Draft Initial Environmental Examination

April 2013

India: Karnataka Integrated Urban Water Management Investment Program
- Byadgi (Urban Water Supply and Sanitation Subproject)

Prepared by Karnataka Urban Infrastructure Development and Finance Corporation, Government of Karnataka for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 8 April 2013)

Currency unit	–	Indian Rupee (Re/Rs)
Re1.00	=	$ .0182832069
$1.00	=	Rs54.695

ABBREVIATIONS

ADB	Asian Development Bank
APMC	Agricultural Produce Market Committee
BOD	Bio-Chemical Oxygen Demand
BPL	Below Poverty Line
CAP	Corrective Action Plan
CBO	Community Based Organizations
CC	Complaint Cell
CFE	Consent for Establishment
CFO	Consent for Operation
CGWB	Central Ground Water Board
CMC	City Municipal Council
CPCB	Central Pollution Control Board
dbA	Decibels
DI	Ductile Iron
DPR	Detailed Project Report
DS	Double Suction
EA	Executing Agency
EAC	Expert Appraisal Committee
EC	Environmental Clearance
EIA	Environmental Impact Assessment
ELSR	Elevated Storage Reservoir
EMP	Environmental Management Plan
GDP	Gross Domestic Product
GoI	Government of India
GoK	Government of Karnataka
GLSR	Ground Level Service Reservoir
GRC	Grievance Redress Committee
GSDP	Gross State Domestic Product
ha	Hectares
HDPE	High Density Polyethylene
H&S	Health and Safety
IA	Implementing Agency
IEE	Initial Environmental Examination
IWRM	Integrated Water Resource Management
KIUWMIP	Karnataka Integrated Urban Water Management Investment Program
KSCB	Karnataka Slum Clearance Board
KSPCB	Karnataka State Pollution Control Board
KTCP	Karnataka Town and Country Planning
KUIDFC	Karnataka Urban Infrastructure Development & Finance Corporation
KUWSDB	Karnataka Urban Water Supply & Drainage Board
M&M	Major and Medium

MFF	Multitranche Financing Facility
MoEF	Ministry of Environment and Forest
MSL	Mean Sea Level
NGO	Non-Government Organisation
NRW	Non Revenue Water
OCRP	Office of Compliance Review Panel
OHT	Over Head Tank
OSPF	Office of the Special Project Facilitator
O&M	Operations & Maintenance
PC	Program Consultants
PCU	Project Co-ordination Unit
PMU	Project Management Unit
PIU	Project Implementation Unit
ppm	Parts per million
RCC	Reinforced Cement Concrete
REA	Rapid Environmental Assessment
RF	Resettlement Framework
RP	Resettlement Plan
SC	Scheduled Caste
SEIAA	State Environmental Impact Assessment Authority
SPS	Sewage Pumping Station
ST	Scheduled Tribe
STP	Sewerage Treatment Plant
SW	StoneWare
TMC	Town Municipal Council
ToR	Terms of Reference
ULB	Urban Local Body
UDWSP	Urban Drinking Water & Sanitation Policy
USD	US Dollars
UWSS	Urban Water Supply & Sanitation
WSP	Waste Stabilization Pond
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

WEIGHTS AND MEASURES

Kl	Kilolitre
km	Kilometre
l/hd/dy	Litres per head per day
lpcd	Litres per capita per day
lps	Litres per second
M	Million
mcm	Million cubic meters
Mg/l	Milligram per litre
Mld	Million litres per day
m	Metre
mm	Millimetre

NOTE{S}

In this report, "$" refers to US dollars.

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EXECUTIVE SUMMARY

1. The Karnataka Integrated Urban Water Management Investment Program (KIUWMIP, the Program) aims to improve water resource management in urban areas in a holistic and sustainable manner. Investment support will be provided to modernize and expand urban water supply and sanitation (UWSS) while strengthening relevant institutions to enhance efficiency, productivity and sustainability in water use.

2. Byadgi water supply and sewerage subproject is one of the subprojects proposed in Tranche-1. Water supply is currently intermittent, unreliable and suffers with huge losses and quality issues. Currently, there is no sewerage system in the town. 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 SPS (2009). This Initial Environmental Examination (IEE) addresses components proposed under Tranche 1 which includes water supply and sewerage components.

3. **Categorization.** Byadgi water supply and sewerage subproject is classified as Environmental Category B as per the SPS as no significant impacts are envisioned. Accordingly this Initial Environmental Examination (IEE) has been prepared and assesses the environmental impacts and provides mitigation and monitoring measures to ensure no significant impacts as a result of the subproject.

4. **Subproject Scope.** The subproject is formulated under this Investment Program to address gaps in water and sewerage infrastructure in a holistic and integrated manner. The main objective of the Investment Program is to improve water efficiency, security and have an important effect on public health. Investments under this subproject includes; (i) construction of storage reservoir; (ii) construction of strategic water network and rehabilitation of distribution network; (iii) installation of water meters (iv) construction of sewer pipes including pumping station; (v) construction of a wastewater treatment plant (WWTP); and (vi) construction of household and community toilets.

5. **Implementation Arrangements.** Karnataka Urban Infrastructure Development & Finance Corporation (KUIDFC) is the Executing Agency (EA) responsible for overall technical supervision and execution of all subprojects funded under the Investment Program. Implementation activities will be overseen by a separate Program Management Unit (PMU) in its head office at Bangalore, in coordination with its regional office and 2 divisional offices established to to supervise the implementing agencies in each geographical area. A team of senior technical, administrative and financial officials, including safeguards specialists, will assist the PMU in managing and monitoring Program implementation activities. The Implementing Agencies (IA) ULBs. Project implementation units (PIUs) dedicated exclusively to the project are set up in each town. The PIUs will be staffed by qualified and experienced officers and are responsible for the day-to-day activities of project implementation in the field, and will be under the direct administrative control of the PMU. Consultant teams are responsible for subproject planning and management and assuring technical quality of design and construction; and designing the infrastructure and supervising construction; and safeguards preparation.

6. **Description of the Environment.** Subproject components are located in Byadgi urban area or in its immediate surroundings which were converted into agricultural or urban use for many years ago, and there is no natural habitat left at these sites. The subproject sites are located in existing right of ways (RoWs) and government-owned land. There are no protected

areas, wetlands, mangroves, or estuaries in or near the subproject location. There are no forest areas within or near Davanagere. Soils are deep, and do not require cutting of rocks for pipe laying.

7. **Environmental Management.** An environmental management plan (EMP) is included as part of this IEE, which includes (i) mitigation measures for environmental impacts during implementation; (ii) an environmental monitoring program, and the responsible entities for mitigating, monitoring, and reporting; (iii) public consultation and information disclosure; and (iv) a grievance redress mechanism. A number of impacts and their significance have already been reduced by amending the designs. The EMP will be included in civil work bidding and contract documents.

8. Locations and siting of the proposed infrastructures were considered to further reduce impacts. These include (i) locating facilities on government-owned land to avoid the need for land acquisition and relocation of people, however the WWTP is to be constructed on private land which will need to be acquired and this is covered under the resettlement plan for the subproject; (ii) laying of pipes in RoWs alongside main/access roads, to reduce acquisition of land and impacts on livelihoods specifically in densely populated areas of the city; and (iii) locating the WWTP outside the town boundary approximately 300m away from the nearest residential dwelling.

9. Potential impacts were identified in relation to location, design, construction and operation of the improved infrastructure. During the construction phase, impacts mainly arise from the need to dispose of moderate quantities of waste soil and disturbance of residents, businesses, and traffic. Mitigation measures have been developed in generic way to reduce all negative impacts to acceptable levels. Various design related measures suggested for the WWTP are; energy efficiency design, sludge handling, and development of green buffer zone around the sewage treatment plant.

10. During the construction phase, impacts mainly arise from the need to dispose of moderate quantities of waste soil; and from the disturbance of residents, businesses, and traffic. These are common impacts of construction in urban areas, and there are well developed methods for their mitigation. These are common temporary impacts of construction in urban areas, and there are well developed methods for their mitigation. Measures such as conducting work in lean season and minimizing inconvenience by best construction methods will be employed. Traffic management will be necessary during pipe-laying on busy roads. In the operational phase, all facilities and infrastructure will operate with routine maintenance, which should not affect the environment. Facilities will need to be repaired from time to time, but environmental impacts will be much less than those of the construction period as the work will be infrequent, affecting small areas only.

11. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. Mitigation will be assured by a program of environmental monitoring to be conducted during construction. The environmental monitoring program will ensure that all measures are implemented, and will determine whether the environment is protected as intended. It will include observations on- and off-site, document checks, and interviews with workers and beneficiaries. Any requirements for corrective action will be reported to the ADB.

12. The stakeholders were involved in developing the IEE through discussions on-site and public consultation, after which views expressed were incorporated into the IEE and in the planning and development of the subproject. The IEE will be made available at public locations

in the city and will be disclosed to a wider audience via the ADB and KUIDFC websites. The consultation process will be continued and expanded during project implementation to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation.

13. The citizens of the Byadgi Town will be the major beneficiaries of this subproject. With the improved water supply, they will be provided with a constant supply of better quality water, piped into their homes. The sewerage system will remove the human waste from those areas served by the network rapidly and treated to an acceptable standard. In addition to improved environmental conditions, the subproject will improve the over-all health condition of the town. Diseases of poor sanitation, such as diarrhoea and dysentery, should be reduced, so people should spend less on healthcare and lose fewer working days due to illness, so their economic status should also improve, as well as their overall health.

14. The most noticeable net environmental benefits to the population of the towns will be positive and large as a result of improved: (i) water efficiency and security through the implementation of NRW reduction programs and expansion and rehabilitation water supply infrastructure respectively; and (ii) river water quality through the expansion of sewerage networks, treatment capacity and sanitation coverage.

15. **Consultation, Disclosure and Grievance Redress.** Public consultations were done in the preparation of the project and IEE. Ongoing consultations will occur throughout the project implementation period with the assistance of the NGOs. A grievance redress mechanism is described within the IEE to ensure any public grievances are addressed quickly.

16. **Monitoring and Reporting.** The PMU, PIU, and DSC consultants will be responsible for monitoring. The DSC will submit monthly monitoring reports to PMU, and the PMU will send semi-annual monitoring reports to ADB. ADB will post the environmental monitoring reports on its website.

17. **Conclusions and Recommendations.** Therefore the proposed subproject is unlikely to cause significant adverse 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. Based on the findings of the IEE, there are no significant impacts and the classification of the subproject as Category “B” is confirmed. No further special study or detailed environmental impact assessment (EIA) needs to be undertaken to comply with ADB SPS (2009) or GoI EIA Notification (2006).

I. INTRODUCTION

A. Introduction to KIUWRMIP

1. The Karnataka Integrated Urban Water Management Investment Program (KIUWMIP, the Program) aims to improve water resource management in urban areas in a holistic and sustainable manner. Investment support will be provided to modernize and expand urban water supply and sanitation (UWSS) while strengthening relevant institutions to enhance efficiency, productivity and sustainability in water use. The Program focuses on priority investments and institutional strengthening in water supply and sanitation within an IWRM context.

2. The program intends to enhance water security and improve river environment through integrated urban water management (IUWM) interventions. KIUWMIP aims to build on water supply and sanitation considerations within an urban settlement by incorporating urban water management within the scope of the entire river basin. IUWM will provide flexible planning amongst water user sectors within the watershed basins. This will allow for optimal sequencing of traditional and new infrastructure with alternative management scenarios to improve water use efficiency. The emerging IWUM approach offers a more diverse and versatile set of options for dealing with larger and more complex urban water challenges.

3. The Program will be implemented over a four-year period beginning in 2014, and will be funded by a loan via the Multitranche Financing Facility (MFF) of Asian Development Bank (ADB). The Executing Agency is the Karnataka Urban Infrastructure Development Finance Corporation (KUIDFC) and implementing agencies for the Investment Program will be respective Urban Local Bodies (ULBs). Byadgi, Harihar, Ranebennur and Davangere are the four towns chosen to benefit from the first tranche of the investment.

4. The expected outcome will be improved water resource planning, monitoring and service delivery in 4 towns of the Upper Tunga Bhadra subbasin. Tranche 1 will have 3 outputs; (i) Output 1: Expanded efficient UWSS infrastructure in 4 towns of the Upper Tunga Bhadra subbasin; (ii) Output 2: Improved water resource planning, monitoring and service delivery in Karnataka; and (iii) KUIDFC strengthened capacity. The IEE is based on an assessment of these components within the project area.

II. POLICY & LEGAL FRAMEWORK

A. Extent of the IEE Study

5. Indian law and ADB policy require that the environmental impacts of development projects are identified and assessed as part of the planning and design process, and that action is taken to reduce those impacts to acceptable levels. This is done through the environmental assessment process, which has become an integral part of lending operations and project development and implementation worldwide.

6. This IEE, for the Byadgi Water Supply and Sewerage Subproject, discusses the environmental impacts and mitigation measures relating to the location, design, construction and operation of all physical works proposed under this subproject. IEE relies mainly on secondary sources of information and site reconnaissance surveys including on-site informal

discussions with the local people. The IEE follows the process and documentation as per the ADB's Safeguard Policy Statement (SPS, 2009).

B. ADB's Environmental Safeguard Policy

7. ADB's Safeguard Policy Statement, 2009, requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for Environmental Assessment are described in detail in ADB Environmental Assessment Guidelines, 2003. This states that ADB requires environmental assessment of all project loans, programme loans, sector loans, sector development programme loans, financial intermediary loans and private sector investment operations.

8. The nature of the 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 categories:

(i) Category A: Projects that could have significant environmental impacts. An Environmental Impact Assessment (EIA) is required.
(ii) Category B: Projects that could have some adverse environmental impacts, but of less significance than those for category A. An Initial Environmental Examination (IEE) is required to determine whether significant 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 that are unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are reviewed.

9. ADB has classed this subproject as Category B and following normal procedure for MFF loans has determined that one IEE will be conducted for each subproject, with a subproject being the water supply and sewerage infrastructure improvements proposed in a subproject town.

C. Government Law and Policies

10. The GoI EIA Notification of 2006 (replacing the EIA Notification of 1994), sets out the requirement for Environmental Assessment in India. This states that Environmental Clearance (EC) 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.

11. Category A projects require EC from the central Ministry of Environment and Forests (MoEF). 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 MoEF prepares comprehensive Terms of Reference (ToR) for the EIA study. On completion of the study and review of the report by the EAC, MoEF considers the recommendation of the EAC and provides the EC if appropriate.

12. 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 EC 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.

13. None of the components of this water supply and sewerage improvement subproject in Byadgi falls under the ambit of the EIA Notification 2006, and, therefore EC is thus not required for the subproject.

14. Besides EIA Notification 2006, there are various other Acts, Rules, Policies and Regulations currently in force in India that deal with environmental issues that could apply to infrastructure development. These are listed in Appendix 2. The specific regulatory compliance requirements of the subproject are shown in Table 1.

Table 1: Action required to Ensure Subprojects Comply with National Environmental Laws

Component	Applicable Legislation	Compliance	Action required
Wastewater Treatment Plant (WWTP)	Water (Prevention and Control of Pollution) Act 1974	Consent for Establishment (CFE) and Consent for Operation (CFO) from Karnataka State Pollution Control Board KSPCB	Based on project review and site inspection KSPCB provides CFE before construction, and stipulate the disposal standards to be met during operation. After completion of construction, CFO is issued confirming compliance with the CFE conditions, if any
		Renewal of CFO during operation	Based on the performance of the WWTP and its compliance with the disposal standards CFO is renewed every year/two years
Diesel Generators	CPCB guidelines	Procure and operate generators manufactured by CPCB approved manufacturers	Procure generators only from approved manufacturers/suppliers the manufacturer/ supplier shall be registered with the CPCB and shall have valid certificates for “Type Approval” and “Conformity of Production”

III. DESCRIPTION OF THE PROJECT

A. Project Need

15. **Water Supply.** Currently water supply within Byadgi is intermittent and varies across the town. Customers are reported to receive up to an hour supply every alternate day. The situation is less than desirable in that the amount of water available to consumers is limited and the prolonged periods during which customers have to store water leads to significant deterioration of its quality, exasperated by the warm climate and a lack of customer understanding of the need for hygienic storage facilities. There is an increased risk of contaminated groundwater entering the water network when the mains are de-pressurised; a risk made greater by the accepted poor condition of the network and lack of maintenance.

16. Tungabhadra flowing at a distance of 40 km from Byadgi is the main source of water supply for the town. This source is supplemented by groundwater abstracted from bore wells in

the town. At present, Byadgi gets water supply from common Tungabhadra-based bulk water facility for Ranebennur and Byadgi. Water is abstracted from the river at Mudhenur intake and pumped to Ranebennur Water Treatment Plant. From this WTP water is pumped to a reservoir at Shivapura in Byadgi through 16.5 km length pumping main pipeline. The supply from this source varies between 1-2 MLD. Besides about 0.5 MLD groundwater, abstracted from five bore wells, is also pumped into the service reservoirs. Water from Shivapura reservoir is pumped to reservoir atop of Bettada Mallappa Hillock from where water flows by gravity to four elevated service reservoirs (ESR) in the town. From the ESRs water is distributed to the public by a gravity system. Total length of the distribution network is around 60km with another 37km, transmission mains, and mainly consists of uPVC pipes between 90-160 mm.

17. Information provided by the ULB's indicated that all residents have access to a drinking water supply, albeit many of them through use of a public stand post. The current per capita volume made available to customers is assessed at 56litres/capita/day, compared to a norm of 135litres/capita/day. Without metering facilities, the assessed figure can only be taken as indicative, and is an average. Supply periods for individual areas are based on the availability of water from the Ranebennur treatment works and are commenced and ended by the operation of the pumps at the works, storage sites or within the network. There is no formal regulation for the valve operations which can lead to an unfair distribution of water, not helped by the fact that those in the lower areas of the town tend to have a longer supply than those on higher ground. The proportion of non-revenue water is high at 39%.

18. **Works under Implementation**. For the improvement of water supply system in the town, Karnataka Urban Water Supply and Sewerage Board (KUWSDB) have proposed a bulk water project for Byadgi. This project is currently in bidding stage (construction period of 24 months), and include the following components:

(i) Construction of river intake works at Mudenur village on the River Tunga-Bhadra;
(ii) Construction of a raw water transmission main from source to a new treatment plant at Mallapana Hillock, Byadgi;
(iii) Construction of a 6.81Mld treatment plant and pumping station, and
(iv) Transmission lines from the proposed treatment plant to the existing storage facilities in Byadgi

19. With the above project under implementation, Byadgi will have adequate amount of bulk treated water in the town for distribution. It is assessed that the town lacks in water storage structures and needs expansion of distribution system to new areas.

20. **Sewerage**. Currently there is no sewerage infrastructure in Byadgi. Individual houses have septic tanks which discharge into open roadside storm water drains. From these drains municipal waste water eventually flows into natural drainage channels and is used for irrigation. Therefore there is dire need to develop a comprehensive sewerage system in the town that will collect, transport, treat and dispose the wastewater from the town safely.

B. Description of the Subproject

21. **Water Supply** To address the current gap in the storage volume, it is proposed to construct a 900KL GLSR at Bettada Mallapa Hillock. This GLSR will receive supply from the proposed WTP and in turn will service the ELSR's within the town by gravity.

22. A strategic water supply network is proposed that: connects the GLSR to the ELSR's within the town, which are filled by gravity supply, and forms a ring main to deliver water to all part of the town that provides capacity for extension of the distribution network and security of supply by interconnecting all of the ELSR's at Bettada Mallapa. Minimum pipe diameter for Strategic network is set at 200mm.

23. **Sewerage**. A comprehensive sewerage system – sewage collection and conveyance network and a facility to treat the sewage to disposal standards, has been proposed for Byadgi under this Investment Program. For the wastewater, the design hypothesis is that, sewers will be planned for those areas of the town where the population density is greater than 100 people/ hectare. The sewer system will be designed as a separate sewer system that carries only the wastewater including sewage and sullage. The underground gravity sewers will carry sewage from households to the Wastewater Treatment Plant (WWTP). The open drain system that exists in the town will cater to storm runoff.

24. There are large numbers of toilet-less households in Byadgi. In the absence of access to individual/shared toilets or functional community toilets, a very large proportion of these households practice open defecation. It is estimated that approximately 1,535 households in Byadgi do not have access to toilets.

25. Based on the disparity in access to sanitation facilities evident in the four towns, especially amongst the low income households and the need for demand promotion to promote ODF communities, OBA mechanism has been proposed to be used. The OBA mechanism will increase the access of sanitation to primarily low income households in the four towns through (i) construction and connection to the sewer network of new individual household toilets; (ii) construction, connection to the sewer network and operation of community toilets; and (iii) sanitation marketing to increase demand for toilet construction and use and promote open defecation free (ODF) communities.

26. Following Table 2 shows the nature and size of the various components of the subproject. The descriptions shown in the Table are based on the present proposals at this feasibility stage. Certain details may change as development of the subproject progresses, particularly in the detailed design stage. It should also be noted that at this stage the infrastructure has been designed in outline only, to determine overall feasibility and budget costs, so certain aspects (such as size of WWTP units) have not yet been finalised. Location of subproject components and conceptual layout plans are shown in Figure 1 to Figure 6.

27. **Implementation Schedule**. As per the suggested schedule, preparation of detailed project report and bids for this subproject will commence in the middle of 2013. The construction is likely to start in April-2014, and should be completed in 24 months.

Table 2: Proposed Subproject & Component Descriptions

Infrastructure	Function	Description	Location
1. Water Supply			
Storage Reservoirs	Provide increased water storage and a head of water required for gravity flow of water through the distribution system	*New* - 1 no,s GLSR - RCC circular tank of 900 KL (15 m diameter)	On small parcel government owned vacant land atop Bettada Mallapa Hillock
Strategic Network	To convey treated water under gravity from GLSR to overhead service reservoirs	*Rehabilitated* - 11 km; 200- 400 mm diameter DI pipes	From GLSR at Bettada Mallappa Hillock to overhead reservoirs for further supply
Distribution network (new & rehabilitation)	To distribute water from service reservoirs to consumers	*New* - 14 km 90-160 mm dia HDPE pipes	Pipes will be laid underground along the roads; this work will cover the outer areas which are presently not covered with the distribution network; ; total road length in the town is 68 km, this work will cover 14 km in the outer areas
Bulk Water Meters	Monitor water flow in the improved network	*New* 22 no,s Bulk Meters (Dia. varying from 150mm to 300mm)	Fixed at strategic locations in WS Strategic Network, Primary mains and Distribution Network
Domestic Meters	Monitor & regulate water usage by consumers and improve cost recovery	*New* 7,030 Domestic Meters, 15mm Dia. and 20mm.	Attached to the water delivery pipe at each house
2. Sewerage			
Sewer network	Collect wastewater from dwelling units and convey by gravity to the terminal sewage pumping station at the WWTP	*New sewer network* 52 km 150-200 mm dia uPVC/SWG sewers, 250-300 mm RCC/SWG sewers, 350-600 mm RCC sewers manholes collection chambers 5,770 house service connections	Along the roads and lanes of the ULB This work will extend to entire town except fringe areas which have low population density (i.e. less than 100people/hectare).
Toilets	Toilets at individual level and community level to cater to households without	*New* 530 - water flush toilets, outlets connected to sewers community toilets (total 107 seats --	These are proposed to ensure access to toilets for all households, irrespective of tenure status or economic constraints. Space availability will determine the level of service for a household, i.e., individual or community

Infrastructure	Function	Description	Location
	toilets	water flush toilets, outlets connected to sewers	toilets. Community toilets shall be designed keeping the needs of men, women, elderly, disabled and children in view. Individual toilets are located within the house premises, and community toilets are constructed in the neighbourhood, where space is available
Sewage Pumping Station	To lift effluent into Waste Water Treatment Plant (WWTP) for treatment	*New terminal pumping station* Including inlet chamber/ screens, gates, sump well, pumps and 300 mm pumping main, all civil, electrical & mechanical works, security fencing/ gates, stand by electric power generation & flow metering	At proposed WWTP site north west side of the town; 4.6 km from the centre of the town (described in more detail below)
Wastewater Treatment Plant	Treatment of collected effluent for to comply with disposal standards	*New WWTP - Waste Stabilization Pond (4.6 MLD)* • Mechanical screens • Grit removal, • Flow measurement & flow splitter box • Anaerobic pond • Facultative pond • Maturation pond	Site for WWTP is selected based on the gravity flow system; the site is situated in the western side of the town, about 0.5 km from the TMC boundary. This site of 5.7 ha (14 acre) is a private agricultural land, which will be acquired for the project. Site is surrounded by agricultural fields and isAccessible by a kutcha road. The treated effluent will be disposed into *Shanbogar nala,* flowing adjacent to the site. This *nala* presently carries untreated wastewater from the town. This *nala* ultimately joins Hombaradi lake, about 8 km further northwest. . The site is situated about 300 m from the habitation.

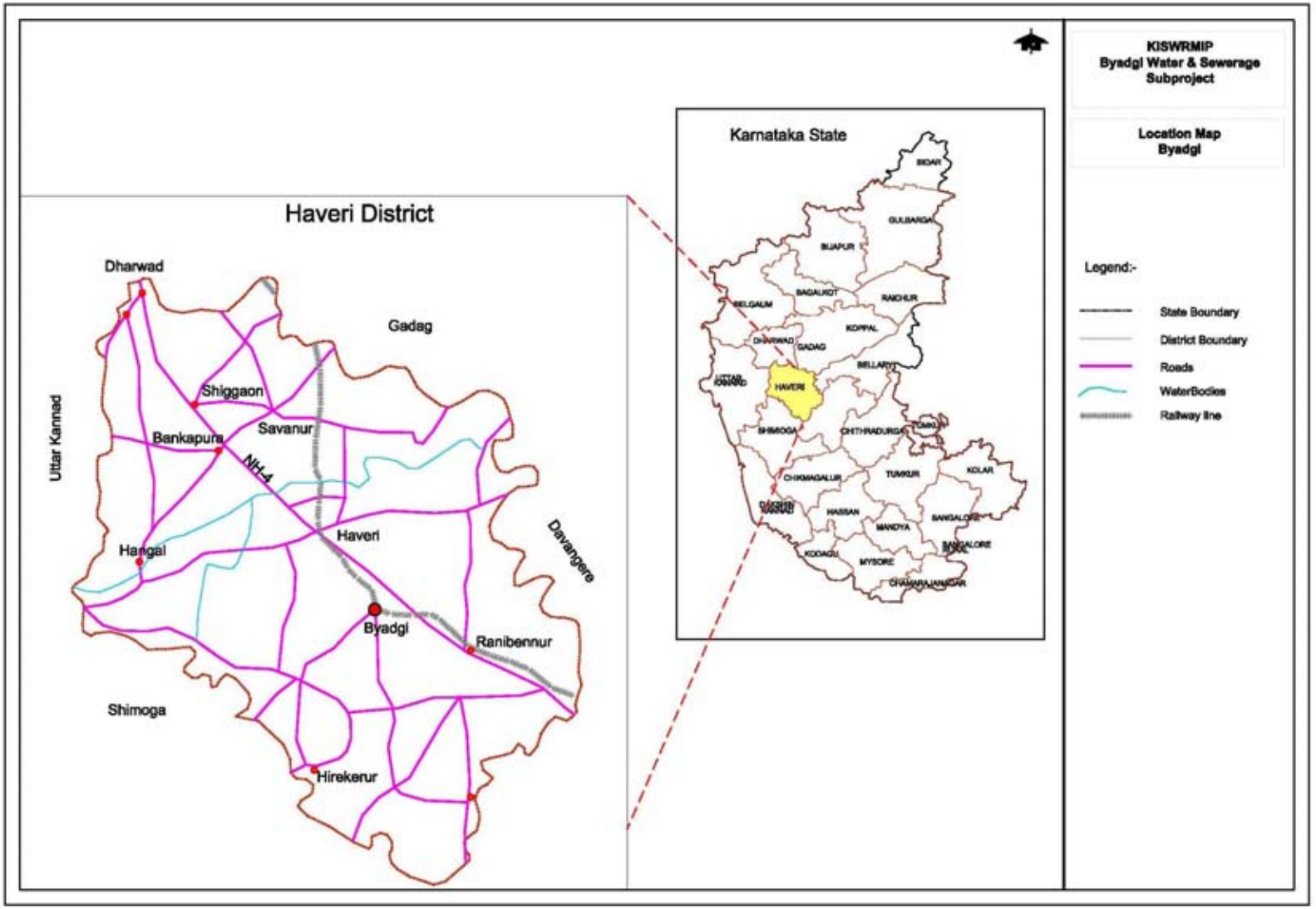


Figure 1: Location of Subproject Town - Byadgi

Figure 2: Location of Subproject Components in the Town

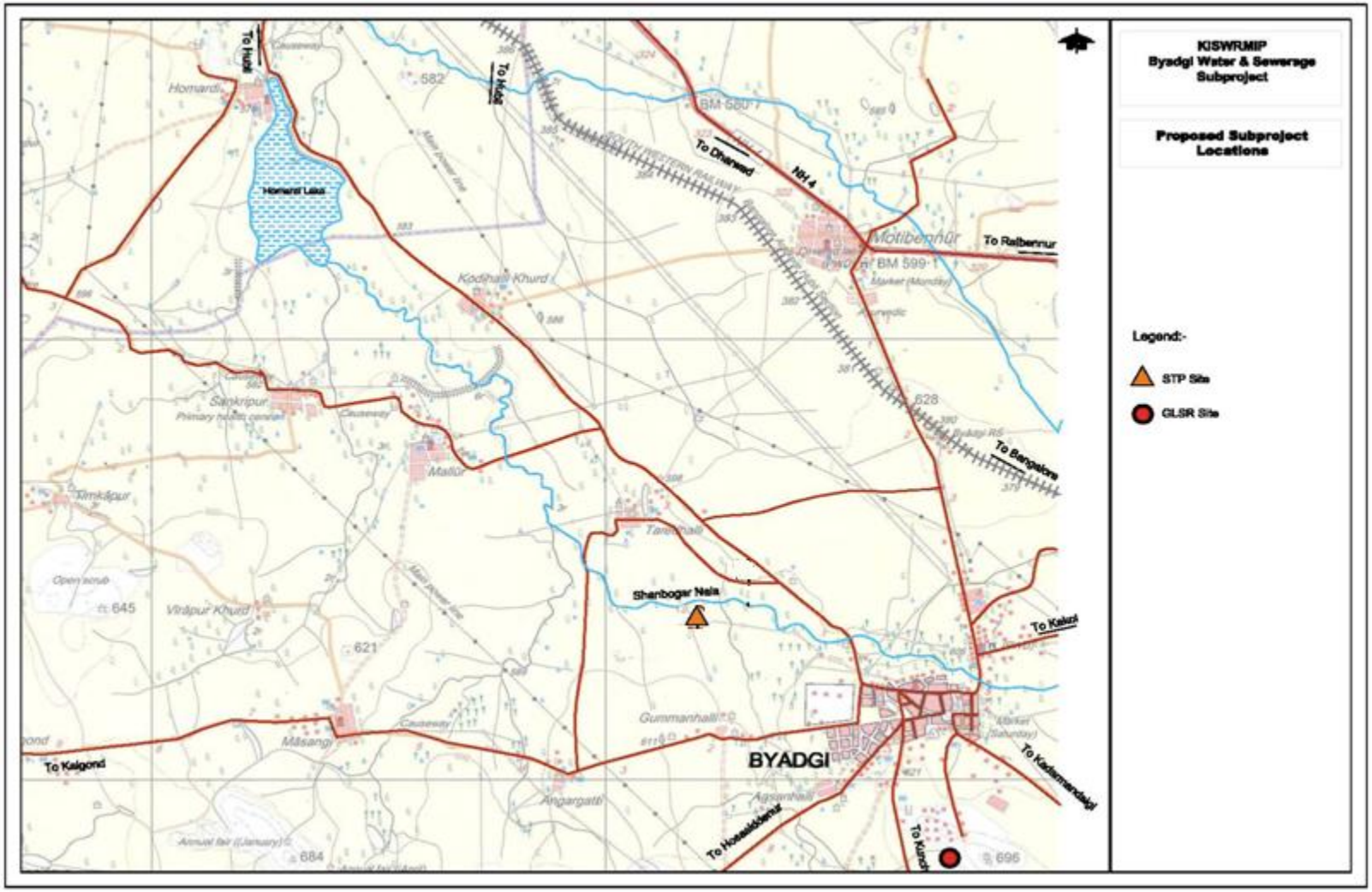
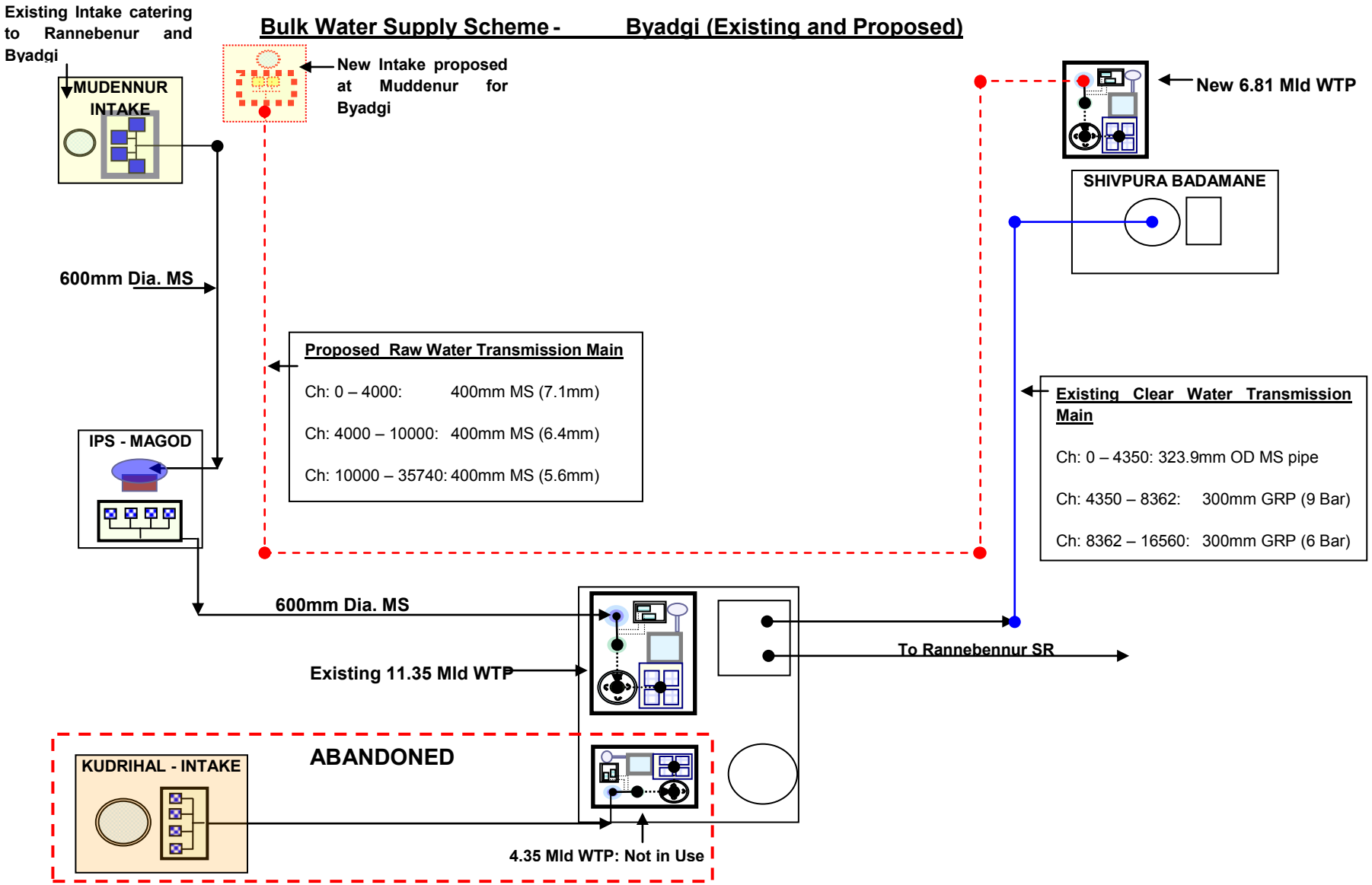


Figure 3: Schematic Diagram of Water Supply System in Byadgi



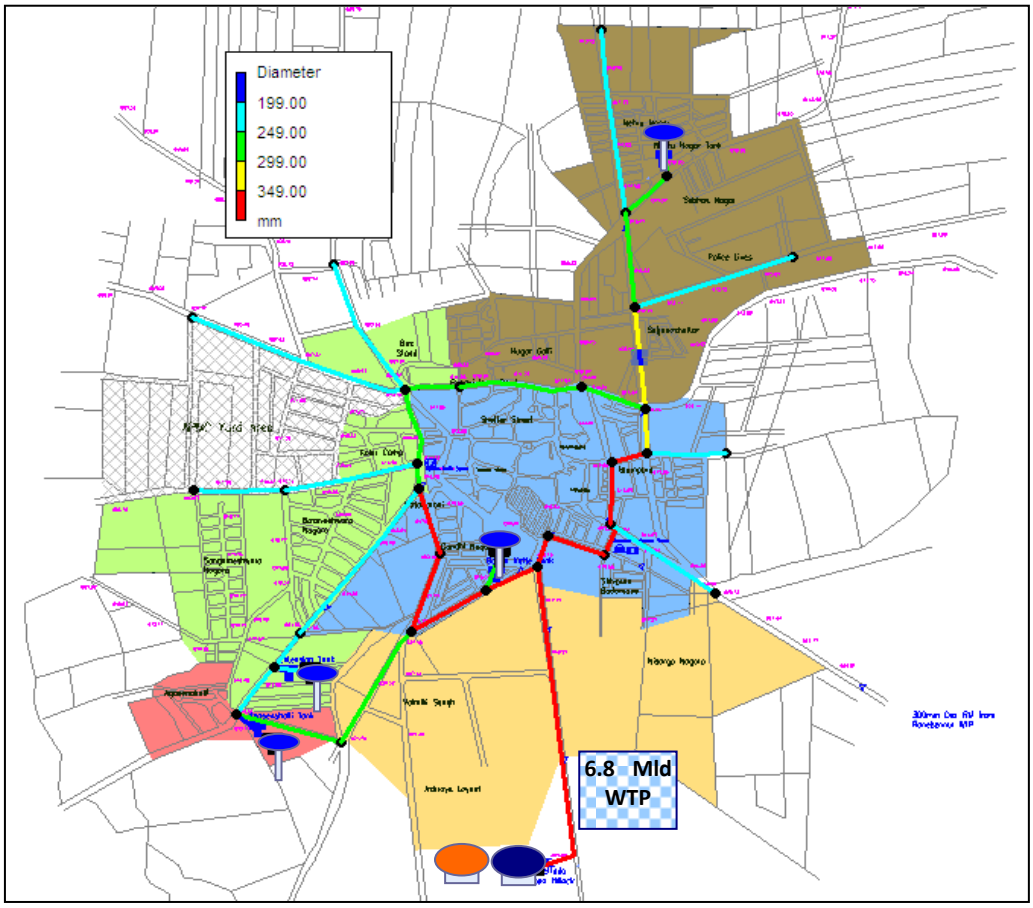


Figure 4: Proposed Strategic Water Network & GLSR

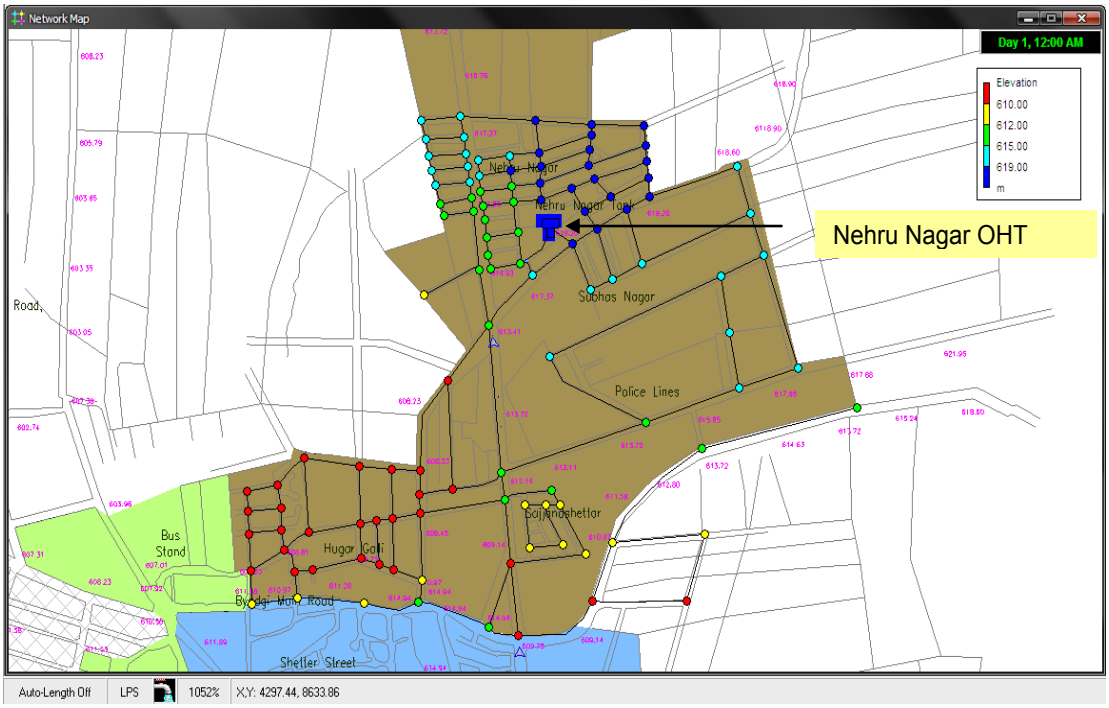


Figure 5: Pipe Network of a Model Zone with Diameters

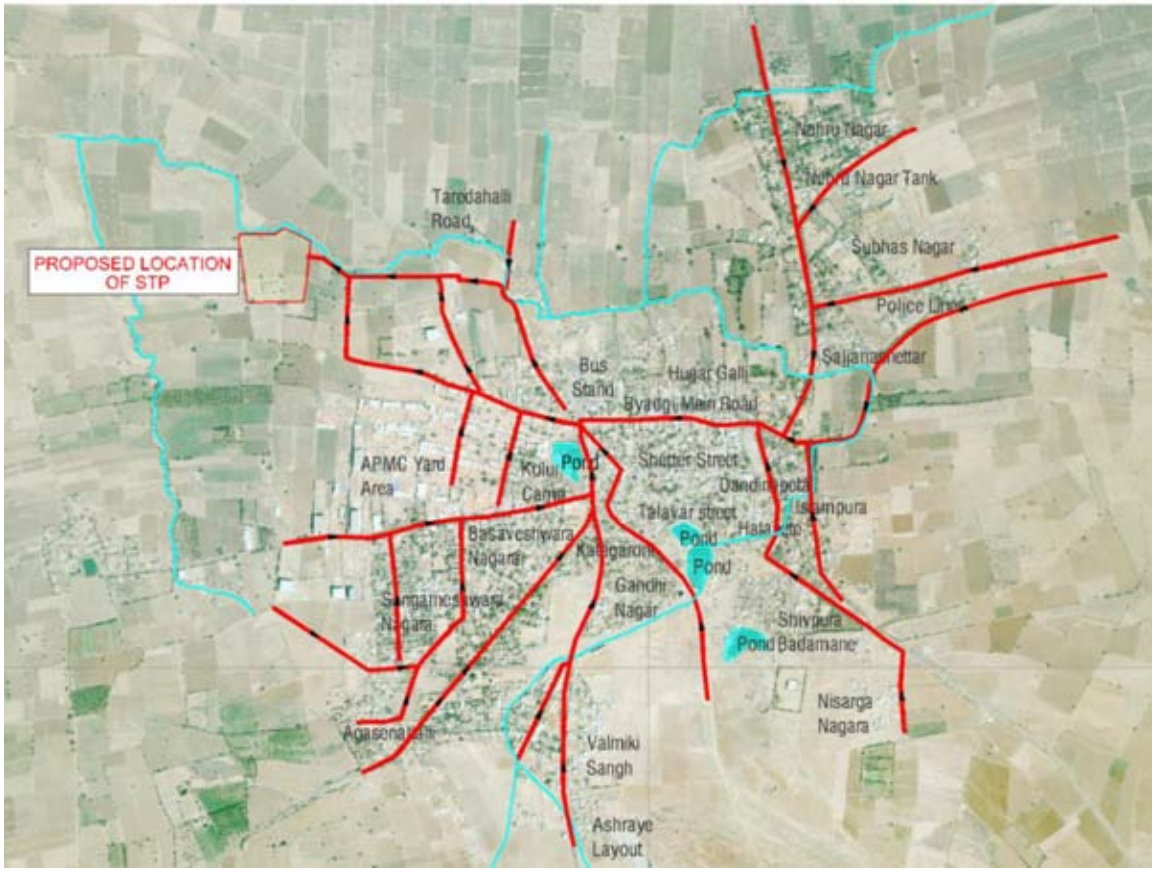


Figure 6: Proposed Sewer Network Coverage

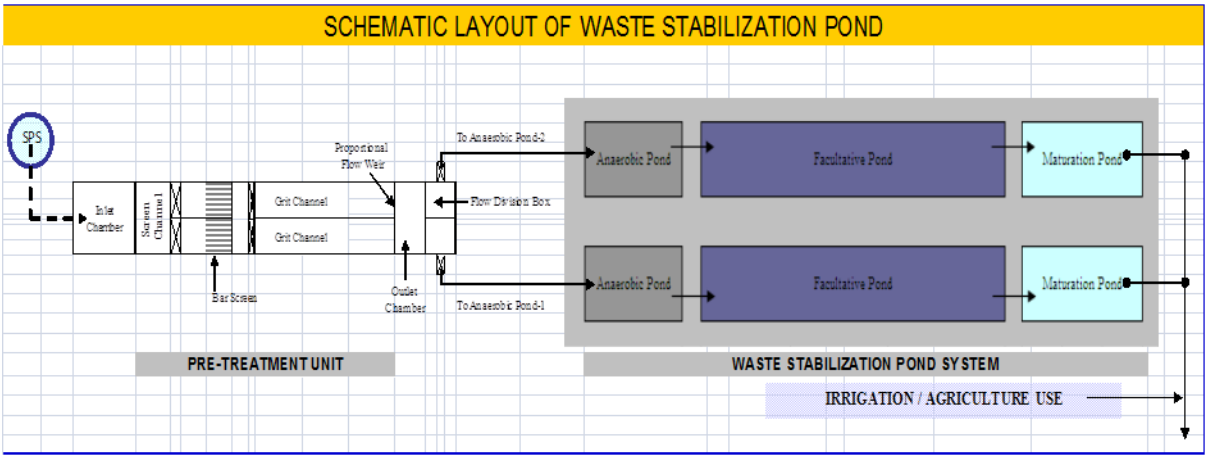


Figure 7: Schematic Layout of Proposed Wastewater Treatment Plant

IV. DESCRIPTION OF THE ENVIRONMENT

A. Physical Resources

1. Location

28. Geographically, Byadgi Town is situated 14.68^0 North latitude and 75.48^0 East longitude, with an average altitude 601 meters above the Mean Sea Level (MSL). Administratively, it is a tahsil headquarter in Haveri District of Karnataka. It is located at about 18 km from Haveri, and 330 km from the State Capital Bangalore. National Highway 4 (NH4), an important highway in the country, connecting Pune/Mumbai with Bangalore passes near the town (at about 5 km). Broad gauge railway main line connecting Mumbai-Bangalore also passes near the town. Location of Byadgi is shown in Figure 1.

2. Topography, Soil & Geology

29. The general topography of town is plain and gently slopes from South (630 meters) to North (609 meters). There are isolated hills in the southern part of the town, with a peak elevation of 696 m above MSL. The town drains into *Shanbogar Nala* which flows from east to west, and carries runoff ultimately to Homaradi Lake in the northwest. Geology consists of the Ranebennur group of Dharwad rock formation and consists more of gravel and chlorite phyllites. The bases of these rocks are less disturbed and have only small cracks, while soil is red and black.

30. In the major part of the district, the soil is characterized by red sandy soil, followed by the medium black soil and deep black soil. The red loamy soil and lateritic soil are seen in very small parts on southern border of the district. As per the seismic zoning map of India, Byadgi Town falls under the Zone II, which is the lowest earth quake risk zone in India. This zone is termed as “low damage risk zone”.

3. Climate

31. Byadgi has a tropical climate characterized by general dryness except during monsoon and blessed with a good and healthy climate throughout the year. The average annual rainfall of Byadgi is 769 mm. The rain fall occurs in monsoon seasons mainly from June to September. Byadgi experiences slight variations in temperature across the year. April and May experiences high temperatures and the lowest is recorded in the months of December and January. The average maximum and minimum temperatures recorded over the last three years are 39.25º C and 14.75º C, respectively. The coolest month is December while the hottest month is April.

32. The relative humidity is high during monsoon (73%) and less in the period between January-March (31%). During January and February the winds blow predominantly from southeast to south, March and April being transitional the south-easterly winds are gradually replaced by northwest or westerly winds. From April to September the winds are predominantly from northwest or west directions, in October the reversal of direction of the winds is completed and during November – December winds blow predominantly from east to southeast. The wind speed ranges from 7.0 to 19.6 Km/ hr and average is 11.4 km/hr.

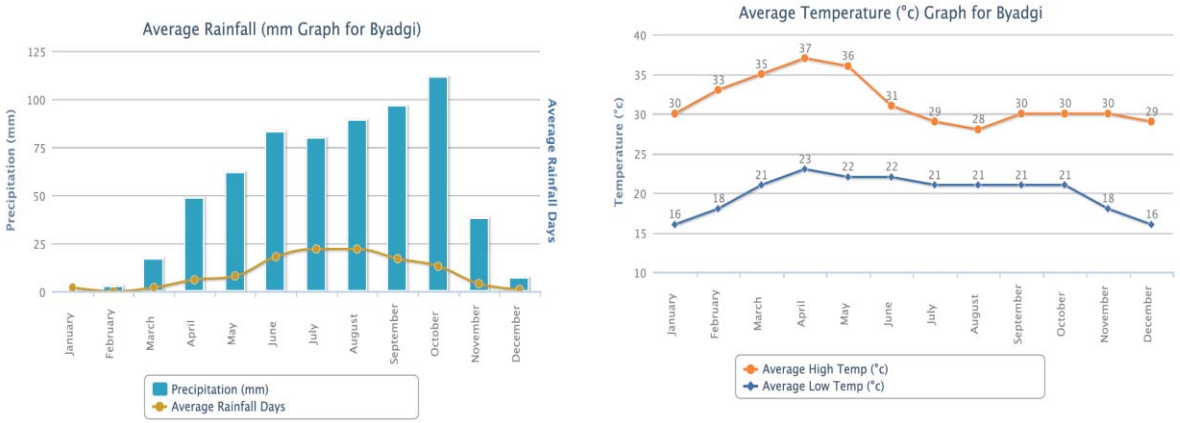


Figure 8: Average Monthly Rainfall & Temperature in Byadgi

4. Air Quality & Noise

33. Karnataka State Pollution Control Board (KSPCB) monitors ambient air quality in the State KSPCB established monitoring stations at various places across the state; however covers major cities, district headquarters and industrial locations. There is no KSPCB monitoring station in Byadgi and hence data on ambient air quality is not available. There are no industries in the town with air polluting potential. In general, Byadgi should have a clean air except the dust emanating from moving traffic on dusty roads, and from construction activity. Noise is almost limited to typical urban activities there is no specific high noise

5. Surface Water

34. Byadgi is located in Tungabhadra River Basin (Figure 5), however located far (40km) from Tungabhdra River. There are no notable rivers/streams in Byadgi. A natural drainage channel, *Shanbogar Nala*, flows from east to west through the town and ultimately reaches Hombaradi Lake about 7 km away from the town. However, due to low flow, the drain water does not generally reach the lake, except during heavy rains. During non-monsoon season, drain mainly carries waste water from households. Water from this drain is generally used for irrigation.

35. Town depends mostly on River Tungabhadra for its drinking water supplies. There are a number of small ponds in town - *Basanakatte* pond, *Chikkanakatti* pond, *Agasanahalli* pond, and *Kudiyuva Neerina Hooda.* Due to moderate rainfall, tanks are mostly in dry condition except otherwise in monsoon. A Neerina Hooda (man-made open water tank) is located in the town, which is currently used for storage of excess water from Tungabhadra supply. Locals use this water for various purposes. There has been no study undertaken for water quality, so no data exists.

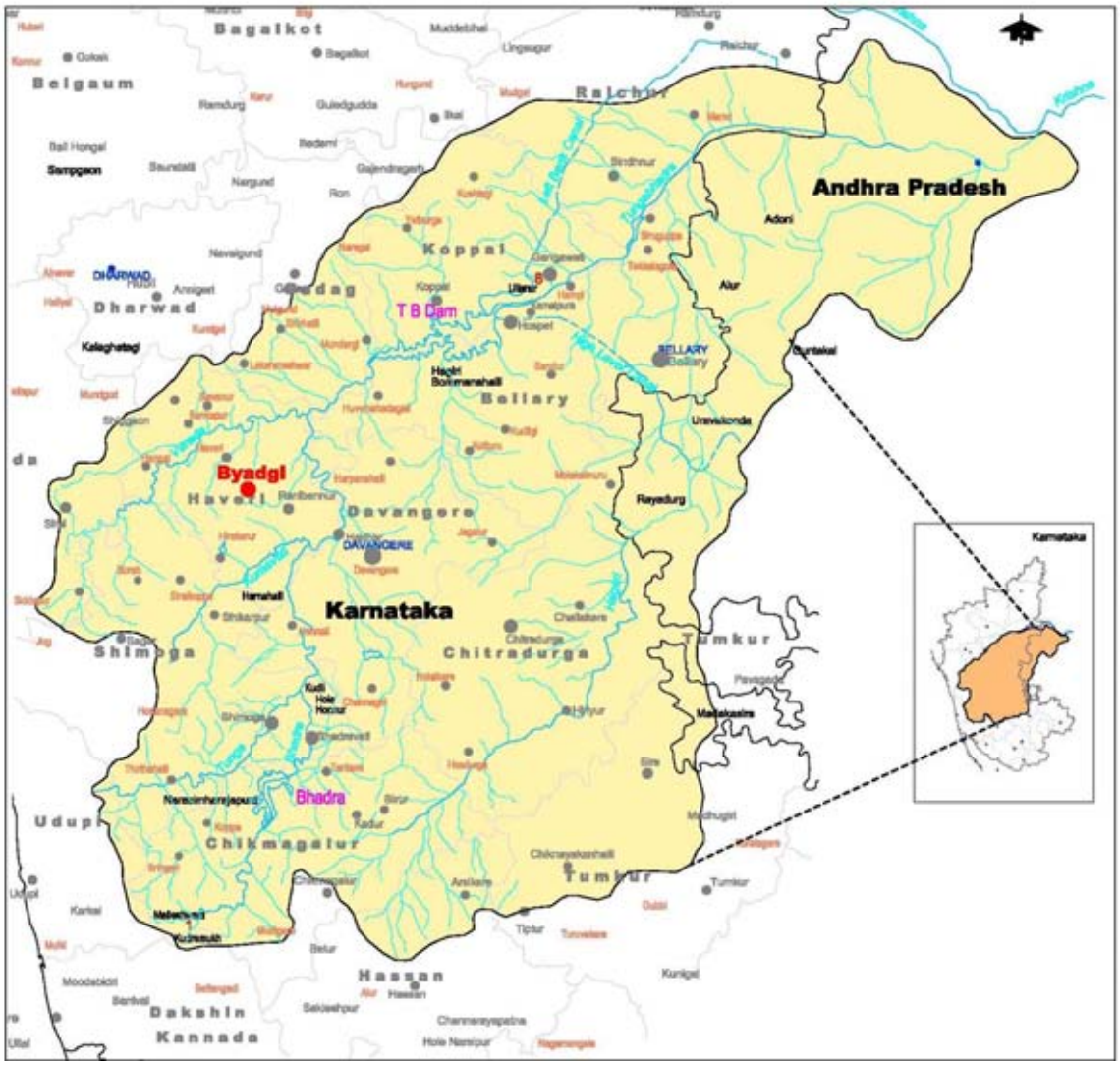


Figure 9: Location of Byadgi in Tungabhadra Basin

6. Ground Water

36. The ground water occurs in the weathered parts of above rocks at shallow depth up to 20 m and generally under semi-confined to confined conditions in the jointed and fractured portions of the above rocks up to about 200 m depth. The ground water also occurs in the inter-granular spaces in the alluvial patches along the stream courses under water table conditions at shallower depth.

37. The Taluk wise groundwater utilization data indicates the stage of ground water development varies between 99.06 to 121.13% for Byadgi. The stage of groundwater development in parts of Haveri, Ranebennure and Byadgi taluks is computed to be more than 100% with water levels in that area showing appreciable declining trends. Table 1 shows the summary of ground water estimation studies in Byadgi.

38. As per the Central Ground Water Board (CGWB), Flouride content in groundwater is present in excess in the district (Fluoride content more than 1.5 ppm). The Electrical conductivity values in the major part of the district are in the range between 1000 and 2000 micro mhos/cm.

Table 3: Groundwater Development in Byadgi Taluk

Particulars		Details
Recharge from rainfall during monsoon season (mcm)		15.91
Recharge from other sources during monsoon season (mcm)		6.53
Recharge from rainfall during non-monsoon season (mcm)		4.62
Recharge from other sources during non-monsoon season (mcm)		4.61
Net annual ground water availability (mcm)		30.83
Ground water draft for drinking and industries (mcm)		2.95
Ground water draft for drinking and industries (mcm)		34.09
Existing gross ground water draft for all uses (mcm)		37.04
Allocation for domestic and industrial use for next 25 years in (mcm)		4.48
Net ground water availability for future irrigation development (mcm)		2.37
Balance ground water irrigation potential available (ha)		290.14
Categorization as on March 2004	Stage of development in %	121.13
	Safe area (%)	12
	Semi critical area (%)	-
	Critical area (%)	-
	O.E. area (%)	88

mcm – million cubic meter; OE – over exploited area

B. Ecological Resources

39. The distribution of forests in Haveri division is uneven. The eastern part of the division comprising of Ranebennur, Haveri and Byadgi ranges receive very less rainfall and are subjected to extreme biotic pressures. The forests in these regions are essentially scrub forests. The species found in these forests are Acacia latronum, Acacia leucophloea and occasionally Arabica arabica.

40. Byadgi Town is a semi urban area surrounded by land that was converted for agricultural use many years ago. Hillocks with sparse vegetation are located in the town. There are no forest areas within or near Byadgi town. To improve the degraded lands, afforestation has been taken up on a large scale by the State Forest department, covering a total area of 12155.135 ha of forest area, 2177.82 ha of non- forest Government lands. The prime objectives are to bring the open lands under vegetation (check soil erosion), to improve land productivity and also encourage people's participation. None of the subproject components are located in these areas.

C. Economic Development

1. Land Use

41. The old part of the city is situated at the central part of the town with irregular street pattern. Public amenities are spread throughout the towns, however a many are concentrated

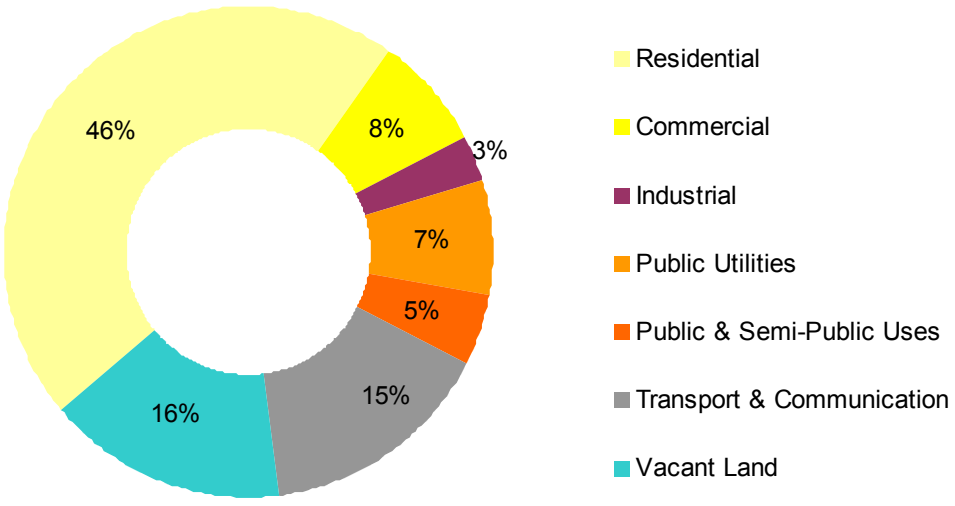
along main road (Major District Road) leading to NH-4. Commercial development is mainly concentrated along the main road which passes through the city; in between Municipal office and the bus stand road. Residential developments are dense in old city part while sparsely located in expansion areas. Except, the old city part, the city has developed into grid iron pattern. The famous Chilly market/industries are located towards west of the town

42. There is no Land Use Plan / Master Plan prepared for the city till date. Existing land use plan of the town is shown in the following table. Residential areas occupy 46% of the total area. Commercial and industrial areas occupy 11%. About 16% of vacant lands are available in the town.

Table 4: Existing Land Use for Byadgi TMC

Land Use	Existing Land Use (2001)	
	Area in Ha	%
Residential	192	46
Commercial	32	8
Industrial	13	3
Public Utilities	31	7
Traffic & Transportation	65	15
Vacant Land	67	16
Public & Semi Public	20	5
Total	420	100

Distribution of Existing Landuse



2. Industry & Agriculture

43. Owning to fertile agricultural lands and favourable climate, Byadgi region is agriculturally rich and is particularly famous for Chilly cultivation. Byadgi has become synonymous with good quality chillies. Byadgi provide all necessary marketing and processing facilities that cater to its vast hinterland cultivating Byadgi Chilly. Besides Chilly, cotton and betel nuts are the other major crops grown in and around Byadgi. The Town has one of the biggest APMC (agricultural produce market committee) market in the state with an annual turnover of $ 75 million. This market attracts traders from all over Karnataka state and also from the neighbouring states like Andhra Pradesh.

44. Industrial development in Byadgi is mainly limited to Chilly based processing units. There are around 25 industries in and around Byadgi town which are involved in grinding chillies into powder. Besides, Byadgi Chilly is also widely used for the extraction of oleoresin, red oil from the pods, due to its bright red colour. Oleoresin oil is used widely by cosmetics industry. There are also a number of units extracting oil from Chillies. The extraction of oleoresin has also led to the creation of cold storage units in Byadgi since the chilly pods have to be maintained at a low temperature of 4 to 6 degree Celsius in order to maintain the colour and purity. This oleoresin is sent to Kerala where it is further refined before being exported to USA, Japan, Europe, etc.

3. Infrastructure

45. **Water Supply**. Byadgi TMC is responsible agency to provide safe drinking water to the people of the town. Currently water supply within Byadgi is intermittent and varies across the town, an hour supply is provided every alternate day. Water supply is provided at a rate of 56 lpcd. System suffers with huge losses as high as 39%.

46. **Sewerage and Sanitation**. There is no sewerage infrastructure in Byadgi. Individual houses have septic tanks which discharge into open roadside storm water drains. From these drains municipal waste water eventually flows into natural drainage channels and is used for cultivation of crops.

47. **Transportation**. Byadgi is well connected via roads and railways. Byadgi is located close to National Highway 4 (NH4) and a broad gauge railway line connecting Bangalore and Mumbai also passes near the town. Nearest railway stations are at Ranebennur (15 km) and Haveri (16km). There are regular train services from here to Bangalore, Hulbi, Pune and Mumbai. Internal road network in the town is well developed. Road network is characterized by narrow and congested lanes in the city core area, and comparatively wide roads in the outer and newly developing areas. The total road length under Byadgi TMC is 69.75 km and 7.3 km length of roads in the town are under the state Public Works Department.

48. **Power Supply**. Hydal power is the main source of energy in Karnataka, with 61% of total installed capacity. Remaining is mostly from thermal power stations. Contribution of wind and solar energy, although increasing, is negligible. Government run Karnataka Power Corporation Limited (KPCL) is responsible for power generation while Karnataka Power Transmission Corporation Limited (KPTCL) is responsible for power transmission. The distribution to users in Byadgi is provided by regional company – Hubli Electricity Supply Company Limited. Power is supplied from the central grid by overhead cables carried on metal and concrete poles, mainly located in public areas alongside roads. The power supply in Byadgi is poor; there are frequent outages in warmer months, and fluctuations in voltage.

D. Socio Cultural Resources

1. Demography

49. The town's population has grown from 5,502 in 1921 to 30,600 in 2001 and in the last decade the town experienced a growth rate of 19.2 %. The highest and lowest population growth rates recorded were 40.17 % during 1921-1931 and 6.65 % during 1961-1971, as shown in the following Table. Growth in the last few decades is also attributed to the extension of city boundaries and merger of adjoining villages with the city.

Table 5: Population Growth of Byadgi Town

Year	Population	Decadal Growth Rate	CAGR
	Nos.	%	%
1921	5,502	-	-
1931	7,712	40.17	3.43
1941	8,783	13.89	1.31
1951	11,625	32.36	2.84
1961	13,450	15.70	1.47
1971	14,345	6.65	0.65
1981	17,935	25.03	2.26
1991	20,574	14.71	1.38
2001	25,663	24.74	2.23
2011	30,600	19.2	1.34

50. **Sex Ratio**. The sex ratio (female population per 1000 male population) in Byadgi was 945 in 2001. This is slightly higher than the Haveri District figure of 942 and Karnataka State's figure of 940.

51. **Literacy**. As per the Census 2001, the total literacy rate (%age of literate population to the total population above six years of age) in Byadgi was 67 %. The male and female literacy rate was 74% and 60%, respectively. The literacy rate in Byadgi town is less than Karnataka State average of 71 %.

52. **SC/ST Population**. The Scheduled Caste (SC) population comprise of 11 % of total population which is lower than the district population at 12.2 %. The Scheduled Tribe (ST) population is 11 % of the total population which is higher than the district level ST population of 8.8 %.

53. **Household Size**. The total number of households in Byadgi as per Census 2001 is 4,792 which accounts for household size of 5.4.

54. **Slums**. There are eight slums in Byadgi TMC which are notified by Karnataka Slum Clearance Board (KSCB)/District Commissioner, with a total population of 4,617.

55. **Area and Population Density**. The Byadgi TMC manages delivery of services in all 23 wards covering an area of 4.20 sq. km. The average population density is 7,661persons per sq km. In the city's central area, the population density range from 20,000 to 45,000 person per sq. km and less than 5,000 persons per sq. km in the outer fringes of the town.

2. History, Culture & Tourism

56. History of Haveri Region dates back to pre-historic period. Evidences are available on existence of pre-historic civilizations on the Tungabhadra and Varada River basins. Stone carvings depicting Stone Age civilizations are found in many parts of the district. About 1300 stone writings of different rulers like Chalukyas, Rastrakutas are found in the district. Though none of the major kingdoms of Karnataka had their headquarters in Haveri, many Mandaliks ruled in this district. However, there are no notable historically or archaeologically important sites/structures found in Byadgi Town.

57. There are various temples and religious places of local interest in the Town. Mallikarjuna temple, Siddeshwara temple, Veerabhadra temple and Kalmeshwara temples are prominent. Byadgi also has two mosques and two Dargahs. Kadaramandalagi Kantesh Temple, located 5 km from Byadgi Town, is a locally prominent religious place attracting scores of devotes during the annual festival in November.

V. ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

A. Overview

58. As a general practice, an IEE should evaluate impacts due to the location, design, construction and operation of the project. 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. In assessing the effects of these processes therefore, all potential impacts of the project should be identified, and mitigation is devised for any negative impacts. Following sections evaluate impacts of the proposed water supply and sewerage project in Byadgi.

B. Location Impact

59. **Location.** These Impacts are associated with planning particularly on the site selection. They include impacts due to encroaching on sensitive areas and impacts on the people who might lose their homes or livelihoods due to the development of the proposed site.

60. Proposed subproject sites are carefully selected to avoid encroachment into sensitive areas and minimise the impacts on people livelihoods and homestead. Except sewage treatment plant, for which 5.7 ha (14 ha) of privately owned agricultural land is being acquired, all the other subproject activities are proposed on government-owned unused vacant lands..

61. **Wastewater Treatment Plant (WWTP) Site**. The site for WWTP is selected away from inhabited areas and there are no environmentally sensitive features. Therefore no adverse impacts are envisaged. Site for WWTP is selected based on the gravity flow system; the site is situated in the western side of the town, about 0.5 km from the TMC boundary. This site of 5.7 ha (14 acre) is a private agricultural land, which will be acquired for the project. Necessary Resettlement Planning study has been conducted along with the IEE study. The site is presently cultivated and is covered with vegetable and cotton crops. Site is surrounded by agricultural fields. The treated effluent will be disposed into *Shanbogar nala* which is flowing adjacent to the site. Site is at about 300 m from the habitation. *Shanbogar nala* presently carries untreated wastewater from the town..This *nala* ultimately joins Hombaradi Lake about 8 km further northwest of the site traversing large tracks of agricultural lands. Untreated wastewater from this nala is presently used for irrigation. The stream mostly carries wastewater except during rains,

and consequently never reaches the lake. This irrigation use will continue after the construction of WWTP as well, but with treated effluent that is safe and suitable for irrigation. No impacts thus envisaged due to location of WWTP at this site.

62. **Utilities.** Water supply pipelines, Telephone lines, electric poles, and wires within the proposed subproject locations may require to be shifted in few cases The mitigate the adverse impacts due to relocation of the utilities, IA will:

(i) Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase;
(ii) Conduct detailed site surveys with the construction drawings and discuss with the respective agencies during the construction phase before ground clearance;
(iii) Require construction contractors to prepare a contingency plan to include actions to be done in case of unintentional interruption of services. In case of disruption of water supply, alternative supply, through tankers, shall be provided

63. **Site selection of construction work camps, stockpile areas, storage areas, and disposal areas**. Priority is to locate these near the subproject locations. However, if it is deemed necessary to locate elsewhere, sites to be considered will not result in destruction of property, vegetation, irrigation, and drinking water supply systems. Residential areas will not be considered for setting up camps to protect the human environment (i.e., to curb accident risks, health risks due to air and water pollution and dust, and noise, and to prevent social conflicts, shortages of amenities, and crime). Extreme care will be taken to avoid disposals near the forest, water bodies, swamps, or in areas which will inconvenience the community. All locations would be included in the design specifications and on plan drawings. Construction work camps shall be located at least 200 m from residential areas. In Byadgi there are no sensitive areas like forest or water bodies. Material stockpiles shall be protected by bunds during the monsoon to arrest the silt laden runoff into drains. The subproject is likely to generate soil from excavations, which needs to be disposed safely. The soil shall be utilized for construction of WWTP, which is located outside the town.

64. **Site selection of 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. 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 Mines and Geology Department. If other sites are necessary, these would to 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.

65. For Byadgi subproject, the quarry material required will be sand and stone aggregate, and the nearest quarries are at Chikkar Kuruvatti, Harihar and Medleri (sand quarries along River Tunga Bhadra) and Chatra at Motebennur in Ranebennur Taluka for stone aggregate. These are existing quarries and are licensed by Mines and Geology Department. The material from the existing quarries will be adequate for the subproject construction, and therefore no new quarry sites will be developed for the purpose.

C. Design Impact

66. These impacts arise from the design of the subproject including the technology used, scale of operation/throughput, waste production, discharge specification, pollution sources, and ancillary services.

67. The water supply improvement proposal for Byadgi does not involve any source augmentation[1] measures; therefore there is no impact of depletion groundwater or surface water resources. Water supply is designed as gravity based system avoiding the need for pumping. The water will be supplied from the GLSR to be constructed at Bettada Mallpa Hillock. This is situated on the higher elevation, and therefore water will be supplied to entire service area by gravity through ESRs.

68. The sewerage system for Byadgi is designed as a separate system of sewage collection (i.e. caters only wastewater). There is considerable length of existing surface drains in the project area that can be used for disposal of storm runoff. The underground gravity sewers will carry sewage from households to the WWTP. Byadgi TMC should ensure that all existing septic tanks are phased out by bypassing the inlet and connecting the toilet discharge from each house directly to sewerage system.

69. The collection system is designed utilizing the natural slope of the town and site for the proposed sewage treatment plant is ideally selected in the north-west outskirts of the town to where collected wastewater can be conveyed by gravity. The design however could not eliminate the pumping completely due to various design constrains and considerations, and therefore a terminal pumping station is proposed at the WWTP site to lift the sewage collected at the terminal point to inlet of the WWTP. To optimize the power consumption, the following needs to be considered in design and selection of pumping systems:

- Design pumping equipment with maximum efficiency to optimize the energy consumption
- Various combinations of number of pumps, stages, motor speed should be considered to select the best pump with ideal specific speeds.
- Specific speeds of the pumps should be selected to achieve maximum efficiency of pumps. For instance, as per American Standard for DS Centrifugal Pumps issued by Hydraulic Institute, New Jersey, the specific speed for Pumps should be in the range of 2000 to 3000 for attaining optimum efficiency. The pumps should be designed accordingly.
- Attainable efficiency for procuring the pumps and motors should be considered as 88 to 92 % for pumps and 94 % for motors. It is proposed that during the procurement, the evaluation of bid shall also be in terms of efficiency.
- The pumps shall conform to IS 1710 – 1989 Specification for Pump and IS 5120–1992 Technical Requirements for Roto-dynamic Special Purpose Pumps and tested to class 3 of IS: 9137-1978 Code for Acceptance Tests for Centrifugal, Mixed Flow and Axial Flow Pumps.

[1] KUWS&DB has proposed an independent Bulk Water Supply Scheme for Byadgi, and is currently in bidding stage. This will provide adequate water for the design period.

70. **Wastewater Treatment Process**. A 4.6 MLD Wastewater Treatment Plant (WWT) will be constructed to meet the design demand of 2030. Based on the techno economic feasibility and land availability, an easy to construction and operate Waste Stabilization Pond based treatment facility is proposed. This treatment process is used in many parts of India and utilises solar energy and algae-bacterial symbiosis for the purification of wastewater. This type of system is easy to construct, simple to operate and has virtually no operating costs. The stabilisation pond treatment system consists of the following stages:

- Inlet works with mechanical screens, grit removal, flow measurement & flow splitter box
- Anaerobic Pond
- Facultative Pond
- Maturation Pond

71. The treatment process is designed to meet the following disposal standards set up for disposal into inland water bodies[2] (Refer Appendix 3) by the Central Pollution Control Board (CPCB) under the Water (Prevention and Control of Pollution) Act, 1974.

- BOD of 30 mg/l
- Suspended solids level of 100 mg/l
- Faecal coliform less than 1000/100 ml

72. Treated sewage meeting the above disposal limits will make it suitable for unrestricted irrigation use. The WWTP site is surrounded by agricultural fields and therefore there is considerable demand for irrigation water. The treated effluent will be discharged into a natural drainage channel passing adjacent to the WWTP site. This natural channel runs through agricultural fields providing easy access for farmers to use for cultivation. This drainage channel is currently carrying untreated sewage from the town. Therefore the treated water disposal will have positive benefits.

73. Except the power requirement at terminal pumping station to lift the incoming sewage into the inlet of WWTP, the WSP process do not required electrical power. The flow between units will be on gravity and process will use natural solar energy.

74. A critical aspect is change in raw sewage characteristics at inlet of WWTP may affect the process and output quality. The system is designed for municipal wastewater, which does not include industrial effluent. Characteristics of industrial effluent widely vary depending on the type of industry, and therefore disposal of effluent into sewers may greatly vary the inlet quality at WWTP, and will upset process and affect the efficiency. Although legally the disposal of effluent meeting certain standards is allowed into municipal sewers (refer Appendix 3), the monitoring of the same is not-practical. Nonetheless, Byadgi, at present, has no industries with problematic wastewater discharges.

75. The above issues need to be considered in design and operation of WWTP. Appropriate measures, such as the following, shall be integrated into planning and design of the WWTP.

[2] These are stringent compared to disposal standards for irrigation use (BOD-100 mg/l).

(i) Conduct regular wastewater quality monitoring (at inlet and at outlet of WWTP) to ensure that the treated effluent quality complies with the standards (Appendix 3)
(ii) Prohibit/prevent disposal of wastewater/effluent from industrial units in the sewers; ensure regular checking to ensure no illegal entry of industrial wastewater into sewers

76. Bad odours may be generated from wet well, primary treatment units and, anaerobic ponds. Besides operating the plant as per the O&M manual, the following measure should be included in the designs:

(i) Provide a green buffer zone of 10-15 m wide around the WWTP; this should be planted with trees in multi-rows. This will act as a visual screen around the open ponds and will improve the aesthetic appearance.

77. **Sludge Management**. Sewage sludge generally consists of organic matter, pathogens, metals and micro pollutants. The concentration of parameters such as metals can be influenced by input to the sewers system from industry. Byadgi is famous for production of Chilly and there are a number of Chilly grinding units and cold storages. However these industries release no problematic discharges and therefore it is unlikely that sewage contains metals. Most importantly, as provided above, no industrial discharges are allowed into municipal sewer system.

78. The anaerobic stage of the stabilisation pond digests most of the sludge produced leaving only a small amount to be removed once in a year. The treatment and drying processes kill enteric bacteria and pathogens, and because of its high content of nitrates, phosphates and other plant nutrients the sludge is an excellent organic fertilizer for application to the land. Adequate drying is however necessary to ensure maximum kill of enteric bacteria. To achieve adequate drying minimum drying period (days) shall be ensured. The drying period, which will be varying depending on the season, shall be determined during detailed design.

79. For removal of sludge, ponds will be allowed dry, and dried sludge will be removed manually or using the small back hoe digger. This will provided to local farmers for use in their fields. Based on the demand, the modalities for selling the manure to farmers will be worked out. Sludge removal is simple operation in WSP, and no Sludge Management Plan is necessary.

80. **Sewer system – collection & conveyance.** The sewerage system for Byadgi is designed as a separate system of sewage collection (i.e. caters only wastewater). There is considerable length of existing surface drains in the project area that can be used for disposal of storm runoff. The underground gravity sewers will carry sewage from households to the WWTP. Byadgi TMC should ensure that all existing septic tanks are phased out by bypassing the inlet and connecting the toilet discharge from each house directly to sewerage system

81. Accumulation of silt in sewers in areas of low over time, overflows, blockages, power outages, harmful working conditions for the workers cleaning sewers etc are some of the issues that needs to be critically looked into during the sewer system design. A properly designed system is a must for system sustainability. Measures such as the following shall be included in sewer system design to ensure that the system provides benefits the benefits as intended:

(i) Limit the sewer depth where possible.

(ii) Sewers shall be laid away from water supply lines and drains (at least 1 m, wherever possible);

(iii) In all cases, the sewer line should be laid deeper than the water pipeline (the difference between top of the sewer and bottom of water pipeline should be at least 300 mm)

(iv) In unavoidable, where sewers are to be laid close to storm water drains or canals or natural streams, appropriate pipe material shall be selected (stoneware pipes shall be avoided)

(v) For shallower sewers, use small inspection chambers in lieu of manholes;

(vi) Design manhole covers to withstand anticipated loads & ensure that the covers can be readily replace if broken to minimize silt/garbage entry

(vii) Ensure sufficient hydraulic capacity to accommodate peak flows & adequate slope in gravity mains to prevent build up of solids and hydrogen sulphide generation

(viii) Equip pumping stations with a backup power supply, such as a diesel generator, to ensure uninterrupted operation during power outages, and conduct regular maintenance to minimize service interruptions. Consider redundant pump capacity in critical areas

(ix) Establish routine maintenance program, including:

- Regular cleaning of grit chambers and sewer lines to remove grease, grit, and other debris that may lead to sewer backups. Cleaning should be conducted more frequently for problem areas.
- Inspection of the condition of sanitary sewer structures and identifying areas that need repair or maintenance. Items to note may include cracked/deteriorating pipes; leaking joints or seals at manhole; frequent line blockages; lines that generally flow at or near capacity; and suspected infiltration or exfiltration; and
- Monitoring of sewer flow to identify potential inflows and outflows

(x) Conduct repairs prioritized based on the nature and severity of the problem. Immediate clearing of blockage or repair is warranted where an overflow is currently occurring or for urgent problems that may cause an imminent overflow (e.g. pump station failures, sewer line ruptures, or sewer line blockages);

(xi) Review previous sewer maintenance records to help identify “hot spots” or areas with frequent maintenance problems and locations of potential system failure, and conduct preventative maintenance, rehabilitation, or replacement of lines as needed;

(xii) When a spill, leak, and/or overflow occurs, keep sewage from entering the storm drain system by covering or blocking storm drain inlets or by containing and diverting the sewage away from open channels and other storm drain facilities (using sandbags, inflatable dams, etc.). Remove the sewage using vacuum equipment or use other measures to divert it back to the sanitary sewer system.

(xiii) Develop an Emergency Response System (ERS) for the sewerage system leaks, burst and overflows, etc. A Template for ERS is provided in Appendix 5.

D. Construction Impacts

1. Construction Method

82. The project involves construction of the following: (i) Ground-level Service Reservoirs (GLSR); (ii) Laying of water supply pipelines along the roads; (iii) Fixing bulk water meters, and district meters and domestic meters in the pipelines; (iv) Laying of sewers along the roads; (v) Sewage Pumping Station, and (vi) Construction of sewage treatment plant. Following table shows the details of construction activities involved in the subproject.

Table 6: Construction Activities for the Subproject

Component	Construction Method	Likely Waste Generated
GLSR	Excavation for foundation manually; depth approximately 1 m deep Construction of foundation and superstructure in Reinforced Cement Concrete (RCC); construction material will be brought to the site on truck and stored nearby. Concrete will be mixed using mixers, transferred manually and compacted using handheld vibrators Construction activity will be confined to a site located outside the town	~200 m3 of excavated soil
Water supply pipelines	Trench excavation along the identified roads; average trench size 0.4-0.7 m wide and 1.5 m deep Trench will be excavated using backhoe and where not feasible will be done manually. Excavated soil will be placed along the trench, and pipes will be placed and joined, and the excavated soil will be replaced and compacted. In narrow roads, where the pipes are laid in the roadway, handheld pneumatic drill will be used to break the road surface. Construction activity will be conducted along the roads in the town; most of the roads in the centre of the town are congested with traffic, pedestrians and activities; roads outside are comparatively wide and less traffic. The work will be conducted by a team of 5 workers at each site	~20,000 m3 of excavated soil; 95% will be utilized for refill; remaining soil (~1,000 m3) need to be disposed off
Fixing of bulk/water meters	Minor civil work – conducted manually	Negligible

Sewer lines	Trench excavation along almost all the roads in the town, average trench size 0.4-1 m wide and 1.5- 3 m deep. Trench will be excavated using backhoe and where not feasible will be done manually. Excavated soil will be placed along the trench. A bed of sand of 100 mm thick will be prepared at the bottom and sewers will be placed and joined. Excavated soil will be replaced and compacted. Where the pipes are laid in the roadway, handheld pneumatic drill will be used to break the road surface. Construction activity will be conducted along the roads in the town; most of the roads in the centre of the town are congested with traffic, pedestrians and activities; roads outside are comparatively wide and less traffic. The work will be conducted by a team of 5 workers at each site	~37,000 m3 of excavated soil; 92-93% will be utilized for refill; remaining soil (~2600 m3) need to be disposed off
Wastewater Treatment plant (WWTP)	This will include construction and fixing of Inlet works with mechanical screens, grit removal, flow measurement & flow splitter box; anaerobic ponds (2 no,s), facultative ponds (2 no,s) and maturation ponds (2 no,s).. The major component in WSP based WWTP is creation of ponds. This involves mainly simple excavation. The ponds will be dug by backhoe diggers and bulldozers. Since the ponds are designed partly in cutting and partly in embankment most of the excavated soil will be utilized. Pitching will then be provided to bottom and side slopes of the pond. Construction activity will be confined to a site located outside the town	This activity will not generate any excess/surplus soil that need to be disposed; the excavated soil will be used to raise the ground level of the site
Sewage pumping station	Sewage pumping station will be constructed within the WWTP site; this will consist of a wet well to collect the incoming sewage, and a room above the wet well to house the pumping station; excavation will be conducted using backhoe digger; RCC well structure will be created in the void to form wet well; a concrete cover with an opening will be made on the top, above with a one-roomed structured will be construction to house the pumps. Construction activity will be confined to a site located outside the town	Soil will be generated from excavation activity; this soil will be utilized at the site

83. As detailed above, except linear components like pipes and sewers, construction activities of all other components will be confined to selected isolated sites (already in use or new). However, the material and waste transport to and from the site will use public roads.

84. Although construction of the pipelines and sewers involves quite simple techniques of civil work, the invasive nature of excavation and the subproject locations in the built-up areas of Byadgi Town, where there are a variety of human activities, will result to impacts to the environment and sensitive receptors such as residents, businesses, and the community in general. These anticipated impacts are temporary and for short duration. Physical impacts will be reduced by the method of working and scheduling of work, whereby the project components will be (i) constructed by small teams working at a time; (ii) any excavation done near sensitive area like school, religious places and house will be protected as per standard construction practices etc. These are discussed in detail in the following sections.

2. Impact on Physical Resources

85. **Topography, Soils & Geology**. Subproject activities are not large enough to affect these features; so there will be no impacts.

86. **Sources of Materials**. Significant amount of gravel, sand and aggregate, will be required for this subproject. The construction contractor will be required to:

(i) Use quarry sites and sources permitted by Mines & Geology Department only
(ii) No new quarry sites shall be developed for the subproject
(iii) Verify suitability of all material sources and obtain approval of implementing agency
(iv) Submit on a monthly basis documentation of sources of materials.

87. **Air Quality**. It is most certain that work will be conducted during the dry season, so there is potential for creating dust from the excavation of dry soil, backfilling, transportation to disposal, and from the import and storage of sand/gravel for bedding. Emissions from construction vehicles, equipment, and machinery used for excavation and construction will also 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 IA/PIU on the designated areas for stockpiling of clay, soils, gravel, and other construction materials;
(ii) Damp down exposed soil and any stockpiled on site by spraying with water when necessary during dry weather;
(iii) Bring materials (aggregates, sand, etc gravel) as and when required;
(iv) Use tarpaulins to cover sand and other loose material when transported by vehicles;
(v) Clean wheels and undercarriage of vehicles prior to leaving construction site
(vi) Fit all heavy equipment and machinery with air pollution control devices which are operating correctly; ensure valid Pollution Under Control (PUC) Certificates for all vehicles and equipment used in the construction activity

88. **Noise Levels.** The soils are deep in the subproject area and therefore activities like rock cutting/blasting that generate high noise are not anticipated. In isolated areas where a hard

stratum is encountered requiring using of pneumatic drills, there will be high noise during the activity. Also, where the pipelines are required to be laid in the roadway, pneumatic drills will be used to break open the road surface. The sensitive receptors are the general population and socio-cultural institutions in the area. Noise will be for a short term (about 2-3 days at each location) thus impact is negative, short-term, and reversible by mitigation measures. The construction contractor will be required to:

(i) Plan activities in consultation with the 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) Construction work shall be limited to day light hours (6 AM to 6 PM) for all the works located within the town; for facilities outside the town (i.e. WWTP) the timings may be relaxed with the permission of Byadagi TMC and PIU, however no work should be conducted between 10 PM – 6 AM at any site.
(iii) Provide prior information to the local public about the work schedule;
(iv) Ensure that there are no old and sensitive buildings that may come under risk due to the use of pneumatic drills; if there is risk, cut the rocks manually by chiselling;
(v) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor; and
(vi) Maintain maximum sound levels not exceeding 80 decibels (dbA) when measured at a distance of 10 m or more from the vehicle/s.

89. **Surface Water Quality.** Byadgi topography is primarily plain; the town receives moderate rainfall. Most of the rainfall occurs during southwest monsoon between July and September. Due to these reasons and also that excavation will not certainly be conducted during rains, there is no impact on drainage and surface water quality is envisaged. In unavoidable case of excavation during rains, there may be temporary impacts like flooding of construction sites, mixing of construction waste and material within the runoff, etc. This may lead to silting and blockage of drains and water bodies. These potential impacts are temporary and short-term duration only and to ensure these are mitigated, construction contractor will be required to:

(i) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets
(ii) Stockpiles shall be provided with temporary bunds
(iii) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with Implementing Agency on designated disposal areas
(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) Dispose any wastes generated by construction activities in designated sites

90. **Groundwater**. Subproject activities do not interfere with groundwater regime, no groundwater abstraction proposed nor do the activities affect groundwater quality.

91. **Landscape and Aesthetics**. The construction work is likely to generate considerable quantities of waste soil. The pipe laying work will generate surplus soil; as small diameter

pipes/sewers are proposed it will generate only 5-7% as surplus as most of the soil will be used for refilling after the pipe is laid in trench. The surplus soil needs to be disposed safely. Indiscriminate disposal of the soil and waste may affect the local environment at the disposal location. These impacts are negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

(i) Prepare and implement Waste Management Plan – it should present how the surplus waste generated will temporarily stocked at the site, transported and disposed properly
(ii) Avoid stockpiling of excess excavated soils as far as possible
(iii) Avoid disposal of any debris and waste soils in the forest areas and in or near water bodies/rivers;
(iv) Coordinate with PIU for beneficial uses of excess excavated soils or immediately dispose to designated areas;

3. Impact on Ecological Resources

92. Subproject sites are located within the town area and in the areas converted for agricultural use long back. There is no natural habitat left in these sites, and therefore no impacts on ecological resources envisaged.

4. Impact on Economic Development

93. **Land Use**. Subproject activities will not affect the land use. All subproject activities are being conducted in the vacant space along the road ways; and other facilities are being developed on government-owned vacant lands. For the construction of sewage treatment plant, 14 acres of land which is currently under agricultural use will be utilized. This change in land use confirms to development plan of the town, so no negative impacts envisaged.

94. **Accessibility.** Transport infrastructure will be affected by the pipe/sewer laying work, as in the narrower streets there is not enough space for excavated soil to be piled off the road. The road itself may also be excavated in places where there is no available land to locate pipes alongside. Traffic will therefore be disrupted, and in some very narrow streets the whole road may need to be closed for short periods. Potential impact is negative but short term and reversible by mitigation measures. The construction contractor will be required to:

(i) Plan pipeline work in consultation with the traffic police
(ii) Plan work such that trench excavation, pipe laying, and refilling including compacting, at a stretch is completed in a minimum possible time;
(iii) Provide for immediate consolidation of backfilling material to desired compaction - this will allow immediate road restoration and therefore will minimise disturbance to the traffic movement;
(iv) Do not close the road completely, ensure that work is conducted onto edge of the road; allow traffic to move on one line;
(v) In unavoidable circumstances of road closure, provide alternative routes, and ensure that public is informed about such traffic diversions;
(vi) At all work sites public information/caution boards shall be provided – information shall inter-alia include: project name, cost and schedule; executing agency and contractor details; nature and schedule of work at that road/locality; traffic diversion details, if any; entry restriction information; competent official's name and contact for public complaints.

(vii) Prepare a Traffic Management Plan – a template is provided for reference at Appendix 4.

5. Impact on Socio Cultural Resources

95. **Impacts on social sensitive areas.** Since the work is being conducted in an urban area, sensitive areas like schools, hospitals and religious centre, the excavation of trenches and pipe/sewer laying activity will create nuisance and health hazard to children and people with ailments. The measures suggested under various heads in this section will minimize the impact in general in all areas, however, special attention is necessary at these locations. Following measures shall be implemented in 250 m around the sensitive locations (schools, hospitals, and religious centres:

(i) No material should be stocked in this area; material shall be brought to the site as and when required
(ii) Conduct work manually with small group of workers and less noise; minimize use of equipment and vehicles
(iii) No work should be conducted near the religious places during religious congregations
(iv) Material transport to the site should be arranged considering school timings; material should be in place before school starts;
(v) Notify concerned schools, hospitals etc 1 week prior to the work; conduct a 30-m awareness program on nature of work, likely disturbances and risks and construction work, mitigation measures in place, entry restrictions and dos and don'ts
(vi) Implement all measures suggested elsewhere in this report – dust and noise control, public safety, traffic management, strictly at the sites.

96. **Socio-Economic – Income.** Excavation of trenches and pipe/sewer laying work in the town will obstruct access to residences/commercial buildings adjacent to the pipeline. Disruption of access to commercial establishments may affect livelihood. Since many of the roads are narrow, construction activities may also obstruct traffic. The potential impacts are negative and moderate but short-term and temporary. The construction contractor will be required to:

(i) Leave space for access between mounds of excavated soil
(ii) Provide wooden planks/footbridges for pedestrians and metal sheets for vehicles to allow access across trenches to premises where required
(iii) Consult affected businesspeople to inform them in advance when work will occur
(iv) Address livelihood issues, if any; implement the Resettlement Plan (RP) to address these issues
(v) Provide sign/caution/warning boards at work site indicating work schedule and traffic information; prevent public entry into work sites through barricading and security; and
(vi) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.

97. **Socio-Economic – Employment**. Manpower will be required during the 24-months construction period. 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 required to:

(i) Employ at least 50% of the labour force, or to the maximum extent, local persons if manpower is available; and
(ii) Secure construction materials from local market.

98. **Socio-Economic – General.** The benefits of implementing 24 x 7 water supply surpasses the temporary construction impacts. Typical benefits are[3]:

(i) 24x7 supply delivers better quality water for public health - High levels of bacterial contamination are experienced in the first 10 minutes of repressurization of an intermittent system, in some cases persisting for up to 20 minutes. Maintaining full pressure removes that risk.
(ii) 24x7 supply gives significantly better service to all consumers - Access to clean water with improved quantity, timing, and pressure, including effective service to supply pipe „tail ends'.
(iii) 24x7 supply revolutionizes service to the poor - Consumers can access more water for improved health and hygiene while saving time in queuing and carrying, and gainfully using the time thus saved for employment opportunities.
(iv) 24x7 supply converts household coping costs into resources for the service provider - Coping costs that consumers need to incur are reduced; they pay for a better service.
(v) 24x7 supply reduces the burden on water resources - Continuous supply reduces water wastage arising from overflowing storage systems and open taps. It saves on stored household water that is discarded when new supply comes in. Because the network is renewed where needed, it also reduces losses arising from leaks in the old pipes.
(vi) 24x7 supply delivers effective „supply management' and „demand management' - Continuous supply makes possible the effective management of leakage through pressure management and flow measurement. Water conservation is also encouraged through metering and price signals via a volumetric tariff to consumers.
(vii) 24x7 supply enables improved efficiency of service provision - Operational efficiencies are achieved because of a reduced need for valvemen, and a conversion of these jobs into more efficient ones of meter reading and customer care. It also makes possible the management of illegal connections.

99. **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 required to:

(i) Develop and implement site-specific Health and Safety (H and S) Plan 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 and S Training[4] for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents;

[3] Water and Sanitation Program, *The Karnataka Urban Water Sector Improvement Project*, Field Note, 2010, Available Online URL: http://www.wsp.org/sites/wsp.org/files/publications/WSP_Karnataka-water-supply.pdf

[4] 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

(ii) All trenches deeper than 2 m shall be protected with wooden bracing to avoid safety risks to workers, public and nearby buildings/structures
(iii) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site;
(iv) Provide medical insurance coverage for workers;
(v) Secure all installations from unauthorized intrusion and accident risks;
(vi) Provide supplies of potable drinking water;
(vii) Provide clean eating areas where workers are not exposed to hazardous or noxious substances
(viii) Provide H and S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers;
(ix) 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;
(x) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;
(xi) Ensure moving equipment is outfitted with audible back-up alarms;
(xii) 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
(xiii) 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 enforced actively.
(xiv) Overall, the contractor should comply with IFS EHS Guidelines on Occupational Health and Safety (this can be downloaded from http://www1.ifc.org/wps/wcm/connect/9aef2880488559a983acd36a6515bb18/2%2BOccupational%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES)

100. **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 are along the road ways, hence safety risk to community is to be considered. Potential impact is negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

(i) Plan material and waste routes to avoid times of peak-pedestrian activities
(ii) Liaise with IA/PIU in identifying risk areas on route cards/maps
(iii) Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure
(iv) Provide road signs and flag persons to warn of dangerous conditions, in case of location near the road
(v) Overall, the contractor should comply with IFS EHS Guidelines Community Health and Safety (this can be downloaded

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.

fromhttp://www1.ifc.org/wps/wcm/connect/dd673400488559ae83c4d36a6515bb18/3%2BCommunity%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES)

101. **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. Provision of proper living facilities and basic amenities (water, sanitation, fire safety, health and safety, etc) shall be ensured.

102. The construction contractor will be required to comply with the following. Overall, the contract should follow the IFC EHS guidelines specific to workers accommodation (this can be downloaded from http://www1.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/ifc+sustainability/publications/publications_gpn_workersaccommodation).

(i) Consult with PIU before locating workers camps/sheds, and construction plants; as far as possible located within reasonable distance of work site
(ii) Minimize removal of vegetation and disallow cutting of trees
(iii) Living facilities shall be built with adequate materials, and should be in good condition and free from rubbish and other refuge
(iv) The camp site should be adequately drained to avoid the accumulation of stagnant water
(v) Provide water and sanitation facilities; water, meeting Indian drinking water standards shall be provided, in adequate quantities (supply of 60- 80 LPCD); all water storage structures must be cleaned regularly and covered properly to avoid any contamination
(vi) Provide separate facilities for men and women; sanitary facilities shall be properly build and well maintained; toilet and bath facilities should be provided on basis of 1 per 15 or less persons
(vii) Train employees in the storage and handling of materials which can potentially cause soil contamination
(viii) Recover used oil and lubricants and reuse or remove from the site;
(ix) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;
(x) Remove all wreckage, rubbish, or temporary structures which are no longer required; and
(xi) Report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.

103. **Social and Cultural Resources – Chance Finds**. Subproject area is not a potential archaeological area and therefore no impacts envisaged.

E. Operational & Maintenance Impacts

104. The improved water supply system should operate without the need for major repair and maintenance. Although the new sewerage system will need regular maintenance during operation; with a few simple precautions this can also be conducted without major environmental impacts.

105. The main requirement for maintenance of the new infrastructure will be for the detection and repair of leaks. The generally flat topography and the usage of good quality DI/HDPE pipes

should mean that pipeline breaks are very rare, and that leaks are mainly limited to joints between pipes. The repair of household connections and the provision of new connections to increase the number of people supplied should greatly reduce the incidence of illegal connections, which are often a major source of leaks.

106. The bulk meters will allow monitoring of amounts of water flowing through individual parts of the network, which will pinpoint areas where there are leaks. A small Leak Detection Team will then visit these areas with audio devices to locate individual leaks, which will then be repaired in essentially the same way that the pipes were installed. 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.

107. The new sewerage system provided under the Investment Program will collect and treat domestic wastewater and sewage produced by the entire town. The proposed treatment plant will treat the sewage collected from the town. The discharge after treatment will comply with Indian wastewater standards.

108. The sewer pipes will not function without maintenance, as silt inevitably collects in areas of low flow over time. The project will therefore provide equipment for cleaning the sewers, including buckets and winches to remove silt via the inspection manholes, diesel-fuelled pumps to remove blockages, etc. Piped sewers are not 100% watertight and leaks can occur at joints. The measures suggested for consideration during the design of sewer network will help in proper functioning of the system. Any repairs will be conducted by sealing off the affected sewer and pumping the contents into tankers, after which the faulty section will be exposed and repaired following the same basic procedure as when the sewer was built. Trenches will be dug around the faulty section and the leaking joint will be re-sealed, or the pipe will be removed and replaced.

109. Waste stabilization pond WWTP involves very simple operation. Once the waste is pumped into the WWTP inlet, it will be flow through the units by gravity, and all units operate without any external power. will be simple. It will only require a daily visit by the operations staff to check the screens, remove grit and arrange for the removal of the grit and screenings containers when required.

110. Sludge will need to be removed from the anaerobic ponds every two years. Removal of sludge from the ponds is a simple process. Ponds are allowed to dry out naturally and the solid sludge is removed by manual digging..The treatment and drying processes kill enteric bacteria and pathogens, and because of its high content of nitrates, phosphates and other plant nutrients the sludge is an excellent organic fertilizer and farmers are normally allowed to remove the dry material for application to their land.

111. It is suggested to develop an Emergency Response System (ERS) for the sewerage system leaks, burst and overflows, etc. A Template for ERS is provided in Appendix 5. Sensitize and train staff in implementation of ERS.

112. The proposed community toilets will not function without regular cleaning and maintenance. Therefore there is a need to develop and implement operation and maintenance (O&M) plans for community toilets with participation from the community. A memorandum of understanding (MoU) between Byadgi TMC and community will be reached prior to any construction and operation of community toilets. As a minimum, the O&M plan should specify (i)

cleaning procedures and frequency; (ii) responsible personnel; (iii) maintenance and repairs schedule; (iv) emergency contact numbers etc.

113. **General**. The maintenance work of the improvement water supply and sewerage system will follow the same procedures as adopted during the construction stage. Byadgi TMC needs to operate and maintain the system as per the manual. Preparation of O&M Manual may be included in the scope of DPR consultants (for item rate contracts) or Construction Contractor (for design-build or turnkey contracts). Measures to minimize the disturbance to general public/ business and dust control, as followed during the construction, is to be implemented during maintenance as well.

114. The provision of an improved and expanded water supply and sewerage system is expected to have indirect economic benefits from the expected improvement in the health, environment and economic well-being.

115. The citizens of the Byadgi Town will be the major beneficiaries of this subproject. With the improved water supply, they will be provided with a constant supply of better quality water, piped into their homes. The sewerage system will remove the human waste from those areas served by the network rapidly and treated to an acceptable standard. With the construction of toilets and targeted awareness program on sanitation proposed, in addition to improved environmental conditions, the subproject will improve the over-all health condition of the town. Diseases of poor sanitation, such as diarrhoea and dysentery, should be reduced, so people should spend less on healthcare and lose fewer working days due to illness, so their economic status should also improve, as well as their overall health.

VI. INSTITUTIONAL ARRANGEMENTS

A. Implementation Arrangements

116. **Executing Agency (EA)**: Karnataka Urban Infrastructure Development & Finance Corporation (KUIDFC) is the executing agency (EA) responsible for implementing the Investment Program. Investment Program implementation activities will be monitored by KUIDFC through a separate Investment Program Management Unit (PMU) for the IWRM Project, which will be set-up within KUIDFC. The Managing Director, KUIDFC will head the PMU and will be assisted by an Executive Director at the Regional office of KUIDFC at Dharwad to oversee the Investment Program progress. A team of senior technical, administrative and financial officials will assist the Executive Director in controlling and monitoring Investment Program implementation activities.

117. The Executive Director will be supported by a new Divisional Office established at Davangere. A Consultant Team will be appointed by EA and the team will work under the Divisional Programme Director (DPD) and will be involved in project planning, preparation of subproject and cost estimates, co-ordination, technical guidance and supervision, financial control, training and overall subproject management

118. All Investment Program decisions will be made by the Executive Director who shall operate from the PMU, Dharwad; only interactions with GoK, GoI and ADB shall be conducted through the KUIDFC office at Bangalore.

119. **Implementing Agency (IA)**: The ultimate implementation responsibility lies with respective ULBs (in this case Byadgi Town Municipal Council). A Programme Implementation

Unit (PIU) will be established in each ULB unless one or more of the ULBs decide to form a single PIU.

120. Other than the above institutional setup, District Level Programme Steering Committee will be set up in each district to monitor implementation of subprojects and institutional reforms. The District Level Programme Steering Committee shall consist of Deputy Commissioner of District, Divisional Program Director from concerned divisional office, Municipal Commissioners' / Chief Officers of Investment programme ULB and President / Chair of investment programme ULB. The District Level Programme Steering Committee will report to the PMU Executive Director: Dharwad.

121. At the Executing Agency (i.e. KUIDFC), environmental issues will be coordinated centrally by an environmental specialist at manager-level (designated as Manager-Environment), reporting to the General Manager (Technical). Manager – Environment, supported by an Environmental Expert (Assistant Manager Rank), will ensure that all subprojects comply with environmental safeguards. The IEE/EIA reports will be prepared by the Consultant Team, and will be reviewed by the Manager-Environment as per the ADB's Environmental Guidelines and forwarded to ADB for review and approval. In case of IEE reports, the ADB could delegate approval of IEE reports fully to the PMU after reviewing the first two reports. However, all the EIA reports shall be sent to ADB for approval. The Manager-Environment will be assisted by an Environmental Specialist, who will be appointed by EA in divisional office at Davanagere.

122. The responsibility fulfilling environmental requirements of GoI/GoK and conducting required level of environmental assessment as per ADB guidelines lies with the implementing agency, i.e. Byadgi TMC. The Consultant Team will assist the IA in this regard.

123. The mitigation measures identified through IEE/EIA are incorporated into the Investment Program cycle. Mitigation measures, which are to be implemented by the Contractor, shall form part of the Contract Documents. The other mitigation measures are undertaken by the IA (itself or in assistance with the Consultant Team) as specified in the IEE. During the construction phase, environmental specialist of Consultant Team will monitor the implementation of the EMP and report to the PMU. The Implementation of EMP and other environmental related measures and the results of environmental monitoring conducted during implementation will be reported to ADB through semi annual Environmental Monitoring Reports. These will also be made available on executing agency (KUIDFC) website for wider public access.

VII. ENVIRONMENTAL MANAGEMENT PLAN

A. Summary Environmental Impact & Mitigation Measures

124. Following Tables show the potential adverse environmental impacts, proposed mitigation measures, responsible parties, and estimated cost of implementation. This EMP will be included in the bid documents and will be further reviewed and updated during implementation.

Table 7: Summary Environmental Impacts & Mitigation Measures – Pre-Construction

Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost of Mitigation
Disturbance/damage to existing utilities on the sites (Telephone lines, electric poles and wires, water lines within proposed project sites)	• Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase; • Conduct detailed site surveys with the construction drawings and discuss with the respective agencies during the construction phase before ground clearance; • Require construction contractors to prepare a contingency plan to include actions to be done in case of unintentional interruption of services.	PIU and Design Consultant	Part of project cost
Design of pumps (design and procure pumps with higher efficiency to optimize the power consumption)	• Design pumping equipment with maximum efficiency to optimize the power consumption • Various combinations of number of pumps, stages, motor speed should be considered to select the best pump with ideal specific speeds. • Specific speeds of the pumps should be selected to achieve maximum efficiency of pumps. For instance, as per American Standard for DS Centrifugal Pumps issued by Hydraulic Institute, New Jersey, the specific speed for Pumps should be in the range of 2000 to 3000 for attaining optimum efficiency. The pumps should be designed accordingly. • Attainable efficiency for procuring the pumps and motors should be considered as 88 to 92 % for pumps and 94 % for motors. It is proposed that during the procurement, the evaluation of bid shall also be in terms of efficiency. • The pumps shall conform to IS 1710 – 1989 Specification for Pump and IS 5120–1992 Technical Requirements for Roto-dynamic Special Purpose Pumps and tested to class 3 of IS: 9137-1978 Code for Acceptance Tests for Centrifugal, Mixed Flow and Axial Flow Pumps.	PIU and Design Consultant	Part of project cost
Design and development of WWTP as per disposal standards set by CPCB (Pollution of surface water, groundwater and land	• The WWTP should be designed for following treated water disposal standards (Notified under Water Act, 1974, for more details refer Appendix 3): ✓ BOD of 30 mg/l ✓ Suspended solids level of 100 mg/l ✓ Faecal coliform less than 1000/100 ml •	PIU and Design Consultant	Part of project cost

Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost of Mitigation
resources)	• Conduct regular wastewater quality monitoring (at inlet and at outlet of WWTP) to ensure that the treated effluent quality complies with the standards • Prohibit/prevent disposal of wastewater/effluent from industrial units in the sewers; ensure regular checking to ensure no illegal entry of industrial wastewater into sewers • Utilize treated water for irrigation use in the surrounding fields		
Sewer network	• Limit the sewer depth where possible. • Sewers shall be laid away from water supply lines and drains (at least 1 m, wherever possible); • In all cases, the sewer line should be laid deeper than the water pipeline (the difference between top of the sewer and bottom of water pipeline should be at least 300 mm) • In unavoidable, where sewers are to be laid close to storm water drains or canals or natural streams, appropriate pipe material shall be selected (stoneware pipes shall be avoided) • For shallower sewers, use small inspection chambers in lieu of manholes; • Design manhole covers to withstand anticipated loads & ensure that the covers can be readily replace if broken to minimize silt/garbage entry • Ensure sufficient hydraulic capacity to accommodate peak flows & adequate slope in gravity mains to prevent build up of solids and hydrogen sulfide generation • Equip pumping stations with a backup power supply, such as a diesel generator, to ensure uninterrupted operation during power outages, and conduct regular maintenance to minimize service interruptions. Consider redundant pump capacity in critical areas • Establish routine maintenance program, including: o Regular cleaning of grit chambers and sewer lines to remove grease, grit, and other debris that may lead to sewer backups. Cleaning should be conducted more frequently for problem areas. o Inspection of the condition of sanitary sewer structures and identifying areas that need repair or maintenance. Items to note may include cracked/deteriorating pipes; leaking joints or seals at manhole; frequent line blockages; lines that generally flow at or near capacity; and suspected infiltration or exfiltration; and	PIU and Design Consultant	Part of project cost

Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost of Mitigation
	○ Monitoring of sewer flow to identify potential inflows and outflows • Conduct repairs prioritized based on the nature and severity of the problem. Immediate clearing of blockage or repair is warranted where an overflow is currently occurring or for urgent problems that may cause an imminent overflow (e.g. pump station failures, sewer line ruptures, or sewer line blockages); • Review previous sewer maintenance records to help identify "hot spots" or areas with frequent maintenance problems and locations of potential system failure, and conduct preventative maintenance, rehabilitation, or replacement of lines as needed; • When a spill, leak, and/or overflow occurs, keep sewage from entering the storm drain system by covering or blocking storm drain inlets or by containing and diverting the sewage away from open channels and other storm drain facilities (using sandbags, inflatable dams, etc.). Remove the sewage using vacuum equipment or use other measures to divert it back to the sanitary sewer system • Develop Emergency Response Plan for all emergencies such as leaks, overflows, bursts; a template of ERP is provided at Appendix 5		
Occupational health hazard – sewer cleaning and maintenance; sludge handling, WWTP operation,	• Provide necessary health & safety training to the staff sewer cleaning & maintenance; WWTP operation; sludge handling • Provide all necessary personnel protection equipment • For personnel cleaning underground sewers there is a risk due to oxygen deficiency and harmful gaseous emissions (hydrogen sulphide, carbon monoxide, methane, etc); the design should consider these risks and provide for adequate equipment (including oxygen masks) for emergency use	Design Consultant/PIU & Operating Agency	Part of project cost
Nuisance to local people, farmers etc due to bad odour from WWTP (bad odours may emanate from wet well, ponds due to anaerobic conditions)	• Provide a green buffer zone of 10-15 m wide around the WWTP; this should be planted with trees in multi-rows. • This will act as a visual screen around the open ponds and will improve the aesthetic appearance.	PIU and Design Consultant	$10,000
Community toilets – operation & maintenance impacts	• Develop and implement operation and maintenance (O&M) plans for community toilets with participation from the community. • A memorandum of understanding (MoU) between Ranebennur CMC and community will be reached prior to any construction and operation of community toilets.	Byadgi TMC, PIU and Design Consultant	Part of project cost

Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost of Mitigation
	• As a minimum, the O&M plan should specify (i) cleaning procedures and frequency; (ii) responsible personnel; (iii) maintenance and repairs schedule; (iv) emergency contact numbers etc.		

Table 8: Summary Environmental Impacts & Mitigation Measures – Construction

Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost of mitigation
Disturbance/ damage to existing utilities on the sites (Telephone lines, electric poles and wires, water lines within proposed project sites)	• Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase	PIU	Part of project cost
	• Conduct detailed site surveys with the construction drawings and discuss with the respective agencies during the construction phase before ground clearance; • Prepare a contingency plan to include actions to be done in case of unintentional interruption of services. • In case of disruption of water supply, alternative supply, through tankers, shall be provided; water may be made available by the Byadgi TMC, but it will the responsibility of contractor to supply to affected people	Construction Contractor	
Construction work camps, stockpile areas, storage areas, and disposal areas (disruption to traffic flow and sensitive areas and receptors)	• Prioritize areas within or nearest possible vacant space in the subproject location; • Construction work camps shall be located at least 200 m from residential areas • Do not consider residential areas for stockpiling the waste/surplus soil; • • Material stockpiles shall be protected by bunds during the monsoon to arrest the silt laden runoff into drains • Surplus soil from trench excavations (pipeline and sewers) shall be utilized for construction of WWTP, which is located outside the town	Construction Contractor	Good construction practice to be followed by contractor – no additional costs

Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost of mitigation
Source of construction 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)	• Contractor should obtain material from existing mines approved/licensed by Mines and Geology Department/ Revenue Department. • Verify suitability of all material sources and obtain approval of implementing agency • No new quarry sites shall be developed for the subproject purpose • Submit a monthly statement of construction material procured indicating material type, source and quantity.	Construction Contractor	Good construction practice to be followed by contractor – no additional costs
Air quality (dust and emissions from construction activity may degrade the air quality)	• Consult with PIU on the designated areas for stockpiling of clay, soils, gravel, and other construction materials; • Damp down exposed soil and any stockpiled on site by spraying with water when necessary during dry weather; • Bring materials (aggregates, sand, etc gravel) as and when required; • Use tarpaulins to cover sand and other loose material when transported by vehicles; • Clean wheels and undercarriage of vehicles prior to leaving construction site • Fit all heavy equipment and machinery with air pollution control devices which are operating correctly; ensure valid Pollution Under Control (PUC) Certificates for all vehicles and equipment used in the construction activity	Construction Contractor	Good construction practice to be followed by contractor – no additional costs
High noisy construction activities may have adverse impacts on sensitive receptors and	• Plan activities in consultation with the PIU so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance; • Construction work shall be limited to day light hours (6 AM to 6 PM) for all the works located within the town; for facilities outside the town (i.e. WWTP) the timings may be relaxed with the permission of Byadagi TMC and PIU, however no work should be conducted between 10 PM – 6 AM at any site.	Construction Contractor	Good construction practice to be followed by contractor – no additional

Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost of mitigation
structures	• Provide prior information to the local public about the work schedule; • Ensure that there are no old and sensitive buildings that may come under risk due to the use of pneumatic drills; if there is risk, cut the rocks manually by chiselling; • Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor; and • Maintain maximum sound levels not exceeding 80 decibels (dbA) when measured at a distance of 10 m or more from the vehicle/s		costs
Impacts on surface drainage and water quality due to contaminated runoff from construction areas in monsoon	• Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets • Stockpiles shall be provided with temporary bunds • Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with Implementing Agency on designated disposal areas • Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies • Place storage areas for fuels and lubricants away from any drainage leading to water bodies • Dispose wastes generated by construction activities in designated sites	Construction Contractor	Good construction practice to be followed by contractor – no additional costs
Impacts on landscape and aesthetics due to construction activity	• Prepare and implement Waste Management Plan – it should present how the surplus waste generated will temporarily stocked at the site, transported and disposed properly • Avoid stockpiling of excess excavated soils as far as possible • Avoid disposal of any debris and waste soils in the forest areas and in or near water bodies/rivers; • Coordinate with PIU for beneficial uses of excess excavated soils or immediately dispose to designated areas	Construction Contractor	Good construction practice to be followed by contractor – no additional costs
Hindrance to traffic movement	• Plan pipeline work in consultation with the traffic police • Plan work such that trench excavation, pipe laying, and refilling including compacting, at a stretch is completed in a minimum possible time; • Provide for immediate consolidation of backfilling material to desired compaction - this will allow immediate road restoration and therefore will minimise disturbance to the traffic movement; • Do not close the road completely, ensure that work is conducted onto edge of the road; allow traffic to move on one line; • In unavoidable circumstances of road closure, provide alternative routes, and ensure that public is informed about such traffic diversions;	Construction Contractor	Good construction practice to be followed by contractor – no additional costs

Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost of mitigation
	• At all work sites public information/caution boards shall be provided – information shall inter-alia include: project name, cost and schedule; executing agency and contractor details; nature and schedule of work at that road/locality; traffic diversion details, if any; entry restriction information; competent official's name and contact for public complaints. • Prepare a Traffic Management Plan – a template is provided for reference at Appendix 4.		
Nuisance/ disturbance to sensitive areas (schools, hospitals and religious places) due construction work in the proximity (within 250 m of such place)	• No material should be stocked in this area; material shall be brought to the site as and when required • Conduct work manually with small group of workers and less noise; minimize use of equipment and vehicles • No work should be conducted near the religious places during religious congregations • Material transport to the site should be arranged considering school timings; material should be in place before school starts; • Notify concerned schools, hospitals etc 1 week prior to the work; conduct a 30-m awareness program on nature of work, likely disturbances and risks and construction work, mitigation measures in place, entry restrictions and dos and don'ts • Implement all measures suggested elsewhere in this report – dust and noise control, public safety, traffic management, strictly at the sites.		
Impediment of access to houses and business	• Leave space for access between mounds of excavated soil • Provide wooden planks/footbridges for pedestrians and metal sheets for vehicles to allow access across trenches to premises where required • Consult affected businesspeople to inform them in advance when work will occur • Address livelihood issues, if any; implement the Resettlement Plan (RP) to address these issues • Provide sign/caution/warning boards at work site indicating work schedule and traffic information; prevent public entry into work sites through barricading and security; and • Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.	Construction Contractor	Good construction practice to be followed by contractor – no additional costs
Employment generation	• Employ at least 50% of the labour force, or to the maximum extent, local persons if manpower is available • Secure construction materials from local market.	Construction Contractor	NA

Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost of mitigation
Workers occupational health & safety	• Develop and implement site-specific Health and Safety (H and S) Plan 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 and S Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents; • All trenches deeper than 2 m shall be protected with wooden bracing to avoid safety risks to workers, public and nearby buildings/structures • Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site; • Provide medical insurance coverage for workers; • Secure all installations from unauthorized intrusion and accident risks; • Provide supplies of potable drinking water; • Provide clean eating areas where workers are not exposed to hazardous or noxious substances • Provide H and S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers; • Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted; • Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas; • Ensure moving equipment is outfitted with audible back-up alarms; • Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate; • Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively. • xiv. Overall, the contractor should comply with IFS EHS Guidelines on Occupational Health and Safety (this can be downloaded from http://www1.ifc.org/wps/wcm/connect/9aef2880488559a983acd36a6515bb18/2%2BOccupational%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES)	Construction Contractor	Good construction practice to be followed by contractor – no additional costs
Community health & safety	• Plan material and waste routes to avoid times of peak-pedestrian activities • Liaise with Byadgi TMC in identifying risk areas on route cards/maps • Maintain regularly the vehicles and use of manufacturer-approved parts to minimize	Construction Contractor	Good construction practice to

Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost of mitigation
	potentially serious accidents caused by equipment malfunction or premature failure • Provide road signs and flag persons to warn of dangerous conditions, in case of location near the road • Overall, the contractor should comply with IFS EHS Guidelines Community Health and Safety (this can be downloaded from http://www1.ifc.org/wps/wcm/connect/dd673400488559ae83c4d36a6515bb18/3%2BCommunity%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES		be followed by contractor – no additional costs
Temporary worker camps	• The contractor should establish and operate the temporary worker camps in compliance with IFC EHS Guidelines specific to workers accommodation ((this can be downloaded from http://www1.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/ifc+sustainability/publications/publications_gpn_workersaccommodation), including the following: • Consult with PIU/Byadgi TMC before locating workers camps/sheds, and construction plants; ; as far as possible located within reasonable distance of work site • Minimize removal of vegetation and disallow cutting of trees • Living facilities shall be built with adequate materials, and should be in good condition and free from rubbish and other refuge • The camp site should be adequately drained to avoid the accumulation of stagnant water • Provide water and sanitation facilities; water, meeting Indian drinking water standards shall be provided, in adequate quantities (supply of 60- 80 LPCD); all water storage structures must be cleaned regularly and covered properly to avoid any contamination • ii.vii. Provide separate facilities for men and women; sanitary facilities shall be properly build and well maintained; toilet and bath facilities should be provided on basis of 1 per 15 or less persons • Train employees in the storage and handling of materials which can potentially cause soil contamination; • Recover used oil and lubricants and reuse or remove from the site; • Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; • Remove all wreckage, rubbish, or temporary structures which are no longer required • Report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work. •	Construction Contractor	Good construction practice to be followed by contractor – no additional costs

Table 9: Summary Environmental Impacts & Mitigation Measures – Operation

Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost of Mitigation
General maintenance and repair work of water supply and sewer system (nuisance and disturbance to people, disruption services etc)	• Follow standard procedures as prescribed by O&M Manual • Ensure that all necessary equipment and tools are available for regular maintenance, especially for sewer network • Ensure there is overflow of sewers due to blockages or leaks; in case of occurrence, attend to these at the earliest • Implement all necessary mitigation measures suggested during construction (to avoid disturbance and inconvenience to people, business and traffic) • Ensure that the treated wastewater quality confirms with the following design standards (Water Act, 1974, refer Appendix 3 for details) ✓ BOD of 30 mg/l ✓ Suspended solids level of 100 mg/l ✓ Faecal coliform less than 1000/100 ml • Implement Emergency Response System (ERS template is provided in Appendix 5 for reference) for events such as leaks, and burst/leaks/overflows of sewers etc) • Implement operation and maintenance (O&M) plans for community toilets with participation of the community.	Byadgi TMC	Part of O&M costs

B. Environmental Monitoring Plan

125. A program of monitoring will be conducted to ensure that all parties take the specified action to provide the required mitigation, to assess whether the action has adequately protected the environment, and to determine whether any additional measures may be necessary. Regular monitoring of implementation measures by construction contractors will be conducted by the PIU with Consultant Team's support. Periodic monitoring and overseeing of implementation of mitigation measures will be PMU. Monitoring during operation stage will be conducted by the Operating Agency, Byadgi TMC, and regulatory compliance monitoring will be conducted by Karnataka State Pollution Control Board (in case of WWTP) as per their normal procedures.

126. Most of the mitigation measures are fairly standard methods of minimizing disturbance from building in urban areas (maintaining access, planning work to minimize public inconvenience and traffic disruptions, finding uses for waste material, etc). Monitoring of such measures normally involves making observations in the course of site visits, although some require more formal checking of records and other aspects. Sampling and monitoring of water and raw/treated wastewater quality will be conducted regularly. Laboratory facilities are included in the subproject.

127. Following Table shows the proposed Environmental Monitoring Plan for this subproject, which specifies the various monitoring activities to be conducted during different phases of the project. The EMP describes: (i) mitigation measures, (ii) location, (iii) measurement method, (iv) frequency of monitoring and (v) responsibility (for both mitigation and monitoring).

Table 10: Environmental Monitoring Plan

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
Pre-Construction						
Identify and include locations and operators of the utilities in the detailed design documents	-	PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU	NA
Require construction contractors to prepare a contingency plan	-	Contractor	Review the contingency plan	Once prior to the relocation of utilities	PIU	NA
Design pumping equipment with maximum efficiency to optimize the power consumption		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	NA
Various combinations of number of pumps, stages, motor speed should be considered to select the best pump with ideal specific speeds.		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	NA
Specific speeds of the pumps should be selected to achieve maximum efficiency of pumps.		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	NA
Attainable efficiency for procuring the pumps and motors should be considered as 88 to 92 % for pumps and 94 % for motors. It is proposed that during the procurement, the evaluation of bid shall also be in terms of efficiency.		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	NA
The pumps shall conform to IS 1710 – 1989 Specification for Pump and IS 5120–1992 Technical Requirements for Roto-dynamic Special Purpose Pumps and tested to class		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as	Once before DPR approval	PMU /PMC	NA

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
3 of IS: 9137-1978 Code for Acceptance Tests for Centrifugal, Mixed Flow and Axial Flow Pumps.			appropriate			
The WWTP should be designed for following treated water disposal standards (Notified under Water Act, 1974, for more details refer Appendix 3): • BOD of 30 mg/l • Suspended solids level of 100 mg/l • Faecal coliform less than 1000/100 ml,		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	NA
Conduct regular wastewater quality monitoring (at inlet and at outlet of WWTP) to ensure that the treated effluent quality complies with the standards		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	NA
Prohibit/prevent disposal of wastewater/effluent from industrial units in the sewers; ensure regular checking to ensure no illegal entry of industrial wastewater into sewers		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	NA
Utilize treated water for irrigation use in the surrounding fields		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	NA
Limit the sewer depth where possible.		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	NA
Sewers shall be laid away from water supply lines and drains (at least 1 m, wherever possible);		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	NA

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
In all cases, the sewer line should be laid deeper than the water pipeline (the difference between top of the sewer and bottom of water pipeline should be at least 300 mm)		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	NA
In unavoidable, where sewers are to be laid close to storm water drains or canals or natural streams, appropriate pipe material shall be selected (stoneware pipes shall be avoided)		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	NA
For shallower sewers, use small inspection chambers in lieu of manholes;		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	NA
Design manhole covers to withstand anticipated loads & ensure that the covers can be readily replace if broken to minimize silt/garbage entry		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	NA
Ensure sufficient hydraulic capacity to accommodate peak flows & adequate slope in gravity mains to prevent build up of solids and hydrogen sulfide generation		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	NA
Equip pumping stations with a backup power supply, such as a diesel generator		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	NA
Establish routine maintenance program, including: • Regular cleaning of grit chambers and sewer lines to remove grease, grit, and other debris that may lead to sewer		PIU / Consultant Team	Review & check the inclusion/ provision in DPR/O&M manual as	Once before DPR /O&M Manual approval	PMU /PMC	NA

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
backups. Cleaning should be conducted more frequently for problem areas. • Inspection of the condition of sanitary sewer structures and identifying areas that need repair or maintenance. • Monitoring of sewer flow to identify potential inflows and outflows			appropriate			
Conduct repairs prioritized based on the nature and severity of the problem. Immediate clearing of blockage or repair is warranted where an overflow is currently occurring or for urgent problems that may cause an imminent overflow		PIU / Consultant Team	Review & check the inclusion/ provision in DPR/O&M manual as appropriate	Once before DPR /O&M Manual approval	PMU /PMC	NA
Review previous sewer maintenance records to help identify “hot spots” or areas with frequent maintenance problems and locations of potential system failure, and conduct preventative maintenance, rehabilitation, or replacement of lines as needed;		PIU / Consultant Team	Review & check the inclusion/ provision in DPR/O&M manual as appropriate	Once before DPR /O&M Manual approval	PMU /PMC	NA
When a spill, leak, and/or overflow occurs, keep sewage from entering the storm drain system by covering or blocking storm drain inlets or by containing and diverting the sewage away from open channels and other storm drain facilities (using sandbags, inflatable dams, etc.). Remove the sewage using vacuum equipment or use other measures to divert it back to the sanitary sewer system		PIU / Consultant Team	Review & check the inclusion/ provision in DPR/O&M manual as appropriate	Once before DPR /O&M Manual approval	PMU /PMC	NA
Develop Emergency Response Plan for all emergencies such as leaks, overflows, bursts; a template of ERP is provided at Appendix 5.		PIU / Consultant Team	Review & check the inclusion/ provision in DPR/O&M manual as	Once before DPR /O&M Manual approval	PMU /PMC	NA

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
			appropriate			
Provide necessary health & safety training to the staff sewer cleaning & maintenance; WWTP operation; sludge handling		PIU / Consultant Team	Review & check the inclusion/ provision in DPR/O&M manual as appropriate	Once before DPR /O&M Manual approval	PMU /PMC	NA
Provide all necessary personnel protection equipment		PIU / Consultant Team	Review & check the inclusion/ provision in DPR/O&M manual as appropriate	Once before DPR /O&M Manual approval	PMU /PMC	NA
For personnel cleaning underground sewers there is a risk due to oxygen deficiency and harmful gaseous emissions (hydrogen sulphide, carbon monoxide, methane, etc); the design should consider these risks and provide for adequate equipment (including oxygen masks) for emergency use		PIU / Consultant Team	Review & check the inclusion/ provision in DPR/O&M manual as appropriate	Once before DPR /O&M Manual approval	PMU /PMC	NA
Provide a green buffer zone of 10-15 m wide around the WWTP; this should be planted with trees in multi-rows. This will act as a visual screen around the open ponds and will improve the aesthetic appearance.		PIU / Consultant Team	Review & check the inclusion/ provision in DPR/O&M manual as appropriate	Once before DPR /O&M Manual approval	PMU /PMC	NA
Develop and implement operation and maintenance (O&M) plans for community toilets with participation from the community. A memorandum of understanding (MoU) between Byadgi TMC and community will be reached prior to any construction and operation of community toilets.		Byadgi TMC, PIU / Consultant Team	Review & check the inclusion/ provision in DPR/O&M manual as appropriate	Once before DPR /O&M Manual approval	PMU /PMC	NA

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
As a minimum, the O&M plan should specify (i) cleaning procedures and frequency; (ii) responsible personnel; (iii) maintenance and repairs schedule; (iv) emergency contact numbers etc.						
Construction						
Conduct detailed site surveys with the construction drawings and discuss with the respective agencies during the construction phase before ground clearance;	-	Contractor	Check contractor records Random checks on site, drawings and interactions with respective agencies	Once prior to the start of ground clearance for construction	PIU	NA
Prepare a contingency plan to include actions to be done in case of unintentional interruption of services.	-	Contractor	Review the plan	Once prior to start of construction	PIU	NA
In case of disruption of water supply, alternative supply, through tankers, shall be provided; water may be made available by the Byadgi TMC, but it will the responsibility of contractor to supply to affected people	Utility relocation site	Contractor	Site observations Informal public consultations	Weekly Once	PIU	NA
Prioritize areas within or nearest possible vacant space in the subproject location Construction work camps shall be located at least 200 m from residential areas Do not consider residential areas for stockpiling the waste/surplus soil;	Sites for worker camp, material store	Contractor	Site observations	Before & after such establishment	PIU	NA
Material stockpiles shall be protected by bunds during the monsoon to arrest the silt laden runoff into drains	Stockpile sites	Contractor	Site observations	Weekly	PIU	NA
Surplus soil from trench excavations (pipeline and sewers) shall be utilized for construction of WWTP, which is located	Excavation /dumping sites	Contractor	Site observations	Weekly	PIU	NA

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
outside the town						
Contractor should obtain material from existing mines approved/licensed by Mines and Geology Department/ Revenue Department. Verify suitability of all material sources and obtain approval of implementing agency No new quarry sites shall be developed for the subproject purpose	-	Contractor	Check sources & approvals	Prior to approval of quarry for material	PIU	NA
Submit a monthly statement of construction material procured indicating material type, source and quantity.	-	Contractor	Record check	Monthly	PIU	NA
Consult with PIU on the designated areas for stockpiling of clay, soils, gravel, and other construction materials;	Stockpile site	Contractor	Site check & approval	Prior to approval	PIU	NA
Damp down exposed soil and any stockpiled on site by spraying with water when necessary during dry weather Bring materials (aggregates, sand, etc gravel) as and when required Use tarpaulins to cover sand and other loose material when transported by vehicles; Clean wheels and undercarriage of vehicles prior to leaving construction site	Work site	Contractor	Site observations Informal public consultations	Weekly	PIU	NA
Fit all heavy equipment and machinery with air pollution control devices which are operating correctly; ensure valid Pollution Under Control (PUC) Certificates for all vehicles and equipment used in the construction activity	Work site	Contractor	Check valid PUC	Prior to start and quarterly there after	PIU	NA
Plan activities in consultation with the PIU so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least	Work site	Contractor	Check work schedule of contractor; public	Prior to start of work	PIU	NA

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
disturbance; Construction work shall be limited to day light hours (6 AM to 6 PM) for all the works located within the town; for facilities outside the town (i.e. WWTP) the timings may be relaxed with the permission of Byadgi TMC and PIU, however no work should be conducted between 10 PM – 6 AM at any site. Provide prior information to the local public about the work schedule;			consultation records			
Ensure that there are no old and sensitive buildings that may come under risk due to the use of pneumatic drills; if there is risk, cut the rocks manually by chiselling;	Work site	Contractor	Site observations	Weekly	PIU	NA
Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor; and	Work site	Contractor	Site observations	Weekly	PIU	NA
Maintain maximum sound levels not exceeding 80 decibels (dbA) when measured at a distance of 10 m or more from the vehicle/s	Work site	Contractor	Noise monitoring	Quarterly	Contractor	NA
Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets Stockpiles shall be provided with temporary bunds Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with PIU on designated disposal areas Install temporary silt traps or sedimentation	Work site	Contractor	Site observations	Weekly	PIU	NA

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
basins along the drainage leading to the water bodies Place storage areas for fuels and lubricants away from any drainage leading to water bodies Dispose wastes generated by construction activities in designated sites Avoid stockpiling of excess excavated soils as far as possible Avoid disposal of any debris and waste soils in the forest areas and in or near water bodies/rivers; Coordinate with PIU for beneficial uses of excess excavated soils or immediately dispose to designated areas						
Prepare and implement Waste Management Plan – it should present how the surplus waste generated will temporarily stocked at the site, transported and disposed properly	-	Contractor	Waste Management Plan review & approval	Once prior to start of construction	PIU	NA
Plan pipeline work in consultation with the traffic police Plan work such that trench excavation, pipe laying, and refilling including compacting, at a stretch is completed in a minimum possible time; Provide for immediate consolidation of backfilling material to desired compaction - this will allow immediate road restoration and therefore will minimise disturbance to the traffic movement Do not close the road completely, ensure that work is conducted onto edge of the road; allow traffic to move on one line In unavoidable circumstances of road	Work site	Contractor	Work program review Site observations Informal public consultation	Once prior to start of construction Weekly during work	PIU	NA

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
closure, provide alternative routes, and ensure that public is informed about such traffic diversions; Plan material and waste routes to avoid times of peak-pedestrian activities Liaise with Byadgi TMC in identifying risk areas on route cards/maps						
At all work sites public information/caution boards shall be provided – information shall inter-alia include: project name, cost and schedule; executing agency and contractor details; nature and schedule of work at that road/locality; traffic diversion details, if any; entry restriction information; competent official's name and contact for public complaints.	Work site	Contractor	Site observations	Once prior to start of construction	PIU	NA
Prepare a Traffic Management Plan – a template is provided for reference at Appendix 4.	Work site	Contractor	Review, approval and on-site implementation of TMP	Once prior to start of construction; weekly during work	PIU	NA
No material should be stocked in this area; material shall be brought to the site as and when required Conduct work manually with small group of workers and less noise; minimize use of equipment and vehicles No work should be conducted near the religious places during religious congregations Material transport to the site should be arranged considering school timings; material should be in place before school starts; Notify concerned schools, hospitals etc 1	Work near sensitive areas	Contractor	Work program review Site observations Informal public consultation	Once prior to start of construction Weekly during work	PIU	NA

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
week prior to the work; conduct a 30-m awareness program on nature of work, likely disturbances and risks and construction work, mitigation measures in place, entry restrictions and dos and don'ts Implement all measures suggested elsewhere in this report – dust and noise control, public safety, traffic management, strictly at the sites.						
Leave space for access between mounds of excavated soil Provide wooden planks/footbridges for pedestrians and metal sheets for vehicles to allow access across trenches to premises where required Consult affected businesspeople to inform them in advance when work will occur Address livelihood issues, if any; implement the Resettlement Plan (RP) to address these issues Provide sign/caution/warning boards at work site indicating work schedule and traffic information; prevent public entry into work sites through barricading and security; and Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.	Work site	Contractor	Site observations Informal public consultation	Weekly	PIU	NA
Employ at least 50% of the labour force, or to the maximum extent, local persons if manpower is available Secure construction materials from local market.	Work site	Contractor	Review records Worker consultation	Weekly	PIU	NA
Develop and implement site-specific	Work site	Contractor	Review and on-	Once prior to	PIU	NA

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
Environment, Health and Safety (EHS) Plan 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 and S Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents; All trenches deeper than 2 m shall be protected with wooden bracing to avoid safety risks to workers, public and nearby buildings/structures Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site; Provide medical insurance coverage for workers; Secure all installations from unauthorized intrusion and accident risks; Provide supplies of potable drinking water; Provide clean eating areas where workers are not exposed to hazardous or noxious substances Provide H and S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers; Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted;			site implementation of EHS Plan	start of construction; weekly during work		

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas; Ensure moving equipment is outfitted with audible back-up alarms; Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate; Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively. Overall, the contractor should comply with IFS EHS Guidelines on Occupational Health and Safety (this can be downloaded from http://www1.ifc.org/wps/wcm/connect/9aef2880488559a983acd36a6515bb18/2%2BOccupational%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES)						
Provide road signs and flag persons to warn of dangerous conditions, in case of location near the road Overall, the contractor should comply with IFS EHS Guidelines Community Health and Safety (this can be downloaded from http://www1.ifc.org/wps/wcm/connect/dd673400488559ae83c4d36a6515bb18/3%2BCo	Work site	Contractor	Review and on-site implementation of EHS Plan	Once prior to start of construction; weekly during work	PIU	NA

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
mmunity%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES						
The contractor should establish and operate the temporary worker camps in compliance with IFC EHS Guidelines specific to workers accommodation ((this can be downloaded from http://www1.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/ifc+sustainability/publications/publications_gpn_workersaccommodation), including the following: Consult with PIU/Byadgi TMC before locating workers camps/sheds, and construction plants; ; as far as possible located within reasonable distance of work site Minimize removal of vegetation and disallow cutting of trees Living facilities shall be built with adequate materials, and should be in good condition and free from rubbish and other refuge The camp site should be adequately drained to avoid the accumulation of stagnant water Provide water and sanitation facilities; water, meeting Indian drinking water standards shall be provided, in adequate quantities (supply of 60- 80 LPCD); all water storage structures must be cleaned regularly and covered properly to avoid any contamination Provide separate facilities for men and women; sanitary facilities shall be properly build and well maintained; toilet and bath facilities should be provided on basis of 1	Workers camp site	Contractor	Site observations and facilities	Once prior to start of construction; monthly during work	PIU	NA

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
per 15 or less persons Train employees in the storage and handling of materials which can potentially cause soil contamination; Recover used oil and lubricants and reuse or remove from the site; Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; Remove all wreckage, rubbish, or temporary structures which are no longer required Report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.						

Environmental Quality Monitoring – Construction						
Ambient air quality	2 points (WWTP site and centre of the town)	-	• SPM, RSPM • Monitoring method as prescribed by CPCB	Once before start of construction Quarterly (yearly 4-times) during construction	Contractor	$ 100 per sample – sum $ 1,800
Operation						
Monitoring of quality of water supplied to consumers	All Service reservoirs		pH, Cl, F, NO3, TC, FC, Hardness, Turbidity BOD, Total Alkalnity, , Total coliform and E-coliform	Monthly once	Byadgi TMC	Part of laboratory O&M Costs
	Consumer end- random sampling in all zones		pH, Cl, F, NO3, TC, FC, Hardness, Turbidity BOD, Total Alkalnity, Total coliform and E-coliform	Yearly once	Byadgi TMC	Part of laboratory O&M Costs
Monitoring of treated	Inlet and outlet of WWTP	Operator	Parameters as specified by KSPCB	Monthly	Byadgi TMC	Part of laboratory

wastewater quality from WWTP			Concentration of various parameters shall be within the specific limits by KSPCB			O&M Costs
	Inlet	operator	Analysis of Wastewater characteristics including heavy metals such as Mercury (as Hg), Lead (as Pb), Cadmium (as Cd), Chromium (as Cr), Zinc (as Zn) and Nickel (as Ni) Concentration of various parameters shall be within the specific limits by KSPCB	Yearly twice	Byadgi TMC	Part of O&M costs
	Inlet and outlet of WWTP	Operator	Parameters as specified by KSPCB Concentration of various parameters shall be within the specific limits by KSPCB	Monthly	Byadgi TMC through accredited lab/ KSPCB	Part O&M costs
Sludge quality and suitability as manure	Anaerobic ponds	Operator	Analysis for concentration of heavy metals and confirm that value are within the following limits (all units are in mg/kg dry basis except pH) • Arsenic - 10.00 • Cadmium - 5.00 • Chromium - 50.00 • Copper - 300.00 • Lead - 100.00 • Mercury - 0.15 • Nickel - 50.00 • Zinc - 1000.00 • PH - 5.5-8.5	Yearly once/ or as required during dried sludge removal from ponds	Byadgi TMC through accredited lab	Part O&M costs

C. Environmental Management & Monitoring Costs

128. Most of the mitigation measures require the Contractors to adopt good site practices, which are part of their normal procedures, so there are unlikely to be major costs associated with compliance. These costs of mitigation by the contractors are included in the budgets for the civil works. Mitigation and monitoring provided by the PIU/PMU or their consultants will be part of incremental administration costs. Costs required for environmental quality monitoring is indicated in the following Table.

Table 11: Environmental Management and Monitoring Costs

Item	Responsible Agency	Quantity/Details	Total Cost (US$)	Source of funds
Tree plantation & maintenance for 2 years at WWTP site	Contractor	-	10,000	Included in the project cost as BOQ item
Air quality monitoring	Contractor	18 samples	1,800	Included in the project cost as BOQ item
Monitoring of implementation of mitigation measures	PIU / PMU / Consultants	As required	Part of incremental admin costs	Project funds
Water quality monitoring	Operating agency/Byadgi TMC	As required	Part of O&M costs of operator	O&M funds
Waste water quality monitoring	Operating agency/Byadgi TMC	As required	Part of O&M costs of operator	O&M funds
Sludge water quality	Operating agency/Byadgi TMC	As required	Part of O&M costs of operator	O&M funds
		Total costs	**$11,800**	

D. Grievance Redress Mechanism

129. A project specific grievance redress mechanism (GRM) will be established to receive, evaluate and facilitate concerns of, complaints and grievances of the DPs in relation to project's social and environmental performances. The main objective of the GRM will be to provide time bound action and transparent mechanism to resolve social and environment concerns.

130. A project GRM will cover the project's towns for all kinds of grievances and will be regarded as an accessible and trusted platform for receiving and facilitating project related complaints and grievances. The multi-tier GRM for the program will have realistic time schedules to address grievances and specific responsible persons identified to address grievances and whom the DPs have access to interact easily.

131. Awareness on grievance redress procedures will be created through Public Awareness Campaign with the help of print and electronic media and radio. The resettlement NGO will ensure that vulnerable households are also made aware of the GRM and assured of their grievances to be redressed adequately and in a timely manner.

132. There will be multiple means of registering grievances and complaints by dropping grievance forms in complaint/ suggestion boxes at accessible locations, or through telephone hotlines, email, post or writing in a complaint registrar book in ULB's project office. There will be complaint registrar book and complaint boxes at construction site office to enable quick response of grievances/ complaints for urgent matters. The name, address and contact details of the persons with details of the complaint / grievance, location of problem area, date of receipt of complaint will be documented. The RPMU's Social development / Resettlement Officer will be responsible at the project level for timely resolution of the environmental and social safeguards issues and registration of grievances, and communication with the aggrieved persons. Annex 1 is the draft PID to be distributed to all affected communities and DPs which include the contact numbers of the respective ULB officer(s) responsible for the KISWRMIP.

E. Grievance Redress Process

133. There will be several tiers for grievance redress process. Simple grievances for immediate redress will first be resolved at site by Contractor.. If unaddressed for up to 7 days the complainants may go to PIU officer in ULB responsible for resettlement/social issues. Project engineer and the resettlement NGO will assist in resolving the issues. Name, designation and contact number of personnel responsible for grievance redress at ULB and RPMU, will be posted at Contractor's and PMDSC's site office in full visibility of public. NGO will be involved in community mobilization and awareness campaign among the communities. Grievances of immediate nature should be resolved at site/ within ULB/PIU level within 15 days of registration of grievances.

134. All grievances that cannot be resolved by ULB/PIU within 15 days will be forwarded to RPMU's Social safeguards/R&R Officer and PMDSC specialist who will review and resolve within 15 working days of grievance registration with the assistance of the Resettlement NGO and concerned PIU/ULB personnel, if required.

135. The grievances of critical nature and those cannot be resolved at RPMU level should be referred to Grievance Redress Committee (GRC)/Steering Committee (ST) set up at district level to be settled within 30 days. All documents related to grievances, follow up action taken to resolve along with explanatory note on nature, seriousness and time taken for grievance redress shall be prepared by RPMU Social safeguard / R&R Officer and circulated to GRC/SC members at least a week prior to scheduled meeting. The decision taken at the GRC/SC level will be communicated to the DPs by RPMU Social safeguards/R&R officer through ULB/PIU and resettlement NGO.

136. For any issues that remain unresolved by the GRC or SC or the decision taken at such meetings are not acceptable, the complainants /DPs can approach the Court of Law as per Govt. of Karnataka legal procedure.

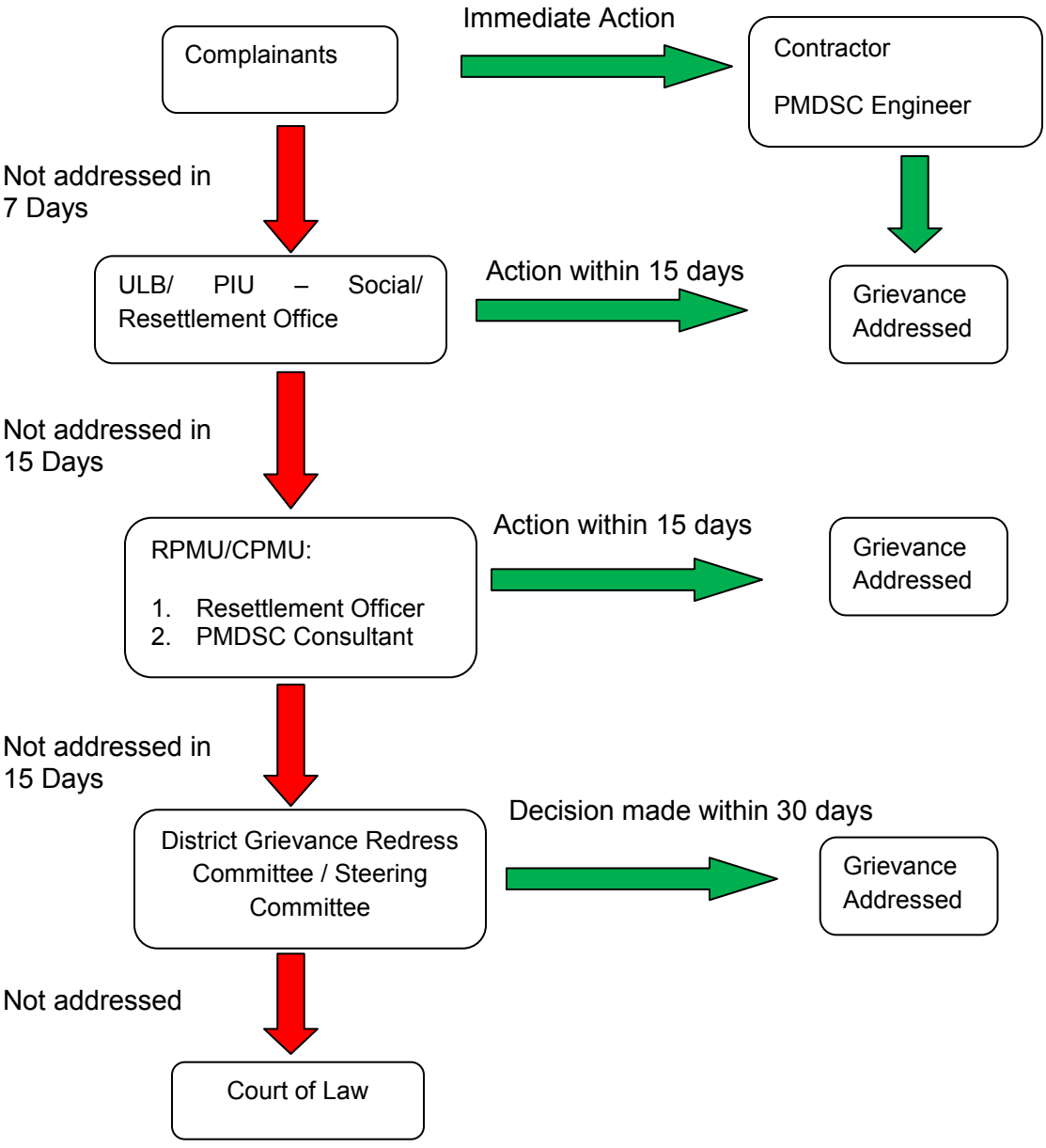
F. GRC / SC composition and selection of members

137. The GRC/ SC for the project will be headed by Dy. Commissioner (DC) of the district with members as followed: (1) ULB Commissioners of project towns,(2) Revenue Department (Registrar) official, (3) RPMU Social safeguard/ R&R Officer of KIUWMIP, (4) ULB officer who will convene the periodic meeting of GRC and will shoulder responsibility of keeping records of grievances/ complaints in details with help from resettlement NGO. Other members, such as, NGO/CBO representatives, wards council representatives, DPs' representatives will be selected by the ULB Commissioner to represent in the GRC/SC meeting. NGO should also deploy one

person in the team who will be responsible for coordinating with all GRC members and the DPs for grievance redress.

138. In the event when the established GRM is not in a position to resolve the issue, Affected Person also can use the ADB Accountability Mechanism (AM) through directly contact (in writing) to the Complain Receiving Officer (CRO) at ADB headquarters or to ADB Indian Resident Mission (INRM). The complaint can be submitted in any of the official languages of ADB's DMCs. The ADB Accountability Mechanism information will be included in the PID to be distributed to the affected communities, as part of the project GRM. A Grievance Redress Mechanism is shown in the Figure 10.

Figure 10: Grievance Redress Process



VIII. PUBLIC CONSULTATION & INFORMATION DISCLOSURE

A. Project Stakeholders

139. 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 are:

(i) Residents, shopkeepers and businesspeople near the work sites;
(ii) Public representatives and prominent citizens of the town
(iii) Byadgi Town Municipal Council
(iv) KUIDFC, GoK

140. Secondary stakeholders are:

(i) Other concerned government institutions (utilities, regulators, etc)
(ii) NGOs and CBOs working in the affected communities;
(iii) Other community representatives (prominent citizens, religious leaders, elders, women's groups);
(iv) The beneficiary community in general; and
(v) ADB as the funding agency

B. Consultation & Disclosure Till Date

141. A series of public consultation meetings were conducted during the project preparation. Various forms of public consultations (consultation through ad hoc discussions on site) have been used to discuss the project and involve the community in planning the project and mitigation measures.

142. Besides, a public consultation workshop was conducted on October 3, 2012 at Davangere for all the four project towns to discuss the proposed project and likely environmental issues and mitigation measures. Key stakeholders – public representatives, officials from various agencies, district level officers, from each project town, including Byadgi, were participated in the workshop. Minutes of this consultation meeting is appended at Appendix 6.

C. Future Consultation & Disclosure

143. EA and IA shall extend and expand the consultation and disclosure process significantly during implementation of the Investment Program.

(i) Consultation during detailed design:

- Focus-group discussions with affected persons and other stakeholders (including women's groups, NGOs and CBOs) to hear their views and concerns, so that these can be addressed in subproject design where necessary; and
- Structured consultation meetings with the institutional stakeholders (government bodies and NGOs) to discuss and approve key aspects of the project.

(ii) Consultation during construction:

- Public meetings with affected communities (if any) to discuss and plan work programmes and allow issues to be raised and addressed once construction has started; and
- Smaller-scale meetings to discuss and plan construction work with individual communities to reduce disturbance and other impacts, and provide a mechanism through which stakeholders can participate in subproject monitoring and evaluation;

(iii) Project disclosure:

- Public information campaigns (via newspaper, TV and radio) to explain the project to the wider town population and prepare them for disruption they may experience once the construction programme is underway;
- Public disclosure meetings at key project stages to inform the public of progress and future plans, and to provide copies of summary documents in Kannada; and
- Formal disclosure of completed project reports by making copies available at convenient locations in the study towns, informing the public of their availability, and providing a mechanism through which comments can be made.

144. Based on ADB requirements, the following will be posted on ADB website: (i) this IEE, upon finalization and approval of ADB; (ii) a new or updated IEE, if prepared, reflecting significant changes in the Project during design or implementation; (iii) corrective action plan prepared during Project implementation to address unanticipated environmental impacts and to rectify non-compliance to EMP provisions; and (iv) environmental monitoring reports. Documents will also be available on the websites of KUIDFC and Byadgi TMC.

IX. RECOMMENDATION & CONCLUSION

A. Recommendation

145. The process described in this document has assessed the environmental impacts of all elements of the infrastructure proposed under the Byadgi Water Supply and Sewerage Subproject. Potential negative impacts were identified in relation to location, design, construction and operation of the improved infrastructure. Mitigation measures have been developed in generic way to reduce all negative impacts to acceptable levels. These were discussed with specialists responsible for the engineering aspects, and as a result some measures have already been included in the outline designs for the infrastructure. This means that the number of impacts and their significance has already been reduced by amending the design. Various design related measures suggested for: energy efficiency design; standard operating procedures for operation and maintenance; providing necessary safety and personal protection equipment for workers engaged in sewer cleaning (protection against oxygen deficiency, harmful gaseous emissions) and development of green buffer zone around the sewage treatment plant.

146. The proposed WWTP will be constructed on a private land. The land will be acquired from the private owner. Necessary Resettlement Planning study has been conducted, and appropriate mitigation/compensatory measures suggested.

147. During the construction phase, impacts mainly arise from the need to dispose waste soil; from the disturbance to residents, businesses, traffic and important buildings; and from safety issues from the construction work. These are common impacts of construction in urban areas, and there are well developed methods for their mitigation.

148. There were limited opportunities to provide environmental enhancements, but certain measures were included. For example it is proposed that the project will employ in the workforce people who live in the vicinity of construction sites to provide them with a short-term economic gain; and ensure that people employed in the longer term to maintain and operate the new facilities are residents of nearby communities.

149. Once the system is operating, the facilities will operate with routine maintenance, which should not affect the environment. As far the sewerage system is concerned, the operation will comply with the O&M manual to be developed for all the activities - operation and maintenance of sewer network, wet well and sewage treatment plant. O&M Manual will be developed during the detailed design stage, and the staff will be provided with necessary training and equipment.

150. The citizens of the Byadgi Town will be the major beneficiaries of this subproject. With the improved water supply, they will be provided with a constant supply of better quality water, piped into their homes. The sewerage system will remove the human waste from those areas served by the network rapidly and treated to an acceptable standard. In addition to improved environmental conditions, the subproject will improve the over-all health condition of the town. Diseases of poor sanitation, such as diarrhoea and dysentery, should be reduced, so people should spend less on healthcare and lose fewer working days due to illness, so their economic status should also improve, as well as their overall health.

151. Mitigation will be assured by a program of environmental monitoring conducted during construction and operation to ensure that all measures are implemented, and to determine whether the environment is protected as intended. This will include observations on- and off-site, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported to the PIU/PMU. There will also be regular and periodic monitoring surveys for quality of water (at reservoirs and at consumer end) and wastewater (raw and treated wastewater quality at WWTP inlet and outlet), and sludge quality to check the suitability as manure.

152. Finally, stakeholders were involved in developing the IEE through city-level consultation meetings with key stakeholders, face-to-face discussions and on site meetings, after which views expressed were incorporated into the IEE and the planning and development of the project. The IEE will be made available at public locations in the city and will be disclosed to a wider audience via the ADB website. The consultation process will be continued and expanded during project implementation to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation.

B. Conclusion

153. The subproject is unlikely to cause significant adverse impacts. The potential adverse 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.

154. Based on the findings of the IEE, the classification of the Project as Category “B” is confirmed, and no further special study or detailed EIA needs to be undertaken to comply with ADB SPS (2009) or GoI EIA Notification (2006). Necessary consent from Karnataka State Pollution Control Board Construction should be obtained for construction and operation of WWTP.

155. This IEE needs to be updated as the subproject preparation progresses to detailed design to reflect the latest subproject design.

Site Photographs

Photo 1: View of Byadgi Town from Hillock

Photo 4: Proposed WWTP Site Surroundings

Photo 2: Proposed WWTP Site

Photo 5: Homardi Lake

Photo 3: Shanbogar Nala near the town

Photo 6: Shanbogar nala at WWTP site

Photo 7: Existing GLSR at Bettada Mallappa Hillock

Photo 10: View of a Road in Byadgi

Photo 8: Proposed GLSR Site - Bettada Mallappa Hillock

Photo 11: Basanakatti Pond

Photo 9: View of Byadgi Main Road

Photo 12: Hunda (Man-made open storage tank)

Appendix 1: REA Checklist

RAPID ENVIRONMENTAL ASSESSMENT (REA) CHECKLIST
Byadgi Water Supply & Sewerage Subproject

Screening Questions	Yes	No	Remarks
A. Project Siting Is the project area…			
▪ Densely populated?	**x**		Subproject activities extend to the entire city including the densely populated areas. There are no major negative impacts envisaged, because water supply/ sewer network will be located in unused government lands alongside the existing roads and can be constructed without causing disturbance to houses and commercial establishments. In narrow streets, disruption to road users is likely, and measures like best activity scheduling/ traffic management, alternative routes, and prior information to road users, houses and shops will minimize the impact to acceptable levels. The construction of the new overhead storage reservoir site is located on the outskirts.
▪ Heavy with development activities?	**x**		Byadgi is a developing town; urban expansion is considerable.
▪ Adjacent to or within any environmentally sensitive areas?			
▪ Cultural heritage site		**x**	
▪ Protected Area		**x**	
▪ Wetland		**x**	
▪ Mangrove		**x**	
▪ Estuarine		**x**	
▪ Buffer zone of protected area		**x**	
▪ Special area for protecting biodiversity ▪		**x**	
▪ Bay		**x**	

Screening Questions	Yes	No	Remarks
Water Supply			
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?		**x**	Subproject will utilize the existing surface sources; no source improvement / augmentation proposed in the subproject
▪ impairment of historical/cultural monuments/areas and loss/damage to these sites?		**x**	There is no historical / cultural monument in the project location.
▪ hazard of land subsidence caused by excessive ground water pumping?		**x**	No ground water source will be used for this project.
▪ social conflicts arising from displacement of communities ?		**x**	The subproject does not involve land acquisition or displacement.
▪ conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?		**x**	No source improvement/ augmentation proposed in the subproject
▪ unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)?		**x**	Subproject involves supply of treated water.
▪ delivery of unsafe water to distribution system?		**x**	Subproject involves distribution of treated water supplies
▪ inadequate protection of intake works or wells, leading to pollution of water supply?		**x**	Subproject will utilize the existing surface sources; no source improvement/augmentation proposed in the subproject
▪ over pumping of ground water, leading to salinization and ground subsidence?		**x**	No ground water is proposed to be abstracted.
▪ excessive algal growth in storage reservoir?		**x**	Regular cleaning of storage reservoir shall be ensured to avoid algal growth in the reservoir.
▪ increase in production of sewage beyond capabilities of community facilities?		**x**	Sewerage system of adequate capacity including treatment is proposed under the subproject
▪ inadequate disposal of sludge from water treatment plants?		**x**	Subproject does not include water treatment works
▪ inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?		**x**	Subproject does not include pumping equipment/stations
▪ impairments associated with transmission lines and access roads?	**x**		Anticipated during construction activities. However impacts are temporary and short in duration. The EMP includes measure to mitigate impacts.

Screening Questions	Yes	No	Remarks
▪ health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.		x	Subproject does not include the design and construction of chlorine facilities and receiving, storing and handling of other hazardous chemicals.
▪ health and safety hazards to workers from handling and management of chlorine used for disinfection, other contaminants, and biological and physical hazards during project construction and operation?		x	Subproject does not include constriction and/ or installation of chlorination unit.
▪ dislocation or involuntary resettlement of people?	x		There may be temporary disturbance to business and squatters/vendors during construction. A resettlement plan has prepared to mitigate/compensate these impacts.
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		x	Not applicable.
▪ noise and dust from construction activities?	x		Short term impact on air quality due to dust generation during construction activities is anticipated. Appropriate dust suppression measures will be taken to minimize dust generation due to construction activities at site. No significant increase in noise level is anticipated due to construction. All equipment and machineries will conform to the Statutory norms.
▪ increased road traffic due to interference of construction activities?	x		Proper traffic management and planning will be ensured during construction.
▪ continuing soil erosion/silt runoff from construction operations?	x		Construction activities (pipe laying, etc.) on hill slopes may increase the chance of land slide and soil erosion. Careful stacking of excavated materials will be ensured to avoid slippage and erosion especially on hill slopes (GLSR site). Construction work during monsoon shall be carried out with due care so that silt run off due to construction operation is prevented. No construction will be allowed during rains.

Screening Questions	Yes	No	Remarks
▪ 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?		x	Trained and skilled staff will be deployed for O&M. Also, quality of treated water will be regularly monitored through water sample testing to ensure delivery of safe water to consumers.
▪ delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals?		x	uPVC pipes will be used for distribution system and are non corrosive in nature.
▪ accidental leakage of chlorine gas?		x	Subproject does not include chlorination unit
▪ excessive abstraction of water affecting downstream water users?		x	Subproject will utilize the existing surface sources; no source improvement / augmentation proposed in the subproject
▪ competing uses of water?		x	Not applicable.
▪ increased sewage flow due to increased water supply	x		Sewerage system of adequate capacity including treatment is proposed under the subproject
▪ increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant	x		Sewerage system of adequate capacity including treatment is proposed under the subproject
▪ large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		x	No such impact anticipated as the import of workforce will be limited to skilled workers; local communities in the vicinity of the project would be employed as much as possible.
▪ social conflicts if workers from other regions or countries are hired?		x	Not anticipated as local communities within the project vicinity will be employed as much as possible.
▪ risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during operation and construction?		x	Not applicable. Construction will not involve use of explosives and chemicals.
▪ community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?		x	Operational area will be clearly demarcated and access will be controlled. Only workers and project concerned members will be allowed to visit the operational sites.
Sewerage			
C. Potential Environmental Impacts Will the Project cause…			
▪ impairment of historical/cultural monuments/areas and loss/damage to these sites?		x	There are no such areas near the subproject sites

Screening Questions	Yes	No	Remarks
▪ interference with other utilities and blocking of access to buildings; nuisance to neighboring areas due to noise, smell, and influx of insects, rodents, etc.?		x	No blocking/interference with other utilities expected. No significant nuisance from operation of the WWTP is envisaged as a result of maintaining a buffer around the sewage treatment plant (approx. 300m away from habitation) and site specific layout design (considering the wind direction) .
▪ dislocation or involuntary resettlement of people?	x		Subproject involves acquisition of land for WWTP construction. A Resettlement Plan has been prepared and will be implemented.
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		x	Not applicable.
▪ impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage?		x	Treatment process will be designed to meet the inland water disposal standards set by the Central Pollution Control Board (CPCB). Periodic water quality monitoring will be conducted to ensure treated wastewater complies with the standards.
▪ overflows and flooding of neighboring properties with raw sewage?		x	Sewerage system has been designed considering the population growth. It has been designed to accommodate sewage until year 2028. Design considers standard peak factors and therefore no such impact envisaged.
▪ environmental pollution due to inadequate sludge disposal or industrial waste discharges illegally disposed in sewers?		x	Proper sludge collection, treatment and disposal systems are part of the WWTP. This sewerage system will cater only to domestic wastewater. Moreover there are no industries in the town that will discharge into sewers
▪ noise and vibration due to blasting and other civil works?		x	No blasting activities envisaged. Temporary nuisance/disturbance due to construction activities will be minimized with appropriate mitigation measures.
▪ risks and vulnerabilities related to occupational health and safety due to physical, chemical, and biological hazards during project construction and operation?		x	Not anticipated. The EMP ensures occupational health and safety measures are implemented.

Screening Questions	Yes	No	Remarks
▪ discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers?		x	There are no sources of hazardous material that will find its way into the sewers. Wastewater other than municipal, i.e. industrial, entering the sewerage system must meet the stipulated standards, and therefore it is unlikely that problematic waste will be discharged into the sewers.
▪ inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances, and protect facilities?		x	WWTP will be located away from the town (approx. 300 m) and adequate buffer zone provided around the site. A Greenbelt composed of plants and trees included to minimize all nuisances.
▪ road blocking and temporary flooding due to land excavation during the rainy season?		x	Flooding is unlikely as work will be mostly conducted during dry season.
▪ noise and dust from construction activities?	x		No major noise generating activities like rock blasting is envisaged. Dust will be temporary and will be controlled with proper dust suppression measures.
▪ traffic disturbances due to construction material transport and wastes?	x		Proper traffic management and planning will be ensured during construction.
▪ temporary silt runoff due to construction?	x		Construction activities (pipe laying, etc.) on hill slopes may increase the chance of land slide and soil erosion. Careful stacking of excavated materials will be ensured to avoid slippage and erosion especially on hill slopes. Construction work during monsoon shall be carried out with due care so that silt run off due to construction operation is prevented. No construction will be allowed during rains.
▪ hazards to public health due to overflow flooding, and groundwater pollution due to failure of sewerage system?		x	Not anticipated. The system is designed to accommodate adequate capacity. Staff and workers will be trained in O&M.
▪ deterioration of water quality due to inadequate sludge disposal or direct discharge of untreated sewage water?		x	Not anticipated. Treated wastewater will meet the disposal standards and proper sludge disposal methods are in place; regular monitoring will be conducted.

Screening Questions	Yes	No	Remarks
▪ contamination of surface and ground waters due to sludge disposal on land?		x	Sludge will be treated/dried and ensured that it is harmless before its disposal on land.
▪ health and safety hazards to workers from toxic gases and hazardous materials which maybe contained in confined areas, sewage flow and exposure to pathogens in untreated sewage and unstabilized sludge?		x	All necessary health and safety training and necessary personal protection equipment will be given to workers and staff during operation of sewerage system
▪ large population increase during project construction and operation that causes increased burden on social infrastructure (such as sanitation system)?		x	No such impact anticipated as the import of workforce will be limited to skilled workers; local communities in the vicinity of the project would be employed as much as possible.
▪ social conflicts between construction workers from other areas and community workers?		x	Not anticipated as local communities within the project vicinity will be employed as much as possible.
▪ risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?		x	Not applicable. Construction/ operation will not involve use of explosives and chemicals.
▪ community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?		x	Operational area will be clearly demarcated and access will be controlled. Only worker and project concerned members will be allowed to visit the construction sites. During operation, entry into WWTP will be restricted.

Climate Change and Disaster Risk Questions The following questions are not for environmental categorization. They are included in this checklist to help identify potential climate and disaster risks.	Yes	No	Remarks
• Is the Project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes (see Appendix 1)?		x	There is a low risk of natural hazards in the project areas. All towns are land locked and expansively cultivated. The general topography of the towns is plains with isolated hills fringing some of the towns. The towns are located in an area of low seismological intensity. The towns are generally dry throughout the year except during the monsoon from June to September. Davanegere and Rannebenur receive the lowest rainfall (annual average rainfall between 300 – 600mm). Whereas Byadgi and Harihar receive higher rainfall (annual average rainfall between 700 – 1000 mm).
▪ Could changes in temperature, precipitation, or extreme events patterns over the Project lifespan affect technical or financial sustainability (e.g., changes in rainfall patterns disrupt reliability of water supply; sea level rise creates salinity intrusion into proposed water supply source)?	x		Low precipitation and increased temperatures could result in disruption to water supply and security. The project proposes improved water security through the rehabilitation and restoration of river bank reservoirs in selected vulnerable towns.
▪ Are there any demographic or socio-economic aspects of the Project area that are already vulnerable (e.g. high incidence of marginalized populations, rural-urban migrants, illegal settlements, ethnic minorities, women or children)?		x	The project will improve the socio-economic conditions of both the poor and non-poor populations of the towns.
▪ Could the Project potentially increase the climate or disaster vulnerability of the surrounding area (e.g., by using water from a vulnerable source that is relied upon by many user groups, or encouraging settlement in earthquake zones)?		x	Not applicable.

* Hazards are potentially damaging physical events.

Appendix 2: Environmental Related Legislations in India

i. The Water (Prevention and Control of Pollution) Act, 1974, amended 1988
   - The Water (Prevention and Control of Pollution) Rules, 1975
   - The Water (Prevention and Control of Pollution) Cess Rules, 1971

ii. The Air (Prevention and Control of Pollution) Act 1981, amended 1987
   - The Air (Prevention and Control of Pollution) Rules, 1982

iii. The Environment (Protection) Act, 1986, amended in 1991 and including the following Rules/Notification issued under this Act
   - The Environment (Protection) Rules, 1986, including amendments
   - The Municipal Solid Wastes (Management and Handling) Rules, 2000
   - The Hazardous Wastes (Management and Handling) Rules, 1989
   - The Bio-Medical Waste (Management and Handling) Rules, 1998
   - Noise Pollution (Regulation and Control) Rules, 2000,
   - Wild Life (Protection) Amendment Act, 2002
   - Environmental Impact Assessment Notification, 2006
   - Environmental Standards of Central Pollution Control Board (CPCB)

iv. The Indian Wildlife (Protection) Act, 1972, amended 1993
   - The Wildlife (Protection) Rules, 1995

v. The Indian Forest Act, 1927

vi. Forest (Conservation) Act, 1980, amended 1988
   - Forest (Conservation) Rules, 1981 amended 1992 and 2003
   - Guidelines for Diversion of Forest Lands for Non-Forest Purpose under the Forest (Conservation) Act, 1980

vii. Ancient Monuments and Archaeological Sites and Remains Act 1958
   - Ancient Monuments and Archaeological Sites and Remains Rules 1959
   - Government of India Notification of 1992 under the above-stated Rules

Appendix 3: Environmental Disposal Standards

1. General Standards for Discharge of Environmental Pollutants Part - A: Effluents

Parameter	Inland surface water	Public sewers	Land for irrigation	Marine/coastal areas
Suspended solids mg/l, max.	100	600	200	(a) For process waste water (b) For cooling water effluent 10 per cent above total suspended matter of influent.
Particle size of suspended solids	shall pass 850 micron IS Sieve	-	-	(a) Floatable solids, solidsmax. 3 mm (b) Settleable solids, max 856 microns
pH value	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
Temperature	shall not exceed 5oC above the receiving water temperature			shall not exceed 5oCabove the receiving water temperature
Oil and grease, mg/l max,	10	20	10	20
Total residual chlorine, mg/l max	1.0	-	-	1.0
Ammonical nitrogen (as N),mg/l, max.	50	50	-	50
Total kjeldahl nitrogen (as N);mg/l, max. mg/l, max.	100	-	-	100
Free ammonia (as NH3), mg/l,max.	5.0	-	-	5.0
Biochemical oxygen demand (3 days at 27oC), mg/l, max.	30	350	100	100
Chemical oxygen demand, mg/l, max.	250	-	-	250
Arsenic(as As).	0.2	0.2	0.2	0.2
Mercury (As Hg), mg/l, max.	0.01	0.01	-	0.01
Lead (as Pb) mg/l, max	0.1	1.0	-	2.0
Cadmium (as Cd) mg/l, max	2.0	1.0	-	2.0
Hexavalent chro-mium (as Cr + 6),mg/l, max.	0.1	2.0	-	1.0
Total chromium (as Cr) mg/l, max.	2.0	2.0	-	2.0
Copper (as Cu)mg/l, max.	3.0	3.0	-	3.0
Zinc (as Zn) mg/l, max.	5.0	15	-	15
Selenium (as Se)	0.05	0.05	-	0.05
Nickel (as Ni) mg/l, max.	3.0	3.0	-	5.0
Cyanide (as CN) mg/l, max.	0.2	2.0	0.2	0.2
Fluoride (as F) mg/l,	2.0	15	-	15

Parameter	Inland surface water	Public sewers	Land for irrigation	Marine/coastal areas
max.				
Dissolved phosphates (as P),mg/l, max.	5.0	-	-	-
Sulphide (as S) mg/l, max.	2.0	-	-	5.0
Phenolic compounds (as C6H50H)mg/l, max.	1.0	5.0	-	5.0
Radioactive materials: (a) Alpha emitters micro curie mg/l, max.	10^{-7}	10^{-7}	10^{-8}	10^{-7}
(b)Beta emittersmicro curie mg/l	10^{-6}	10^{-6}	10^{-7}	10^{-6}
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
Manganese	2 mg/l	2 mg/l	-	2 mg/l
Iron (as Fe)	3mg/l	3mg/l	-	3mg/l
Vanadium (as V)	0.2mg/l	0.2mg/l	-	0.2mg/l
Nitrate Nitrogen	10 mg/l	-	-	20 mg/l

These standards shall be applicable for industries, operations or processes other than those industries, operations or process for which standards have been specified in Schedule of the Environment Protection Rules, 1989.

Standards for Diesel Generator Sets: Stack Height

The minimum height of stack to be provided with each generator set can be worked out using the following formula:

H = h+0.2x ÔKVA

H = Total height of stack in metre

h = Height of the building in metres where the generator set is installed

KVA = Total generator capacity of the set in KVA

Based on the above formula the minimum stack height to be provided with different range of generator sets may be categorised as follows:

For Generator Sets	Total Height of stack in metre
50 KVA	Ht. of the building + 1.5 metre
50-100 KVA	Ht. of the building + 2.0 metre
100-150 KVA	Ht. of the building + 2.5 metre
150-200 KVA	Ht. of the building + 3.0 metre
200-250 KVA	Ht. of the building + 3.5 metre
250-300 KVA	Ht. of the building + 3.5 metre

Similarly for higher KVA ratings a stack height can be worked out using the above formula.

PART-E Noise Standards

Noise limits for domestic appliances and construction equipments at the manufacturing stage in dB(A).

Window air conditioners of 1 -1.5 tonne	68
Air coolers	60
Refrigerators	46
Diesel generator for domestic purposes	85
Compactors (rollers), front loaders, concentrate mixers, cranes (movable), vibrators and saws	75

Appendix 4: Traffic Management Planning (TMP)

A. Principles for TMP around the Water Pipes Sewer Construction Sites

1. One of the prime objectives of this TMP is to ensure the safety of all the road users along the work zone, and to address the following issues:

(i) the safety of pedestrians, bicyclists, and motorists travelling through the construction zone;
(ii) protection of work crews from hazards associated with moving traffic;
(iii) mitigation of the adverse impact on road capacity and delays to the road users;
(iv) maintenance of access to adjoining properties; and
(v) addressing issues that may delay the project.

B. Operating Policies for TMP

2. The following principles will help promote safe and efficient movement for all road users (motorists, bicyclists, and pedestrians, including persons with disabilities) through and around work zones while reasonably protecting workers and equipment.

(i) Make traffic safety and temporary traffic control an integral and high-priority element of every project from planning through design, construction, and maintenance.
(ii) Inhibit traffic movement as little as possible.
(iii) Provide clear and positive guidance to drivers, bicyclists, and pedestrians as they approach and travel through the temporary traffic control zone.
(iv) Inspect traffic control elements routinely, both day and night, and make modifications when necessary.
(v) Pay increased attention to roadside safety in the vicinity of temporary traffic control zones.
(vi) Train all persons that select, place, and maintain temporary traffic control devices.
(vii) Keep the public well informed.
(viii) Make appropriate accommodation for abutting property owners, residents, businesses, emergency services, railroads, commercial vehicles, and transit operations.

3. **Figure A2 to Figure A12** illustrates the operating policy for TMP for the construction of water pipes and the sewers along various types of roads.

C. Analyze the impact due to street closure

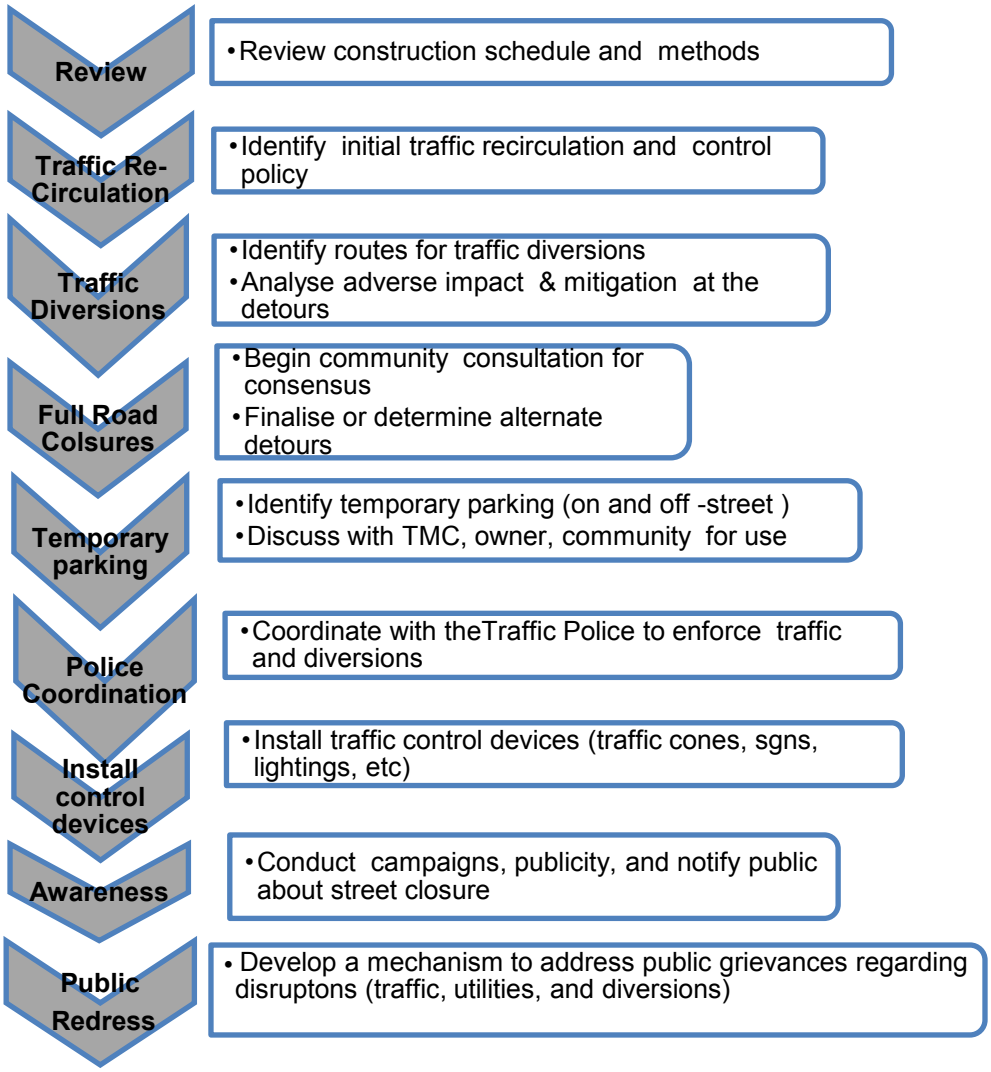
4. Apart from the capacity analysis, a final decision to close a particular street and divert the traffic should involve the following steps:

(i) approval from the Byadgi TMC / 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 A1: 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 centres. In addition, the project will publish a brochure for public information. These brochures will be widely circulated around the area and will also be available at the PIU, and the contractor's site office. The text of the brochure should be concise to be effective, with a lot of graphics. It will serve the following purpose:

(i) explain why the brochure was prepared, along with a brief description of the project;
(ii) advise the public to expect the unexpected;
(iii) educate the public about the various traffic control devices and safety measures adopted at the work zones;
(iv) educate the public about the safe road user behaviour to emulate at the work zones;
(v) tell the public how to stay informed or where to inquire about road safety issues at the work zones (name, telephone, mobile number of the contact person; and
(vi) indicate the office hours of relevant offices.

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

11. The purpose of installing traffic control devices at the work zones is to delineate these areas to warn, inform, and direct the road users about a hazard ahead, and to protect them as well as the workers. As proper delineation is a key to achieve the above objective, it is important to install good traffic signs at the work zones. The following traffic control devices are used in work zones:

- Signs
- Pavement Markings
- Channelizing Devices
- Arrow Panels
- Warning Lights

12. Procedures for installing traffic control devices at any work zone vary, depending on road configuration, location of the work, construction activity, duration, traffic speed and volume, and pedestrian traffic. Work will take place along all the major roads (Station Road, Main Road, Hausabhavi Road & Kadaramandagi Road etc), and the minor internal roads. As such, the traffic volume and road geometry vary. The main roads are narrow but carry considerable traffic and width of the road varies from 6 -10 m. internal roads are also narrow but carry very less traffic. The width varies from 4 m to 7 m. However, regardless of where the construction takes place, all the work zones should be cordoned off, and traffic shifted away at least with traffic cones, barricades, and temporary signs (temporary “STOP” and “GO”).

13. **Figure A2 to Figure A9** 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 as applicable to Byadgi town:

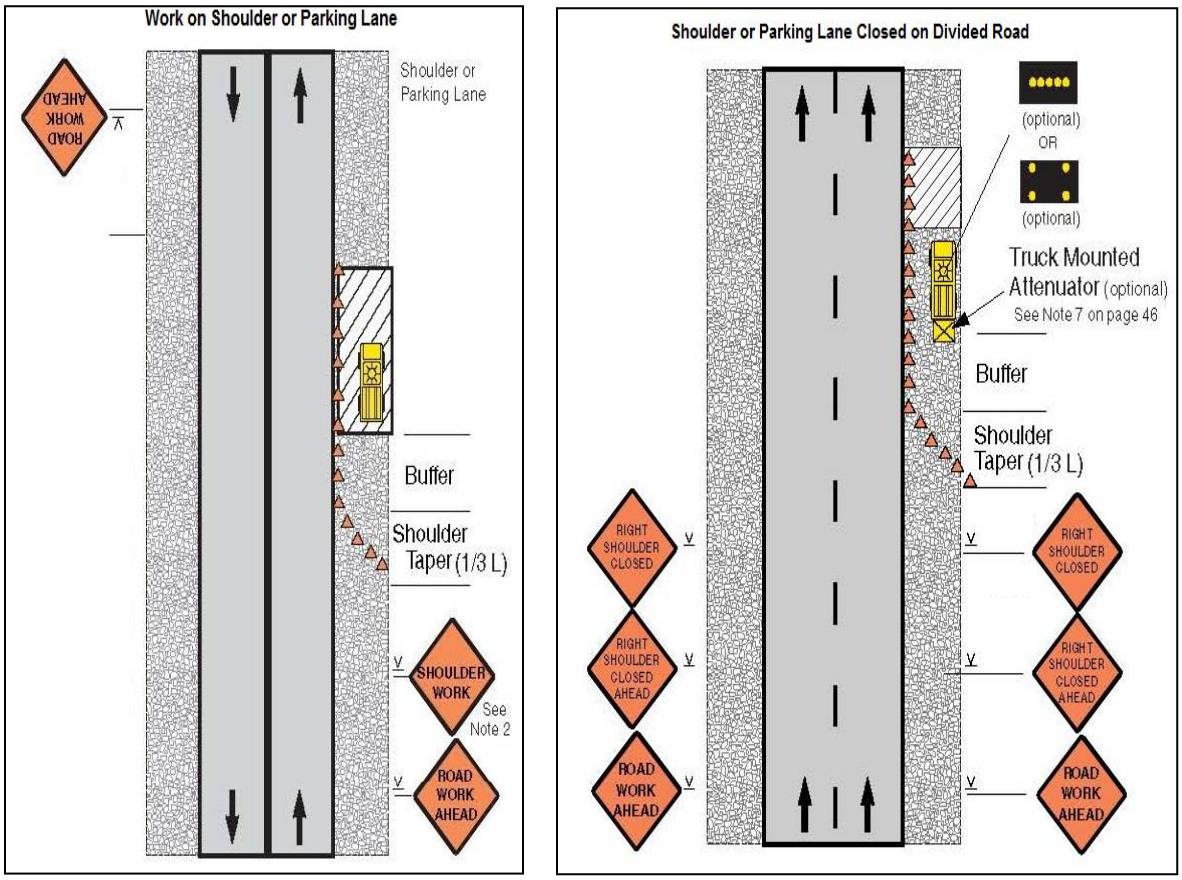
- Work on shoulder or parking lane
- Shoulder or parking lane closed on divided road
- Work in Travel lane
- Lane closure on road with low volume
- Lane closure on a two-line road with low volume (with yield sign)
- Lane closure on a two-line road with low volume (one flagger operation)
- Lane closure on a two lane road (two flagger operation)
- Street closure with detour

14. The work zone should take into consideration the space required for a buffer zone between the workers and the traffic (lateral and longitudinal) and the transition space required for delineation, as applicable. For the works, a 30 cm clearance between the traffic and the temporary STOP and GO signs should be provided. In addition, at least 60 cm is necessary to install the temporary traffic signs and cones.

15. Traffic police should regulate traffic away from the work zone and enforce the traffic diversion result from full street closure in certain areas during construction. Flagggers/ 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.

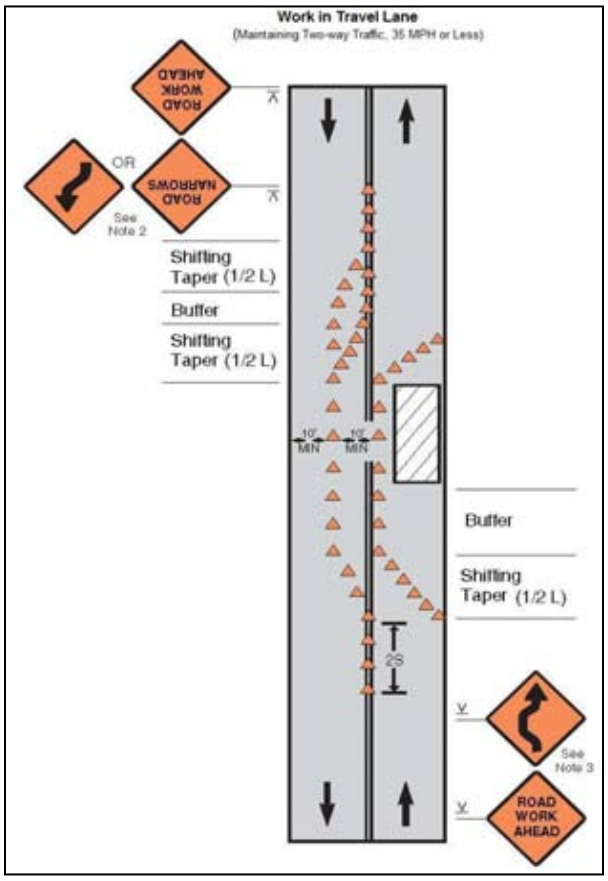
16. In addition to the delineation devices, all the construction workers should wear fluorescent safety vests and helmets in order to be visible to the motorists at all times. There should be provision for lighting beacons and illumination for night constructions.

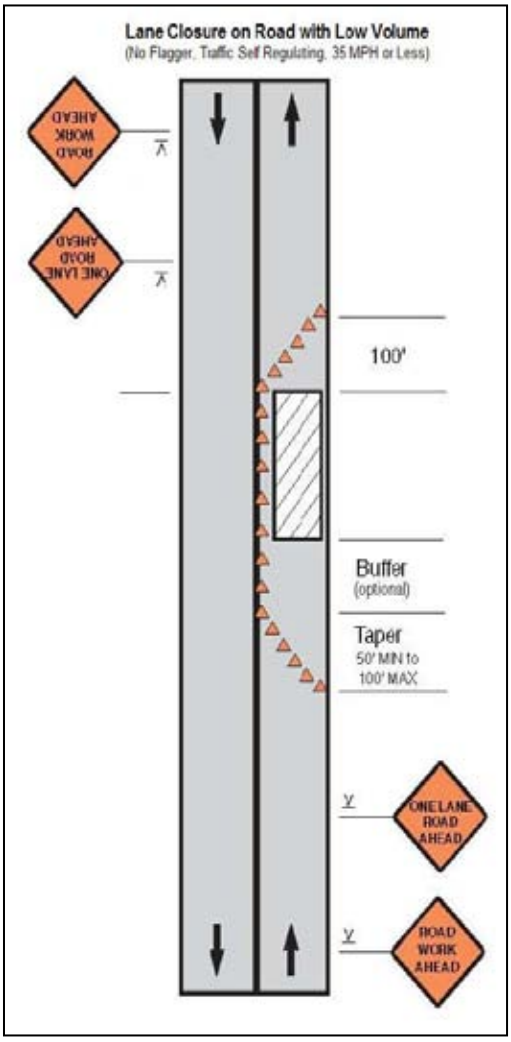
Figure A2 & A3: Work on shoulder or parking lane & Shoulder or parking lane closed on divided road)



Source: PPTA consultants

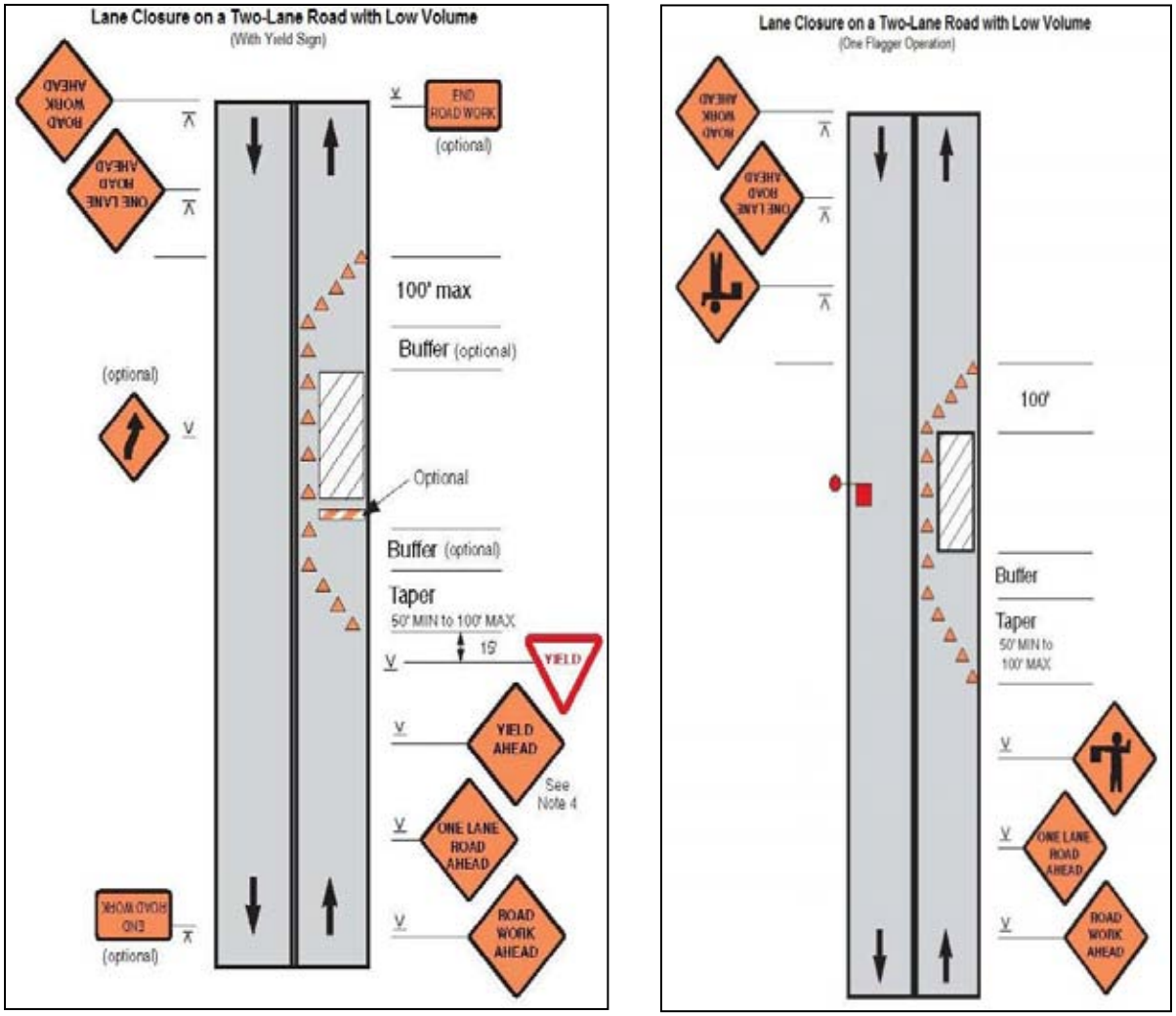
Figure A4 & A5: Work in Travel lane & Lane closure on road with low volume





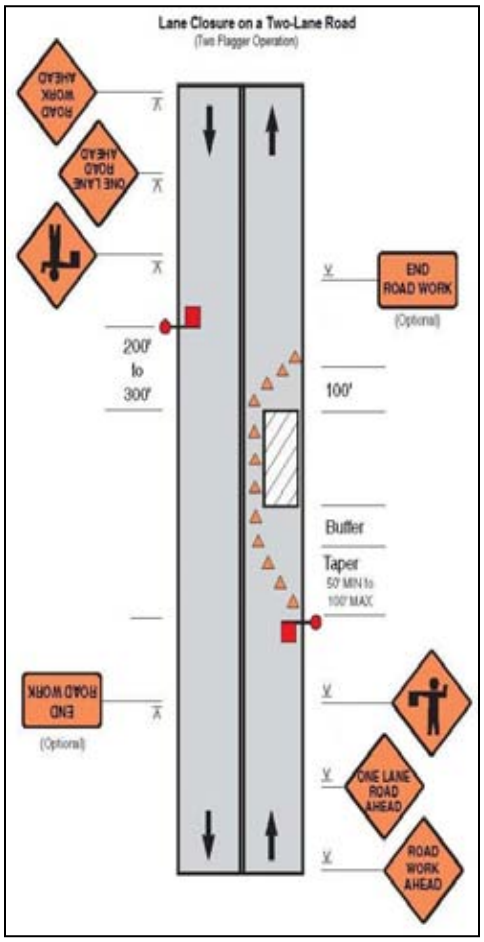
Source: PPTA consultants

Figure A6 & A7: Lane closure on a two-line road with low volume (with yield sign) & Lane closure on a two-line road with low volume (one flagger operation)

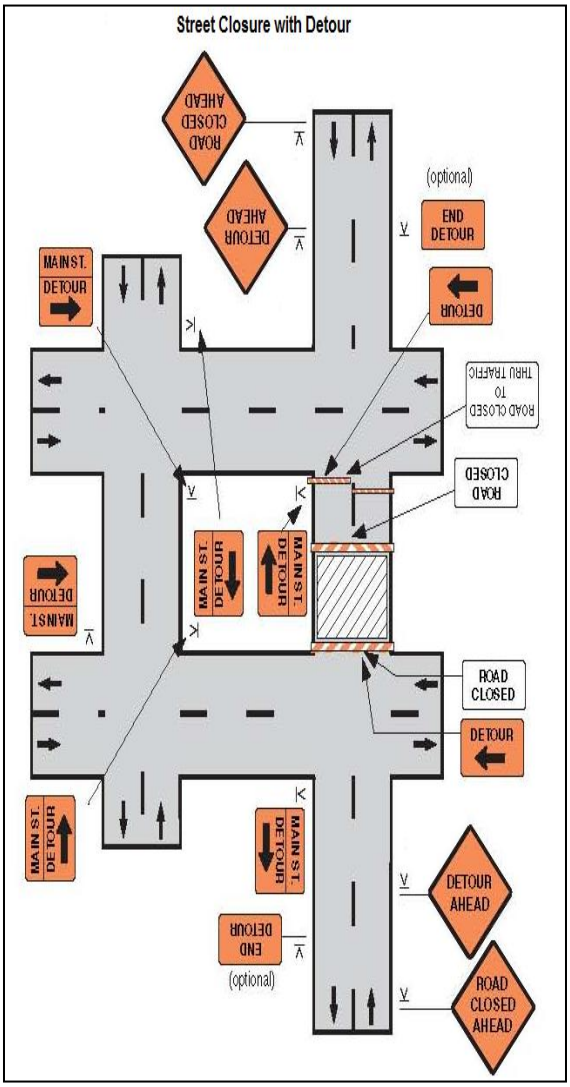


Source: PPTA consultants

Figure A8 & A9: Lane closure on a two lane road (two flagger operation) & Street closure detour



Source: PPTA consultants



Appendix 5: Emergency Response Plan Template – Sewer Network Operation

Section 1.
System Information

Keep this basic information easily accessible to authorized staff for emergency responders, repair people, and the news media.

System information

System Name and Address		
Directions to the System		
Basic Description and Location of System Facilities		
Population Served and Service Connections	_____ people	_____ connections
System Owner		
Name, Title, and Phone Number of Person Responsible for Maintaining and Implementing the Emergency Plan		_____ Phone _____ Mobile

Section 2.
Chain of Command – Lines of Authority

The first response step in any emergency is to inform the person at the top of this list, who is responsible for managing the emergency and making key decisions.

Chain of command – lines of authority

Name and Title (as required)	Examples of Responsibilities During an Emergency	Contact Numbers
Mr/Ms……. Wastewater System Manager	Responsible for overall management and decision making for the wastewater system. The Wastewater System Manager is the lead for managing the emergency, providing information to regulatory agencies, the public and news media. All communications to external parties are to be approved by the wastewater system manager.	Phone: Mobile:

Name and Title (as required)	Examples of Responsibilities During an Emergency	Contact Numbers
Mr/Ms …….. Wastewater System Operator	In charge of operating the wastewater collection system, performing inspections, maintenance and sampling and relaying critical information, assessing facilities, and providing recommendations to the wastewater system manager.	Phone: Mobile:
Mr/Ms Wastewater Treatment Plant Operator	In charge of running wastewater treatment plant, performing inspections, maintenance and sampling and relaying critical information, assessing facilities, and providing recommendations to the wastewater system manager.	Phone: Mobile:
Mr/Ms…….. Office Administrator	Responsible for administrative functions in the office including receiving phone calls and keeping a log of events. This person will provide a standard carefully pre-scripted message to those who call with general questions. Additional information will be released through the wastewater system manager.	Phone: Mobile:
Mr/Ms…… Field Staff	Delivers door hangers, posts notices, and supports wastewater system operator.	Phone: Mobile:

Section 3.
Events that Cause Emergencies

The events listed below may cause wastewater system emergencies. They are arranged from highest to lowest probable risk.

Events that cause emergencies

Type of Event	Probability or Risk (High-Med-Low)	Comments
Burst of sewer line		
Leak of sewer line		
Overflow of sewer line		

Section 4.
Emergency Notification

Notification call-up lists - Use these lists to notify first responders of an emergency.

Emergency Notification List				
Organization or Department	**Name & Position**	**Telephone**	**Night or Cell Phone**	**Email**
Urban Local Body				
Wastewater Operator (if contractor)				
Primacy Agency Contact				
Wastewater Systems Manager Contact				

Priority Customers				
Organization or Department	**Name & Position**	**Telephone**	**Night or Mobile Phone**	**Email**
Hospitals or Clinic(s)				
Public or Private Schools				
Public Water System				

Notification List				
Organization or Department	**Name & Position**	**Telephone**	**Night or Mobile Phone**	**Email**
Police				
Regulatory Agency				
Authorized Testing Laboratory				

Service / Repair Notifications				
Organization or Department	**Name & Position**	**Telephone**	**Night or Mobile Phone**	**Email**
Bangalore Electricity Supply Company				
Electrician				
Water Testing Lab.				
Wastewater systems operator/manager				
Plumber				
Pump Supplier				
“Call Before You Dig”				
Rental Equipment				

Service / Repair Notifications				
Organization or Department	**Name & Position**	**Telephone**	**Night or Mobile Phone**	**Email**
Supplier				
Pipe Supplier				

Notification procedures

Notify wastewater system customers

Who is Responsible:	
Procedures:	

Alert local law enforcement, or regulatory officials, and local health agencies

Who is Responsible:	
Procedures:	

Contact service and repair contractors

Who is Responsible:	
Procedures:	

Procedures for issuing a health advisory

Who is Responsible:	
Procedures:	

Other procedures, as necessary

Who is Responsible:	
Procedures:	

Section 5.
Effective Communication

Communication with customers, the news media, and the general public is a critical part of emergency response.

Designated public spokesperson

Designate a spokesperson (and alternate) and contact regulatory agency for delivering messages to the news media and the public.

Designate a spokesperson and alternates

Spokesperson	Alternate

Section 6.
The Vulnerability Assessment

This is an evaluation of each wastewater system component to identify weaknesses or deficiencies that may make them susceptible to damage or failure during an emergency. It also assesses facilities for security enhancements that may guard against unauthorized entry, vandalism, or terrorism.

Facility vulnerability assessment and improvements identification

System Component	Description and Condition	Vulnerability	Improvements or Mitigating Actions	Security Improvements
Collection System				
Sewage Pumping				
Other Considerations				

Section 7.
Response Actions for Specific Events

In any event there are a series of general steps to take:

1. Analyze the type and severity of the emergency;
2. Take immediate actions to save lives;
3. Take action to reduce injuries and system damage;

4. Make repairs based on priority demand; and
5. Return the system to normal operation.

The following tables identify the assessment, set forth immediate response actions, define what notifications need to be made, and describe important follow-up actions.

A. Power outage

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

B. Collection system blockage or line break

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

C. Collection system pumping facilities failure

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

D. Vandalism or terrorist attack

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

E. Flood

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

F. Earthquake

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

G. Hazardous materials spill into collection system

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

H. Electronic equipment failure

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

I. Other

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

Section 8.
Returning to Normal Operation

Returning to normal operations

Action	Description and Actions

Section 9.
Plan Approval

Plan approval

This plan is officially in effect when reviewed, approved, and signed by the following people:

Name/Title	Signature	Date

Section 10.
Certificate of Completion

I certify to the Government of Nepal that this wastewater system has completed an Emergency Response Plan (ERP).

I certify that this document was prepared under my direction or supervision.

Wastewater Systems: _____

System Name: _____

Address: _____

Print Name of Person Authorized to Sign this Certification on behalf of the System:

_____ **Title:** _____

Signature: _____

Phone: _____ **Fax:** _____ **Email:** _____

Completion of the following:

□ Security Vulnerability Assessment

□ Emergency Response Plan

Source: www.rcap.org (modified)

Appendix 6: Minutes of the Stakeholder Consultation Meeting (October 3, 2012, Davangere)

The meeting was attended by key stakeholders from four project towns of Byadgi, Ranebennur, Harihar and Davangere including public/elected representatives from each town, ULB officials, officials from other line departments and executing agency KUIDFC, and NGOs/CBOs. The meeting was chaired by Davangere District Deputy Commissioner,

The PPTA consultants made detailed presentations – in Kannada and English on overall programs, pilot towns, technical studies, poverty social development aspects, and environmental and social safeguard issues related to proposed subprojects in respective towns.

Byadgi Town Meeting Session

- Chief Officer (CO) Mr.Mahantesh promised to provide further assistance to check the availability of land at proposed alternative locations for WWTP.
- Dr. Mahantesh suggested that, the source of water supply is from both borewells (about 50% of the total supply) and surface water source (50% of the total supply).
- Requested to amend the report to reflect this. Dr. Mahantesh stated that, the project sanctioned by GoK worth 22.7 Crores is to construct new WTP and transmission system for Byadgi. Suggested to include this in the report.

KUIDFC

- Mr.Arifullah Sharief stated that, the Draft Feasibility Studies (DFSs) are subject to change to address stakeholder comments and concerns.
- Mr.Arifullah Sharief suggested to use Ashraya Scheme Government Order(GO) for land acquisition in Byadgi and other ULB, if required. (GO states that, compensation for land acquisition can be paid at 3 times to the guidance value of the land)

Other discussions

- Provision for Sewer Connections – include connection cost as a separate item. Check with project staff of KMRP/NKUSIP.
- Surrounding areas of ULBs and gaps in the existing sewerage system of the town – Check whether the villages and settlements are within the ULB's jurisdiction/ boundary and also population densities.
- Demarcate the roads where larger diameter sewers and WS mains are proposed in all ULBs, to carryout sample surveys and to check impacts during construction. Identify streets where complete road closure is required?
- For land acquisition, a map showing alignment of the sewer to discharge treated effluent in to the stream in Byadgi needs to be prepared.
- Maps or drawings to be prepared to show proposals/ options for both water supply and wastewater system.
- Refine the cost estimates to show following items separately: Laying of sewer network: Road restoration cost; Construction of collection chambers and connections from

individual properties to collection chambers; Land cost for WWTPs and Pumping Stations; Construction cost of WWTP

- Identify industrial demand and location for recycling treated wastewater
- Preparation of comparison table for the selection of pipe material for sewerage and water supply system
- Resolve issues with Byadgi WWTP and alignment of sewer to convey treated effluent and location of outfall.
- Plan awareness program for the sanitation in each ULB