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GOVERNMENT OF KARNATAKA

Karnataka Urban Water Supply Modernization Project (KUWSMP)

ENVIRONMENTAL AND SOCIAL ASSESSMENT (ESA) OF CONTINUOUS WATER SUPPLY PROJECT IN KALABURGI (GULBARGA), KARNATAKA, INDIA

DRAFT FINAL REPORT
2014

KUIDFC

Karnataka Urban Infrastructure Development Finance Corporation (KUIDFC)

Draft Final Report: Environmental and Social Assessment (ESA) for Continuous Water Supply in Kalaburgi

Abbreviations

AE	Assistant Engineer
AEE	Assistant Executive Engineer
CMC	City Municipal Corporation
CPCB	Central Pollution Control Board
CPHEEO	Central Public Health & Environmental Engineering Organisation
DoEE	Department of Ecology & Environment (DoEE)
DPR	Detailed Project Report
DRIP	Dam Rehabilitation and Improvement Project
EA	Environmental Assessment
EAC	Expert Appraisal Committee
EC	Empowered Committee
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EP	Environment Protection
ESMP	Environmental and Social Management Plan
FGD	Focused Group Discussions
GLSR	Ground Level Storage Reservoir
GoI	Government of India
GoK	Government of Karnataka
JE	Junior Engineer
Km	Kilometer
KSPCB	Karnataka State Pollution control Board
KUIDFC	Karnataka Urban Infrastructure Development Finance Corporation
KUWASIP	Karnataka Urban Water Sector Improvement Project
KUWSSDB	Karnataka Urban Water Supply Sewerage and Drainage Board
KUWSMP	Karnataka Urban Water Supply Modernization Project
LPCD	Litres per capita per day
mg/l	Milligrams per liter
MoEF	Ministry of Environment & Forests
NH	National Highway
NRRP	National Rehabilitation & Resettlement Policy (NRRP
O&M	Operation & Management
OD	Operational Directives
OHT	Over Head Tank
OP	Operational Policy
PAF	Project Affected Families (PAFs)
PIU	Project Implementation Units
PPP	Public Private Partnership
PSP	Private Sector Participation
PPE	Personnel Protective Equipment
R & R	Rehabilitation & Resettlement
RAP	Resettlement Action Plans
RPM	Respirable Particulate Matter
SEAC	State's Environmental Appraisal Committee
ESA	Sectoral Environmental and Social Assessment
SH	State Highway
SPM	Suspended Particulate Matter
SPV	Special Purpose Vehicle
STP	Sewerage Treatment Plant

TDS	Total Dissolved Solids
ToR	Terms of Reference
UDD	Urban Development Department
UGD	Underground drainage
ULB	Urban Local Body
UWS	Urban Water Supply
UWSS	Urban Water Supply Sanitation
WB	World Bank
WSS	Water Supply and Sanitation

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EXECUTIVE SUMMARY

1.1. Background

In 2003, Government of Karnataka (GoK) with assistance from the World Bank launched Karnataka Urban Water Sector Improvement Project (KUWASIP) for providing a continuous water supply (24X7) to address issues of poor quality, intermittent supply, illegal connection and supply of contaminated ground water. The State Government selected five demonstration zones in three project towns of Hubli-Dharwad, Belgaum, and Gulbarga to pilot the 24X7 urban water supply (UWS). The project envisaged setting a policy, institutional and regulatory environment in the urban water sector, enabling service improvements, sustainable investments and coverage expansion. The project was successfully implemented and closed on 31st March 2011.

Based on the success of the project and with the support from the local communities, City wise scale up has been proposed through World Bank funding. The total project cost is for all the three cities is estimated at about 1809 crores in INR or $ 279 million in US. This up scaling project for the identified cities known as "Karnataka Urban Water Supply Modernization Project" (KUWSMP) has been approved by the GoK.

Karnataka Urban Infrastructure Finance Corporation (KUIDFC) on behalf of the Government of Karnataka is preparing the Karnataka Urban Water Supply Modernisation Project (KUWSMP). The project involves modernizing water supply systems and capacity for providing continuous piped water supply in the three cities of Hubballi-Dharwad, Kalaburgi and Belagavi.

An Environmental and Social Assessment (ESA) has been carried out to integrate environmental and social concerns with project design, identify potential adverse environment and social impacts during different phases of the project implementation (pre-construction, during construction and post construction) and recommend mitigation measures, complying with environmental and social safeguard policies of the World Bank, Government of India, and Government of Karnataka.

1.2. Project Area Profile

Kalaburgi city is the divisional headquarters of Kalaburgi revenue division having jurisdiction over the five districts of Bellary, Bidar, Kalaburgi, Raichur and Koppal. The city is located in North Karnataka, 625 km north of Bangalore. With a population of 543,147 (2011 Census), the conurbation is among the largest municipal corporations in the State, after Bangalore, Hubli-Dharwad and Mysore. The city is divided into 55 administrative wards to manage urban services delivered by Kalaburgi City Corporation (GCC).

A summary profile of the city is presented in Table I below.

Table 1: Fact File

Sl. No.	Attributes	
1.	Population 2011	543,147
2	Total Households	102830[1]
2.	Area Kalaburgi Municipal Corporation	55 sq. km

[1] 2011, Census

Sl. No.	Attributes	
3.	No. of Wards	55
4.	Population Decadal Growth rate (2001-2011)	23 %
5.	Population Density (2011)	9875 persons per sq.km
6.	Literacy Rate	72%
7.	Sex Ratio	953
8.	Economy	Regional Market and Service Centre

1.3. Project Description

KUWSMP will support the Government of Karnataka (GoK) and the participating urban local body to achieve the project development objective to "Improve water service quality to a continuous supply (24x7) across Kalaburgi city through the establishment of institutionally and financially sustainable service delivery arrangements at ULB level". The key project activities include financing goods and services to improve water supply systems in these three cities to 24X7 by investing in improved capacity to meet water demand, reduced non-revenue water, network expansion, setting up of city level water institutions (SPV) and hiring an Operator to strengthen and manage the systems for a duration (12 years). The operator will also strengthen the city level institutions.

The Project period would be 12 years consisting of a design & implementation period of 4 years (the “transition phase” to convert the system to continuous pressurized supply) & operation & management period of 12 years – comprising the 4 year transition phase and a further 8 years when the supply is continuous and pressurized.

As part of project preparation, detailed studies were carried out by *M/s Tata Consulting Engineers In association with SREI Infrastructure Finance Ltd* in Sept 2012 to understand the physical and capital investments required for providing continuous water supply to Kalaburgi. However, the hired Operator shall study the existing system, measure performance and carry out assessments of the system and propose and implement investments that will ensure delivery of continuous water supply in the project cities. The activities of the Operator will include the following.

- Augmentation / development of water sources
- Rehabilitation of existing or laying of new transmission line(s),
- Rehabilitation or expansion or new water treatment plant(s)
- Development and / or expansion of pumping station(s)
- Renovation or rehabilitation or construction of new service reservoirs (underground or over-ground)
- Replacement and /or extension of distribution network
- Replacement and/ or provision new house service connections.

1.4. Environmental and Social Assessment of the Project

The Environmental and Social Assessment (ESA) was carried out with the objectives of:

- Identifying key social and environmental issues associated with the proposed water supply augmentation (24x7 water supply) such as rehabilitation works to be implemented at the pre-construction, construction and operation phases of project.
- Identifying the positive and adverse impacts of sub project activities on physical and social environments.
- Proposing suitable mitigation measures for potentially adverse environmental and social impacts, and measures for enhancement of positive impacts and preparing specific Environmental and Social Management Plans.
- Detailing out roles and responsibilities of various agencies involved in carrying out the proposed action plans.

The scope of work carried out under this study comprised of –

a) Reviewing all applicable policies including operational policies of the World Bank and environmental laws / regulations in India within which KUWSMP is to be implemented.
b) Detailed analysis of Environmental Profile of the project city including assessing and establishing base line water quality.
c) Socio-economic profiling of the cities through primary survey, stakeholder consultations, focus group discussions and analysis of secondary information.

1.4.1. Review of Environmental Policies and Institutions

The review of the environmental policies conclude that as the activities currently contemplated in this project fall under the rehabilitation & modernization project, these will not necessitate any detailed environmental impact assessment (EIA) studies. This project is identified as category B and the Operational Policy 4.01 will be applicable to assess the impacts however marginal or temporary it might be. Due to the dependence on multipurpose dams that share water for the drinking water needs of the city, Safety of Dams (OP 4.37) is triggered. OP 4.11 for Cultural Properties will be triggered, in cases of 'chance find' of cultural properties during the construction phase of the project.

The review reveals that various legal approvals and clearances on social and environmental aspects will have to be obtained during Transition and Sustaining stages. During constructions, the project would require consent from the state pollution control board to operate the DG set under Air (Prevention & Control of Pollution) Act, 1981 and also attract Noise Control Regulations under Environment (Protection) Act, 1986. Permissions/Approvals from Railways and State and National Highway Authorities is envisaged during Transition Phase. The storage and handling of chlorine for disinfecting the water, during Transition and Sustaining Periods, will necessitate consent from the Pollution Control Board as per the provisions of Manufacture, Storage and Handling of Hazardous Chemicals Rules, 1989.

1.4.2. Base Line Environmental Profile

The detailed base line environmental profiles do not indicate any sensitive environmental features that could be affected by the proposed activities under KUWSMP. Kalaburgi, with its rich historic back ground has a few heritage structures like the Gulbarga Fort and Haft Gumbaz. The project activities are not expected to impact these structures. However, necessary approval shall have to be obtained from National Monuments

Authority, for carrying out construction within 300 m of the monument. In addition construction activities need to consider precautionary measures to avoid damages of archaeological structures during excavation works.

The entire Kalaburgi city has been divided in five sewerage zones viz. 2D1 (AA1), 2D2 (B), 2D3 (C), 1D1 (D) & 1D2 (E) and 3D1 (F) except sewerage district 3D1, all sewerage districts are drainable by gravity to the existing Sewage Treatment Plant (STP) near Kotnoor village. The STP is designed as waste stabilization ponds with a capacity of 27.24 MLD. Also a sewerage scheme comprising 67.23 km of additional network and a STP of 40 MLD is being implemented at a cost of INR 579 million (USD 10 million), as part of the ADB supported North Karnataka Urban Sector Improvement Project (NKUSIP). This project is expected cover 53% of the households and increase the sewage treatment capacity to 67 MLD. While this would be sufficient for the current sewerage generation of about 60 MLD (80% of 75 MLD), the sewage generation is expected to increase to 120 MLD in 2026 and 160 MLD by 2041 and would require augmentation of treatment capacities by 53 and 100 MLD in the respective years.

1.4.2.1. Base Line Sample Surveys

In order to establish the baseline water quality 10 samples were collected and bacteriological & physiochemical analysis was conducted to analyze water quality as below:

- Raw water from source river intake at Harasur Village on Bennithora.
- Treated Water from ShorGumbaz WTP
- Eight water samples from Public Taps.

These samples surveys indicated that the quality of treated water meets the organoleptic and physical standards of IS 10500. Coliforms and E.coli were found in both raw and treated water sample. Residual Chlorine was observed high in the water samples taken at public taps which confirms the protocol.

1.4.3. Socio-Economic Profile

The base line socio economic profile of the project area does not indicate the presence any sensitive social features. The primary survey and stakeholder consultation revealed that current intermittent water supply is not satisfactory and respondents have to adopt coping mechanisms to overcome its deficiencies. Further it indicated that the respondents are aware of the benefits of 24x7 water supply and are willing to pay for the better supply.

1.5. Impacts and Environmental Management Plan

Kalaburgi is not located near any eco-sensitive area. The proposed project activities will have environmental impact on the adjoining settlement in terms of dust and noise during construction. Soil pollution and impact on water quality and hydrology will be marginal and temporary. The critical issues will be to ensure adequate safety and precautionary measures to minimise impacts during construction and provision of sanitation facilities in the construction area to avoid contamination surface / sub-surface sources during operation. While the impacts are not very severe and permanent, care has to be taken to ensure that the ambient environmental conditions do not deteriorate. The

negative impacts that are likely due to construction activities in narrow and congested roads need critical attention. **Table 3** presents the summary of major impacts of the project and recommended mitigation measures.

1.6. Impacts and Social Management Plan

There are no significant adverse impacts by the project. The proposed project does not involve displacement of structures; does not cause any impact on community structures except for a few temporary inconveniences to the public during construction phase. The proposed project requires private land to the extent of 4 acres which is proposed to be purchased. Implementation of the suggested mitigation measures during different phases of the project will prevent or minimize adverse impacts. A standalone document, Resettlement Policy Framework (RPF) has been prepared that consists resettlement planning and entitlement provisions. The RPF outlines the principles and approaches to be followed in minimising and mitigating the adverse social and economic impacts due to the project. **Table 4** below presents the summary of major impacts of the project and recommended mitigation measures.

Table 3: Environmental Management Plan (EMP) for the proposed Project

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
Design Phase					
1.	Pre construction activities	• The pre-construction phase will give rise to fugitive dusts and frequent exhaust emissions into the atmosphere as equipment is delivered to the pumping stations/ water treatment plant/ overhead tanks and along major roads and streets where the proposed new network will pass through.	➢ Air pollution control measure like water sprinkling ➢ Limit hours of operation in populated areas ➢ Use of barriers to reduce exposure ➢ Plants, machinery and equipment may be handled so as to minimize generation of dust. ➢ Low emission construction equipment generator sets and pollution free certified vehicles may be used	Operator	SPV
Construction/Transition Phase					
1.	Construction of New Intake structure at Harasur Village	• Increase water pollution during construction • Deterioration of water quality	➢ Use of barriers to reduce water pollution ➢ Plants, machinery and equipment may be handled so as to minimize generation of dust. ➢ Dump solid waste in specified place to minimize contamination of water ➢ Ensure implementation of Waste Management Plan (ECoP) for environmentally sound management of waste ➢ Prior water use plan shall be prepared and arrange alternate source of water to fulfill more basic needs ➢ Ensure prior information regarding supply of water to consumers ➢ Ensure implementation of Project Planning and Design Plan (ECoP) before planning of activity ➢ Site preparation should be as per Site Preparation Plan (ECoP) for site clearance	Operator	Operator /and ULB/ SPV

2.	Laying of Raw Water pumping main of 1200 mm dia. for a length of 13.0 km.	➢ Increase in Dust levels due to construction ➢ Soil pollution or soil erosion ➢ Increase noise levels due to excavation ➢ Landscape degradation ➢ Pressure on local resources ➢ Loss of fertile top soil of the agriculture land along the alignment ➢ Accumulation of Excess Earth ➢ Damage to standing crops during break down of the transmission main or maintenance operations ➢ Emissions from use of construction equipments/DG sets for construction activities ➢ Temporary Disruption of natural drainage pattern	➢ Air pollution control measure like water sprinkling ➢ Limit hours of operation in populated areas ➢ Use of barriers to reduce exposure ➢ Plants, machinery and equipment may be handled so as to minimize generation of dust. ➢ Low emission construction equipment generator sets and pollution free certified vehicles may be used ➢ Half Yearly Air/Noise quality monitoring may be conducted at construction sites. ➢ Dump solid waste in specified place to minimize contamination of water ➢ Ensure implementation of Waste Management Plan (ECoP) for environmentally sound management ➢ Midterm environment audit should be carried out for performance of ESMP implementation	Contractor	Operator and ULB/SPV
3.	Construction of WTPs / New Clear Water Pumping station	• Increase dust or other gaseous (SO_2 & NO_2) levels due to the movement of construction vehicles and equipments • Accumulation of construction waste • Accumulation of earth material • Increase health risk in nearby areas • Increase health risk in construction Labour	o Air pollution control measure like water sprinkling o Use of barriers to reduce exposure o Plants, machinery and equipment may be handled so as to minimize generation of dust. o Low emission construction equipment generator sets and pollution free certified vehicles may be used o Quarterly Yearly Air/Noise quality monitoring may be conducted at construction sites. o Dump solid waste in specified place to minimize contamination of water o Discharge wastewater at authorized locations and after treatment o Ensure implementation of Waste Management Plan for o environmentally sound management of waste o Measures to prevent accidental spills o Ensure implementation of Construction Plants & Equipments Management Plan for management of construction equipments	Contractor	Operator and ULB/SPV

		•	o Ensure implementation of water for construction plan for water management o Alternate material or material should be reused for construction of WTP to reduce construction cost o Using low noise generating equipment such as pneumatic hammers / drills, provision of encasings around generators and avoiding construction during nights		
4.	Rehabilitation of existing WTPs and Clear water pumping Stations	• No major impact anticipated	o Ensure implementation of Waste Management Plan for environmentally sound management of waste	Contractor	Operator and ULB/SPV
5.	Laying of Clear Water Transmission System (42 km)	• Pressure on local resources • Increase in Dust Levels to due to earth work and other construction activities • Accumulation of Excess Earth • Damage to standing crops during break down of the transmission main or maintenance operations	o Air pollution control measure like water sprinkling o Plants, machinery and equipment may be handled so as to minimize generation of dust. o Low emission construction equipment generator sets and pollution free certified vehicles may be used o Quarterly Yearly Air/Noise quality monitoring may be conducted at construction sites. o Dump solid waste in specified place to minimize contamination of water o Ensure implementation of Waste Management Plan for environmentally sound management ➢ Ensure implementation of Construction Plants & Equipments Management Plan (ECoP 9.0, for construction equipments ➢ Ensure implementation of Water bodies Management Plan (ECoP 7.0,) during laying of pipeline near to water bodies ➢ Midterm environment audit should be carried out for performance of ESMP implementation ➢ Refilling and replacement the excavated topsoil back in the same field and provision of soil barriers with the excavated earth to avoid spillage on the adjoining land	Contractor	Operator and ULB/SPV

6.	Dismantling of existing Elevated Service Reservoir	• Increase in Dust Level due to dismantling • Accumulation of demolition waste	➢ Use of barriers to reduce exposure ➢ Low emission construction equipment generator sets and pollution free certified vehicles may be used ➢ Dump solid waste in specified place to minimize contamination of water ➢ Ensure implementation of Waste Management Plan for environmentally sound management of waste ➢ Ensure implementation of Construction Plants & Equipments Management Plan for management of construction equipments ➢ Provision of sprinkling of water & scaffolding. Sprinkling method is used for refilling of trenches so that shrinking should be minimized ➢ There should be proper covering of excavated or dismantled material while transportation of these waste materials	Contractor	Operator and ULB/SPV
7.	Construction of new overhead and ground reservoirs	• Increase dust levels due to construction of reservoirs • Soil pollution due to leakages from vehicles and equipments • Accumulation of earth material • Accumulation of construction waste	➢ Air pollution control measure ➢ Limit hours of operation in populated areas ➢ Use of barriers to reduce exposure ➢ Low emission construction equipment generator sets and pollution free certified vehicles may be used ➢ Half Yearly Air/Noise quality monitoring may be conducted at construction sites. ➢ Dump solid waste in specified place to minimize contamination of water ➢ Ensure implementation of Waste Management Plan for environmentally sound management of waste ➢ Ensure implementation of Construction Plants & Equipments Management Plan for management of construction equipments ➢ Ensure implementation of Project Planning and Design Plan before planning of activity ➢ Site preparation should be as per Site Preparation Plan for site clearance ➢ Ensure implementation of Construction Camp Plan for labour camps		

8.	Laying of about 970 km of additional distribution line	• Increase dust levels due to excavation of earth. • Water pollution due to leakages or damages of existing distribution lines • Soil pollution due to leakages from vehicles and equipments • Soil erosion and accumulation of excavated materials • Accumulation of construction waste • Impact on city drainage system	➢ Use of barriers to reduce exposure ➢ Refilling and replacement the excavated topsoil back in the same field and provision of soil barriers with the excavated earth to avoid spillage on the adjoining land. ➢ Ensure implementation of Waste Management Plan for environmentally sound management of waste ➢ Ensure implementation of Construction Plants & Equipments Management Plan for management of construction equipments. ➢ Ensure implementation of Water bodies Management Plan during laying of pipeline near to water bodies ➢ Ensure implementation of Cultural Properties Plan if any cultural property is being impacted due to interventions ➢ Ensure implementation of water for construction plan for water management ➢ Preparation of traffic diversion plans and prior intimation of the construction schedule to the people in the areas of construction ➢ Preparation of utility shifting plans, procuring appropriate approvals / permissions in advance and completion of activities in the earliest possible time ➢ Using low noise generating equipment such as pneumatic hammers / drills, provision of encasings around generators and avoiding construction during nights ➢ Prior Consultation should be carried out for implementation or laying of pipe line in private land and habitat		
Operation Phase					
12.	24X7 Continuous Supply of Water During Operation	• Operation Failure of Transmission Lines- due to mechanical failure or third party interference. • Bursting or breakage of distribution mains- as a result of increased pressure or aggressiveness of pumping.	➢ Before implementation of project an water connections census should be taken to reduce extra use of water ➢ Illegal water tapping source should be identified ➢ Ground water should be kept a backup supply source in system failure ➢ Ensure Indian Drinking Water Standards (BIS:10500)	Operator	ULB/ SPV

		• Power outages, which may disrupt water supply. • Air quality impacts that would arise during the operation of the pumping stations would include emissions from generators • Generation of Additional Quantity of Wastewater from the Zones leading to contamination of surface / sub-surface sources • Flooding of Low Lying Areas due to overflow of storm water drains • Deficiencies in Storage and Handling of Chlorine at the water treatment plant • Occurrence of chlorine intoxication if water is over chlorinated during treatment • Generation of sludge from WTP Leading to contamination of surface and sub surface sources • Generation of Waste Water	➢ Alternate supply arrangements such as supply through tankers should be provided if Leakages, Contamination and shortage of Water ➢ Check leakages and prevent ➢ Cross contamination of water should be avoided ➢ Plan and cost for augmentation and strengthening the storm water drainage network in the city ➢ Ensure environmentally sound and safe storage and containment of oil and diesel for DG Sets ➢ Ensure proper/efficient treatment of sludge before disposal. ➢ Ensure routine maintenance practices; ➢ Wastes should be collected, stored and managed on-site. Measures to ensure that wastes do not enter municipal water courses way must be ensured at all times during operations and maintenance in WTPs/Pumping stations. ➢ Procure diesel generators with soundproofing. ➢ Ensure environmentally sound and safe storage and containment of oil and diesel ➢ Ensure implementation of Water bodies Management Plan (ECoP) during laying of pipeline near to water bodies ➢ Proper sludge management has to be prepared and followed by SPV / Operator ➢ The untapped waste water component of 17% will be undertaken under the UGD program in a long term strategy and the cleaning of the existing sewerage network on continuous basis for smooth management.		

Table 4: Social Management Plan (SMP) for the proposed Project

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
Design Phase					
1.	Awareness generation and people's confidence building Seeking participation of stakeholders Designing the project keeping in view the social, environmental and technical features	• People apprehension of the project • People's fear on loss of land and property • People's threat of inconvenience	➢ Meetings with stakeholders ➢ Loud speaker announcements on upcoming project seeking participation of people ➢ Insertions in cable TV on upcoming project and its benefits ➢ Hoardings indicating the temporary nature of inconvenience ➢ Design of socially acceptable, environmentally sensitive and technically feasible project engaging a team of consultants	ULB	ULB
2.	Land Requirements	• A total of 45423 sq mt land required. Of this 20234 sq mt required from pvt land owners.	➢ Will be attempted to purchase directly through willing buyer and willing seller method		
Construction /Transition Phase					
3.	Replacement of existing PSC pipe and laying of new pipe	• Disruption of water supply to the consumers during implementation • Water conflicts due to shortage of water • Unhygienic condition in construction camp • Increase Health problems among labourers and Populace in general.	➢ Alternate supply arrangements such as supply through tankers should be provided. ➢ Awareness generation indicting temporary nature of disruption – targeting awareness more toward women who are the household water managers. ➢ Install speed breaker and sign ages near settlements ➢ Prepare traffic management plan. and prior intimation of the construction schedule to the people in the areas of construction. ➢ crossings/ bridges to avoid accidents and other construction hazards ➢ Provide safety measures	Contractor & Operator	ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
			(mask, gloves, hat etc.) to minimize exposure ➢ Provide sirens in vehicles to avoid any collision with human/animals ➢ Child labour must be strictly prohibited ➢ Provision of temporary ➢ Ensure implementation of Construction Camp Plan (ECOP) for labour camps ➢ Ensure implementation of Health & Safety Management Plan (ECOP) for public and workers safety		
4.	Construction of WTP	• Noise pollution • Increase health risk in nearby areas • Increase health risk in construction Labour	• Limit hours of operation in populated areas • Use of barriers to reduce noise pollution • Plants, machinery and equipment may be handled in such a way so as to minimize generation of dust. • Dump solid waste in specified place to minimize contamination of water • Organize awareness programs on environmental resource management • Child labour must be strictly prohibited • Ensure implementation of Construction Camp Plan (ECOP,) for labour camps • Ensure implementation of Health & Safety Management Plan (ECOP 10,) for public and workers safety • Preparation of traffic diversion plans and prior intimation of the construction schedule to the people in the areas of construction • Provision of temporary crossings/ bridges to avoid accidents and other construction hazards • Using low noise generating equipment such as pneumatic	Contractor & Operator	ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
			hammers / drills, provision of encasings around generators and avoiding construction during nights		
5.	Rehabilitation of existing WTPs	• Noise pollution • Increase health risk in nearby areas • Occupational Hazard leading to Health risk in construction Labour	• Ensure implementation of Health & Safety Management Plan (ECOP) for public and workers safety.	Contractor & Operator	ULB/SPV
6.	Dismantling of existing Elevated Service Reservoir	• Accumulation of demolition waste • Increase health risk in Construction labour • Temporary disruption of water • Increase noise levels due to demolition and movement of vehicles • Temporary disruption of traffic due to movement of vehicles	• Limit hours of operation in populated areas • Prepare traffic management plan • Provide safety measures (mask, gloves, hat etc.) to minimize exposure • Child labour must be strictly prohibited • Ensure implementation of Health & Safety Management Plan (ECOP) for public and workers safety. • Ensure implementation of Cultural Properties Plan (ECOP,) if any cultural property is being impacted due to interventions • Preparation of traffic diversion plans and prior intimation of the construction schedule to the people in the areas of construction • First aid facilities to be provided at the construction camps. Any case of disease outbreak may be immediately subjected to medical treatment. Mosquito repellent to be provided to the labours such as odomas, coil and sprays. The camps to maintain cleanliness and hygienic condition. • Provision of scaffolding. • There should be proper covering of excavated or dismantled material while	Contractor & Operator	ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
			transportation of these waste materials		
7.	Construction of new overhead reservoirs	• Increase noise levels due to movement of heavy vehicles and construction equipment • Disruption of traffic due to movement of vehicles and equipments • Increase health risk in nearby area • Increase occupational health risk of construction labourers • Increase sanitation problems due to construction camp • Accumulation of construction waste	• Limit hours of operation in populated areas • Cross contamination of water should be avoided • Prepare traffic management plan • Preparation of traffic diversion plans and prior intimation of the construction schedule to the people in the areas of construction • Provide safety measures (mask, gloves, hat etc.) to minimize exposure • Organize awareness programs on environmental resource management • Child labour must be strictly prohibited • Ensure implementation of Health & Safety Management Plan for public and workers safety. • Ensure implementation of Cultural Properties Plan (ECOP) if any cultural property is being impacted due to interventions • Ensure implementation of Construction Camp Plan (ECOP) for labour camps	Contractor & Operator	ULB/SPV
8.	Laying of pipeline and construction of ESR in sensitive locations like schools, hospitals, religious, cultural and tourist locations	• Increase noise levels due to movement of heavy vehicles and construction equipment • There will be disruption to the movement of vehicles • Increase in Dust levels due to earth work or replacement of pipe • There will be noise pollution hampering	• Priority work planning in sensitive location • Limit hours of operation in sensitive zones during peak service hours. • Hospitals need special planning for emergency management • Laying of pipeline in alternate street, if possible, to avoid traffic disruptions and commuting problems • Install speed breaker and signages near settlements • Hoardings and signboards	Contractor & Operator	ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
		classes and lectures. • Landscape degradation and uneven dug surface will have possibility of accidents. • Disruption of water supply to the consumers during implementation	intimating the temporary nature of inconvenience • Construction activities to be scheduled carefully to minimize the impact of noise from construction machinery during school hours. • Barricades, temporary noise control measures and dust suppression measures through watering		
9.	Laying of pipeline and construction of ESR in commercial areas	• Loss of livelihood for vendors • Limited access to small shop and low sales	• Adequate provision for space shall be left so that the pedestrians have access to shops and local service providers • Immediate cleaning up of debris as part of planned process • Alternative livelihood planning to compensate or the temporary loss of livelihood	Contractor & Operator	ULB/SPV
10.	Construction of any nature and in any location	• Safety hazards and accidents • Occupational Hazards in all construction sites including health impacts due to absence of proper housing and sanitation facilities in labour camps	• Fencing of the excavation site and providing proper caution sign boards • Protective measures to workers as per occupational and safety norms • Develop women sensitive work conditions with toilets blocks catering to women's needs • Include creches in worksites. • Develop and implement site-specific Health and Safety (H&S) Plan which will include measures such as: • *excluding public from the site;* • *ensuring all workers are provided with and use Personal Protective Equipment (PPE);* • *health and safety Training for all site personnel;* • *documented procedures to be followed for all site activities; and*	Contractor & Operator	ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
			• *documentation of work-related accidents;* • *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; • Training of workers on safety and health and set down rules and regulations of all new workers at the site, personal protective protection and preventing injuring to fellow workers. • 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; and		

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
11.	Focus on cultural properties	• Access to any of the cultural properties is severed during construction;	• Immediately after completion of construction, the Contractor will affect clearance of the precincts of cultural properties. • Access needs to be restored at the Contractor's cost.		
Operations/Sustaining Phase					
12.	24X7 Continuous Supply of Water During Operation	• Disruption in water supply leading to inadequacy • Generation of Additional Quantity of Wastewater from the Zones leading to contamination of surface / sub-surface sources • Flooding of Low Lying Areas due to overflow of storm water drains • Occurrence of chlorine intoxication if water is over chlorinated during treatment	• Ensure alternate drinking water supply through tankers. In case of Contamination and/or shortage of Water • Involve ward level women's groups like SHGs and Neighbourhood Groups in monitoring. • Measures for water removal though pumping in case of flooding • Ensure implementation of Health & Safety Management Plan (ECOP for public and workers safety. • Ensure implementation of water quality Management (Eco for better water quality • Create awareness on precautions/preventive measures to be taken up in case of over chlorination.	Operator	ULB/SPV

Chapter 1: INTRODUCTION

The Karnataka Urban Infrastructure Finance Corporation (KUIDFC) on behalf of the Government of Karnataka is preparing the Karnataka Urban Water Supply Modernisation Project (KUWSMP). The project involves modernizing water supply systems and capacity for providing continuous piped water supply in the project cities. The project will be implemented in the three cities Hubli-Dharwad, Gulbarga and Belgaum in the state of Karnataka in India. The cities are 2nd, 4th and 5th biggest cities of the state by population and are located in the arid / semi-arid northern region of the state. Geologically, all the three cities are located in the Deccan Plateau and are known for their limited water resources (both surface and sub-surface). The project by virtue of the proposed water supply improvements would lead to positive improvements in the quality of water delivered to the consumers and associated health improvements due to reduced incidences of water borne diseases. To deal with environment land and social issues arising out of KUWSMP, Environmental and Social Assessments were conducted in the three cities and an ECoP and a Resettlement Policy and Framework (RP&F) is also prepared based on the assessments. This document describes the environment and social concerns of the Project and presents the principles and approach to be followed in minimizing and mitigating adverse environment and social impacts caused by construction of water supply schemes under the project.

1.1 Project Background

In 2003, Government of Karnataka (GoK) with assistance from the World Bank launched Karnataka Urban Water Sector Improvement Project (KUWASIP) for providing a continuous water supply (24X7) to address issues of poor quality, intermittent supply, illegal connection and supply of contaminated ground water. The State Government selected five demonstration zones in three project towns of Hubli Dharwad, Belgaum, and Gulbarga to pilot the 24X7 urban water supply (UWS). The project envisaged setting a policy, institutional and regulatory environment in the urban water sector, enabling service improvements, sustainable investments and coverage expansion. The project was successfully implemented and closed on 31st March 2011.

Based on the success of the project and with the support from the local communities, City wise scale up has been proposed through World Bank funding. The total project cost is for all the three cities is estimated at about 1809 crores in INR or $ 279 million in US. This up scaling project for the identified cities known as “Karnataka Urban Water Supply Modernization Project” (KUWSMP) has been approved by the GoK and includes setting up of city level utilities (SPV) and hiring of an Operator to identify and implement investments that will ensure delivery of continuous water supply in the project cities. The activities of the operator will include the following.

- Augmentation / development of water sources
- Rehabilitation of existing or laying of new transmission line(s),
- Rehabilitation or expansion or new water treatment plant(s)
- Development and / or expansion of pumping station(s)
- Renovation or rehabilitation or construction of new service reservoirs (underground or over-ground)
- Replacement and /or extension of distribution network
- Replacement and/ or provision new house service connections.

The project will finance, amongst others, physical investments in the water supply system to facilitate continuous water supplies (Component 1) along with the systems, procedures and equipment that will build the institutions to sustainably deliver those improved services (Component 2).

Component 1 - Capital Investment Program

Capital Works: These include bulk capacity augmentation; enhancing capacity or resilience of transmission/feeder mains; treatment plant renovations/capacity enhancement; pump station upgrades; service reservoir improvements; distribution network sectorization, pipeline rehabilitation/replacement; water meters for bulk supplies and consumer consumption; replacement of house connections; and new connections to low income households.

Service Improvement Plan: The Operator will prepare and implement a Service Improvement Plan (SIP), approved by the Client, which will set out the needed investments for capital works and utility systems & equipment. The initial SIP will be prepared during the Start Up Period and will be updated annually to capture new and better quality data. An Expert Reviewer will advise on the suitability of, and any amendments required to, the SIP.

Construction Management: The Operator will act as the Client's Construction Manager for implementing the SIP and will contract with third party contractors for delivery of the agreed capital works and the systems & equipment. A Technical Auditor will certify payments to be made by the Construction Manager.

Component 2 – Institution Building

SPV set up and operations: This will finance costs associated with operationalizing the SPVs including (i) preparation of institutional staffing, training and delegation plan; (ii) office equipment (iii) staff training costs and (iv) incremental operating costs during the project period.

Systems and Equipment for Service Delivery: This will finance all the systems and equipment needed to establish well-run service delivery arrangements at the city level including computer systems (MIS, GIS, Billing and Collection, Call Center, CMMS), preparation of Standard Operating Procedures, and purchase of operational equipment and vehicles.

Partial payment of Operator Fees during the transition period: The project will finance 50% of the operator fee during the transition period as a result of the additional costs incurred at this time due to intensive staff training, capacity building, and heavier operating costs (especially for leakage control). These important activities will allow the operator to turnaround and stabilize service delivery in readiness for the Sustaining Period.

Component 3 – Technical Assistance for Sector Development

The project will support activities aimed at further developing the urban water sector in the State.

Preparing a State Urban and Rural Water Supply and Sanitation Strategy: The study would cover policy, service delivery arrangements, performance standards, regulatory requirements, investment needs and sector financing.

Developing Low Cost Sanitation approach in project cities: The study would look at national, regional and international experiences and would include preparation of detailed designs for pilot implementation in each city.

Project Impact Evaluation: This would assess the impact of providing continuous water supplies at both the household level and the city level.

Improving Social Accountability: This would support implementation and routine capture of consumer feedback on the quality of WSS services in each city and make it available on line for easy access by all stakeholders.

Improved dam management: Preparation of Operation and Maintenance Plans and Emergency Preparedness Plans for the five dams providing water to the three cities and considered Large Dams under the Bank's policy "Safety of Dams" (OP4.37).

Component 4 - Project Management

This component finances activities to ensure efficient and effective project implementation. This includes, among others, equipment to establish PMU/PIU offices, consultants to support technical evaluations, third party monitoring, expert reviewer, safeguards and fiduciary auditing, construction quality assurance, communications and others.

1.2 Kalaburgi City and the proposed project

Kalaburgi city is the divisional headquarters of Kalaburgi revenue division having jurisdiction over the five districts of Bellary, Bidar, Kalaburgi, Raichur and Koppal. The city is located in the latitude 170 - 2' North and longitude 260 - 51' East at an average altitude of 458 meters above the mean sea level and comprises in 58 Municipal administrative wards with a total area of 55.0 Sq.km.

Water to the Kalaburgi City is supplied from three surface water sources: 9 MLD of water is supplied from Bhogsa Reservoir, 20 MLD water can be supplied from Bennithora Reservoir (under renovation) and around 55 MLD of water is supplied from the Bheema river located at around 20 kms. There are a number of working bore-wells accounting to about 1273 numbers, 364 bore-wells are fitted with power pumps (3 phase - submersible pumps) and about 590 bore-wells are with hand pumps and 319 bore-wells are fitted with single phase pumps having supply capacity of about 8.00 MLD of water[2]. The physical features along the proposed alignment in each of the project cities are described below.

Detailed studies were carried out to understand the physical and capital investments required for providing continuous water supply to Kalaburgi in Sept 2012 and the study has identified the following key activities for the city.

- ✓ Surface water source Bennithora River scheme: A new intake structure at Harasur Village, a raw Water pumping main of 1200 mm dia. for a length of 13.0 km and a new Water Treatment plant of 100 MLD at Salam Tekdi has been proposed
- ✓ Surface water source Bheema River Scheme: A Water treatment plant of 50 MLD is proposed near the All India Radio Station where 3.5 acres land is available
- ✓ Two water treatment plants - one at Salam Tekdi and the other at Kotnoor are proposed.
- ✓ Upgradation in terms of the alum dosing plant, laboratory up-gradation etc has been proposed for the existing Water Treatment plants at Old Filter Bed Treatment Plant on Sultanpur Road, Shorgumbaz Water Treatment Plant and Kotnoor IPS Water Treatment Plant.
- ✓ The Clear Water Pumping Station needs minor repairs like painting, plastering etc.

[2] *Karnataka Urban Water Sector Improvement Project- Upscaling 24X7 Water Supply To Cover Entire Corporation, Gulbarga*

- ✓ The Pumping Station at Old Bed Filter Station of 40 HP pump house needs change in pumping machinery and two new clear water pumping station has been proposed at AIR WTP location and at Shorgumbaz WTP location
- ✓ Laying of about 42 km of additional lines of different diameters from 1150 mm to 90 mm is proposed. This is in addition to the existing 47.30 km length.
- ✓ One ground service reservoir is newly proposed
- ✓ Upgradation / replacement of about 970 km of additional distribution line is newly proposed.
- ✓ Dismantling of 15 elevated service reservoirs and construction of five service reservoirs are proposed. Apart from this all the exiting elevated and ground reservoirs shall be integrated into the system is also proposed.

1.3 Environmental and Social Assessment (ESA)

An Environmental and Social Assessment (ESA) has been carried out to integrate environmental and social concerns with project design, identify potential adverse environment and social impacts during different phases of the project implementation (pre-construction, during construction and post construction) and recommend mitigation measures, complying with environmental and social safeguard policies of the World Bank, Government of India, and Government of Karnataka.

1.4 ESA Objectives

Within the broad framework of mitigation of the adverse influences in the environmental and social domains of the ensuing water supply project influences through ESA, the broad objectives are:

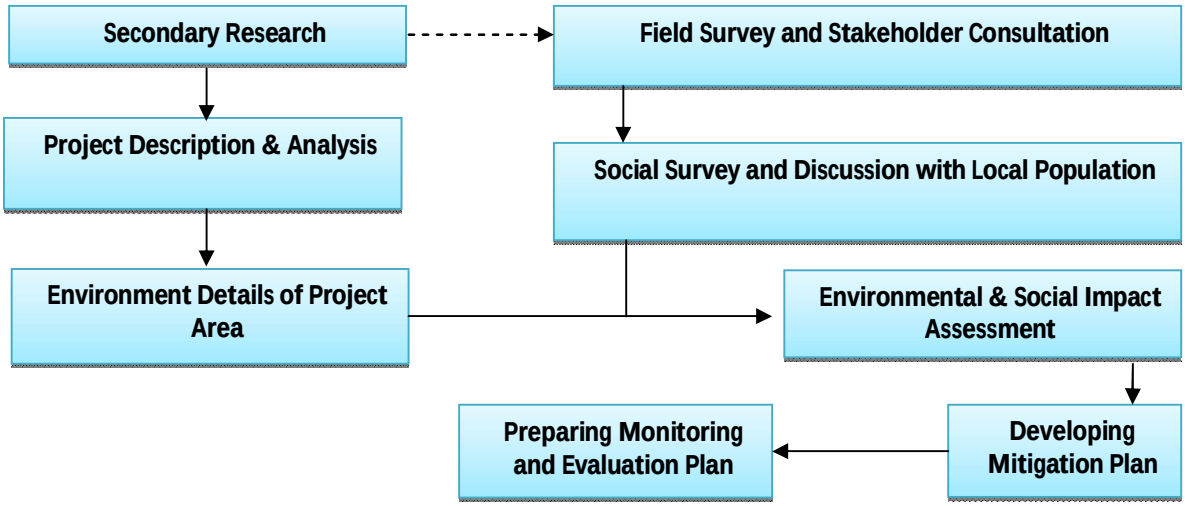
- Identification of key social and environmental issues associated with the proposed water supply augmentation (24x7 water supply) such as rehabilitation works to be implemented at the pre-construction, construction and operation phases of project.
- Identification of the positive and adverse impacts of sub project activities on physical and social environments.
- Propose suitable mitigation measures for potentially adverse environmental and social impacts, and measures for enhancement of positive impacts. This will be attained through a comprehensive Environmental and Social Assessment Studies and preparing (a) ECoP and (b) Resettlement Policy and Framework.
- Detail out roles and responsibilities of various agencies involved in carrying out the proposed action plans.

In addition to the above mentioned objectives, ESA will also suggest additional detailed environmental and social studies / activities that may be required to be carried out to ensure sustainability and monitoring of ESMP.

1.5 Methodology and Approach to ESA

The approach in carrying out the ESA has been a mix of technical as well as participatory exercise. A comprehensive approach and methodology, with a step-wise approach, has been adopted to develop the Environmental and Social Management Plan for project area which is shown in **Figure 1.1.**

Figure 1.1: Methodology and Approach of ESA



The steps have been elaborated as follows:

Step 1: A comprehensive policy & regulatory review at national & state level has been carried out by summarizing the applicable policies and regulations. Applicable Safeguard policies of the World Bank have also been reviewed and summarized.

Step 2: Secondary and Primary data collection and analysis. All the relevant data from secondary sources has been presented geographically & in database format. Identification of issues with different attributes has been further confirmed through stakeholder consultations. This leads to identification of issues, causes and impacts on a broad level.

Step 3: Extent and level of impacts are assessed based on the outputs from the earlier studies.

Step 4: Based on the impact analysis of adaptive and mitigation, activities has been formulated and the Environmental and Social Management Plan (ESMP) has been devised.

Step 5: A monitoring and evaluation (M&E) plan including a list of key environmental and social indicators for monitoring at various levels has been prepared.

Step 6: An institutional assessment has been carried out and outputs of steps 4 and 5 have been mapped with respective institutions so that 'roles' and "responsibilities" for implementation are assigned during implementation.

1.6 Scope of ESA

A. Environmental Assessment will encompass the following:

Review of the key activities undertaken in pre-construction, construction and post construction phase and initial design of proposed 24x7 Water Supply Systems. The study includes review and analysis of available engineering reports. The outcome is further strengthened by discussions with various stakeholders (KUIDFC, KUWSDB, ULBs, design consultants, transaction advisors) and is inter-linked to various environmental aspects.

Detailed Environmental Profile of the project city: The available secondary information and primary monitoring / investigations with regards to the physical, biological and socio-economic conditions are collected and analyzed. The outcome includes basic demographic and socio-economic characteristics, existing water supply situation, status of other related infrastructure (wastewater, solid waste, drainage, roads, ground water, etc.). It also describes physical environmental profiling considering air, water, noise, soil quality,

attributes at different locations; ecological profiling in terms of aquatic / terrestrial flora and fauna and other environmental features in project areas. This section also entails mapping of physical feature and environment attributes.

Assess base line water quality and health profile of project city: This section includes primary sample survey to assess water quality at critical locations of water supply network like source, treatment plant, service reservoirs and consumer points especially in slums and determining associated health impacts of water quality. It also entails soil sampling and inventory of possible locations of cross contamination or leakages duly correlated with existing drainage network.

The health profile and other household information of project city: from available secondary information and adequate primary household surveys, collected and analyzed.

Stakeholder consultations (jointly carried out along with other activities of social assessment) to understand the key environmental, social and health issues associated with current water supply systems and proposed project interventions to guide formulation of EMP and ECoP. Stakeholder Consultation was conducted in the city for identification of issues, impacts and their mitigation (Chapter 6).

Policy, Regulatory and Institutional Framework: the environment management plan, its implementation and monitoring is to be reinforced by incorporating all applicable operational policies of the World Bank and environmental laws / regulations in India. It includes review policies, laws and acts regarding environment and analysis of institutional framework in terms of agencies involved in planning, designing, operating and maintaining the project activities and the relevant regulatory agencies, so as to assess

- the capacity,
- willingness and
- resource requirement of the institutions for effective integration / management of environmental aspects

Identification and analysis of key environmental issues: this includes analysis of the base line environmental data collected from various departments in terms of changes in the physical, biological or socio-economic environment and other negative and positive impacts likely to result from the proposed project improvements. It also covers provision of broad alternatives for various sub-components, choices of sites and identify issues of particular concern for each such alternative / intervention regarding augmentation of water sources, its reliability and sustainability, location and; operation of water treatment plants, pumping stations.

Environmental Management Plan (EMP): The environmental management plan included (a) the recommended mitigation actions and management plan for the potential negative impacts identified; (b) the measures (prevention, mitigation and compensation) complying with the nature, scale and potential of the anticipated environmental impacts; (c) monitoring and supervision plan; and (d) defining roles and responsibilities of all agencies involved (contractors, the project implementation and monitoring agencies).

The measures to be included are both structural and non-structural measures.

The structural measures could comprise

- Appropriate changes in the designs,
- Protection of physical entities to minimize impacts on ecology and hydrology.

The Non-structural approaches could include

- Construction schedules designed to minimize conflicts and
- Training agencies in principles and methods of environmental protection.

B. Social Assessment will include the following

The scope of work for social assessment will include the following

Review of the experiences from the predecessor project in the demo zones through stakeholder's consultations involving communities and other stakeholders. Experience sharing consultation with ULB staff and officials, elected members - past and present- of the ULBs, staff of Urban Water Supply Board, media, prominent institutions, NGOs, health institutions/service providers etc.

Review of reports on demo zone including a) Project Appraisal document; b) Implementation Completion Report; c) Rapid social assessment and communications strategy; d) M&E reports; e) impact assessment study; f) IEC materials; g) land acquisition framework; and h) resettlement action plans.

Socio Economic Profiling: Socio-economic profile includes different caste/religious groups (the dominant and marginal groups), socio-economic profile, occupational categories, gender relations, etc. It also covers analysis of geographical spread of the ULB and its relationship with socio-economic composition of the society with special emphasis on gender analysis.

Baseline survey of sample households for key parameters socio-economic profile, current service levels, coping costs, health parameters, an assessment of willingness to pay and ability to pay.

Indigenous people: Identify any indigenous people; examine the applicability or otherwise of the Bank's Operational Directive on Indigenous Peoples (OP 4.10). If the policy is found applicable on indigenous group, prepare a tribal development plan that meets the requirements of Bank policy.

Land Acquisition Requirements: It covers review exiting R&R framework and update in consultation with KUIDFC. Identification of land acquisition requirements and develop the process and framework for land acquisition, compliance with provisions of the Bank's OP/BP 4.12 on involuntary resettlement. For land acquisition which may take place in the first eighteen months, the consultant will prepare Resettlement Action Plan, following the Project's Resettlement Policy Framework, OP 4.12 and new LA and R&R Act 2013.

Stakeholder Consultations: It covers primary stakeholders, NGOs, CBOs, elected representatives, ULB officials, other Government departments, eminent citizens, other opinion makers and the general public. Stakeholder Consultation includes: a) semi structured interviews, b) PRA methods, c) direct observation, d) focus group discussions, e) sample surveys of households and f) secondary literature review.

Resettlement Policy Framework:

Outlines Resettlement Action Plan (RAP) addressing key social issues; presents entitlement matrix for the project, poverty / gender / tribal development frameworks; road map for carrying out specific social Assessment and Rehabilitation Action Plans for each of these activities.

Resettlement Action Plan (RAP): This includes Resettlement Action Plan (RAP) addressing key social issues, land acquisition; entitlements as per RPF and also poverty/gender/tribal development plans as required for the project.

C. Environmental Code of Practice (ECoP) 24x7 Water Supply Systems

ECoP provides guidance in integration of environmental concerns during design, implementation and operation of water supply project (KUWSMP).The ECoP essentially covers code of practice for each activity and sub activity in project development cycle. It

recommends mitigation measures for negative environmental impacts; provides specific guidance for good practices (with support information on type designs / drawings / lay outs, etc.) with examples; and specific environmental enhancement opportunities in terms of selection of suitable designs, technologies (for WTPs), opportunities for energy efficiency, conservation of water resources (including reuse / recycling).

It provides details of reference and resource materials; training and capacity building requirements; and general codes of practice for planning and design, construction, supervision and monitoring and operation of 24x7 water supply projects.

1.7 Structure of the report

The present report is the Draft on the Environmental and Social Assessment Study carried out by the consultant for the project.

Chapter 2: STUDY AREA AND PROJECT DESCRIPTION

2.1 Kalaburgi City and its characteristics

Kalaburgi city is the divisional headquarters of Kalaburgi revenue division having jurisdiction over the five districts of Bellary, Bidar, Kalaburgi, Raichur and Koppal. The city is located in North Karnataka, 625 km north of Bangalore. With a population of 543,147 (2011 Census), the conurbation is among the largest municipal corporations in the State, after Bangalore, Hubli-Dharwad and Mysore. The city is divided into 55 administrative wards to manage urban services delivered by Kalaburgi City Corporation (GCC).

The territorial jurisdiction of the Municipal Corporation covers 55 sq. km, which is shown in Figure 2.1. The area under the jurisdiction of City Corporation has increased by 22 sq kms in the 1995, with variations due to inclusion of some villages and extension area into the CC limits to sustain growth of city.

Socio-economic profile of Kalaburgi city is summarized in following sections.

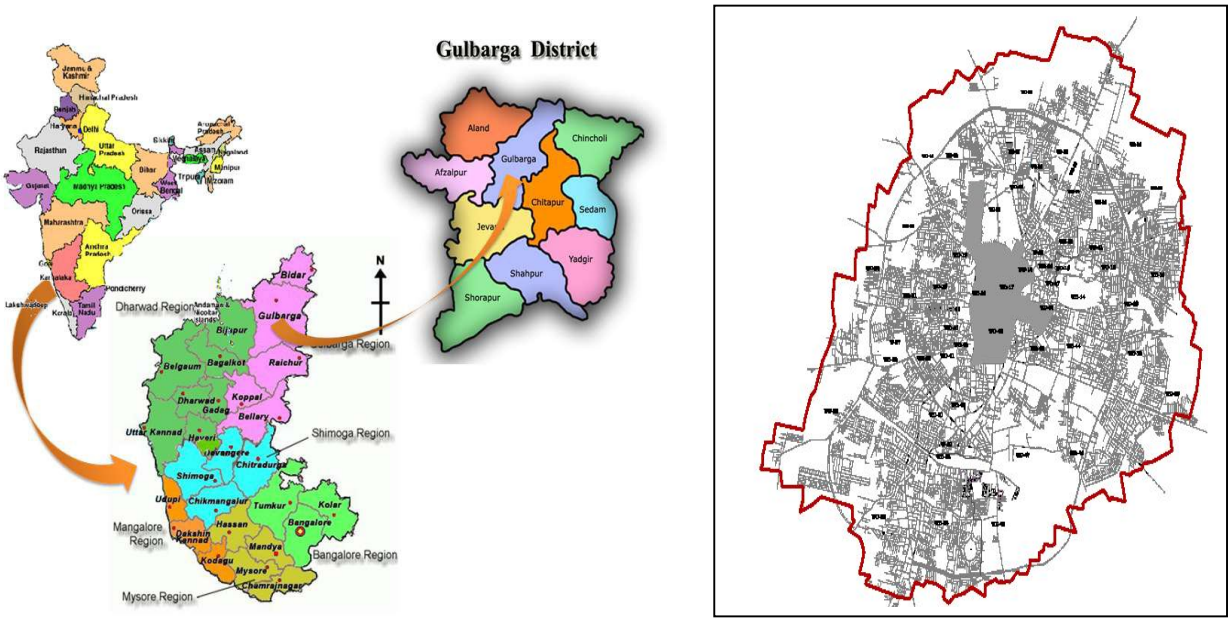


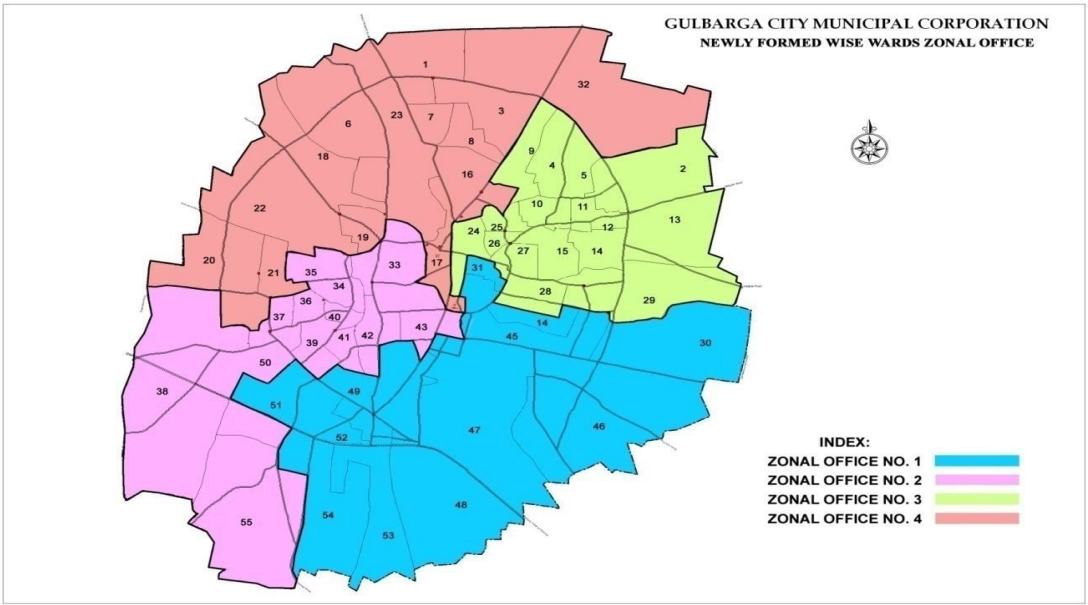
Table 2.1: Fact File

Sl. No.	Attributes	
1.	Population 2011	543,147
2	Total Households	102830[3]
2.	Area Kalaburgi Municipal Corporation	55 sq. km
3.	No. of Wards	55
4.	Population Decadal Growth rate (2001-2011)	23 %
5.	Population Density (2011)	9875 persons per sq.km
6.	Literacy Rate	72%
7.	Sex Ratio	953
8.	Economy	Regional Market and Service Centre

(Source: Census of India, 2011 and ULB records)

[3] 2011, Census

Figure 2.1: Area of Kalaburgi City Municipal Corporation



Population

Kalaburgi has grown rapidly with an annual growth rate of 3 percent since 1971 to 2001, however has declined to 2.0 percent in 2011. The population of the city, which was 1,45,558 in 1951, has increased to 5,43,147 by 2011, which is almost four folds. The decadal growth of the city is found to be highest during 1961-71 and 1971-81.

Table 2.2: Population growth trends and density-Kalaburgi

Years	Population	Decadal Growth (in %age)
1951	77,189	-
1961	97,069	20.48
1971	145,588	33.33
1981	221,325	34.22
1991	310,920	28.82
2001	430,265	27.74
2011	543147	20.78

Source: Census of India 2011

The population density for the city has increased from 7,378 persons per sq. km during 1981 to 9422 persons per sq. km during 1991 and declined to 7823 persons per sq. km during 2001, due to the expansion of the municipal area. Population density of the city in 2011 was recorded as 9875 persons per sq. km.

As per Census 2011, total work force of the city was 32.95 percent comprising of 178207 persons. Total main workers (147199 persons) constituted 82.6 percent of the total work force. Total main workers in all the wards ranged from 25-50 percent. About 93.67 percent of main workers are engaged in other services, 3.39 percent main workers are engaged in agriculture sector and remaining 2.92 percent are engaged in household industries.

Slum

Slum area of Kalaburgi is 1.48 sq. km which is 2.7% of the total area of the city. 60 slums where 42 are notified and rest 18 are Non-notified. Over 70% of slums have existed more than 10 years in the city due to the fact that Kalaburgi has been one of the continuously inhabited cities in India. The population for this slum is 60190 (11.13%)

Economy and Industry

Kalaburgi is primarily a regional market and service center. Textile, Oil and Dal industries are the major industries of the city. Kalaburgi district is known for a huge reserve of limestone and gypsum the basic raw materials for cement production, as a result; some of the biggest cement industries of the country are located here. ACC, Birla, Ultra tech are few to be named. The district is also known for land stone deposits, the famous Shahabad stone - a well-known building material is from this district. As a result, stone polishing industry is also prominent here. Dal industries are mainly located on the Kapnoor industrial area on the Humnabad road.

Kalaburgi has been a prominent trade and commerce centre since Nizam's time. Larger concentration of functions like health, education, trade, commerce industry and banking have all extended the service catchment of the city to the entire region. However, for higher order functions like airport, advanced health and educational services, trade and industry, the city looks up to Hyderabad, the capital city of Andhra Pradesh. As a result, Kalaburgi's dependence on the state capital is restricted to the mandatory functions like "political and administrative activities" only.

History & Monuments

Historically, Kalaburgi distinguishes itself as the first capital of "Bahamani Dynasty" whose glory lasted till 1874. Later, until reorganization, of the states in 1956, the city was under the control of the Nizam of Hyderabad. The influence of Muslim rule for a longer period on the city is very much evident through several well-known monuments like fort, mosques (Shaha Bazaar, Masjid, Jama Masjid) several royal tombs and a holy tomb of a Muslim saint "Khwaja Banda Nawaz". However, the city also came under the influence of the great social reformer "Basavanna" which is indicated in the holy temple "Sharana Basaveshwara" in the heart of the city. These monuments have enhanced the historical importance of the city.

Transportation Services

Kalaburgi city is linked by Mumbai / Delhi to Chennai / Bangalore broad-gauge railway line to the state capital and other towns and cities of the country. The Bangalore-Humnabad State highway passes through the city. The other important state highways, which link the city, are Kalaburgi - Sedam, Kalaburgi- Aland and Kalaburgi- Afzalpur. It is situated at a distance of 225 km west of Hyderabad, 550 km South of Mumbai and 625 km North of Bangalore. The nearest airport is located at Hyderabad, which is at a distance of 225 Km; the nearest River is Bheema which is at a distance of 25 km. The length of the type of roads is Cement Concrete 128 km, Black Topped 397 km, Kacha Roads 298 km and total length of the road is 823 km.

2.2 Current Water Supply System

This section reviews and highlights the key activities and design parameters of the proposed 24x7 water supply systems in the city, based on the available engineering report (Project Report- Final, Karnataka Urban Water Sector Improvement Project- Upscaling 24x7 Water Supply To Cover Entire Corporation – Kalaburgi; Tata Consulting Engineers In association with SREI Infrastructure Finance Ltd.).

Currently about 75 MLD[4], at 135 lpcd is supplied to Kalaburgi City mainly from three sources namely, Bhosga Reservoir, Bennithora Reservoir and Bheema river. Numbers of interventions are proposed within the city in place of existing water supply infrastructure all

[4] As per TCE report

pipe lines will be relayed at the old pipe line place. Kalaburgi 2.2.1 Source of Water Supply and sanitation Status[5]

At present Kalaburgi City receives water mainly from three sources namely, Bhosga Reservoir, Bennithora River and Bheema River executed under Kalaburgi Water supply scheme I, II, III respectively.

1. Bhosga Water Supply System:

Bhosga Reservoir is located on the western part of the city. Due to frequent drying up of reservoir due to less rainfall in the catchment area this is not considered as a reliable source of water. At present, 10MLD of water is drawn from this source and is treated at the old Filter bed area. RCC pipe of 750mm dia exists which was laid back during 1970's.

2. Bennithora Water Supply Schemes:

Bennithora River flows on the northern part of the city at about 15 Km from the city. An intake structure along with a 615mm dia CI raw water transmission system constitutes the pumping main system up to BPT at Salam Tekdi which is around 10Km in length. This system is presently under rehabilitation under the ongoing PI works of KUIDFC consultant. The old CI pipe of 600mm dia is being replaced by 615mm dia MS pipes with internal Cement mortar lining and external guiniting. On commissioning of this scheme the city can draw an additional 20 MLD of water.

Figure 2.2 : Bennithora Reservoir

3. Bheema Water Supply scheme:

Bheema River flows on the Southern part of the city at about 20 Km from the city out skirts. New Rising main of 1118 mm dia MS pipe for a length of 19.20 Km from the intake point to the IPS station at Kotnoor is put into operation in 2007. The system has been designed for the intermediate stage of 2016 for the discharge of 55 MLD and upgradeable for the ultimate design discharge of 105 MLD. The MS pipes are lined with cement mortar lining internally and guiniting externally.

From the IPS station at Kotnoor, 40 MLD of water is pumped to the existing treatment plant at Shorgumbaz through 914 mm dia MS pipes with internal cement mortar lining and external guiniting.

[5] *Page 11, 12 and 13, Project Report- Final, Karnataka Urban Water Sector Improvement Project- Upscaling 24x7 Water Supply To Cover Entire Corporation – Gulbarga; Tata Consulting Engineers In association with SREI Infrastructure Finance Ltd*

4. Ground Water Source

There are a number of bore-wells accounting to about 1729 numbers. 409 bore-wells are fitted with power pumps (3 phase - submersible pumps) and about 919 bore-wells are with hand pumps and 401 bore-wells are fitted with single phase pumps and supplying 8.0 MLD water to the city. Due to scanty rainfall during last few years, the ground water is dwindling and is causing failure of hand pumps. Ground water is available at a depth of 300ft to 400ft and is slightly fluoride affected in some of the areas (more than 3ppm). Also these bore well water are generally found to be hard in nature with calcium and magnesium contents present above prescribed limits in some areas. These bore wells are also presently under service and are operated daily for around 2 hours a day as per the requirement. Separate dedicated lines have been laid where 3 phase pumps have been installed which generally feeds the nearby local areas.

Separate tanks have been constructed near the bore-wells where single phase pumps have been installed. This pump lifts the water to the nearby tank (common tank) from where water is collected by the individuals.

2.3 Water Treatment Plant

Kalaburgi City has three number of Water Treatment Plants of capacities varying from 9 MLD to 25 MLD located at Old Filter Bed Area, Kotnoor IPS and Shor Gumbaz. These Water Treatment plants are within 10 km from the City Centre.

2.4 Clear Water Pumping Stations

At present there are 16 Clearwater pumping station under operation. In the final reorientation design it is proposed to retain only 3 clear water pumping stations. The remaining thirteen stations are proposed to be abundant.

2.5 Water Distribution Pumping Station

The town is divided into two zones – North and South zones with 10 Water Distribution Pumping Station

2.6 Service Reservoirs

There are 33 numbers of Elevated Service Reservoirs and 6 Ground level service reservoirsand 7 Clear water reservoirs in the city.

2.7 Distribution System

About 75 MLD of water is supplied to the city population. The city is divided into 55 Municipal administrative wards and the existing distribution of water is done through 4 GLSR's and 27 ESR's. Totally 32 water supply distribution zones have been formed for the equitable distribution of water during the city remodeling period in early 2000, tapping the feeder mains is carried for feeding the system near KBN Engineering College. New Zones are formed due to creation of new reservoirs one each in the High court Area, Biddapur colony, Sainagar area, Hirapur area, Islamabad colony and Buland Parvez (Next to Mecca colony tank) colony.

2.8 Distribution Pattern

The distribution supply to the city is carried out on alternate day basis for a period of 2 hours. This has resulted in operation of many valves during supply day. It was observed that in areas such as Mecca colony, Roza colony, Billalabad area, Old SP office area, Market area, etc online pumps are used by the residents for drawing water during supply hours due to non-availability of adequate pressure in the network.

2.9 Consumer Connections

Kalaburgi city was having 34107 no's of domestic water supply connections and 446 no's of commercial connections as on June 2011. The City has a 24x7 water supply system for a portion of the area executed by KUIDFC and being operated by a Private operator. Connections in this demonstration zone are by 100% metering system.

2.10 Existing Sewerage System

Karnataka Urban Water Supply & Drainage Board (KUWSDB) has implemented sewerage scheme in Kalaburgi city in two stages. Stage I was completed in year 1975 and stage II works were completed in year 2002. Stage III works are presently under implementation phase.

The entire Kalaburgi city has been divided in five sewerage zones viz. 2D1 (AA1), 2D2 (B), 2D3 (C), 1D1 (D) & 1D2 (E) and 3D1 (F) except sewerage district 3D1, all sewerage districts are drainable by gravity to the existing sewage treatment plant near Kotnoor village.

The total length of existing sewerage network including the private layout, implemented by corporation, KUWSDB is approximately 280 km with about 4447[6] HH connected to sewer lines with capacity of STP is 27.24 MLD.

In addition to the above facilities, the city population has individual sanitation facilities such as septic tanks (21,483 households) and other sanitation arrangements. It is estimated that about 79,182 households (79.73 %) of the total 99,312 households have sanitation facilities. The remaining 20,130 households hence would require sanitation facilities.

2.11 Existing Sewage Treatment Plant

The existing sewage treatment plant in Kalaburgi City is located to the south of the city near Kotnoor village area, behind Kendriya Vidyalaya and is designed as waste stabilization ponds. The sewage treatment plant was designed to serve a population of 3, 00,000. The capacity of the plant is 27.24 MLD.

2.12 Proposed Sewerage System For the City

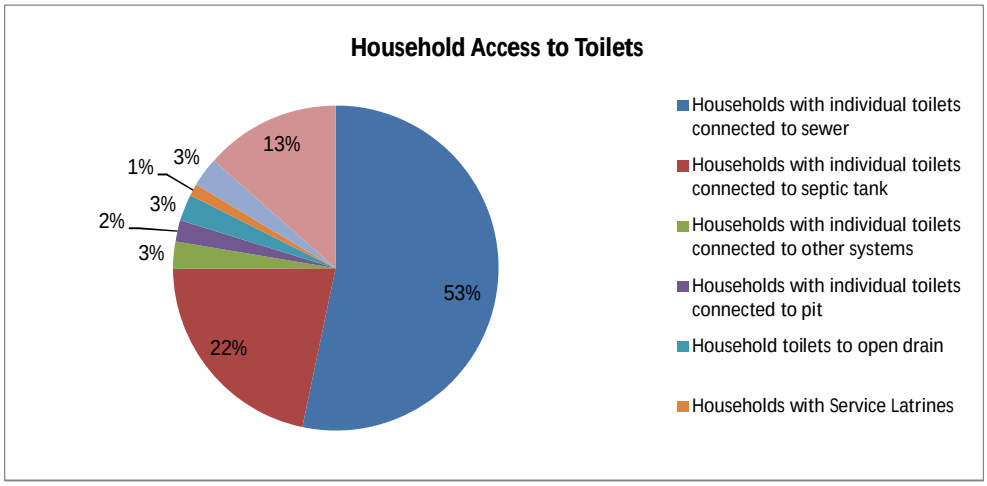
In order to improve the sewerage facilities in the city, a sewerage scheme comprising 67.23 km of additional network and a STP of 40 MLD is being implemented at a cost of INR 579 million (USD 10 million), as part of the ADB supported North Karnataka Urban Sector Improvement Project (NKUSIP). This project is expected cover 53% of the households and increase the sewage treatment capacity to 67 MLD.

While this would be sufficient for the current sewerage generation of about 60 MLD (80% of 75 MLD), the sewage generation is expected to increase to 120 MLD in 2026 and 160 MLD by 2041 and would require augmentation of treatment capacities by 53 and 100 MLD in the respective years.

2.13 Sanitation Facilities Kalaburgi

Sanitation facilities in Kalaburgi as per 2011 census data indicate that 53.29% households are having individual toilets which are connected to sewer lines and 33.18% toilets are not connected to sewer lines. It also reveals that 13.5% households are practicing open defecation.

[6] Ref note on sanitation options under KUWSMP



2.14 Existing Storm Water Drainage System

Kalaburgi at present has around 90km of the storm water drains which is about 10% of the existing road network. The existing storm water drains are not maintained periodically. Silts and debris are a common sight in many of the existing drains.

Kalaburgi in past few years is experiencing rainfall exceeding the average rain fall in the region. Due to undulating terrain, non-availability of proper drainage system supported by heavy rains, the city has witnessed floods in the past few years. Water logging is a common sight in the low lying areas. These low lying areas are generally occupied by slum dwellers which add to the woes of the hygiene conditions. Water borne diseases are commonly reported during these periods.

By the implementation of 24x7 system water is supplied to the consumer in pressurized system. The distribution system is expected to be free from contamination and ingress of external water. Due to water logging in these low line areas during rainy season the region may pose serious threat to the quality of the water being delivered in the event of pipe burst. Hence it is recommended that the concerned authorities to provide a scientific means of collection and disposal of drainage for the city.

2.15 Study of Alternatives

Various alternatives have been assessed by the design consultants[7] to design a least cost viable project aimed at 24X7 water supply to the residents of Kalaburgi Corporation.

The Project Report addressed many technical issues pertaining to the Water supply component with respect to the Existing system, its conditions, and rehabilitation requirements, necessity of additional infrastructure requirements, Project area, and water demands for various consumers like residential, non-residential and industrial users.

The existing piping system in the distribution and Transmission system was analyzed with respect to the existing field conditions, present O&M practices through interactions with the concerned line-man / section officers, Laboratory test reports and its probable impact with respect to the 24x7 up-scaling was analyzed. Based on the above aspects, its probable integration with the proposed system was analyzed and accordingly conclusions were drawn. A brief summary of the design alternatives is provided below.

[7] *Tata Consulting Engineers in association with SREI Infrastructure Finance Ltd*

2.15.1 Reduced Per-capita Supply

Reduction in per capita supply from normative 135 LPCD to 100LPCD including the bulk supply System

2.15.2 Improved Operational Duration

The present operational duration of pumping stations and treatment plants is about 20 hours a day. Analysis was carried out to assess the quantity improvements by increasing the operational durations of pumping stations to 22 hours and 24 hours a day respectively.

Bulk Quantity enhancement of the transmission main was analyzed by replacing the existing pumping machinery to higher capacity pumps. The impacts on the initial capital investments and the increased O&M expenses were also analyzed.

2.15.3 Distribution System Integration

It is observed that about 35% approx. of the project cost is estimated for the distribution network improvements only. Almost all distribution pipe is proposed for replacement that was arrived based on the analysis carried out both in the site and at the laboratory. The consultants have also analyzed other available options for project improvements in the Distribution system. The technology availability on pipe rehabilitation and its usage for the present scenarios were explored.

- Option-1: Complete replacement of the distribution network
- Option-2: 25% replacement of the existing distribution network
- Option-3: 50% replacement of the existing distribution network
- Option-4: 75% replacement of the existing distribution network

Emphasis was mainly on the UFW reductions, DMA formations, Pipe leakage repairs and rehabilitation etc. (Detailed analysis report for alternatives is provided in Annexure 1)

2.15.4 Conclusions on alternative studies:

Various possible alternatives have been analyzed for the improvements in the system both in terms of the Bulk water supply and distribution system our conclusions and recommendations are as follows:

Per-capita consumption analysis: Considering increasing economic standards of the city and community demand for adequate water supply, a per capita supply level of 135LPCD was considered for Kalaburgi up-scaling the water supply in Kalaburgi.

Bulk water supply: Various viable options of bulk improvements have been analysed with respect to the increase in hours of operation for Pumping stations and treatment plants. The possibility of overloading the treatment plants, replacements of existing pumping machinery was also analysed. Upon careful analysis of the system, it is observed that source reliability, power reliability along with the probable O&M expenses plays a major role in accepting the preferred alternative.

Under the given circumstances, the consultants feel that 20 hours operational durations of Pumping stations and treatment plants, along with equal extraction of water from both the sources would be the ideal situation for Kalaburgi city. This can also help in addressing the minimum needs of the city in the event of failure of any one of the sources.

Distribution system: Various alternatives for the existing distribution system integration have been analysed by the consultants. Techniques for UFW reduction, pipe rehabilitation works were also studied. Upon careful analysis of the alternatives, the consultants recommend that complete replacement of the existing distribution system for the following reasons

- Rehabilitation of the existing system has constraints such as minimum diameters, straight stretches of pipe lines, etc. apart from time consuming process and may not be an economical option. This also requires details of underground assets mapping of various utilities.
- The behavioural characteristics of the pipes when subjected to 24x7 water pressure are unknown. This may have serious impact when 24x7 system is implemented.
- The end results of the pipe network after rehabilitation depends on the quality of the work man ship and the technology involved. There are every chances of compromise with quality when implemented to such a large extent.
- The residents of the area would be severely affected due to stoppage of water supply, blocking and digging of roads during the rehabilitation works.
- UFW reduction programs is a time consuming process involving formation of DMA, carrying out water balance analysis, leak detection studies, repair of leaks. This is an iterative and continuous process to be carried out until the desired levels are achieved. The time factor plays a critical role in the overall process.
- This aspect will be further analysed by the operator and distribution system will be re-designed with optimum use / replacement of the distribution system.

2.15.5 Demand Projection

Water has become a very important commodity for the growth of the cities. Identification of feasible and perennial source is imperative to meet the ever-increasing demand owing to increasing population and improved standards of living. The population of Kalaburgi city is expected to reach 9.25 Lakhs by the year 2031 and 11.40Lakhs by the year 2041 as per population projections. The present treated water requirement is about 100 MLD and this demand will be 174 MLD by the year 2031 and 209 MLD by the year 2041. The present supply is about 75 MLD from surface sources and about 8 MLD from ground water source. There is a need for augmentation of present water supply system to take care of immediate as well as future water demand of the city. Considering transmission and treatment plant losses of 5% the raw water requirement to meet the water demand by the year 2041 is 210 MLD (80.3 Mcum per year).

Table 2.3: Demand Estimation

Sl. No.	Description	Demand (MLD)					Remarks
		2011	2021	2026	2031	2041	
1	Population	572276	729884	829318	926815	1139530	
2	Domestic	86.36	110.14	125.12	139.85	171.91	@ 135 LPCD and 10% losses
3	Industries / Bulk	6.67	22.22	22.22	22.22	-	As per CPHEEO with 10% losses
4	Fire	2.66	3.00	3.20	3.38	3.75	As per the information available with 10% losses
		95.68	135.36	150.54	165.45	197.88	As per the DPR

(Source: Table 74, page 83, Project Report- Final, Karnataka Urban Water Sector Improvement Project- Upscaling 24x7 Water Supply To Cover Entire Corporation – GulbargaK; Tata Consulting Engineers In association with SREI Infrastructure Finance Ltd.)

The details of the water supply system based on the TCE Design report have been presented below:

2.15.6 Source Studies

The population of Kalaburgi city is expected to reach 9.25 Lakhs by the year 2031 and 11.40Lakhs by the year 2041 as per population projections. The present treated water requirement is about 100 MLD and this demand will be 174 MLD by the year 2031 and 209 MLD by the year 2041. The present supply is about 75 MLD from surface sources and about 8 MLD from ground water source. There is a need for augmentation of present water supply system to take care of immediate as well as future water demand of the city. Considering transmission and treatment plant losses of 5% the raw water requirement to meet the water demand by the year 2041 is 210 MLD.

The project proposes to utilize100 MLD of water from Bennithora reservoir and 105 MLD from Bheema reservoir to meet future water requirements of the city. Availability of water in these reservoirs was analysed and as presented in Annexure V, 205 MLD of water is available to meet the requirements of Kalaburgi.

2.15.7 Water Treatment Plant

The water treatment plant requirements are worked out based on the demand estimation. The existing treatment facility available has been reviewed and phase wise requirements of WTP has been worked out and the details are given below.

Table 2.4: Treated Water Demand for the Kalaburgi City

S. No.	Water Treatment Plant	Years				
		2011	**2021**	**2026**	**2031**	**2041**
1	Salam Tekdi	45.24	71.09	77.51	83.73	97.13
2	Shorgumbaz	35.54	45.09	51.05	56.73	69.44
3	Kotnoor	14.91	19.18	21.99	25.00	31.31
A	**Total**	**95.68**	**135.36**	**150.54**	**165.45**	**197.88**
Existing Water Treatment capacity in MLD						
1	Salam Tekdi	-	-	-	-	-
2	Shorgumbaz	40.00	-	-	-	-
3	Kotnoor	11.00	-	-	-	-
4	Old Filter Bed	9.00	-	-	-	-
B	**Total**	**60.00**	-	-	-	-
Propose Water Treatment capacity in MLD						
1	Salam Tekdi	75.00	25.00	-	-	-
2	Shorgumbaz	-	-	-	-	-
3	Kotnoor	12.50	12.50	12.50	12.50	-
	Total	**87.50**	**37.50**	**12.50**	**12.50**	-

Note: *Existing WTP of 11.3 MLD in Old Filter Bed area is discarded due to bad condition.*

(Source: Table 93, page 107, Project Report- Final, Karnataka Urban Water Sector Improvement Project- Upscaling 24x7 Water Supply To Cover Entire Corporation – Gulbarga; Tata Consulting Engineers In association with SREI Infrastructure Finance Ltd.)

2.15.8 Storage Capacity

Reliability on availability of water is the most important aspect of the 24x7 system. Hence it is suggested to provide about 50% of the daily requirements as the storage to be provided in the reservoirs at various locations in the system to cater to the fluctuating needs of the system.

As suggested earlier about 35% of the demand requirements are proposed to be stored in the Service reservoirs. The balance 15% is proposed to be stored in Ground level tanks near the Treatment plant areas.

Table 2.5: Storage Requirements of Kalaburgi City

Sl No.	Description	Total Demand (MLD)	Storage Capacity (ML)	Remarks
1	Service Reservoirs	197.00	69.00	-
2	GLR at Salam tekdi	-	15.00	In WTP area
3	GLR at Shorgumbaz	-	10.00	In WTP area
4	GLR at at AIR station	-	5.00	In WTP area
	Total	197.00	99.00	-

(Source: Table 100, page 116, Project Report- Final, Karnataka Urban Water Sector Improvement Project- Upscaling 24x7 Water Supply To Cover Entire Corporation – Gulbargai; Tata Consulting Engineers In association with SREI Infrastructure Finance Ltd.)

The above approach can take care of the following fluctuations.

- Minor Disruption in the Raw water Pumping stations, treatment plants
- Fluctuations in demand

2.15.9 Pumping System

The following clear water pumping stations is identified for the Kalaburgi city. Many of the existing pumping stations have been used. The details of the observations for the pumping stations are provided below.

Clear water pumping station at Kotnoor is found to be in good condition apart from small maintenance issues like the plastering and painting, rehabilitation of the pump pits etc. Hence, the pump station has been integrated with minor rehabilitation works into the proposed scheme.

The existing old 40HP pump house in old Filter bed area is found to be in bad condition. Hence, has been suggested for complete replacement, whereas the existing 20HP pump house in old Filter bed area is found to be in good condition. Hence, has been suggested for integration with minor rehabilitation works.

Table 2.6: Details of Clear Water Pump Stations

Sl. No.	Location	Remarks
1	Clear Water Pumping station at IPS Kotnoor	Existing
2	Clear Water Pumping station at AIR WTP location	Proposed
3	Clear Water Pumping station at Shorgumbaz WTP location	Proposed
4	Clear Water Pumping station at Old filter bed location- 20 HP pump house – for Demo zone	Existing
5	Clear Water Pumping station at Old filter bed location- 40 HP pump house – for nearby ESR	Existing Replaced

(Source: Table 101, page 116, Project Report- Final, Karnataka Urban Water Sector Improvement Project- Upscaling 24x7 Water Supply To Cover Entire Corporation – Gulbarga; Tata Consulting Engineers In association with SREI Infrastructure Finance Ltd.)

2.15.10 Clear water Transmission System

The entire project area has been further divided into different command area of the treatment plants based on the topography; physical boundaries and other man made features such that the system flows by gravity and feed the service reservoirs.

The existing clear water transmission main was re-modelled during early 2003 and is found to be in good condition and has been integrated into the proposed network. However, due to increase in demand and formation of new zones, additional pipe lines/ parallel pipe are proposed as per the requirement.

2.15.11 Local Distribution System

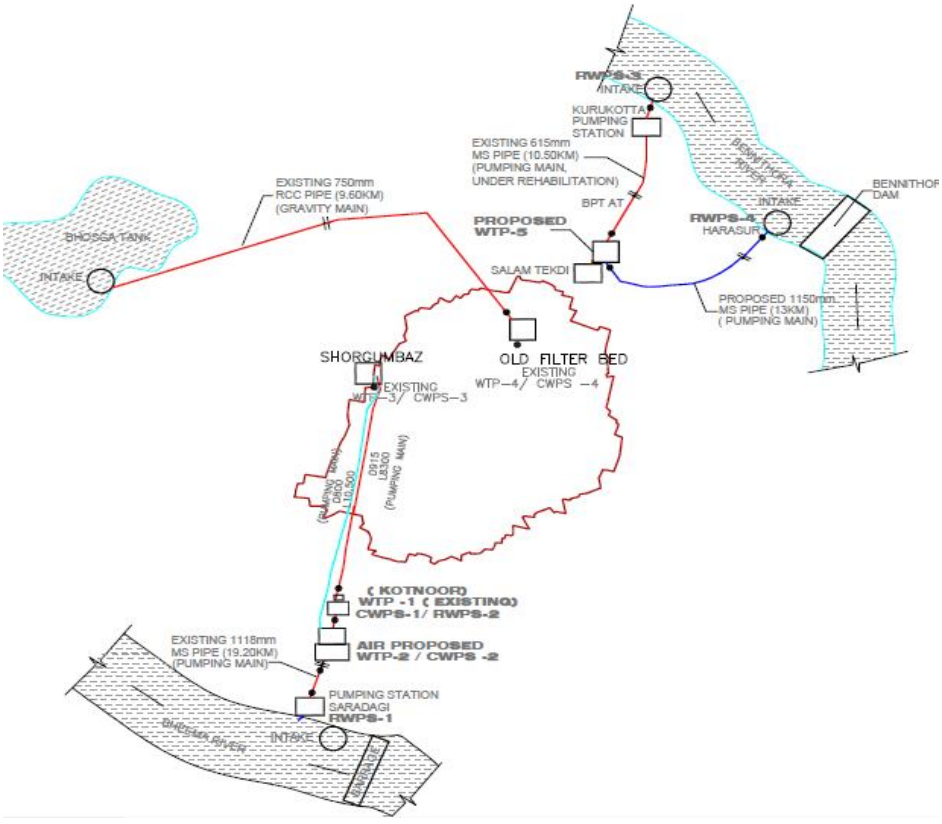
The distribution system network is divided into 42 zones for the equitable distribution of water. The command of the existing ESR and its pressure at the tail end points has been analysed, New reservoirs under constructions have been considered and accordingly the requirement of additional Reservoirs have been worked out. Accordingly 42 zones have been formed for the equitable distribution of water. Each zone is planned to be fed with a service reservoir. Interlinking of the zones has been done at the boundary with valves which shall be operated during emergency only. The summary of the distribution pipe network is provided in table given below.

Table 2.7: Summary of Distribution Network

S. No.	Summary	Length (KM)
1	Total Road Length	931.87
2	Total Pipe Length (suggested)	983.32
3	Total Existing Pipe Suggested for use	11.79

(Source: Table 108, page 123, Project Report- Final, Karnataka Urban Water Sector Improvement Project- Upscaling 24x7 Water Supply To Cover Entire Corporation – Gulbarga; Tata Consulting Engineers In association with SREI Infrastructure Finance Ltd.)

Figure 2.3: Flow Diagram of Water Supply - Existing and proposed



2.15.13 SCADA

The SCADA system shall be used for effective monitoring of water supplied and consumed. In this contest flow meters are proposed to be installed at inlet and outlet of WTP, pumping station, reservoirs and DMA. Flow and pressure information measured at these locations will be transferred through GPRS/GSM wireless technology and will be stored at a central location. It is proposed to set up a SCADA unit at the corporation office. This would help in monitoring the water supplied and consumed at various stages of distribution.

Chapter 3: LEGISLATIVE, REGULATORY & POLICY FRAMEWORK

3.1 Introduction

The chapter reviews various policies, regulations and administrative framework within which "Karnataka Urban Water Supply Modernization Project" (KUWSMP) is to be implemented. It includes operational policies / directives of the World Bank, sector-specific Environmental Policies & Regulations of the Government of India and the institutional profile of various agencies such as KUIDFC, KUWSDB, Project Local Bodies, KSPCB and other bodies associated with the project.

Policy and regulatory frameworks at national and state level have been formulated to provide for social and environmental safeguards in the last two decades. The policy framework includes in particular water sector related policies and policies related to environmental safeguards, both at the national and state level. Sector policies include Constitutional Provisions, National Water Policy and State Water Policy. Environmental & Social Safeguard related policies include National Environment Policy, National Forest Policy, State's Forest Policy & National Policy on Resettlement & Rehabilitation, State Resettlement & Rehabilitation and Karnataka Urban Drinking Water and Sanitation Policy. The EIA notification of 2006 forms the basis of environmental & social assessment of water resources project in Country as well in State of Karnataka. Detailed review on various applicable policies and legislative framework has been discussed in the inception report and this section would just highlight the necessary protective measures.

3.2 Applicable Policy, Rules & Regulation to project interventions / activities: Environmental

3.2.1 EIA Notification

EIA is Guidelines for environmental impact assessment governing all development interventions that take place within the boundaries of India provided by the Government of India. EIA notification was first issued by Ministry of Environment and Forests (MoEF) in 1994 and later amended in 2002 and 2006. Under the latest EIA Notification, 14th September 2006, all projects listed in Schedule -1 of the Notification require prior environmental clearance. The objective of the notification is to formulate a transparent, decentralized and efficient regulatory mechanism to:

- Incorporate necessary environmental safeguards at planning stage
- Involve stakeholders in the public consultation process
- Identify developmental projects based on impact potential instead of the investment criteria.

As per new notification, Category A projects require submission of EIA report as per issued Terms of Reference (ToR) by national environmental appraisal committee and public consultation before getting environmental clearance from Expert Appraisal Committee (EAC), MoEF while Category B projects require clearance from State's Environmental Appraisal Committee (SEAC)/SEIAA. Since the activities currently contemplated in this project fall under the rehabilitation & modernization project, this notification appears not to be applicable. ***However, environmental and social due diligence needs to be carried out, while preparing detailed project report for rehabilitation and modernization sub components.***

3.2.2 Legal Framework of Government of India for Environmental Compliance

The Government of India has laid out various policy guidelines, acts and regulations pertaining to environment. The Environment (Protection) Act, 1986 is umbrella legislation for the protection of environment. As per this Act, the responsibility to administer the

legislation has been jointly entrusted to the Ministry of Environment and Forests (MoEF), Government of India and the Central Pollution Control Board (CPCB)/ State Pollution Control Boards (SPCBs).

3.2.3 Key Environmental Laws and other related Regulations

The key environmental laws and regulations as relevant to the investments under the project are given in the table below. The key environmental regulations can also be accessed at www.moef.nic.in/rules-and-regulations.

Table 3.1: Applicable Environmental Laws and Regulations

Rules & Regulation	Major Provisions	Remarks
The Environmental Protection Act, 1986	Chapter 1, Item 2 Chapter II, Item 3 (1), (2) Chapter III, Items 7, 8, 9, 11, 15, 17 Environment (Protection) Rules 1986, Item 3	Umbrella act applicable for all activities. No specific approvals / clearances required.
The Water (Prevention and Control of Pollution) Act, 1974	Chapter 1, Item 2, Chapter V, Item 24, 25, 26, 28, 31, 32, 33, Chapter VII, Item 42, 43, 44, 45, 46, 48, 49 Water (Prevention & Control of Pollution) Rules 1975, Schedule IV	Applicable for the construction facilities such as labour camps, concrete batching plants, etc.
Forest Conservation Act 1980, and 1988 amendment	Item 2, 3 (A), 3(B) Forest Conservation Rules, Item 2, 6, 7, 8, 9	Not Applicable, as no forest land would be acquired.
Wildlife Protection Act (1972) (as amended up to 1993)	Item (24), (14), (15), (16), (17), (23), (24), (25), (26), (27), (28), (36), (37), Chapter 3, Chapter 4, (Part I, Part II, Part III, Schedule I, Part IV), Schedule II (Part I, Part II), Schedule III, (Part IV, Part V & Part VI)	Not applicable; No protected area is close to present activity.
The Air (Prevention and Control of Pollution) Act, 1981	Chapter I, Item 2, Chapter IV, Item 19, 20, 21, 26, 28, 29 National Ambient Air Quality Standards Schedule VII of EPA Act	Applicable during the construction phase e.g. operation of batching plant if required.
EIA notification dated September 14, 2006	Rule 2, Rule 3, Rule 4, Rule 5, Rule 7, Schedule 1 (c)	Not applicable
Noise Pollution (Regulation and Control Act) 1990	Sections 3, 4, 5, & 5A	Applicable for construction activities
The Municipal Solid Wastes (Management and Handling) Rules,	Item 3, 5, 7, 9, Schedule 2, Schedule 3, Schedule 4	It will be applicable during the construction phase e.g. from Construction Camp, disposal of construction debris and

Rules & Regulation	Major Provisions	Remarks
2000		operation phase for the WTP sediments
Hazardous Wastes (Management & Handling) Rules, 2008	Chapter 1, Item 2 Chapter II, Item 4 (1)	Applicable during both construction and operation phase.
National Water Policy,2012	Clause 1.3 (iv & ix), 3.1,3.2, 3.6, 5 (5.1 to 5.4), 6.1, 6.2, 6.3, 7 (7.1, 7.2, 7.3 & 7.4), 8,2, 8.3, 9.6, 10, 11.3 & 11.5	Applicable in both construction and operation phase
National Environment Policy, 2006	Sub-Section 5.2.5 (i & ii), 5.2.8, 5.2.9, 5.2.10, 5.6 & 5.7	Application is restricted for mainstreaming and not required for clearance from Competent Authority.
National Forest Policy, 1988	Clause 4.4.1 & 4.8.1	Applicable only if forest land involved; unlikely as both existing and proposed water supply pipeline are part of project, which do not pass through any forest areas
National Policy on Resettlement & Rehabilitation, 2007	Chapter 1, Item 1 (1.1), (1.4), (1.6) and (1.7) Chapter II, Item 2 (2.1) Chapter III, Item 3 (3.1) Chapter IV, Item 4 (4.1 4.2.1, 4.2.2, 4.3.1, 4.3.2 and 4.4.1) Chapter VI (6) Chapter VII (7) Chapter VIII (8.1 & 8.2)	The proposed project rehabilitation and modernization is unlikely to involve any need of resettlement and rehabilitation (R&R).
Karntaka Preservation Tree Act, 1976	Chapter 1 & 5	Compensatory action as per the act shall be done
Manufacture, Storage and Import of Hazardous Chemicals Rules 1989, amended 1994 and 2000	Part I, II Column 2, 3, 4 Schedule I, II, III, IV, V, VI, VII, VIII, IX, X	The Rules provide indicative criteria for hazardous chemicals and require occupiers to identify major accident hazards and prepare on-site and off-site emergency plans

3.3 Applicable Policy, Rules & Regulation to project interventions / activities: Social

All strategic interventions on human development, spread across all social issues, need directives of policies and legal support to operationalize the appropriate actions. These policies and legislations help to overcome the constraints and support administrator, implementer, community and individual in delivery of justice. This section includes the National policies and Acts as detailed under

3.3.1 National Policies and Acts

i. National Tribal Policy, 2006.

ii. The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013.

The National Tribal Policy (2006)

The Policy has the following objectives:

Regulatory Protection

- Providing an environment conducive to the preservation of traditional and customary systems and regime of rights and concessions enjoyed by different ST communities, and reconciliation of modes of socio-economic development with these.
- Preventing alienation of land owned by STs and restoring possession of wrongfully alienated lands.
- Protection and vesting of rights of STs on forestlands and other forest rights including ownership over minor forest produce (MFP), minerals and water bodies through appropriate legislations and conversion of all forest villages into revenue villages.
- Providing a legislative frame for rehabilitation and resettlement in order to minimize displacement, ensure that affected persons are partners in the growth in the zone of influence, provide for compensation of social and opportunity cost in addition to market value of the land and rights over common property (NPV).
- Empowerment of tribal communities to promote self-governance and self-rule as per the provisions and spirit of the Panchayats (Extension to the Scheduled Areas) Act, 1996.
- Protection of political rights to ensure greater and active participation of tribal peoples in political bodies at all levels.

The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013.

The Act is applicable to the whole of India except the state of Jammu and Kashmir. The provisions of this Act relating to land acquisition, compensation, rehabilitation and resettlement, shall apply, when:

- Government acquires land for its own use, hold and control, including land for Public sector undertakings.
- Government acquires land with the ultimate purpose to transfer it for the use of private companies for stated public purpose
- Government acquires land for Public Private Partnership Projects.

Only Rehabilitation & Resettlement provisions will apply when:

- Private companies purchase land for a project, and the same exceeds the area thresholds set by the State Governments for such purchase.
- Schedule I outlines the proposed minimum compensation based on a multiple of market value.
- Schedule II through VI outlines the resettlement and rehabilitation entitlements to land owners and livelihood losers, which shall be in addition to the minimum compensation per Schedule I.

3.3.2 Other legislations in the social domain applicable to construction projects

Construction stage generally involves equity, safety and public health issues. The construction agencies therefore will be required to comply with laws of the land, which include the following legislation presented in Table 3.2.

Table 3.2: Legislations applicable to construction projects

S. No.	Act	Provisions under the Act
1	Contract Labor (Regulation and Abolition) Act, 1970	The Act provides for certain welfare measures to be provided by the contractor to contract labour
2	Minimum Wages Act, 1948	The employer is supposed to pay not less than the Minimum Wages fixed by the Government as per provisions of the Act.
3	Payment of Wages Act, 1936	The Act lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers
4	Equal Remuneration Act, 1979	The Act provides for payment of equal wages for work of equal nature to Male and Female workers and not for making discrimination against Female employees
5	Workmen's Compensation Act 1923	The Act provides for compensation in case of injury by accident arising out of and during the course of employment
6	Payment of Gratuity Act, 1972	The gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years
7	Employees PF and Miscellaneous Provision Act 1952	The Act provides for monthly contributions by the employer plus workers
8	Maternity Benefit Act, 1951	The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage, etc.
9	Payment of Bonus Act, 1965	The Act provides for payments of annual bonus subject to a minimum of 83.3% of wages and maximum of 20% of wages
10	Industrial Disputes Act, 1947	The Act lays down the machinery and procedure for resolution of industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment
11	Industrial Employment (Standing Orders) Act; 1946	The Act provides for laying down rules governing the conditions of employment
12	Trade Unions Act, 1926	The Act lays down the procedure for registration of trade unions of workers and employers. The trade unions registered under the Act have been given certain immunities from civil and criminal liabilities
13	Child Labour (Prohibition and Regulation) Act, 1986	The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of child labour is prohibited in Building and Construction Industry
14	Inter-State Migrant Workmen's (Regulation of Employment and Conditions of Service) Act, 1979	The inter-state migrant workers, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, travelling expenses from home to the establishment and back, etc.;

S. No.	Act	Provisions under the Act
15	The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and the Cess Act of 1996	The employer of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation for Workers near the workplace, etc
16	The Factories Act, 1948	The Act lays down the procedure for approval of plans before setting up a factory, health and safety provisions, welfare provisions, working 4-6 hours and rendering information-regarding accidents or dangerous occurrences to designated authorities

3.3 Applicable Policy, Rules & Regulation at State level

Policy and regulatory frameworks at national and state level have been formulated to provide social and environmental safeguards in the last two decades as presented in Table 3.3.

Table 3.3: Rules and regulations at State Level

S. N	Act	Provisions under the Act
1.	Karnataka Forest Act, 1963	This Act restricts the powers of the state in respect of de-reservation of forests, use of forestland for non-forest purposes and cutting of trees.
2.	Karnataka Urban Water Supply & Drainage Board Act, 1973	To undertake the investigation, preparation and execution of schemes for the regulation and development of drinking water and drainage facilities in the urban areas, it is considered necessary to have a statutory board at the State level which will help in bringing about co-ordination in the activities relating to the implementation of such schemes.
3.	State Water Policy, 2002	Under this act, there should be an integrated and multi-disciplinary approach to the planning, formulation, clearance and implementation of projects, including catchment area treatment and management, environmental and ecological aspects, the rehabilitation of affected people and command area development.
4.	Karnataka Ground Water Act, 2011	To give priority for drinking water and for protection of drinking water sources in the State
5.	Karnataka Urban Drinking Water and Sanitation Policy, 2002	The policy focuses on raising the levels of efficiency in the management of drinking water systems in urban areas so as to give satisfactory service to the citizens while at the same time discouraging over exploitation of resources and preventing wastage.
6.	Karnataka Town and Country Planning Act, 1961	Applicable in both construction and operation phase. As per this act, the obligatory duties of the Municipal Corporation limits its role to construction and maintenance of such facilities as roads, water supply, sewerage, solid waste management, firefighting, schools & public places, markets etc. The law also specifies certain discretionary duties of urban local bodies like promotional activities such as welfare programmes for citizens, housing and provision of services (transport, promoting companies, co-operative societies to provide services in the city, acquisition of land, its development and management of facilities)

S. N	Act	Provisions under the Act
7.	Karnataka Municipal Corporations Act, 1976	Applicable in both construction and operation phase. As per this act, the obligatory duties of the Municipal Corporation limits its role to construction and maintenance of such facilities as roads, water supply, sewerage, solid waste management, firefighting, schools & public places, markets etc.

3.4 World Bank Policies

The operational guidelines under which World Bank (WB) projects are appraised are **based** on EAs in the "project cycle". WB's EA source book, directives, policies, drafts terms of reference and technical updates have guided the preparation of this EA. All central and state EA regulations and conventions referred were dealt in accordance with the WB procedures ensuring that all issues raised have been identified and satisfactorily addressed. The WB classify Category "A" projects as those "likely to have significant environmental impacts that are diverse and unprecedented". On the other hand Category "B" projects are those whose "potential adverse environmental impacts on human populations or environmentally important areas-including wetlands, forests, grasslands, and other natural habitats are less adverse than those of Category A projects[8]. The applications of World Bank Safeguard Policies in project are summarized in the Table 3.4.

Table 3.4: Application of Bank Safeguard Policies

WB Safeguard Policy	Summary	Application to the Project and Compliance Mechanisms
Environmental Assessment (OP/BP 4.01)	This is an umbrella policy to address environmental management issues in the project. The environmental consequences of the project are taken in to consideration during the project cycle and are taken into account in selection, siting, planning and designing of projects. It emphasizes upon the mitigation measures so as to reduce the adverse environmental consequences.	This project is identified as category B and the Operational Policy 4.01 will be applicable to assess the impacts however marginal or temporary it might be. The proposed investments could have adverse but geographically limited environmental impacts. Physical/civil works are of rehabilitation nature on existing canal system and are unlikely to cause any significant adverse environmental or social impacts. Most impacts are likely to be limited to the rehabilitation phase of the infrastructure and no long-term adverse impacts are expected. The social and environmental assessment has been carried out and a range of preventive and mitigation measures are proposed as part of the Environmental and Social Management Plan (ESMP). Wherever required, Environmental Management Plans (EMP) is also prepared.
Natural habitats (OP 4.04, BP 4.04)	This policy emphasizes upon the conservation of the natural habitats like land, water, etc. It focuses upon the natural resource management	This OP is not applicable to the project. The project investments would not convert any critical or non-critical natural habitats. Any identified adverse impact is limited in nature and scope, both spatially and temporally.

[8] World Bank Operational Policy, 4.01, Environmental Assessment, January 1999

WB Safeguard Policy	Summary	Application to the Project and Compliance Mechanisms
	so as to ensure environmentally sustainable development. It aims to support the protection maintenance and rehabilitation of the natural habitats and critical and semi-critical ecosystems.	Further, any unlikely adverse impact on natural habitats would be addressed through the screening criteria included in the ESMP and an EMP has been prepared to deal with such possibilities. Finally, support for management of wetland and waterlogged areas will be enhanced in the project.
Forestry (OP 4.36, BP 4.36)	This policy emphasizes upon the management, conservation, and sustainable development of forest ecosystems and their associated resources.	No forestry activities or activities on forest land are envisaged. Additionally, there are no forests in the projects areas. This OP is not applicable to the project
Safety of Dams (OP 4.37, BP 4.37)	This policy is concerned with the safety of new and existing dams on which Bank financed projects are directly dependent. The policy distinguishes between construction of new dams and existing dams / dams under construction.	This OP is applicable to the project, due to the dependence on multipurpose dams that share water for the drinking water needs of the project cities. Hence, no significant impacts are anticipated due to the project activities. To ensure compliance to the policy, an assessment was carried out the measures are being implemented under the World Bank financed Dam Rehabilitation and Improvement Project (DRIP) and also through KUWSMP. The Dam Safety Panel and Unit in the State of Karnataka would be responsible under the DRIP to ensure issues of dam safety are addressed.
Cultural Properties (OP 4.11)	The policy ensures avoidance of impacts on cultural properties and supports development of mitigation and enhancement measures through porjects.	No archaeological or other cultural sites of significance are impacted by the proposed project. This OP however is triggered, considering the historical back ground of the project cities and to address the instances of 'chance find' of cultural properties during the construction and operation phase of the project.
Indigenous Peoples (OP 4.10, BP 4.10)	This policy asserts that the adverse impacts of the development projects on the indigenous people should be mitigated or avoided and the benefits of the project should be accrued to them.	A detailed spatial census analysis does not indicate any tribal population in the proposed project area. Therefore, no impact (adverse or positive) is expected by project on tribal. This OP is not applicable to the project.
Involuntary Resettlement (OP 4.12)	This policy aims at avoiding, if not minimizing adverse impacts on the local population due to project and	The system rehabilitation and modernization involves very minimal land acquisition. This OP is applicable to the project.

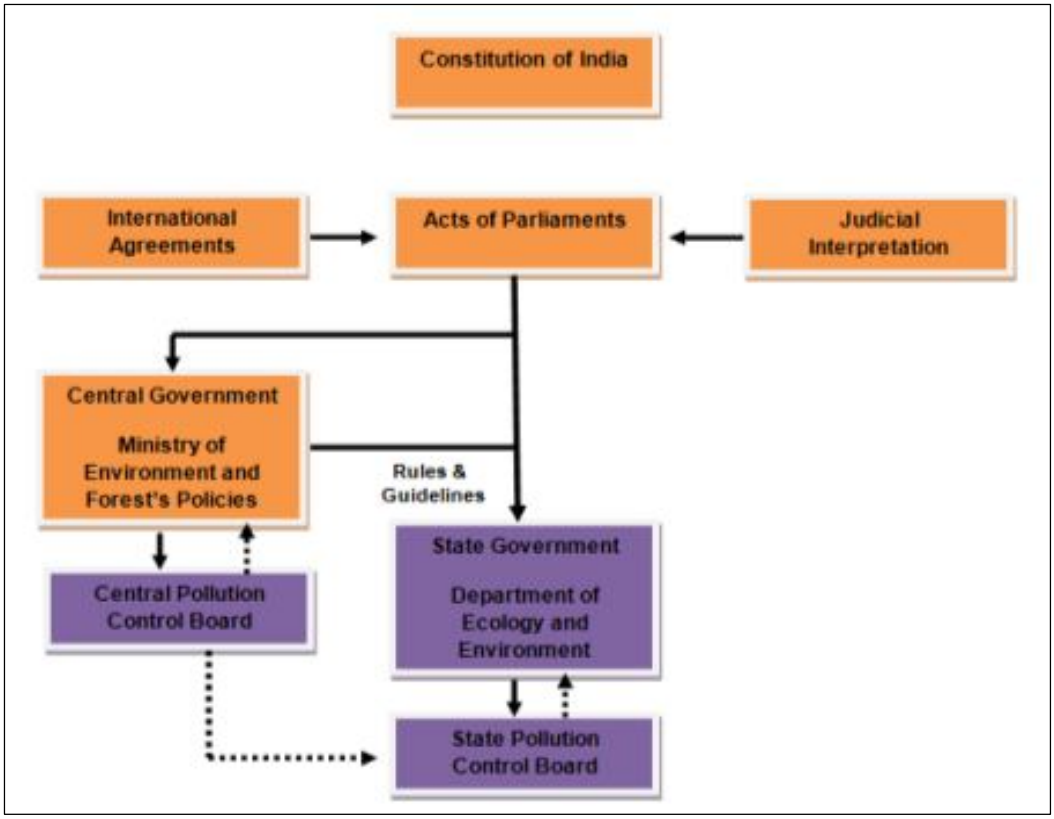
WB Safeguard Policy	Summary	Application to the Project and Compliance Mechanisms
	where unavoidable it ensures that those affected improve or at least restore their livelihood.	
Projects in Disputed Areas (OP 7.60, BP 7.60)	This policy is concerned with the disputed area in project	The project is not in a disputed area and the OP is not applicable to the project.

The analysis of the above policy, legal and regulatory framework indicated that a number of acts, regulations and agencies are involved at national, state and district level. All the agencies are functioning as per their mandate while there appears to be lack of integrating mechanism for overall development of the water sector in the state. With regard to planning and implementation of Karnataka Urban Water Sector Improvement Project (KUWSMP) is involved to provide drinking water and sanitation facilities in all urban areas. An institutional structure is also proposed for the overall execution of project.

3.5 Legal Monitoring Agency for Environmental Safeguards

The legal and institutional framework with respect to the environment is shown in Fig 3.1

Figure 3.1: Legal and institutional framework for environmental safeguards



The Karnataka Department of Ecology & Environment (DoEE) is primarily responsible for protecting and preserving environmental quality in the state. The Karnataka State Pollution Control Board (KSPCB) is responsible for enforcing the regulations, and has a wider role in environmental governance than any other government body in the state and it reports both to the Central Pollution Control Board (CPCB) in Delhi and the DoEE. In addition to monitoring and enforcing industrial environmental standards, the KSPCB also monitors other environmental issues, such as municipal solid waste, and biomedical waste. The

supervisory powers exercised by Ministry of Environment & Forests (MoEF) are not vested with the DoE as per the regulatory framework but instead lie with KSPCB. DoEE is dependent on the state government for resources, whereas, KSPCB raises most of its financial resources through consent fee and water cess.

3.6 Other Line Agencies Involved

Table 3.5 shows the relevant departments and agencies and their roles and responsibilities.

Table 3.5: Line Departments and their Key Roles and Responsibilities

Department	Key Activities
Forest Department	The main function of the Forest Department is to protect, conserve and manage the forest. In the recent years, it has been noticed that the forest reserves have been decreasing. Henceforth, Joint Forest Management has been initiated so as to ensure protection of forest against encroachers, grazing and also to increase the vegetation cover. In addition to this, it has also pioneered research and development for improving the quality of seedlings. Green belt can be developed in the waste lands so as to increase vegetation cover. Further, plants which are of ecological and economic importance can be encouraged on the waste lands. Cooperation with the Forest Department should be encouraged in relation to natural habitats.
Department of Water Resource	The main responsibility of the Water Resource Department is to supply, conserve and manage the water resources in the State.
Department of Urban Development	The main functions of the Urban Development Department is to plan, regulate, control and facilitate urban development for creating major infrastructure facilities, development of residential layouts, construction of houses for under privileged citizens. To facilitate and finance creation of infrastructure to provide adequate water supply from assured and safe sources of supply and proper sanitation to all the Urban Local Bodies through Karnataka Urban Water Supply and Drainage Board (KUWSDB).
Social Welfare Department	The main objective of this department is to bring the target groups into the main stream of development by making them self-reliant. Various laws and policies are being implemented for the upliftment of the SCs/STs under protective discrimination basis.
Karnataka Pollution Control Board	The main function of KSPCB is to prevent, control or abate pollution. It advises the State Government on the matters concerning the prevention, control and abatement of pollution. Further, it disseminates information relating to pollution

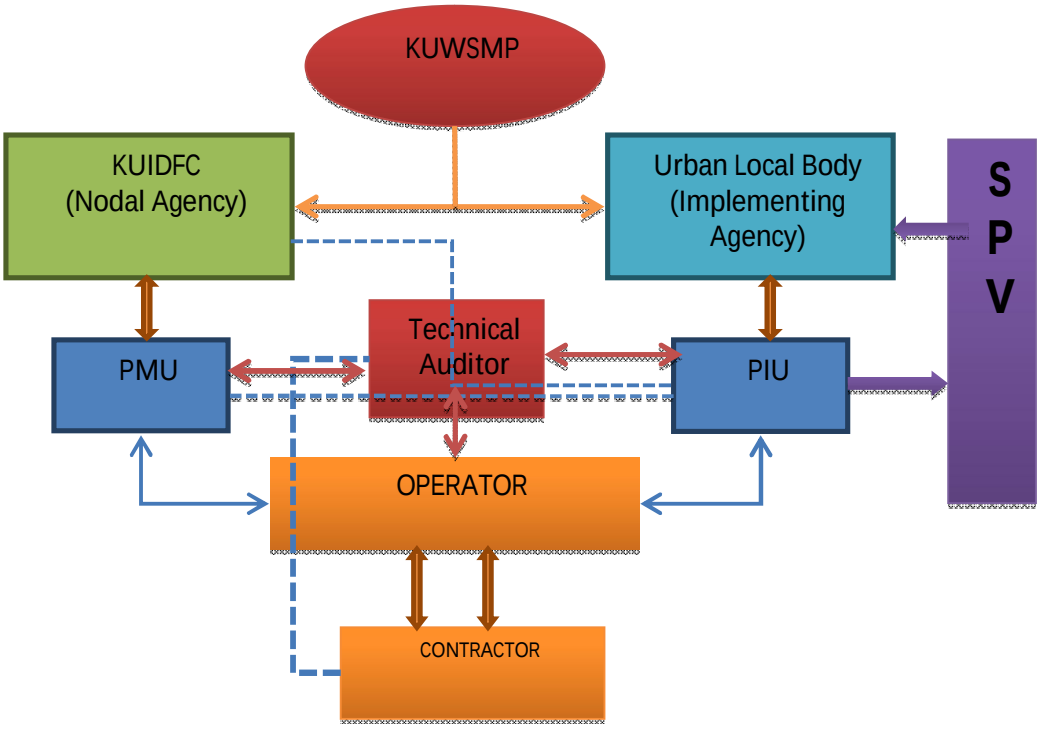
In general, there is little available expertise/ functional position in the agencies with respect to environment and social sector to address various social and environmental issues. However, activities under the project will support greater attention to environmental and social issues.

3.7 Institutional Setup for Project

The Environmental Management Plan (EMP) and Resettlement Action Plan process does not stop once a project (planning and design) got approval for implementation. During implementation of project, Operator (Construction Manager for ULB) and Third Party Contractor will be responsible for ensuring that the environmental commitments made to regulatory agencies, lending agencies and other stakeholders during the EA process are met. To execute EMP and RAP is a cumulative responsibility of all parties involved, indicative responsibility mechanism has been presented in EMP and RAP, as developed for up gradation projects.

The institutional stakeholders in implementation of EMP and RAP are as shown in the following figure:

Figure 3.2: Roles and Responsibilities of Stakeholders



Environmental and Social Cell - shall be integrated under the PMU at KUIDFC and PIU at ULB/ SPV level and can serve for mainstreaming social and environmental safeguards for the project. The proposed cell will be include Environmental and Social experts. The Cell will consist of M & E, Communication Experts and Civil Engineer to assist the Corporation for effective implementation of ESMP. The Cell officials and local body staff will assist SPV focal points in project area for planning, implementation & monitoring of ESMP.

Key duties and function of the proposed cell would be:

ESMP planning, implementation and monitoring - Provide technical assistance in ESMP planning implementation & monitoring for each sub project activity.

Information/ Data Base Management - Manage comprehensive environmental & social information management system/data bases and documentation.

Training and Capacity building - Periodic workshops/ Meetings seminars on Social & Environment aspects; develop tailor made courses; organize basic /orientation training programs; organize documentation of staff experience on Social & Environmental issues/ solutions / lessons learned program ; develop environmental 'tool kits' for staff – CDs/ slides organize inter and intra states field visits; experience sharing program; organize study tours to provide exposure to the similar experience /best practices of the oversees etc. Enhancement of the staff capacity and their commitment are key pre-requisite for the effective implementation of project.

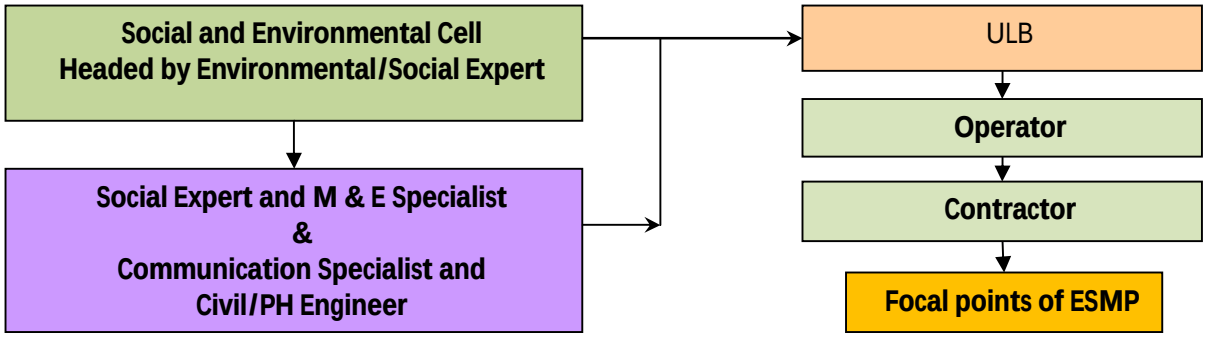
Awareness/ Sensitization - Develop/ Implement social & environmental awareness/ sensitization programs.

Inter-sectoral linkages and inter-agency coordination - Facilitate effective inter-sectoral linkages and inter-agency coordination among and between agencies and other key stakeholders involved in water sector management in relation to socio- environmental issues.

Grievance Redressal – Provide technical assistance to PIU related to grievance redressal mechanism to attend to any social and environmental grievances made by any person, community group.

Provide assistance for Project - Provide essential guidance and inputs related to Environmental & Social aspects for Next Phase.

Figure 3.3: Environmental and Social Organizational Cell Structure



3.7.1 Legal Approvals / Clearances Required

The following are the various legal approvals and clearances on social and environmental aspects that the GoK may require before initiating site work.

Table 3.6: Legal Approvals and Clearances

Project Activity	Compliances/Clearances	Responsible Agency	
		Primary	Overall
Use of Diesel Generator sets at any stage during project cycle.	Consent from KSPCB under Air Act	Operator	SPV/PIU
Replacement of Old Pipe line, laying new pipe line, construction of WTP and Reservoirs	Approvals / authorization from State Forest Department in case of land appropriation of forest land (if any other than the identified proposed sites.) and cutting of trees **Kalaburgi: None as per the proposed design**	Operator	SPV/PIU
	Permissions from Railways for crossing railway lines **Kalaburgi: Central Railway at locations Zone 1 and 2 (Ward no : 48, 53, 55)**	PIU	SPV/PIU/
	Permissions from PWD/NHAI /RDPR/Village Panchayat Local Authority for road cutting.	PIU	SPV/PIU/
	Permissions from Irrigation Department for drawing water from irrigation canals for water supply.	PIU	SPV/PIU
	Permission from Central Ground Water Board for withdrawing Ground Water (if required at any stage of project)	PIU	SPV/ULB

Project Activity	Compliances/Clearances	Responsible Agency	
		Primary	Overall
	Permission from Traffic Police Commissioner office for traffic management.	PIU	SPV/PIU
Storage and Handling of Chlorine for Water Treatment	Permission from KSPCB under MS&H Rules, 1989 for Storage and Handling of Chlorine	ULB	ULB/SPV
Archeological Clearances	Permission from National Monuments Authorities to carry out augmentation works around heritage structures in the city	Operator	SPV

Chapter 4: BASELINE ENVIRONMENTAL AND SOCIAL PROFILE

4.1 Environment Profile

An analysis of environmental characteristics and issues has been carried out for Project. The baseline environmental conditions are described in terms of Land Environment, Climate & Air Environment, Water Environment, Forest & Biodiversity and public health.

4.2 Land Environment

Land environment is described in terms of Geology, Topography, Soil and land use.

4.2.1 Geology and Topography

The northern part of Kalaburgi district represents a plateau, typical of Deccan Trap terrain and is deeply indented with ravines. The southern part represents undulating terrain with sparsely distributed knolls & tors. The ground elevation varies significantly from 340 m amsl in southeast to 620 m amsl in the north. The regional slope is towards south and southeast.

4.2.2 Soil Characteristics

The soil characteristics of Kalaburgi comprise medium black varieties that can support pulses, jowar and paddy as main crops. This soils vary in depth and texture, depending on the parent rock type, physiographic settings and climatic conditions.

4.2.3 Land Use

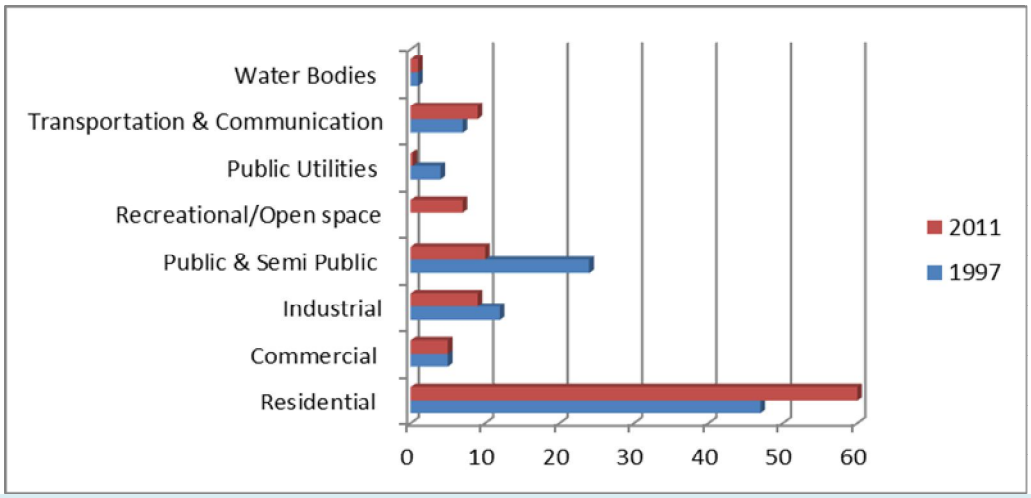
Land has remained as an important factor for economic activities in Project area. With the rising population, increasing pressures are being felt on the finite land resources, to meet the demands of food and fodder. As per Project Report on KUWSIP-Up scaling 24x7 Water Supply, 59.44 percent of the area was under residential use, 8.88 percent area in Industrial followed by 4.96 percent in commercial, 8.99 percent in Transportation and 0.88 percent in Public Utilities.

Table 4.1: Land use Pattern

S. No	Land Use	Pattern Area (ha)	% of total area
1	Residential	4082.35	59.44
2	Commercial	340.67	4.96
3	Industrial	610.23	8.88
4	Public & Semi Public	685.54	0.88
5	Park, Open Space and Play Ground	446.56	6.50
6	Utilities and Services	23.76	0.34
7	Transportation and Communication	617.43	8.99
	TOTAL	6806.54	**89.99**
8	Water Sheet	37.51	0.54
9	Agriculture	23.97	0.37
	GRAND TOTAL	6868.02	**100**

There has been substantial increase in area under residential use from1997 to 2011, to cater to the growing population and to balance the growth and enhance economic development in the area. There has been proportionate increase in share of area under transportation use, public and semi-public, and for parks and open spaces. The following table 4.1 shows the land use pattern in Kalaburgi City in 1997 and 2011 (Figure 4.1)

Figure 4.1: Change in Landuse Pattern of City



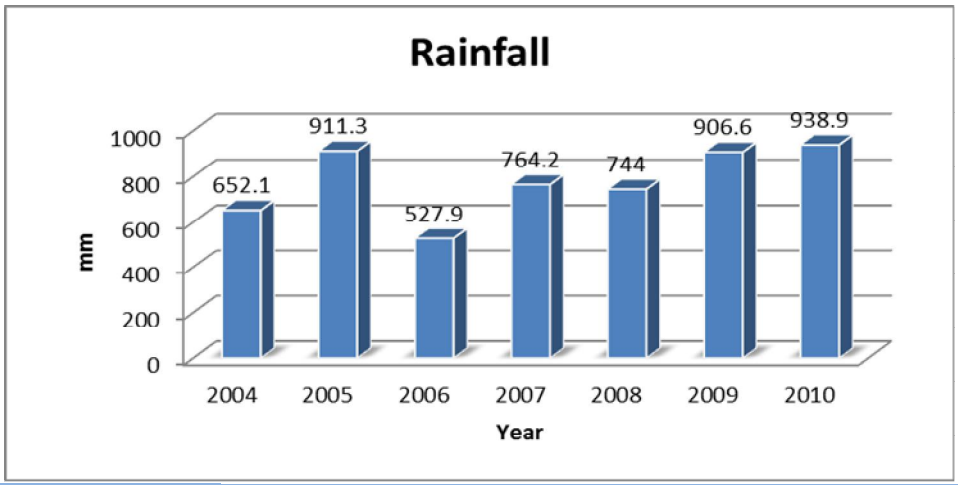
4.3 Climate and Air Environment

4.3.1 Climate and Rainfall

Kalaburgi district lies in the northern plains of Karnataka and has semi - arid type of climate. Dry climate prevails for most part of the year. December is the coldest month with mean daily maximum and minimum temperatures being 29.5°C & 15° to 10°C respectively. During peak summer, temperature shoots up to 45°C. Relative humidity varies from 26% in summer to 62% in winter.

The southwest monsoon sets in the middle of June and extends till the end of September. Bulk of the annual rainfall occurs during this season, which constitutes over 78% of the annual rainfall. Significant rainfall occurs during the winter monsoon owing to northeastern monsoon, which constitutes 9% of the annual rainfall. Normal Rainfall of the district is 7738 mm (2001 - 2010) and actual rainfall is 674 mm (2011). Season wise rainfall in the district during the decade 2004 to 2010 is shown in **Figure 4.2**.

Figure 4.2: Rainfall Pattern in Kalaburgi



4.3.2 Wind Speed and Direction

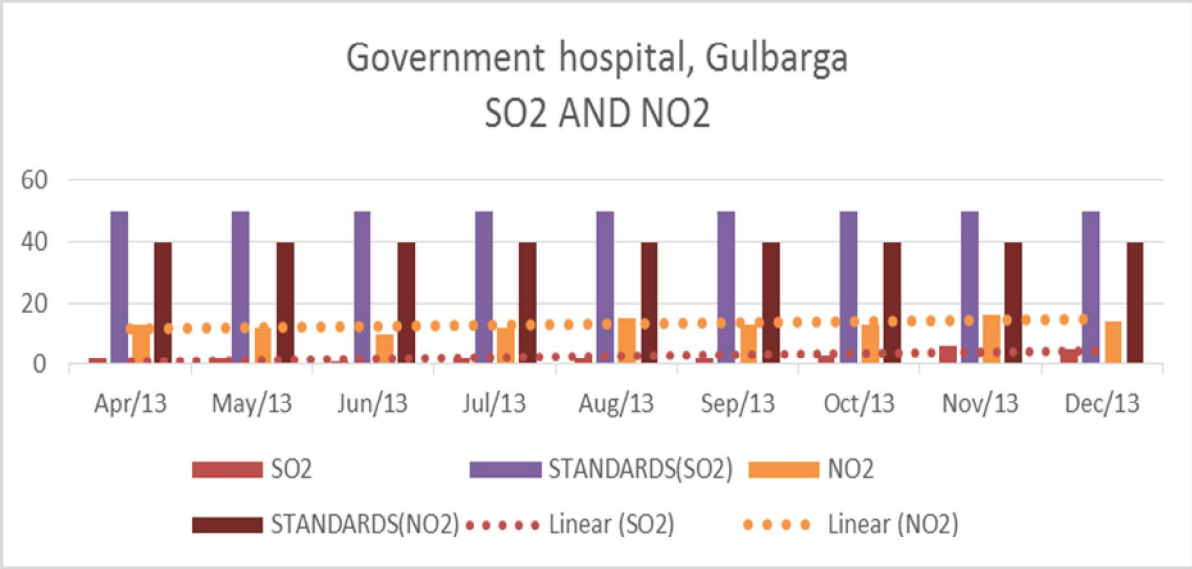
The predominant wind direction in Kalaburgi is from west to south-west in the monsoon season and from east to north east during winter seasons.

4.3.3 Air Quality

The Karnataka State Pollution Control Board (KSPCB) monitors ambient air quality in the State. The ambient air quality data was collected form Karnataka State Pollution Control Board (KSPCB) from April to December, 2013. The parameters wise air quality is summarized below.

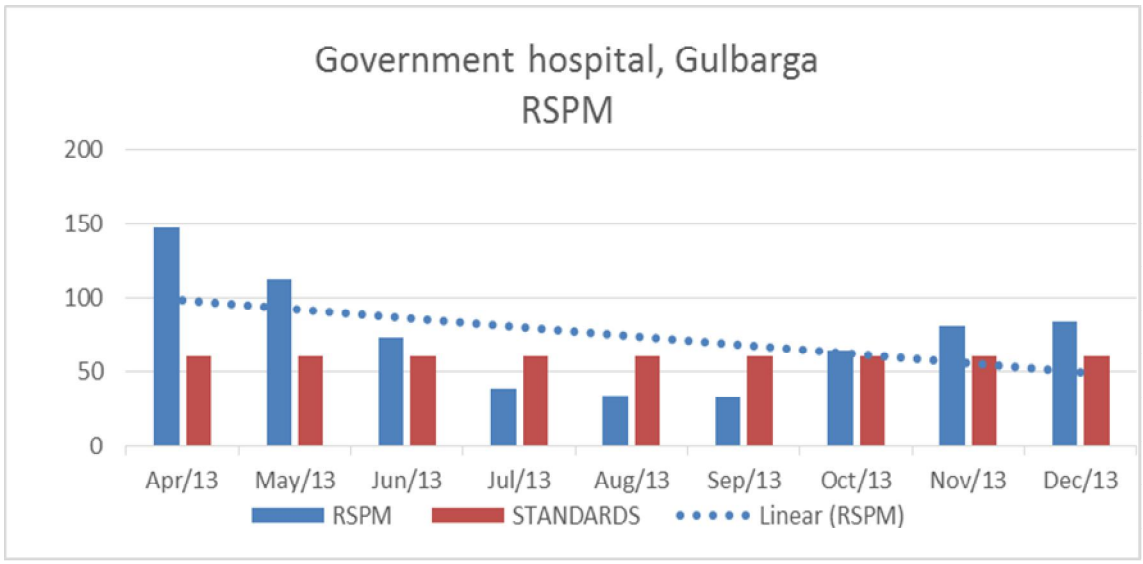
SO_2 and NO_2: Both SO_2 and NO_2 concentration was observed within the limit which is shown in Figure 4.5. Highest NO_2 was recorded in November while lowest in June, 2013.

Figure 4.3: SO2 and NO2 Concentration



Particulate Mater$_{2.5}$ ($PM_{2.5}$): The PM $_{2.5}$ was found within the permissible limit except April, May, October, November and December months of 2013. Highest PM $_{2.5}$ was observed in April while lowest in August (Shown in **Figure 4.4**).

Figure 4.4: Particulate Matter 2.5 Concentration



The ambient air quality can be changed during construction phase due to movement of vehicles and construction activities.

4.4 Water Environment

Water environment of the study area is described in terms of surface & ground water resource and surface & ground water quality.

4.4.1 Surface Water Resources

Kagina and Bhima are the major rivers of Kalaburgi. Kagina river originates in Andhra Pradesh and joins Bhima in the district. Bennithora, a tributary of Bhima, flows through the district.

The present sources, a) Bhosga Reservoir, b) Bennithora Reservoir and c) Bheema River has been studied in detail to estimate dependability as a source for water supply for the horizon year 2041.

Bhosga Reservoir

This reservoir is situated at a distance of 9.6Km from Kalaburgi city. It has a catchment area of 90.13 Sq.km. Under the above scheme the capacity of the Bhosga Reservoir was increased from 289Mcft to 418Mcft.

The gross storage of 11.85 Mcum was ensuring an average supply of 18 MLD during normal average rainfall year and at least 7 MLD in the scanty rainfall year. The full tank level has been reduced to 493.36 m during the year 1990 because of structural stability of earthen dam. For the reduced FRL the gross storage available is 9.28 Mcum as against 11.85 Mcum at 494.38 m level.

Bennithora River / Reservoir

Irrigation Department of Government of Karnataka has constructed Dam across Bennithora River at Khurj village in Chittapur Taluka in order to irrigate an area of 20234 Ha. The total water requirement for Khariff and Rabi crops is 120.10 Mcum.

The total catchment of area of the reservoirs is 2204 Sq.km. Out of total catchment area, 1266 sq.km is in Karnataka and balance 938 sq.km is in Maharastra state. Average annual weighted rainfall is 629 mm. The upper reaches of catchment consist of hilly terrain with forest cover and the lower reach is moderately flat.

Bheema River

Bheema River is a tributary to Krishna River and flows at a distance of about 26 Km from Kalaburgi City. An impounding reservoir has been created by constructing a vented barrage across the river near Saradagi village to store water for non monsoon period and commissioned during 1993. The operation and maintenance of barrage is with Karnataka Urban Water Supply and Drainage Board. This barrage is exclusively for water supply purpose. The catchment area at the barrage site is 21600 sq. miles (55944 sq. km) and the maximum discharge is 151.40 Cumecs.

4.4.2 Surface Water Quality

The proposed alignment of main does not encroach / pollute any surface water bodies in the city. Hence no significant impacts are anticipated on the surface water quality due to the proposed alignment. Although Kootnur Nala carries wastewater from various parts of city and joins Bhima river at about 1 km upstream of the intake well for water supply to the city. The Jagat Tank (Basaveswara Tank) located in the heart of the city adjacent to the Fort also receives wastewater from the old city area of Kalaburgi.

Activities involving replacement of existing distribution pipeline in the close proximity of households will have an adverse impact due to waterlogging and leakages. This impact is temporary and limited to the construction phase.

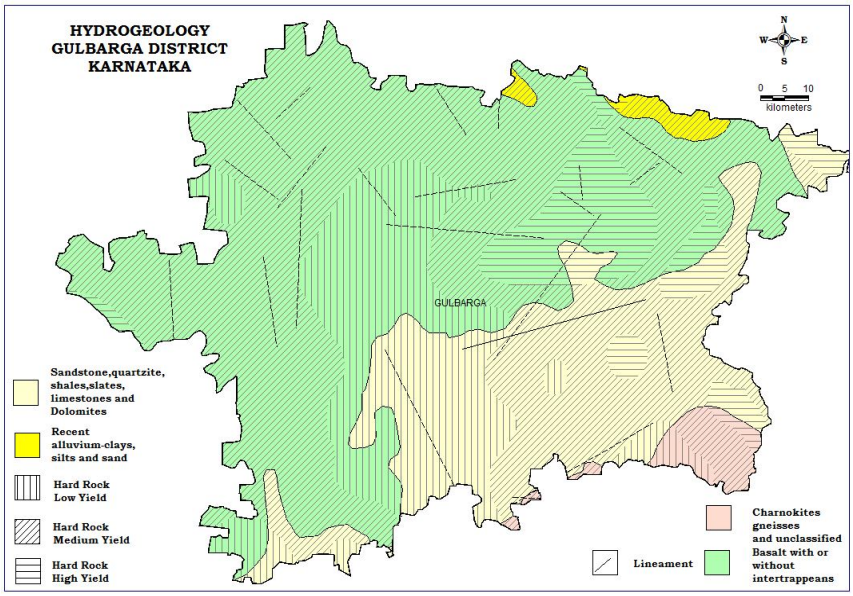
Improvement in the distribution system will not have any direct impact on the surface water quality. With the increase of population, the water demand would increase which in turn will lead to higher generation of sewage. As such proper sewerage system needs to be put in place along with the water supply scheme to ensure that the surface water quality is not adversely affected.

4.4.3 Hydrogeology & Ground Water Resources

The southern part of the district comprises the Peninsular Gneiss and granites. Central, north-eastern and south-western part comprises of sedimentary formations viz. sandstone, quartzite, shale, slate, limestone and dolomite (**Figure 4.5**). Deccan Trap basalts cover northern and north-western parts. A small portion in the north is covered by alluvium and in the north-eastern part by laterite.

Annual ground water recharge of the district is in the most of the area ranged in 0.025-.10m category and only in Jevargi taluk it falls in 0.1 to 0.15m category. The net annual ground water availability is 63789 ham. The total annual ground water draft is 25382 ham. The net ground water availability for future irrigation development is 37591 ham. As per CGWB data, Considering total command and non- command area, almost entire district is categorized as Safe for future ground water development. The average stage of ground water development in the district is 57%.

Figure 4.5: Hydrological Map of Kalaburgi District



Depth to Water Level: Pre & Post Monsoon 2011, depth to water table of the district is given in **Figure 4.6** & **Figure 4.7**. Depth to water level in 24 NHS piezometers in the district during pre – monsoon (May 2011) and post – monsoon (Nov. 2011) periods were in the range of 1.20 to 15.70 mbgl and 1.01 to 13.36 mbgl respectively. Seasonal water level fluctuation (May & November 2011) as observed in 60 NHS dug wells indicate that in 85% of NHS there is rise in ground water level in the range of 0.032 to 1.309 m, whereas in 14% of NHS there is fall in ground water level in the range of 0.024 to1.602 m. Seasonal water level fluctuation as observed in 12 NHS piezometers indicate that there is rise in ground water level in the range of 0.060 to 1.630 m and fall in the range of 0.151 to 0.181 m.

Figure 4.6: Pre-monsoon water level Kalaburgi

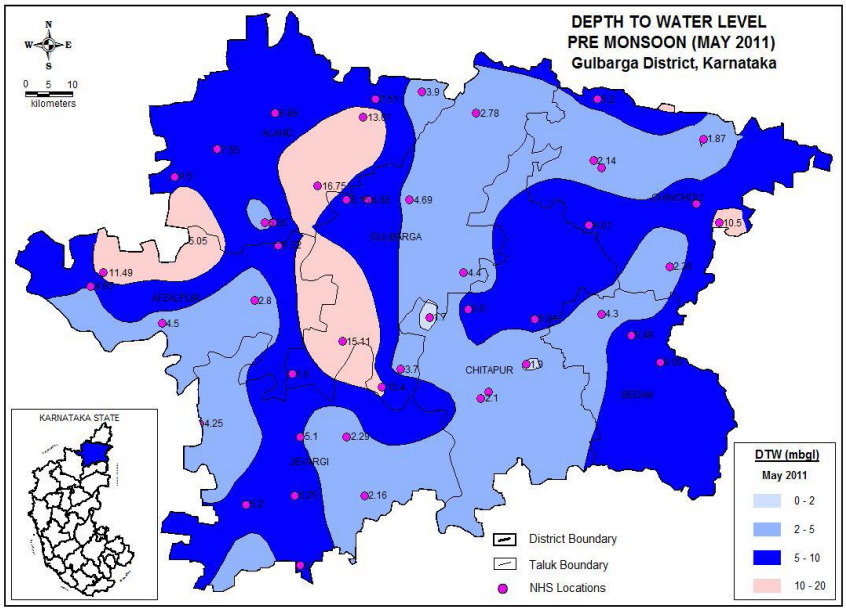
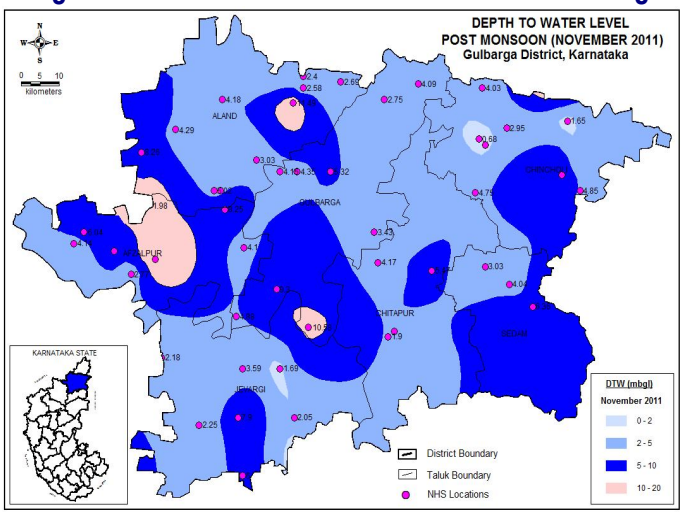


Figure 4.7: Post-monsoon water level Kalaburgi



Source: Ground Water Brochure of Gulbarga District, Karnataka(2012)

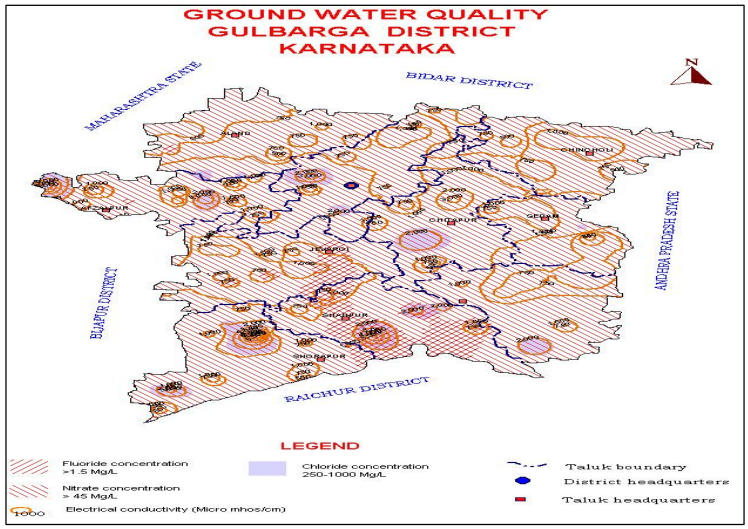
4.4.4 Ground Water Quality

Quality of ground water of the Kalaburgi district, in general is good and potable (**Figure 4.8**). It is suitable for domestic and irrigation purposes. Water samples collected from NHS (dug wells) were analyzed by CGWB to decipher the quality of shallow aquifer. All-important parameters viz. EC, pH & TDS are within permissible limit, whereas fluoride concentration beyond permissible limit has been found to occur in a few samples collected by Central Ground Water Board from Kalaburgi. Nitrate content beyond permissible limit has been found to occur in a few samples collected from Kalaburgi. Specific conductance ranges from 427 to 3550 micro mhos per cm. at 25^0C and chloride is in the range of 28 to 652 ppm, thus rendering it suitable for irrigation.

As per Central Ground Water Board, the no. of Groundwater Monitoring Wells (as on 31st March 2011) is 73 Dug wells and 24 Piezometer. Pre-Monsoon depth to water level during May 2011 is 1.87-16.75 mbgl whereas during Post-Monsoon, the depth to water level during Nov 2011 is 0.68-11.98 mbgl. Long term water level trend in 10 years (2002-2011):

The water level fluctuation during May 2011 shows 0.005-1.034 m/year of wells rise in water level & 0.002-0.944 m/year of wells shows fall in water level whereas during Nov 2011, the water level fluctuation shows 0.010-1.230 m/year of wells rise in water level & 0.025-0.391 m/year wells shows fall in water level.

Figure 4.8: Ground water Quality Map of Kalaburgi District



(Source: Ground Water Brochure of Gulbarga District, Karnataka, 2012)

4.5 Forest & Biodiversity Aspect

As per the Forest Survey of India, the land classified under forests is only 1.82% in entire district in 2011. Open forest cover is showing decreasing trend from 2005-2011 in district (**Table 4.2)**. The proposed project is rehabilitation and modernization of existing water supply infrastructure which do not pass through any forest area. Therefore, there is no impact anticipated on forest land.

Table 4.2: Forest Cover in Project Area (Area in km^2)

District	Year	Geographical Area (GA)	Very Dense Forest	Moderate Dense Forest	Open Forest	Total	% of GA	Change	Scrub
Kalaburgi	2011	16224	0	87	209	296	1.82	0	46
	2007	16224	0	87	209	296	1.82	0	46
	2005	16224	0	84	215	299	1.84	0	50

Source: Forest Survey of India Report, 2007, 2009 & 2011

4.5.1 Protected Areas

There is one wildlife sanctuary in project area i.e. Chincholi wildlife sanctuary in Kalaburgi located at a distance of 60 km from the city. The proposed project is rehabilitation and modernization of existing water supply infrastructure and project does not come under any protected areas. Therefore, no impact is anticipated due to proposed project.

4.6 Wetlands

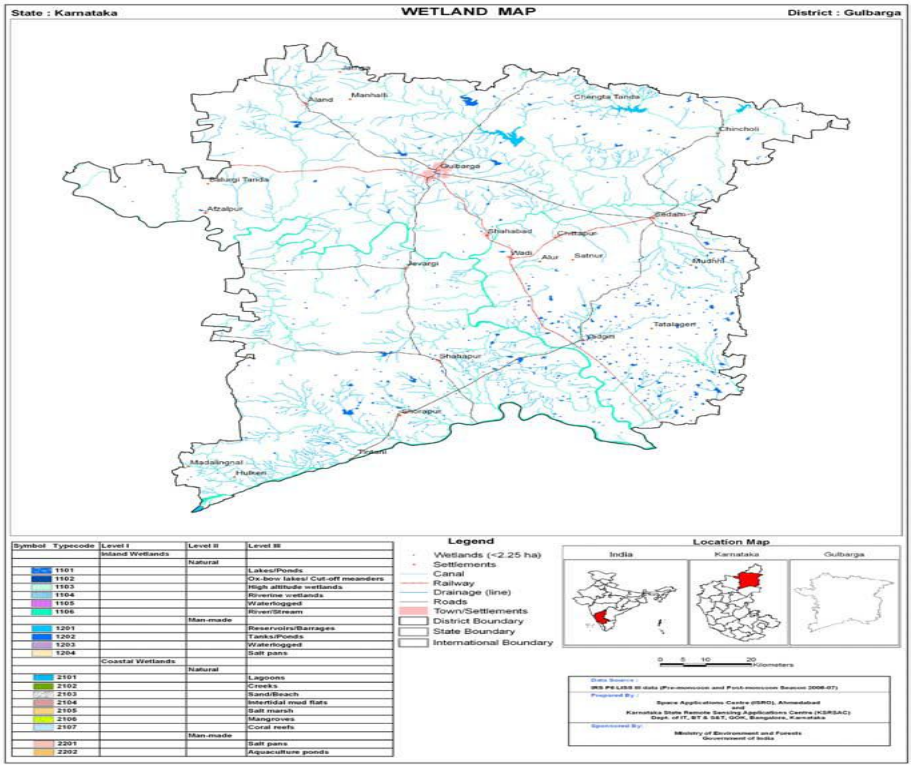
As per the National Wetland Atlas of Karnataka (2010), Area estimates of various wetland categories for Kalaburgi district shows that there were 646 wetlands, which include 232 wetlands smaller than 2.25 ha and shown in **Figure 4.9**. Total wetland area estimated to be 34741 ha (**Table 4.3**). The only types of wetlands observed in the district area River/Stream (22653 ha), Tanks/Ponds (8471 ha) and Reservoirs/Barrages (3385 ha). River/Barrage (65 %) singularly dominated the extent under wetlands. Analysis of wetland status in terms of aquatic vegetation, it is estimated to be 2791 ha and 1890 ha of wetland area was under vegetation in post-monsoon and pre-monsoon respectively. The open water extent (24484 ha) accounted for 71 percent of wetland in post-monsoon, which had decreased to 20125 ha in pre-monsoon season. Moderate turbidity dominated the open water in post-monsoon (24373 ha) as well as pre-monsoon (15766 ha).

Table 4.3: Number and Types of Wetland in Kalaburgi

S. No.	Wet code	Wetland Category	No of wetlands	Total Wetland area	% of wetland area	Open Water	
						Post-monsoon area	Pre-monsoon area
1	1106	River/Stream	30	9936	29.74	8333	6619
2.	1201	Reservoirs/ Barrages	3	19213	57.50	11190	5393
3.	1202	Tanks/ Ponds	255	3832	11.47	2567	1627
Sub-Total			**288**	**32981**	**98.71**	**22090**	**13639**
4		Wetlands (<2.25 ha), mainly Tanks	431	431	1.29	-	-
Total			**719**	**33412**	**100.0**	**22090**	**13639**

Source: National Wetland Atlas, Karnataka, 2010

Figure 4.9: Wetland Map of Kalaburgi



Source: National Wetland Atlas, Karnataka, 2010

4.7 Heritage

List of monuments and heritage sites as per Archeological Survey of India:

Name of the monument/site	Location
Gulbarga fort and great mosque in it	Kalaburgi
Haft Gumbaz (Tombs of Firozshah)	Kalaburgi

The fort has an area of 0.5 acres (0.20 ha) and periphery length of 3 kilometers (1.9 mi). It is well fortified with double fortification. A 30 feet (9.1 m) wide moat surrounds the fort. The fort is a monumental structure highly fortified with 15 towers mounted with 26 guns; each gun located inside the fort is 8 meters (26 ft.) long and is still well preserved.

The mosque is unique in India, with a huge dome Haft Gumbaz covering the whole area, four smaller ones at the corners, and 75 smaller still all the way around. The tomb building measures 158' X 78' and its walls are 42' high including the parapet, above which rise two hemispherical domes to a further 30'. Kalaburgi's old moated fort is in a much deteriorated state, but it has a number of interesting buildings inside including the Jama Masjid, reputed to have been built by a Moorish architect during the late 14th or early 15th century who imitated the great mosque in Cordoba, Spain. The project activities are not expected to impact these structures. However, necessary approval shall be obtained from National Monuments Authority, for carrying out construction within 300 m of the monument. In addition Construction activities need to consider precautionary measures to avoid damages of archaeological structures during excavation works since the fort is the old city area of Kalaburgi.

4.8 Baseline Water Sample Survey

Quality of water supplied to consumers is very critical in assessing the impacts of proposed improvements under the project. The present practice of intermittent water supply to the project cities is expected to deliver bad quality of water due to systemic problems such as illegal connections, cross contamination due to soil, wastewater inflows and various other means adopted by the consumer to cope with the low pressure problems.

A reconnaissance survey of the entire supply and distribution system was carried out before finalising the number and locations of the samples in project city and the operation and flow sequence of the system was studied. Based on the survey, 10 samples were collected at the following locations on 16th May, 2014 and bacteriological & physiochemical analysis were conducted to analyze water quality at supply end.

- Raw water from source river intake at Harasur Village on Bennithora Scheme
- Treated Water from Shor Gumbaz WTP
- Eight water samples from public Public Taps and locations are given below.

S. No	Location	WARD NO.
3	Lal Hanuman Gudi	18
4	Devi Nagar	23
5	Basaveshwar Colony	29
6	Heera Pura	38
7	Raja Pura	45
8	Sai Nagar	55

The water samples were analysed with National Drinking Water Standards (IS: 10500). The water sampling results are at Annexure **VI**.

4.8.1 Water Quality at Source

Both raw and treated water samples were collected for quality assessment and results are given in Table 4.4.

Table 4.4: Raw and Treated Water Results (Physical and Chemical)

S. No	Parameters	Result		Acceptable Limits as per IS 10500
		Raw Water	Treated Water	
1	Colour, Hazen Unit	16.2	6.9	MAX.5
2	Odour	Agreeable	Agreeable	Agreebale
3	Taste	Not Agreeable	Not Agreeable	Agreebale
4	Turbidity,NTU	38	12.1	MAX.1
5	Ph	8.36 @24 DEG C	7.76 @24 DEG C	6.50 TO 8.50
6	Total Dissolved Solids, mg/l	342	336	Max.500
7	Aluminium, mg/l	0.026	0.07	Max. 0.03
8	Ammonia, mg/l	<0.05	<0.05	Max. 0.5
9	Anionic, mg/l	<0.2	<0.2	Max. 0.2
10	Barium, mg/l	<0.1	<0.1	Max. 0.7
11	Boron, mg/l	<0.1	<0.1	Max. 0.5
12	Calcium, mg/l	22.9	24.5	Max. 75
13	Chloramines, mg/l	<0.05	<0.05	Max. 4.0

S. No	Parameters	Result		Acceptable Limits as per IS 10500
		Raw Water	Treated Water	
14	Chlorides, mg/l	29.9	34.3	Max. 250
15	Copper, mg/l	<0.05	<0.05	Max. 0.05
16	Fluorides, mg/l	0.5	0.05	Max. 1.0
17	*Free Residual Chlorine, mg/l	<0.05	0.1	Min. 0.2
18	Iron, mg/l	2.1	0.89	Max. 0.3
19	Magnesium, mg/l	18.9	20.8	Max. 30
20	Manganese, mg/l	<0.1	<0.1	Max. 0.1
21	Nitrates, mg/l	1.7	1.7	Max. 45
22	Phenolic Compounds, mg/l	Absent	Absent	Max. 0.001
23	Selenium, mg/l	<0.01	<0.01	Max.0.01
24	Silver, mg/l	<0.01	<0.01	Max. 0.1
25	Sulphates, mg/l	25.5	45	Max. 200
26	Sulphide, mg/l	<0.05	<0.05	Max. 0.05
27	Total Alkalinity, mg/l	210.7	189.2	Max. 200
28	Zinc, mg/l	0.02	0.01	Max. 5
29	Total Hardness	134.6	146.9	Max. 200
30	Cadmium, mg/l	< 0.003	< 0.003	Max 0.003
31	Cyanide, mg/l	Absent	Absent	Max 0.05
32	Lead, mg/l	<0.01	<0.01	Max 0.01
33	Mercury, mg/l	<0.001	<0.001	Max 0.001
34	Molybdenum, mg/l	<0.01	<0.01	Max 0.07
35	Nickel, mg/l	<0.01	<0.01	Max 0.02
36	Total Arsenic, mg/l	<0.01	<0.01	Max 0.01
37	Total Chromium, mg/l	<0.01	<0.01	Max 0.05

4.8.2 Microbiological tests

S. No	Parameters	Result		Protocol
		Raw Water Sample	Treated Water Sample	
1	Coliform Organisms/100 ml	920, 000	1400	Less Than 1
2	E.Coli Bacteria/100ml	Present	Present	Absent

From the Table 4.4, Turbidity was observed high (38) in raw water and low (1.4) in treated water. The pH was recorded slight alkaline in raw water sample and neutral in treated water sample. All heavy metals were found within the permissible limit in both Raw and Treated water sample. Coliforms were found in both raw and treated water sample. Highest coliform numbers was counted in raw water sample as compared to treated water sample. E.Coli was present in both raw and treated water samples.

4.8.3 Water Quality at Consumer End

Water quality sampling at consumer end was conducted and results are shown in Figure 4.10 and given in Table 4.5.

Residual Chlorine was observed high (1) at Heera Pur water sampling location followed by Devi Nagar, Basaveshwar Colony and Raja pura which may be due to chlorine dose. While other site just confirm norms.

Figure 4.10: Residual Chlorine at Consumer End

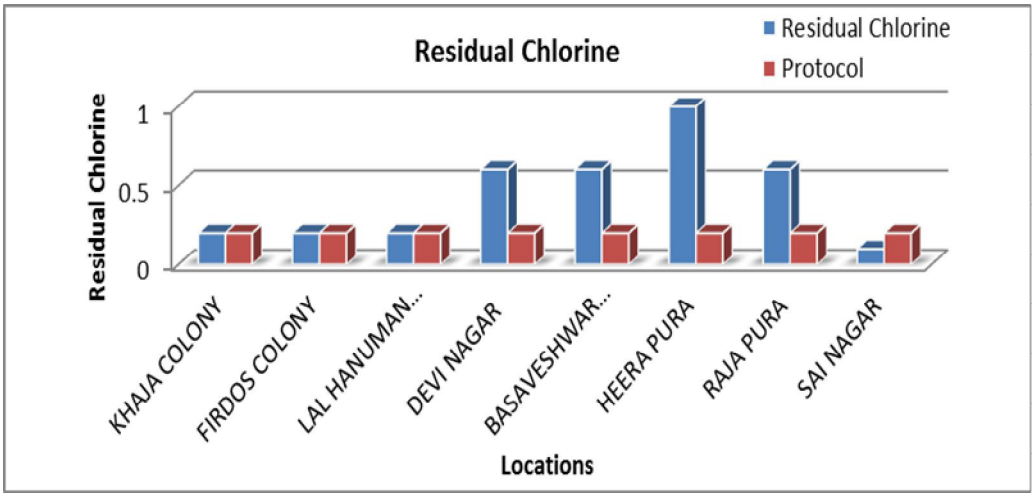


Table 4.5: Water Quality at Consumers End (Tap Water)

S. NO	LOCATION	WARD NO.	FREE RESIDUAL CHLORINE		E.COLI BACTERIA/100ML	
			RESULT	PROTOCOL	RESULT	PROTOCOL
1	KHAJA COLONY	4	0.2	MIN 0.2	60 CFU	ABSENT
2	FIRDOS COLONY	13	0.2	MIN 0.2	LESS THAN 1CFU	ABSENT
3	LAL HANUMAN GUDI	18	0.2	MIN 0.2	LESS THAN 1CFU	ABSENT
4	DEVI NAGAR	23	0.6	MIN 0.2	LESS THAN 1CFU	ABSENT
5	BASAVESHWAR COLONY	29	0.6	MIN 0.2	LESS THAN 1CFU	ABSENT
6	HEERA PURA	38	1	MIN 0.2	LESS THAN 1CFU	ABSENT
7	RAJA PURA	45	0.6	MIN 0.2	LESS THAN 1CFU	ABSENT
8	SAI NAGAR	55	0.1	MIN 0.2	LESS THAN 1CFU	ABSENT

4.8.4 Soil Quality

In order to assess possibility of cross contamination in the demonstration zones in the project city; soil samples were collected at the distribution network and analyzed for its bacteriological and physiochemical characteristics.

Soil was black cotton and poor to medium porosity which indicates deficient moisture and low water holding capacity. All samples were found alkaline in nature. Nitrate levels in the samples were found medium to high due to accumulation. The bacterial content count showed varying results with higher count due to which contamination of water cannot be ruled out.

Parameters	Samples		
	S1	S2	S3
pH	8.4	7.7	8.1
TDS, mg/l	360	340	390
TOC, %l	0.5	0.6	0.5

Parameters	Samples		
	S1	S2	S3
Porosity	37.29	40.44	43.99
Nitrate µg/gm	1120	400	2000
Total Coliform, MPM	5	45	45
Fecal Coliform, count	10	8	6

Source: KWASSIP, Demo-project report

4.9 Major findings from secondary data analysis

The issues identified from the secondary data are summarized below (Table 4.6).

Table 4.6: Major Social Issues/Findings based on Secondary Data Related to Proposed Project

Major Social Issues	Cause	Major findings in district
Water Supply infrastructure	Poor Rainfall and Inadequate water storage infrastructure	Decreased Water supply and storage capacity
Changes in land use particularly	Forest cover is going to reduce	Forest Exists only 1.82% in project area
Limited availability of Surface Water	Lower forest cover, insufficient natural surface water resources, topography of the local area.	Limited water supply
Limited availability of Ground Water	Overuse of ground water, topography and geological conditions of the area.	57% Ground water development of the district. Increasing use of ground water
Surface & Ground Water Quality	Kootnur Nala carries wastewater from various parts of city and joins Bhima river at about 1 km upstream of the intake well for water supply to the city. The Jagat Tank (Basaveswara Tank) located in the heart of the city adjacent to the Fort also receives wastewater from the old city area of Kalaburgi.	Surface and Ground water quality is of concern. Drinking water quality was observed above permissible limit in some part of project area due to lower strata and geological conditions of the region. It may also be due to unscientific practices such as improper management of sewage and solid waste.
Ground Water Level	Increased withdrawal of ground water	Increased dependence on ground water resources due to limited availability of surface water

4.10 Social Profile

Social profile Kalaburgi City was analysed based on secondary source information primarily drawing from the *Census Report 2011*.

4.10.1 Sex Ratio

Sex ratio in 2011 (female population per 1,000 male populations) in Kalaburgi is 964, which is more or less same as that of the State urban average of 963 as well as district urban sex ratio of 968 as per census 2011. Although the sex ratio from last decade has shown drastic improvements, (920 sex ratio as per census 2001), but the region remains among the most vulnerable to pre-natal sex determination and selection.

4.10.2 Literacy Rate

Literacy rate (percentage of literate population to the total population above six years of age) in the city is average 72 percent in (the male literacy rate is 76 percent and the female literacy rate is 67 percent) –much lower the State urban average of 87.58 percent and

National urban average of 84.11 percent (census 2011). This is in spite of, the significance attributed to the city as a regional educational centre and the home to Kalaburgi University.

Slum:

Of the total slum population, 86% are literates and the remaining 14% are illiterates in which 45% are male and 55% are females.

Source: MoUD, GOI, 2014; Report on Slum free city plan of action, Kalaburgi

4.10.3 Average Household Size

The total number of households in City according to the 2011 census was 102830, with household size of 5.25. There has been decrease in household size from 6 in 2001 to 5.25 in 2011.

Slum: The total number of households in slums is 12084 according to 2011 census, with household size of 4.98.

4.10.4 Workforce Participation

The percentage of workers to the population in the city is 32.95 percent comprising of 178207 persons. It is further interesting to note that a significant percentage of the workers i.e. 76 percent are men. Thus, the women were not found to be gainfully employed in a big way. 3.39 percent main workers were engaged in agriculture sector and remaining 2.92 percent were engaged in house hold industries (census 2011). About 93.67 per cent of the total workers in the city are engaged in other services, that is those who were neither agricultural labourers nor household workers.

4.10.5 Ward wise Analysis

Population: The total population of the city is 5, 40,717 in 2011. Population ranged from 434 in ward number 57 and 58 to 19993 in ward number 23. Analysis of population distribution (ward wise) showed that ward numbers 23, 55, 13, 54, 20, 38, and 22 were most populated, while ward number 57, 58, 9, 51 and 48 were least populated.

Child Population: The child population [0-6 years] is reported to be 69,325 comprising 13 percent of the total population. The child population in the wards is found to vary significantly. While ward 13 had the highest number of children (2832 i.e. 4.1 percent of total child population), wards 57 (51) and 58 (51) had the least number of children. The increase or decrease in the percentage of child population in the ward is a result of the number of households, the social composition of the population and so on.

SC/ST Population: The percentage of the scheduled caste and schedule tribe population in the town is 15.07 percent and 1.88 percent respectively. The concentration of the scheduled caste and schedule tribe population is found to vary in the different wards in the city. While wards number 10 and 5 had minimal representation from the community, the highest concentration of population (more than 40 percent) is in ward numbers 40, 16, 45, 50, 53, 58, 57, 39 and 46.

The percentage of the scheduled caste and schedule tribe population in the slum is 49.5 percent and 7.9 percent respectively.

Source: AKM data

Literate Population: The percentage of literate population to the total population is about 72 percent in the town. The male and female literates accounts for 76 per cent and 67 per cent of the literates respectively. Thus, there is significant variation among male and female literates. The percentage of literate population is found to vary across the wards. The proportion of illiterate population in wards vary from 12 percent (ward number 51) to 43.58

percent (ward no.6). Wards with more than 35 percent population illiterate were 6, 7, 1, 16, 10, 40, 45 and 37.

Gender Relation: Out of the total population 50.9% are male whereas 49% are females. The minority group has 51% of males and rest as females. For literates 46% are females. Female workers contribute 24% of the total workers, whereas main female workers forms 21% and marginal female workers forms 39%.

Of the total slum households, 29% forms the minority group with a BPL population of 49880 persons. For women headed category, 16% of the households belong to the women headed households while 15% of the minority population belongs to child labourers.

Table 4.7: Gender Relation

Population	Total	Male	Female
Total	540717	275291	265426
Scheduled Castes (SC)	81467	41341	40126
Scheduled Tribes (ST)	10146	5115	5031
Literates	387663	210204	177459
Total Worker	178207	135212	42995
Main Worker	147199	116323	30876
Marginal Worker	31008	18889	12119

Source: MoUD, GOI, 2014; Report on Slum free city plan of action, Gulbarga

4.10.11 Slum location, Spread & Details

Slum and squatter settlements in Kalaburgi are growing at alarming rates due to increased construction activities and industrial activities. The general composition of majority of slums comprises of scheduled tribes, scheduled caste, and other backward classes, forming the weaker section of the society. The Regional Centre for Urban and Environment Studies, Hyderabad was analyzed existing housing scenario in terms of the structures, its type, access to electricity and other related issues which are summarized below.

Table 4.8: Physical location

Area(Sq. Meters)							
No. of Slums	Below 10,000	10,000 to 20,000	20,000 to 40,000	40,000-60,000	60,000-80,000	80000-1,00,000	1,00,000 Above
	18	12	19	8	2	0	1

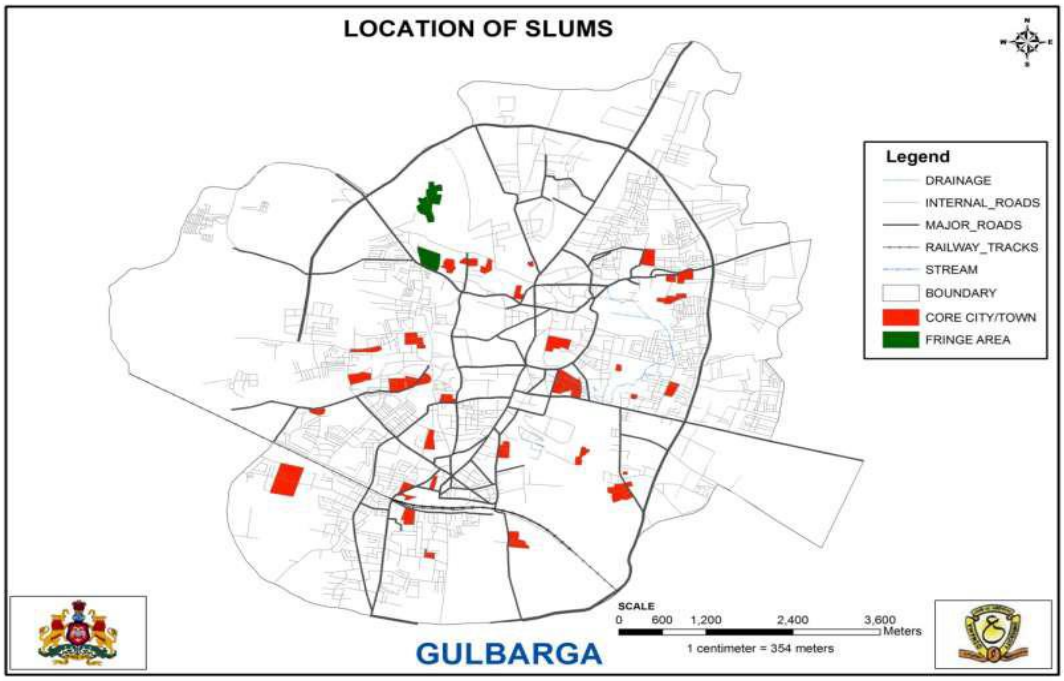
Whether slum is Located		
No. of Slums	Core	Fringe
	50	10

Physical location of slum								
No. of Slums	Along Nallah (Major Storm water Drain)	Along Other Drains	Along Railway Line	Along Major Transport Alignment	Along River / Water Body Bank	On River/ Water Body Bed	Others (Hazardous or Objectionable)	Others (Non-Hazardous / Non - objectionable)
	0	12	8	8	0	4	4	24

Whether the Slum is prone to flooding due to rains?				
No. of	Not prone	Upto 15 days	15-30 Days	More than a Month

Slums	4	56	0	0	
Type of Area surrounding Slum					
No. of Slums	Residential	Industrial	Commercial	Institutional	Other
	53	3	2	0	2

Source: MoUD, GOI, 2014; Report on Slum free city plan of action, Gulbarga



4.11 Findings of the Primary Survey

The Communications and Social Intermediation Strategy (CSIS) study was undertaken in the Kalaburgi city by Samaj Vikas, a Development Support Organisation with a 2.7% sample size. The household survey covered all wards and slum /non-slum households. The sample size for Gulberga has been as follows:

City	Population	Total Households	Actual Sample Size	%
Kalaburgi	5,43,000	1,02830	2770	2.7

4.11.1 Socio-economic features

The survey revealed that majority (59%) of the households in the city are nuclear in nature with 41% joint families. Average family size is 5.4 in Kalaburgi.

The study on house ownership of the sampled households shows that 84% of the households own houses in Kalaburgi while only 16% have rented houses.

In case of slums, 85% households own houses while 12% live in rented accommodations. 3% live in government quarters.

4.11.2 Economic Profile

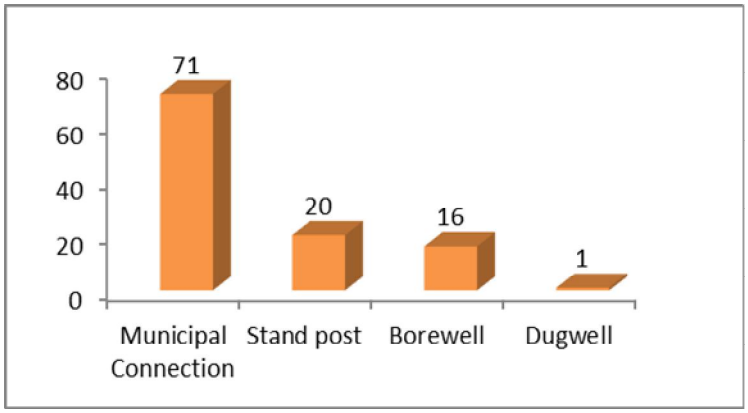
Income data of the sample population indicates that 15.9% of slum households in Kalaburgi respectively, have an average monthly income of less than Rs. 5000 is 12.4%. The non-slum households having an average monthly income of less than Rs. 5000/- are 12.4%. Having an average monthly income of more than Rs. 20,000/- in slum and non-slum areas are 16% and 26.1% respectively.

4.11.3 Supply of Water

Drinking Water Supply is a basic facility provided by the Municipal Corporation. The study collected information regarding water supply in Kalaburgi; in both slum and non-slum

households. This categorization helped in understanding the issues faced by the slum households. Figure 1 shows that Municipal Household Connection is the major source of water supply in the city with 71% having the same. People do depend on other sources as well. In Kalaburgi, 20% households respectively use either stand posts or hand pumps for drinking water. 1% household use dug well (open well) water in Kalaburgi. However, in and around Kalaburgi, 16% of households use bore well respectively.

Figure 4.11: Source of HH Water Supply



4.11.4 Hours of supply

Every urban household desires assured water supply at convenient timings. As reported by the users, 72% of the households are supplied water for one hour in Kalaburgi. 21% of the households report water supply up to two hours and the balance households report water supply from two to above four hours and above. This kind of supply is causing hardship to users, in particular to employed women and low income households. This unassured irregular supply at inconvenient timings propels users to look forward to safe and assured 24/7 water supply as in the demo zones.

Table 4.9: Hours of supply

Hours of supply	
In hrs	%of Households
1	72
2	21
3	3
4&above	5
Total	100

4.11.5 Per Capita Water Consumption

The field survey attempted to understand water consumption pattern in the ULB at the household level. There is no major difference in water use in demo zone and non demo zone houses as seen from the data

Table 4.10: Per Capita Water Consumption in Kalaburgi

Per Capita Water Consumption in Kalaburgi		
Consumption In Liters/capita /day	**% of Respondents**	
	Non Demo	Demo
Less than 40	20	16
40 – 70	64	57
70 – 100	14	21

100 – 135	1	5
Above 135	0	1
Total	100	100

Consumption of 40-70 lpcd by majority of the households in demo and non-demo zones is revealed from the table above. 21% and 5% consume 70-100 lpcd and 100-135 lpcd respectively. There is also a specific need of creating awareness among stakeholders on the fact that poor and slum dwellers use and can use water judiciously if better access to quality supply is provided to them.

Table 4.11: Per Capita Water Consumption in Kalaburgi

Per Capita Water Consumption in Kalaburgi (%HH)		
Consumption In Litres / capita /day	**% of Respondents**	
	Non Slum	Slum
Less than 40	18	22
40 – 70	65	63
70 – 100	15	14
100 – 135	2	1
Above 135	0	1
Total	100	100

Comparisons between slum and non-slum indicates that there is hardly any difference in consumption with non-slum dwellers consuming marginally more in the 40-70lpcd, 70-100lpcd and above 100lpcd categories.

4.11.6 User Adoptions

As the households are provided with irregular unassured water supply, some of them have adopted several means to tap water from their connections. The survey findings indicate that in Kalaburgi, 12% of the sample households resort to pit-tapping (dug pits) to get water and most of them use booster motor pumps as well.

Table 4.12: Methods Used to Get Water from HH Connections

Methods Used to Get Water from HH Connections	
Methods	**% of Respondents**
No of HH Connection Users	1958
No of HH having Pits Dug	306
No of HH Using Motor Pump	167
% HH having Pits Dug	16
% HH Using Motor Pump	9

4.11.7 Fetching Water

No distinct gender bias is visible in fetching water in case of stand post. Although in 39.7 % cases the wife (or the leading female) fetches water, head of the family's and the son's involvement in this activity is app 24% and 30 % respectively. Daughters and daughter-in-laws are seldom sent to collect water

Table 4.13: HH Members involved in getting water from stand post

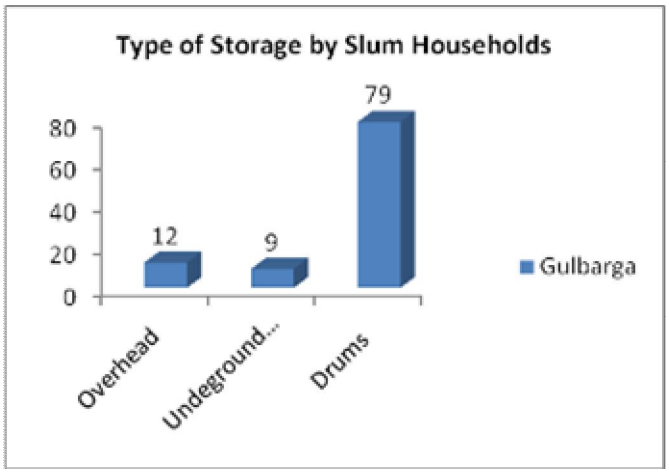
HH member involved in getting water from stand post % HH	
Family member fetching water	**% of Respondents**
Wife	39.7
Daughter	3.9

Daughter-in-law	2.1
Granddaughter	0.3
Head	23.7
Son	29.5
Others	0.8

The study finds that each sample household on an average spends about half an hour to two hours to fetch water from stand post. This is primarily due to the fact that frequency of water supply is poor in the three cities. The Table above shows that women are the primary group who are engaged in fetching water However, in Kalaburgi, in almost 40% of the households, fetching water is taken up by only one family member.

4.11.8 Coping With Intermittent Supply

Figure 4.12: Type of Storage by Slum Households



The intermittent supply with low frequency has compelled citizens to adopt coping mechanisms by creating household level storage. All types of households, across income ranges, in the Kalaburgi city depend on storage facilities. It can be observed that more than 79% of sample households in slums in the Kalaburgi use drums, buckets and vessels for storing the water. Some of them do use overhead tanks and underground sumps as well for storage of water.

4.11.9 Water Quality

The survey collected users perceptions regarding water quality in demo zones and non-demo zones. Demo zone households reported no water quality problem. This is due to the fact that they receive safe 24/7 treated water supply. Only 31% households in Kalaburgi perceive water quality problems. The survey went further to understand type of problems perceived by the users. Out of 31% households, who reported water quality problems in Kalaburgi, 56% had reported bad smell followed by taste as a major problem.

The enquiry was furthered with type of home level treatment by users to make the water potable. This analysis is done on slum and non-slum households to understand variations in practices if any.

4.11.10 Household Level Water Treatment

Though water quality is perceived as a problem by users, more than 40-60% households; both slum and non-slum, do not take up any further treatment. Filtering by cloth is a common practice for 32% the households; both slum and non-slum. Candle filters are used by about 3-9 % of the households. About 2-5 % households use other electric/ non-electric purifiers for improving water quality. This is another reason for switching over to safe 24/7 water supply. There is a definite need of creating awareness on the water quality assurance and benefits under 24/7 water supply regime.

The survey listed the water treatment practices across social categories. It can be seen from the table below that 51% of the SC/ST households are not treating water at household level. Another 32% SC/ST households just filter by cloth and only 3% treat water using various means. The water treatment practices followed by other households from other social categories are not significantly different. This further strengthens the need for good quality water supply requiring no further treatment at household level. There is a need to create awareness among these households on safe water handling practices at household level.

Table 4.14: Social Category wise HH level water treatment practices

Social Category wise HH level water treatment practices (% HH)		
Type of Treatment	**% of Respondents**	
	SC/ST	Others
No further treatment	51	40
Filtration by cloth	32	32
Use candle filters	3	9
Boiling	8	8
Water purifiers & other gadget (electric)	2	5
Water purifiers & other gadget (non electric)	2	5
Others	1	1
Total	100	100

4.11.11 Reasons for not having house connections

The survey also aimed at understanding reasons for households not having municipal house service connection. The table 30 gives the Households' Source of Water Supply. According to this data 70.7% (Kalaburgi) households have Municipal Household Connection. This means the remaining 29.3% (Kalaburgi), households; both slum and non-slum have no Municipal Household Connection. The following table provides reasons as enumerated by these households for not having Municipal Household Connection.

Table 4.15: Reasons for not having HH Water Connection

Reasons for not having HH Water Connection		
Reasons	**% of Respondents**	
	Non Slum	Slum
Can't afford	33	12
No proper records	183	93
No distribution in the area	129	56
No pressure/technical not possible	45	16
Lengthy process getting one	14	2
Others	0	0
Total	404	179
Total No of Survey Households	1790	980
% HH not having HH connections	**22.6**	**18.3**

The technical reasons such as low/no pressure are cited by 61% in Kalaburgi.
Surprisingly affordability as an issue was raised by 12% slum households and 33% non –slum households.

4.11.12 Satisfaction Levels in Demo and Non-Demo Zones

The field survey aimed at understanding water supply services and also satisfaction level of domestic users. The data is segregated in users from demo zone and users from non-demo

zone. The below tables present the satisfaction levels in each of these areas. Some parameters vary due to the very nature and features of 24x7 water supply; these include, hours of supply, timing and access to water. In Demo zone areas of the city, every household is given water supply. It can be seen that there is extremely wide variation in satisfaction levels of demo zone and non-demo zone.

4.11.13 Satisfaction Levels in Demo Zones

Users of 24x7 water supply in demo zone expressed that they have received continuous water supply with adequate pressure where they are not required to store water. The below table shows that households in demo zone do receive good quality water. Further, grievance redressal and fault repair services are efficient and users are satisfied. The overall satisfaction level crosses 92% in Kalaburgi in demo zone. However, the picture is completely different in non-demo zone areas.

Table 4.16: Satisfaction Levels in Demo Zone (% HH)

Indicators	% of Respondents
Pressure of water supply	92
Quality of water supply	91
Access to water supply	95
Grievance redressal & Fault repair	90
Overall level of satisfaction	**92**

The findings indicate half of the user households are not satisfied with current water supply services in Kalaburgi. This can be seen from the analysis satisfaction is 55% whereas in Kalaburgi.

Table 4.17: Satisfaction Levels in Non Demo Zone Areas (% HH)

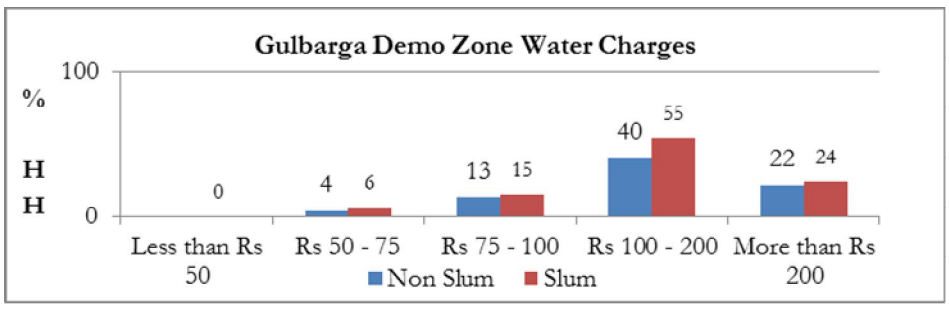
Indicators	% of Respondents
No. of hours of water supply	66
Pressure of water supply	65
Quality of water supply	73
Access to water supply	68
Grievance redressal & Fault repair	56
Timing of water supply from municipality	66
Overall level of satisfaction	**55**

4.12 Water Charges

4.12.1 Payments in Demo zone

The data shows that about 55% and 40% of the users in slum and non-slum areas of Kalaburgi demo zone receive a monthly bill in the range of Rs. 100 to Rs. 200. As there is no subsidy on water charge payment, the water bills are based on usage.

Figure 4.13: Water Charges in Demo Zone



4.12.2 Willingness to Pay by Volumetric Billing

The primary survey data indicates that above 63% of the sample non-slum households are willing to pay up to Rs. 250/- per month for 24/7 water supply. This was the response of the households when asked 'if the present water supply is improved to 24/7, then how much they would be willing to pay'. On the other hand 73% of the sample slum households are ready to pay Rs250 per month for 24X7 water supply. This indicates that the slum households which include poor suffer from the intermittent water supply and are willing to pay more for an assured safe 24/7 water supply. 2% non-slum & slum dwelling respondents are willing to pay as per bill.

Figure 4.14: Willingness to Pay by Non Slum HH

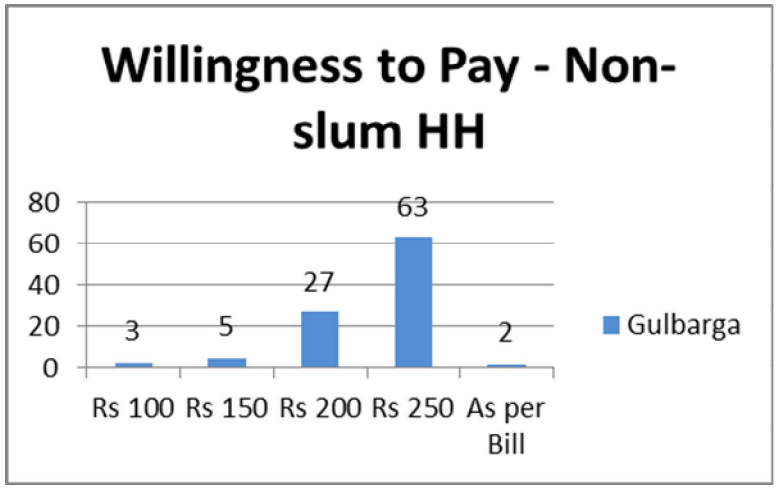
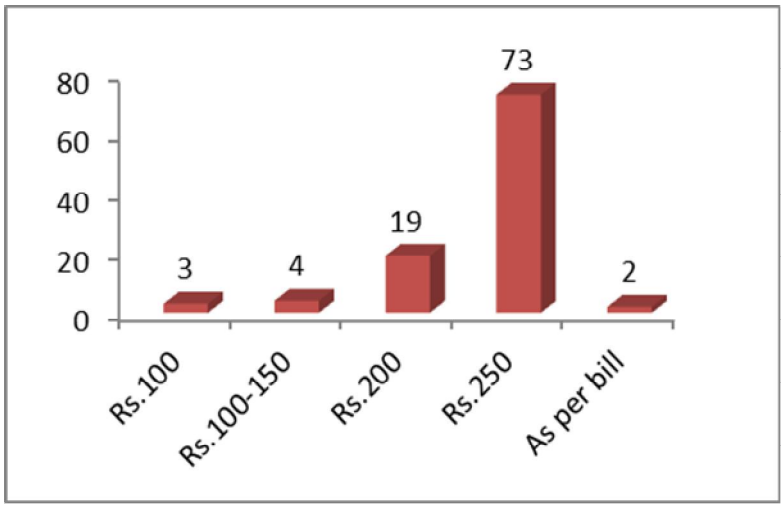


Figure 4.15: Willingness to Pay by Slum HH



The field survey reveals majority of the stand post users are willing to pay more for continuous water supply than the households with house service connections. The below table shows that a large section of households using stand posts (83%) are willing to pay Rs 250 per month for assured water supply. This indicates that stand post users are put to hardship under intermittent water supply regime are craving for more assured and reliable water supply and area willing to pay more for the same.

Table 4.18: Willingness to Pay by Different Facility Users

Willingness To Pay by Different Facility Users (% HH)		
Monthly Water Charges	**% of Respondents**	
	Stand posts	HH Connection
Rs 100	1	3
Rs 150	4	5

Rs 200	12	29
Rs 250	83	60
As per meter	1	2
Total	100	100

Table 4.19: Willingness to Pay across Income Categories

Willingness to Pay Across Income Categories (% HH in non slum areas– all cities together)								
Monthly Water Charges	Less than Rs 5000		Rs 5000 – 10000		Rs 10000 - 20000		More than Rs 20000	
	Non Slum	Slum	Non Slum	Slum	Non Slum	Slum	Non Slum	Slum
Rs 100	5	4	4	4	5	4	5	6
Rs 150	8	4	7	4	7	6	7	7
Rs 200	16	9	19	13	20	14	23	15
Rs 250	56	63	55	64	53	64	48	63
As per meter	16	19	15	15	16	30	17	10
Total	100	100	100	100	100	100	100	100

The above table reveals that there is willingness to pay for assured water supply across different income categories; both among slum and non slum households. This indicates that citizens, irrespective of their income category are looking forward to having assured continuous water supply and are willing to pay more for this. It can also be seen that more number of slum households are willing to pay up to Rs. 250/- per month. This reminds us of the need for a project pro-poor policy to encourage such behavior among the poor and vulnerable and for making sure they access the services.

4.12.3 Health Profile

As per the household survey conducted for a sample size of 2270 households in Kalaburgi, around 80% of the respondents were aware of the water borne diseases such as typhoid, diarrhoea, gastroenteritis, cholera and others. The monthly medical expenditure reported by the respondents ranged between Rs. 20 to Rs. 3, 000 per month, with more than 89% of the respondents spending less than Rs. 500 per month. During the last six months, the medical expenditure incurred by the respondents ranged between Rs. 400 to Rs. 65, 000. Around 86% of the respondents visited private health centres and the balance visited government health centres for treatment.

Table 4.20: Respondents reporting water borne diseases.

Diseases	**% of Respondents**
Typhoid	33.22
Diarrhoea	18.98
Gastroenteritis	37.97
Cholera	9.83

Table 4.21: Average household Monthly Medical Expenditure

Range of Monthly expenditure	**% of Respondents**
Less than 0	20.44

0-100	14.46
100-1000	61.41
More than 1000	3.69

Table 4.22: Knowledge of Water-borne diseases

Knowledge about Water-borne diseases	**% of Respondents**
No	19.64
Yes	80.36

Table 4.23: Source of Medical treatment

Treatment Source	Kalaburgi
Non-Government	86.48
Government Hospital	13.52

Source: Household (Primary) survey conducted by CSIS consultants

4.13 Conclusion:

The base line socio economic profile of the project area does not indicate the presence any sensitive social and environmental features, which could be impacted due to the project activities. Kalaburgi, with its rich historic back ground has a few heritage structures. The project activities shall ensure that these structures are not impacted during the construction or operation phase of the project. Other than the above, the project is critical in improving the water supply service levels in Kalaburgi.

Chapter 5: ASSESSMENT OF ENVIRONMENTAL IMPACTS

5.1 Introduction

This chapter presents an overview of the key environmental issues related to the proposed project. An analysis of the baseline environmental situation, observations during site visits, discussions with state, district and village level functionaries as well as the public consultations have clearly brought out the following key social and environmental issues that need to be addressed in the project design and implementation of project.

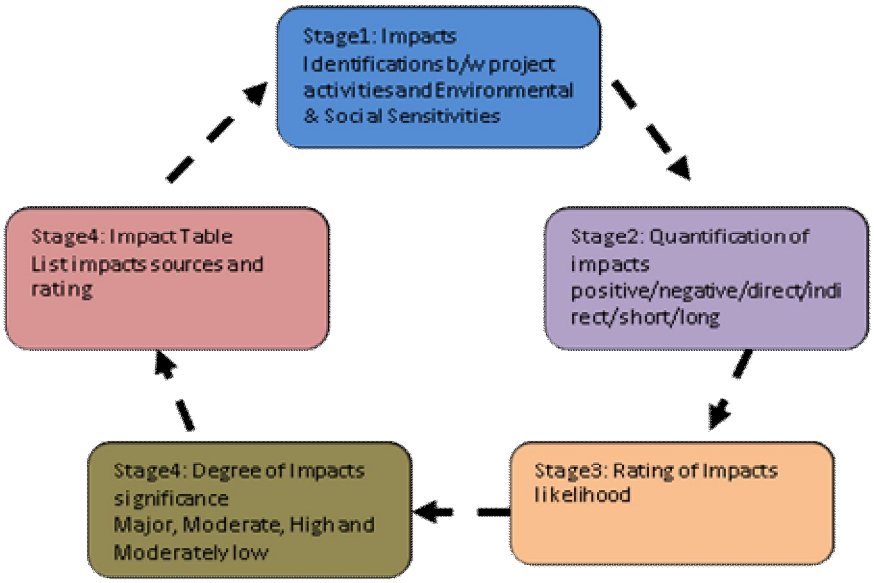
5.2 Associated and Potential Environmental Impacts

For the identification and rating of key issues and impacts that are likely to occur during the phases of this project and the significance of the associated impacts, a "5-Step-Tool" was used.

5.2.1 Rating of Impacts

Five steps were followed sequentially in order to rate the impacts of the various activities of the project as shown below:

Figure 5.1: Rating Impacts



5.2.2 Determining the Magnitude of Impact

For the identification and rating of key issues and impacts the "5-Step-Tool" has been adopted on environmental impact and the impact assessment matrix has been prepared.

Impact Assessment Matrix

Likelihood	Negative Consequence				
	Hardly any	Little	Considerable	Great	Extreme
High	Moderate	Moderate	Major	Major	Major
Medium High	Minor	Moderate	Moderate	Major	Major
Medium	Minor	Minor	Moderate	Moderate	Major
Medium Low	Negligible	Minor	Minor	Moderate	Moderate
Low	Negligible	Negligible	Minor	Minor	Moderate

LOW	Consequences			High
Hardly any	Little	Considerable	Great	Extreme
Local, small-scale, easily reversible change on social characteristics or values of the communities of interest or communities can easily adapt or cope with change.	Short-term recoverable changes to social characteristics and values of the community of interest or community has substantial capacity to adapt and cope with change.	Medium-term recoverable changes to social characteristics and values of the communities of interest or community has some capacity to adapt and cope with change.	Long-term recoverable changes to social characteristics and values of the communities of interest or community has limited capacity to adapt and cope with change.	Irreversible changes to social characteristics and values of the communities of interest or community has no capacity to adapt and cope with change

5.2.3 Associated and Potential Impacts

Activities during lying of new trunk main will involve excavation, transportation & lying of pipe and reinstating excavated farm land, road and stream sections. Replacement and strengthening of the feeder mains will include digging of roads in the areas where replacement and strengthening is planned and reinstating the roads and drains thus disturbed.

The alignment of the proposed new main transmission line are proposed in such a way that the main runs principally along private public roads and that, there will be no land acquisition.

The project proposes dismantling of OHT/ELSR/GLSRs and construct new structures. It is proposed to dismantle overhead reservoirs and construct the new ones in its near vicinity. Extra care needs to be taken during the dismantling of the structures like caution board and prior information to nearby community. Dismantling and new construction may lead to air pollution and health & safety problems to nearby habitation. **It is strongly recommended during construction of both ELSR and GLSR a detailed geotechnical/ soil study should be carried out**.

An environment management plan or mitigation measures have been suggested in Chapter 7 and environmental code of practices are also prepared for this project.

Since the distribution network in the city is to be re-laid, extra precaution needs to be taken in areas which are congested. Proper barricading needs to be provided on such trenched. Proper "Caution" tapes and signboards need to be put in place in both local and English language to highlight the working area.

Before the work is undertaken in the city, a proper traffic flow management plan should be prepared and implemented to ensure that the public and good movement is not adversely effected due to the construction activity.

There should be proper parking facilities at nearby houses, parks, playgrounds. Alternate lanes should be taken for pipeline laying so that access can be provided to residents. Start and end period date for the implementation and lying of pipeline work should be displayed in boards which are written in both local and English language.

5.2.4 Land Environment

A new intake of 100 MLD is planned on the downstream of the Harasur village at about 13Km N-E of Salam Tekdi BPT. The entire stretch of this new alignment as presented in figure 5.2 passes along public roads and there will be no land acquisition. Laying the trunk pipelines will involve excavating a trench. The width of the trench would depend on the pipeline diameter and in no case would exceed 2.5 m. for the entire length of alignment. These earthwork activities will be localised and will have temporary impact on the topography of the area. Similarly, excavation of roads to replace the distribution pipeline will not have a significant impact on the topography

Figure 5.2: Proposed Alignment

5.2.5 Water Environment

1. Water Availability

There are no major rivers or reservoirs in the near vicinity of the city other than present surface sources. This project may increase pressure on the available water sources. The present sources, a) Bhogsa Reservoir b) Bennithora Dam and c) Bheema River have been studied in detail to estimate the available quantity and dependability as a source for water supply to city for the horizon year 2041.

In the absence of above data Bhogsa reservoir operation simulation studies was not possible and hence could not assess the reliability of the source. However based on the past experience of the Corporation it could be taken that Bhosga reservoir yield is at least 7 MLD in the worst rainfall years (Source Project Report, Gulbarga, TCE).

Irrigation Department of GoK has constructed Dam across Bennithora River at Khurj village in Chittapur Taluka in order to irrigate an area of 20234 Ha. The total water requirement for Khariff and Rabi crops is 120.10 Mcum. In order to assess the dependability of the Bennithora reservoir for supplying water to Kalaburgi City, the simulation studies have been carried out for 15 years for different quantity of water supply from this source to City keeping the ultimate irrigation demand (120 Mcum per annum) and drinking water needs of 1.35 Mcum (3.7 MLD) for villagers nearby unaltered. The City demand was superimposed on the demand of the present users and the dependability of the reservoir is worked out (Source Project Report, Gulbarga, TCE).

The dependability of Bennithora Reservoir for supplying water to Kalaburgi City for different quantities of 20 MLD (7.3 Mcum per year) was 82% and for the 55 MLD (20.07 Mcum per year) and 110 MLD (40.15 Mcum per year) was 67% and 60 % respectively (Source Project Report, Kalaburgi, TCE). While dependability on Bheema River was worked as 73% for present demand of 55 MLD (20.07 Mcum per year) and 72% for the future demand of 110 MLD (40.15 Mcum) from this source. The summary of the dependability are presented below.

Water Source	Dependability of source for the demand of		
	7 MLD (2.56 Mcum per year)	55 MLD (20.07 Mcum per year)	110 MLD (40.15 Mcum per year)
Bhosga Reservoir	100%	---	---
Bennithora Reservoir	100%	67%	60%
Vented Barrage across Bheema river	100%	73%	72%

Bhosga and ground water source could be considered as supplementary source for Bennithora and Bheema river sources.

2. Surface Water Quality

The proposed alignment of main passes agriculture fields which does not encroach / pollute any surface water bodies in the city. Hence no significant impacts are anticipated on the surface water quality due to the proposed alignment. Although Kootnur Nala carries wastewater from various parts of city and joins Bhima river at about 1 km upstream of the intake well for water supply to the city. The Jagat Tank (Basaveswara Tank) located in the heart of the city adjacent to the Fort also receives wastewater from the old city area of Kalaburgi.

Activities involving replacement of existing distribution pipeline in the close proximity of households will have an adverse impact due to waterlogging and leakages. This impact is temporary and limited to the construction phase.

Improvement in the distribution system will not have any direct impact on the surface water quality. With the increase of population, the water demand would increase which in turn will lead to higher generation of sewage. As such proper sewerage system needs to be put in place along with the water supply scheme to ensure that the surface water quality is not adversely affected.

3. Ground Water Quality

Since alignment of the pipeline is on a fairly flat terrain, no activities of the project construction or operations are expected to interfere with the ground water characteristic of the region. Hence major impacts on ground water quality are not anticipated. Also, it is recommended that some water harvesting schemes be implemented in the city to recharge the depleting ground water.

5.2.6 Climatic and Air Environment

Impacts on Climate

No changes in climatic conditions are anticipated due to the project execution.

4. Air Quality

Suspended particulate matter and dust are major sources of air quality impacts during the excavation and construction process. As the project envisages lying of the pipeline in agricultural land and rigid road network, the impact of air pollution will not be very significant.

However, on site the impact on air quality due to the project is likely to be higher. Adequate dust suppression measures and protective measures to the work force will significantly reduce impacts. AWS (Automatic Weather Station) technique should be use for the monitoring of air pollution.

Considering the size of the pipe material being laid, transportation and lifting machinery will be required during the construction phase. The movement of these vehicles on these temporary roads will contribute to the deterioration of air quality. No air quality impacts are anticipated during the operation phase of the project.

5.2.7 Noise Environment

Construction Phase: Movement of vehicles, transporting construction material and noise generating activities at the construction site, are major sources of noise pollution during construction. Material movement and associated laying work are primary noise generating activities on site and will be distributed over the entire construction period. Proper safety measures as mentioned in the management plan need to be adopted, to mitigate any adverse impact of the noise generated by such equipment.

Activities involving replacement of existing pipeline in the close proximity of households will have an adverse impact due to noise pollution. This impact is temporary and limited to the construction phase.

However, selection of construction equipment and timing of activities, as envisaged in the management plan, will mitigate the impact.

Operation Phase: Except during regular maintenance activities, no noise generating activities are envisaged during the project operation phase and hence no noise impacts are predicted then.

Ecological Resources

The project activity does not involve encroachment of sensitive environmental features or cutting of trees /vegetation. Hence no impacts are predicted on the ecological resources of the project area.

Archaeological / Cultural Properties

No structures of archaeological or historical importance lie along the main alignment route and hence there would be no impact on the Archaeological / Cultural properties. While in city, Fort, Masjid and Tombs of Firozshah are found as historical monuments under the central protection category. Construction activities around these structures need to include adequate precautionary measures and clearances from NMA.

Other Issues

It is understood that the right of way for the proposed alignment will be in understanding with landowners. The pipeline will be laid one meter below ground level and as such no existing activity will be affected.

5.3 Construction Phase Specific Impacts and their Rating

Impacts identified for various project activities are summarized in Table 5.1 below.

Table 5.1: Summary of Social and Environmental Impacts

Sl. No.	Project Activity	Environmental Impact
I.	**Construction Stage**	
1	Construction of New Intake structure at Harasur Village	• Increase dust levels in the area due to construction activities • Accumulation of construction waste • Increase water pollution during construction

Sl. No.	Project Activity	Environmental Impact
		• Deterioration of water quality • Temporary Disruption of water supply
2.	Laying of Raw Water pumping main of 1200 mm dia. for a length of 13.0 km.	• Increase in Dust levels due to construction • Soil pollution or soil erosion • Increase noise levels due to excavation • Disruption of traffic flow during transportation of construction materials • Landscape degradation • Pressure on local resources • Loss of fertile top soil of the agriculture land along the alignment • Accumulation of Excess Earth • Damage to standing crops during break down of the transmission main or maintenance operations • Unhygienic condition in construction camp • Emissions from use of construction equipments/DG sets for construction activities • Temporary Disruption of natural drainage pattern
3.	Construction of WTPs	• Increase dust or other gaseous (SO_2 & NO_2) levels due to the movement of construction vehicles and equipments • Increase health risk in nearby areas • Increase health risk in construction Labour • Accumulation of construction waste • Accumulation of earth material • Acquisition of Private land for construction of Salam Kotnoor WTP (3.5 Acres) near AIR Station
4.	Rehabilitation of existing WTPs in terms of the alum dosing plant, laboratory up-gradation etc	• No major impact anticipated
5.	Rehabilitation of Clear water pumping Stations	• Increase dust levels • Safety of labour during painting and plastering
6.	Construction of New Clear Water Pumping station	• Increase dust or other gaseous (SO_2 & NO_2) levels due to the movement of construction vehicles and equipments • Increase health risk in nearby areas • Increase health risk in construction Labour • Accumulation of construction waste
7.	Laying of Clear Water Transmission System (42 km)	• Increase in Dust levels due to construction • Soil pollution or soil erosion • Increase noise levels due to excavation • Disruption of traffic flow during transportation of construction materials • Accumulation of Excess Earth • Unhygienic condition in construction camp • Emissions from use of construction equipments/DG sets for construction activities

Sl. No.	Project Activity	Environmental Impact
		• Temporary Disruption of natural drainage pattern
8.	Dismantling of existing Elevated Service Reservoir	• Increase in Dust Level due to dismantling • Increase health risk in nearby areas especially Sheikh Roza, HSR ESR, Old Filter bed, Old PWD quarters, Mahaveer Nagar, Dariyapur, Basavanagar and SB College Tank. • Accumulation of demolition waste • Increase health risk in Construction labour • Temporary disruption of water • Increase noise levels due to demolition and movement of vehicles • Temporary disruption of traffic due to movement of vehicles
9.	Construction of new overhead and ground reservoirs	• Increase dust levels due to construction of reservoirs • Increase noise levels due to movement of heavy vehicles and construction equipments • Disruption of traffic due to movement of vehicles and equipments • Soil pollution due to leakages from vehicles and equipments • Accumulation of earth material • Increase health risk in nearby area • Increase occupational health risk of construction labours • Increase sanitation problems due to construction camp • Accumulation of construction waste • Impact on city drainage system
10.	Laying of about 970 km of additional distribution line	• Increase dust levels due to excavation of earth. • Increase noise levels due to movement of heavy vehicles • There may be cases of destruction of underlying cables(Telephones and internet) • Water pollution due to leakages or damages of existing distribution lines • Disruption of water supply to the consumers during implementation • Water conflicts due to shortage of water • Soil pollution due to leakages from vehicles and equipments • Soil erosion and accumulation of excavated materials • Increase occupational health risk of construction labours • Increase sanitation problems due to excavation • Increase risk on ground water contamination • Impact on city drainage system • There will be an increase in traffic congestion on major roads and streets as a result of intermittent movement of equipment and materials. This will impact on travel time, and may result in negative perception about the project, amongst road users, residents and commercial establishments • If project implementation will require the procurement of

Sl. No.	Project Activity	Environmental Impact
		more than one contractor, the possibility of conflicts and workplace violence occurring may arise. This may hinder or slow down project activities. Impediment to the work schedule will pose a negative social impact as successful project management and monitoring will be thwarted
II	**Operation Stage**	
	24X7 Continuous Supply of Water During Operation	• Operation Failure of Transmission Lines- due to mechanical failure or third party interference. • Bursting or breakage of distribution mains- as a result of increased pressure or aggressiveness of pumping. • Power outages, which may disrupt water supply. • Air quality impacts that would arise during the operation of the pumping stations would include emissions from generators • Generation of Additional Quantity of Wastewater from the Zones leading to contamination of surface / sub-surface sources • Occurrence of chlorine intoxication if water is over chlorinated during treatment

Based on 5 step tool and Impact Assessment Matrix as described in sections 5.2.1 and 5.2.2 above, a conclusive rating has been done and presented below:

Project Phase	Sub-component	Potential Impact	Degree of Consequence	Rating
Pre - construction	Air	Fugitive dust and exhaust fumes from vehicles	Considerable	Moderate
	Soil	Soil compaction and soil structure changes due to influx and stationary positioning of heavy duty equipment and vehicles	Little	Minor
		Leakages from stacked equipment and subsequent seeping through of contaminated oils and chemicals	Considerable	Moderate
	Noise	Increase above permissible noise level, (55Db in residential, 65 in commercial and 75 in industrial area) due to movement of vehicles, equipment and machines to the pumping stations	Considerable	Moderate
	Ground water	Saltwater Intrusion	Considerable	Moderate
		Increase of groundwater vulnerability	Considerable	Moderate

Project Phase	Sub-component	Potential Impact	Degree of Consequence	Rating
Construction		Introduction of turbid waste water into surface water during cleaning	Considerable	Moderate
	Air	Cement, dust (during demolition), other dusts, exhaust fumes, hazardous gases (NOx,CO, SOx, PM 2.5, PM10)	Considerable	Major
		Demolition works releasing asbestos dust into the atmosphere	Great	Major
		GHG Emissions	Considerable	Minor
	Water quality / hydrology	Contamination from (oils, fuel, chemicals substances etc)	Great	Moderate
		Contamination by human faecal wastes	Considerable	Moderate
		Water contamination by sediments	Considerable	Moderate
	Soil / Geology	Creation of pathways for contaminants as a result of borehole/well drilling	Considerable	Moderate
		Loss or compaction of top soil due to movement of heavy vehicles and equipment	Considerable	Moderate
		Contamination of soil by oil spills, fuel etc	Considerable	Minor
	Noise	Extensive noise pollution as a result of on-going construction works.	Considerable	Moderate
	Waste	Social and health concerns arising due to poor waste management practices	Considerable	Moderate
	Traffic	Increase in travel time due to works.	Considerable	Moderate
Post Construction	Air	Exhaust fumes from equipment and diesel generator plant.	Little	Minor
	Soil	Groundwater contamination from accidental spills.	Considerable	Moderate
	Noise	Nuisance due to increase in noise levels	Little	Negligible
	Water quality and hydrology	Cross Contamination/ Leakages	Considerable	Moderate

5.4 Conclusion

Kalaburgi is not located near any eco-sensitive area. The construction of proposed units will have environmental impact on the adjoining settlement in terms of dust and noise during construction. Soil pollution and impact on water quality and hydrology will be marginal and temporary. The impact on the air quality due to the operation of construction machineries in the site is found to be considerable due to digging of trenches and demolition activities. The negative impacts that are likely due to construction activities in narrow and congested roads need critical attention. For mitigation of these impacts following measures are suggested: Compliance with Air Act 1981 and Noise Rules, EP Act 1986 will be mandatory for contractors. There will be no significant adverse impacts in terms of flooding, gas emission, waste discharge, health risks etc. Hence no Environmental Clearances are required for the project.

Chapter 6: STAKEHOLDER CONSULTATION

Consultation with relevant stakeholders has been an important component of the social and environmental baseline assessment and to obtain perceptions and views of the stakeholders on social and environmental concerns pertaining to the local area. The objective of stakeholder consultation was to identify environmental & social issues, impacts, and options to minimize potential negative impacts. The views held by the stakeholders were analyzed and are presented in this section.

6.1 Major Findings from ESA Stakeholders Consultation

The methodology followed in focus group discussion and stakeholder meeting is given below

- Meeting various line department officials and other stakeholders
- Motivating and encouraging interactions and deliberations on pertinent issues
- Eliciting feedback and responses from the participants and recording them
- Identification of ways and means to identify Environmental & Social issues, options & resolve conflicts, if any, between stakeholder groups.
- Consultations at the demo and non-demo level were carried out through a checklist.

The stakeholder consultation was conducted with various groups involving officials, professionals and city population from various areas of the project towns. The in-depth discussion on various water supply and related subjects brought forth some key issues which are as mentioned below:

Highlights of the Stakeholder Consultations with domestic users

- Willingness to accommodate the escalated cost
- Reduction/almost negligible incidence of water borne diseases.
- Customers expressed satisfaction with water quality, volume, mode of supply, supply frequency, supply time in demo zones
- They also expressed satisfaction with the water supply department in terms of the charged tariff, consumer redressal, maintenance and repairs in demo zones
- They have expressed the need to improve the water supply through the proposed 24 X 7 plan in non demo zones
- Knowledge of on-going efforts to bring in the 24 X 7 supply in all regions
- Customers also suggested alternatives and other solutions for anticipated problems and conflicts that could arise through the design, implementation, supply, distribution, maintenance and tariff related issues

Discussions were held with various industrial, commercial and institutional stakeholders the following issues :

- Industrial consumer profile – Type and size of the industry, types of water consuming industrial activities, usage of corporation water supply for industry, use of corporation water for industry workers colony, etc.
- Type of access to water – Exclusive industry connection, Shared with other industries
- Current sources used for water (common or separate for drinking and other uses?)
- Satisfaction with water quality, volume, mode of supply, supply frequency, supply time
- Current water consumption for drinking and other uses
- Type of infrastructure available for water storage – Syntex, cemented (overhead, ground level or underground)
- Average cost incurred for water connection and operationalization
- Average water bill paid with billing frequency
- Defaults in bill payment

- Satisfaction with the water supply department in terms of the charged tariff, consumer redressal, maintenance and repairs
- Observed instances of water wastage
- Coping mechanisms to face supply problems - Purchase of water from commercial sources (bottled water, tanker supply, etc.), Use of filters and other purifiers
- Local conflicts on water usage and methods used for conflict resolution
- Overall perception on the need to improve the water supply through the proposed 24 X 7 plan
- Knowledge of on-going efforts to bring in the 24 X 7 supply
- If aware, satisfaction with the feasibility of the new scheme
- Anticipated problems and conflicts that could arise through the design, implementation, supply, distribution, maintenance and tariff related issues with suggested alternatives and other solutions

Expected expenditure at the industry level to accommodate required changes in plumbing, meter replacement and storage – willingness to accommodate the escalated cost and if not willing, who should bear it?

6.2 Discussions on gender related issues

At the outset it was deemed necessary to understand the prevalent gender issues in the project cities. A series of stakeholder consultation in different project cities have been conducted at this stage of social assessment to find out women's concerns regarding the 24x7 water supply project to be taken up. The consultation was carried out in local language to establish the comfort level. Consultation team was present to initiate this process where their primary role was to facilitate discussions and analysis with the women. Initial selection of women's groups for consultation was done in a manner that they represented women from demo zones, non-demozones. Women stakeholders of various categories, including women office bearers in local bodies and line agencies, self-help groups, women headed households, NGO representatives, working women and teachers of local schools / colleges were considered for gender consultation and situational analyses. The issues are highlighted below:

- Cut across caste/class/color women's lives revolve around the water availability in the household.
- In the 24*7 supply demo zones the women members were hassle free from fetching and storing water.
- Their families are enjoying a good health status with no incidences of water borne diseases and adoption of hygienic practices.
- The women folk are getting ample time to take up gain full employment resulting in economic upliftment of their families. They get time to even indulge in other household chores/recreation etc.
- In the non-demo zones the women are most of the time involved in fetching water and storing it.
- They are experiencing a lot of physical discomfort in fetching water from far/near sources.
- The spurt of water borne diseases is affecting their health and they have to spend both time and money in tending to those who are ill in the family.
- Personal hygiene becomes difficult to practice when each and every drop of water counts.
- Adding on to all the other woes is the community fights which occur due to lack of water. Many a times it takes a violent turn with the male members getting involved as well.

The detailed stakeholder consultation is provided in Annex 2

6.3 CSIS Stakeholders Consultation

This was arranged in coordination with Kalaburgi Municipal Corporation. The list of invitees included users from the demonstration zones, representatives of various institutions such as educational institutions, Lions Club, Rotary Club, Resident Welfare Associations, student groups, Local NGOs, eminent persons like teachers, professors, former corporators, Industry Leaders, academicians, professional such as architects, entrepreneurs, media representative and officials of Municipal Corporation, Water Board, Operator, etc. The session was open to share their concerns, opinion, feedback and suggestions. Key points raised were:

- The city NGO representative stressed on the need of introducing continuous 24x7 supply to the entire city. He said presently the people of Gulbarga town is facing problems related to water supply and demo zone experience has created impact that 24X7 supply is possible and affordable.
- A woman participant from demo zone, an SHG member, shared her experience and said that 24X7 supply to her house have reduced their work burden, timing and she is using the same for other household activities. This demo zone experience to be expanded to complete Gulbarga.
- One of the participants said that due to bad water quality they incidence of people falling ill and vomiting due to jaundice, etc. He has urged corporation to supply clean water to the town.
- Users of Demo Zone expressed satisfaction about 24X7 supply in their area and requested up-scaling for entire city.
- Another participant reported about water contamination through mixing of drainage water. He asked the concerned authorities to take immediate action so that at least they get water without contamination. In reply the Commissioner assured that the water contamination due to underground drainage will be solved.

6.4 Conclusion

The Stakeholder Consultations revealed that there is clear support for the project and people are in fact impatient for the arrival of 24x7 water. The stakeholders are aware of the benefits of continuous water supply specifically health benefits to the family. Women, who play a key role in ensuring water for the family, are eagerly waiting for this project. In addition to health benefits, they indicated that time saved can be used for economic and social activities. The environmental aspects may be included during communication campaigns to increase awareness among stakeholders.

Chapter 7: ASSESSMENT OF SOCIAL IMPACTS

7.1 Introduction

The proposed project will generate some social impacts in the project area. A good number of these impacts will be beneficial, especially the improvement of availability of potable water in city, reduction of water borne diseases, reduction in man- hours spent (especially women and children) in sourcing for water, and the establishment of an environmentally sound, safe and sustainable water sanitation system. However there will be some negative impacts in the project which although will be in the form of temporary inconveniences, will have to be mitigated.

Social Impact are social ramifications and it is imperative that decision-makers understand the consequences of their decisions before they act and people get negatively affected Social assessment helps to make the project responsive to social development concerns.

This social impact assessment has been undertaken to ensure *social sustainability relating to equity, empowerment and security.*

In simple words, social impact component seeks to understand the community as it is now as understood from the baseline, and seeks to determine:

- What will change as a result of this project?
- What social implications will it have as a result of these changes?
- How can those social impacts be assessed?
- What can be done to reduce the impacts of this project?
- What can be done to maximise the benefits of this project?

This chapter presents a summary of the identified potential impacts associated with the Kalaburgi water supply project in the social domain.

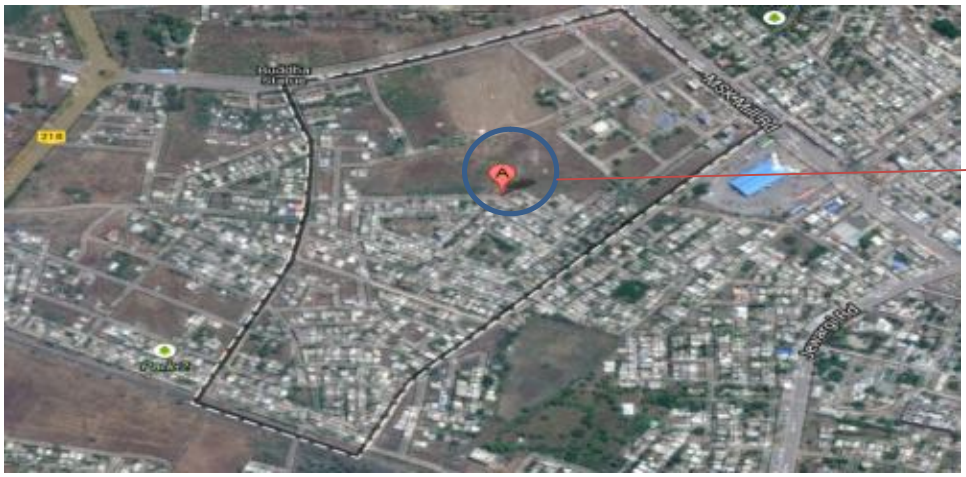
7.1.1 Social set up of the ESR Sites

As evident from the design, major components of WS Project will be constructed within the existing component locations as there will be alterations and rehabilitations of the existing structures. The new WTP will be located in a barren land close to the existing WTP. However construction of the ESR will involve dismantling of the existing structures and constructing new structures. The locational features of the proposed ESR have been provided below.

A. Kotnoor

Proposed ESR is near All India Radio Station compound. There is no dense Flora and Fauna concentration near the site. There are sparse settlements in proximity to the proposed ESR. The surroundings mainly consist of residential plots. The Pumping Station is located within a km from the proposed location. The proposed site has boundary walls hence no direct impact to the residential area.

B. CIB Colony:



Proposed ESR is in CIB Colony. There are moderately dense settlements in close proximity to the proposed ESR. The surroundings mainly consist of residential plots.

C. PWD Quarters

Proposed ESR is near railways lines area. The surrounding of site is vacant. There is no flora and fauna concentration in the site. There are sparse settlements in close proximity to the proposed ESR.

D. University:

Proposed ESR is next to existing Badepur GDA tank. There is no Flora and Fauna concentration in the site. There are sparse settlements in proximity to the proposed ESR. The surroundings mainly consist of residential plots.

E. Ganesh Nagar:

Proposed ESR is near Shastri Nagar road. The surrounding of site is vacant. There is no Flora and Fauna concentration in the site. There are sparse settlements in close proximity to the proposed ESR.

The locational attributes indicate that the components are not located in eco-socially sensitive locations and thus would not create major impacts.

Preliminary land availability has been checked for the proposed water treatment plants, clear water reservoirs and clear water pumping stations and Service reservoirs.

7.1.2 Land Required / Availability Status

City Corporation possess most of the proposed land, whereas in Salam Tekdi, 1 area is available with the City Corporation out of required 5 Acres. It is to be mentioned that 4 Acres of land need to be acquired for WTP cum Clear Water Reservoir. Details of the land required / Availability status is given below:

Table 7.1: Land Required / Availability Details – Kalaburgi City

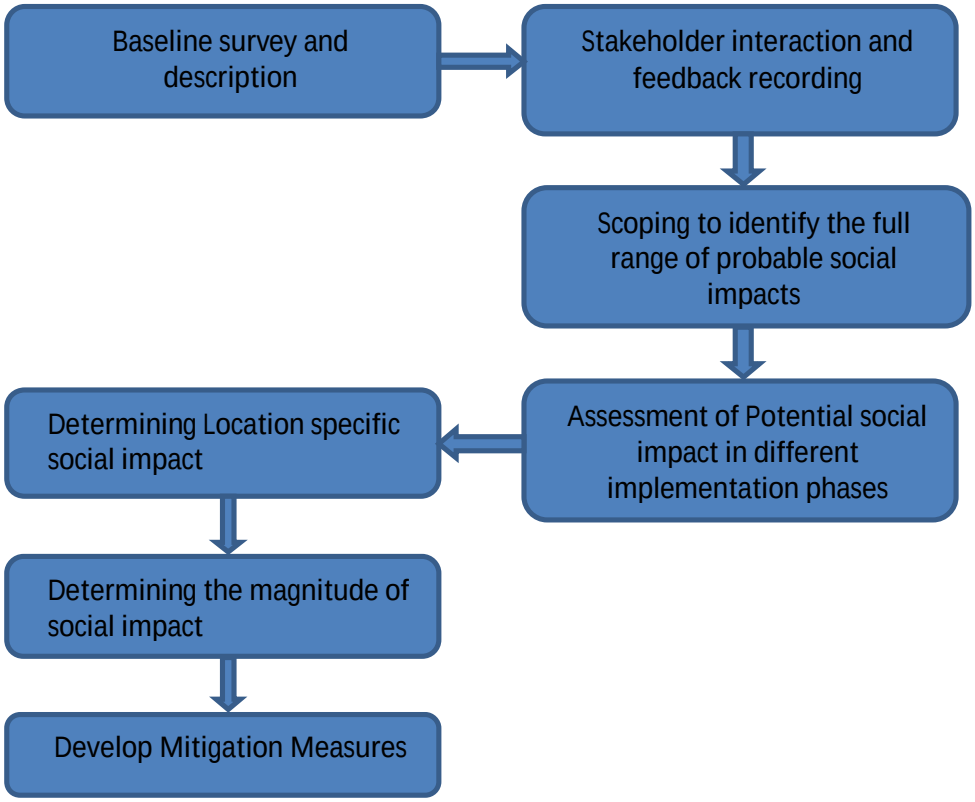
Sl. No	Location	ESR / GLSR/ OHT	Land Ownership	Area Required (sq m)	Status
1.	Kotnoor	WTP	KUWS&DB	3.50 acres	Land is in possession of Corporation
2.	CIB Colony	ESR	City Corporation	30m x 40m	Land is in possession of Corporation

Sl. No	Location	ESR / GLSR/ OHT	Land Ownership	Area Required (sq m)	Status
3.	PWD Quarters (Near Railway line)	ESR	City Corporation	25m x 25m	Land is in possession of Corporation
4.	Ganesh Nagar GDA	ESR	City Corporation	50m x 25m	Land is in possession of Corporation
5.	Dubai Colony	ESR	City Corporation	50m x 50m	Land is in possession of Corporation
6.	University	GLSR	City Corporation	35m x 35m	Land is in possession of Corporation
7.	Salam Tekdi	WTP cum Clear Water Reservoir	1 Acre is in the possession of City Corporation 4 Acres is Private Land	5 Acres	*4 acres of Pvt. Land is proposed to be directly purchased*

Ref: *Project Report on KUWASIP-Up scaling 24x7 Water Supply: Tata Consulting Engineers In association with SREI Infrastructure Finance Ltd and updated in consultation with KUIDFC*

7.2 Process for Social Impact Assessment

The Social Impact assessment and mitigation process is a multi-stage progression involving participative and technical approaches. The process has been presented below



7.2.1 Baseline survey and stakeholder feedback

The detailed baseline analysis has been presented in chapter 4. Kalaburgi has a population of 543,147 as per the 2011 Census. The area of the city is 55sq.km with a density of 9831 persons per sq. km. Slum population is about 11.13% of the total city population. Location wise, around 50 slums which are located in the core area are characterized by closely bound clusters while in fringe areas, the settlements are found scattered all over the city. The population density for slum is 40669 persons per sq. km in 2011. Sample survey indicates that Municipal Household Connection (71%) is the major source of water supply among the sample population. People do depend on other sources as well. In Kalaburgi, 20% households respectively use either stand posts or hand pumps for drinking water. On the other hand 1% households use dug well (open well) water. Kalaburgi has different durations of water supply in different parts of the city; 72% of the households report water supply up to one hour and the balance 28% households report water supply from more than one hour to above four hours and more. Every urban household desires assured water supply at convenient timings and are ready to pay for it.

Stakeholder interactions revealed the limited water supply situation and its mitigation through water tanker coupled with low maintenance of existing infrastructure in non-demo zones. Women are worst affected as this kind of supply is causing hardship to users, in particular to employed women and low-income households. This un-assured irregular supply at inconvenient timings propels users to look forward to safe and assured 24/7 water supply as in the demo zones.

Prevalence of water borne diseases arising out of unhygienic conditions was mentioned by participants in stakeholders consultations. On the other hand demo zones depict a picture of positivity where consumers are satisfied with the services in terms of quantity and quality. Disease incidence is low. The positive impacts for people in general and women, in specific has been indicated below;

All Users	
Positive	• Availability of quality water for a duration required and at a time wanted by all • Health and Environmental improvements • Reduced health expenses and thereby increasing savings • Productive use of time • Less suffering during monsoons and adverse climatic conditions • Improved public safety • Better infrastructure facilities • Improved access to services • Improvements in quality of life
Women	
Positive	• Availability of quality water for a duration required and at a time wanted by all • Reduced drudgery of carrying water from long distances • Reduced disease burden due to reduction in water borne and water related diseases • Productive use of time directing towards gainful employment • Women have leisure • Less suffering during monsoons and adverse climatic conditions • Improved safety

Hence the water supply project will induce a major positive impact touching upon the quality of life of people and in addressing the Millennium Development Goals.

However along with the overarching positive impact of improvement in quality of life, a full range of other social impacts – negative and positive – needs to be determined which will call for focused intervention. This has been attempted in the following section.

7.2.2 Scoping to identify full range of social impacts

The potential social impacts associated with any construction activity are as follows

i) Negative perception about the project

Considering that Kalaburgi is already impacted by heavy traffic jams, further increase in traffic congestions as a result of movement of equipment and materials along the road and streets where works will be conducted is envisaged. This will impact on travel time, and may result in negative perception about the project, amongst residents and road users. It will also disrupt movement of inhabitants to places of work, business and schools, resulting in loss in man-hours. Traffic in city is already heavy and will be highly affected by this.

ii) Air pollution and Impact on human health

One of the potential impacts of the proposed sub-projects will be on the air quality due to the dust generated during excavation. The amount of dust generated will be depend upon the level of digging and the prevailing weather conditions. Thus, it is expected to lead to marginal impact on ambient air quality. Air pollution will may lead to bronchial disorders.

iii) Elevated Noise Levels

Increased noise pollution from construction equipment will disturb residences, and especially schools and institutions in area. For elderly and students, noise is disturbing and affects their comfort. This could be a problem especially in sensitive areas like schools and hospitals located in vicinity of the construction sites.

iv) Traffic Congestion

The construction activities could lead to inconvenience to public during water supply pipeline laying along thick commercial areas and narrow streets, or where public facilities are located. This could lead to inconvenience to access business, residential and other immediate facilities for the public and impact on livelihood due to loss of access to business. Resident may not be able to take out their vehicles from their house premises and space for parking may also be reduced. However, such impacts are likely to last for a short duration only.

v) Impact on livelihood

The excavation and alignment of pipeline work may lead to road blockage and as a result the commercial establishments and vendors will have some inconvenience in operating their business on daily basis. But loss of livelihood is not expected. The vendors can move to nearby places as and when required. As per anecdotal evidence gathered during field visit, most shop-owners and mobile vendors are welcoming the water supply project implementation as they see a direct benefit of improved living and working conditions. They are aware of, and prepared to face temporary inconveniences caused by construction if the project is implemented in a timely manner. Further on the positive side, about 100 persons are likely to be employed during construction phase. Some of the locals will also get employment. This will marginally improve the employment scenario during project construction phase.

vi) Impact on existing utility services

The road opening activities may damage the underground water pipelines or electricity poles in the vicinity of the site for the proposed sub-projects. This will lead to water supply

interruptions, disruption in electricity supply and will involve expensive repair costs. Hence, it is recommended that adequate precautions be taken during construction phase to minimize such impacts.

vii) Occupational Health and Safety hazards

There are potential hazards like falling in the trenches and excavated area for the workers as well as for the pedestrians. Further labour camps may not be safe and secure with adequate facilities and security arrangements. The issue of security and healthy environment is particularly relevant for women. There is also the possibility of engaging children violating the Child Labour Law.

viii) Failure to Restore Temporary Construction Sites

Excessive debris, trash or construction remnants (e.g. dirt piles) would create problems related to drainage, unhygienic conditions and poor aesthetics.

7.3 Potential Social Impacts in different implementation phases

Social impacts are linked with different phases of implementation and thus such impacts during pre-construction, construction and operation were identified. Operationally there will be minimal social impacts and these can be addressed through good management practice and good local communication by the Executing Agency. The construction phase impinges the maximum primarily because of the multiplicity of activities at different project sites linked with different components like

- Laying of pipe
- Rehabilitation of Existing WTP
- Dismantling of existing Elevated Service Reservoir
- Construction of new overhead reservoirs
- Relaying of complete Water Distribution Network

The local community is directly impacted due to the high influx of construction workers for extended periods of time and also due to access issues, dust, noise, increased traffic on site. On the other hand from workers perspective occupational hazards are significant during this stage where women especially remain vulnerable from security, privacy and health and hygiene aspects.

The implementation phase specific impacts with special reference to varied construction activities have been identified below:

Table 7.2: Identified Potential Impacts by phases

Pre-construction phase		
Social Impacts		
Positive	1	The project will undertake a stakeholders/public consultation exercise to sensitize the inhabitants of Kalaburgi on the social safeguards components of the project. The public consultation process is seen to be a positive impact, as it will form a basis for project concept decision-making and implementation.
	2	The implementing agency (KUIDFC/ULB) may also help establish project supervision committees at the community levels to enable participation, monitoring and evaluation when rehabilitation works commence.
Negative	1	Land acquisition is an inevitable activity in the preconstruction stage. While government to government transfers involves official notifications and subsequent transfer, acquiring private land calls for compliance with the Land Acquisition and Rehabilitation and Resettlement Act 2013. Land

		acquisition as a process is lengthy involving a series of stages from identification of Project Affected Persons to preparation of RP and its implementation. This often comes with hitches between the PAP and the donor and delays.
	2	Considering that Kalaburgi is already impacted by heavy traffic jams, further increase in traffic congestions as a result of movement of equipment and materials along the road and streets where works will be conducted is envisaged. This will impact on travel time, and may result in negative perception about the project, amongst residents and road users. It will also disrupt movement of inhabitants to places of work, business and schools, resulting in loss in man-hours. Traffic in city is already heavy and will be highly affected by this.
	3	Noise from heavy-duty project vehicles and equipment may exceed the MoEF/CPCB acceptable noise level limits, resulting in nuisance.
	4	Properties may be accidentally damaged or destroyed during the movement of heavy duty vehicles and equipment
	5	Accidents involving vehicles or pedestrians are likely to occur during vehicle and equipment movement to pumping stations/Water Treatment Plant and work areas within the city. This may occur in areas where many schools are located close to the working areas

Occupational Health and Safety		
Positive	1	During the pre-construction phase, Occupational Health and Safety (OHS) awareness programs will be conducted. Awareness programs and interactive sessions will benefit primarily the contractors' personnel, ULB and KUIDFC staff. Guidelines on safe practices and safe behaviours will be made available to these groups in order to minimize the occurrence of occupational incidents or accidents in the course of implementing project activities. This is especially in the areas where major construction works will take place.
Negative	2	During the pre-construction phase air pollution from exhaust fumes of vehicles and equipment moving to the pumping stations and work areas may occur. This will pose an occupational health risk (*respiratory infections and diseases*), especially for people living in and carrying out activities around the neighbourhoods and also, personnel conveying equipment to the construction site
	3	Exposure to noise pollution, injuries and accidents during movement of equipment to the work areas.

Construction Phase		
Social Impacts		
Positive	1	Employment of skilled and unskilled labour will be promoted. Artisans and professionals from the Kalaburgi will be provided contractual employment during this phase. This will help promote community goodwill.
	2	The construction phase will see to the implementation of a viable waste management plan for project activities

Construction Phase		
Negative	1	Laying of pipe • Increase dust levels due to excavation of earth causing respiratory problem. • Increase noise levels due to movement of heavy vehicles cause health issues. • There may be cases of destruction of underlying cables (Telephones and internet). • There may be cases of destruction of underlying existing water supply line which leads to leakages and shortage of water nearby locality. • Loss of Fertile Top Soil of the Agriculture Land along the alignment affecting productivity. • Loss of vegetative cover leading to air pollution affecting health. • Damage to standing crops during break down of the transmission main or maintenance operations affecting income of people. • Accumulation of Excess Earth causing respiratory problems. • Disruption of traffic flow in the roads. • Disruption of Utilities such as electricity, telephone and other services. • Disruption of water supply to the consumers during implementation. • Water conflicts due to shortage of water
	2	Rehabilitation of existing WTPs in terms of the alum dosing plant, laboratory up-gradation etc. • Noise pollution • Contamination of water
	3	Construction of WTPs at Salam Tekdi and Kotnoor • Increase dust or other gaseous (SO2 & NO2) levels due to the movement of construction vehicles and equipment • Increase health risk in construction Labour
	4	**Dismantling of existing 15 Elevated Service Reservoir** (KHB colony, Dariyapur, Mahaveer Nagar, SB Tank ELSR, CIB Colony Tank, Basavanagar, Badepur GDA, Ganesh Nagar GDA, DC Tank, Old SP Office, Sheikh Roza, Dubai Colony GDA, HSR ESR, Old Filter bed and Old PWD quarters tank) • Increase in Dust Level due to dismantling • Accumulation of demolished waste • Temporary disruption of water • Increase noise levels due to demolition and movement of vehicles
	5	Construction of new overhead and ground reservoirs • Increase dust levels due to construction of reservoirs • Increase noise levels due to movement of heavy vehicles and construction equipment • Accumulation of construction waste • Increase risk on ground water contamination • Impact on city drainage system
Occupational Health and Safety		
Negative	1	In the course of rehabilitation works, there would be a moderate to severe likelihood of the occurrence of workplace hazards. Activities such as removal and replacement of pipes, trench digging, mechanical, structural works and

Construction Phase		
		electrical installations could predispose personnel to hazards. "**Unsafe behaviours**" and **"unsafe conditions"** will pose a serious occupational health and safety risk. Hazardous conditions or practices likely to impact on occupational health and safety will include: a) Works involving removal and replacement of transmission and distribution pipes (collapse) b) Works involving valve replacement and installation of valve chambers. c) Conveying and lifting of heavy equipment (transformers, generators) d) Works at heights (i.e. rehabilitation of elevated tanks) e) Use and exposure to hazardous energy f) Water treatment upgrades g) Electrical installations etc. h) Demolition works

Operation and Maintenance Phase		
Social Impacts		
Positive	1	Improvement in overall water supply and sanitation services for Kalaburgi
	2	There will be job creation and employment. For instance, more workers may be employed in water supply department as managers, Technicians etc.
	3	Surge in improved health, standard of living; personal and infrastructural hygiene is envisaged as there would be an availability of flowing water in households and public places (Markets, motor parks).
	4	Services delivered by commercial establishments *(restaurants),* hospitals, businesses etc. will be enhanced directly and indirectly
	5	The upgrades in the pumping stations and entire water supply and sanitation system will make it suitable for educational tours, (for example university students studying in the fields of water engineering, etc)
Negative	1	Operation Failure of Transmission Lines**-** due to mechanical failure or third party interference.
	2	Bursting or breakage of distribution mains- as a result of increased pressure or aggressiveness of pumping.
	3	Power outages, which may disrupt water supply
	4	Air quality impacts that would arise during the operation of the pumping stations would include emissions from generators
	5	Generation of Additional Quantity of Wastewater from the Zones leading to contamination of surface / sub-surface sources
	6	Occurrence of chlorine intoxication if water is over chlorinated during treatment

7.3.1 *Activity specific impacts in Sensitive Areas*

While the phase specific impacts have been elaborated above, impacts of contraction will have specific and significant in sensitive locations – sensitivity being defined in terms of critical social, cultural, religious services with being delivered in those locations. Critical or sensitive locations include hospitals and health units, schools and educational institutions, crematorium, historic and tourist locations, market place, major residential complexes and major road junctions. Some of the sensitive locations within Kalaburgi city and the type of impact envisaged have been indicated in the table below:

Sl. No	Activity	Identified Locations which will be affected	Nature of Impact
1	Laying of pipeline in institutional locations like schools	The city has numerous schools that provide students with quality education. To name a few: - St. Joseph's Covent School - National Lily Rose School - Pragnya High School - Kenbridge School - Crescent School - DAV Public School - Kendriya Vidyalya - Aditya Birla Public School The city is a prominent educational hub with 6 engineering colleges, 7 polytechnic colleges, 2 medical colleges, 13 law colleges and other institutes. To name a few: - Appa Institute of Engineering & Technology - PDA College of Engineering - Kalaburgi University, Kalaburgi - Govt Polytechnic - Govt. College Of Teacher Education,	• There will be disruption to the movement of vehicles and students / Teachers during construction phase. • Increase in Dust levels due to earth work or replacement of pipe. • There will be noise pollution hampering classes and lectures during construction phase. • Landscape degradation and uneven dug surface will have possibility of accidents. • Disruption of water supply to the consumers during implementation
2	Laying of pipeline near Hospitals and Medical Centres	The city has a number of Government and Private Hospitals recognised by government for Medical reimbursement. To name a few: - Basaveshwar hospital - Medicare multi-speciality hospital - S.B. Medical Centre - Mahadevappa Rampure Medical College(MRMC) - KBN Medical College	• Noise pollution during construction phase. • The medical facility will face problems in terms of transportation of patients, visits by patient party and handling emergencies during construction phase. • Disruption of water supply to hospitals during implementation
3	Laying of pipeline in Markets and Commercial Areas	Kalaburgi is primarily a regional market and service centre. Textile, oil & Dal industries are major industries of city. It is known for cement industry & stone polishing industry. Some of the market areas are Kanni	• Since there will be disruption to the movement of vehicles and pedestrian during construction phase. • There is a possibility of commercial activities being affected due to non-commutable

Sl. No	Activity	Identified Locations which will be affected	Nature of Impact
		market at Godutainagar, Mijgori market at Darga road, Big Bazar at MG road etc. Supermarkets such as Kirana bazar & Janata bazar at Bhavikatti road.	road conditions during construction phase. • Vendors may have to shift locations which might affect their regular business during construction phase. • Loss of livelihood and sales during construction phase.
4	Laying of pipeline through Intersections and Main City Roads, Narrow Lanes, Densely Populated areas	Kalaburgi is located in North East part of Karnataka. The city is well connected by roads and railways to Mumbai, Bangalore, New Delhi, and Hyderabad and also has National Highways. It has 5.5km long four-landed ring road.	• There will be disruption to the movement of vehicles and pedestrian during construction phase. • Traffic congestions on major roads will lead to delay in commuting for regular commuters during construction phase. • The problem will be pronounced if there are no route diversion possibilities.
5	Laying of pipeline in Tourist attractions and Historic Places	A wide variety of historical sites, temples and pilgrims exist in and around the city, most notably the Kalaburgi Fort, Jama Masjid, Khwaja Bande Nawaz Dargah (pilgrim), Shri Sharana Basaveshwar Temple, Sannathi (Buddhist site), Kesaratagi Garden, Narayanapura Dam.	• Tourism will be affected temporarily because of disruptions in connectivity and commuting during construction phase.

7.4 Conclusion

There are no significant adverse impacts by the project. Focus Group Discussions have been done in the project area to discuss the project details and identified impacts with stake holders. The proposed project involve very minimal (only 4 acres) land acquisition; do not cause any impact on community structures except for a few temporary inconveniences to the public during construction phase. Implementation of the suggested mitigation measures during different phases of the project will prevent or minimize adverse impacts. Therefore, no further studies are required and no rehabilitation plan is necessary.

Chapter 8: ENVIRONMENTAL MANAGEMENT PLAN

8.1 Introduction

The Environmental Management Plan details out impacts due to project activities at different phases of the project. Both EMP also details the mitigation/ enhancement measures which will be required over and above the project design. Implementation schedule for each of the suggested measures along with the primary responsibility for implementation is also incorporated in the EMP. This chapter also includes the Monitoring Plan as well as the Institutional Arrangement in implementing EMP.

8.2 Environmental Mitigation Measures

The mitigation measures in the environmental domain are presented as below:

AIR

- Dust suppression should be instituted, using water tankers mounted on tractors and sprinklers for dust control.
- Vehicles transporting construction materials prone to fugitive dust emissions should be covered.
- Trucks carrying sand should have tarpaulin sheets to cover bed and sides of trucks.
- Idling of delivery trucks or other equipment should not be permitted during loading and unloading
- All construction vehicles should comply with emission standards and maintained.
- Dust suppression measures in addition to the traffic management should be followed on roads used for transportation o material.

LAND

The solid waste generated during the construction phase is usually Excavated earth material and Construction debris. Excavated earth material should be reused for backfilling between foundations; to fill up the low-lying areas with consultation local municipal body and whereas, topsoil will be reused for Landscaping/Greenbelt development purpose.

WATER

- Construction equipment requiring minimum water for cooling and operation for optimum effectiveness should be chosen.
- Appropriate sanitation facilities, septic tank and soak pits should be provided for the workers onsite and offsite to reduce impact on water resources
- Discharge of construction wastes to surface water bodies or ground water should not be allowed during construction.
- During Construction period in rainy season, the water quality is likely to be affected due to the construction work and loosening of topsoil. This is likely to increase the suspended solids in the run – off during heavy precipitation. In order to reduce the impact on water quality, temporary sedimentation tanks will be constructed for the settlement of the suspended matter. However, it is envisaged that the monsoon period will be avoided for cutting and filling of earthwork.

NOISE

- Restriction on the usage of noise generating activities, and traffic movement in the Residential areas during night to avoid high noise avoiding sleep disturbance to residents during the construction phase.
- Generator sets should be provided with noise shields around them.
- Vehicles used for transportation of construction material should be well maintained.
- The workers operating high noise machinery or operating near it should be provided with adequate personal protective equipment including ear plugs.

8.3 Environmental Management Plan

The Environmental management Plan provides the road map for managing adverse environmental impacts arising from the implementation of such a project. The detailed plan has been provided in the following table.

Table 8.1: Environmental Management Plan (EMP)

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
Design Phase					
1	Pre construction activities including	• The pre-construction phase will give rise to fugitive dusts and frequent exhaust emissions into the atmosphere as equipment is delivered to the pumping stations/ water treatment plant/ overhead tanks and along major roads and streets where the proposed new network will pass through.	➢ Air pollution control measure like water sprinkling ➢ Limit hours of operation in populated areas ➢ Use of barriers to reduce exposure ➢ Plants, machinery and equipment may be handled so as to minimize generation of dust. ➢ Low emission construction equipment generator sets and pollution free certified vehicles may be used	Operator	SPV
Construction/Transition Phase					
1.	Construction of New Intake structure at Harasur Village	• Increase water pollution during construction • Deterioration of water quality	➢ Use of barriers to reduce water pollution ➢ Plants, machinery and equipment may be handled so as to minimize generation of dust. ➢ Dump solid waste in specified place to minimize contamination of water ➢ Ensure implementation of Waste Management Plan) for environmentally sound management of waste ➢ Ensure implementation of Project Planning and Design Plan before planning of activity ➢ Site preparation should be as per Site Preparation Plan for site clearance	Operator	Operator and ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
2.	Laying of Raw Water pumping main of 1200 mm dia. for a length of 13.0 km.	• Increase in Dust levels due to construction • Soil pollution or soil erosion • Increase noise levels due to excavation • Landscape degradation • Pressure on local resources • Loss of fertile top soil of the agriculture land along the alignment • Accumulation of Excess Earth • Damage to standing crops during break down of the transmission main or maintenance operations • Emissions from use of construction equipments/DG sets for construction activities • Temporary Disruption of natural drainage pattern	- Air pollution control measure like water sprinkling - Use of barriers to reduce exposure - Plants, machinery and equipment may be handled so as to minimize generation of dust. - Low emission construction equipment generator sets and pollution free certified vehicles may be used - Quarterly Yearly Air/Noise quality monitoring may be conducted at construction sites. ➢ Dump solid waste in specified place to minimize contamination of water ➢ Ensure implementation of Waste Management Plan for environmentally sound management ➢ Ensure implementation of Construction Plants & Equipments Management Plan for construction equipments ➢ Ensure implementation of Water bodies Management Plan during laying of pipeline near to water bodies ➢ Midterm environment audit should be carried out for performance of ESMP implementation	Contractor	Operator and ULB/SPV
3.	Construction of WTPs	• Increase dust or other gaseous (SO_2 & NO_2) levels due to the movement of construction vehicles and equipments • Accumulation of construction waste • Accumulation of earth material	➢ Air pollution control measure like water sprinkling ➢ Use of barriers to reduce exposure ➢ Plants, machinery and equipment may be handled so as to minimize generation of dust. ➢ Low emission construction equipment generator sets and pollution free certified vehicles may be used ➢ Quarterly Yearly Air/Noise quality monitoring may be	Contractor	Operator and ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
4.	Construction of New Clear Water Pumping station	• Increase dust or other gaseous (SO_2 & NO_2) levels due to the movement of construction vehicles and equipments • Increase health risk in nearby areas • Increase health risk in construction Labour • Accumulation of construction waste	conducted at construction sites. ➢ Dump solid waste in specified place to minimize contamination of water ➢ Discharge wastewater at authorized locations and after treatment ➢ Ensure implementation of Waste Management Plan for environmentally sound management of waste ➢ Measures to prevent accidental spills ➢ Ensure implementation of Construction Plants & Equipments Management Plan for management of construction equipments ➢ Ensure implementation of water for construction plan for water management ➢ Alternate material or material should be reused for construction of WTP to reduce construction cost ➢ Using low noise generating equipment such as pneumatic hammers / drills, provision of encasings around generators and avoiding construction during nights	Contractor	Operator and ULB/SPV
5.	Rehabilitation of existing WTPs and Clear water pumping Stations	• No major impact anticipated	➢ Ensure implementation of Waste Management Plan for environmentally sound management of waste	Contractor	Operator and ULB/SPV
6.	Laying of Clear Water Transmission System (42 km)	• Pressure on local resources • Increase in Dust Levels to due to earth work and other construction activities • Accumulation of Excess Earth	➢ Air pollution control measure like water sprinkling ➢ Plants, machinery and equipment may be handled so as to minimize generation of dust. ➢ Low emission construction equipment generator sets and pollution free certified vehicles may be used	Contractor	Operator and ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
		• Damage to standing crops during break down of the transmission main or maintenance operations	➢ Quarterly Yearly Air/Noise quality monitoring may be conducted at construction sites. ➢ Dump solid waste in specified place to minimize contamination of water ➢ Ensure implementation of Waste Management Plan for environmentally sound management ➢ Ensure implementation of Construction Plants & Equipments Management Plan (ECoP 9.0, for construction equipments ➢ Ensure implementation of Water bodies Management Plan (ECoP 7.0,) during laying of pipeline near to water bodies ➢ Midterm environment audit should be carried out for performance of ESMP implementation ➢ Refilling and replacement the excavated topsoil back in the same field and provision of soil barriers with the excavated earth to avoid spillage on the adjoining land.		
7.	Dismantling of existing Elevated Service Reservoir	• Increase in Dust Level due to dismantling • Accumulation of demolition waste	➢ Use of barriers to reduce exposure ➢ Low emission construction equipment generator sets and pollution free certified vehicles may be used ➢ Dump solid waste in specified place to minimize contamination of water ➢ Ensure implementation of Waste Management Plan for environmentally sound management of waste ➢ Ensure implementation of Construction Plants & Equipments Management Plan for management of construction equipments	Contractor	Operator and ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
			➢ Provision of sprinkling of water & scaffolding. Sprinkling method is used for refilling of trenches so that shrinking should be minimized ➢ There should be proper covering of excavated or dismantled material while transportation of these waste materials		
8.	Construction of new overhead and ground reservoirs	• Increase dust levels due to construction of reservoirs • Soil pollution due to leakages from vehicles and equipments • Accumulation of earth material • Accumulation of construction waste	➢ Air pollution control measure ➢ Limit hours of operation in populated areas ➢ Use of barriers to reduce exposure ➢ Low emission construction equipment generator sets and pollution free certified vehicles may be used ➢ Half Yearly Air/Noise quality monitoring may be conducted at construction sites. ➢ Dump solid waste in specified place to minimize contamination of water ➢ Ensure implementation of Waste Management Plan for environmentally sound management of waste ➢ Ensure implementation of Construction Plants & Equipments Management Plan for management of construction equipments ➢ Ensure implementation of Project Planning and Design Plan before planning of activity ➢ Site preparation should be as per Site Preparation Plan for site clearance ➢ Alternate material or material should be reused for construction of WTP to reduce construction cost ➢ Ensure implementation of Construction Camp Plan for labour camps	Contractor	Operator and ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
9.	Laying of about 970 km of additional distribution line	• Increase dust levels due to excavation of earth. • Water pollution due to leakages or damages of existing distribution lines • Soil pollution due to leakages from vehicles and equipments • Soil erosion and accumulation of excavated materials • Accumulation of construction waste • Impact on city drainage system	➢ Use of barriers to reduce exposure ➢ Refilling and replacement the excavated topsoil back in the same field and provision of soil barriers with the excavated earth to avoid spillage on the adjoining land. ➢ Ensure implementation of Waste Management Plan for environmentally sound management of waste ➢ Ensure implementation of Construction Plants & Equipments Management Plan for management of construction equipments. ➢ Ensure implementation of Water bodies Management Plan during laying of pipeline near to water bodies ➢ Ensure implementation of Cultural Properties Plan if any cultural property is being impacted due to interventions ➢ Ensure implementation of water for construction plan for water management ➢ Preparation of traffic diversion plans and prior intimation of the construction schedule to the people in the areas of construction ➢ Preparation of utility shifting plans, procuring appropriate approvals / permissions in advance and completion of activities in the earliest possible time ➢ Using low noise generating equipment such as pneumatic hammers / drills, provision of encasings around generators and avoiding construction during nights	Contractor	Operator and ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
			➢ Prior Consultation should be carried out for implementation or laying of pipe line in private land and habitat		
Operation Phase					
10.	24X7 Continuous Supply of Water During Operation	• Operation Failure of Transmission Lines- due to mechanical failure or third party interference. • Bursting or breakage of distribution mains- as a result of increased pressure or aggressiveness of pumping. • Power outages, which may disrupt water supply. • Air quality impacts that would arise during the operation of the pumping stations would include emissions from generators • Generation of Additional Quantity of Wastewater from the Zones leading to contamination of surface / sub-surface sources • Flooding of Low Lying Areas due to overflow of storm water drains • Deficiencies in Storage and Handling of Chlorine at the water treatment plant	• Before implementation of project an water connections census should taken to reduce extra use of water • Illegal water tapping source should be identified • Ground water should be kept a backup supply source in system failure • Ensure Indian Drinking Water Standards (BIS:10500) • Alternate supply arrangements such as supply through tankers should be provided if Leakages, Contamination and shortage of Water • Check leakages and prevent • Cross contamination of water should be avoided • Plan and cost for adequate centralised / decentralized / individual sanitation facilities in the city • Plan and cost for augmentation and strengthening the storm water drainage network in the city • Ensure environmentally sound and safe storage and containment of oil and diesel for DG Sets • Ensure proper/efficient treatment of sludge before disposal. • Ensure routine maintenance practices; • Wastes should be collected, stored and managed on-site. Measures to ensure that wastes do not enter municipal water courses way must be ensured at all	Operator/ ULB	ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
		• Occurrence of chlorine intoxication if water is over chlorinated during treatment • Generation of sludge from WTP Leading to contamination of surface and sub surface sources • Generation of Waste Water	times during operations and maintenance in WTPs/Pumping stations. • Procure diesel generators with soundproofing. • Ensure environmentally sound and safe storage and containment of oil and diesel • Ensure implementation of Water bodies Management Plan (ECoP 7.0, during laying of pipeline near to water bodies • Ensure implementation of water quality Management (EcoP 8.0,) for better water quality • Proper sludge management has to be prepared and followed by SPV / Operator • The untapped waste water component of 17% will be undertaken under the UGD program in a long term strategy and the cleaning of the existing sewerage network on continuous basis for smooth management.		

8.4 Environmental Monitoring Plan

The monitoring programme is devised to ensure that the envisaged purpose of the project is achieved and results in the desired benefit to the target population. To ensure the effective implementation of the ESMP, it is essential that an effective monitoring programme be designed and carried out. Broad objectives of the monitoring programme are:

- To evaluate the performance of mitigation measures proposed in the ESMP
- To suggest improvements in the management plans, if required
- To satisfy the statutory and community obligations
- To provide feedback on adequacy of Environmental Impact Assessment

8.4.1 Monitoring Indicators

The monitoring programme contains monitoring plan for all performance indicators, reporting formats and necessary budgetary provisions. Physical, biological and environmental management components identified as of particular significance in affecting the environment at critical locations have been suggested as Performance Indicators (PIs). The Performance Indicators shall be evaluated under three heads as:

- Environmental condition indicators to determine efficacy of environmental management measures in control of air, noise, water and soil pollution;
- Environmental management indicators to determine compliance with the suggested environmental management measures.
- Operational performance indicators have also been devised to determine efficacy and utility of the mitigation/ enhancement designs proposed.

Table 8.2: Environmental Monitoring Indicators

S. No.	Indicator	Details	Stage	Responsibility
A.	**Environmental Condition Indicators and Monitoring Plan**			
1.	Air Quality	The parameters to be monitored, frequency and duration of monitoring as well as the locations to be monitored will be as per the Monitoring Plan prepared (Refer Table 7.3)	Construction	Contractor under the monitoring of PIU
2	Noise Levels		Construction	Contractor under the monitoring of PIU
3	Water Quality		Pre-construction, Construction and Operation	Contractor under the monitoring of PIU
B.	**Environmental Management Indicators and Monitoring Plan**			
1.	Construction Camps	Location of construction camps have to be identified and parameters indicative of environment. In the area has to be reported	Pre-construction	PIU
2.	Tree Cutting (if any)	Progress of tree removal marked for cutting is to be reported	Pre-construction	Forest Department to PIU
3.	Soil Erosion	Visual Monitoring and operation inspection	Construction &Operation	PIU

For each of the environmental condition indicator, the monitoring plan specifies the parameters to be monitored; location of the monitoring sites; frequency and duration of monitoring. The monitoring plan also specifies the applicable standards, implementation and supervising responsibilities. The monitoring plan for environmental condition indicators of the project in construction and operation stages is presented in **Table 8.3.**

Table 8.3: Environmental Monitoring Plan

Attribute	Project Stage	Parameters	Special Guidance	Standards	Frequency	Duration	Location	Responsibility
Air Quality	Construction	All parameters as per National Ambient Air Quality Standards, 2009 like PM_{10}, $PM_{2.5,}$ SOx, NOx	High volume sampler to be located 50m from the plant in the Downwind direction. Use method specified by CPCB	Air (prevention and Control of Pollution) Rules, 2009	Quarterly	24 hours	Near the Construction area Sensitive locations like Schools, Hospitals, Water bodies, etc	Operator
Surface Water	Construction	All Parameters as per drinking water standards (BIS:10500) and WHO guidelines	Grab sample collected from source and Analyze as per standards	National Drinking Water Standards (IS:10500} and Inland surface water (IS:2296), 1982	Daily	As per the contract	Surface and Ground Water Sources	Contractor
	Operation							ULB
Noise	Construction	Noise level on Db (A) scale	Equivalent noise levels using a meter	Noise Rule, 2000	Quarterly in a year	Leq in dB (A) fir day and night time	Construction site, Hot mix or batching plant	Contractor

Monitoring and evaluation is primarily required to ensure proper and timely implementation of mitigation measures identified in the planning stage, based on the ESMP. Monitoring at regular intervals during implementation and for a specified period in the post implementation stages is necessary to identify and implement any change / improvement needed in the execution of the activity or in the mitigation measures.

A monitoring and evaluation cell to be created at State level (KUIDFC) under the supervision of an official familiar with environmental issues of the proposed scheme. In specific situations, one may consider appointing external agencies to carry out the monitoring and evaluation activities and report to the supervising official (EE/AE of KUIDFC/Engineers of ULB). The indicators to be monitored can be framed from the ESMP taking into consideration the activities involved.

The feedback received from monitoring and evaluation cell will be discussed with the implementing officials and the contractor and corrective actions will be taken, where necessary. The ESMP requires detailed supervision, monitoring and evaluation of the impact of the project on the environment.

8.5 Capacity Building and Training

The KUIDFC/ULB currently has limited capacity for environmental management. The training and capacity building program developed for the project aims at building environmental awareness and environmental management capacity in the project administration structure as well as in the intended target communities.

The training programs for the staff in the project agencies at various levels as well as for the communities will be organized. Both KUIDFC and ULB to work in the project will require capacity building for survey, design, preparation of designs, drawings and cost estimates for the water supply and sanitation schemes by using computer-oriented tools.

8.5.1 Objectives

The capacity building for environment management shall be integrated with overall capacity building component of the project with the following objectives:

- To build and strengthen the capability of urban water and sanitation agency/institutions (KUIDFC and ULB) and other partners (NGOs, Contractors and Supporting Organisations) to integrate sound environmental management in water and sanitation services.
- To orient the service delivery of staff and Welfare association representatives to the requirements of the projects' Environmental Management Framework.
- Systematic capacity building initiatives shall be introduced only after the completion of training needs assessment.
- The training shall be of plummet mode. All the trained staff and other shall in turn conduct further trainings at State, District and community levels for improved service delivery.

8.5.2 Training Approach

A specific training program for the key officials of the project, focused on the procedural and technical aspects of environmental assessment and management shall be developed. This training would be mandatory for the ULB Staff and Contractors personnel. The project shall fulfil (a) short-term training on ESMP application in planning and implementing of schemes under the proposed project to all stakeholders concerned including the potential beneficiary communities (b) water quality monitoring and conservation training to Department of urban Development and regulating authorities (ULB). The training shall involve initial orientation, main training program and livener training programs. The main and livener training programs shall be for duration of 2-3 days each, where as the initial orientation workshop shall be of duration of one day.

8.5.3 Training Resources

Some specialized institutions identified for training are:

- Karnataka Urban Water Supply & Drainage Board
- Department of Environment and Ecology, Karnataka
- Environment Management and Policy Research Institute, Bangalore
- Central Ground Water Board
- Karnataka Pollution Control Board

8.5.4 Training Programmes

The various training programmes along with the details are presented in the **Table 8.4** below.

Table 8.4: Training Programs

Sl.	Trainings	Purpose of the Training	Participants	Schedule	Course content
1.	Introduction to Environmental Management in Proposed Project including ESMP	➢ Procedural & technical aspects of Environmental Assessment. ➢ To equip with knowledge and skills necessary for undertaking environmental appraisal as per the requirements of the ESMP. ➢ To undertake periodic supervision of environmental performance of schemes ➢ To prepare for planning and monitoring implementation of environmental mitigation measures identified through the appraisal process. ➢ To equip with skills necessary for water quality testing using the field testing kits under the Community	Personnel from KUIDFC, ULB, Operator	➢ Orientation Workshop – 1 day ➢ Detail training with regards to the environmental and social management plan-2	Environment aspects pertaining to sustainability of water sources, water quality, protection of sources and Environmental appraisal. Water quality monitoring, prevention of pollution & surveillance.
2.	Environmental Awareness and Sensitization	To build awareness on safe drinking water, water conservation, environmental sanitation and personal hygiene.	Personnel of ULB, Welfare Associations and NGOs	One day workshop at the community level.	-
3.	Orienting for planning, design and implementation of project interventions including environmental issues / safeguard	➢ To create awareness among the implementation agencies as well as the monitoring units so as to have in depth understanding of the interventions being implemented under the proposed project. ➢ The orientation shall educate the agencies with regards to the environmental issues / safeguard to be taken into consideration during the implementation of the proposed interventions.	KUIDFC, ULB, Operator, Contractor	3 day workshop – First day induction program, and next 2 days in detail training with regards to the environmental issues/safeguards.	
4.	Orientation for Water Quality monitoring	To build awareness on water quality monitoring amongst implementation agencies.	ULB, Operator staff, Lab staff, Community, NGOs	One day training at the community level.	

8.6 Cost Estimates for EMP

The environmental budget is estimated for the various environmental management measures in the ESMP, summarized in Table 8.5.

Table 8.5: Cost Estimates for EMP

Component	Stage	Item	Sampling Locations	Frequency	Unit	Quantity	Unit Cost (INR)/sample	Total Cost (INR)
Air Mitigation Cost								
Air	Construction Phase	Dust Management with sprinkling of Water	Laying/replacement of mains and distribution pipeline	One time	Km	823	11,000.00	9,053,000.00
	Construction Phase	Dust Management with sprinkling of Water	Dismantling of existing Elevated Service Reservoir	One time	Number	9	11,000.00	99,000.00
Safety hazards to workers and residents	Construction Phase	Putting fences or other barricades to demarcate the area	At construction site during pipe laying Cost of barricading/ wire 100 kgs @Rs 600 per Kg = Rs 60,000/- Labour required for this work 4 nos @ 200/- = Rs 800/- per day=8000 (the same material will be reused)	Regular	KM	10	68,000.00	680,000.00
Monitoring Cost								
Air	Construction Phase	Monitoring at construction sites	Laying/replacement of mains (4 Nos.), Dismantling of existing reservoirs (9 Nos.), proposed WTP (2 Nos.) and proposed clear water reservoirs (48 Nos.)	Quarterly	Number (63)	252	7,500.00	1,890,000.00
	Operation	(if DG sets use as power backup)	WTP/Pumping Station	Quarterly	Number (5)	20	4,000.00	80,000.00

Component	Stage	Item	Sampling Locations	Frequency	Unit	Quantity	Unit Cost (INR)/sample	Total Cost (INR)
Water (Surface and Ground)	Construction Phase	From the Ground Water/Surface water bodies of the Construction Site	From Intake point (2 Nos.), WTP (2 Nos.) and Sensitive Locations (8) Nos.	Quarterly	Number (12)	48	6,000.00	288,000.00
	Operation	At least one sample at each stage of supply consumer point and public tap	From Intake point (2 Nos.), WTP (2 Nos.), Public Tap (10 Nos.), and Consumer point (55 Nos.@ 1sample from each municipal ward)	Daily	Number (69)	69	6,000.00	414,000.00
Noise	Construction Phase	Construction Site	Laying/replacement of mains (4 Nos.), Dismantling of existing reservoirs (9 Nos.), proposed WTP (2 Nos.) and proposed clear water reservoirs (48 Nos.)	Quarterly	Number (63)	252	1,000.00	252,000.00
	Operation	(if DG sets use as power backup)	WTP/Pumping Station	Quarterly	Number (5)	20	1,000.00	20,000.00
Sub-Total							**47,500.00**	**12,776,000.00**
Environmental Audit						2	500,000.00	1,000,000.00
Preparation of specific environment related community awareness materials						LS	200,000.00	200,000.00
Trainings @2 Training/year						6	100,000.00	600,000.00
Internal Supervision/Year						7	200,000.00	1,400,000.00
Sub-Total								**3,200,000.00**
Contingencies@5%								798,800.00
Grand Total								**16,774,800.00**

Chapter 9: SOCIAL MITIGATION AND MANAGEMENT MEASURES

9.1 Resettlement and Rehabilitation issues

This chapter that consists resettlement planning and entitlement provisions, has been worked out on the basis of assessment of the current conditions in all the project states. This SMF outlines the principles and approaches to be followed in minimising and mitigating the adverse social and economic impacts due to the project. Resettlement Policy and Framework (RPF) presented as standalone document that presents approach and principles in detail in addressing the land acquisition, resettlement and rehabilitation.

The Resettlement Plan of SMF spells out the actions / tasks required to involve the community, and reduce adverse impacts on PAPs/PAFs at various stages of project along with the agency (agencies) responsible for these actions / tasks and their time frame.

9.2 Social Mitigation Plan

Social impact assessment is not just to forecast impacts - it should identify means to mitigate adverse impacts. This includes the possibility of avoiding the impact by not considering the project at all, if the felt impact is likely to be too severe. Alternately if the predicted impact is minimal and can be managed, mitigation measures must be put in place. This could be in the form of:

1. Modification of the specific event in the project;
2. Operation and redesign of the project or policy;
3. Compensation for the impact by providing substitute facilities, resources and opportunities.

Ideally, mitigation measures should be built into the selected alternative, but it is appropriate to identify mitigation measures even if they are not immediately adopted or if they would be the responsibility of another person or government unit. Ideally effort should be to avoid all adverse impacts. The Social management plan presents the possible social impacts arising from the commissioning of such a project along with the mitigation measures and institutional responsibility in accomplishing it.

The standard mitigation measures have been presented below:

Air, noise and Water Pollution	Impact on human health	• Enclosures or hoardings to be put up at the proposed sites • Use of Water sprinklers • Generally, construction shall be continued only after school hours Necessary use of on site technologies to reduce levels

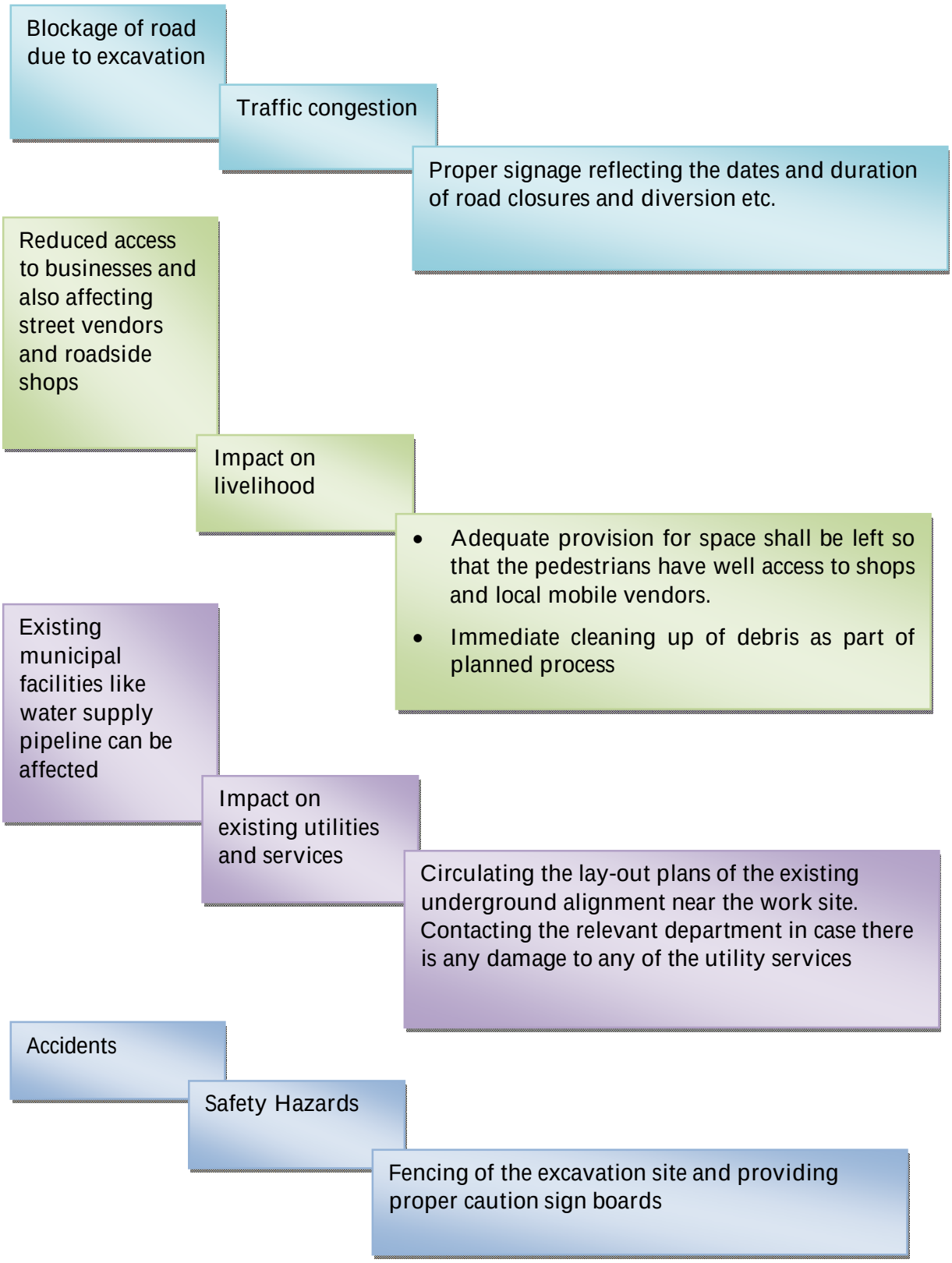

Blockage of road due to excavation
Traffic congestion
Proper signage reflecting the dates and duration of road closures and diversion etc.
Reduced access to businesses and also affecting street vendors and roadside shops
Impact on livelihood
Adequate provision for space shall be left so that the pedestrians have well access to shops and local mobile vendors.
Immediate cleaning up of debris as part of planned process
Existing municipal facilities like water supply pipeline can be affected
Impact on existing utilities and services
Circulating the lay-out plans of the existing underground alignment near the work site. Contacting the relevant department in case there is any damage to any of the utility services
Accidents
Safety Hazards
Fencing of the excavation site and providing proper caution sign boards

Table 9.1: Social Mitigation Plan (SMP)

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
Design Phase					
1.	Awareness generation and people's confidence building Seeking participation of stakeholders Designing the project keeping in view the social, environmental and technical features	• People apprehension of the project • People's fear on loss of land and property • People's threat of inconvenience	➢ Meetings with stakeholders ➢ Loud speaker announcements on upcoming project seeking participation of people ➢ Insertions in cable TV on upcoming project and its benefits ➢ Hoardings indicating the temporary nature of inconvenience ➢ Design of socially acceptable, environmentally sensitive and technically feasible project engaging a team of consultants	ULB	ULB
2.	Land Acquisition	•	➢		
Construction /Transition Phase					
3.	Replacement of existing PSC pipe and laying of new pipe	• Disruption of water supply to the consumers during implementation • Water conflicts due to shortage of water • Unhygienic condition in construction camp	➢ Alternate supply arrangements such as supply through tankers should be provided. ➢ Awareness generation indicting temporary nature of disruption – targeting awareness more toward women who are the	Contractor & Operator	ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
		• Increase Health problems among labourers and Populace in general.	household water managers. ➢ Install speed breaker and sign ages near settlements ➢ Prepare traffic management plan. and prior intimation of the construction schedule to the people in the areas of construction. ➢ crossings/ bridges to avoid accidents and other construction hazards ➢ Provide safety measures (mask, gloves, hat etc.) to minimize exposure ➢ Provide sirens in vehicles to avoid any collision with human/animals ➢ Child labour must be strictly prohibited ➢ Provision of temporary ➢ Ensure implementation of Construction Camp Plan (ECOP) for labour camps ➢ Ensure implementation of Health & Safety Management Plan (ECOP) for public and workers safety		
4.	Construction of WTP	• Noise pollution • Increase health risk in nearby areas • Increase health risk in construction Labour	• Limit hours of operation in populated areas • Use of barriers to reduce noise pollution • Plants, machinery and equipment may be handled in such a way so as to minimize generation of dust. • Dump solid waste in specified place to minimize contamination of water • Organize awareness programs on environmental resource management • Child labour must be strictly prohibited • Ensure implementation of Construction Camp Plan (ECOP,) for labour camps • Ensure implementation of Health & Safety Management Plan (ECOP 10,) for public and workers safety	Contractor & Operator	ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
			• Preparation of traffic diversion plans and prior intimation of the construction schedule to the people in the areas of construction • Provision of temporary crossings/ bridges to avoid accidents and other construction hazards • Using low noise generating equipment such as pneumatic hammers / drills, provision of encasings around generators and avoiding construction during nights		
5.	Rehabilitation of existing WTPs	• Noise pollution • Increase health risk in nearby areas • Occupational Hazard leading to Health risk in construction Labour	• Ensure implementation of Health & Safety Management Plan (ECOP) for public and workers safety.	Contractor & Operator	ULB/SPV
6.	Dismantling of existing Elevated Service Reservoir	• Accumulation of demolition waste • Increase health risk in Construction labour • Temporary disruption of water • Increase noise levels due to demolition and movement of vehicles • Temporary disruption of traffic due to movement of vehicles	• Limit hours of operation in populated areas • Prepare traffic management plan • Provide safety measures (mask, gloves, hat etc.) to minimize exposure • Child labour must be strictly prohibited • Ensure implementation of Health & Safety Management Plan (ECOP) for public and workers safety. • Ensure implementation of Cultural Properties Plan (ECOP,) if any cultural property is being impacted due to interventions • Preparation of traffic diversion plans and prior intimation of the construction schedule to the people in the areas of construction • First aid facilities to be provided at the construction camps. Any case of disease outbreak may be immediately	Contractor & Operator	ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
			subjected to medical treatment. Mosquito repellent to be provided to the labours such as odomas, coil and sprays. The camps to maintain cleanliness and hygienic condition. • Provision of scaffolding. • There should be proper covering of excavated or dismantled material while transportation of these waste materials		
7.	Construction of new overhead reservoirs	• Increase noise levels due to movement of heavy vehicles and construction equipment • Disruption of traffic due to movement of vehicles and equipments • Increase health risk in nearby area • Increase occupational health risk of construction labourers • Increase sanitation problems due to construction camp • Accumulation of construction waste	• Limit hours of operation in populated areas • Cross contamination of water should be avoided • Prepare traffic management plan • Preparation of traffic diversion plans and prior intimation of the construction schedule to the people in the areas of construction • Provide safety measures (mask, gloves, hat etc.) to minimize exposure • Organize awareness programs on environmental resource management • Child labour must be strictly prohibited • Ensure implementation of Health & Safety Management Plan for public and workers safety. • Ensure implementation of Cultural Properties Plan (ECOP) if any cultural property is being impacted due to interventions • Ensure implementation of Construction Camp Plan (ECOP) for labour camps	Contractor & Operator	ULB/SPV
8.	Laying of pipeline and construction of ESR in sensitive	• Increase noise levels due to movement of heavy vehicles and construction equipment	• Priority work planning in sensitive location • Limit hours of operation in sensitive zones during peak service hours.	Contractor & Operator	ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
	locations like schools, hospitals, religious, cultural and tourist locations	• There will be disruption to the movement of vehicles • Increase in Dust levels due to earth work or replacement of pipe • There will be noise pollution hampering classes and lectures. • Landscape degradation and uneven dug surface will have possibility of accidents. • Disruption of water supply to the consumers during implementation	• Hospitals need special planning for emergency management • Laying of pipeline in alternate street, if possible, to avoid traffic disruptions and commuting problems • Install speed breaker and signages near settlements • Hoardings and signboards intimating the temporary nature of inconvenience • Construction activities to be scheduled carefully to minimize the impact of noise from construction machinery during school hours. • Barricades, temporary noise control measures and dust suppression measures through watering		
9.	Laying of pipeline and construction of ESR in commercial areas	• Loss of livelihood for vendors • Limited access to small shop and low sales	• Adequate provision for space shall be left so that the pedestrians have access to shops and local service providers • Immediate cleaning up of debris as part of planned process • Alternative livelihood planning to compensate or the temporary loss of livelihood	Contractor & Operator	ULB/SPV
10.	Construction of any nature and in any location	• Safety hazards and accidents • Occupational Hazards in all construction sites including health impacts due to absence of proper housing and sanitation facilities in labour camps	• Fencing of the excavation site and providing proper caution sign boards • Protective measures to workers as per occupational and safety norms • Develop women sensitive work conditions with toilets blocks catering to women's needs • Include creches in worksites. • Develop and implement site-specific Health and Safety (H&S) Plan which will include measures such as: • *excluding public from the*	Contractor & Operator	ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
			site; • *ensuring all workers are provided with and use Personal Protective Equipment (PPE);* • *health and safety Training for all site personnel;* • *documented procedures to be followed for all site activities; and* • *documentation of work-related accidents;* • *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; • Training of workers on safety and health and set down rules and regulations of all new workers at the site, personal protective protection and preventing injuring to fellow workers. • 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		

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
			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		
11.	Focus on cultural properties	• Access to any of the cultural properties is severed during construction;	• Immediately after completion of construction, the Contractor will affect clearance of the precincts of cultural properties. • Access needs to be restored at the Contractor's cost.		
Operations/Sustaining Phase					
12.	24X7 Continuous Supply of Water During Operation	• Disruption in water supply leading to inadequacy • Generation of Additional Quantity of Wastewater from the Zones leading to contamination of surface / sub-surface sources • Flooding of Low Lying Areas due to overflow of storm water drains • Occurrence of chlorine intoxication if water is over chlorinated during treatment	• Ensure alternate drinking water supply through tankers. In case of Contamination and/or shortage of Water • Involve ward level women's groups like SHGs and Neighborhood Groups in monitoring. • Measures for water removal though pumping in case of flooding • Ensure implementation of Health & Safety Management Plan (ECOP for public and workers safety. • Ensure implementation of water quality Management (Eco for better water quality • Create awareness on precautions/preventive measures to be taken up in case of over chlorination.	Operator	ULB/SPV

Table 9.2: Entitlement Matrix

Sr. No.	Impact Category	Unit of Entitlement	Details of Entitlements	Remarks
Loss of Assets - Titleholders				
1	Loss of private land	Land owner(s) Individual / Household	• As per provisions of RFCTLARR Act, 2013; or direct purchase. • Amount equivalent to current stamp duty and registration charges on compensation amount for replacement of lost assets. • In case of land owners become marginal farmers, landless or those who are already marginal, the following entitlement shall be provided: (a) Subsistence allowance of Rs 40,000/- (b) Assistance of Rs 1,00,000/- for creating Income Generating Assets and (c) the Training Assistance	
2	Loss of structure (Residential or Commercial or Res-cum-Commercial)	Owner/Family	• Replacement cost determined on the basis of R&BD current Schedule Rates and without depreciation and other provisions prescribed in RFCTLARR Act 2013; or direct purchase • Shifting allowance as per provisions of RFCTLARR Act, 2013 • Subsistence allowance of Rs 40,000 if the structure is lost completely (RFCTLARR Act 2013) • Resettlement allowance of Rs 50,000 if the structure is lost completely (RFCTLARR Act 2013) • Additional 25% structure compensation for partially	

Sr. No.	Impact Category	Unit of Entitlement	Details of Entitlements	Remarks
			affected structures towards reconstruction of affected structures. • In case more than 25% of house is affected and unviable for retaining, full compensation will be paid. • Right to salvage materials from affected land or structure	
Loss of Assets - Non Titleholders				
3	Encroachers - Unauthorized occupation of government lands by encroachments	Affected Person (Individual/Family)	• Assistance amount equivalent for impacted structures at replacement cost determined on the basis of R&BD Schedule of Rates as on date without depreciation • Encroachers shall be given advance notice of 2 months in which to remove assets	
4	Squatters residing on public/government lands for residential or commercial or for both purposes	Affected person (Individual/Family)	• Assistance amount equivalent for impacted structures at replacement cost determined on the basis of R&BD Schedule of Rates as on date without depreciation • Shifting Allowance as per provisions under RFCTLARR Act, 2013 • Subsistence allowance of Rs 40,000 if the structure is lost completely (RFCTLARR Act 2013) • Resettlement allowance of Rs 50,000 if the structure is lost completely (RFCTLARR Act 2013) • Two months advance notice to remove assets	
Loss of livelihood – Title and Non-Titleholders				

Sr. No.	Impact Category	Unit of Entitlement	Details of Entitlements	Remarks
5	Loss of livelihood – title holders and commercial squatters	(Individual/Family)	• One time grant of Rs 25,000 (value prescribed under RFCTLARR Act 2013) • Training assistance	For commercial squatters, the eligibility will become from the date of Census survey
6	Forseeable and unforeseen impacts* likely during the construction stage	Owner, affected person	• Payment of damages if any to structures • Temporary access would be provided, where necessary.	Such as temporary impacts on structures, temporary disruption to access or passage, particularly in congested slums if the option of mobile units is not used;
7	Temporary loss of income of mobile kiosks, if any; and	Kiosk owner	Two months advance notice to vacate the area	
Vulnerable people				
8	Vulnerable persons		• Assistance to include in government welfare schemes if not included, if eligible as per Government criteria; and • One time lump sum assistance Rs 20,000. • Additional benefits to SC and ST as per the provisions of RFCTLARR Act 2013.	
9	Women		In case of extending any productive asset, joint ownership in the name of husband and wife will be offered in case of non - women headed households. While disbursing the entitlements, women will be	

Sr. No.	Impact Category	Unit of Entitlement	Details of Entitlements	Remarks
			given the first priority to receive the entitlement benefits over other entitled persons.	
10	Loss of or impact on any Common or cultural Property Resource such as shrine, temple, mosque, handpump, shed, etc.	Community, Village/ Ward	Resources such as cultural properties and community assets shall be conserved (by means of special protection, relocation, replacement, etc.) in consultation with the community.	
11	Unforeseen impacts		Any unforeseen impacts shall be documented and mitigated in accordance with the principles and objectives of the Policy	

9.3 Consultations Strategy and Participation Framework

To ensure peoples' participation in the planning phase and aiming at promotion of public understanding and fruitful solutions of developmental problems such as local needs of drinking water and problem and prospects of resettlement, various sections of project affected persons and other stakeholders will be engaged in various consultation throughout the project planning and implementation.

Public participation, consultation and information dissemination in a project begins with initial Social assessment activities during the initial phases of project preparation. Public consultation activities and information dissemination to PAPs and local authorities continues as the project preparation activities proceed in a project. Through respective local governments and civil society, PAPs are regularly provided with information on the project and the resettlement process prior to and during the project preparation and implementation stage.

The information dissemination and consultation with PAPs during project preparation should include but not limited to the following:

- project description and its likely impacts
- objective and contents of the surveys
- general provisions of compensation policy
- mechanisms and procedures for public participation and consultation
- resettlement options (reorganization on remaining land, relocation to a fully developed resettlement site, or cash compensation)
- grievance redress procedures and its effectiveness
- tentative implementation schedule
- roles and responsibilities of the sub-project proponents and local authorities
- feedback on the income generation activities and effectiveness
- feedback regarding relocation site(s)
- preferences for the mode of compensation for affected fixed assets (i.e., cash or land-for-land)

A detailed consultation and communication plan shall be developed for each sub-project as part of the RAP. This framework shall be a sub-set of the overall communication strategy of the project. Some of the methods that can be used for the purpose of communication will include provisions of information boards, pamphlets distribution, wall paintings, drum beating, organizing meetings with key informants and village committees and opinion gathering through post cards, phones and SMSes. Certain per centage of the project cost will be allocated for preparation and implementation of communication strategy.

It is good practice to document details of all public meetings held with people and local government officials with dates, location and the information provided and the major emerging issues. It is recommended that RAP and other documents include this list, as an attachment. Where public announcements are made, the details, together with a copy of the text of the announcements should be provided in the documents.

9.4 Grievance Redress Mechanism

The GRC will be constituted by the Project Authority with the aim to settle as many disputes as possible on LA and R&R through consultations and negotiations. There will be one GRC for each city. The GRC will comprise five members headed by a retired Magistrate. Other

members of the GRC will include a retired ULB Officer, Social Development Officer, representative of PAPs and ULB Chairman/ or his/her nominee (Elected Head of Corporation/ULB) of the concerned city. Grievances of PAPs in writing will be brought to GRC for redressal by the RAP implementation agency. While the GRC is in place, in general all the grievances in first go will be reviewed and attempted to be addressed by the field level officer – JE/AE/anyother designated officer. All the unresolved and major ones will only be escalated to the level of GRC. The RAP implementation agency will provide all necessary help to PAPs in presenting his/her case before the GRC. The GRC will respond to the grievance within 15 days. The GRC will normally meet once in two months but may meet more frequently, if the situation so demands. A time period of 30 days will be available for redressing the grievance of PAPs. The decision of the GRC will not be binding to PAPs. This means the decision of the GRC does not debar PAPs taking recourse to court of law, if he/she so desires. Broad functions of GRC are as under:

- Record the grievances of PAPs, categorize and prioritize them and provide solution to their grievances related to resettlement and rehabilitation assistance.
- The GRC may undertake site visit, ask for relevant information from Project Authority and other government and non-government agencies, etc in order to resolve the grievances of PAPs.
- Fix a time frame within the stipulated time period of 30 days for resolving the grievance.
- Inform PAPs through implementation agency about the status of their case and their decision to PAPs and Project Authority for compliance.

The GRC will be constituted within 3 months by an executive order from competent authority from the date of mobilization of RAP implementation agency. The RRO will persuade the matter with assistance from implementation agency in identifying the suitable persons from the nearby area for the constitution of GRC. Secretarial assistance will be provided by the PIU as and when required.

9.5 Monitoring and Evaluation (M&E) at Project and Sub-project Level

M&E would be carried out for regular assessment of both process followed and progress of the RAP implementation. The Resettlement Action Plan will contain indicators and benchmarks for achievement of the objectives under the resettlement programme. These indicators and benchmarks will be of three kinds:

i) Input indicators, indicating project inputs, expenditures, staff deployment, etc.

ii) Output indicators, indicating results in terms of numbers of affected persons compensated and resettled, training held, assistance disbursed, etc,

iii) Impact indicators, related to the longer-term effect of the project on people's lives.

The benchmarks and indicators will be limited in number, and combine quantitative and qualitative types of data. Some of these indicators may include, percentage of PAPs actually paid compensation before any loss of assets; percentage of PAPs whose incomes after resettlement are better than, or at least same as before resettlement; percentage grievances resolved; and/or percentage of cases to court. The first two types of indicators, related to process and immediate outputs and results, will be monitored to inform project management about progress and results, and to adjust the work programme where necessary if delays or problems arise. The results of this monitoring will be summarized in reports which will be submitted to the PMU/World Bank on a regular basis. Provision will be made for participatory monitoring involving the project affected persons and beneficiaries of the resettlement programme in assessing results and impacts. Depending on the need, for participatory monitoring, options like joint monitoring teams with PAPs representatives;

forming village/community teams for their own review and sharing their observations with the PIU; joint reviews of the implementation, etc will be attempted.

The internal monitoring will be carried out by the KUIDFC/PMU. The Project Authority will engage services of an external agency (third party), which will undertake independent concurrent impact evaluations at least twice during the project implementation period. Such independent evaluation will focus on assessing whether the overall objectives of the project have been met and will use the defined impact indicators as a basis for evaluation. Specifically, the evaluation will assess: (i) The level of success (including the constraints and barriers) in land acquisition programme, resettlement plan, and income recovery of the PAPs after they have been displaced from the project affected area, and, (ii) the types of complaints/ grievances and the success of the handling of grievance and public complaints towards the construction of project's infra-structures, means of redress for assets and lands and the amount of compensation, resettlement, and other forms of complaints.

Annexure I: ANALYSIS OF ALTERNATIVES (TECHNOLOGY & SITE)

Since the proposed project is effectively an on-going modernization and rehabilitation of existing urban water supply infrastructure in the city, there is a limited scope for considering alternatives to achieve intended development objectives. One alternative considered, but rejected was to create new water supply infrastructure in the targeted areas. This would lead to major social and environmental impacts considering the baseline situation in the project areas. Instead, interventions focused on rehabilitation and modernization of existing water supply infrastructure would have limited impacts only. Various alternatives to the project are discussed in the sections below.

Option 1 - Increasing water supply efficiency and sufficiency by acquiring land

A positive alternative towards achieving efficient and sustainable water supply for the current and estimated projected population would be to acquire land for the construction of new pumping stations, Water treatment plant and new pipeline distribution to support the existing ones. This will provide new areas for water optimization and enhance pumping capacity and output especially in the new receiving areas. The option will encourage excavation of trenches, lying of new pipes etc.

Constraints

- High costs required for purchase of lands
- Availability of land required for establishment of a new water supply network.
- Heavy financial requirements for building new structures; purchase of additional piping materials; excavating new trenches; purchase and installation of mechanical and electrical equipment etc.
- Amount of power and energy required to pump water from new pumping stations

Option 2 - Alternatives to pipeline routes

This option will require the acquisition of new Right –of –Ways (ROWs), whereas in the proposed project most of the ROW is in existence and will only be upgraded.

Constraints

- Most neighborhoods and communities within the project area are already built up. Creation of new ROW will require removal of existing structures and displacement of people and movable property i.e. market tables etc.

Pipe Laying Alternatives

Several alternatives to laying of pipes within the project area exist. They include:

- Excavating old pipes and installing new pipes in the old pipeline routes by trench digging
- Abandon old pipes in the existing network and install new pipes parallel to the network
- Installing new pipes in a new pipeline route by trench digging

Option 1-Excavating old pipes and installing new pipes in the old pipeline routes by trench digging

This would involve the excavation of old pipes, which pass through the old pipeline network. Kalaburgi is a city, which is currently undergoing rapid infrastructural expansion, most especially with regard to its road network. Currently, a huge percentage of the old water pipeline network sits under newly expanded avenues and roads, pursuing this project implementation option would therefore mean a pseudo-destruction of parts of newly constructed roads, and reconstructing after new pipes are laid.

Option 2- Abandon old pipes in the existing network and install new pipes in a parallel position.

A modification of *Option 1* would be to leave the existing pipeline as it is, especially networks consisting of asbestos pipes *(in order to minimize the complexity of excavation and management of disused asbestos material)*. New pipes could be laid parallel to the abandoned old network, thereby maintaining the same network channel but encouraging supply through new safer pipe-type alternatives e.g. PVC.

Option 3- Installing new pipes in a new water pipeline route by trench digging

This involves the installation of new pipes in a new pipeline route by digging trenches all along the newly proposed pipeline route. It is not necessarily the cheapest of all the options and it may have considerable short-term negative socio-economic impacts such as involuntary resettlement *(in unplanned areas)*, temporary loss of income due to lost man-hours, lack of access to business space (in cases where business premises are affected by the need to resettle). It also creates local employment opportunities, as trench digging will require the engagement of local labor.

Option 4- Horizontal/Vertical Directional drilling (trenchless pipe lying)

This option minimizes environmental disruption by installing pipes along surface bore paths. This can be achieved by exploiting new pipeline routes (expanded network) and through exploiting old pipeline routes (existing network). For instance, rather than removing or demolishing structures on the Right-of-Way, drainages, concrete walkways etc. could be drilled in order to lay new pipes. This will reduced the occurrence of compensation for displaced persons. However there is the likelihood of affecting the foundation of existing structures.

Advantages:

- Cost: Substantial cost savings are possible. However, even when trenchless methods are more expensive, such technology may be the best alternative because of other considerations discussed below.
- Environmental effects: Less soil is disturbed so impacts on adjacent organisms and water bodies can be reduced significantly.
- Disruption: Traffic delays are reduced or eliminated, as is heavy truck traffic associated with culvert excavation deep below the roadway.
- Speed of installation: Construction often takes less time, regardless of the road fill depth.
- Safety: Many safety concerns associated with steep-excavation slopes, work inside trench boxes, and worker exposure to traffic may be eliminated or reduced.
- Less engineering: Less surveying, fewer design calculations, and fewer drawings and specifications may be required.
- Fewer unknowns: Minimal ground disturbance results in fewer contingencies associated with subsurface conditions with pipe lining options

Disadvantages:

- Cost: Where placement is shallow and traffic is not a major constraint, excavation is usually more cost effective.
- Level of engineering difficulty: Specialized expertise in related technologies and the impact on subsurface site conditions is required.
- Decreased flow capacity: Practices such as lining pipes with thick structural sections reduce pipe openings, decreasing the pipe's flow capacity.

- Grade or alignment corrections: Effecting necessary changes to the existing grade and alignment are not always possible.
- Shorter design life: Rehabilitation techniques such as spot repair or grouting have a shorter design life than new pipe installation.
- Susceptible to fire damage: Forest engineers found that culverts lined with plastic or replaced with corrugated polyethylene pipe were damaged severely when subjected to wildfires. Fire caused the plastic to burn or melt from one-half to the complete culvert length. Engineers should be aware of this potential for fire damage.

Option 6 - Do Nothing

A No Project scenario was also considered but rejected, as there is a dire need to improve water supply service delivery and increase water availability to ensure minimum water requirement, as well as reform the water resources management to meet the demands of a fast growing population. This has been incorporated as its own project sub-component. Analysis of the no project versus with project scenario is presented in Table:

Analysis of No Project versus With Project Scenario

No Project Scenario	With Project Scenario
– Existing inefficient system will continue with environmental & social problems. – No new technologies use – Inefficient & unsustainable Water Resource Management – Unsafe water supply structures – Limited knowledgebase – Poor Water Quality – Unbalance water supply	– Improved, sustainable & efficient water delivery system (24x7) – Improved knowledgebase for implementing efficient water resource management system – Short term environmental impact during construction may take place but risk factor will reduce and better water management system will emerge – Possible increase in miss use of water and wastewater, but mitigated through awareness – Improve water quality – Safer water supply can be achieved.

The “do-nothing” option would involve maintaining the status quo. This would mean that no further rehabilitation and expansion of the existing network in the area would be undertaken, excluding water works and routine pipeline maintenance.

It will also mean that the current predominant practices in obtaining water supply in the two zones will be maintained. These include:

- Rainwater harvesting
- Surface water harvesting

The Preferred Option

There preferred option would be to apply alternatives as they best fit into the engineering designs and implementation of tasks in order to achieve the objectives of the project. The project involves a multi-disciplinary approach and therefore will require a combination and interplay of best practices as the need arises.

The type and range of alternatives which may be considered include:

a. Demand alternatives (e.g. using energy more efficiently rather than building more alternative generating capacity)

b. Input or supply alternatives (e.g. use of waste drainage water)

c. Activity alternatives (e.g. providing public transport rather than increasing road capacity)

d. Location alternatives (e.g. location of field crusher etc)

e. Process alternatives (e.g. use of waste minimizing and energy efficient and efficient process technologies, use of optimum chemicals)

Alternatives available in site activities should be analyzed on the basis of:

a. Impact of each alternative

b. Mitigation measures for each alternative

During execution of the project, construction equipments, machinery and plants are likely to cause adverse impact on the environment. The impact can be due to the emissions, dust, noise and oil spills that concern the safety and health of the workers, surrounding settlements and environment as a whole. Impacts of construction activities can be reduce through good construction practices. An environment and Social Management Plan (Chapter 8) and Environmental Code of Practices are prepared for the project. An environmental and social cell is also proposed at KUIDFC level which will assist local body to sustainable implementation of ESMP and ECoP during planning, construction and operation phase.

Annexure II: MAJOR FINDINGS FROM STAKEHOLDERS CONSULTATION

Consultation with relevant stakeholders had been an important component of the social and environmental assessment exercise to obtain the perceptions and views of the stakeholders on social and environmental concerns pertaining to the local areas. The objective of stakeholder consultation was to identify environmental & social issues, impacts, and options to minimize potential negative impacts. The views held by the stakeholders were analyzed and are presented in this chapter.

Stakeholders were consulted through primary household survey (Demo and Non Demo zone) and discussions with concerned line department which were organized by City Corporation Kalaburgi and Karnataka Urban Infrastructure Development & Finance Corporation.

The stakeholder consultation was conducted with various groups involving officials, professionals and city population from various areas of the project towns. The in-depth discussion on various water supply and related subjects brought forth some key issues which are as mentioned below:

Minutes of the Meetings and Consultations held in Kalaburgi		
1	**Meeting with ULB officials:**	Meeting City Commissioner and City Engineer of Kalaburgi, discussing SESA objectives and city specific issues
	Participants:	Sri. S.B. Kattimani (K.M.A.S) Commissioner (Kalaburgi), Sri. R.P. Jadhav, A.E.E & Executive Engineer (I/C), Consultant (IPE Global Private Limited) and Various Stakeholders
	Date:	21st & 22nd November 2013
	Venue:	Office of the Municipal Commissioner
	Discussion: 	During the meeting with the Municipal Commissioner (Kalaburgi) and other technical members, various points have been discussed by the consultant on the present situation of water supply and its availability for 24*7. Honorable commissioner has discussed various aspects of the 24*7 water supply and their implications. He also discussed the water charges and other costs related to the water supply. City Engineer has explained each and every point of the existing situation of the 24*7 water supply. He also informed about the situation of Water Treatment Plant (WTP), IPS, Oil Filter Bed and Intake Points at various locations like; Kontoor, Shorgumbaz, River Bheema, In the meeting SESA points have been discussed with the municipal commissioner and other officials.
2	**Site Visits**	
	Agenda	– Site visit of various WTP, GLSR, Filter Beds & Intake Points
	Participants	– Assistant Engineer of KUIDFC – Consultant (IPE Global Private Limited)
	Venue : Kotnoor WTP **Date:** 21st & 22nd November 2013	- The technical details like number of plant running, maintenance issues etc were discussed

		
	Venue : Water Spillage at Kotnoor WTP **Date:** 21st & 22nd November 2013 The reason of water spillage issues were discussed	
	Venue : Intake point at River Bheema **Date:** 21st & 22nd November 2013	
	Venue : Shorgumbaz WTP **Date:** 21st & 22nd November 2013	
	Venue : Old Filter Bed **Date:** 21st & 22nd November 2013	
	Venue : Water Spillage at Old Filter Bed **Date:** 21st & 22nd November 2013	

	Venue : Meeting residents of Non-Demo Zone **Date:** 21st & 22nd November 2013	
	Venue : Meeting residents of Demo Zone **Date:** 21st & 22nd November 2013 The issues related to satisfaction with the water supply department in terms of the charged tariff, consumer redressal, maintenance and repairs were discussed	
	Venue : Regular billing of 24x7 water supply in demo zone **Date:** 21st & 22nd November 2013 The issues related to water billing error and issues were discussed	
	Venue : Customer Service Centre (Grievance Cell) of 24x7 water supply **Date:** 21st & 22nd November 2013 The issues related to frequency of call per day and time to rectifications were discussed	
3	**Interaction with Community**	
	Purpose:	FGD with Domestic Consumer groups – High, medium and low economic category households
	Participants:	– Various respondents from different community. o Ward No. 18: Somadutta Patil, Sri Ram, Govt High School (Vijay Nagar Colony), Revansiddappa (Shik Roza), Honashetty (Shik Roza) o Ward No. 31: Siddram (Contractor), Pawar o Ward No. 35: Rahul Kalyankar, Gurulingappa

		o Ward No. 39: Sanjeev I Reddya, P. Niradi, Amrut, Aruna Electronic Contractor) Shanti Nagar o Ward No. 43: Mohammad Hussain, Rukmini Jagtap, o Ward No. 49: Mohamad Amjad, Mohammad Sahab, o Ward No. 50: Vijay Kumar, Vijay Kumari, Santosh o Ward No. 51: Jagadri Patil, Vijay Kumar, Sanjeev Kumar, Prakash, Sanjeev Kumar S. Harsur o Ashok Nagar: Basappa Nayak, Subhash, Ram Chandra – Consultant (IPE Global Private Limited)
	Date:	21st & 22nd November 2013
	Venue:	Ward No. 18, 31, 35, 39, 43, 49, 50, 51 and Ashok Nagar
	Discussion	Discussion held on various points like: • Family profiles – size, workers / dependents, etc. • Type of access to water – Exclusive household connection, Shared with other tenants, Public stand posts, others • Current sources used for water (common or separate for drinking and other uses?) • Satisfaction with water quality, volume, mode of supply, supply frequency, supply time • Current water consumption for drinking and other uses • Type of infrastructure available for water storage – Syntex, cemented (overhead, ground level or underground) • Average cost incurred for water connection and operationalization • Average water bill paid with billing frequency • Defaults in bill payment • Satisfaction with the water supply department in terms of the charged tariff, consumer redressal, maintenance and repairs • Observed instances of water wastage • Coping mechanisms to face supply problems - Purchase of water from commercial sources (bottled water, tanker supply, etc.), Use of filters and other purifiers • Local conflicts on water usage and methods used for conflict resolution • Overall perception on the need to improve the water supply through the proposed 24 X 7 plan • Knowledge of on-going efforts to bring in the 24 X 7 supply • If aware, satisfaction with the feasibility of the new scheme • Anticipated problems and conflicts that could arise through the design, implementation, supply, distribution, maintenance and tariff related issues with suggested alternatives and other solutions

		• Expected expenditure at the household level to accommodate required changes in plumbing, meter replacement and storage – willingness to accommodate the escalated cost and if not willing, who should bear it?
	Purpose:	FGDs with Commercial Consumers – Owners / Managers of Shops, Malls and market conglomerates, hotels and restaurants, amusement parks, etc.
	Participants:	– Various respondents from different community. o Ward No. 18: Somadutta Patil, Sri Ram, Govt High School (Vijay Nagar Colony), Revansiddappa (Shik Roza), Honashetty (Shik Roza) o Ward No. 31: Siddram (Contractor), Pawar o Ward No. 35: Rahul Kalyankar, Gurulingappa o Ward No. 39: Sanjeev I Reddya, P. Niradi, Amrut, Aruna Electronic Contractor) Shanti Nagar o Ward No. 43: Mohammad Hussain, Rukmini Jagtap, o Ward No. 49: Mohamad Amjad, Mohammad Sahab, o Ward No. 50: Vijay Kumar, Vijaya Kumari, Santosh o Ward No. 51: Jagadri Patil, Vijay Kumar, Sanjeev Kumar, Prakash, Sanjeev Kumar S. Harsur o Ashok Nagar: Basappa Nayak, Subhash, Ram Chandra – Consultant (IPE Global Private Limited)
	Date:	21st & 22nd November 2013
	Venue:	Ward No. 18, 31, 35, 39, 43, 49, 50, 51 and Ashok Nagar
	Discussion	During the discussion various points have been discussed as under: • Commercial consumer profile – Type and size of the establishment, involved in public dealing on a large scale, types of water consuming commercial activities, etc. • Type of access to water – Exclusive establishment connection, Shared with other establishments, Public stand posts, others • Current sources used for water (common or separate for drinking and other uses?) • Satisfaction with water quality, volume, mode of supply, supply frequency, supply time • Current water consumption for drinking and other uses • Type of infrastructure available for water storage – Syntex, cemented (overhead, ground level or underground) • Average cost incurred for water connection and operationalization • Average water bill paid with billing frequency

		• Defaults in bill payment • Satisfaction with the water supply department in terms of the charged tariff, consumer redressal, maintenance and repairs • Observed instances of water wastage • Coping mechanisms to face supply problems - Purchase of water from commercial sources (bottled water, tanker supply, etc.), Use of filters and other purifiers • Local conflicts on water usage and methods used for conflict resolution • Overall perception on the need to improve the water supply through the proposed 24 X 7 plan • Knowledge of on-going efforts to bring in the 24 X 7 supply • If aware, satisfaction with the feasibility of the new scheme • Anticipated problems and conflicts that could arise through the design, implementation, supply, distribution, maintenance and tariff related issues with suggested alternatives and other solutions • Expected expenditure at the establishment level to accommodate required changes in plumbing, meter replacement and storage – willingness to accommodate the escalated cost and if not willing, who should bear it?
	Purpose:	In-depth Interviews with Industrial Consumers – Owners / Managers of Industries such as steel rolling mills, soft drink manufacturers, pharmaceuticals, ice factories, etc
	Participants:	– Various respondents from different community. o Ward No. 18: Somadutta Patil, Sri Ram, Govt High School (Vijay Nagar Colony), Revansiddappa (Shik Roza), Honashetty (Shik Roza) o Ward No. 31: Siddram (Contractor), Pawar o Ward No. 35: Rahul Kalyankar, Gurulingappa o Ward No. 39: Sanjeev I Reddya, P. Niradi, Amrut, Aruna Electronic Contractor) Shanti Nagar o Ward No. 43: Mohammad Hussain, Rukmini Jagtap, o Ward No. 49: Mohamad Amjad, Mohammad Sahab, o Ward No. 50: Vijay Kumar, Vijay Kumari, Santosh o Ward No. 51: Jagadri Patil, Vijay Kumar, Sanjeev Kumar, Prakash, Sanjeev Kumar S. Harsur o Ashok Nagar: Basappa Nayak, Subhash, Ram Chandra – Consultant (IPE Global Private Limited)
	Date:	21st & 22nd November 2013
	Venue:	Ward No. 18, 31, 35, 39, 43, 49, 50, 51 and Ashok Nagar

	Discussion	During the discussion various points have been discussed as under: • Industrial consumer profile – Type and size of the industry, types of water consuming industrial activities, usage of corporation water supply for industry, use of corporation water for industry workers colony, etc. • Type of access to water – Exclusive industry connection, Shared with other industries • Current sources used for water (common or separate for drinking and other uses?) • Satisfaction with water quality, volume, mode of supply, supply frequency, supply time • Current water consumption for drinking and other uses • Type of infrastructure available for water storage – Syntex, cemented (overhead, ground level or underground) • Average cost incurred for water connection and operationalization • Average water bill paid with billing frequency • Defaults in bill payment • Satisfaction with the water supply department in terms of the charged tariff, consumer redressal, maintenance and repairs • Observed instances of water wastage • Coping mechanisms to face supply problems - Purchase of water from commercial sources (bottled water, tanker supply, etc.), Use of filters and other purifiers • Local conflicts on water usage and methods used for conflict resolution • Overall perception on the need to improve the water supply through the proposed 24 X 7 plan • Knowledge of on-going efforts to bring in the 24 X 7 supply • If aware, satisfaction with the feasibility of the new scheme • Anticipated problems and conflicts that could arise through the design, implementation, supply, distribution, maintenance and tariff related issues with suggested alternatives and other solutions • Expected expenditure at the industry level to accommodate required changes in plumbing, meter replacement and storage – willingness to accommodate the escalated cost and if not willing, who should bear it?
	Purpose:	In-depth Interviews with Institutional Consumers – Administrators of Schools, colleges, private offices, Hostels, etc.

	Participants:	– Various respondents from different community. o Ward No. 18: Somadutta Patil, Sri Ram, Govt High School (Vijay Nagar Colony), Revansiddappa (Shik Roza), Honashetty (Shik Roza) o Ward No. 31: Siddram (Contractor), Pawar o Ward No. 35: Rahul Kalyankar, Gurulingappa o Ward No. 39: Sanjeev I Reddya, P. Niradi, Amrut, Aruna Electronic Contractor) Shanti Nagar o Ward No. 43: Mohammad Hussain, Rukmini Jagtap, o Ward No. 49: Mohamad Amjad, Mohammad Sahab, o Ward No. 50: Vijay Kumar, Vijaya Kumari, Santosh o Ward No. 51: Jagadri Patil, Vijay Kumar, Sanjeev Kumar, Prakash, Sanjeev Kumar S. Harsur o Ashok Nagar: Basappa Nayak, Subhash, Ram Chandra – Consultant (IPE Global Private Limited)
	Date:	21st & 22nd November 2013
	Venue:	Ward No. 18, 31, 35, 39, 43, 49, 50, 51 and Ashok Nagar
	Discussion	During the discussion various points have been discussed as under: • Institutional consumer profile – Type and size of the institution, number of students and / or staff in the institution, usage of corporation water supply for the institution, use of corporation water for hostels, staff quarters, etc. • Type of access to water – Exclusive institutional connection, Shared with other institutions • Current sources used for water (common or separate for drinking and other uses?) • Satisfaction with water quality, volume, mode of supply, supply frequency, supply time • Current water consumption for drinking and other uses • Type of infrastructure available for water storage – Syntex, cemented (overhead, ground level or underground) • Average cost incurred for water connection and operationalization • Average water bill paid with billing frequency • Defaults in bill payment • Satisfaction with the water supply department in terms of the charged tariff, consumer redressal, maintenance and repairs • Observed instances of water wastage

		• Coping mechanisms to face supply problems - Purchase of water from commercial sources (bottled water, tanker supply, etc.), Use of filters and other purifiers • Local conflicts on water usage and methods used for conflict resolution • Overall perception on the need to improve the water supply through the proposed 24 X 7 plan • Knowledge of on-going efforts to bring in the 24 X 7 supply • If aware, satisfaction with the feasibility of the new scheme • Anticipated problems and conflicts that could arise through the design, implementation, supply, distribution, maintenance and tariff related issues with suggested alternatives and other solutions • Expected expenditure at the institution level to accommodate required changes in plumbing, meter replacement and storage – willingness to accommodate the escalated cost and if not willing, who should bear it?

AnnexureIII: NRRP 2007 AND LAND KEY TENETS OF THE ACQUISITION AND R&R ACT 2013

Sl. No.	Policy Principles	NRRP (2007)	New LAA (2013)	Remarks
1	Involuntary resettlement should be avoided whenever feasible, if unavoidable it should be minimized	✓	✓	LAA is applicable wherever private land is to be acquired by Government for public purpose.
2	A Resettlement Plan should be prepared wherever resettlement is envisaged	✓	✓	According to the NRRP, RP should be prepared when it involves resettlement of more than 400 families (roughly about 2,000 persons) in plain areas and 200 families (roughly about 1000 people) in hilly areas, Desert Development Programme (DDP) blocks, areas mentioned in Schedule V and Schedule VI of the Constitution of India. New LAA states to prepare a SIA.
3	Affected people are to be identified and recorded as early as possible to establish their eligibility, through a census, which serves as a cut-off date, and prevents subsequent influx of Encroachers.	✓	✓	LAA provides for every affected person to receive a notification prior to acquisition and for a hearing in case of any objection. Acquisition under the Act is permitted within one year from the date of declaration of intent to acquire, failing which, the process has to start again. LAA does not regard non-titleholders as APs.
4	Detailed socio-economic surveys should be conducted to analyze impacts and Affected Persons (APs) should be classified under different categories	✓	✓	NRRP predefines the broad categories of APs and compensation packages for them. This compensation does not take into account the varying open market rates and local conditions in different urban and rural areas across the country. New LAA predefines specific land value estimation process and also compensation packages.
5	Losses of APs should be estimated on case-by-case basis	✗	✓	Broad categories of PAPs and compensation for each are predefined in the NRRP. The New LAA, however, differentiates the losses due to land acquisition in rural and urban areas.
6	All PAPs should be provided with better standard of living and absence of a formal title to land is not a bar to entitlements	✓	✓	NRRP indicates provisions for better living standard for PAPs. However, it does not provide scope for dealing with finer issues of resettlement because of predefined categories and compensation packages. Compensating PAPs without having formal title to land is also not clearly mentioned. New LAA considers this as important.

Sl. No.	Policy Principles	NRRP (2007)	New LAA (2013)	Remarks
7	All Project Affected Families (PAFs) should be compensated based on losses incurred	✗	✓	Under NRRP "project affected family" means a family/person whose place of residence or other properties or source of livelihood are substantially affected by the process of acquisition of land for the project and who has been residing continuously for a period of not less than three years preceding the date of declaration of the affected zone or practicing any trade, occupation or vocation continuously for a period of not less than three years in the affected zone, preceding the date of declaration of the affected zone. NRRP extends benefits based on the above mentioned definition. Loss of livelihoods of any PAF has to be compensated as per New LAA.
8	PAPs if non-titleholders	✗	✗	LAA does not recognize any PAPs other than titleholders. NRRP, though not clearly, but has the provision of benefits for PAPs residing for consecutive three years in the affected zone, as mentioned previously. New LAA also does not clearly say anything about non-titleholders entitlements for R&R assistances.
9	All PAPs should be compensated at replacement cost for lost assets, including transaction and transition costs	✗	✓	The NRRP's concept of replacement cost is not clearly defined. However, the NRRP does consider various compensation packages to substitute the losses of PAPs. New LAA predefines specific land value estimation process and also compensation packages.
10	Wherever feasible land-for- land option should be provided for acquired land	✓	✓	For, socially disadvantaged groups like SC / ST, the New LAA provides for this entitlement.
11	Land allotted should be in the joint name of husband and wife if families are affected	✓	✗	Only NRRP opines for it.
12	Vulnerable PAPs should be identified and provided with special assistance	✓	✗	NRRP clubs vulnerable PAPs including BPL persons, landless, elderly, physically challenged, widow, unmarried girls, orphans, SCs, STs and other minorities and provisions of benefits have been considered for them.
13	Social networks and cultural links should be preserved. Common	✓	✗	Only NRRP recommends this.

Sl. No.	Policy Principles	NRRP (2007)	New LAA (2013)	Remarks
	property resources should be replaced			
14	PAPs are to be assisted to integrate economically and socially into host communities	✓	✗	Only NRRP recommends this.
15	Each involuntary resettlement is conceived and executed as part of a development project or program with time-bound action plan	✓	✓	LAA does not provide for resettlement. However, it specifies the time limit for acquisition, though the project / program for which it is conceived need not necessarily be time-bound. New LAA considers involuntary resettlement for land acquisition for public purpose not only to be executed as part of development project but also significantly as State Government's responsibility.
16	The Affected Persons are to be fully informed and closely consulted	✓	✓	LAA recognizes only titleholders, who are to be notified prior to acquisition. New LAA considers public disclosure as important but not necessarily for non-titleholders.
17	Organization and management of RP activities should be carried out through proper institutional structures and efficiently monitored	✓	✗	Under NRRP, a National Monitoring Commission is proposed to be set-up, which shall be chaired by the Secretary, Department of Land Resources, under the Ministry of Rural Development and comprise seven other Secretaries.
18	Provisions for grievance redressal procedures	✓	✓	Under NRRP, Grievances Redressal Cell will be set-up under the Commissioner, Resettlement. LAA, previous and new, provide for a hearing of objections filed by PAPs
19	All costs should be borne by requiring body and shall be a part of project cost	✓	✗	The New LAA says that all costs should be borne by the requiring body but not as part of project cost.

Annexure IV: WARD WISE AREA, POPULATION AND HOUSEHOLDS

Ward No.	Ward name	Area (ha)	Ward No.	Ward name	Area (ha)
1	Nizampur	237.20	29	Basaveshwar	155.12
2	Zam Zam Colony	135.44	30	Vishwesharya Nagar	191.00
3	Shivaji Nagar	61.50	31	Santraswadi	19.20
4	New Bank Colony	58.85	32	Kapnoor	320.74
5	Khwaja Banda Nawaz College	50.87	33	Kalaburgi Fort	121.18
6	Shaikh Roza	180.70	34	Shranabasaveshwar	16.74
7	Chaanveer nagar	44.51	35	Ganga Nagar	27.28
8	Gandhi Nagar	31.73	36	Brahmapur	32.84
9	Khan Colony	43.89	37	Hussain Chowk	52.30
10	Naya Mohalla Nagar	18.40	38	Heerapur and Biddapur	444.25
11	Khwaja Colony	28.87	39	Shanti Nagar	37.15
12	Mehboob Nagar	9.31	40	Brahmpur	15.07
13	Makkha Colony	116.03	41	Shranabasaveshwar College	23.88
14	Khwaja Banda Nawaz (Darga Area)	42.24	42	Anand Nagar	30.98
15	Mominpura (Naya Mohalla)	50.65	43	Daddapur	39.11
16	APMC Market	73.12	44	Gajipur	63.66
17	Irvadi Nagar (Super Market Circle)	44.24	45	Bharav Nagar	83.18
18	Gurubasava (Shaikh Roza)	96.52	46	Rajapur	329.94
19	Vishwesharya Colony	33.56	47	Kuvempu	318.95
20	Mejava Nagar	185.08	48	Dariyapur	234.80
21	Sachinanand Colony	32.11	49	Indira Nagar	71.23
22	Malewadi	201.65	50	CIB Colony	110.61
23	Gokul Nagar	196.86	51	Godutai	65.59
24	Maminipur	34.13	52	Railway Station	60.68
25	Vakkalaobra	23.33	53	Vishal Nagar	147.98
26	Kadi Budigalli	11.69	54	Rajiv Gandhi Park	172.75
27	Haft Gumbaz	15.75	55	Ram Nagar	280.30
28	Muktampur	60.47			

WARD WISE POPULATION DETAILS

Ward	No. of HHs	Population
WARD NO.-0001	2305	12621
WARD NO.-0002	2088	12634
WARD NO.-0003	1662	7971
WARD NO.-0004	2305	14468
WARD NO.-0005	1283	7592
WARD NO.-0006	1388	6613
WARD NO.-0007	1563	8047
WARD NO.-0008	1517	7249
WARD NO.-0009	597	3097
WARD NO.-0010	873	5202
WARD NO.-0011	1732	10278
WARD NO.-0012	1183	6946
WARD NO.-0013	2833	17133
WARD NO.-0014	2357	14145
WARD NO.-0015	1484	7982
WARD NO.-0016	953	5318
WARD NO.-0017	1391	7061
WARD NO.-0018	2574	13365
WARD NO.-0019	1680	8039
WARD NO.-0020	2811	16355
WARD NO.-0021	1955	10589
WARD NO.-0022	3176	15446
WARD NO.-0023	3985	19993
WARD NO.-0024	1838	10075
WARD NO.-0025	1518	9333
WARD NO.-0026	875	5708
WARD NO.-0027	1193	6544
WARD NO.-0028	1724	9636
WARD NO.-0029	2624	13918
WARD NO.-0030	2608	12596
WARD NO.-0031	1003	5048
WARD NO.-0032	2025	11095
WARD NO.-0033	1591	8027
WARD NO.-0034	1089	5006
WARD NO.-0035	1647	8445
WARD NO.-0036	2316	11703
WARD NO.-0037	1307	7531
WARD NO.-0038	3235	16218
WARD NO.-0039	1298	7164
WARD NO.-0040	1790	9275
WARD NO.-0041	1263	6964
WARD NO.-0042	1747	8180
WARD NO.-0043	1003	4870
WARD NO.-0044	1503	7703
WARD NO.-0045	2266	12339
WARD NO.-0046	2068	10393

Ward	No. of HHs	Population
WARD NO.-0047	1163	5989
WARD NO.-0048	955	4847
WARD NO.-0049	1395	6808
WARD NO.-0050	2446	12175
WARD NO.-0051	923	4268
WARD NO.-0052	1766	8695
WARD NO.-0053	2008	10736
WARD NO.-0054	3356	16820
WARD NO.-0055	3731	17334
Kusnoor (OG) (Part) WARD NO.-0056	1202	6262
Rajapur (OG) WARD NO.-0057	91	434
Kotnoor Darwesh (OG) WARD NO.-0058	568	2864
	102830	**543147**

Annexure V: PROPOSED WATER SUPPLY SYSTEM

A. GENERAL

It is proposed to upscale the existing system with required modifications as necessary for the successful implementation of 24x7 water supply system to the cover the entire service area. The system is designed such that the requirements of 2031 and 2041 are being addressed separately on the bulk and treatment plants. This can substantially eliminate the investments at the start of the project.

Based on the source studies it is planned for implementing dual mechanisms so that in the event if any one system fails the other source can be used to cater to the demand to an extent. Hence the feeder system has been designed in such a way that the water can reach the reservoirs from any one of the source without any obstructions.

B. WATER POLICY IN KARNATAKA:

Objective:

- Provide drinking water at the rate of 55 litres per person per day in the rural areas, 70 litres per person per day in towns and 100 litres per person per day in the city municipal council areas and 135 litres per person per day in city corporation areas.
- Improve performance of all water resource projects.
- Provide a legislative, administrative and infrastructural environment, which will ensure fair, just and equitable distribution and utilization of the water resources of the State to benefit all the people of the State.

Allocation priorities

In planning and operation of water resources projects, water allocation priorities are broadly as follows:

- Drinking water
- Irrigation
- Hydropower
- Aquaculture
- Agro industries
- Non-Agricultural Industries
- Navigation and other uses

Private Sector Participation

- Private sector participation are encouraged in various aspects of planning, investigation, design, construction, development and management of water resources projects for diverse uses, wherever feasible.
- Depending upon specific situation, to bring in various combinations of private sector participation, in building, owning, operation, leasing and transferring of water resources facilities.

Water Rates:

Water rates for various uses to be revised in a phased manner and fixed so as to cover at least the operation and maintenance charges of providing services.

Monitoring:

Close monitoring of planning, execution and performance of water resources projects to be undertaken to identify bottlenecks and to obviate time and cost overruns.

Action plan:

- Make water accounting and audit mandatory.

- Mobilize community and stakeholder participation through Users Organizations, empower them, provide training, technical support and create public awareness.

C. DRINKING WATER AND SANITATION POLICY IN KARNATAKA:

Objective:

- Ensure universal coverage of water and sanitation services that people want and are willing to pay for
- Ensure a minimum level of service to all citizens.

Institutional arrangements:

Policy formulation

- Encouraging the use of public private partnerships as well as private sector participation to achieve the sector goals.
- Ensuring co-ordination and collaboration among the various agencies both at the policy and operational level through the establishment of appropriate committees and agencies.

Tariff:

The longer-term objective is to establish an appropriate cost recovery mechanism through adequate tariff to ensure that revenue cover operation and maintenance costs, debt service plus a reasonable return on capital. In the medium term, however, subsidies to be continued to the needed and to be focused in areas such as pockets and communities of extreme poverty and investments with large-scale externalities like wastewater treatment.

Tariff need to be structured in a manner so that excessive consumption and wastage of water is discouraged. Achieve 100% metering and volumetric pricing based on long run marginal costs.

Private Sector Participation:

To improve efficiency in service provision, continuously update technology and ultimately bring in private investment into sector, the GOK to actively encourage private sector participation.

D. SOURCE STUDIES

Background

The increase in the concentration of human activities intensifies the competition for all types of sources among the most vital of which is the water. Water has become a very important commodity for the growth of the towns/cities.

The major water related problems of rapidly growing towns/cities are;

a) the need for dependable supplies of potable water,

b) severe and growing sanitation problems including pollution of streams, lakes, estuaries and ground water from domestic and industrial sewage and solid wastes, and

c) depletion of ground water aquifers caused by reduction of infiltration and over pumping of aquifers.

Identification of feasible and perennial source is imperative to meet the ever-increasing demand owing to increasing population and improved standards of living. The problem of source identification becomes easier in respect of cities/towns situated in the proximity of any perennial source, where there are no such facilities and where it has to depend upon seasonal monsoon rainfall only, it becomes rather difficult to cope up with the needs. Therefore, in locations where there is no scope for surface water identification then efforts becomes absolutely necessary to conserve the available water and depend on ground water. Source of water will be either surface or sub-surface provided it should be perennial besides technically and economically feasible.

City Municipal Corporation, Town / City Municipal Council (CMC/TMC) or any independent authority constituted for this purpose is responsible for providing safe drinking water of adequate

quantity to the people of the city. The major objective of such authorities is to plan well ahead and identify additional sources of water to meet ever-increasing demand owing to increased population and also for stepping up per capita supply

The population of Gulbarga city is expected to reach 9.25 Lakhs by the year 2031 and 11.40 Lakhs by the year 2041 as per population projections. The present treated water requirement is about 100 MLD and this demand will be 174 MLD by the year 2031 and 209 MLD by the year 2041. The present supply is about 75 MLD from surface sources and about 8 MLD from ground water source. There is a need for augmentation of present water supply system to take care of immediate as well as future water demand of the city. Considering transmission and treatment plant losses of 5% the raw water requirement to meet the water demand by the year 2041 is 210 MLD (80.3 Mcum per year).

E. PRESENT WATER SOURCE

At present water supply to Gulbarga City is from:

Ground Water Source

1729 Borewells drilled at different locations in and around the city with power pumps or hand pumps.

Surface Source

Three water sources, a) Bhosga Reservoir, b) Bennithora Reservoir and c) Bheema River water supply scheme executed under Gulbarga Water Supply Scheme (GWSS) I, II, III respectively.

GROUND WATER SOURCE

There are 1729 number bore-wells drilled at different location in and around the city. 409 bore-wells are fitted with power pumps (3 phase - submersible pumps) and about 919 bore-wells are with hand pumps and 401 bore-wells are fitted with single phase pumps. 810 Bore wells fitted with power pumps are yielding of about 8.00 MLD of water. Due to scanty rainfall during last few years, the ground water is dwindling and causing failure of hand pumps. Ground water is available at a depth of 300ft to 400ft and is slightly fluoride affected in some of the areas (more than 3 ppm) also these bore well water is generally found to be hard. These bore wells are operated daily for around 2 hours a day. Separate dedicated distribution mains have been laid from bore wells where 3 phase pumps have been installed, which supply to the nearby local areas.

Separate tanks have been constructed near the bore-wells where single phase pumps have been installed. Through these tanks water is being supplied to people nearby.

Ground water resource recharge and utilization status indicate that draft or exploitation is more than recharge. In the absence of sufficient recharge they are not likely to maintain the same yield for a longer duration. Hence it is suggested to augment/initiate recharge by constructing rain-harvesting structures in the catchment areas and also desilt the existing tanks in and around the city.

As the quality of ground water is not meeting the CPHEEO drinking water standards and also limitation in the yield of bore wells, this ground water source is not considered for augmenting water supply system to the city. Ground water table shall be recharged using rainwater harvesting methods and this source could be used when there is emergency and shortage of surface water because of bad monsoon.

F. SURFACE WATER SOURCE

There are no major rivers or reservoirs in the vicinity of the city other than present surface sources. The present sources, a) Bhosga Reservoir, b) Bennithora Reservoir and c) Bheema River has been studied in detail to estimate dependability as a source for water supply for the horizon year 2041. The index map showing the location of these sources with respect to city is shown in **Exhibit-VI.1**

BHOSGA RESERVOIR

The water supply scheme to the city was completed by the erstwhile Government of Hyderabad, the original water supply scheme to the city with Bhosga Reservoir as source was designed for a prospective population of 1,00,000. This scheme has been remodelled under comprehensive water supply scheme to City, Gulbarga Water Supply Scheme Stage-I. The scheme has been completed during 1970 and under this scheme the capacity of the reservoir was increased from 8.44Mcum (298 Mcft) to 11.85 Mcum (418 Mcft).

This reservoir is situated at a distance of 9.6Km from Gulbarga city. It has a catchment area of 90.13 Sq.km. Under the above scheme the capacity of the Bhosga Reservoir was increased from 289Mcft to 418Mcft. The salient features of the Bhosga Reservoir have been presented in Table given below. The area capacity details of the reservoir are given in table given below

SALIENT FEATURES OF BHOSGA RESERVOIR

The gross storage of 11.85 Mcum was ensuring an average supply of 18 MLD during normal average rainfall year and at least 7 MLD in the scanty rainfall year. The full tank level has been reduced to 493.36 m during the year 1990 because of structural stability of earthen dam. For the reduced FRL the gross storage available is 9.28 Mcum as against 11.85 Mcum at 494.38 m level.

Simulation Studies for Bhosga

Bhosga Reservoir operation and maintenance lies with Gulbarga City Corporation. The details of reservoir inflow or the reservoir levels and releases for drinking water is not available with the Corporation. In the absence of above data reservoir operation simulation studies is not possible and hence could not assess the reliability of the source.

However based on the past experience of the Corporation it could be taken that Bhosga reservoir yield is at least 7 MLD in the worst rainfall years. The yield of 10 MLD could be considered from this source.

AREA-CAPACITY DETAILS OF BHOSGA RESERVOIR

1.	Location	9.6 km from Gulbarga city on west side
2.	Catchment Area	90.23 Sq Km, (34.80 Sq.Miles)
3.	Length of bund	Earthen Dam, 1020 m (3345 ft)
4.	Slope U/S	2:1
5.	Tank bund level	497.43 m (1632.00 Ft).
6.	Full Reservoir Level	494.38 m (1622.00 Ft)
		493.36 m (1618.65 Ft (Decreased during 1990)
7.	Tank capacity at FRL	11.85 Mcum (418.65 Mcft) at 494.38 m.
8.	Masonry Weir	
	i) Length	152.4 m (500 Ft)
	ii) Weir crest level	494.38 m (1622 .00 Ft)
	iii) Shape of Weir	Ogee weir.
	iv) Sill level of outlet	487.68 m (1600.00 Ft)
	v) No of sluice valves	3 Nos @ different levels.
	vi) Gravity Main	760 mm (30” dia) RCC Hume pipe 8992 m (29500 ft)
	1) Gravity main slope	1 in 3800.
	2) Discharge	20.25 MLD (4.5 MGD)
Outlet RL of Old filter bed		485.47 m (1592.75 ft)

BENNITHORA RIVER / RESERVOIR

Second Stage Gulbarga Water Supply Scheme was developed with Bennithora River as water source. The scheme was completed and commissioned during 1978 the design capacity of this scheme is 20.43 MLD. Under this scheme river head works (Jackwell) has been constructed near Kurokota village and 10.70 Km long CI rising main of diameter 600 mm was laid to convey water from head works to break pressure tank at Salam tekdi. PSC gravity mains 500 mm dia, 8.2 Km long has been laid from break pressure tank to treatment works at the old Filter bed area.

Irrigation Department of Government of Karnataka has constructed Dam across Bennithora River at Khurj village in Chittapur Taluka in order to irrigate an area of 20234 Ha. The total water requirement for Khariff and Rabi crops is 120.10 Mcum.

The Bennithora reservoir is created by constructing a composite earthen and concrete dam across the River near Khurj village in Gulbarga District. The reservoir is located at about 20 km from the Gulbarga City. The total catchment of area of the reservoirs is 2204 Sq.km. Out of total catchment area, 1266 sq.km is in Karnataka and balance 938 sq.km is in Maharastra state. Average annual weighted rainfall is 629 mm. The upper reaches of catchment consist of hilly terrain with forest cover and the lower reach is moderately flat. The salient features of the Bennithora Reservoir have been presented in Table given below. The area capacity details of the reservoir are given in Table given below.

The 75% dependable yield at the dam site is 173 Mcum.

SALIENT FEATURES OF BENNITHORA RESERVOIR

Sl No.	Particular	Details
Location		
a)	Taluka	Chittapur
b)	District	Gulbarga
c)	Nearest Village	Khurj
d)	Approach	About 3 km off Gulbarga-Chincholi road
e)	River	Bennithora
f)	Latitude	17o 27’ N
g	Longitude	77o01’ E
Hydraulic Data		
a)	Catchments Area	2204.09 Sq km (851 Sq.Miles).
b)	Mean annual weighted Rainfall	24.77” (629.2 mm)
c)	75% Dependable yield at dam site	6090.93 Mcft (172.45 Mcum)
d)	Design Discharge	8801 Cumecs
Reservoir Data		
a)	Gross Storage Capacity	5296.75 Mcft (149.98 Mcum)
b)	Gross Storage level	43438.89 m
c)	Dead storage capacity	327.77 Mcft (9.28 Mcum)
d)	Dead storage level (LSL)	428.22 m
e)	Live storage capacity	4968.98 Mcft (140.7 Mcum)
f)	River bed level	418.00 m
g)	Full Tank Level	438.89 m
h)	Maximum Water Level	440.56 m
i)	Top of Bund Level	441.71 m
j)	Allocation for Irrigation	4242 Mcft (120.1 Mcum)

k)	Water Spread area at FSL	267.70 Msft (31.073 Msqm)
DAM DATA		
a)	Length of dam	7677.00 ft (2340.00 m)
b)	Length of earthen dam	7240.73 ft (2207.0 m)
c)	Length of Masonry dam	436.35 ft (133.00 m)
d)	Maximum height of Masonry Dam above ground level	102.98 ft (31.39 m)
e)	No of Gates Spillway	7
f)	Size of Gates Spillway	15 m X 11.5 m
	Crest level of spill	1402.18 ft (427.39 m)

AREA-CAPACITY DETAILS OF BENNITHORA RESERVOIR

Reduce level in m	Area (T. sq.m)	Capacity (Mcum)
417.88	7.80	0.00
418.19	17.65	0.01
418.80	48.96	0.02
419.10	70.61	0.04
420.01	158.86	0.15
420.93	283.45	0.34
421.23	332.22	0.44
422.15	409.52	0.82
422.76	635.64	1.16
423.06	708.39	1.37
423.98	949.47	2.10
424.28	1037.73	2.40
425.20	1325.73	3.48
425.81	1541.26	4.35
426.11	1649.96	4.84
427.02	2009.49	6.51
427.94	2403.40	8.53
428.24	2543.69	9.28
429.16	2798.24	11.81
429.77	3298.06	13.72
430.07	3779.30	14.80
430.68	4824.45	17.42
430.99	5398.60	18.97
431.29	6001.54	20.71
431.60	6640.71	22.63
431.90	7307.75	24.76
432.21	8000.81	27.09
432.82	9503.98	32.42
433.12	10312.24	35.44
433.73	12012.36	42.23
434.04	12894.94	46.03
434.64	14790.16	54.47

Reduce level in m	Area (T. sq.m)	Capacity (Mcum)
434.95	15765.65	59.12
435.25	17177.77	64.23
435.86	18942.93	74.97
436.17	20076.35	80.92
436.78	22399.85	91.02
437.08	23606.66	100.87
437.39	24870.14	108.25
438.88	31073.84	149.99

Simulation Studies for Bennithora

In order to assess the dependability of the Bennithora reservoir for supplying water to Gulbarga City, Reservoir operation simulation studies have been carried out. For a simulation study minimum 15 years data is required, however in the absence of 15 years reservoir data 5 years available data has been used from 2006-07 to 2010-11 and also river flows measured from 1976-77 to 1985-86 at Kurikota Gauging station upstream of the dam site has been considered.

The available flows into reservoir each month, Pan evaporation depths at dam site and area-elevation –capacity curve of the reservoir has been collected. The inflows into reservoir are shown in the Table given below. The depth of evaporation losses is given in Table given below.

INFLOWS INTO BENNITHORA RESERVOIR (MCUM)

Month/Year	2006-07	2007-08	2008-09	2009-10	2010-11
June	3.19	0.00	0.00	0.00	1.10
July	0.00	0.63	0.00	0.00	53.91
August	0.00	1.83	18.01	16.20	186.84
September	13.09	225.31	81.74	30.00	79.36
October	3.74	7.22	26.41	18.82	29.19
November	0.00	0.00	1.22	0.00	0.00
December	0.00	0.00	0.00	0.00	0.00
January	0.00	0.00	0.00	0.00	0.00
February	0.00	0.00	0.00	0.00	0.00
March	0.00	0.00	0.00	0.00	0.00
April	0.00	0.00	0.00	0.00	0.00
May	0.00	0.00	0.00	0.00	0.00
Total	**20.02**	**234.99**	**127.39**	**65.02**	**350.40**

The simulation studies have been carried out for 15 years for different quantity of water supply from this source to City keeping the ultimate irrigation demand of 120 Mcum per annum and drinking water needs of 1.35 Mcum (3.7 MLD) for villagers nearby unaltered. The City demand is superimposed on the demand of the present users and the dependability of the reservoir is worked out.

The details of simulation studies for a typical year are given in Table given below. The dependability of Bennithora Reservoir for supplying water to Gulbarga City for different quantities of 20 MLD (7.3 Mcum per year) is 82% and for the 55 MLD (20.07 Mcum per year) and 110 MLD (40.15 Mcum per year) is 67% and 60 % respectively.

GAUGED FLOWS OF BENNITHORA RIVER AT KURIKOTA SITE (MCUM)

Month/ year	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86
June	0.00	2.95	22.91	1.95	8.38	20.11	0.00	0.06	0.00	0.28
July	4.87	3.85	21.07	0.08	0.00	4.84	36.19	1.39	29.93	1.36
August	61.28	3.00	38.40	0.51	82.04	20.50	1.87	31.46	26.39	0.48
September	26.53	3.23	100.75	64.96	27.98	231.66	30.89	269.24	21.24	1.53
October	5.75	12.86	49.58	18.35	6.12	71.36	21.72	272.55	27.81	8.98
November	10.34	3.96	17.39	12.46	1.02	28.52	13.68	16.28	6.12	0.00
December	1.87	2.80	6.43	3.31	0.14	7.02	2.61	6.51	1.73	0.00
January	0.54	0.08	2.72	0.99	0.06	2.95	0.40	3.26	0.96	0.00
February	0.08	0.00	0.71	0.03	0.00	0.62	0.00	1.39	0.00	0.00
March	0.03	0.00	0.31	0.00	0.00	0.03	0.00	0.17	0.00	0.00
April	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.62	0.00
May	0.00	2.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	111.29	34.80	260.27	102.65	125.73	387.61	107.35	602.37	114.80	12.63

EVAPORATION LOSSES

Month	Evaporation Loss in MM
January	164.92
February	170.91
March	266.91
April	283.5
May	318.99
June	228.9
July	189.87
August	186.62
September	150.15
October	180.11
November	165.9
December	149.95

G. BHEEMA RIVER

Bheema River is a tributary to Krishna River and flows at a distance of about 26 Km from Gulbarga City. During monsoon it carries large flows and four months in a year the flows in the river is due to irrigation return flows. Under Gulbarga water supply Scheme Stage-III, water supply to Gulbarga City has been augmented to supply 55 MLD of water to City. The Bheema river supplies water throughout the year in addition to the Bhosga and Bennithora sources for the city.

An impounding reservoir has been created by constructing a vented barrage across the river near Saradagi village to store water for non monsoon period and commissioned during 1993. The operation and maintenance of barrage is with Karnataka Urban Water Supply and Drainage Board. This barrage is exclusively for water supply purpose. The catchment area at the barrage site is 21600 sq. miles (55944 sq. km) and the maximum discharge is 151.40 Cumecs. The salient features of the vented barrage have been presented in Table below.

Salient Features of Vented RCC Barrage

The salient features of the Bheema Barrage is provided in the table given below:

Sl No	Particular	Details
Location		
a)	Taluka	Gulbarga
b)	District	Gulbarga
c)	Nearest Village Approachable	Saradagi
d)	River	Bheema
e)	Latitude	17°10'30" N
f)	Longitude	76°47' E
Hydraulic Data		
a)	Catchment Area	21600 Sq miles
b)	Maximum observed flood	151.4Cumecs
c)	HFL of river	383.80 m
d)	Average River Bed level	374.0 m
e)	River flank level	386.0 m
f)	Area of Submergence	4.24 Sq.Km
Data of BARRAGE		
a)	Bed level (min)	374.0 m
b)	Full pond level	379.5 m
c)	Gross storage	7.08 Mcum
d)	Live storage	7.08 Mcum
e)	Height of piers from average	5 m
f)	Width of piers	2.6 m
g)	Length of Barrage	310 m
h)	No of openings	126
i)	Width of openings	1.5 m

Simulation Studies:

In order to assess the dependability of the storage created by constructing RCC vented barrage at Saradagi, a detailed simulation studies have been carried out for the present demand and future water supply demand of Gulbarga City. The area capacity details for the barrage are given in Table below.

AREA-CAPACITY DETAILS VENTED BARRAGE

Reduced Level (m)	Area M.Sqm	Capacity in Mcum
375.00	0.35	0.011
376.00	0.84	0.361
377.00	1.64	0.589
377.25	1.92	1.035
377.50	2.21	1.551
377.75	2.49	2.139
378.00	2.77	2.794
378.25	2.90	3.504
378.50	3.02	4.245
378.75	3.15	5.018
379.00	3.28	5.822
379.25	3.76	6.701
379.50	4.24	7.08
379.75	4.72	8.819
380.00	5.20	10.058

The water levels at Barrage site from 2005 to 2010 have been collected. Based on the Elevation – Capacity data capacity of the barrage from 1st and 15th of every month has been arrived. In the absence of depth of pan evaporation at the barrage site, the data of pan evaporation for Bennithora Dam site has been considered for this site. The details of simulation study for a typical year are shown in Table below for the future demand of 40.15 Mcum (110 MLD). The dependability is worked as 73% for present demand of 55 MLD (20.07 Mcum per year) and 72% for the future demand of 110 MLD (40.15 Mcum) from this source.

BHEEMA RIVER-VENTED BARRAGE -RESERVOIR SIMULATION

RIVER BED LEVEL	374	m	DEAD STORAGE CAPACITY	0.011	Mcum
BARRAGE FULL WATER LEVEL	379.5	m	LIVE STORAGE CAPACITY	7.080	Mcum
BARRAGE TOP LEVEL	379.5	M	GROSS STORAGE CAPACITY	7.08	Mcum
HIGHEST FLOOD LEVEL	383.8	M			

WATER DEMAND FOR GULBARGA CITY

Year	Month / date	Initial level (m)	Initial live storage (mcum)	Evap. Losses (mcum)	Drinking water demand (mcum)	Shortfall for drinking water (mcum)	Drinking water failure counts	Final live storage (mcum)
2005	JAN - 1st	378.00	2.80	0.30	1.67	0.00	0	0.82
	15 th	378.20	3.50	0.33	1.67	0.00	0	1.50
	FEB-1st	378.20	3.50	0.27	1.67	0.00	0	1.56
	15 th	378.20	3.50	0.27	1.67	0.00	0	1.56
	MAR-1st	378.20	3.50	0.27	1.67	0.00	0	1.56
	15th	378.20	3.50	0.27	1.67	0.00	0	1.56
	APR-1st	378.20	3.50	0.21	1.67	0.00	0	1.61
	15th	378.20	3.50	0.21	1.67	0.00	0	1.61
	MAY-1st	378.20	3.50	0.26	1.67	0.00	0	1.57
	15th	378.00	2.80	0.24	1.67	0.00	0	0.89
	JUN-1st	377.60	1.85	0.19	1.67	0.03	1	0.01
	15th	378.10	3.15	0.23	1.67	0.00	0	1.25
	JUL-1st	378.00	2.79	0.20	1.67	0.00	0	0.92
	15th	378.40	3.87	0.22	1.67	0.00	0	1.98
	AUG-1st	383.30	7.08	0.32	1.67	0.00	0	5.08
	15th	380.00	7.08	0.32	1.67	0.00	0	5.08
	SEP-1st	379.00	5.82	0.30	1.67	0.00	0	3.85
	15th	380.60	7.09	0.34	1.67	0.00	0	5.08
	OCT-1st	379.50	7.09	0.53	1.67	0.00	0	4.89
	15th	378.50	4.24	0.41	1.67	0.00	0	2.16

Year	Month / date	Initial level (m)	Initial live storage (mcum)	Evap. Losses (mcum)	Drinking water demand (mcum)	Shortfall for drinking water (mcum)	Drinking water failure counts	Final live storage (mcum)
	NOV-1st	378.30	3.50	0.40	1.67	0.00	0	1.42
	15th	377.80	2.20	0.35	1.67	0.00	0	0.18
	DEC-1st	376.80	0.55	0.29	1.67	1.42	1	0.01
	15th	376.80	0.55	0.29	1.67	1.42	1	0.01
TOTAL				**7.01**	**40.15**	**2.88**	**3**	

SUMMARY OF SIMULATION STUDIES

Reservoir simulation studies have been carried out for Bennithora and Bheema vented barrage reservoirs. In the absence of inflow details of Bhosga reservoir simulation studies could not be carried out. Based on the past history the Bhosga reservoirs could supply at least 7 MLD even in the below average rainfall year. The summary of the results of simulation studies has been presented in Table below.

SUMMARY OF SIMULATION STUDIES

Water Source	Dependability of source for the demand of		
	7 MLD (2.56 Mcum per year)	55 MLD (20.07 Mcum per year)	110 MLD (40.15 Mcum per year)
Bhosga Reservoir	100%	-	-
Bennithora Reservoir	100%	67%	60%
Vented Barrage across Bheema river	100%	73%	72%

Bennithora reservoir has been created for irrigation purpose and its operation and maintenance is with the Irrigation Department (KNNL), Government of Karnataka. In the average rainfall year reservoir will meet the requirement of irrigation as well as drinking water demand. In the below average rainfall years drinking water should get top priority as per National water policy and irrigation releases may be curtailed. If situation demands, it should be allowed to draw water from dead storage also.

In the absence of inflow data of vented barrage it is difficult to assess the dependability of Bheema source. Based on the discussions with Karnataka Urban Water Supply and Drainage Board officials it is understood that 50 MLD is supplied from this source to the city without any shortage in the past as well as present. Whenever there is shortage of water in the barrage, water Board used to request Irrigation Department to make good by releases from Narayanapura reservoir across Krishna River. As the barrage storage capacity is not sufficient to meet the future demand of 110 MLD during non monsoon period. It is recommended to either to construct another storage barrage upstream of the existing or ask for the releases from one of the biggest reservoir, Narayanapura Dam in order to meet the non monsoon period water demand of the city. Bhosga and ground water source could be considered as supplementary source for Bennithora and Bheema river sources.

The height of the barrage could not be increased to the design height of 5m due to the resistance from the farmers in the upstream side of the barrage area due to submergence. At present water is stored upto 4m height only as a result the storage capacity of the barrage has reduced significantly.

H. RAW WATER TRANSMISSION SYSTEM

Bhosga Reservoir Scheme

The proposed systems intend to use this system as a backup source in the event of extreme conditions. The entire scheme will be operational depending on the water availability in the reservoir. Hence the scheme is integrated into the proposed system without any rehabilitation works.

Observations: This is not considered as a reliable source. However due to its proximity to the city and its gravity nature this is considered as a cheapest source in terms of the O&M.

- The system is found to be under leakage.
- Silting up of pipes is being reported.
- Rehabilitating of the scheme involves the replacement of the pipe network from the source to the treatment plant. As the source reliability is not assured, hence no rehabilitation works has been suggested. This system is planned to be in operation as per the requirement and shall be periodically monitored.The details of the scheme are as per the details provided in the table given below;

DETAILS OF BHOSGA SCHEME- PROPOSED

Sl No	Type	Details	Remarks
1	Reservoir Intake at Bhosga Village	10 MLD	Existing
2	Raw water Gravity Main- 8.50Km – RCC- 750mm from intake to Existing WTP at Old Filter bed area		Existing
3	Proposed Treatment plant at old Filter bed area	9.09 MLD	Existing
4	River Intake at KuriKotta Village	20 MLD	Existing
5.	From Treatment Plant to Downstream Reservoir for distribution		

Bennithora River Scheme

A new intake of 100MLD is planned on the downstream of the Harasur village at about 13Km N-E of Salam Tekdi BPT so that it can extract dead storage reservoir water in the extreme conditions.

The intake is supplemented by a raw water pumping station of sufficient capacity to pump water from Reservoir Intake to the proposed Treatment plant at Salam Tekdi. This shall work in tandom with the 20 MLD Existing intake located in Kurokotta village. As the the distance to the treatment plant for the 20 MLD intake is less. This shall be used to the maximum extent. Depending upon the water requirement the pumping station at Harasur village is planned to be operated.

Observations:

The intake works at Kurikotta was constructed in early 1980's. The civil structure has been poorly maintained hence rehabilitation in terms of plastering and painting and restoring to original conditions have been suggested.

The mechanical and electrical parts rehabilitation is being dealt in the respective chapters.

The old 600mm CI pipes are being replaced with the new MS pipes of 615mm diameter. The construction activity was planned to be completed by August 2011. Hence the scheme has been integrated into the proposed system. As per the information collected from KUWS&DB, the scheme was commissioned in the month of September 2011.

DETAILS OF BENNITHORA SCHEME- PROPOSED

Sl No	Type	Details	Remarks
1	River Intake at Harasur Village	100 MLD	Proposed
2	Raw water Pumping Main- 13.00Km – MS- 1200mm from intake to Proposed WTP at Salam Tekdi-10mm thick MS pipe		Proposed
3	Proposed Treatment plant at Salam Tekdi	100 MLD	Proposed
4	River Intake at KuriKotta Village	20 MLD	Existing
5	Raw water Pumping Main- 10.50Km – MS- 615mm from intake to Proposed WTP at Salam Tekdi	20 MLD	Existing
6	From Treatment Plant to Downstream Reservoir for distribution through feeder mains		

Bheema River Scheme

The existing intake point of Bheema reservoir is planned to be rehabilitated as per the requirements. The existing pumping main will be used to pump a raw water requirement of 105 MLD as per the design capacity. The existing Electro Mechanical Works would required to be altered suitably.

From the intake point the raw water is pumped to the existing IPS/ WTP at Kotnoor through the existing raw water main. 40 MLD of water is pumped to the Shorgumbaz treatment plant through the existing raw water main.

Due to non availability of land inside the IPS Kotnoor area for the treatment of additional 50 MLD. The same is planned at about 2 KM south of IPS Kotnoor near the All India Radio Station where a land of 3.50 acres are kept reserved for the said purpose by the water board.

Observations:

- The intake works was constructed in the year 1993. The civil structure is found to be in good condition. Hence minor rehabilitation works have been suggested.
- The mechanical and electrical parts rehabilitation is being dealt in the respective chapters.

Under the PI works, new MS pipe of 1118mm diameters have been executed recently and is found to be in good condition. Hence, no rehabilitation works are suggested for the raw water transmission pipeline.

DETAILS OF BHEEMA WATER SUPPLY SCHEME- PROPOSED

Sl. No.	Type	Details	Remarks
1	River Intake at Saradagi Village	105 MLD	Existing
2	Raw water Pumping Main- 19.20Km – MS- 1118mm from intake to WTP at Kotnoor / All India Radio	105 MLD	Existing
3	Proposed Treatment plant at All India Radio	50 MLD	Proposed
4	Existing Treatment plant at Kotnoor IPS station	11.30	Existing
5	Raw water Pumping station at Kotnoor (IPS)	40.00	Existing
6	Raw water Pumping Main- 8.30Km – MS- 914mm from intake to existing WTP at Shorgumbaz	40 MLD	Existing
7	Existing Treatment plant at Shorgumbaz	40 MLD	Existing
8	From Treatment Plant to Downstream Reservoir for distribution through feeder mains		

* * *

Annexure VI: WATER QUALITY TEST RESULTS

Format No. BTH/QF/164

BANGALORE TEST HOUSE

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OHSAS 18001 : 2007 & ISO 9001 : 2008
JAS-ANZ
Cert. No. RQ91/JA/1111
Cert. No.: RQ91/JA/IC/1111

TEST REPORT

Report No. : ED/2014/05/0475	Report Date : 22/05/2014
Issued to : IPE Global Private Limited IPE Global House, B 84, Defence Colony, New Delhi, DELHI - 110024.	Customer Reference : Data Sheet, Dated: 17/05/2014
	Date of Receipt : 19/05/2014
	Date of Start of Test : 20/05/2014
Sample Nature/ Name : Tap Water	Date of Completion of Test : 22/05/2014
	Job Order No. : ED/2014/05/0475
	Sample Particulars : Tap Water from Gulbarga, Ward No: 55, Sai Nagar, Date of Sampling: 17/05/2014
Sample Condition : Satisfactory	

SL. No.	PARAMETERS	Results	Acceptable Limits as per IS: 10500-2012	Permissible Limits as per IS: 10500-2012	Test Method
1	Free Residual Chlorine, mg/L	0.1	Min.0.2	Min.1.0	IS: 3025 (P 26)
	MICROBIOLOGICAL TESTS:				
2	Description	Colourless and transparent liquid with sediments filled in sterilised bottle.			
3	E. coli Bacteria	Less than 1 CFU	Absent	--	IS: 5887 (Part I) 1976

ANALYST

AUTHORIZED SIGNATORY

NOTE : 1. The result listed refer only to the tested samples & applicable parameters. Endorsement of products is neither inferred nor implied. 2. Samples will be destroyed after 15 days from the date of issue of test certificate unless otherwise specified. 3. This report is not to be reproduced wholly or in part & cannot be used as an evidence in the Court of law & should not be used in any advertising media without our special permission in writing. 4. Sample(s) not drawn by us unless otherwise stated. 5. Total liability of our laboratory is limited to the invoice amount. Any dispute arising out of this report is subject to Bangalore Jurisdiction only.

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OHSAS 18001 : 2007 & ISO 9001 : 2008

Cert. No. RQ91/JA/1111
Cert. No.: RQ91/JA/IC/1111

TEST REPORT

Page : 1 of 1

Report No. : ED/2014/05/0476	Report Date : 22/05/2014
Issued to : IPE Global Private Limited IPE Global House, B 84, Defence Colony, New Delhi, DELHI - 110024.	Customer Reference : Data Sheet, Dated: 16/05/2014
Sample Nature/ Name : Tap Water	Date of Receipt : 19/05/2014 Date of Start of Test : 20/05/2014 Date of Completion of Test : 22/05/2014 Job Order No. : ED/2014/05/0476
Sample Condition : Satisfactory	Sample Particulars : Tap Water from Gulbarga, Ward No: 38, Heera Pura , Date of Sampling: 16/05/2014

SL. No.	PARAMETERS	Results	Acceptable Limits as per IS: 10500-2012	Permissible Limits as per IS: 10500-2012	Test Method
1	Free Residual Chlorine, mg/L	1.0	Min.0.2	Min.1.0	IS: 3025 (P 26)
	MICROBIOLOGICAL TESTS:				
2	Description	Colourless and transparent liquid with sediments filled in sterilised bottle.			
3	E. coli Bacteria	Less than 1 CFU	Absent	--	IS: 5881 (Part I) 1976

ANALYST

AUTHORIZED SIGNATORY

NOTE : 1. The result listed refer only to the tested samples & applicable parameters. Endorsement of products is neither inferred nor implied. 2. Samples will be destroyed after 15 days from the date of issue of test certificate unless otherwise specified. 3. This report is not to be reproduced wholly or in part & cannot be used as an evidence in the Court of law & should not be used in any advertising media without our special permission in writing. 4. Sample(s) not drawn by us unless otherwise stated. 5. Total liability of our laboratory is limited to the invoice amount. Any dispute arising out of this report is subject to Bangalore Jurisdiction only.

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OHSAS 18001 : 2007 & ISO 9001 : 2008
JAS-ANZ
Cert. No. RQ91/JA/1111
Cert. No.: RO91/JA/IC/1111

TEST REPORT

Report No. : ED/2014/05/0477	**Report Date** : 22/05/2014
Issued to : IPE Global Private Limited IPE Global House, B 84, Defence Colony, New Delhi, DELHI - 110024.	**Customer Reference** : Data Sheet, Dated: 17/05/2014
	Date of Receipt : 19/05/2014
	Date of Start of Test : 20/05/2014
	Date of Completion of Test : 22/05/2014
Sample Nature/ Name : Tap Water	**Job Order No.** : ED/2014/05/0477
	Sample Particulars : Tap Water from Gulbarga, Ward No: 13, Firdos Colony, Date of Sampling: 17/05/2014
Sample Condition : Satisfactory	

SL. No.	PARAMETERS	Results	Acceptable Limits as per IS: 10500-2012	Permissible Limits as per IS: 10500-2012	Test Method
1	Free Residual Chlorine, mg/L	0.2	Min.0.2	Min.1.0	IS: 3025 (P 26)
	MICROBIOLOGICAL TESTS:				
2	Description	Colourless and transparent liquid with sediments filled in sterilised bottle.			
3	E. coli Bacteria/ml	Less than 1 CFU	Absent	--	IS: 5887 (Part I) 1976

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TEST REPORT

Page : 1 of 1

Report No. : ED/2014/05/0478	**Report Date** : 22/05/2014
Issued to : IPE Global Private Limited IPE Global House, B 84, Defence Colony, New Delhi, DELHI - 110024.	**Customer Reference** : Data Sheet, Dated: 17/05/2014
	Date of Receipt : 19/05/2014
	Date of Start of Test : 20/05/2014
	Date of Completion of Test : 22/05/2014
Sample Nature/ Name : Tap Water	**Job Order No.** : ED/2014/05/0478
	Sample Particulars : Tap Water from Gulbarga, Ward No: 4, Khaja Colony, Date of Sampling: 17/05/2014
Sample Condition : Satisfactory	

SL. No.	PARAMETERS	Results	Acceptable Limits as per IS: 10500-2012	Permissible Limits as per IS: 10500-2012	Test Method
1	Free Residual Chlorine, mg/L	0.2	Min.0.2	Min.1.0	IS: 3025 (P 26)
	MICROBIOLOGICAL TESTS:				
2	Description	Colourless and transparent liquid with sediments filled in sterilised bottle.			
3	E. coli Bacteria/ml	60 CFU	Absent	--	IS: 5887 (Part I) 1976

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Report No. : ED/2014/05/0479		Report Date	: 22/05/2014
Issued to : IPE Global Private Limited IPE Global House, B 84, Defence Colony, New Delhi, DELHI - 110024.		Customer Reference	: Data Sheet, Dated: 17/05/2014
		Date of Receipt	: 19/05/2014
		Date of Start of Test	: 20/05/2014
		Date of Completion of Test	: 22/05/2014
Sample Nature/ Name	: Tap Water	Job Order No.	: ED/2014/05/0479
		Sample Particulars	: Tap Water from Gulbarga, Ward No: 29, Basaveshwar Colony , Date of Sampling: 17/05/2014
Sample Condition	: Satisfactory		

SL. No.	PARAMETERS	Results	Acceptable Limits as per IS: 10500-2012	Permissible Limits as per IS: 10500-2012	Test Method
1	Free Residual Chlorine, mg/L	0.6	Min.0.2	Min.1.0	IS: 3025 (P 26)
	MICROBIOLOGICAL TESTS:				
2	Description	Colourless and transparent liquid with sediments filled in sterilised bottle.			
3	E. coli Bacteria/ml	Less than 1 CFU	Absent	--	IS: 5887 (Part I) 1976

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Page : 1 of 1

Report No. : ED/2014/05/0480	**Report Date** : 22/05/2014
Issued to : **IPE Global Private Limited** **IPE Global House, B 84,** **Defence Colony, New Delhi,** **DELHI - 110024.**	**Customer Reference** : Data Sheet, Dated: 17/05/2014
	Date of Receipt : 19/05/2014
	Date of Start of Test : 20/05/2014
Sample Nature/ Name : Tap Water	**Date of Completion of Test** : 22/05/2014
	Job Order No. : ED/2014/05/0480
	Sample Particulars : Tap Water from Gulbarga, Ward No: 23, Devi Nagar , Date of Sampling: 17/05/2014
Sample Condition : Satisfactory	

SL. No.	PARAMETERS	Results	Acceptable Limits as per IS: 10500-2012	Permissible Limits as per IS: 10500-2012	Test Method
1	Free Residual Chlorine, mg/L	0.6	Min.0.2	Min.1.0	IS: 3025 (P 26)
	MICROBIOLOGICAL TESTS:				
2	Description	Colourless and transparent liquid with sediments filled in sterilised bottle.			
3	E. coli Bacteria/ml	Less than 1 CFU	Absent	--	IS: 5887 (Part I) 1976

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TEST REPORT

Report No. : ED/2014/05/0481	**Report Date** : 22/05/2014
Issued to : IPE Global Private Limited IPE Global House, B 84, Defence Colony, New Delhi, DELHI - 110024.	**Customer Reference** : Data Sheet, Dated: 17/05/2014
	Date of Receipt : 19/05/2014
	Date of Start of Test : 20/05/2014
	Date of Completion of Test : 22/05/2014
Sample Nature/ Name : Tap Water	**Job Order No.** : ED/2014/05/0481
	Sample Particulars : Tap Water from Gulbarga, Ward No: 18, Lal Hanuman Gudi, Shasa Bajer, DOS: 17/05/2014
Sample Condition : Satisfactory	

SL. No.	PARAMETERS	Results	Acceptable Limits as per IS: 10500-2012	Permissible Limits as per IS: 10500-2012	Test Method
1	Free Residual Chlorine, mg/L	0.2	Min.0.2	Min.1.0	IS: 3025 (P 26)
	MICROBIOLOGICAL TESTS:				
2	Description	Colourless and transparent liquid with sediments filled in sterilised bottle.			
3	E. coli Bacteria/ml	Less than 1 CFU	Absent	--	IS: 5887 (Part I) 1976

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TEST REPORT

Report No. : ED/2014/05/0482	**Report Date** : 22/05/2014
Issued to : IPE Global Private Limited IPE Global House, B 84, Defence Colony, New Delhi, DELHI - 110024.	**Customer Reference :** Data Sheet, Dated: 17/05/2014
	Date of Receipt : 19/05/2014
	Date of Start of Test : 20/05/2014
Sample Nature/ Name : Tap Water	**Date of Completion of Test** : 22/05/2014
	Job Order No. : ED/2014/05/0482
	Sample Particulars : Tap Water from Gulbarga, Ward No: 45, Raja Pura, Date of Sampling: 17/05/2014
Sample Condition : Satisfactory	

SL. No.	PARAMETERS	Results	Acceptable Limits as per IS: 10500-2012	Permissible Limits as per IS: 10500-2012	Test Method
1	Free Residual Chlorine, mg/L	0.6	Min.0.2	Min.1.0	IS: 3025 (P 26)
	MICROBIOLOGICAL TESTS:				
2	Description	Colourless and clear transparent liquid filled in sterilised bottle.			
3	E. coli Bacteria/ml	Less than 1 CFU	Absent	--	IS: 5887 (Part I) 1976

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TEST REPORT

Report No. : ED/2014/05/0483	**Report Date** : 29/05/2014
Issued to : IPE Global Private Limited IPE Global House, B 84, Defence Colony, New Delhi, DELHI - 110024.	**Customer Reference** : Data Sheet, Dated: 17/05/2014 **Date of Receipt** : 19/05/2014 **Date of Start of Test** : 19/05/2014 **Date of Completion of Test** : 29/05/2014 **Job Order No.** : ED/2014/05/0483
Sample Nature/ Name : Raw Water	**Sample Particulars** : Water from Gulbarga, River Intake at Harasur Village on Bennithora Scheme, DOS: 17/05/2014
Sample Condition : Satisfactory	

SL. No.	PARAMETERS	Results	Acceptable Limits as per IS: 10500-2012	Permissible Limits as per IS: 10500-2012	Protocol
	Table 1: Organoleptic and Physical Parameter				
1	Colour, Hazen units	16.2	Max.5	Max.15	IS: 3025 (P 4)
2	Odour	Agreeable	Agreeable	--	IS: 3025 (P 5)
3	Taste	Not Agreeable	Agreeable	Agreeable	IS: 3025 (P 7&8)
4	Turbidity, NTU	38.0	Max.1	Max.5	IS: 3025 (P 10)
5	pH	8.36 @ 24 deg C	6.50 to 8.50	No relaxation	IS: 3025 (P 11)
6	Total Dissolved solids, mg/L	342.0	Max.500	Max.2000	IS: 3025 (P 16)
	Table 2: General Parameters				
7	Aluminium, as Al, mg/L	0.026	Max.0.03	Max.0.2	IS: 3025 (P 55)
8	Ammonia, as NH3, mg/L	< 0.05	Max.0.5	No relaxation	IS: 3025 (P 34)
9	Anionic Detergents, as MBAS, mg/L	< 0.2	Max.0.2	Max.1.0	Annex K of IS: 13428
10	Barium, as Ba, mg/L	< 0.1	Max.0.7	No relaxation	IS: 15302
11	Boron, as B, mg/L	< 0.1	Max.0.5	Max.1.0	IS: 3025 (P 57)
12	Calcium, as Ca, mg/L	22.9	Max.75	Max.200	IS: 3025 (P 40)
13	Chloramines, as Cl2, mg/L	< 0.05	Max.4.0	No relaxation	IS: 3025 (P 26)
14	Chlorides, as Cl, mg/L	29.9	Max.250	Max.1000	AN-S-003
15	Copper, as Cu, mg/L	< 0.05	Max.0.05	Max.1.5	IS: 3025 (P 42)
16	Fluorides, as F, mg/L	0.5	Max.1.0	Max.1.5	AN-S-003
17	*Free Residual Chlorine, mg/L	< 0.05	Min.0.2	Min.1.0	IS: 3025 (P 26)
18	Iron, as Fe, mg/L	2.1	Max.0.3	No relaxation	IS: 3025 (P 53)
19	Magnesium, as Mg, mg/L	18.9	Max.30	Max.100	IS: 3025 (P 46)

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	Date of Receipt : 19/05/2014
	Date of Start of Test : 19/05/2014
	Date of Completion of Test : 29/05/2014
Sample Nature/ Name : Raw Water	**Job Order No.** : ED/2014/05/0483
	Sample Particulars : Water from Gulbarga, River Intake at Harasur Village on Bennithora Scheme, DOS: 17/05/2014
Sample Condition : Satisfactory	

SL. No.	PARAMETERS	Results	Acceptable Limits as per IS: 10500-2012	Permissible Limits as per IS: 10500-2012	Protocol
20	Manganese, as Mn, mg/L	< 0.1	Max.0.1	Max.0.3	IS: 3025 (P 59)
21	Nitrates, as NO3, mg/L	1.7	Max.45	No relaxation	AN-S-003
22	Phenolic compounds, as C6H5OH, mg/L	Absent	Max.0.001	Max.0.002	IS: 3025 (P 43)
23	Selenium, as Se, mg/L	< 0.01	Max.0.01	No relaxation	IS: 3025 (P 56)
24	Silver, as Ag, mg/L	< 0.01	Max.0.1	No relaxation	Annex J of IS: 13428
25	Sulphates, as SO4, mg/L	25.5	Max.200	Max.400	AN-S-003
26	Sulphide, as H2S, mg/L	< 0.05	Max.0.05	No relaxation	IS: 3025 (P 29)
27	Total Alkalinity, as CaCO3, mg/L	210.7	Max.200	Max.600	IS: 3025 (P 23)
28	Zinc, as Zn, mg/L	0.02	Max.5	Max.15	IS: 3025 (P 49)
29	Total Hardness, as CaCO3, mg/L	134.6	Max.200	Max.600	IS: 3025 (P 21)
	Table 3: Toxic Substances				
30	Cadmium, as Cd, mg/L	< 0.003	Max.0.003	No relaxation	IS: 3025 (P 41)
31	Cyanide, as CN, mg/L	Absent	Max.0.05	No relaxation	APHA
32	Lead, as Pb, mg/L	< 0.01	Max.0.01	No relaxation	IS: 3025 (P 47)
33	Mercury, as Hg, mg/L	< 0.001	Max.0.001	No relaxation	IS: 3025 (P 48)
34	Molybdenum, as Mo, mg/L	< 0.01	Max.0.07	No relaxation	By GFAAS
35	Nickel, as Ni, mg/L	< 0.01	Max.0.02	No relaxation	IS: 3025 (P 54)
36	Total Arsenic, as As, mg/L	< 0.01	Max.0.01	Max.0.05	IS: 3025 (P 37)
37	Total Chromium, as Cr, mg/L	< 0.01	Max.0.05	No relaxation	IS: 3025 (P 52)
38	* Applicable for Chlorinated water				

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Report No. : ED/2014/05/0483	**Report Date** : 29/05/2014
Issued to : IPE Global Private Limited IPE Global House, B 84, Defence Colony, New Delhi, DELHI - 110024.	**Customer Reference** : Data Sheet, Dated: 17/05/2014
	Date of Receipt : 19/05/2014
	Date of Start of Test : 19/05/2014
	Date of Completion of Test : 29/05/2014
Sample Nature/ Name : Raw Water	**Job Order No.** : ED/2014/05/0483
	Sample Particulars : Water from Gulbarga, River Intake at Harasur Village on Bennithora Scheme, DOS: 17/05/2014
Sample Condition : Satisfactory	

SL. No.	PARAMETERS	Results	Acceptable Limits as per IS: 10500-2012	Permissible Limits as per IS: 10500-2012	Protocol
MICROBIOLOGICAL TESTS:					
	Description	Almost colourless liquid with sediments filled in plastic can.			
1	Coliform organisms/100ml	920000	Less than 1	--	IS: 1622 - 1981
2	E. coli Bacteria/100ml	Present	Absent	--	IS: 1622 - 1981

Remarks : The sample does not conform to IS: 10500-2012 for Chemical/Microbiological tests in the above respect.
The sample is unfit for drinking in the above respect.

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TEST REPORT

Report No. : ED/2014/05/0484	Report Date : 29/05/2014
Issued to : IPE Global Private Limited IPE Global House, B 84, Defence Colony, New Delhi, DELHI - 110024.	Customer Reference : Data Sheet, Dated: 17/05/2014
	Date of Receipt : 19/05/2014
	Date of Start of Test : 19/05/2014
	Date of Completion of Test : 29/05/2014
Sample Nature/ Name : Treated Water	Job Order No. : ED/2014/05/0484
	Sample Particulars : Water After Clear Water Reservoir at Shorgumbaz WTP, DOS: 17/05/2014
Sample Condition : Satisfactory	

SL. No.	PARAMETERS	Results	Acceptable Limits as per IS: 10500-2012	Permissible Limits as per IS: 10500-2012	Protocol
	Table 1: Organoleptic and Physical Parameter				
1	Colour, Hazen units	6.9	Max.5	Max.15	IS: 3025 (P 4)
2	Odour	Agreeable	Agreeable	--	IS: 3025 (P 5)
3	Taste	Not Agreeable	Agreeable	Agreeable	IS: 3025 (P 7&8)
4	Turbidity, NTU	12.1	Max.1	Max.5	IS: 3025 (P 10)
5	pH	7.76 @ 24 deg C	6.50 to 8.50	No relaxation	IS: 3025 (P 11)
6	Total Dissolved solids, mg/L	336.0	Max.500	Max.2000	IS: 3025 (P 16)
	Table 2: General Parameters				
7	Aluminium, as Al, mg/L	0.07	Max.0.03	Max.0.2	IS: 3025 (P 55)
8	Ammonia, as NH3, mg/L	< 0.05	Max.0.5	No relaxation	IS: 3025 (P 34)
9	Anionic Detergents, as MBAS, mg/L	< 0.2	Max.0.2	Max.1.0	Annex K of IS: 13428
10	Barium, as Ba, mg/L	< 0.1	Max.0.7	No relaxation	IS: 15302
11	Boron, as B, mg/L	< 0.1	Max.0.5	Max.1.0	IS: 3025 (P 57)
12	Calcium, as Ca, mg/L	24.5	Max.75	Max.200	IS: 3025 (P 40)
13	Chloramines, as Cl2, mg/L	< 0.05	Max.4.0	No relaxation	IS: 3025 (P 26)
14	Chlorides, as Cl, mg/L	34.3	Max.250	Max.1000	AN-S-003
15	Copper, as Cu, mg/L	< 0.05	Max.0.05	Max.1.5	IS: 3025 (P 42)
16	Fluorides, as F, mg/L	0.5	Max.1.0	Max.1.5	AN-S-003
17	*Free Residual Chlorine, mg/L	0.1	Min.0.2	Min.1.0	IS: 3025 (P 26)
18	Iron, as Fe, mg/L	0.89	Max.0.3	No relaxation	IS: 3025 (P 53)
19	Magnesium, as Mg, mg/L	20.8	Max.30	Max.100	IS: 3025 (P 46)

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Format No. BTH/QF/164

BANGALORE TEST HOUSE

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OHSAS 18001 : 2007 & ISO 9001 : 2008
JAS-ANZ
Cert. No. RQ91/JA/1111
Cert. No.: RO91/JA/C/1111

TEST REPORT

Report No. : ED/2014/05/0484	**Report Date** : 29/05/2014
Issued to : IPE Global Private Limited IPE Global House, B 84, Defence Colony, New Delhi, DELHI - 110024.	**Customer Reference** : Data Sheet, Dated: 17/05/2014 **Date of Receipt** : 19/05/2014 **Date of Start of Test** : 19/05/2014 **Date of Completion of Test** : 29/05/2014 **Job Order No.** : ED/2014/05/0484
Sample Nature/ Name : Treated Water	**Sample Particulars** : Water After Clear Water Reservoir at Shorgumbaz WTP, DOS: 17/05/2014
Sample Condition : Satisfactory	

SL. No.	PARAMETERS	Results	Acceptable Limits as per IS: 10500-2012	Permissible Limits as per IS: 10500-2012	Protocol
20	Manganese, as Mn, mg/L	< 0.1	Max.0.1	Max.0.3	IS: 3025 (P 59)
21	Nitrates, as NO3, mg/L	1.7	Max.45	No relaxation	AN-S-003
22	Phenolic compounds, as C6H5OH, mg/L	Absent	Max.0.001	Max.0.002	IS: 3025 (P 43)
23	Selenium, as Se, mg/L	< 0.01	Max.0.01	No relaxation	IS: 3025 (P 56)
24	Silver, as Ag, mg/L	< 0.01	Max.0.1	No relaxation	Annex J of IS: 13428
25	Sulphates, as SO4, mg/L	45.0	Max.200	Max.400	AN-S-003
26	Sulphide, as H2S, mg/L	< 0.05	Max.0.05	No relaxation	IS: 3025 (P 29)
27	Total Alkalinity, as CaCO3, mg/L	189.2	Max.200	Max.600	IS: 3025 (P 23)
28	Zinc, as Zn, mg/L	0.01	Max.5	Max.15	IS: 3025 (P 49)
29	Total Hardness, as CaCO3, mg/L	146.9	Max.200	Max.600	IS: 3025 (P 21)
	Table 3: Toxic Substances				
30	Cadmium, as Cd, mg/L	< 0.003	Max.0.003	No relaxation	IS: 3025 (P 41)
31	Cyanide, as CN, mg/L	Absent	Max.0.05	No relaxation	APHA
32	Lead, as Pb, mg/L	< 0.01	Max.0.01	No relaxation	IS: 3025 (P 47)
33	Mercury, as Hg, mg/L	< 0.001	Max.0.001	No relaxation	IS: 3025 (P 48)
34	Molybdenum, as Mo, mg/L	< 0.01	Max.0.07	No relaxation	By GFAAS
35	Nickel, as Ni, mg/L	< 0.01	Max.0.02	No relaxation	IS: 3025 (P 54)
36	Total Arsenic, as As, mg/L	< 0.01	Max.0.01	Max.0.05	IS: 3025 (P 37)
37	Total Chromium, as Cr, mg/L	< 0.01	Max.0.05	No relaxation	IS: 3025 (P 52)
38	* Applicable for Chlorinated water				

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	Sample Particulars : Water After Clear Water Reservoir at Shorgumbaz WTP, DOS: 17/05/2014
Sample Condition : Satisfactory	

SL. No.	PARAMETERS	Results	Acceptable Limits as per IS: 10500-2012	Permissible Limits as per IS: 10500-2012	Protocol
MICROBIOLOGICAL TESTS:					
	Description	Colourless liquid with sediments filled in plastic can.			
1	Coliform organisms/100ml	1400	Less than 1	--	IS: 1622 - 1981
2	E. coli Bacteria/100ml	Present	Absent	--	IS: 1622 - 1981

Remarks : The sample does not conform to IS: 10500-2012 for Chemical/Microbiological tests in the above respect.

The sample is unfit for drinking in the above respect.

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