made available at the place of work. (v) Where loose soil is met with, shoring and strutting shall be provided to avoid collapse of soil. (vi) Protective footwear and protective goggles should be provided to all workers employed on mixing of materials like cement, concrete etc. (vii) Welder's protective eye-shields shall be provided to workers who are engaged in welding works. (viii) Earplugs shall be provided to workers exposed to loud noise, and workers working in crushing, compaction, or concrete mixing operation. (ix) The contractor shall supply all necessary safety appliances such as safety goggles, helmets, safety belts, ear	Construction Contractor	Project Costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
		plugs, mask etc., to workers and staffs. (x) The contractor will make sure that during the construction work all relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Services) Act, 1996 are adhered to. (xi) The contractor shall not employ any person below the age of 14 years for any work and no woman will be employed on the work of painting with products containing lead in any form.		
Batching and Crusher plant	Setting up of Batching and Crushers Plant,	(i) Hot mix plants, crushers and Ready mix concrete batching plants shall be located at least 500 m away from the nearest habitation. (ii) Contractor shall obtain NOCs / Consent to Establishment &Operate the plants from the Tamil Nadu State Pollution Control Board (TNPCB) and submit a copy to the PIU. (iii) Specifications of hot mix plants and batching plants, other construction vehicles, equipment and machinery to be procured will comply to the relevant Bureau of Indian Standard (BIS) norms and with the requirements of the relevant current emission control legislations	Construction Contractor	Project cost
	Water for construction	(i) The contractor should source the requirement of water preferentially from surface water bodies, such as rivers and tank in the project area. Boring of any tube wells are prohibited. To avoid disruption / disturbance to other water users, the contractor should extract water from fixed locations. (ii) Only at locations where surface water sources are not	Construction Contractor	Project cost

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
		available, the contractors can contemplate extraction of groundwater. Consent from the PIU engineer that no surface water resource is available in the immediate area for the project is a pre – requisite prior to extraction of groundwater. The contractor must need to comply with the requirements of the State Groundwater Department and seek their approval for doing so. (iii) The use of surface water by the contractor should be allowed only after written permission/consent of the community/ panchayat/ owner indicating the quantum of water allowed to be drawn.		
Sources of Materials	Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution.	(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 required under law, including Environmental Clearance prior to approval by PIU	Construction Contractor to prepare list of approved quarry sites and sources of materials with the approval of PIU	Project cost
	Identification and selection of Quarries	(i) The contractor should source materials (like gravel, aggregates) from existing licensed quarries with the suitable materials for construction. (ii) Apart from approval of the quality of the quarry materials,	Construction Contractor in coordination with PIU	Project cost

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
		the engineer's (PIU) representative will verify the legal status of the quarry operation, as to whether approval under Mining Department is obtained.		
	Sand	The contractor will identify sand quarries with requisite approvals for the extraction of sand under Tamil Nadu Minor Minerals Concession Rules, 1959 (Corrected upto 31 March 2001or latest) for use in the project.	Construction Contractor in coordination with PIU	Project cost
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 (iii) Timely submission of monthly monitoring reports including documentary evidence on EMP implementation such as photographs	Construction Contractor	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.	Construction Contractor in coordination with PIU	Project 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	Construction Contractor to finalize locations in consultation and approval of PIU	Project cost-

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
		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.		
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.	Construction 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	(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 site.	Construction Contractor and PIU	-
EMP Implementation	Irreversible impact to the	(i) Project manager and all key workers will be required to	Construction Contractor	Project cost / PMU cost

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
Training	environment, workers, and community	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.		
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 carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons.	**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 (x) Ensure that all the construction equipment, machinery are fitted with	Construction Contractor	Contractor costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
		pollution control devises, which are operating correctly, and have a valid pollution under control (PUC) certificate **For distribution network works** (i) Barricade the construction area using hard barricades (of 2 m height) on both sides (ii) Initiate site clearance and excavation work only after barricading of the site is done (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 dust 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 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 (vii) Conduct work sequentially - excavation, distribution network laying, backfilling; testing section-wise (for a minimum length as possible) so that backfilling, stabilization of soil can be done. (viii) 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. (ix) Backfilled trench at any		

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
		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. (x) 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. (Xi)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;		
Surface water quality	Mobilization of settled silt materials, and chemical contamination from fuels and lubricants during construction can contaminate nearby surface	(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	Construction Contractor	Contractor costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
	water quality. Ponding of water in the pits / foundation excavations	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).		
	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	Construction Contractor	Contractor costs
Noise Levels	Increase in noise level due to earth-moving and excavation equipment, and the transportation of equipment, materials, and	(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; (ii) Minimize noise from construction equipment by using vehicle silencers, fitting	Construction Contractor	Contractor costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
	people	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 80 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; (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.		
Removal of rock during excavation for pipelaying works	Increase in vibration due to the controlled blasting and associated activities	(i) During excavation for pipelaying works, wherever removal of rock is identified, alternatives like drilling and chiselling, controlled 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. (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. (iii) Permission shall be obtained from The District Collector for controlled blasting for excavation.	Construction Contractor	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
		Conditions stipulated in the permission issued by the District Collector shall be complied with during implementation. (iv) The contractor shall submit a blasting plan in advance to PIU; and implement in accordance to the plan. (v) Blasting shall be done through an licensed Explosive Contractor only (vi) For controlled blasting, explosives including blasting caps, shall be transported to the blasting site only through exclusive vehiclein 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. (vii)Cost for implementation of mitigation measures and liability are the responsibility of contractor. (viii) Proper prior notice will be issued to the Residents before Commencing construction activity works Schedule (ix) Proper information will be Given to Police Officials (x) Workers (Flagman) shall be stationed on both end of roads to warn people before firing any blasts and not to permit the traffic. (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.		

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
		(xii) 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. (xiii) Minimum Explosive will be used for Control Blasting for Residential areas (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. (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. (xvi) The contractor shall do the activities after obtaining the blasting permission from District Collector, Tiruppur. (xvii) For the diversion of traffic in the blasting area, the contractor shall prepare a traffic management plan and obtain permission from Tiruppur Corporation and traffic police. 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.		

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
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, oils, lubricants, and other similar items.	(i) 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., (ii) Avoid stockpiling any excess spoils at the site for long time. Excess excavated soils should be disposed of to approved designated areas immediately (iii) If disposal is required, the site shall be selected preferably from barren, infertile lands; sites should be *located* away from residential areas, forests, water bodies and any other sensitive land uses (iv) 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 (v) Residual and hazardous wastes such as oils, fuels, and lubricants shall be disposed of in disposal sites approved by TNPCB; (vi) Prohibit burning of construction and/or domestic waste; (vii) 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. (viii) Conduct site clearance and restoration to original condition after the completion of construction work; PIU to ensure that site is properly	Construction Contractor	Contractor costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
		restored prior to issuing of construction completion certificate		
Accessibility and traffic disruptions	Traffic problems and conflicts near project locations and haul road	**Distribution networks** (i) Prepare a distribution network 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 distribution network 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 500m 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	Construction Contractor	Contractor costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
		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 (xiii)At work site, public information/caution boards shall be provided including contact for public complaints **Controlled blasting** (xiv)The contractor shall submit a		

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
		blasting plan in advance to PIU; and implement in accordance to the plan. (xv)Proper prior notice will be issued to the Residents before Commencing WSIS activity works Schedule (xvi)Proper information will be Given to Police Officials (xvii)Workers (Flagman) shall be stationed on both end of roads to warn people before firing any blasts and not to permit th traffic. (xviii)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. (xix) For the diversion of traffic in the blasting area, the contractor shall prepare a traffic management plan and obtain permission from Municipality and traffic police 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 (v) Notify affected public by public information notices, providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.		
Socio-	Loss of	(i) Inform all businesses and	Construction	Contractor

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
Economic Loss of access to houses and business	income	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	costs
Socio-Economic – Employment	Generation of temporary employment and increase in local	(i) Employ local labor force as far as possible (iii) Comply with labor laws	Construction Contractor	Contractor costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
	revenue			
Occupational Health and Safety	Occupational hazards which can arise during work	(i) Follow all national, state and local labor laws (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] 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 laborers to ensure safety during implementation. (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 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.	Construction Contractor	Contractor costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
		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; and (x) Disallow worker exposure to noise level greater than 85 dB(A) 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	(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	Construction Contractor	Contractor costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
		(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 (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		

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
		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 biodegradable 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	Temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants Unsanitary and poor living conditions for workers	(i) As far as possible located the camp site within the work 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	Construction Contractor	Contractor costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
		summers; ensure conditions of livability at work camps are maintained at the highest standards possible at all times; (vii) Consult PIU before locating project offices, sheds, and construction plants; (viii) Minimize removal of vegetation and disallow cutting of trees (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 much 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 (x) Camp shall be provided with proper drainage, there shall not be any water accumulation (xi) Provide drinking water, water for other uses, and sanitation facilities for employees (xii) Prohibit employees from cutting trees for firewood; contractor should provide proper facilities including cooking fuel (oil or gas; fire wood not allowed) (xiii) Train employees in the storage and handling of materials which can potentially cause soil contamination (xiv) Recover used oil and lubricants and reuse or remove from the site (xv) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; provide a		

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
		compost pit for biodegradable waste, and non-biodegradable / recyclable waste shall be collected and sold in local market (xvi)Remove all wreckage, rubbish, or temporary structures which are no longer required (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		
Post-construction clean-up	Damage due to debris, spoils, excess construction materials	(i) Remove all spoils wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required; and (ii) All excavated roads shall be reinstated to original condition. (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.	Construction Contractor	Contractor costs

EHS = environmental Health and Safety, EMP = environmental management plan, m = meter, NOC = no objection certificate, OHT=overhead tank, PIU= Program Implementation Unit, PWD = Public Works Department, SEMP = site environmental management plan, TNPCB = Tamil Nadu Pollution Control Board, WTP = water treatment plant.

[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

Table32:Operation Stage Environmental Impacts and Mitigation Measures

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
WTP operation –	Public health, safety and environmental impacts	(i) Ensure proper knowledge transfer, hands-on training to municipal staff engaged in WTP operation has been provided by contractor prior to handover of facility (ii) Ensure continuous uninterrupted power supply (iii) Operate and maintain the facility following standard operating procedures of operational manual (iv) Undertake preventive and periodic maintenance activities as required (v) Conduct periodic training to workers	PIU and TCMC	Operating costs
Operation and maintenance of distribution system	Blocks, overflows, system malfunction, occupational health and safety	(i) Establish regular maintenance program, including: • Regular cleaning of grit chambers and lines to remove grease, grit, and other debris that may lead to water backups. Cleaning should be conducted more frequently for problem areas • Inspection of the condition of storage reservoirs (OHT's) and identifying areas that need repair or maintenance. Items to note may include cracked/deteriorating pipes; leaking joints or seals; frequent line blockages; lines that generally flow at or near capacity; and • Monitoring of water flow to identify potential inflows and outflows (ii) Develop an Emergency Response System for the water system leaks, burst and overflows, etc. (iii) Provide all necessary personnel protection equipment	PIU and TCMC	Operating costs

PIU= Program Implementation Unit, TCMC = Tiruppur City Municipal Corporation.

Table33: Construction Stage Environmental Monitoring Plan

Sample	Monitoring Location	Responsibility	Parameter to monitor	Frequency	Cost (₹)
Ambient air quality	5 Sampling Locations (at WTP site – 1 no. ; at Head work site – 1 no.; near OHT work site - 1 no, and near distribution work sites in city – 2 no's)	Construction Contractor in Coordination with PIU	PM $_{10}$, PM $_{2.5}$, SO_x, NO_x and CO	Once before start of construction. Three season in a year for 2 years during construction	35 samples x 5500 per sample = ₹192,500
Noise Level	5 Sampling Locations (at WTP site – 1 no. ; at Head work site – 1 no.; near OHT work site - 1 no, and near distribution work sites in city – 2 nos)	Construction Contractor in Coordination with PIU	Noise level Day and night time noise (dB(A))	Once before start of construction. Three season in a year for 2 years during construction	35 samples x 1500 per sample = ₹52,500
Surface Water Quality	2 Sampling Locations. (one location on upstream and another location on downstream side of River Bhavani near to Head work site)	Construction Contractor in Coordination with PIU	River Water quality – standard parameters	Once before start of construction. Four season in a year for 2 years during construction	18 samples x 5000 = ₹90,000
Construction disturbances, nuisances, public and worker safety,	All work sites	Supervising staff and safeguards specialists of PIU	Implementation of construction stage EMP including dust control, noise control, traffic management, and safety measures. Site inspection checklist to review implementation is appended at Appendix 6.	Weekly during construction	Staff and consultant costs are part of incremental administration costs

Table34: Operation Stage Environmental Monitoring Plan

Sample	Monitoring Location	Responsibility	Parameter to monitor	Frequency	Cost (₹)
Source (raw) water quality	At intake location in River Bhavani	O&M Operator / TCMC	All Drinking water parameters	Once prior to start of operation and monthly during operation	O&M Costs
Treated water Quality	At the WTP Outlet	O&M operator / CCMC	All Drinking water parameters	Monthly once during operation	O&M Costs
Sludge quality and suitability as manure	WTP	O&M Operator / TCMC	Start of operation and Yearly once	Analyses for concentration of heavy metals and confirm that values are within the limits specified in the SWM rules.	O&M costs (testing to be done at an accredited external laboratory)

CCMC = Coimbatore City Municipal Corporation, O&M = operation and maintenance, SWM = Solid Waste Management,TCMC = Tiruppur City Municipal Corporation, WTP = water treatment plant.

VIII. INSTITUTIONALARRANGEMENTS

A. ImplementationArrangements

165 The MAWS ofGovernment of Tamil Nadu acting through the 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.

166 The implementing agency for this subproject is Tiruppur City Municipal Corporation (TCMC). A Project Implementation Unit (PIU) will be established in TCMC headed by full-time a Project Manager (a senior official of TCMC) and comprising dedicated full-time staff from engineering and other departments of TCMC. PIU under the TCMC will be responsible for planning, implementation, monitoring and supervision, and coordination of all activities of subproject. New Tirupur Area Development Corporation Limited (NTADCL) will assist PIU in day-to-day implementation of the subproject.

167 **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 Vice President in the Projects Wing. At PIU level, the safeguard measures will be handled/ managed by the Environmental Specialist from NTADCL and the role of Safeguard Officer will be mainly to coordination, overseeing the implementation of safeguard tasks, grievance redress and reporting.

168 **PMU Safeguard Responsibilities**. Key tasks and responsibilities of the PMU, 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;
(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; and
(vii) Ensure that consent to Establishment(CTE) is obtained from TNPCB for the proposed WTP.

2. Construction stage:

(i) Prior to start of construction:
- Ensure that all necessary clearances/permissions/licenses, including that of contractor’s are in place prior to start of construction; and
- 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) for WTP from TNPCB.

169 **PIU Safeguard Responsibilities.** Key tasks and responsibilities of the PIU assisted by NTADCL 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) Ensurethat 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; and

(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, including consent to establish (CTE) from TNPCB for WTP, 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) 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;

(iii) Ensure contractor compliance with staff resources as per the IEE/EMP/Bid Document;

(iv) Guide contractor on updating EMP / preparing Site Environmental Plan at the start of the project;

(v) Update IEE and EMP, ensure that IEE reflects the final design being implemented by contractor;

(vi) Conduct public consultation and information disclosure as necessary

(vii) Take necessary action for obtaining ROW;

(viii) Supervise day-to-day EMP implementation on site by contractor, including the environmental monitoring plan;

(ix) Supervise ambient environmental monitoring by contractors;

(x) Take corrective actions when necessary to ensure no environmental impacts;

(xi) Conduct continuous public consultation and awareness;

(xii) Address any grievances brought about through the grievance redress mechanism in a timely manner as per the EMP;

(xiii) 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;

(xiv) Implement corrective or preventative actions in case of non-compliance or new/unanticipated impacts;

(xv) 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;

(xvi) 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;

(xvii) Review and approve monthly progress reports submitted by Contractor on EMP compliance;

(xviii) Prepare quarterly environmental monitoring reports and submit to PMU /TNUIFSL; and

(xix) Provide any assistance in environmental safeguard related tasks as required by PMU to ensure compliance and reporting to ADB.

3. Operation stage:

(i) Obtain all clearances as required for operation of project prior to operation, such as consent to operate (CTO) for WTP from TNPCB;

(ii) Conduct environmental management and monitoring activities as per the EMP; and

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

2. **Contractor's Responsibilities:**

4. Bidding stage:

(i) Understand the EMP requirements and allocate necessary resources (budget, staff, etc.); and
(ii) Understand the regulatory compliance requirements related to labor welfare, safety, environment, etc.

5. 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); and
  (b) Traffic management plan (sample is Appendix 5).
(vi) Implement the mitigation measures as per the EMP including CWM and traffic management 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 NTADCL; and
(xiii) Comply with applicable government rules and regulations.

6. Training Needs

170 Table35presents 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 35: Outline Capacity Building Program on EMP Implementation

Description	Target Participants and Venue	Schedule
1. Introduction and Sensitization to Environmental Issues (1 day) - ADB Safeguards Policy Statement - Government of India and Tamil Naduapplicable 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)	Yearly once and as & when required
2. EMP implementation (1/2 day) - 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 - AC pipe protocol - Traffic management plan - Waste management plan - Site clean-up and restoration - Controlled Blasting	All PIU staff, contractor staff and consultants involved in the subproject At PIU	Yearly Once, to be conductedby CMSC at the PIU office; part of project implementation cost
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)	Contractors' EHS officer to conduct program, with guidance of NTADCL

ADB = Asian Development Bank, CMSC = Construction Management and Supervision Consultant, EHS = environmental Health and Safety, EMP = environmental management plan, NTADCL = New Tiruppur Area Development Corporation Limited,OHS = occupational health and safety, PMU = program management unit, PIU = program implementation unit, SOP = standard operating procedures.

171 **Monitoring and Reporting**. 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 of the 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.

172 During construction, results from internal monitoring by the contractor will be reflected in their monthly EMP implementation reports to the PIU. NTADCL will monitor, review and advise contractors for corrective actions if necessary. Quarterly Environmental Monitoring Report (QEMR)summarizing compliance and corrective measures, if any, taken will be prepared by

NTADCL team at PIU and submitted to PMU. During operation, PIU will conduct management and monitoring actions as per the operation stage EMP and submit to PMU an annual report.

173 Based on PIU Quarterly EnvironmentalMonitoring 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 TCMC websites.

174 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

B. Environmental Management Plan Costs

175 The subproject is assessed to have no design or location impacts, except for that of laying of distribution pipelines passing through residential areas.

176 Construction stage impacts are typical for the construction activity and mitigation provided is mainly in terms of good construction practices like water sprinkling to arrest dust generation, clearing of excess soil, which will be incorporated into the Bill of Quantities and construction contractor's documents which will be binding during implementation. Therefore, there will be no additional costs of environmental management beyond the contractor's costs which are absorbed in the overall project costs for civil works. The operation phase mitigation measures are again of good operating practices, which will be the responsibility of operation agency, therefore there are no additionalcosts.

177 The monitoring proposed mainly includes site inspections and informal discussions with workers and local people and this will be the responsibility of PMU, costs of which are part of project management. The air quality and noise level monitoring of construction phase will be conducted by the contractor, since this is an additional cost, and therefore it needs to be part of subproject cost. The environmental management and monitoring costs are summarized in Table 36.

Table36: Cost Estimates to Implement the EMP

	Particulars	Stages	Unit	Total Number	Rate (₹)	Cost (₹)	Costs Covered By
A.	**Implementation staff**						
~~1~~	EHS Supervisor	Construction	per month	24	35,000	840,000/-	~~Civil works contractor~~
	Subtotal (A)					**840,000/-**	
B.	**Mitigation Measures**						
1	Tree Plantation with maintenance	Construction	Per tree	820	1,000	820000	Project costs (PIU)
2	Preparation of plans traffic management plan, waste (spoils) management plan etc.),	Construction	Lump sum	-	-	350,000	Civil works contractor

	Particulars	Stages	Unit	Total Number	Rate (₹)	Cost (₹)	Costs Covered By
	traffic management at work sites (Pavement Markings, Channelizing Devices, Arrow Panels and Warning Lights)						
	Subtotal (B)					**410,000/-**	
C.	**Monitoring Measures**						
1	Air quality monitoring Three seasons in a year for 2 years	Construction	per sample	35	5,500	192,500	Civil workscontractor
2	Noise levels monitoring Three seasons in a year for 2 years	Construction	Per sample	35	1,500	52,500	Civil work contractor
3	Surface water monitoring Three seasons in a year for 2 years	Construction	Per sample	18	5,000	90,000	Civil work contractor
	Subtotal (C)					**335,000/-**	
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)						
	Total (A+B+C+D)				₹	**1,585,000/-**	

EHS = environmental Health and Safety,EMP = environmental management plan,PMU = program management unit, PIU = program implementation unit.

Note: Trees Plantation with maintenance in Headworks site -150, WTP site – 200 nos, Clear water alignment – 100 nos.OHT sites:320 Nos

IX. FINDINGS AND RECOMMENDATION

178 The IEE assessed the environmental impacts of all components proposed under the Tiruppur Water Supply Subproject. Potential negative impacts were identified related to design, location, construction and operation of the subproject. Negative impacts are assessed to be minimal, temporary and can be mitigated.

179 The potential adverse environmental impacts of the proposed water supply subproject are mainly related to the construction period, which can be minimized by the mitigating measures and environmentally sound engineering and construction practices.

180 As stated above, most impacts are due to construction; this is because construction work is to be carried out within the city including densely populated areas. The important impacts identified are generation of dust and noise from construction activities; disturbance to traffic flows; impacts due to disposal of large quantities of surplus soil; disturbance and inconvenience to local people due to trenching along the road; impact on road-side hawkers and vendors; public safety; interference and damage to other infrastructure facilities.

181 These impacts are mostly temporary in nature and can be effectively avoided or mitigated by observing the proposed mitigation measures. The mitigation measures includes careful alignment of pipelines in order to minimize the impact on land, following existing alignment along roads, laying of pipeline over ground to avoid excavation and cutting of trees, minimizing the construction area, wetting of soil and construction area to reduce the dust; immediate transport of excess soil; beneficial use of excess soil; scheduling of activities to reduce the noise impacts; special precaution near to sensitive areas like schools and hospitals, and, traffic diversions and public information to reduce the impact. Proper safety measures during construction activities for ensuring worker’s as well publicsafety.

X. CONCLUSIONS

182 This IEE has assessed all potential environmental impacts associated with the subproject. There are no impacts that are significant or complex in nature, or that need an in-depth study to assess the impact. Thus, the subproject is unlikely to cause significant impacts. The potential impacts that are associated with design, construction, and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures.

183 The residentsof the Tiruppur City will be the major beneficiaries of this subproject. The new water supply system provides good quality of drinking water on 24x7 basis. In addition to improved environmental conditions, the subproject will improve the over-all public health in the project area.

184 The subproject components are located in Tiruppur City Municipal Corporationarea. Proposed intake well and WTP are located outskirt of the town. The subproject component sites (for OHTs) are selected on government owned land and the pipelines are proposed along the existing public roads. Within the project area there is no sensitive areas like forest or protected areas or nationally important / protected monuments. No eco-sensitive areas are located in the subproject area.

185 The proposed scheme will provide water supply on daily basis at 135 LPCD also the quality of water will be maintained as per BIS 10500:2012 drinking water quality.Therefore, as

per ADB SPS, the project is classified as environmental category ‘B’ and does not require further environmental impact assessment. This IEE has been updated by PIU during the implementation phase to reflect changes and the WTP design.

Rapid Environmental AssessmentChecklist

Water Supply

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 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 (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 – Water Supply System for Corporation areas of Tiruppur City Municipal Corporation

Sector Division : Urban Development

Screening Questions	Yes	No	Remarks
A. PROJECT SITING IS THE PROJECT AREA…			
▪ Densely populated?	✓		Subproject activities are in the urban areas of Tamil Nadu State. The central areas of the project towns are characterized by densely populated areas with narrow streets, while the outer areas are sparsely developed with wider roads. The outer areas (which are mainly recently added areas to the municipal limits) also comprise densely populated core town/village habitations surrounded by agricultural and vacant lands. Newly developing residential areas have low density and well-planned layouts.
▪ Heavy with ddevelopmentactivities?	✓		
▪ Adjacent to or within any environmentally sensitive areas?			
▪ Cultural heritage site		✓	There are 413 nationally protected monuments in 27 districts of Tamil Nadu. The ADB Mission team confirmed during pre- and fact-finding missions that water supply subproject components' locations are not within nor adjacent to any protected monuments.
▪ Protected area		✓	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 fact-finding missions that Tranche 2 locations are not in these protected areas.
▪ Wetland		✓	
▪ Mangrove		✓	
▪ Estuarine		✓	

Screening Questions	Yes	No	Remarks
▪ Buffer zone of protected area		✓	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		✓	
▪ Bay		✓	
B. POTENTIAL ENVIRONMENTAL IMPACTS Will the Project cause…			
▪ pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture, and soil erosion runoff?		✓	**Not anticipated.** The Mission team confirmed during pre- and fact-finding missions that Tranche 2 raw water sources are no upstream wastewater discharge.
▪ impairment of historical/cultural monuments/areas and loss/damage to these sites?		✓	**Not anticipated.** The Mission team confirmed during pre- and fact-finding missions that Tranche 2 locations are not within nor adjacent to any protected historical/cultural monuments/areas.
▪ hazard of land subsidence caused by excessive ground water pumping?		✓	**Not anticipated.** Groundwater will not be used as source.
▪ social conflicts arising from displacement of communities?		✓	**Not anticipated.** Physical displacement is not anticipated. Temporary impacts to businesses may occur during pipelaying works and will be addressed through resettlement plans prepared to comply with ADB SPS requirements.
▪ conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?		✓	**Not anticipated.** The design engineers and project preparatory team confirmed required amount of water by subprojects is negligible compared to the volumetric flow rates and availability of the surface water source. The IEEs provided lean season flows and availability to downstream users.
▪ unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)?		✓	**Not anticipated.** There are no sources of pollution upstream of the intakes. Monitoring and analysis conducted on raw water sources during design phase indicate good quality water (no pathogens and heavy metals). The WTPs are designed as state-of-the-art facilities.
▪ delivery of unsafe water to distribution system?		✓	**Not anticipated.** The WTPs are designed as state-of-the-art facilities which includes on-site and timely monitoring of treated water prior to distribution. 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.
▪ inadequate protection of intake		✓	**Not anticipated.** The design engineers and

Screening Questions	Yes	No	Remarks
works or wells, leading to pollution of water supply?			project preparation consultants confirmed protection of intake works are included in the design and specifications.
▪ over pumping of ground water, leading to salinization and ground subsidence?		✓	**Not applicable.**
▪ excessive algal growth in storage reservoir?		✓	**Not anticipated.** The design engineers and project preparation consultants confirmed all overhead tanks and ground-level reservoirs are covered.
▪ increase in production of sewage beyond capabilities of community facilities?		✓	**Not anticipated.** New sewerage system will be developed at the project area
▪ inadequate disposal of sludge from water treatment plants?		✓	**Not applicable.**The WTP 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.
▪ inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?		✓	**Not anticipated.** WTPs will include buffer zones as required and condition in the Consent to Establish by the Tamil Nadu State Pollution Control Board.
▪ impairments associated with transmission lines and access roads?		✓	**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.
▪ health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.	✓		**Anticipated but can be managed.** Potential hazard during O&M phase but not significant and can be mitigated. Chlorine will be handled by qualified and trained personnel. Dealing with chlorine chemicals will follow the proper handling of the chemical per source or manufacturer's manual. No other hazardous chemicals will be involved.
▪ dislocation or involuntary resettlement of people?	✓		**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.
▪ noise and dust from construction activities?	✓		**Anticipated but temporary, site-specific and can be mitigated.**No blasting activities envisaged. Nuisance/disturbance due to elevated noise may be experienced by sensitive receptors during construction. Noise will be

Screening Questions	Yes	No	Remarks
			minimized with mitigation measures specified in the EMPs. During operations, noise may be experienced by sensitive receptors due to WTP 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.
▪ increased road traffic due to interference of construction activities?	✓		**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.
▪ continuing soil erosion/silt runoff from construction operations?	✓		**Anticipated during construction but temporary, site-specific and can be mitigated.** EMPs and contract provisions include requirement for contractors to provide silt control measures.
▪ delivery of unsafe water due to poor O&M treatment processes (especially mud accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems?		✓	**Not anticipated.** The WTPs are designed as state-of-the-art facilities which includes on-site and timely monitoring of treated water prior to distribution. Each WTP will include laboratory to conduct monitoring of drinking water quality per WHO Drinking Water Guideline Values. Parameters to be monitored include residual chlorine. 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.
▪ delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals?		✓	**Not anticipated.** Treated water will be tested prior to distribution (see above) to ensure it meets WHO Drinking Water Guideline Values. The O&M Manual, standard operating procedures, equipment, trainings and regular maintenance (which are part of the contracts) will ensure safe drinking water is supplied to the system.
▪ accidental leakage of chlorine gas?		✓	**Not applicable.** Chlorine gas will not be used. During operations, sodium hypochlorite solution or dry calcium hypochlorite will be used. The EMPs include measures and monitoring requirements conforming with IFC EHS Guidelines. O&M Manuals will include health and safety requirements for managing chemicals.
▪ excessive abstraction of water affecting downstream water users?		✓	**Not anticipated.** The design engineers and project preparatory team confirmed required

Screening Questions	Yes	No	Remarks
▪ competing uses of water?		✓	amount of water by subprojects is negligible compared to the volumetric flow rates and availability of the surface water source. The IEEs provided lean season flows and availability to downstream users.
▪ increased sewage flow due to increased water supply		✓	**Not anticipated.** The increased sewage flow will be handled by the sewage management system included in TNUFIP Tranches 1 and 2.
▪ increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant		✓	
▪ large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		✓	**Not anticipated.** Engaging local labor will be a priority in TNUFIP.
▪ social conflicts if workers from other regions or countries are hired?		✓	**Not anticipated.** Engaging local labor will be a priority in TNUFIP.
▪ 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 operation and construction?	✓		**Anticipated but can be mitigated.** Construction is anticipated involve occasional use of explosives and chemicals however adequate mitigation measures have been identified and included. During operations, chlorination prior to distribution is required. The EMPs include measures and monitoring requirements conforming with IFC EHS Guidelines. O&M Manuals will include health and safety requirements for managing chemicals.
▪ 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. WTPs, overhead tanks and ground-level reservoirs are located inside ULB properties with compound walls and security personnel. 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.	1	Intakes and other structures

	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.)?		(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 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)?	0	No significant effect
	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): <u>Medium Risk</u>

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 Act, 1951 - 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.

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 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:	

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), and (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, and (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.

SAMPLE OUTLINE TRAFFIC MANAGEMENT PLAN

A. Principles for TMP around the Water Supply Scheme Implementation 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 A5.1**illustrates the operating policy for TMP for the construction of water pipes 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 Corporation/ Highways/ 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 A5.1: Policy Steps for the TMP

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

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 A5.2 to Figure A5.6 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; and
- Street closure with detour.

13. 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.

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 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 A5.2 and A5.3: Work on shoulder or parking lane and Shoulder or parking lane closed on divided road

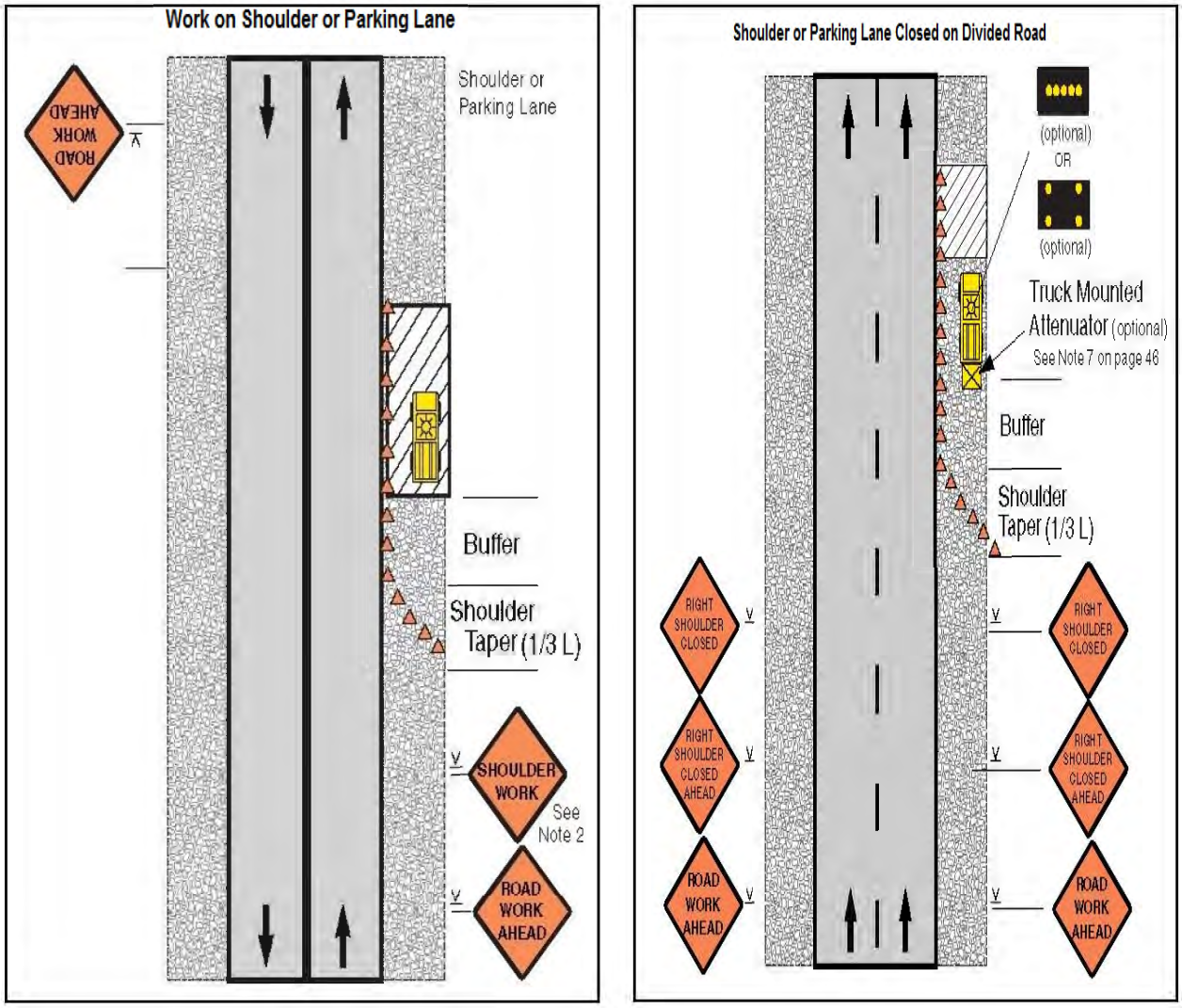


Figure A5.4 and A5.5: Work in Travel lane and Lane closure on road with low volume

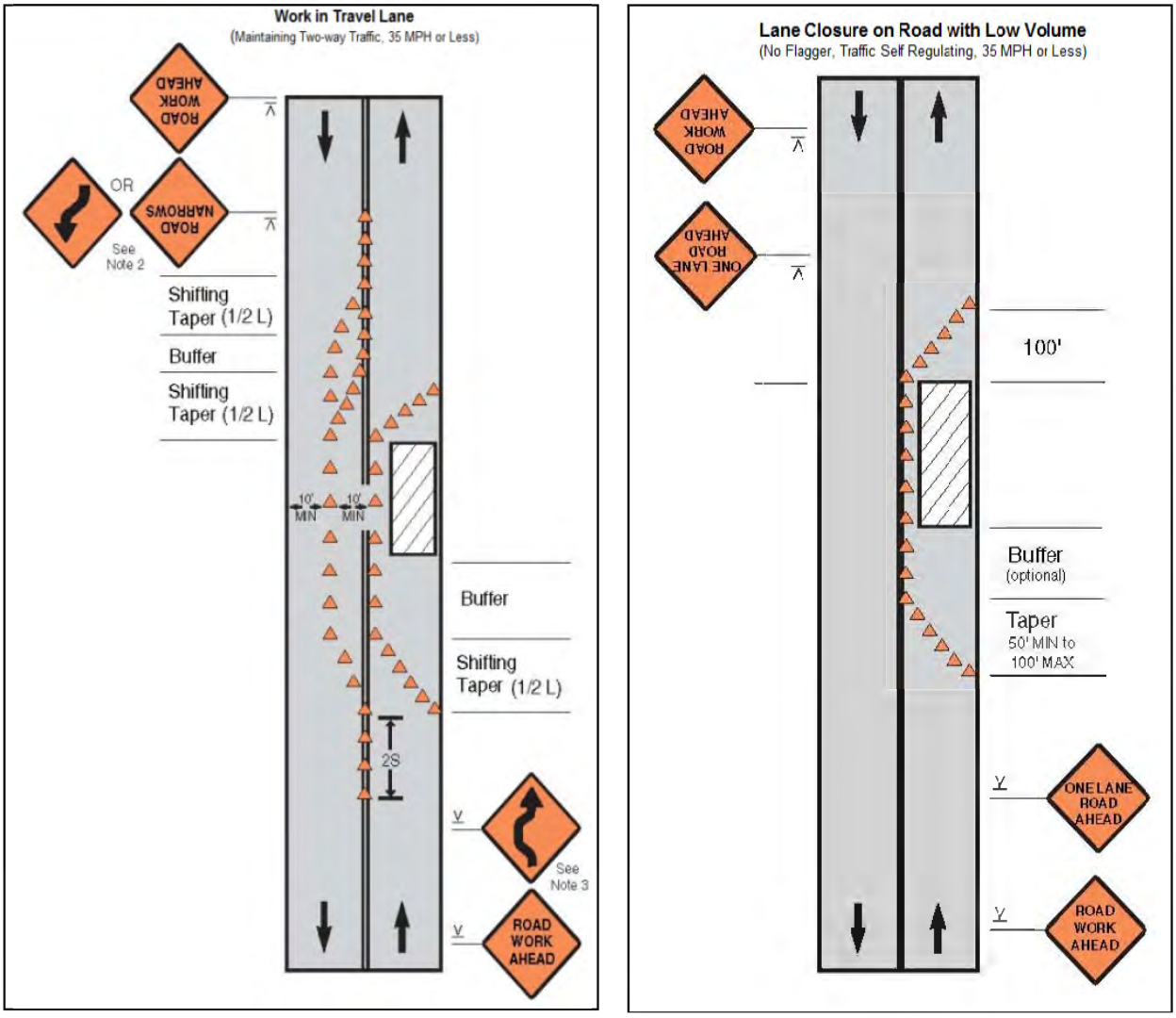
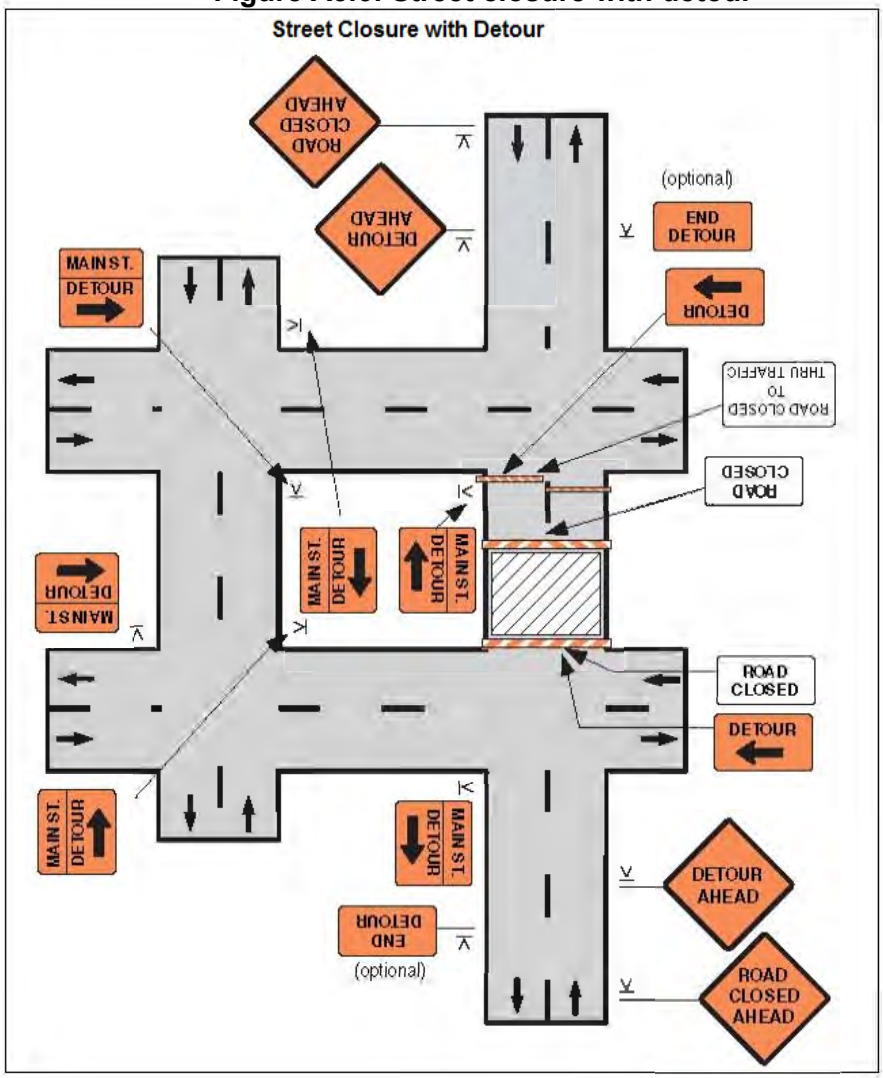


Figure A5.6: Street closure with detour



Appendix 6: SAMPLE ENVIRONMENTAL SITE INSPECTION REPORT

Project Name: Tiruppur Water Supply Scheme
Contract Number:

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	

Monitoring Items	Compliance
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	**Name**
Position	**Position**

QUARTERLY REPORTING FORMAT FOR TCMC /PIU

1. Introduction

- Description of sub-project implemented by PIU
- Environmental category of the subproject
- Details of site personnel and/or consultants responsible for environmental monitoring
- Subproject status

No.	Subproject Name	Subproject status	List of Works	Progress of Works
		Design☐ Pre-Construction☐ Construction☐ Operational Phase☐		

2. Compliance status with National/ State/ Local statutory environmental requirements

No.	Subproject Name	Statutory Environmental Requirements	Status of Compliance	Action Required

3. Compliance status with environmental loan covenants, if any

No. (List schedule and paragraph number of Loan Agreement)	Covenant	Status of Compliance	Action Required

4. Compliance status with the environmental management and monitoring plan

- Provide the monitoring results as per the parameters outlined in the EMP. Append supporting documents where applicable, including Environmental Site Inspection Reports.
- There should be reporting on the following items which can be incorporated in the checklist of routine Environmental Site Inspection Report followed with a summary in the semi-annual report send to ADB. Visual assessment and review of relevant site documentation during routine site inspection needs to note and record the following:
  - What are the dust suppression techniques followed for site and if any dust was noted to escape the site boundaries;

- If muddy water was escaping site boundaries or muddy tracks were seen on adjacent roads;
- adequacy of type of erosion and sediment control measures installed on site, condition of erosion and sediment control measures including if these were intact following heavy rain;
- Are their designated areas for concrete works, and refuelling;
- Are their spill kits on site and if there are site procedure for handling emergencies;
- Is there any chemical stored on site and what is the storage condition?
- Is there any dewatering activities if yes, where is the water being discharged;
- How are the stockpiles being managed;
- How is solid and liquid waste being handled on site;
- Review of the complaint management system;
- Checking if there are any activities being under taken out of working hours and how that is being managed.

Summary Monitoring Table

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						
Construction Phase						
Operational Phase						

Overall Compliance with EMP

No.	Sub-Project Name	EMP Part of Contract Documents (Y/N)	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 subproject

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/m^3	SO_2 µg/m^3	NO_2 µg/m^3

Site No.	Date of Testing	Site Location	Parameters (Monitoring Results)		
			PM10 µg/m^3	SO_2 µg/m^3	NO_2 µg/m^3

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 conducted, if any
- Copies of environmental clearances and permits
- Sample of environmental site inspection report
- Other

Public Information Notice Template

Public Announcement

Tiruppur City Municipal Corporation

Providing water supply scheme to Tiruppur City Municipal Corporation Area in Tiruppur district

Under this project, works are being conducted by xxxxxxxx Contractor to provide water supply scheme for Tiruppur City Municipal Corporation area in Tiruppur district

As part of this, works for laying pipeline 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.

Minutes of the Public Consultation Conducted on 24 January 2018 at Tiruppur Corporation, Zone 2, Thottipalayam&Tiruppur Corporation Central Office, Tiruppur for The Proposed Water Supply Scheme (WSS) by Tirupur City Municipal Corporation

The Public Consultation commenced at 11.00 AM with officials from Tirupur City Municipal Corporation (TCMC).The public/residents of the area and the residential association members were present at the meeting based on prior public notice given in newspapers about the details of the public consultation. The proof of participation of the individuals in the meeting is from the details of the officials and the public participants entered in the attendance register. The copy of Attendance register is attached herewith.

Officials of TCMC welcomed the gathering and outlined the procedure for Public Consultation. They described that the TCMC have proposed to develop the Water Supply Scheme (WSS) and Under Ground Sewerage Scheme for Tiruppur City Municipality Corporation. They requested the gathered public to express their views and opinions. 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:

The Tiruppur City Municipality Corporation is providing the drinking water to the public with the source of 118 MLD at the rate of 115.58 LPCD. The frequency of water distribution is from 3 - 8 days for the existing house hold service connections. By providing proper infrastructure to the existing schemes the frequency of distribution can be increasedand the per capita can be at the rate of 135 LPCD. Thus, the Tiruppur City Municipality Corporation proposed the new water supply scheme to meet the above purposes. The scheme consists of new water treatment plant to provide the good quality of water to the public and the OHT's are also proposed in addition to the existing OHT's. The scheme will be implemented under the AMRUT Scheme at the project cost of Rs. 834 Crores.

Following this, the TCMC 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 TCMC
1.	There is scarcity of water in the existing distribution system.	As said earlier, the upon implementation of this proposed scheme the per capita distribution will be at the rate of 135 LPCD (as per CPHEEO). Also, the scheme will reduce the frequency of distribution. Thus, there will not be any water scarcity after implementation of this scheme.
2.	Leakages in the existing water supply line in their locality.	The existing scheme consist of PVC pipes in some areas of TCMC which will be replaced under this proposed scheme.
3.	Explanation needed about the quality and durability of pipes to be used for the proposed scheme.	All the materials will be used as per IS standard and hence durability will also be higher.
4.	About the project cost and the implementation of project whether increase in	The individual households will have to pay taxes for the house service connection. Also,

S. No.	The views and questions of the public / stake holders	Clarification given by the Officials of TCMC
	the taxes of the households in the project area.	the tax payment will be calculated based on the type and built-up area of houses which will be declared by Government of Tamil Nadu.
5.	About the sizes of the pipes used. If there will be increase in population in the locality the scheme will hold or need replacement.	The sizes of pipes are calculated based on the ultimate period population calculated for 2050. Thus there will not be any resizing of pipes required untilthe year 2050.
6.	In any case water supply line can be laid above the ground which will be easier for maintenance.	The TCMC does not have such road width to provide the above ground water supply lines. Also, there is possibility for malpractices in the connection. Thus, above ground lines are not possible.
7.	Water supply line gets broken and mixed with sewer lines. This proposal will replace this problem.	This scheme will resolve this issue. The existing old pipes will be replaced and new pipes with good quality will be provided for water supply scheme. Also, there is a proposal for Under Ground sewerage system.
8.	Whether the existing line in the house service connection will be replaced.	The house service connections will have new pipes along with water meters.
9.	The quality of the water in the existing connection is not good. In some areas the water provided is not meeting the drinking purposes.	In this scheme the WTP is proposed to treat the water. The house service connection will have drinking water and they do not need further treatments in the house.
10.	Frequency of distribution is not constant in the locality.	The proposed scheme is planned to provide the drinking water in the daily basis. In the initial period we will decrease the frequency and the final will be daily water supply for the peoples.
11.	No. of OHT's proposed against the existing wards in the Tiruppur Corporation area	At present TCMC have 60 wards, upon implementing the scheme TCMC will have 66 OHT's against 60 wards.

The officials of TCMC concluded the Public Consultation with vote of thanks.

Copy of the photographs and copy of the News Paper advertisement of the entire proceedings are enclosed.

Brief Summary of the project details circulated to the stakeholders / Public

திருப்பூர் மாநகராட்சி பகுதியில் புதிய குடிநீர் திட்டம்

திருப்பூர் மாநகராட்சி பகுதியில் தற்போது மூன்று குடிநீர் திட்டங்கள் செயல்பாட்டில் உள்ளது. திட்டங்களிலிருந்து தினசரி 118.00 எம்.எல்.டி குடிநீர் பெறப்பட்டு (புதிய திருப்பூர் பகுதி மேம்பாட்டு கழகத்திடமிருந்து தற்காலிக அடிப்படையில் கூடுதலாக பெறப்படும் 50 எம்.எல்.டி உட்பட) நாளொன்றுக்கு நபர் ஒன்றுக்கு 115.68 லிட்டர் வீதம் வழங்கப்பட்டு வருகிறது. போதிய உள்கட்டமைப்பு வசதி இல்லாத காரணத்தினால் மூன்று நாள் முதல் 8 நாட்கள் வரை குடிநீர் விநியோகம் செய்யப்பட்டு வருகிறது.

மாநகராட்சியின் மக்கள் தொகை 2011ம் ஆண்டு கணக்கெடுப்பின்படி 877778 ஆகும். 2020 , 2035 மற்றும் 2050 எதிர்பார்க்கப்படும் மக்கள் தொகை முறையே 10,80,000, 14,80,000 மற்றும் 19,50,000 இலட்சமாகும். குடிநீர் தேவையின் விபரம் 2020,2035 மற்றும் 2050 முறையே 149.00, 203.65, மற்றும் 267.67 எம்.எல்.டி ஆகும்.

கூடுதல் குடிநீர் தேவையினை பூர்த்தி செய்யவும், குடிநீர் விநியோக கால இடைவெளியை குறைக்கவும், புதிய நீரேற்று தலைமையிடம் அமைக்கவும், முக்கிய நீரேற்று குழாய்கள் அமைக்கவும், 28 இடங்களில் மேல்நிலை நீர்த்தேக்கத் தொட்டிகள் அமைக்கவும், குடிநீர் குழாய்கள் அமைக்கவும் அம்ரூத் 2017–18 திட்டத்தின் கீழ் ரூ. 834.00 கோடியில் புதிய குடிநீர் திட்டம் செயல்படுத்தப்பட உள்ளது.

இத்திட்டத்தில் சுத்திகரிப்படாத குடிநீர் நீரேற்றம் செய்ய 1400 மி.மீ விட்டம் உள்ள குழாய்கள் 22.23 கீ.மீ நீளத்திற்கு அமைக்கவும், இடைக்காலத்தில் 196 எம்.எல்.டி சுத்திகரிப்பு நிலையம் அமைக்கவும், 1800 மி.மீ முதல் 450 மி.மீ வரை பிரதான சுய ஒட்ட நீரேற்று குழாய்கள் கட்டவும் 5.00 இலட்சம் முதல் 20.00 இலட்சம் வரை கொள்ளளவு கொண்ட 28 நீர்த்தேக்கத் தொட்டிகள் அமைக்கவும், சுமார் 850 கி.மீ நீளத்திற்கு விநியோக குழாய்கள் அமைக்கவும் 1,60,000 வீட்டு குடிநீர் குழாய்கள் அமைக்கவும் திட்டமிடப்பட்டுள்ளது.

இத்திட்டத்தின் செயலாக்க காலம் 24 மாதங்களாகும். இத்திட்டம் முடிவடைந்த பயன்பாட்டிற்கு வரும் பட்சத்தில் திருப்பூர் மாநகரம் குடிநீர் விநியோகத்தில் முழுமையடையும். இதனால் பயன்பெருவோர் எண்ணிக்கை 10,80,000 ஆகும்.

ஆணையாளர்,
திருப்பூர் மாநகராட்சி.

Attendance of Public Hearing

Tiruppur City Municipal Corporation.
Water Supply Scheme &
Underground Sewerage Scheme

3

S.No.	Name, Address & Phone No.	Signature	
1.	மாரியம்மாள் 5/1802, பாரதியார் வீதி பிச்சம்பாளையம் திருப்பூர் செல்: 8489235809	மாரியம்மாள்	F
2.	புவனா 3/8, வ.உ.சி நகர் 4 வீதி திருப்பூர் கொங்கு மெயின் ரோடு திருப்பூர் செல் - 9868974960	Bhuvan	F
3.	கீதா 3/2A வ.உ.சி நகர் 4 வீதி கொங்கு மெயின் ரோடு திருப்பூர் செல் - 8870826796	ЄТ77	F
4.	கனகம்மாள் 3/1B வ.உ.சி நகர் பிச்சம்பாளையம் புதூர் திருப்பூர் செல் - 9698961936	கனகாம்பாள்	F
5.	S. பிரியா பாரதியார் வீதி 5/499 பிச்சம்பாளையம் புதூர் திருப்பூர் செல் - 9047608673	S. Priya	F

TIRUPPUR CITY MUNICIPAL CORPORATION
WATER SUPPLY SCHEME &
UNDERGROUND SEWERAGE SCHEME

4

S.NO	NAME & ADDRESS & PHONE NO	SIGNATURE	S.NO
6	பன்னீர்செல்வி 5/950 பிச்சம்பாளையம் புதூர் திருப்பூர் செல் - 8489230351	K. Ponni Selvi	F
7	தேவி 5/485 லட்சுமி நகர் பிச்சம்பாளையம் புதூர் திருப்பூர் செல் - 9659240840	T. தேவி	F
8	கவிதா 5/487 ஜீவா வீதி பிச்சம்பாளையம் புதூர் திருப்பூர் செல் - 8489537644	கவிதா	F
9	பாமா 5/485/2A லட்சுமி நகர் பிச்சம்பாளையம் புதூர் திருப்பூர் செல் - 7871085744	பாமா	F
10	ரஞ்சனா 5/498 பிச்சம்பாளையம் புதூர் திருப்பூர் செல் - 9994768726	Ranjana	F

TIRUPPUR CITY MUNICIPAL CORPORATION
WATER SUPPLY SCHEME &
UNDERGROUND SEWERAGE SCHEME

5

S.NO	NAME & ADDRESS & PHONE NO	SIGNATURE	
11	எல்லம்மாள் 5/752 பிதாசுபாளையம் புதூர் திருப்பூர் தொலை - 8148538281	எல்லம்மாள்	F
12	சாந்தி 5/777 நாகா நகர் 2 வீதி பிதாசு பாளையம் புதூர் திருப்பூர் தொலை - 9489893235	சாந்தி	F
	சாதனா 5/156 லட்சுமி நகர் பிச்சம்பாளையம் புதூர் திருப்பூர்	சாதனா	F
13	லட்சுமி 5/640 இந்திரா நகர் பிதாசு பாளையம் புதூர் திருப்பூர் - 8870069186	லட்சுமி	F
14.	R. விமலாதேவி. 20/152 தெனியப்பன் கோவில்வீதி P.N. ரோடு திருப்பூர் - 9942077387	R.Vimala devi	F

TIRUPPUR CITY MUNICIPAL CORPORATION
WATER SUPPLY SCHEME &
UNDERGROUND SEWERAGE SCHEME

S.NO	NAME, ADDRESS & PHONE NO	SIGNATURE	S
15.	S. Manimekalai Prabu Nagar Vijayapuram Post Nallur 9442120788.	S. Manimekalai	M
16	S. Sangeetha 8/390 Uppilipalayam Arulpuram Thaneerpandal Tirpur -5 9786440871	S. Sangeetha	F
17	S. Dhandapani 33. Bridge way colony Extn Tirupur 7 969842 1414	[signature]	M
18	R. Raja 5/290 Ganesh Nagar Piehm palayam Tirupur - 9524724498	R. Raja	M
19.	S. Anandhakumar 28-B Thiruvallur nagar 1 Street Tirupur 9159422115	S. Anandhakumar	M
20	S. Natarajan 21/10 Mohan nagar Tirupur 641604 9505071441.	[signature]	M
21.	K. SHANMUGAM 9442604909 12/90 [illegible]	K[signature]	M

TIRUPPUR CITY MUNICIPAL CORPORATION
WATER SUPPLY SCHEME 4
UNDERGROUND SEWERAGE SCHEME 7

S.NO	NAME, ADDRESS + PHONE NO	SIGNATURE	Gender mark
22	C. Radhakrishnan காமராஜ் நகர் மேற்கு 9488323223 7/4 P.N. Road திருப்பூர்-2	C. Radhakrisan	M
23	R. Kavitha 7/4 Kamaraj Nagar II st. 9488632087 P.N. Road Tirupur 2.	R. Kavitha	F
24	அருணா 25/ வெற்றிவேல் காம்பௌண்டு) [illegible] திருப்பூர்.	அருணா	F
25	L. Kaviya 9543698813 5/592 Pitchampalayam pudur Tirupur	L. Kaviya	F
26	K. Mohanasundaram 8/2623 Teachers colony 3 street Pantiyan nagar Tirupur	K. Mohanasundaram	M
27	Velmurugan Chettipalayam Tirupur	M. Velmurugan	M
28	N. [illegible] நெ. 559. [illegible] திருப்பூர்-2		M

TIRUPPUR CITY MUNICIPAL CORPORATION
WATER SUPPLY SCHEME &
UNDERGROUND SEWERAGE SCHEME

S.NO	NAME, ADDRESS & PHONE NO	SIGNATURE	S
29	R. Karthik [illegible] 2 [illegible] 15 [illegible] 99524 68 94	R. Karthik	M
30	[illegible] 51, [illegible] [illegible] 9976 813207	[illegible]	M
31	K. [illegible] 55, [illegible] [illegible] (PO) [illegible] 9994584329	K. [illegible]	M
32	T. Kavitha Guruvayoorappan 7/9A Pappanna Nagar Selvaraj Theatre east Tirupur 9894928596	G [illegible]	F
33	Gowthami D.No. 1371 Palanisamy Nagar Tirupur Ph. 9500823127	Gow[illegible]	F
34	D. Vidhya 4/249, Sri Nagar Kumarasamy Nagar East Side Tiruppur ph. 9843347589	[illegible]	F

TIRUPPUR CITY MUNICIPAL CORPORATION
WATER SUPPLY SCHEME &
UNDERGROUND SEWERAGE SCHEME

S.NO	NAME, ADDRESS & PHONE NO	SIGNATURE	
	T. [illegible]		
	[illegible]		
	[illegible]		M
	[illegible]		
	7708842532		
	M. V. D. [illegible]	[illegible]	M
	[illegible]		
	94430-24043		
	[illegible]		M
	[illegible]		
	9443355435		
	R. [illegible]		
	[illegible]		
	[illegible] 2, [illegible] Phone: 9629809266		M
	[illegible]		
	[illegible]		
	[illegible] 2, [illegible]		M
	[illegible]		
	[illegible]		
	[illegible] -2, ICDS		M
	[illegible]		
	[illegible]		M
	[illegible] -2 9150299673		
	M. [illegible]		
	[illegible] 7867095120		M

TIRUPPUR CITY MUNICIPAL CORPORATION
WATER SUPPLY SCHEME 4
12 UNDERGROUND SEWERAGE SCHEME

S.No.	NAME, ADDRESS & PHONE NO	SIGNATURE	S.
1	P. Karthiga, Pongalur 9942092950 2/41, N.N. pudur Pongalur, Palladam(TK) Tiruppur.	P. [illegible]	F
2	M. Hemalatha 67, Manikandan Nagar, 9003951922 k. chettipalayam, Tiruppur.	[illegible]	F
3	Vidhya. V 9597791248 59, M.G.R Nagar, Samandipuram, Tiruppur	[illegible]	F
4	K. Mona Sangavi vengateshwara nagar kangeyam Main Road 8925457008 Tirupur	K. [illegible]	F
5	B. Keerthika 128, NP Nagar, 3rd street serangadu East Tirupur. 7305439720	B. [illegible]	F
6	R sankaran. S/o. P. Perumal. 9894336865 14/2, Sangeetha puram 7th street mangalam road TUP - 641604	R. [illegible]	M
7	R. krishnan. S/o, Ramasamy. 9500919671 [illegible] k. Chettipalayam mamani[illegible] near Tirupur 9500919671. Dharapuram near [illegible]		M

TIRUPPUR CITY MUNICIPAL CORPORATION
WATER SUPPLY SCHEME 4
UNDERGROUND SEWERAGE SCHEME

13

S.NO	NAME, ADDRESS + PHONE NO	SIGNATURE	
8.	R. Sivakumar 1/260 Ambedkar Nagar K. Chettipalayam Tiruppur 9585176095	R. Sivakumar	M
9.	K. Vijayakumar 9942788466 66/77 Samundipuram Kumar Nagar Tiruppur	[signature]	M
10.	T. Gunasekaran 49, Mariamman Kovil Street 8056992467 Tiruppur - 641603	[signature]	M
11	Murugan AMC Tiruppur	Murugan	M
12	K. Thirumalaisubramaniam 3/204 Mariamman Kovil Garden 9043798989 Mannarai...	[signature]	M
13.	P. MASILAMANI 14 LRG Layout Karuvampalayam 9578846456	[signature]	M
14.	P. Sivakumar 46/1, Mangalam Rd Street 8124688257	[signature]	M
15.	G. Stellamuthu.		F
16.	S. Saravanan 6/1 K.V.R. Nagar 1st St. 9894013176	[signature]	M

TIRUPPUR CITY MUNICIPAL CORPORATION
WATER SUPPLY SCHEME &
14 UNDERGROUND SEWERAGE SCHEME

S.NO	NAME, ADDRESS & PHONE NO	SIGNATURE	
17	[illegible]		M
	[illegible]		
	[illegible] 9003345662		
18	P. [illegible]	P. [illegible]	M
	[illegible]		
	[illegible] 9942352257		
19	P. [illegible]		M
	[illegible] 9500337325		
	[illegible]		
20	M. [illegible] 9843349146	[illegible]	M
	[illegible]		
	[illegible]		
21	[illegible] 9843716106	[illegible] 24/01/18	M
	[illegible]		
	[illegible]		
22	[illegible]	[illegible]	F
	[illegible]		
23	M. [illegible]	[illegible]	F
	AMC [illegible]		
24	[illegible]	[illegible]	F
	A.M.C [illegible]		

TIRUPPUR CITY MUNICIPAL CORPORATION
WATER SUPPLY SCHEME &
UNDERGROUND SEWERAGE SCHEME
15

S.No	NAME, ADDRESS & PHONE NO	SIGNATURE	
25	ABIRAMI. S AMC Tiruppur		F
	NA		
26	NATHIYA. M AMC Tirupur		F
27	Priyanka. B. AMC Tirupur.		F
28	K. Bhuvaneshwari TMC. Tirupur		F
29	S. L. Shruthi TMC Tirupur		M
30	[illegible]		M
31	N. [illegible] 16/4 [illegible] P.N [illegible]		M
32	K. Mohanambal No 35 K.M:... Nagar [illegible] mobile no 9994630998		M

Photos of Public Hearing

Public Hearing - Newspaper Clippings

தீக்கதிர்

23 - JAN 2018

குடிநீர் மற்றும் பாதாளச் சாக்கடை திட்டப்பணிகள்

[illegible]

தினமணி

24 . JAN 2018

குடிநீர், பாதாள சாக்கடைத் திட்டம் குறித்து பொதுமக்களிடம் இன்று கருத்துக் கேட்பு

திருப்பூர், ஜன 23: மாநகராட்சி பகுதியில் பாதாள சாக்கடைத் திட்டம் மற்றும் புதிய குடிநீர் திட்டம் செயல்படுத்துவது தொடர்பாக, பொதுமக்களிடம் புதன்கிழமை (ஜனவரி 24) கருத்து கேட்கப்படுகிறது.

இதுகுறித்து மாநகராட்சி ஆணையர் மா.அசோகன் கூறியதாவது:

திருப்பூர் பழைய மாநகராட்சி பகுதியில் பாதாள சாக்கடைத் திட்டம் செயல்பாட்டில் உள்ளது. அதேபோல், மாநகராட்சி 12, 13, 14, 22, 23, 24, 27, 32, 43, 44, 45, 49, 50, 57, 56, 58, 59 மற்றும் 60-ஆவது வார்டு பகுதிகளில் ரூ.300 கோடியில் இத் திட்டம் செயல்படுத்தப்பட உள்ளது.

மேலும், பெரியார்காலனி [illegible] கழிநீர் பண்ணை [illegible] சுத்திகரிப்பு நிலையமும், ஆண்டிபாளையத்தில் புதிய சுத்திகரிப்பு நிலையமும் கட்ட முடிவு செய்யப்பட்டுள்ளது. இதுதொடர்பாக பயனாளிகள் கருத்துக்களைக் கேட்கும் கருத்தாய்வுக் கூட்டம் தொட்டிபாளையம் 2-ஆம் மண்டல அலுவலகத்தில், ஜனவரி 24-ஆம் தேதி காலை 11 மணிக்கும், மாநகராட்சி மைய அலுவலகத்தில் பகல் 12 மணிக்கும் நடைபெற உள்ளது. இக் கூட்டத்தில் பொதுமக்கள் கலந்துகொண்டு தங்களது கருத்துகளைத் தெரிவிக்கலாம்.

அதோடு, திருப்பூர் மாநகராட்சி பகுதியில் மூன்று குடிநீர் திட்டங்கள் செயல்பாட்டில் உள்ளது. அம்ருத் 2017-18 திட்டத்தின் கீழ், ரூ.834 கோடி மதிப்பில் புதிய குடிநீர் திட்டம் செயல்படுத்தப்பட உள்ளது. இத் திட்டத்தில் புதிய மேல்நிலை நீர்த்தேக்கத் தொட்டிகள் கட்டுதல், குடிநீர் [illegible] குழாய்கள் பதித்தல் மற்றும் குடிநீர் விநியோகக் குழாய்கள் பதித்தல் போன்ற பணிகள் மேற்கொள்ளப்பட உள்ளன. இதுதொடர்பாகவும் அக்கூட்டத்தில் பயனாளிகளின் கருத்துக்கள் கேட்கப்பட உள்ளது என்றார்.

Summary: Announcement and Information on Water Supply Project in Tiruppur Inviting Suggestions.

திருப்பூர் மாநகராட்சி

பாதாள சாக்கடை திட்டம் குறித்து பொதுமக்களிடம் நாளை கருத்து கேட்பு

தி இந்து

23 JAN 2018

பாதாள சாக்கடை திட்டம்:

பொதுமக்களிடம் கருத்துகேட்பு

தினத்தந்தி

23 JAN 2018

பாதாள சாக்கடை திட்டம் தொடர்பாக

பொதுமக்கள் கருத்து கேட்பு கூட்டம்

திருப்பூரில் நாளை நடக்கிறது

Summary: Announcement and Information on Water Supply Project in Tiruppur Inviting Suggestions

தினமலர்

24. JAN 2018

பாதாள சாக்கடை திட்டம் இன்று கருத்துகேட்பு

[illegible]

தினமணி

25 JAN 2018

திருப்பூரில் ரூ. 834 கோடியில் புதிய குடிநீர்த் திட்டம்

[illegible]

தினமணி

25 - JAN 2018

குடிநீர், புதை சாக்கடைத் திட்டங்கள்: பொது மக்களிடம் கருத்துக் கேட்பு

திருப்பூர், ஜன. 24: திருப்பூர் மாநகராட்சிப் பகுதியில் புதிதாக குடிநீர்த் திட்டம், புதை சாக்கடைத் திட்டம் ஆகியவற்றை செயல்படுத்துவது தொடர்பாக பொது மக்களிடம் புதன்கிழமை கருத்துக் கேட்கப்பட்டது.

திருப்பூர் மாநகராட்சி பகுதியில் மூன்று குடிநீர்த் திட்டங்கள் செயல்பாட்டில் உள்ளன. இந்நிலையில், அம்ருத் 2017-18ஆம் திட்டத்தின் கீழ் ரூ. 834 கோடியில் புதிய குடிநீர்த் திட்டம் செயல்படுத்தப்பட உள்ளது. வார்டு எண் 12, 13, 14, 22, 23, 24, 27, 32, 43, 44, 46, 49, 50, 51, 56, 58, 59 மற்றும் 60 ஆகிய பகுதிகளில் ரூ.300 கோடியில் புதை சாக்கடைத் திட்டம் செயல்படுத்தப்பட உள்ளது. பெரிய சர்க்கார்பாளையம் கழிவுநீர் பண்ணை வளாகத்தில் கூடுதல் சுத்திகரிப்பு மையமும், ஆண்டிபாளையத்தில் புதிதாக சுத்திகரிப்பு மையமும் கட்ட முடிவு செய்யப்பட்டுள்ளது.

இது தொடர்பாக பொது மக்களிடம் கருத்துகளைக் கேட்கும் கலந்தாய்வுக் கூட்டம், திருப்பூர் மாநகராட்சி அலுவலகத்தில் புதன்கிழமை நடைபெற்றது. இதில், மாநகராட்சி செயற்பொறியாளர் தமிழ்செல்வன் கலந்துகொண்டு இந்த இரு திட்டங்கள் குறித்தும் விளக்கினார். தொடர்ந்து பொதுமக்கள் கேட்ட சந்தேகங்களுக்கு பதில் கூறினார். இதில் அதிகாரிகள் மற்றும் பொதுமக்கள் பங்கேற்றனர்.

Summary: Announcement and Information on Water Supply Project in Tiruppur Inviting Suggestions

தினகரன்

25 JAN 2018

திருப்பூர் மாநகராட்சியில்

பாதாள சாக்கடை திட்டம் குறித்து பொதுமக்களிடம் கருத்து கேட்பு

தீக்கதிர்

25 - JAN 2018

திருப்பூர் மாநகரில் 17 வார்டுகளில் ரூ.250 கோடியில் பாதாளச் சாக்கடைத் திட்டம்

தினமணி

25 -JAN 2018

திருப்பூர் மாநகரில் 17 வார்டுகளில் ரூ. 250 கோடியில் புதை சாக்கடைத் திட்டம் விரிவாக்கம்

Summary: Announcement and Information on Water Supply Project in Tiruppur Inviting Suggestions

Permission for Controlled Blasting - Extension
From District Collector, Tirupur on 06.11.2020

PROCEEDINGS OF THE DISTRICT COLLECTOR, TIRUPPUR

PRESENT:- Dr. K.Vijayakarthikeyan, I.A.S.,

Rc. No. 1370/2020/Mines **Date: 06.11.2020.**

Sub: Mines and Minerals – Tiruppur District – underground Drinking water project works for 18 areas – Removal of hard rocks encountered during underground Drinking water project work for laying of pipes by using mild explosives – Permission requested by The Commissioner, Tiruppur Corporation - Permission granted – Orders issued - regarding

Ref 1. The Commissioner, Tiruppur Municipality, Tiruppur letter R.c. No. 4814/E1/2017 dated 05.11.2020.

2. Special Deputy Tahsildar (Mines) report dated: 05.11.2020.

ORDER:-

Kind attention is invited on the above cited references.

2. The Commissioner, Tiruppur Corporation, Tiruppur vide letter dated 02.11.2020 has submitted representation to the District Collector with a request to grant permission to use small amount of explosives for the removal of hard rocks encountered during the underground drinking water project work to be Carried out by M/s. Annai (JV) for laying of pipes from the area listed below:-

1. Perumanallur SH 196 Road
2. Vavipalayam ODR
3. Angeripalayam ODR
4. Thirumurugan Poondi Ring Road
5. Uthukuli SH 19A
6. Vanjipalayam MDR
7. 15, Velampalayam MDR
8. Anupparpalayam ODR
9. Athupalayam ODR
10. Kangeyam ODR
11. Mannarai ODR
12. Thotti Mannarai ODR

13. Kanjampalayam ODR
14. Samundipuram main road
15. College Road
16. Kongu main road
17. Kannaki nagar main road
18. 60 feet road

3. Accordingly as instructed by the Deputy Director (Mines), the subject area was inspected by the Special Deputy Tahsildar (Mines) on 05.11.2020.

At the time of inspection it is noticed that, digging work is under progress, Hard massive, moderately weathered type of rock is encountered below the topsoil in the excavated portion. The occurrence of hard massive rock causes hindrance to the digging work in the subject area.

By nature the rock type noticed in the above area is very hard and it cannot be broken manually or by using machineries. It can be removed only by using mild blasting. Further only by removal of the rock alone, the digging work can be carried further in the above area.

Since the rock encountered in the above area is hindrance to the underground drinking water project work for laying of pipes and it can be removed only by using mild blasting. Hence, it is recommended to grant permission to remove the hard rock which is hindrance for the underground drinking water project work of Commissioner, Tiruppur Corporation and the contract was allotted to M/s. RPP Annai (JV) in the above fields by adhering all the safety measures and direct supervision of the blasting agency by following the below mentioned safety measures.

- The explosives used for blasting the rock should be mild one and it should be handled only by valid shot fire permit holder.
- Before conducting blasting operation, proper warning, precautioning and all the safety measures should be taken to all about the blasting to be conducted in the above area.
- The hindrance to the general public, cattles, animals etc., will not be allowed at any cost at the time of blasting.

13. Kanjampalayam ODR
14. Samundipuram main road
15. College Road
16. Kongu main road
17. Kannaki nagar main road
18. 60 feet road

3. Accordingly as instructed by the Deputy Director (Mines), the subject area was inspected by the Special Deputy Tahsildar (Mines) on 05.11.2020.

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Since the rock encountered in the above area is hindrance to the underground drinking water project work for laying of pipes and it can be removed only by using mild blasting. Hence, it is recommended to grant permission to remove the hard rock which is hindrance for the underground drinking water project work of Commissioner, Tiruppur Corporation and the contract was allotted to M/s. RPP Annai (JV) in the above fields by adhering all the safety measures and direct supervision of the blasting agency by following the below mentioned safety measures.

- The explosives used for blasting the rock should be mild one and it should be handled only by valid shot fire permit holder.
- Before conducting blasting operation, proper warning, precautioning and all the safety measures should be taken to all about the blasting to be conducted in the above area.
- The hindrance to the general public, cattles, animals etc., will not be allowed at any cost at the time of blasting.

- The contractor is held responsible, if any problem/ law and order situation arises in the subject matter.
- The rough stone quarried should not be used for any commercial purposes. If the contractor wants to transport the quarried material, they should pay necessary seiniorage fee.
- The subject areas were surfounded by powerlines, buildings etc., If any damage (or) other problems occurs, the contractor will be held responsible and atmost care should be taken at the time of conducting blasting operation.
- The subject work should be carried out under the direct supervision of Tiruppur Corporation officials.
- The completion report should be furnished to the District Collector once in a month.

4. In view of above, and based on the recommendation of the Special Deputy Tahsildar (Mines) permission granted to remove the hard rock which is hindrance for underground drinking water project work of Commissioner, Tiruppur Corporation through the contractor M/s. RPP – Annai (JV) Limited in the above fields for laying of pipes.

Sd/- K. Vijayakarthikeyan,
District Collector,
Tiruppur.

/ True Copy/ By Order/

06.11.2020

For Collector,
Tiruppur

To,

The Commissioner,
Tiruppur Corporation,
Tiruppur

Copy to:

1. The Superintendent of Police, Tiruppur.
2. The Commissioner of Police, Tiruppur.
3. The Deputy Superintendent of Police, Avinashi
4. Revenue Divisional Officer, Tiruppur
5. Tahsildar, Tiruppur North, Tiruppur South, Avinashi
6. M/s. RPP-Annai(JV)Private Ltd.,
   S.F.No.454, Ragupayjunaiken Palayam,
   Poondurai main road, Railway Colony (Po),Erode-638002.

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Permission for Controlled Blasting - Extension
From District Collector, Tirupur on 22.09.2020

PROCEEDINGS OF THE DISTRICT COLLECTOR, TIRUPPUR

PRESENT:- Dr. K.Vijayakarthikeyan, I.A.S.,

Roc. No. 1032/2020/Mines **Date: 22 .09.2020.**

Sub: Mines and Minerals – Tiruppur District – underground drainage works for 13 areas – Removal of hard rocks encountered during underground drainage work by using mild explosives – Permission requested by The Commissioner, Tiruppur Corporation - Permission granted – Orders issued - regarding.

Ref 1. The Commissioner, Tiruppur Municipality, Tiruppur letter R.c. No. E1/4814/2017-3 dated 17.09.2020.

2. Assistant Geologist (Mines) and Special Deputy Tahsildar (Mines) report dated: 21.09.2020.

ORDER:-

Kind attention is invited on the reference cited above.

2. The Commissioner, Tiruppur Corporation, Tiruppur vide letter dated 17.09.2020 has submitted representation to the District Collector with a request to grant permission to use small amount of explosives for the removal of hard rocks encountered during the underground drainage work from the area listed below:-

1. Amaravathipalayam to Puthupalayam road
2. Vanjipalayam to Divisional Engineer, High Way department office (College road)
3. Rakkiyapalaym - Ammapalayam –Tirumurugan poondi – Pooluvapatti – Neruperichal nall road
4. Attayampalayam to Velayuthampalayam
5. Attayampalayam – Karuvalur road
6. Andipalayam – Veerapandi (Palladam road) – Kaliveerakumarasamy koil – Koilvali
7. Velampalayam Ring road
8. Palladam road – Muthaiyan temple – 60 feet road – Dharapuram road – Chandrapuram – Cheran nagar
9. Sevanthampalayam to Muthanampalayam four road – Kangeyam road – Peruntholuvu road
10. Kangeyam road – Chennimalaipalayam
11. Mannarai to Gettu thottam
12. Union mill road full
13. Mangalam road to ABT Road to Palladam Road.

- The subject work should be carried out under the direct supervision of Tiruppur Corporation officials.
- The progress report should be furnished to the District Collector once in a month's time.

4. In view of above, and based on the recommendation of the Assistant Geologist (Mines) and Special Deputy Tahsildar (Mines) permission is hereby granted to remove the hard rock which is hindrance for underground drainage work of Commissioner, Tiruppur Corporation through the contractor M/s. Koya & Company Construction Limited in the above fields.

Sd/- K. Vijayakarthikeyan,
District Collector,
Tiruppur.

/True Copy/ By Order/

22.05.2020

For Collector,
Tiruppur

To

The Commissioner,
Tiruppur Corporation,
Tiruppur

Copy to:

1. The Superintendent of Police, Tiruppur.
2. The Commissioner of Police, Tiruppur.
3. The Deputy Superintendent of Police, Avinashi
4. Revenue Divisional Officer, Tiruppur
5. Tahsildar, Tiruppur North, Tiruppur South, Avinashi
6. M/s. Koya & Company Construction Limited,
   A-30, Viswabharathi Park,
   Kaikatti puthur, Avinashi, Tiruppur – 641 654.