

Initial Environmental Examination

March 2016

IND: Bihar Urban Development Investment Program—Bhagalpur Water Supply Subproject

Prepared by Bihar Urban Infrastructure Development Corporation Limited of the Government of Bihar for the Asian Development Bank. This is an updated version of the draft originally posted in January 2012 available on <http://www.adb.org/projects/41603-023/documents>.

Initial Environmental Examination

Final
Updated

March 2016

**IND: Bihar Urban Development Investment Program
—Improvement of Water Supply System at Bhagalpur
(BWSP1)**

WTP Refurbishment, Construction of New Water Storage Reservoir, Laying of Water Distribution Pipelines, customer care center and Arrangement of Metered House Connection at all the DMAs

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ABBREVIATIONS

ADB	Asian Development Bank
AP	Affected Person
ASI	Archaeological Survey of India
BOQ	Bill of Quantities
BPL	Below Poverty Line
BUDIP	Bihar Urban Development Investment Program
BUIDCO	Bihar Urban Infrastructure Development Corporation
CBO	Community-based organization
CBD	Central Business District
CFE	Consent for Establishment
CFO	Consent for Operation
CGWB	Central Ground Water Board
CWR	Clear water reservoir
DLAO	District Land Acquisition Officer
DSC	Design and Supervision Consultant
EAC	Expert Appraisal Committee
EARF	Environmental Assessment and Review Framework
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMS	Environmental Monitoring Specialist
EPA	Environmental Protection Agency
ESMC	Environment and Social Management Cell
GoB	Government of Bihar
GRC	Grievance Redress Committee
GSHAP	Global Seismic Hazard Assessment Program
H & S	Health and safety
IR	Involuntary Resettlement
IEE	Initial Environmental Examination
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
LAA	Land Acquisition Act
MFF	Multi-tranche financing facility
MLD	Million liters per day
MOEFCC	Ministry of Environment, Forests and Climate Change
NAAQS	National Ambient Air Quality Standards
NGO	Nongovernmental organization
NRRP	National Resettlement and Rehabilitation Policy
NRW	Non-revenue water
O & M	Operation and maintenance
OHSA	Occupational Health and Safety Administration
OHT	Overhead tank
PHED	Public Health Engineering Department
PIU	Project Implementation Unit
PMC	Project Management Consultant
PMU	Project Management Unit
RF	Resettlement Framework

ROW	Rights-of-way
RP	Resettlement Plan
RS	Resettlement Specialist
SDS	Social Development Specialist
SEIAA	State Environment Impact Assessment Authority
SPS	Safeguard Policy Statement
STP	Sewage treatment plant
TDS	Total dissolved solids
TOR	Terms of reference
UFW	Unaccounted for water
UIDSSMT	Urban Infrastructure Development Scheme for Small and Medium Towns
ULB	Urban local body
USEPA	United States Environmental Protection Agency
WTP	Water treatment plant

Weights and Measures

lakh	–	100 thousand = 100,000 100 lakhs = 10,000,000
$\mu\text{g}/\text{m}^3$	–	micrograms per cubic meter
km	–	kilometer
lpd	–	liters per day
m	–	Meter
mg/l	–	milligrams per liter
mm	–	millimeter
ppm	–	parts per million

Note{s}

- (i) "\$" refers to US dollars
- (ii) "INR" and "Rs" refer to Indian rupees

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EXECUTIVE SUMMARY

1. Bihar Urban Development Investment Program (BUDIP) will help to improve social and economic development in two selected towns/cities in the State, particularly district headquarters with significant development potential. BUDIP is funded by a Multi-tranche Financing Facility (MFF) loan from the Asian Development Bank (ADB). The Executing Agency (EA) is the Urban Development & Housing Department (UDHD) of the Government of Bihar (GoB); and the Implementing Agency is the Bihar Urban Infrastructure Development Corporation (BUIDCo) which is the Project Management Unit (PMU) for BUDIP. ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for Environmental Assessment are described in ADB's Safeguard Policy Statement (SPS). This states that ADB requires Environmental Assessment of all project loans, program loans, sector loans, sector development program loans, loans involving financial intermediaries, and private sector loans.

2. Initial Environmental Examination report of the project was prepared for Tranche 1 of Bhagalpur water supply and disclosed in website in the year 2013. In the year (October 2014) DBO contractor was selected for the said project and carried out detail design (service improvement plan) for the project. This is updated Initial Environmental Examination (IEE). The report is updated as per final design. Now Bhagalpur Water Supply Project 1 (BWSP1) is ready for implementation under Tranche 1 loan. The Tranche 1 investments for Bhagalpur comprise of: (i) rehabilitation of existing Barari Water Works, WTP and treated water pumping stations; (ii) construction of 19 new Overhead Tanks (OHTs) and (iii) construction of new distribution network and integration of rehabilitated existing networks; (iv) provision of service connections to achieve full coverage; and (v) operations, maintenance and service provision to customers.

3. An Environmental Management Plan (EMP) is proposed as part of this report which includes (i) mitigation measures for significant environmental impacts during implementation, (ii) an environmental monitoring program, and the responsible entities for mitigation, monitoring, and reporting; (iii) a process for public consultation and information disclosure; and (iv) a grievance redress mechanism.

4. BWSP1 is needed because the present water supply system is inadequate for the needs of the growing population. Per capita supply is as low as 34 liters per day (lpcd) compared with the required 135 lpcd and unaccounted for water (UFW) is over 40%. The storage and distribution network is insufficient to meet even present requirements. Improvement in the water supply system has been identified as a major priority for Bhagalpur town.

5. The final design and cost estimation for Tranche 1 works has been completed by DBO contractor in Oct 2015. The Development (works) Phase of the subproject will start from the end of year 2015 and will be completed by 2019, and the Contract Completion Date (end of Operations) is 2022.

6. The subproject sites are located in the built-up area of Bhagalpur town, and are generally flat. While the region is classified as prone to earthquakes, cyclones and floods, historically the only significant impact has been some water logging and flash flooding in the area of the Barari water works. There is one protected area known as the Vikramshila Gangetic Dolphin Sanctuary. This is located within the River Ganga from where water is being drawn through the existing intake structures. However, since this has been the practice for the past hundred years since prior to the declaration of the Sanctuary, the Tranche 1 subproject will have no further impact.

7. There are no wetlands, mangroves, or estuaries in or within the subproject sites. Trees, vegetation (mostly shrubs and grasses), and animals in the subproject area are those commonly found in urban areas. The subproject sites are not located in agricultural lands. The subproject sites are not located in or near any historically, culturally, archaeologically or

architecturally significant or tourist areas.

8. Potential negative impacts were identified in relation to construction and operation of the improved infrastructure. No impacts were identified due to the project design or location. As per design tree cutting will be needed at 2 OHT locations and customer service centre at Barari. Mitigation measures have been developed to minimize all negative impacts to acceptable levels.

9. There are no Asbestos Cement Pipes existing and no such pipes have been proposed in the current investments and so any related hazard from asbestos fibres has been avoided. During the construction phase, impacts mainly arise from the need to dispose of large quantities of waste soil and import a similar amount of sand to support the pipes in the trenches, and from the disturbance of residents, businesses, traffic and important buildings by the construction work. These are common impacts of construction in urban areas, and there are well developed methods for their mitigation.

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

11. Once the system is operating, most facilities (such as water treatment works, pumping facilities, and OHTs) will operate with routine maintenance, which should not affect the environment. Leaks in the distribution network will need to be repaired from time to time, but environmental impacts will be much less than those of the construction period as the work will be infrequent, affecting small areas only. It will also be conducted in areas that have already been excavated, so there will be no need to have special protection measures for archaeological material which should have been identified during construction.

12. The main impact of the operating water supply system will be benefits to the citizens of Bhagalpur. They will be provided with a continuous pressurized supply of safe water with a positive effect on the quality of life, especially public health. This will reduce the incidence of disease associated with poor quality of water supply and sanitation. This will also lead to economic gains as people will have a reliable and secure water supply available at all times thus reducing efforts in coping with intermittent water supply. The time thus saved would result in an increase in their income and savings in medical care costs.

13. Mitigation will be assured by a program of environmental monitoring conducted during construction and operation to ensure that all measures in the EMP are implemented and to determine whether the environment is protected as intended. This will include observations on- and off-site, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported to the PMU. There will also be longer-term surveys to monitor the expected improvements in the quality of domestic water and the health of the population.

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

15. Therefore the subproject is unlikely to cause significant adverse impacts. The potential adverse impacts that are associated with design, construction, and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures. In the current tranche water will continue to be pumped from the existing intake wells in the River

Ganga. This is unlikely to have any impact on the Vikramshila Gangetic Dolphin Sanctuary as the existing intake works have been operating for more than 100 years since before the declaration of the Vikramshila Gangetic Dolphin Sanctuary.

16. Based on the findings of the IEE, the classification of the Rehabilitation, Construction, Operations, Maintenance, and Management of Bhagalpur Water Supply Project 1 (BWSP1) as Category "B" is confirmed, and no further special study or detailed EIA needs to be undertaken to comply with ADB SPS (2009) or GoI EIA Notification (2006). There is no requirement of any No Objection Certificate (NOC) or Clearance under the Wildlife Protection Act, 1972.

I. INTRODUCTION

A Purpose of the Report

17. The Bihar Urban Development Investment Program (BUDIP) is expected to improve the urban environment and living conditions in targeted urban areas. It will: (i) improve and expand urban infrastructure and services in urban areas; and (ii) strengthen urban institutional, management, and the financing capacity of the institutions, including the urban local bodies (ULBs). The project will be implemented in 2 urban areas: Bhagalpur and Gaya in the state of Bihar.

18. BUDIP currently being implemented is funded by Multi-tranche Financing Facility (MFF) loan from the Asian Development Bank (ADB). The Executing Agency (EA) is the Urban Development & Housing Department (UDHD) of the Government of Bihar (GoB); and the Implementing Agency (IA) is the Bihar Urban Infrastructure Development Corporation (BUIDCO), which is the Project Management Unit (PMU) for BUDIP.

19. Initial Environmental Examination report of the project was prepared for Tranche 1 of Bhagalpur water supply and disclosed in website in the year 2013. In the year (October 2014) DBO contractor was selected for the said project and carried out detail design (service improvement plan) for the project. This is updated Initial Environmental Examination (IEE). The report is updated as per final design. Now Bhagalpur Water Supply Project 1 (BWSP1) is ready for implementation under Tranche 1 loan. Package work includes rehabilitation of existing water treatment works including pumping machinery and instrumentation, construction of 19 new OHTs, phased development of a new distribution system including metered customer connections and construction of new service centers and rehabilitation of existing service centers..

20. This IEE report covers the general environmental profile of Bhagalpur and includes an overview of the potential environmental impacts and their magnitude on physical, ecological, economic, social and cultural resources within the subproject's influence area during design, construction, and operation stages. An Environmental Management Plan (EMP) is also proposed as part of this report which includes mitigation measures for significant environmental impacts during implementation of the project, and an environmental monitoring program, including the responsible entities for mitigation, monitoring and reporting.

21. The legal framework and principles adopted for addressing environmental issues in the proposed subproject have been guided by the existing legislation and policies of the Government of India, Government of Bihar, Asian Development Bank and the Environmental Assessment Review Framework (EARF) adopted for BUDIP. ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS), 2009. According to the SPS, environmental assessment is required for all subprojects under a MFF modality.

22. An environmental assessment using ADB's Rapid Environmental Assessment (REA) through checklist for Water Supply (**Ref. Appendix 1**) was conducted for the Augmentation of Water Supply for Bhagalpur under the Tranche 1.

23. The subproject comprises of (i) WTP refurbishment, (ii) construction of new Water Storage Reservoirs, (iv) laying of water distribution pipelines, (v) arrangement of metered house connection at all the DMAs and (vi) Customer Service Center. In addition Multi-year operation of the entire water supply system and capacity building/training of Bhagalpur Municipal water Supply staff.

24. BWSP1 sub-project is a DBO contract where the contractor had during the first year, prepared a service improvement plan (SIP) and designs for the distribution network, overhead tanks and renovation of the existing water treatment plant (WTP). 3.5 years are

allowed for construction. He also taken operation and management of the entire water supply system after half a year from contract commencement date and will remain responsible for this till contract end in 8 years.

25. Results of the assessment show that the proposed development is unlikely to cause significant adverse impacts. Thus this Initial Environmental Examination (IEE) report has been prepared in accordance to ADB SPS's requirements for environment **Category B** projects.

B Extent of the IEE Study

26. This IEE report is prepared on the basis of detailed screening and analysis of all environmental parameters, field investigations and stakeholder consultations to meet the requirements for Environmental Assessment process and documentation per ADB's Safeguard Policy Statement (SPS, 2009) and the Government of India Environmental Impact Assessment (EIA) Notification of 2006.

27. The IEE has been prepared to meet the following objectives:

- (i) to provide critical facts, significant findings, and recommended actions;
- (ii) to present the national and local legal and institutional framework within which the environmental assessment has been carried out;
- (iii) to provide information on the existing geographic, ecological, social and temporal context including associated facilities within the subproject's area of influence;
- (iv) to assess the subproject's likely positive and negative direct and indirect impacts to physical, biological, socio-economic and physical cultural resources in the subproject's area of influence;
- (v) to identify mitigation measures and any residual negative impacts that cannot be mitigated;
- (vi) to describe the process undertaken during project design to engage stakeholders and the planned information disclosure measures and the process for carrying out consultation with affected people and facilitating their participation during project implementation;
- (vii) to describe the subproject's grievance redressal mechanism for resolving complaints about environmental performance;
- (viii) to present the set of mitigation measures to be undertaken to avoid, reduce, mitigate or compensate for adverse environmental impacts;
- (ix) to describe the monitoring measures and reporting procedures to ensure early detection of conditions that necessitate particular mitigation measures; and
- (x) to identify who is responsible for carrying out the mitigation and monitoring measures.

C. Environmental Regulatory Compliance

ADB Policy

28. ADB requires the consideration of environmental issues in all aspects of ADB's operations, and the requirements for Environmental Assessment are described in ADB SPS 2009. This states that ADB requires Environmental Assessment of all project loans, program loans, sector loans, sector development program loans, loans involving financial intermediaries, and private sector loans.

29. **Screening and Categorization:** The nature of the environmental assessment

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

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

30. **Environmental Management Plan.** An EMP which addresses the potential impacts and risks identified by the environmental assessment shall be prepared. The level of detail and complexity of the EMP and the priority of the identified measures and actions will be commensurate with the Project's impact and risks.

31. **Public Disclosure.** ADB will post the following safeguard documents on its website so affected people, other stakeholders and the general public can provide meaningful inputs into the project design and implementation:

- (i) For environmental category A projects, draft EIA report at least 120 days before Board consideration;
- (ii) Final or updated EIA and/or IEE upon receipt; and
- (iii) Environmental Monitoring Reports submitted by PMU during project implementation upon receipt.

32. The above is to meet the requirements of ADB's Public Communication Policy 2011.

National and State Laws

33. The implementation of the subprojects will be governed by Government of India (GoI) and State of Bihar environmental acts, rules, regulations, and standards. These regulations impose restrictions on the activities to minimize/mitigate likely impacts on the environment. It is the responsibility of the project executing and implementing agencies to ensure subprojects are consistent with the legal framework, whether national, state or municipal/local. Compliance is required in all stages of the subproject including design, construction, and operation and maintenance.

34. **EIA Notification. The GoI EIA Notification of 2006, as amended (replacing the EIA Notification of 1994),** sets out the requirement for environmental assessment in India. This states that Environmental Clearance (EC) is required for specified activities/projects, and this must be obtained before any construction work or land preparation (except land acquisition) may commence. Projects are categorized as A or B depending on the scale of the project and the nature of its impacts. Category A projects requires Environmental Clearance from the Ministry of Environment, Forests and climate Change (MoEFCC). Category B projects require environmental clearance from the State Environment Impact Assessment Authority (SEIAA).

35. The proposed subproject is not listed in the EIA Notification of 2006 "Schedule of Projects Requiring Prior Environmental Clearance" thus EC is not required.

36. **Water (Prevention and Control of Pollution) Act of 1974, Rules of 1975, and amendments.** Control of water pollution is achieved through administering conditions imposed in consent issued under provision of the Water (Prevention and Control of Pollution) Act, 1974. These conditions regulate the quality and quantity of effluent, the location of discharge and the frequency of monitoring of effluents. Any component of the Project having potential to generate sewage or trade effluent will come under the purview of this Act, its rules and amendments. Such projects have to obtain Consent to Establish (CTE) under Section 25/26 of the Act from State Pollution Control Board (SPCB) before starting implementation and Consent to Operate (CTO) before commissioning. The Water Act also requires the occupier of such subprojects to take measures for abating the possible pollution of receiving water bodies.

37. The proposed subproject component rehabilitation of WTP will be required CTE and CTO under the Water Act. Emissions and discharges shall comply with standards notified by the Central Pollution Control Board. Consent to Establish for rehabilitation of WTP is received on 09.03.2016.

38. **The Air (Prevention and Control of Pollution) Act 1981, amended 1987 and The Air (Prevention and Control of Pollution) Rules, 1982.** The subprojects having potential to emit air pollutants into the atmosphere have to obtain CTE under Section 21 of the Air (Prevention and Control of Pollution) Act of 1981 from SPCB before starting implementation and CTO before commissioning the project. The occupier of the project/facility has the responsibility to adopt necessary air pollution control measures for abating air pollution. The following require CTE and CTO from Bihar Pollution Control Board: (i) diesel generators; and (ii) hot mix plants, wet mix plants, stone crushers etc, if installed for construction. Emissions and discharges shall comply with standards notified by the Central Pollution Control Board.

39. **The Noise Pollution (regulation and control) rules, 2000, as amended.** Since the subproject corridor/ area is located within the city, the construction activity and use of heavy machinery and vehicles may increase the ambient noise levels during the construction phase. It is considered necessary to regulate and control noise producing and generating sources with the objective of maintaining the ambient air quality standards in respect of noise. The occupier of subprojects have to take measures for abatement of noise pollution ensuring that the existing noise levels do not exceed the standards specified under the Noise Pollution (regulation and control) rules, 2000, as amended.

40. **The Indian Forest Act, 1927; Forest (Conservation) Act, 1980, amended 1988; Forest (Conservation) Rules, 1981 amended 1992 and 2003; and Guidelines for Diversion of Forest Lands for Non-Forest Purpose under the Forest (Conservation) Act, 1980**

41. **The Forest (Conservation) Act, 1980** applies to diversion of forest areas and felling of roadside plantations. Depending on the size of the tract to be cleared, clearances are applied for at the following levels of Government:

- Forest land involving up to 5 hectares (ha) will be cleared by the Regional Office of MoEFCC.
- Forest land involving more than 5 ha and up to 20 ha will be cleared by the Regional Office after referring the case to MoEFCC.
- Conversion of forest land (i) having density above 0.4 irrespective of the area involved, and, (ii) of more than 20 ha in the plains and 10 ha in the hilly region, irrespective of density, will be cleared by MoEFCC.

42. The Act requires:

- Compensatory afforestation is compulsory for conversion.
- Afforestation will be done over an equivalent area of non-forest land.
- As far as possible, the non-forest land for compensatory afforestation should be identified contiguous to or in the proximity of Reserved Forest or Protected Forest. If non-forest lands are not available in the same district other non-forest land may be identified elsewhere in the State.
- Where non-forest lands are not available, compensatory afforestation may be carried out over degraded forest twice in extent to the area being diverted.

43. The forest land conversion will follow the “Guidelines for Diversion of Forest Lands for Non-Forest Purpose” under the Act. Restrictions and clearance procedure proposed in the Act applies wholly to the natural forest areas, even in case the protected/designated forest area does not have any vegetation cover.

44. For felling of trees permission will be required from line agency/ Urban Local Body and State Forest Department. As per the provision of forest act compensation i.e. plantation of 3 trees for each tree fell will be followed. During the selection of alignment routes the network designer will screen the subproject areas to find the best alternatives to minimize impacts on trees.

45. The Bihar Forest (Amended) Act, 1990 and Bihar Public Land Encroachment Act, 1956 (BPLE)

46. The Bihar Forest (Amended) Act, 1990 provides that encroachment of forest land is a cognizable and non-bailable offence. If any Forest Officer, not below the rank of the Divisional Forest Officer (DFO), has reasons to believe that forest land has been encroached, the Officer can evict the encroachers and can use all power conferred on a Magistrate under the Bihar Public Land Encroachment Act, 1956. The Indian Forest Act, 1927 provides realization of royalty and compensation for damages of forest produce and forest land from the encroachers.

47. Ancient Monuments and Archaeological Sites and Remains Rules, 1959. Bihar Ancient Monuments and Archaeological Sites, remains And Art Treasures Act, 1976.

48. The Rules designate areas within a radius of 100m and 300m from the “protected property” as “protected area” and “controlled area” respectively. No development activity (including mining operations and construction) is permitted in the “protected area” and all development activities likely to damage the protected property are not permitted in the “controlled area” without prior permission of the Archaeological Survey of India (ASI). Protected property includes the site, remains, and monuments protected by ASI or the State Department of Archaeology.

49. As per state Rules No person, including the owner or occupier of a protected area, shall construct any building within protected area or carry on any mining, quarrying excavating, blasting or any operation of a like nature in such area, or utilize such area or any part thereof in any other manner without the permission of the State Government:

50. Subproject activities within Archaeologically Protected Areas will be avoided. If activities are to be done in the controlled area of protected properties, then the executing and implementing agencies and the line department will have to take the necessary NOC from ASI.

51. There is no requirement for NOC from archeological Survey of India (ASI), Govt. of India. But in case of chance finds, the protocol should be followed as per mitigation measures addressed in Environmental Management Plan.

International Environmental Agreements

52. In addition to national and state rules and regulations, international conventions such

as the International Union for Conservation of Nature and Natural Resources (IUCN), Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Convention on Migratory Species of Wild Animals (CMS), Ramsar Convention on Wetlands of International Importance and Millennium Development Goals are applicable for selection and screening of subprojects under restricted/sensitive areas. India is a party to these conventions.

- **International Union for Conservation of Nature and Natural Resources (IUCN)**

53. The IUCN Red List of Threatened Species (also known as the IUCN Red List or Red Data List), founded in 1963, is a comprehensive inventory of the global conservation status of plant and animal species. The IUCN is an authority on the conservation status of species. A series of Regional Red Lists are produced by countries or organizations, which assess the risk of extinction to species within a political management unit. The IUCN Red List is set upon precise criteria to evaluate the extinction risk of thousands of species and subspecies. These criteria are relevant to all species and all regions of the world. The aim is to convey the urgency of conservation issues to the public and policy makers, as well as help the international community to try to reduce species extinction.

54. Present Bhagalpur Water supply project is not linked with IUCN conservation issue.

- **Convention on Migratory Species of Wild Animals (CMS)**

55. CMS was adopted in 1979 and entered into force on 1 November 1983. CMS, also known as the Bonn Convention, recognizes that states must be the protectors of migratory species that live within or pass through their national jurisdictions, and aims to conserve terrestrial, marine and avian migratory species throughout their ranges. CMS Parties strive towards strictly protecting these species, conserving or restoring the places where they live, mitigating obstacles to migration and controlling other factors that might endanger them. Migratory species that need or would significantly benefit from international cooperation and CMS encourages the Range States to conclude global or regional agreements. Present project is not linked with CMS.

- **Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)**

56. CITES is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. CITES were first formed, in the 1960s. Annually, international wildlife trade is estimated to be worth billions of dollars and to include hundreds of millions of plant and animal specimens. The trade is diverse, ranging from live animals and plants to a vast array of wildlife products derived from them, including food products, exotic leather goods, wooden musical instruments, timber, tourist curios and medicines. Levels of exploitation of some animal and plant species are high and the trade in them, together with other factors, such as habitat loss, is capable of heavily depleting their populations and even bringing some species close to extinction. Many wildlife species in trade are not endangered, but the existence of an agreement to ensure the sustainability of the trade is important in order to safeguard these resources for the future. Because the trade in wild animals and plants crosses borders between countries, the effort to regulate it requires international cooperation to safeguard certain species from over-exploitation.

57. CITES is not applicable for Bhagalpur water supply project.

- **Ramsar Convention on Wetlands of International Importance 1971**

58. The Convention on Wetlands of International Importance, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The Ramsar Convention is an international treaty for the conservation and

sustainable utilization of wetlands The Ramsar Convention is the only global environmental treaty that deals with a particular ecosystem.

59. The said Bhagalpur water supply project is not located within Ramsar site.

- **Millennium Development Goals**

60. The Millennium Development Goals (MDGs) were adopted in the General Assembly of the United Nations in the year 2000 by all the countries of the world and the world's leading development institutions. The target date for achieving the MGDs by all the countries has been fixed as 2015. The MGDs are as follows:

- Eradicate extreme hunger and poverty
- Achieve universal primary education
- Promote gender equality and empower women
- Reduce child mortality
- Improve maternal health
- Combat HIV / AIDS malaria and other diseases
- Ensure environmental sustainability
- Develop a global partnership for development

61. Though the MGDs do not directly apply to the project, the mitigation measures while preparing the Environmental Management Plan and will make the project sustainable and can help achieve some of the goals in the regional context.

62. **World bank Environmental, Health, and Safety (EHS) Guidelines - EHS Guidelines for water & sanitation:**
(<http://www.ifc.org/wps/wcm/connect/e22c050048855ae0875cd76a6515bb18/Final%2B-%2BWater%2Band%2BSanitation.pdf?MOD=AJPERES>).

63. Employers and supervisors are obliged to implement all reasonable precautions to protect the health and safety of workers. Preventive and protective measures should be introduced according to the following order of priority:

- Eliminating the hazard by removing the activity from the work process. Examples include substitution with less hazardous chemicals, using different manufacturing processes, etc;
- Controlling the hazard at its source through use of engineering controls. Examples include local exhaust ventilation, isolation rooms, machine guarding, acoustic insulating, etc;
- Minimizing the hazard through design of safe work systems and administrative or institutional control measures. Examples include job rotation, training safe work procedures, lock-out and tag-out, workplace monitoring, limiting exposure or work duration, etc.

64. Providing appropriate personal protective equipment (PPE) in conjunction with training, use, and maintenance of the PPE.

The application of prevention and control measures to occupational hazards should be based on comprehensive job safety or job hazard analyses.

65. The summary of environmental regulations and mandatory requirements for the proposed subproject is shown in **Table 1**.

Table 1: Applicable Environmental Regulations

Applicability of Acts/Guidelines	Compliance Criteria
The EIA notification, 2006 (and its subsequent amendments in 2009) provides for categorization of projects into category A and B, based on extent of impact	The sub project is not covered in the ambit of the EIA notification as this is not covered either under Category A or Category B of the notification. As a result, the categorization, and the subsequent environmental assessment and clearance requirements, either from the state or the central Government is not triggered. Environmental Clearance is not required for the proposed sub project at Bhagalpur
Wild Life (Protection) Act 1972, Amendment Act, 1993 and 2002 and Wildlife (Protection) Rules, 1995	Clearance from state and national wildlife boards, Central Empowered Committee of Hon'ble Supreme Court of India and the State Wildlife Department, as applicable. The wildlife protection act is not applicable for the proposed subproject.
The Indian Forest Act, 1927; Forest (Conservation) Act, 1980, amended 1988; Forest (Conservation) Rules, 1981 amended 1992 and 2003	Acquisition of forest land will be not required for the subproject. Clearance from Forest department for cutting of trees, if any. On date status of NOC is depicted in Table 2 below.
Ancient Monuments and Archaeological Sites and Remains Rules, 1959. Bihar Ancient Monuments and Archaeological Sites, remains And Art Treasures Act, 1976 provide guidance for carrying out activities, including conservation, construction and reuse in and around the protected monuments.	The sub-project area is not located within and nearby the state protected monuments area . No NOC needs to be obtained There is no requirement of clearance from ASI, Govt. of India
Water (Prevention and control of pollution) Act, 1974, as amended Air (prevention and control of pollution) Act, 1981, as amended and Noise Pollution (Regulation and Control) Rules, 2000, as amended.	Consent to Establish (CTE) and Consent to Operate (CTO) from the Bihar Pollution Control Board for setting up of hot mix plants, wet mix plants, stone crushers and diesel generators (if any). For renovation/Refurbishment of WTP CTE/CTO will be required from Bihar State Pollution Control Board. To be obtained by the BMC/Contractor, prior to construction.

66. Status and target date for getting all NOC except land allotment (deal separately under resettlement plan) is given in Table below.

Table 2: Detail of requirement of NOC and status

Sr. No	NOC/ Department	Purpose	Responsibility	Timeframe
1	CTE/CTO	Refurbishment of WTP	PMU/PMC	Consent to Establish is received on 09.03.2016. (Ref. Appendix 2)
2	Utilities	Telephone lines, electric poles and wires, water pipe (old) existing within right-of-	Contractor-PIU/DSC	2 months (after commencing of contract and

Sr. No	NOC/ Department	Purpose	Responsibility	Timeframe
		way (ROW) may be damaged.		followed by confirmatory survey)
3	Transport Dept.	During construction work Traffic Management Plan	Contractor-PIU/DSC	1 month (As per requirement during implementation of the project)
4	BMC	Entire work in city area	Contractor-PIU/DSC	1 month
5	PHED/PWD	Road cutting during construction	Contractor-PIU/DSC	1 months (before construction)
6	BMC	For tree cutting at Constable Training School, CTS (1- tree) Tilkamanjhi University, TMU (4-Tree) and customer care centre at Barari.	Contractor with the help of PMU-PIU - PMC	Application has been sent to concern department on 01.01.2016 for tree felling at CTS and TMU

D. Report Structure

67. This Report contains eight (8) sections including this introductory section: (i) Introduction; (ii) Description of the Project; (iii) Description of the Environment; (iv) Anticipated Impacts and Mitigation Measures; (v) Information Disclosure, Consultation and Participation;(vi) Grievance Redressal Mechanism; (vii) Environmental Management Plan; and (viii) Recommendations and Conclusions.

II. DESCRIPTION OF THE PROJECT

A. Existing Condition

68. Bhagalpur Municipal Corporation (BMC) area is 30.17 sq.km, with 51 wards, and 2011 population of 398,318 and an UA of 410,210 (2011 Census). Topographically, the land slopes southwards. Demographically, the city's main future growth is towards the south and east. **Figure 2** show the BMC area.

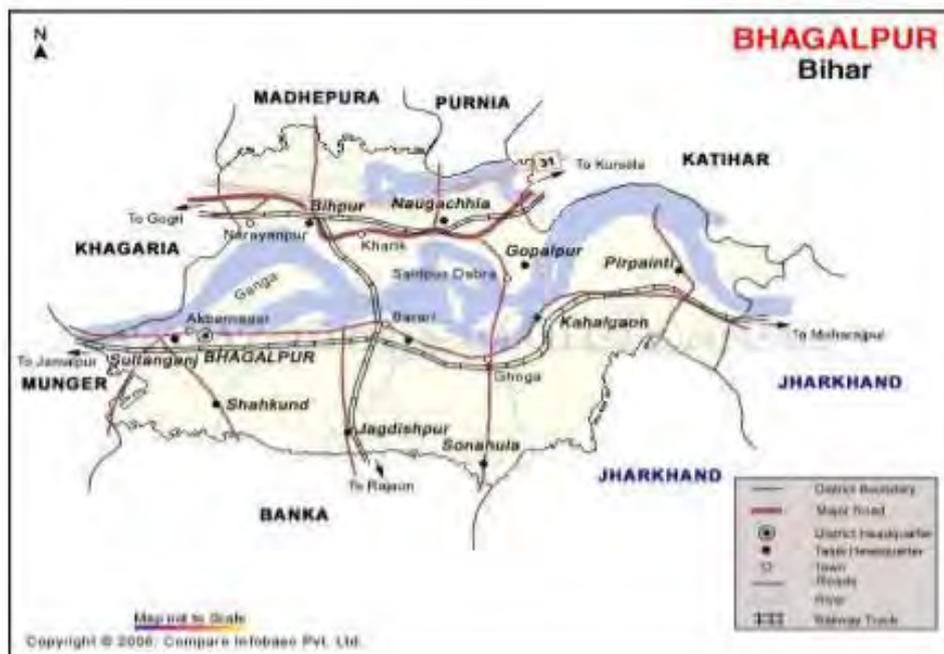


Figure 1: District Map of Bhagalpur

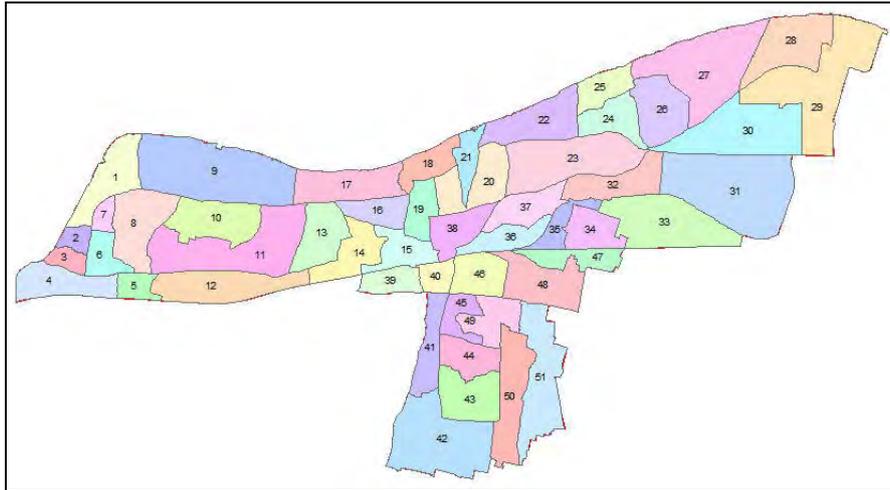


Figure 2: Ward and Ward Boundary of Bhagalpur

69. The existing water supply system in makes use of both river water and groundwater. The ground water source is also not adequate for the long term, and the current surface water source is not sufficient in terms of quality or quantity.¹ The ground water table is depleting and contaminated with fluoride and traces of arsenic.

70. While BMC report that 81% of households are connected, the 2001 Census data and Vision 2027 document indicated that 77% of households rely on hand pumps or tube wells and 22% have a tap connection. Others depend on open wells and other sources. The ADB-supported capacity development technical assistance (CDTA)² analysis for 2010 is that 54% of the population is connected, per capita supply is 34 lpcd, and physical losses are at least 26%.

71. **Intakes.** The existing raw water intakes (two jack well-type) are located at the Barari water treatment works on a subsidiary channel of the Ganga River which remains dry for a considerable part of the year. BMC has to periodically dredge the channel to bring water to the intakes. River water quality is a cause of concern due to effluent from the Champa *nala* which drains much of the city's wastewater just upstream of Barari headworks. The existing water supply system in town consists of the Barari Water Treatment Works on the River Ganga, 61 tube wells, and transmission and distribution networks covering different parts of the town. Water is being extracted from two existing intake wells located at the confluence of the Champa *Nala* and the River Ganga. Champa *Nala* is also locally known as Jamania *Nala*. The water treatment plant is on the southern bank of the River Ganga flowing on the northern fringe of the town. The first water works at Barari was originally commissioned in 1885 with a slow sand filter of 0.5 mgd (2.27 MLD) capacity. This had been augmented over the years with additional capacities added periodically with 0.6 mgd mechanical filter, 1.2 mgd Peterson filter, and 2.0 mgd Jewel filter. The total installed capacity in the works is 3.8 mgd (17.27 MLD). The actual treatment capacity goes down to even 2 mgd (9 MLD) during summer months as the river recedes from the current location of existing intake wells. Location of existing intakes and WTP is shown in **Figure 3**.

1 ADB TA 7106: Sub-appraisal Report and Central Ground Water Board Report and Ground Water Quality Monitoring Results

2 ADB TA 7884: Advanced Project Preparedness for Poverty Reduction - Capacity Building for Bihar Urban Infrastructure Development Project (Subproject 16)

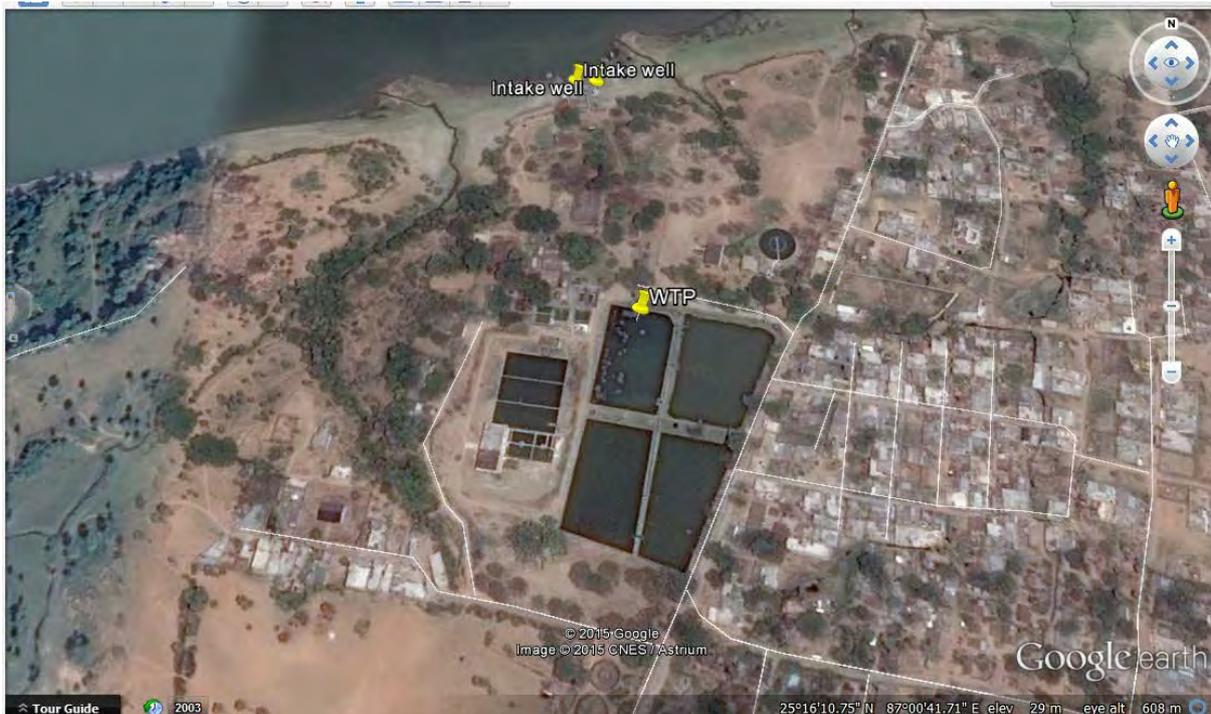


Figure 3: Location of the existing intake, WTP and the Ganges River

72. Turbidity of the surface water also exhibits a considerable variation during the year, and ranges from 500 NTU to 1,000 NTU.

73. Raw water from the Ganga River is directly pumped into a circular inlet chamber by a 350 mm diameter and another 400 mm cast iron (CI) pipes from the intakes. These two lines are reported to be interconnected for flexibility of operation. The old inlet chamber is still being used to feed raw water to two water treatment plants, WTP (described below). During the non-monsoon period, a 400 mm diameter CI branch line from the raw water main of the one of the intakes directly feeds a third treatment plan. During the monsoon period, settlement is required to reduce turbidity and the water is pumped to WTP 3 from the settlement tanks.

74. *Sedimentation tanks.* There are four sedimentation tanks (or pre-settling tanks) for WTP 1 and WTP 2. From the inlet chamber an open channel conveys water to the first sedimentation tank, supernatant of the first tank being passed to the second tank and so on. These tanks are earthen reservoirs with no bottom lining but with some limited embankment protection. Raw water fed into WTP 3 does not normally undergo any preliminary sedimentation.



Figure 4-Sedimentation Tank

75. **Water Treatment Plants (WTPs).** WTP 1 was constructed in 1886 and is known as a Patterson Filter. Initially a slow sand filter was used to filter the raw water which was later modified to an alum dosing and clariflocculator system followed by rapid sand filter some 70 to 80 years back. Rated capacity is 5.455 MLD. In the 1930s another 2.728 MLD mechanical filter (WTP 2) was built. The last plant known as a Jewel Filter (or WTP 3) was constructed about 50 years back having capacity 9.092 MLD. Total design capacity is therefore about 17.3 MLD.

76. Inlet and outlet pipelines of these three WTPs are now interconnected. However, the chemical dosage systems (alum for clariflocculation, lime for pH adjustment, and bleaching powder for disinfection) are separate for each WTP. Almost all pipeline works in these WTPs are of CI and more than a hundred years old.

77. *Alum and Lime Dosing.* Alum and lime dosing in each of these plants is done manually. Alum cakes are kept in the water channel and are gradually dissolved by continuous flow of water. The current method of application is crude and purely based on the experience of the operators.

78. *Flocculation and Clarification.* WTPs 1 and 2 have rectangular clariflocculator but without any flocculating blades or any scrapper assembly for sludge collection. WTP 3 has a circular clariflocculator with clearly demarcated flocculation and clarification zones. It also has a scrapper assembly which is in working condition. Currently, underflow from all clariflocculators is drained to nearby drainage channels and there is no system of recycling settled sludge water.

79. *Filtration.* The slow sand filters are now abandoned. WTP 1 was modified with two rectangular rapid sand filters. Two mechanical filters of equal size are also provided in the open air at the downstream side of the clariflocculator in WTP 2. WTP 3 also has two filter beds in the new filter house building. The backwash is normally done once in a day. There are also air compressors for cleaning of beds by air-scouring which is normally done once in a week.

80. *Disinfection.* Currently disinfection of treated water is done by adding bleaching powder directly into the flowing raw water with alum/lime dosing.

81. *Clear water storage.* Clear water from both WTP 1 and WTP 2 is stored in an old underground reservoir (Sump 1) constructed in brick masonry with guiding baffle walls to reduce short-circuiting of flow. This reservoir is at a higher elevation and is connected to two other clear water reservoirs (Sump 2 and Sump 3) at lower level adjacent to the old clear water pump house. Total capacity of the underground sumps is 8,200 m³. Out of this, 5,400 m³ is available to store treated water from WTP 1 and 2,700 m³ for treated water from WTP 2. Treated water is pumped to the city by two separate transmission mains, 300 mm and 350 mm diameters, both originating from the old clear water pump house.

82. Treated water from WTP 3 is conveyed by one 400 mm diameter CI line and stored in a separate sump (Sump 4) of capacity 9,100 m³ with adjoining new clear water pump house. Sump 4 is located at a higher elevation and connected by a gravity line of 300 mm diameter (with a sluice valve) to Sump 1 for operational flexibility. All these underground sumps are provided with either access stairs or hatches and air vents. Except Sump 1, none of the sumps are said to have any baffle wall to avoid short circuiting of flow and give the incoming treated water adequate travel time for disinfection following addition of bleaching powder.

83. **Figure 5** shows layout plan of existing Water Treatment Plants at Barari.

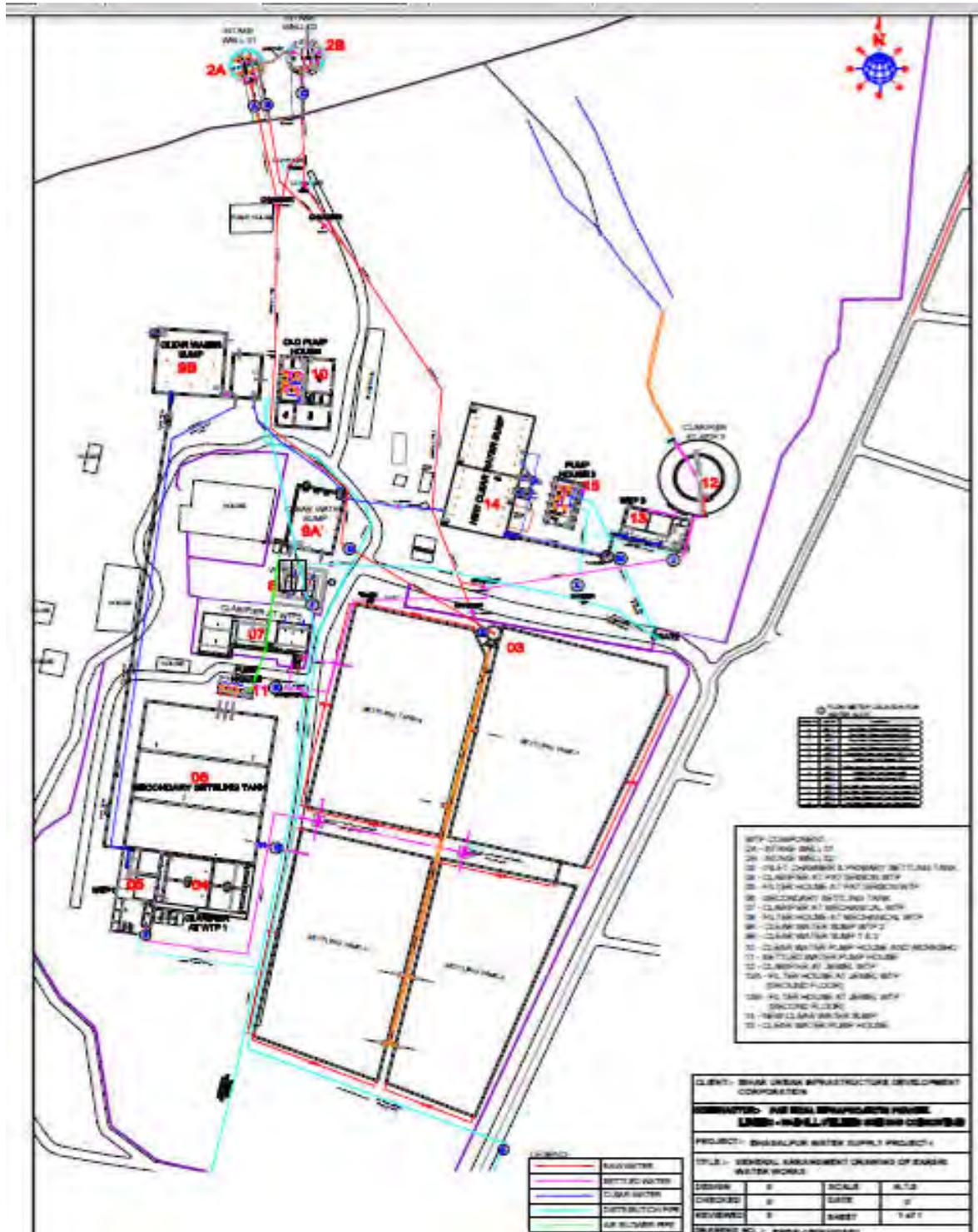


Figure 5 Layout of Existing WTP

84. **Tube wells.** In addition to the surface water described above, there are 61 tube wells in the town, which are operated primarily by BMC, as well as BRJP, and one tube well by Public Health and Engineering Department (PHED). The tube wells are fitted with pumps and motors of varying capacity ranging from 7.5 HP to 30 HP. Power supply is intermittent in nature, with 6 to 14 hours average in a day. Total output from the tube wells is estimated between 10 and 18 MLD depending on availability of electricity.

85. **Overhead water storage reservoirs.** There are 7 Overhead tanks (OHT), ranging from 450 cum to 550 cum capacity, and staging height ranging from 18m to 22m. However, only five (4) are functional at present. Out of these functional OHTs two (2) are made of steel

and the rest are constructed in Reinforced Cement Concrete.

Table 3: Existing OHT locations and status

SR. no.	Location of existing Over head Tank	Status	Capacity
1	Housing Board	Discarded - New construction under the project	450 cum
2	Manik Sarkar	Dismantled- New construction under the project	450 cum
3	Sikandarpur	Dismantled-New construction under the project	550 cum
4	Iskchak	No change	450 cum
5	CTS	No change	450 cum
6	Ghantaghar	No change	450 cum
7	Gosala	No change	450 cum

86. **Distribution system.** The distribution system has a total pipe length of about 57.319 km out of 328 km of road length. The distribution system is of CI pipes, ranging in size from 100 mm to 300 mm diameter. **Table 4** provides details of the existing distribution pipe network.

Table 4: Existing Distribution Pipe Size and Lengths

Pipe Size	Length (km)
100 mm	22.5
150 mm	22.05
200 mm	12.081
250 mm	0.69
Total	57.319 km



Jewel Filter



Mechanical Filter



Patterson Filter



Jewel Clariflocculator

Figure 6: Existing Water Treatment Plants

B. Justification of the proposed water augmentation project

87. The proposed water supply improvement project for Bhagalpur is planned after analyzing the present situation and proper justification.

88. The subproject is needed because the present water supply system of Bhagalpur is inadequate for the needs of the growing population. Per capita supply is low as 40 liters per capita per day (lpcd) which is below the required 135 lpcd and the unaccounted for water (UFW) is around 40%. The storage and distribution network is insufficient and old to meet even present requirements. Improvement and rehabilitation in the water supply system has been identified as a major priority for Bhagalpur. The objective of this sub-project is to provide continuous (24x7) pressurized, safe water of 135 lpcd to the entire population, through household connections where feasible, at the required minimum pressure head. In other words, the water service will meet the Indian National Service Level Benchmarks.

C Proposed Subproject and Components

89. The design has been developed considering the future demand based on the population projections. **Table 5** shows the total water demand upto year 2047.

Table 5: Demand Projection

Demand at	SN	Details	Base Year	Intermediate Stage	Ultimate stage
			Year: 2017	2032	2047
Primary demand	1	Population (Souls)	472350	603000	766000
	2	Rate of WS (LPCD)	135	135	135
	3	Daily Demand (Lits)	63767250	81405000	103410000
	4	Floating Population (@5%)	23617.5	30150	38300
	5	Rate of WS (LPCD)	15	15	15
	6	Floating Demand	3,54,263	4,52,250	5,74,500
	7	Total Demand (Litters)	6,41,21,513	8,18,57,250	10,39,84,500
	8	Total Demand (MLD)	64.12	81.86	103.98
	9	Fire Demand*	2.17	2.46	2.77
	(a)	Total Demand	66.29	84.31	106.75
	(b)	Non-domestic	3.31	4.22	10.68
	(c)	Total (a+b) (at tap)	69.61	88.53	117.43
Distribution input	(d)=(c)/0.9	Demand with 10% losses in Distribution System	77.34	98.36	130.47
WTP Output	(e)=(d)/0.99	Demand with 1% losses in PW RM at outlet of WTP	78.13	99.36	131.79
WTP input	(f)=(e)/0.97	Demand with 3% losses in WTP at inlet of WTP	80.54	102.43	135.87
Jackwell Output	(g)=(f)/0.99	Add 1% for losses in RW transmission system	81.36	103.47	137.24

Floating population: There is no mention in CPHEEO. It is assumed as 5% for both the stages as per Bid document- Part 5: Project Information Memorandum

** Fire demand is computed as per CPHEEO manual

Distribution system and the OHTs are designed for the demand of 130.47 MLD.

Work Component 1: Refurbishment of WTP- The refurbishment work includes introduction of (i) alum and lime dosing systems with necessary chemical storage and mixing tanks, dosing-pumps, metering device with 100% standby capacity; (ii)

flash mixers for coagulant rapid mixing; (iii) chlorination system with necessary dosing mechanism, storage and safety equipment in all three existing treatment plants; (iv) electrical actuators for all existing sluice valves in the Jewel Filter unit; (v) servicing of existing machinery and equipment, and (vi) painting of various units.

Mechanical, Electrical, and Instrumentation works-(i) Installation of 2 nos. of centrifugal pumps with accessories; (ii) replacement of sluice and non-return valves, pipes and fittings, (iii) air blowers for filters, (iv) chemical mixing and metering system, flash mixing system, (v) chlorination system, (vi) electrical works including 33 kV/0.433 kV substation works, LT switch gear panels and instrumentation works at pumping station (vii) electro- magnetic flow meter, ultrasonic type level indicator, pressure loggers, and (viii) online residual chlorine monitoring system, and chlorine leak detection system.

90. Environment Audit report for Water Treatment Plants which are considered under the project is attached as **Appendix 3**.

91. WTP refurbishment proposal in figure shown below.

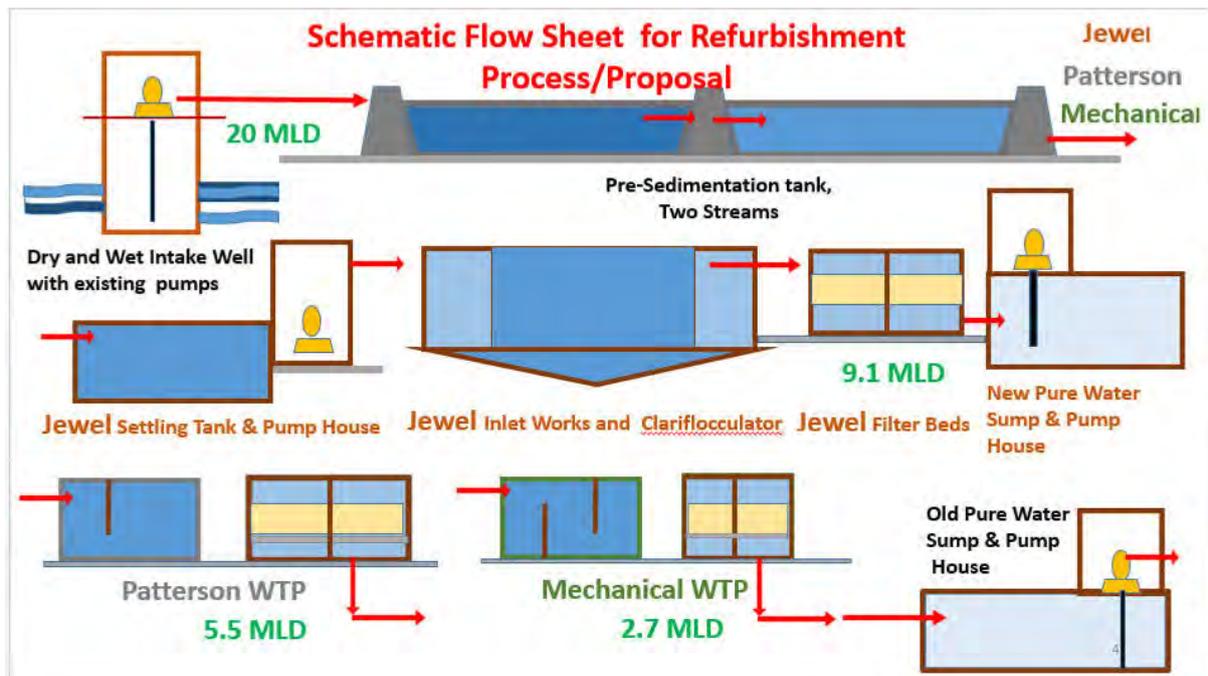


Figure 7: Schematic Flow Diagram for WTP Refurbishment work

Work Component 2: Laying of Distribution pipeline- The District Meter Area serve to better manage the distribution network, based on the pressure patterns control and on the water flows monitoring. A DMA is fed from few monitored input pipe lines and supply and consumption can be easily compared.

The length of new pipes to be laid is estimated at about 460.636 km. The pipe materials will be Ductile Iron.

92. The **Table 6** shows the proposed distribution pipeline of different diameter.

Table 6: Proposed Water Distribution Pipeline- DI K-7 pipe

Diameter (mm)	Length (m)
	DI K-7 pipe
100	340
150	53
200	34
250	6
300	18.5
350	0.01
400	6.9
500	1.1
600	0.729
Total	460.239, i.e approx 460 km

Source: SIP Bhgalpur water supply, 2015

93. Existing pipelines 57.319 km will be also remains in the project

Work Component 3: Overhead Water Storage Reservoirs- The water distribution system has been designed with formation of DMAs. The DMAs are connected to nearest SRs. An examination of existing capacities of reservoirs and water demand to be met has been done in the design section. Accordingly, in this package 19 number of water storage reservoirs have been considered. **Table 7** shows the location, the capacity, the DMAs served.

Table 7: Proposed locations of water reservoir

Sr. No.	Name of Location	Land Remark	Ward	Capacity (CUM)	Staging Height (m)	Land Area*	Type of Foundation	No. of DMAs
1	Within the Campus of T.M. Bhagalpur University (TMBU), Bhagalpur	Govt, Land	11	1660	22	35m X 35m	Stone pile with Raft	2
2	Within the Campus of Constable Training School, Nathnagar	Govt, Land	8	1260	20	40 m X 40 m	Concrete pile with raft	2
3	Mahashay Deodi-1, Near the Existing Tube Well in Champanagar	Private land	1	885	23	15m X 15m	Stone pile with Raft	1
4	Mahashay Deodi-2, Near the Thakurbari in Champanagar	Private land	1	1135	23	15m X 15m	Stone pile with Raft	2
5	Abir Mishra Lane (near Nathnagar Police Station), Nathnagar	Govt. land	3	1385	21	20m X 20m	Stone pile with Raft	2
6	Within High school at Jaglal Company Bagh	Govt. land	13	1520	24	20m X 20m	Stone pile with Raft	3
7	BMC Godown, Tatarpur	Govt. land	15	1135	21	20m X 20m	Stone pile with Raft	3
8	Lajpat park	Govt. land	20	1260	21	20m X 20m	Concrete pile with raft	2
9	Within the campus of the Road Division, Adampur, Bhagalpur	Govt. land	22	1660	26	20m X 20m	Stone pile with Raft	2
10	Housing board colony	Govt. land	29	1385	21	25m X 25m	Stone pile with Raft	3
11	Adjacent (west side) to Bhagalpur Central Jail, near Anandanagar Colony (south west of Sunderban)	Govt. land	30	1660	22	20mX20m	Stone pile with Raft	2

Sr. No.	Name of Location	Land Remark	Ward	Capacity (CUM)	Staging Height (m)	Land Area*	Type of Foundation	No. of DMAs
12	In front of Medical Quarter, Surkikal	Govt. land	26	1260	23	20m X 20m	Stone pile with Raft	2
13	Open land to the north of the temple, Sarbajanik Thakurbari, Warsaliganj	Trustee land	49	1135	22	30m X 30m	Stone pile with Raft	3
14	North of Bazar Samity campus, Agricultural Market Complex, Opp. Babarganj Police Station Baghbari.	Govt. land	50	1660	20	20m X 20m	Concrete pile with raft	4
15	Open land to the west of the tube well, Aliganj Katghar, Hussainabad	Govt. land	42	1420	22	15m X 12m	Stone pile with Raft	2
16	Mughalpara Kawali Maidan, Hussainabad	Trustee land	44	1260	22	30m X 30m	Stone pile with Raft	2
17	Barahpura eidgah	Govt. land	33	1810	22	14mX28m	Stone pile with Raft	3
18	Manik-sarkar	Govt. land	20	1385	20	30m X 27m	Stone pile with Raft	2
19	Sikandarpur	Govt. land	46	1520	21	37m X 44m	Stone pile with Raft	2

* NOC received

Source: Service Improvement Plan, SIP Bhagalpur water supply.

94. As per present design proposed construction project involves relocation of 1 hut and one cattle shed at one project location (Housing Board). Rehabilitation & resettlement issue deals separately under Resettlement Plan.

Work Component 4: Customer Service Centre (CSC)- It is assessed that 1 (One) customer service centre (CSC) will be required to cater to about 10,000 connections. The location of CSC, is identified to establish at Barari WTP. In addition 2 CSCs, one at Bhagalpur Municipality office, and other at Nath nagar will be rehabilitated. Future CSCs offices in the city area are proposed to be located on government land or within existing government buildings or rented space.

Work Component 5: Metered House Connection at all the DMAs

It is proposed to arrange 68000 metered house connection by 2019.

95. **Appendix 4** shows project location and maps of the proposed project components.

96. **Appendix 5** shows photo illustration and location details of project components.

97. **Appendix 6** shows site management plan and approach road drawing for all water storage reservoirs and major working areas.

98. **Appendix 7** shows layout plan for customer care unit at Barari. Google map and site photo of 2 CSCs, which to be renovated are shown in **Appendix 7**.

99. **Table 8** shows the components of the subproject based on the present proposals which are expected to be substantially correct, although certain details may change as development of the subproject progresses.

Table 8: Description of the proposed water supply subproject for Bhagalpur City

Component	Function	Description	Location
General	Improvement of water supply system in Bhagalpur city	<ul style="list-style-type: none"> ➤ Satisfy the future needs ➤ Enhancement of pumping, distribution and storage facilities to supply quality water to new areas and existing area with sufficient quantity 	Bhagalpur city
Refurbishment/ Rehabilitation of WTP.	Replacement of pumping equipments running at lesser efficiency, since machinery has outlived their lives. Quality of the supply water get improved through disinfection	The refurbishment work includes introduction of (i) alum and lime dosing systems with necessary chemical storage and mixing tanks, dosing-pumps, metering device with 100% standby capacity; (ii) flash mixers for coagulant rapid mixing; (iii) chlorination system with necessary dosing mechanism, storage and safety equipment in all three existing treatment plants; (iv) electrical actuators for all existing sluice valves in the Jewel Filter unit; (v) servicing of existing machinery and equipment, and (vi) painting of various units.	At Barari water works
		All related electrical,	

Component	Function	Description	Location
		mechanical, instrumentation works	
Construction of overhead water storage reservoirs	Enhancement of additional storage capacity as per proposed DMAs	Construction of 19 over head water storage reservoirs	Abhir Mishara, Thakurbadi, Aliganj, Anand nanagr, BMC Godown, Barahpura, Bazar Samiti, Constable Training School, Housing Board, Jaglal High School, Lajpath Park, Manik Sarkar, Masaydevdi-1, Masaydevdi-2, Mughalpura, RCD Adampur, Sikandarpur, Surkikal, TMBU
New pipe laying	Distribution of water at different pockets of BMC	Approx. Length- 460.239 km DI pipe	Bhagalpur municipal area
Metered house connection	To supply measured water	Approx. 68000 nos.	Throughout the Bhagalpur city
Customer Service Centers	To cater to about 68000 connections	Attending customer call and resolving service related issues	Throughout the Bhagalpur city – need basis

Source: SIP Bhagalpur Water Supply

100. The design standards adopted under this sub-project are followed the Manual on Water Supply published by Ministry of Urban Development, Government of India. The same criteria are followed by the Public Health Engineering Department (PHED), the line department. Key design features of the proposed subproject are summarized in **Table 9** below.

Table 9: Design features of the subproject

S. No:	Design features	Descriptions
Construction of overhead tanks		
1	Foundation	Open type Reinforced Cement Concrete (RCC) raft
2	Super structure	RCC cylindrical shaft for overhead
3	Water tank	RCC cylindrical type
4	Material of construction of over head tanks	RCC (M30)
5	Total storage capacity	26395 Cum additional
6	Minimum storage capacity	20% of the average daily demand
7	Supply hours	24 hours
8	Location	Referred above Table
Laying of distribution pipeline		

S. No:	Design features	Descriptions
1	Subproject area	Bhagalpur City
2	Design period	30 years
3	Pipe diameter range	100 to 600 mm dia.
4	Net per capita water supply (excluding losses)	135 liters per capita per day
5	Distribution losses (allowable)	15%
6	Material of construction for distribution mains and laterals	Ductile Iron K7
7	Location	Throughout the city except newly laid area

Source: SIP Bhagalpur

D. Implementation Schedule

101. The proposed sequence of the works implementation under Water Supply Project is as given in the **Figure 8**.

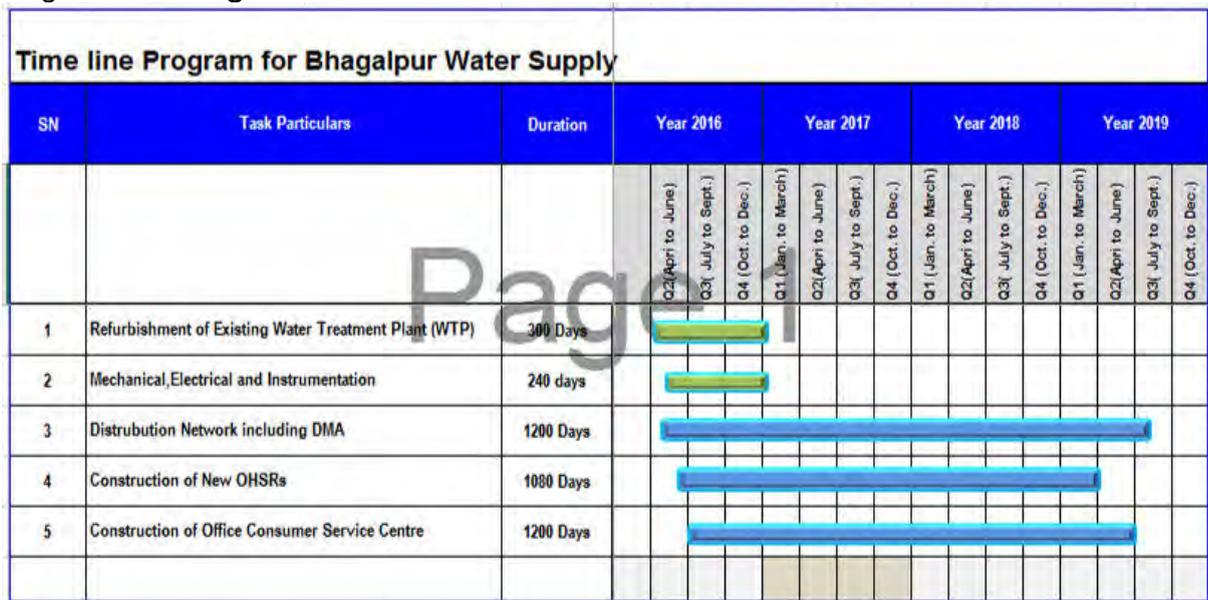


Figure 8: Implementation schedule- BWSP1

102. **Training – Training schedule defined in SIP Part-III** The Contractor shall deploy a Human Resources Development and Training Specialist, to assess the training needs and prepare a Training Program describing all on-the-job and class-room training activities to be conducted during the project. The Training Plan shall be finalised and approved within six (6) months from the Commencement Date. Implementation of the Training Program shall be finalised at least six (6) months before the Contract Completion Date. Commencing at least 6 months before the Contract Completion Date, the BMC deputed Managers (Operations Manager, Technical Manager, Financial Manager and Customer's Manager), still operating under the responsibility of the Contractor will take over water supply and maintenance duties. The Training Programme will comprise of both on-the job training as well as class room training. On job training will be provided to staff that has been seconded for prolonged periods on deputation to the Contractor. If the Contractor is unsatisfied with the performance of a seconded staff member, he/she will inform BMC. If the unsatisfactory situation continues, the Contractor is allowed to reject further secondment deputation of the staff concerned and the BMC may nominate replacement. The Contractor will provide hands-on training to the deputed BMC staff related to all aspects of water supply operations including but not limited to: water production, storage, transmission and distribution, DMA based operation and maintenance, including water meter repair and maintenance, billing, fee collection, leak detection and leakage repair etc. The Contractor will also provide hands-on training to the deputed BMC staff in administrative, financial and customer affairs.

III. DESCRIPTION OF THE ENVIRONMENT

A. Physical Conditions

1. Administrative Boundaries

103. Bhagalpur city has a long history and is the administrative headquarters of Bhagalpur District. It is a Class-I town. The town is situated at the banks of the holy Ganga River. It is situated at a distance of about 225 km from state capital city Patna. It is connected to different cities and towns of Bihar by broad gauge railway lines and roadways. Since this town is situated in the Gangetic plains, it is very fertile and is a major producer of silk. Mango, rice, barley and wheat are other major crops grown. Bhagalpur derives its name from Bhagattapuram, which means "city of good luck".

104. Bhagalpur is part of the Jagdishpur C.D. block (Bhagalpur Sadar sub division), which accommodates 19.45% of the total population of the district. The area of Bhagalpur Municipal Corporation (BMC) is 30.17 sq.km with a population of 3,98,138 (Census 2011). Bhagalpur has been divided into 51 wards. BMC is providing civic facilities in the town.

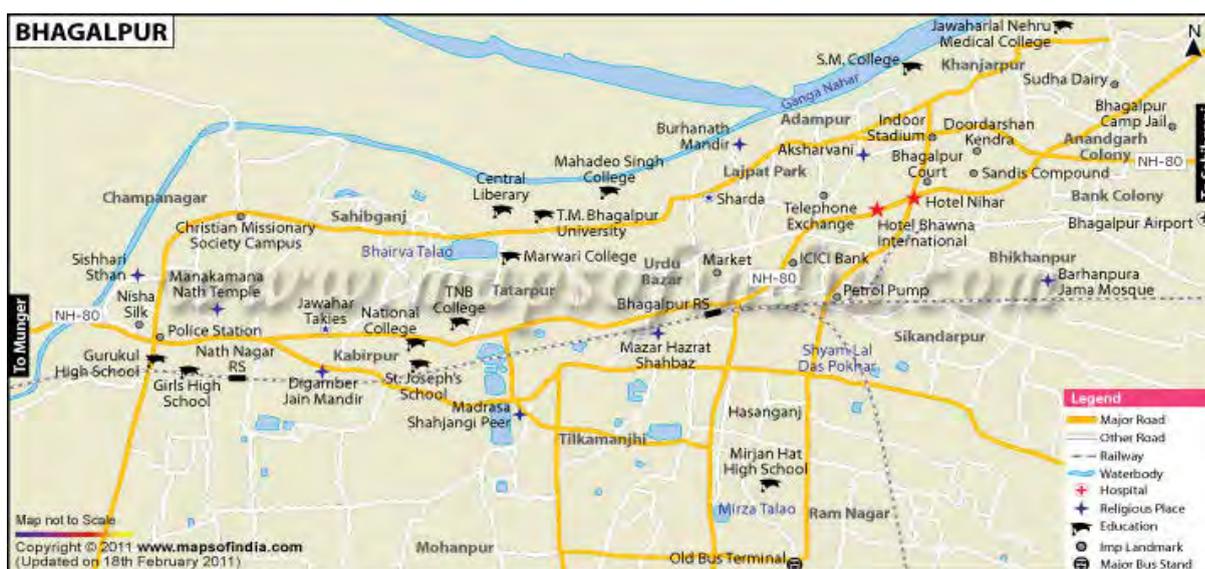
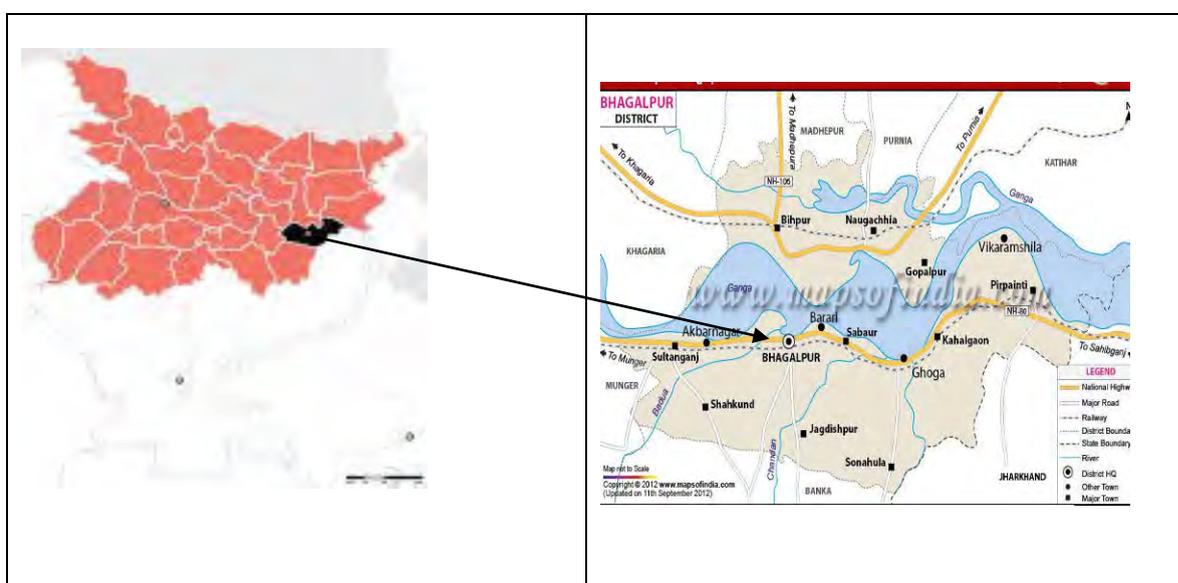


Figure 9: Bhagalpur City

2. Topography, Drainage and Natural Hazards

105. **Topography.** Bhagalpur District is divided into two parts by the Ganga River. The northern part is composed of an alluvial plain for the most part. The drainage is from west to east. The land of north is very fertile. The southern part has a generally level surface, except on the southern border, where the land is hilly. The town of Bhagalpur is situated on a raised belt of limestone, extending along the southern bank of the Ganga. According to the district gazetteer this forms a natural barrier against the incursion of the river.

106. District is one of the oldest districts of Bihar located in the south-eastern part of the state. It is situated in the plains of the Ganga basin at a height of 43 m above sea level. It lies between 25°07' - 25°30'N Latitude and between 86°37' - 87°30' E longitude. The district is surrounded by Munger, Khagaria, Madhepura, Purnea, Kathiar and Banka Districts of Bihar and Godda and Sahebganj Districts of Jharkhand.

107. The topography of Bhagalpur is undulating in nature. The ground level varies from 34 m to 52 m msl. The general slope is towards the river to the north.

108. **Drainage.** The part of the district towards the south of the Ganga River falls in the Badua- Koa sub-basin and the area to the north of the Ganga falls in the Baghmati - Kosi sub-basin. These two sub-basins are parts of the Mid-Ganga basin in Bihar. The district is principally drained by the Ganga River, which enters the district at Sultanganj. The northern boundary of the district is marked by the river Kosi (Ghugri) known to be heavily laden with silt and sand. The Ganga River has two major tributaries joining from south, the Badua and Koa. Apart from these, a number of ephemeral streams such as Gahra, Chanan, Kadwa, Gerua and Bhena from Chotnagpur plateau join the Ganga.

109. **Natural Hazards.** The area being close to the seismically active Himalaya, it is prone to seismic hazards. As per the Seismic Zoning Map of India (IS: 1893-2002), the Indian sub-continent is divided into four zones named II, III, IV and V. The area under investigation falls under Zone-IV of the Seismic Zonation Map of India **Figure 10** prepared by the Bureau of Indian Standards. With reference to the MSK intensity scale used for all engineering design purposes, the region lies in the high to moderate damages risk zone.



Figure 10: Seismic Zonation Map of India

110. The GSHAP seismic hazard map of Bihar also reveals that the area lies in the high hazard zone.

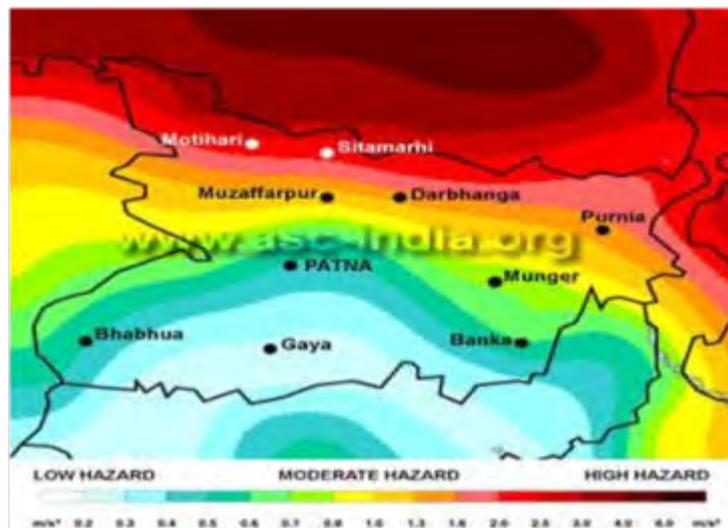


Figure 11: GSHAP Seismic map of Bihar

111. Bihar is vulnerable to different kinds of disaster such as flood, cyclone and earthquake due to its geographical and topographical location. Vulnerability of District / Municipal Area can be estimated from the following facts:

- ✓ The earthquake hazard map of Bihar shows that Bhagalpur District falls in Seismic Zone IV, which is a high damage risk zone and an earthquake up to a magnitude

of 8.0 on the Richter scale is possible. Thus Municipal Area is an earthquake hazard prone area and falls in the high damage risk zone.

- ✓ The wind hazard map of Bihar, shows that District falls in a high damage risk zone with cyclonic wind velocities around 47m/s possible. Thus Municipal Area is a wind hazard prone area and falls under high damage risk zone.

112. **Figure 12** shows the flood hazard map of Bihar. It shows that that most of District is susceptible to flooding. Municipal Area falls almost entirely in a flood susceptible risk zone.

113. It is evident that Bhagalpur town located in district is susceptible to natural hazards with high risk or probability of occurrence of a high intensity earthquake, cyclone and also flooding. Natural calamities result in recurring losses and eats into the hard earned developmental gains. Since most of the natural disasters are barely predictable and almost non-preventable, a state of preparedness and ability to respond quickly to a natural calamity is probably the only way to mitigate loss of life and property and the human suffering.

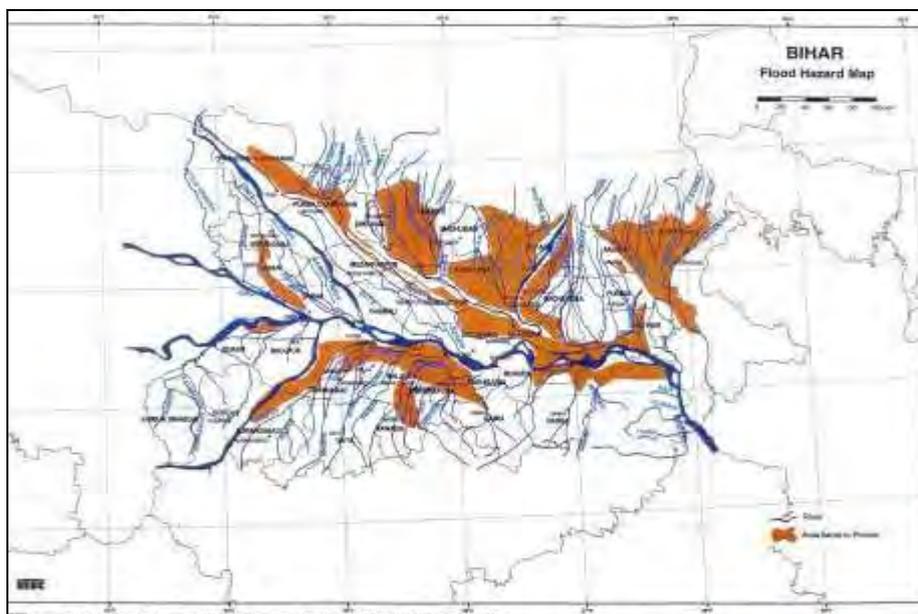


Figure12: Flood Hazard Map of Bihar

3. Geology, Geomorphology, Mineral Resources, and Soils

114. **Geology.** As per the district gazetteer, the north of the district is purely composed of the gangetic alluvial deposits. Four principal formations occur in the district namely Alluvium, new and old; the Rajmahal trappist formation; the Damuda series, the coal measures of India; and the gneissic series. The alluvial formation occupies the greater part of the district, thinning out towards the southern side. Much of it is composed of deposits from the present rivers. There is also presence of old alluvial, which is stiff clay with presence of kankar. The Damuda rock formation, to which Indian coal measures belong is seen only in one place in the district, namely at Pathargatta Hill. The gneissic rocks occupy a considerable area in the south of the district, in the Chandan, Katura, and the Danra Sakhwara Parganas, where they are contiguous with similar rock formations of Hazaribagh and with the whole east side of the peninsula down to Mysore. These are metamorphic rocks.

115. **Geomorphology.** Geomorphologically, the District forms a part of the Mid-Ganga Foreland Basin. The north and central part of the district towards the north and south of the Ganga respectively forms a flat Indo-Gangetic alluvium tract (parts of the North Bihar Plains and Central Bihar Plains respectively). The southern part of the district forms a marginal alluvial tract. The general elevation of the alluvium tract remains within 45 m above mean sea level (msl). The general slope of the region in the north and south is towards the Ganga River.

There are some detached hard rock bodies of pre-cambrian age, which stand out as prominent peaks (inliers) within the alluvial plains. Among these, the highest one is at Shakhund with a height of 143 m.

116. **Mineral Resources.** The principal mineral produced in the district is galena. Apart from galena, China clay, fire clay, mica, garnet, quartz, feldspar and antimony are also found.

117. **Soils.** The soils in the district are mainly derived from the older and newer alluvium. These alluvial plain soils are light grey to dark grey in colour, rather heavy and texturally fine in nature. The pH values range from neutral to acidic and the acidity of the soil gradually increases from north to south. The hilly soils are acidic with low nitrogen, and medium to high potash.

118. The soils derived from older alluvium are mainly loamy in character with moderate to heavy texture and well drained. In low lands these are poorly drained with heavy texture. These soils comprise an association of vertisols, entisols, alfisols, and ultisols. Black soils found in Shakhund, Sonhaulia, and Sultanganj belong to vertisols category. Sandy soils (Diara soils) derived from younger alluvium are light textured, and well drained. These are moderate to highly fertile calcareous soils and found along the banks/course of the Ganga River. These comprise the soil association of inceptisols and entisols.

4. Climate

119. In general a warm and humid climate prevails in the district. Winter starts from November and extends up to February. The temperature usually does not drop below 15.0 deg. C, but during the coldest months (late December to early January) the temperature can come down to 8.0 deg. C. During this period, the wind blows from the northwest and west.

120. The month of March and April are the driest months of the year with a relative humidity of 50 – 55 % in the morning and 35 – 40 % in the afternoon. The humidity increases in May and June to 80 % or more. The summer period begins from March with peak temperatures of 40 – 45°C in May. About 80 % of the rainfall comes during the southwest monsoon, which normally breaks in the second fortnight of June. The monsoon lasts until late September. Generally the eastern and north-eastern part of the district receives higher rainfall. The annual normal rainfall in the district remains above 1148 mm (**Table10**). The climatic condition of the district is shown in the **Figure 13** below.

Table 10: Monthly Rainfall Pattern of Bhagalpur (2008-2013) in mm

Month	2009	2010	2011	2012	2013
January	2.0	0.0	2.4	16.3	0.0
February	2.7	4.2	3.1	0.0	14.5
March	2.5	4.0	33.0	2.5	0.0
April	0.0	2.2	73.9	5.7	58.7
May	202.8	65.7	89.5	19.5	143.3
June	65.8	105.8	332.2	79.4	182.1
July	326.2	234.3	179.1	311.6	142.8
August	500.9	195.6	358.8	142.7	266.8
September	220.0	127.5	152.6	124.0	160.4
October	172.1	19.9	39.9	54.0	319.3
November	2.8	5.3	0.0	16.7	6.8
December	0.8	0.7	0.0	0.0	0.0
Total	1498.6	765.2	1264.5	772.4	1294.7

Source-India Meteorological Department



Figure 13: Climatic Condition of the District

5. Ambient Air Quality

121. There are no data on ambient air quality for Bhagalpur Town, which is not subject to monitoring by the Bihar State Pollution Control Board as there are no major industries. The nearest station is located at Patna. Traffic is the only significant pollutant in the city, so levels of oxides of sulphur and nitrogen are likely to be well within the National Ambient Air Quality Standards (NAAQS). The particulate matter (PM₁₀ and PM_{2.5}) are also likely to be within the limits as the town has significant cover under the vegetation. Since the proposed project will not contribute any air emissions, the ambient air quality is not a valued environmental component (VEC) in the project.

122. Recently ambient air quality monitoring has been conducted at different project locations and **Table 11** shows monitoring result. Values of all parameters are within the standard.

Table 11: Ambient air quality monitoring result
Status of Ambient Air Quality of Bhagalpur

S.No	Site name	Main Pollutants 2015 ($\mu\text{g}/\text{m}^3$)			
		PM ₁₀	PM _{2.5}	SO ₂	NO ₂
		CPCB standard 100	CPCB standard 60	CPCB standard 80	CPCB standard 80
1	Tilakmanjhi Chowk	79	36	24	52
2	Collectriate	68	31	17	39
3	Mahashay Deorhy	64	28	14	46
4	Barari Housing	74	26	21	44
5	Thakurbari	69	28	23	56
6	Constable Training School, CTS	61	24	12	46
7	Mount Assisi School	56	19	12	30
8	T.M. University	78	45	24	56
9	S.M. College	59	24	19	43
10	Sadar Hospital	87	56	26	41
11	WTP Barari	76	34	18	41
12	Beside WTP boundary- Transmission Rising main route	84	32	16	44

(BUDIP project data, Date of sampling: 2.11.15 to 5.11.15)

6 Ambient Noise levels

123. The noise level measurements have been carried out recently as part of primary baseline data generation activity to establish ambient noise levels in the project area and surroundings. The measured noise levels have been provided in **Table 12** below.

Table 12: Recent Ambient Noise Level Monitoring Data at Project Location Sites and Surroundings

	Monitoring Locations	Noise Level in dB (A)			
		Day Time 6 AM- 10 PM		Night Time 10 PM—6 AM	
		Leq in dB(A)	Standard (dB(A))	Leq in dB(A)	Standard (dB(A))
1.	Tilakmanjhi Chowk	62.6	65	52.4	55
2.	Collectorate	63.1	65	51.6	55
3.	Mahashay Deorhy	62.7	65	54.3	55
4.	Barari Housing	53.4	65	44.1	55
5.	Thakurbari	64.7	65	51.8	55
6.	Constable Training School, CTS	63..8	65	54.3	55
7.	Mount Assisi School	49.2	50	39.1	40
8.	T.M. University	48.6	50	39.7	40
9.	S.M. College	48.7	50	41.8	40
10.	Sadar Hospital	48.6	50	38.2	40
11	WTP Barari	61.6	65	54.7	55
12	Beside WTP boundary- Transmission Rising main route	64.2	65	52.9	55

(BUDIP project data, Date of sampling: 2.11.15 to 5.11.15)

124. Earlier (in 2013) ambient noise level monitoring has been conducted at Bhagalpur. Results are shown in **Table 13**.

Table 13: Ambient Noise Level Data at Project Location Sites and Surroundings

	Monitoring Locations	Average Noise Level in dB (A)							
		Day Time				Night Time			
		Minimum	Maximum	Leq (Day)	Standard (dB(A))	Minimum	Maximum	Leq (Night)	Standard (dB(A))
1	Present WTP Site (Barari water Works)	56.8	60.7	56	65	53.2	55.4	53.4	55
2	Present Intake Well	65.4	68.8	65.4	65	60.1	62.5	58.4	55

	Monitoring Locations	Average Noise Level in dB (A)							
		Day Time				Night Time			
		Minimum	Maximum	Leq (Day)	Standard (dB(A))	Minimum	Maximum	Leq (Night)	Standard (dB(A))
3	Point near BMC Filter system at Existing WTP Complex	62.3	63	61	65	58.4	60.1	54.2	
4	Barari Ghat under Vikramshila Bridge	54.8	58.3	53.2	65	49.6	51.4	51.0	55
5	Zero mile Chowk (Location along Raw Water Transmission)	63.8	56.9	65	65	51.2	54.6	50.2	55
6	Collectorate near Kachhari Chowk (Location along Clear Water transmission main)	60.20	63.7	62.0	65	49.8	53.4	51.2	55
7	Tilakamanjhi Chowk (Location along Treated water main)	62.7	65	65	65	59.8	53.4	55	55
8	Ishakchak Mor	60.7	61.8	63	65	56.7	50.9	53	55
9	Lohia Over bridge near Railway Station (Location along Treated water main)	60.9	57.2	61.9	65	57.8	52.0	54	55

Source: CDTA Survey 2013

125. It is clear from the above description that noise levels are well within the stipulated limits. The generation of noise is mainly due to commercial and human activities.

7. Water Resources

a. Surface Water

126. The river system of the district consists of a reach of the Ganga about sixty miles in length to the north; and to the south, there are a few hill streams, which are sandy narrow water courses for most of the year, but are torrential during monsoons.

127. The main rivers include:

- The Ganga: The Ganges flows from the west to the east cutting the district to its northern side. In the middle, a great mass of granite divides the river into two great bends, one northward round of the town of , the second southwards to Colgong, where it meets a range of hills and again moves northwards. At the edge of the district it joins up with other tributaries. The Ganga is navigable for the whole year.
- The Chandan: The Chandan is the largest of the hill streams in the south of the district. It originates from the hills of North Parganas, and joins the Ganga. It floods the plains of south during the rainy season.

128. From local investigation and logical interpretation, it seems that the flow of the Ganga near city will be in the tune of 5000-7000 cum/sec. The hydrology report carried out confirms a minimum flow of 10002 m³/s during the lean season at Bhagalpur. From the Status Paper of Ganga River by NRCD in August 2009, the minimum flow in the Ganges is about 1500cum/sec. The nearest water quality monitoring station on the River Ganges is located at Hathidah near Mokama about 125 km from Bhagalpur. It is noted that concentration level of all the parameters is within the standard of surface water quality.

129. **Appendix 8** shows River water quality, intake water quality, treated/ supply water quality. Results indicate that all the parameters are within the standard for drinking after treatment.

b. Ground Water

130. **Sources and Quality.** The sand layers in the Quaternary Alluvium (both newer and older) form the main source of ground water in the district. Based on the strata logs and hydro-geological properties, the aquifer system in the district can be divided into two categories:

- The shallow aquifers within 50 m depth; and
- The deep aquifers within 50 – 200 m depth.

131. In shallow aquifers, the ground water occurs under unconfined conditions and in deeper aquifers under semi-confined to confined conditions. The shallow aquifers consisting of fine to medium sand with clay, silt and kankars are the main sources of ground water in the marginal alluvial tract in south. In general the thickness of these aquifers varies from 13 to 18 m, being more at central parts than the eastern and western parts of the marginal alluvium.

132. The thickness of the aquifer is controlled by the geometry of the underlying basement rock. The deeper aquifers mainly consist of sand, gravel and calcareous nodules with alternating layers of clay. The exploration data reveals the presence of four to five major aquifers with cumulative thickness 20 to 85 m. These aquifers thin out towards Sultanganj in the western part since clay dominance increases. The composition of the aquifer is not homogeneous at many places. These are very often mixed with silt and some clay, which impedes their water yielding capacity. These zones vary between 14.30 m /hr at Rampur to 202.70 m /hr at Madarganj with reference draw down of 6 – 27m. The hydro-geological map is shown in **Figure 14**.

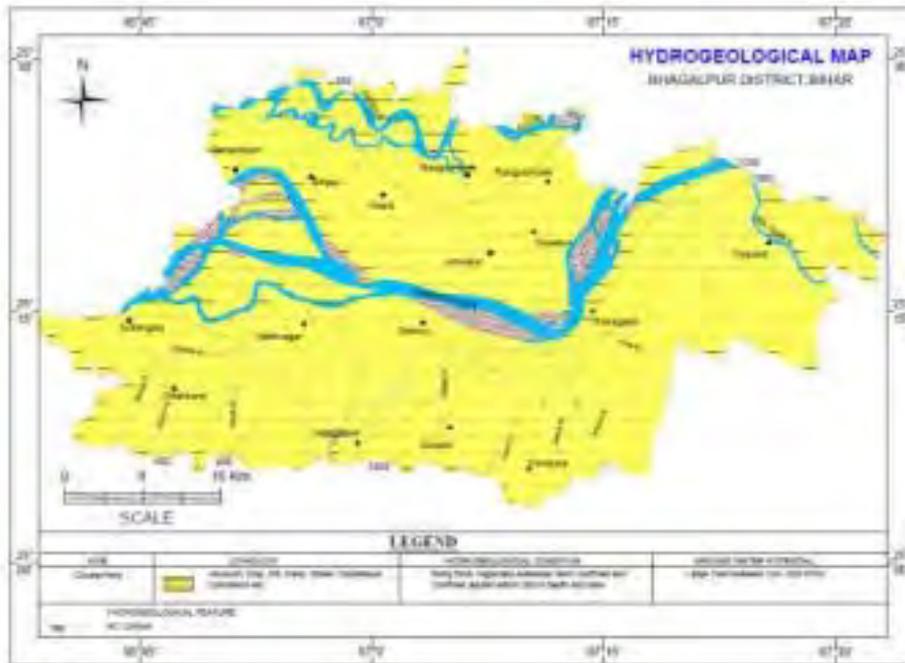


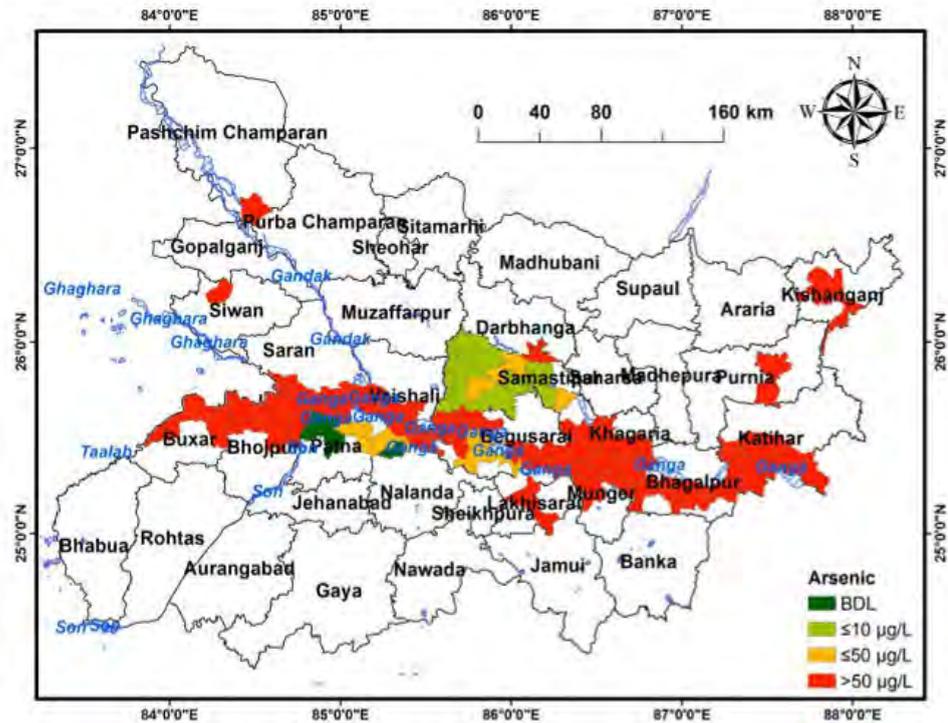
Figure 14: Hydro-geological Map of Bihar

Source: Ground Water Information Booklet, CGWB, 2009)

133. Ground water quality data for Bhagalpur District has been collected from the Central Ground Water Board. They have developed the data base from the partial and complete analysis of water samples collected from the district. The study of this analytical data reveals that in general the quality of ground water is suitable for drinking and irrigation purposes.

134. Some of the blocks in the District of Bhagalpur are affected by arsenic contamination in ground water, such as Sultanganj, Nathnagar and Jagdispur. Arsenic levels of more than the permissible limit of 0.05 mg/l (as per WHO norm) have been reported. The PHED, Govt. of Bihar has conducted a blanket testing for arsenic in the state. The hand pumps where arsenic concentration was found to be more than 0.05 mg/l were marked with red paint. Arsenic occurs sporadically in hand pumps and it largely depends on the depth of the tube well and from which formation it taps water. A sudden surge in arsenic concentration in the tube wells is found between the depth range of 12 and 40 m. After 40 m there is a drastic decline in arsenic concentration. In dug wells arsenic concentration is reported as below detection limit (BDL).

135. **Appendix 8** shows ground water quality as sample collected from different tube wells in and around the town. At few locations concentration of fluoride, iron and turbidity level were above the standard. Coliform was detected in 6 samples out of 24 samples. **Figure 15** and **16** shows arsenic and fluoride map of Bihar, respectively.



Arsenic map

Source: International Research Journal of Environment Sciences Vol. 4(2), 70-76, February (2015)



Source: Ashoka Ghosh 2009, AN Patna

Figure 15: Arsenic map of Bihar



FLUORIDE CONTAMINATION IN BIHAR

Fluoride contaminated aquifers in dry areas of following Districts of Bihar is confirmed:-

- Gaya
- Nawada
- Rohtas
- Katihar
- Munger
- Bhagalpur
- Jehanabad
- Aurangabad
- Jamui



www.ancollege.org

Source : India Water Portal

Figure 16: Fluoride map of Bihar

B. Ecological Resources

136. There are no wetlands, mangroves, or estuaries in or within the sites as the distribution pipeline alignment and WTP site are within the built up municipal limits of the town, and the trees and vegetation (mostly shrubs and grasses) are those commonly found in urban areas.

137. There are no dense woodlands in the area, but there are patches of low jungles. Major species of trees found here include Sal, Bamboo, Khair, Salai, and Kasambar. The main fruit trees indigenous to the district include: mango (*Mangifera indica*), mahua (*Bassia latifolia*), jackfruit (*Artocarpus integrifolia*), banana (*Musa Sapientum*), date palm or khajur, and tal tree, tamarind (*Tamarindus Indica*), plums, the jamun (*Eugenia Jambulina*), custard apple, guava and lime.

138. There is one forest area of 24 acres, Sundarban (ward no. 3) which is located within 100 m of the proposed water treatment plant. As per the state notification, that area is protected for conservation of tree species only. No wildlife is present in Sundarban. Trees are mainly Teak, Mehagani, Mango, Litchi, Jamun, Arjun, Tamarind and Rubber. There will be no cutting of trees in Sundarban during project implementation.

139. There is 1 tree at Constable Training school, 4 nos, at TM University water reservoir locations and 16 trees at proposed Barari customer service centers are need to be cut for construction work. Permission will be obtained before felling of the trees.

140. The district is known for its variety of monkeys and bats. Two species of Indian bear are also found in the district. Other species includes hyena, wolf, several species of cats, mongoose, Indian fox, the wild dog, jackal, deers such as barakhamba, the spotted deer, the four horned antelope and the barking deer are also found in the district. However, many of these species are now found rarely in the district.

141. Vikramshila Gangetic Dolphin Sanctuary (VGDS). This is a 50 km stretch of the Ganges River from Sultanganj to Kahalgaon. Designated in 1991, it is the only protected area for the endangered Gangetic dolphins in Asia. Once found in abundance, only a few hundred remain, of which half are found here. The Gangetic dolphins (*Platanista gangetica gangetica*) have been declared as the National Aquatic Animal of India. Gangetic Dolphins (known as

Soons by Locals) are classified as endangered on the 2006 IUCN Red List of Threatened Species and included in Schedule-I of the Indian Wildlife Protection Act, 1972. The sanctuary also contains rich diversity of other threatened aquatic wildlife, including the Indian smooth-coated otter (*Lutrogale perspicillata*), gharial (*Gavialis gangeticus*), a variety of freshwater turtles, and 135 species of waterfowl.

142. A strategy has been developed (2010) by the Ministry of Environment and Forest, Govt. of India for reducing the effects of water development on rivers in the Ganga basin, particularly on the habitation of the Gangetic Dolphin: The Ganga River dolphins need to be considered in the assessment of impacts of water development projects. The preferred option from a conservation perspective is to refrain from interfering with the natural flow regime and to avoid constructing barriers to animals and sediment movement. However, socio-political conditions make it impractical to completely halt water developmental activities especially in the Ganga basin, so the immediate goal must be to manage such activities in ways that will minimise the harm to dolphins and other aquatic species. The subproject sites are in the built-up area of town therefore animals are those commonly found in urban areas. None of the subproject activity for BWSP1 (Tranche 1) will fall in the Vikramshila Gangetic Dolphin Sanctuary.

C. Economic development

143. Bhagalpur being a district headquarters has been functioning as an administrative town with sustained growth in tertiary economic activities. The major economic activities are related to trade and commerce, thus it offers a number of wholesale and retail markets which act as a distribution center for nearby towns and villages.

144. **Land use.** The existing land use distribution of Municipal Area based on the primary survey is tabulated in **Table 14**.

Table 14: Existing Land Use of Municipal Area, 2007

	Land Use Category	Existing Land Use		Range as per Urban Development Plan Formulation & Implementation (UDPFI) guidelines in %
		Area in Ha	Land Use in %	
1	Residential	1129	37.42	40-45
2	Commercial	127	4.22	3-4
3	Industrial	214	7.10	8-10
4	Public & Semi-public	436	14.44	10-12
5	Recreational	128	4.24	18-20
6	Transport	533	17.64	12-14
7	Open land & Water bodies	449	14.88	
8	Special area	1	0.04	
	Total	3018	100	

Note – The above table is taken from 'Town of Bhagalpur Draft master Plan Vision 2027' - Prepared by Department of Urban Development, Government of Bihar, May 2009.

145. The residential land use at 37.42% is slightly below the standard guideline of 40-45%. Of the total residential land use around 2% is under mixed use. Commercial is 4.22%, which is fractionally higher than the standard guideline of 3-4%.

146. The percentage of land under industrial use is 7.1%, lower than the norm of 8-10% given by UDPFI. However it is interesting to note that the industrial use within the town is confined to household industries and thus land under industrial use has a mixed character. This indicates that the town is significantly lacking in proper industrial infrastructure and a major thrust is required for the development of the industrial sector. Diversification and broadening of the economic base is imperative in order to help generation of greater employment opportunities for the local community at large.

147. The public and semi-public land use at 14.44 % is more than sufficient in comparison to the standard guidelines, the main intervention that is required is in providing enough

schools and quality educational, health, recreational and socio-cultural facilities to the inhabitants.

148. Recreational land use at 4.24% is grossly inadequate against the standard guideline of 18-20% showing that there is an ample scope and need for accommodating more recreational facilities. Land use under transportation at 17.64% shows a higher level of traffic and transportation infrastructure existing in the town in comparison to the standard guidelines. This is mainly because of the airport landing ground within the town, which accounts for almost 17% of the total land use under the category of transport and 2.98% of the total land use. However, there is an urgent need for improving the existing roads, creation of more transport terminals and parking areas to cater to the increasing demand for the same by the local population in the town.

149. **Commerce.** The economy of Bhagalpur town is to a large extent dependent on agriculture and silk. Bhagalpur is famous worldwide for its silk production. The silk industry in this town is hundreds of years old, and the town has a famous Silk Institute. The town also has rice and sugar mills, and silk and wool weaving factories. The town has flourishing commercial activity in areas mostly concentrated in the central region, along the national highways and major roads within the town. Most of the developments in the older parts of the town are haphazard in nature. However the development and the commercial activity in the newly developed areas are mostly planned and organized.

150. The commercial activities present in the town may be broadly divided into retail and wholesale shopping, service and repairing shops, cold storage facilities, godowns and warehouse, breweries and distilleries, restaurants, hotels and dharamshalas and a sizable informal sector. The nature of commercial establishments on local streets mostly comprises of general stores, STD booths, dhabas etc. The informal sector is mostly in the form of small shops on footpaths or roadsides and thelas. A significant part of the population is engaged in the service sector and is self-employed. Thus trade and commerce is providing employment to a large section of the population in the town. The present area under commercial use is 137 ha. This includes the area under the commercial use along the major roads, the agriculture marketing board land, and other commercial uses in the town. The godowns are also calculated under the commercial use.

151. Centralised and uncontrolled commercial development has caused a lot of chaos and congestion in wards no 34, 35, 36, 37, and 38, which is the CBD area, especially along the major roads. The Sujanager Bazaar area is the most congested area that requires immediate improvement. Overall, the growth of commercial activities needs to be controlled and new developments channelled to newer areas to reduce congestion in the existing areas.

152. **Industrial development.** According to the district gazetteer, the district of Bhagalpur has been industrially active for a long time. It was famous for its Tussar Silk, dyeing, salt, indigo, and glassware industries in earlier times. Apart from that small-scale industries, such as basket weaving and distilleries making Taari from Mahua flowers were also prevalent.

153. Handloom silk industry in Nath Nagar, Hussainabad and Mirzanhat area are the existing industrial areas in the town. It may be noted that most of the households within the ward number 1 to 10 around the Nathnagar area have looms and could be categorized under small-scale household industries.

154. The bigger industries and industrial zones in the town are mostly confined to areas like Barari and Bahadurpur, which are just outside the present town boundary. The Industrial Estate at Barari is on the left side of the road leading to Vikramshila Setu, spread over an area of approximately 51 acres. The Bahadurpur area is spread around an area of 15 acres along -Savore road, which houses the Bihar Spun Silk Mill.

155. **Agriculture.** The economy of the Bhagalpur District is dependent mainly on agriculture and silk. The Gangetic plains are very fertile and the main crops include rice, wheat, maize, barley, sugarcane and oilseeds.

156. **Water supply.** The present supply of water in the town is described in Section II.

157. **Sewerage and Sanitation.** There is no organized sewerage system in the town. Absence of a proper waste water disposal system has resulted in septic tank effluent and sullage getting discharged into the storm water drains which are mostly open. Under the Ganga Action Plan, intercepting sewers have been laid in part of the town intercepting major drainage outfalls on the River Ganges. The intercepted flow is diverted through a collection chamber, into a grit chamber for grit removal and biologically treated in an aerated lagoon before its disposal into the Ganges River. Absence of a sewerage system is also linked to the poor water supply conditions in the town. The per capita supply is currently too low to ensure effective operation of a sewerage system.

158. The present sewage treatment plant (STP) at Sahebganj has a capacity of 11 MLD. As part of the Ganga Action Plan, a trunk sewer was laid from Maharajghat to the western side of the University in Sahebganj and the STP provided to treat the sewage before its disposal into river Ganges.

159. **Drainage.** In all, there are 25 major drains in the town. This covers the area north of the railway line which flows northwards into the Ganges and westwards into the Jamunia Nala. The areas covered include the Barari railway drain, Barari, Mayaganj, Mayaganj Bari Khanjarpur, Maharajghat, Khirnighat, Koilaghat, Adampur, Manik Sarkar, Mansoorganj, Sakhichand, Naya bazaar, University (Sahebganj), Champanagar Mehraw and Tanti Bazaar. On the south of the railway line, there are 10 major drains that follow the slope towards the south and south-east discharging into the low lying areas as well as a few water bodies. These drains act as sewer lines for all practical purposes during the dry weather season.

160. **Solid waste.** The generation of solid waste in the city is estimated to be of the order of about 132 tonnes per day. There are a total of 108 dustbins placed in various locations within the municipal corporation area. There are 24 big containers, 100 drums in various corners, 12 five tonner trolleys, 2 loader machines, one swiping machine and 2 jet machines, 2 compacters, 45 hand trolleys which are used for transportation of the solid waste. For transporting the wastes, there are 12 trailers and 19 bullock carts. Presently, there is no organized solid waste management method being adopted. There are no organized places of solid waste disposal, and random dumping is practiced by the municipal team. The wastes are dumped in low lying areas, along the road sides and also along the open drains. The drainage lines are the worst affected and have almost become solid waste dumping channels, resulting in the silting, obstruction and over flow of the sewerage and drainage at many places. There are 8 locations in which such ad-hoc dumping is undertaken at present. Segregation at source is not practiced and the collection is made from cement bins placed at various locations within the town. The transporting vehicles are also open, and during transportation the waste is scattered throughout the town roads.

161. **Transportation.** In , the east-west axis of the town running parallel to the River Ganges is the most important and active transport corridor being an important node in the region (the district headquarters) and being a commercial town attracts a lot of traffic, of which intercity through traffic forms a sizable portion. There are seven major roads in the town, out of which three are most important. The first and foremost is the National Highway-80 (Zero Mile to Champa nallah via Tilkamanjhi, Railway Station and Kabirpur Chowk), next is the PWD road stretch from Barari More to Champa nallah, and third is the alternative bye pass (Zero Mile to Kabirpur Chowk) passing through the southern side. The other major roads are Baunsi Road from the Railway station towards Maheshpur and Mirjanhat Road from Bholanath pul to Krishi Bazar.

D. Social and Cultural Resources

162. **Demography.** District has a population of 400,146 people (Census 2011) which comprises about 3 % of the total population of the State. It is the fifteenth largest district in Bihar in 2011 in terms of population. It is the third most urbanized district in the state with an urbanization level of 18.67%. Bhagalpur is a Class- I town as per Census definition and has a total population of 400146 (Census 2011). The town alone accounts for 13.17% of the total population of the district. The area of Bhagalpur Municipal Corporation is 30.17 sq.km. Thus

the gross density of the town is about 13,263 persons per sq km or 133 persons per Ha in 2011. The average literacy rate of town is 79.26 %, which is considerably higher than the State average of 47.53%.

Table 15: Demographic status of Bhagalpur city

Bhagalpur City	Total	Male	Female
Population	400146	212,813	187,333
Literates	273,695	153,821	119,874
Children (0-6)	54,818	28,734	26,084
Average Literacy (%)	79.26 %	83.56 %	74.34 %
Sex ratio	880		
Child Sex ratio	908		

Source: Census 2011

163. **Health and educational facilities.** In terms of the number of educational institutions as per the Town Directory, Census of India, 2011, Bhagalpur is not deficient in any level of educational facilities from primary to college level as per UDPI norms. There are 5 major colleges (including one medical college) and 2 universities (agriculture and general).

164. Planning for health is very important since it has a direct bearing on the human resource development and as an indicator of quality of life. As per the data provided by the Town Directory, Census of India, 2011, Bhagalpur is deficient in higher order hospital facilities although it has enough number of nursing homes to cater to the future projected population.

165. **History, culture, and tourism.** District is named after its main city, and corresponds to some portions of the ancient kingdoms of Anga and Mithila. References to Bhagalpur can be found in Indian epics like the Ramayana and the Mahabharata where Bhagalpur has been described as the kingdom of Anga. Mandar Hill, situated 52 km south from Bhagalpur, is believed to have been used as Churner during Samudra-Manthan by God and Danav according to Hindu mythology. Ancient cave sculptures of Emperor Ashoka's regime are found in the neighbourhood, and at Sultangunj, 20 km west of Bhagalpur, a temple of the Gupta period still exists. The tomb of Suja, brother of Moghul emperor Aurangzeb, in the heart of the town, is reminiscent of the city's association with the Mughal period. Ruins of ancient Vikramshila University are located 44 km east of Bhagalpur. It was the medieval centre to the conservation and propagation of Buddhist education, established by King Dharampal of Bengal at the end of the 8th century.

166. Chhath Puja, Laxmi Puja, Kali Puja and Dussehra are the major festivals in Bhagalpur. Bihula and Bishahari puja is specially celebrated in Bhagalpur.

167. Within the town one can visit Karngarh and the four hillocks, attractive Jain temples, a Christ Church near the city tower, an old cemetery in a very ruined shape, and museum besides Burh Nath temple on the riverside in Jogsar Mohallah.

168. Bhagalpur is equally famous for Visharhi Asthan, the venue for the Bihula or the Mansa Puja held every July when the snakes are worshipped. A little distance from the Visharhi Asthan temple lies the colourful Durga Asthan. Next door is the Mahashay Deori, a typical Thakur Bari. Mahashay was the honorific hereditary title given by Akbar in 1664 to Sri Ram Ghosh, the collector. The Mahashay deori is worth a visit. It revives the memory of a typical Mughal Zamindar's residence of deori replete with open court yard, a temple with a strange deity called Batuk Bhairab (possibly a Buddhist image) which was discovered by the early Mahashays at Tilhakothi where they used to live during the Mughal days.

169. Of the total 51,52,906 tourists who visited the non-Buddhist destinations in 2005 in Bihar, about 7% was accounted by / Sultanganj, and this accounted for about 6.32% of the entire tourist traffic in both Buddhist and Non-Buddhist destinations (58,44,209) in Bihar.

170. The subproject sites are not located within any sensitive historical, archaeological area.

171. **Sensitive Environmental Receptors.** The sensitive environmental receptors existing along the alignment of proposed sub-project include religious places, educational institutions, health care centres, community property resources, etc. These sensitive receptors will be not affected due to implementation of the project.

172. It is noted few religious places, health centers and schools are located within or near the ROW. All the sensitive environmental receptors existing along the subproject sites shall be properly supervised during the subproject execution stage so as to avoid and minimise any negative impact. As such, these sites may face the minor impacts of temporary disruption of access and increased air and noise pollution during execution of the proposed subproject.

IV. ANTICIPATED IMPACTS AND MITIGATION MEASURES

173. This section of the IEE reviews possible subproject-related impacts, in order to identify issues requiring further attention and screen out issues of no relevance. ADB SPS (2009) require that impacts and risks will be analyzed during pre-construction, construction, and operational stages in the context of the subproject's area of influence. As mentioned previously, the primary impact areas are (i) Barari Water Works, , OHTs, and pipe network alignments; (ii) main routes/intersections which will be traversed by construction vehicles; and (iii) quarries and borrow pits as sources of construction materials. The secondary impact areas are: (i) the entire Bhagalpur municipal area outside of the delineated primary impact area; and (ii) the entire Bhagalpur District in terms of over-all environmental improvement.

174. As per contract agreement of this sub project the DBO contractor has been finalized the IEE and which to be approved by ADB

175. As per contract clause Upon completion of SIP and all detail design, the contractor will update the draft IEE and EMP for the project to reflect the changes ,submit the updated IEE and EMP to the Employer for review and submission to ADB and shall not commence any work until the final approval of both is obtained from ADB

176. **Methodology.** Issues for consideration have been raised by the following means: (i) input from interested and affected parties; (ii) desktop research of information relevant to the proposed subproject; (iii) site visit and professional assessment by environment specialist engaged by the implementing agency; and (iv) evaluation of proposed design scope and potential impacts based on the environment specialist's past experience.

177. Categorization of the subproject has been undertaken using ADB's REA Checklist for Water Supply. REA checklist is attached as **Appendix 1**.

178. In the case of this subproject (i) most of the individual elements are relatively small and involve straightforward construction and operation, so impacts will be mainly localized and not greatly significant; (ii) most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving excavation and earth movements; and (iii) being located in the built-up area of Bhagalpur town, will not cause direct impact on biodiversity values. The subproject will be in properties held by the local government and access to the subproject locations is thru public rights-of-way and existing roads hence, land acquisition and encroachment on private property will not occur.

A Pre construction - Planning and Design Phase

179. Planning principles and design considerations have been reviewed and incorporated into the site planning process whenever possible. The concepts considered in design of the

proposed water supply subproject are: (i) no involuntary land acquisition; (ii) substantial reduction of water losses in sub-project area; (iii) augmentation in adequacy of drinking water supply at the user end; (iv) providing adequate infrastructure facilities for storage and distribution of water in deficient areas; (v) most suitable construction methodology; and (vi) site constraints.

180. Design Features. The design standards adopted under this sub-project are from the Central Public Health and Environment Engineering Organization (CPHEEO) Manual on Water Supply published by Ministry of Urban Development, Govt. of India. The same criteria are followed by the Public Health Engineering Department (PHED), the line department.

181. Design of the proposed components: It is proposed that the BWSP1 (Tranche 1) investments are commissioned by the year 2019 and the plan horizon year shall be 2032. The population forecast and demand calculations have also been done for the mid period, year 2032. The networks comprising of distribution system and rising mains are sized for 2 year design capacity and the pumping machinery and service reservoirs have been designed for the prospective year of 2032. The demand modelling has been undertaken with progressive increase in rate of supply with an overall average service level of about 135 lpcd for the year 2032.

182. Rehabilitation of Barari Water Works: It is proposed to renovate and improve the treatment process in the Barari Water works by adding chemical coagulation and flocculation units and replacing the electromechanical units. The existing disinfection systems are proposed to be completely replaced with gas-chlorination systems including all necessary dosing arrangements and related instrumentation. It is also proposed to install flow, pressure and water quality monitoring equipment and instrumentation for ensuring robust monitoring of the output quality and quantity from the works.

183. Distribution Network: The town has been subdivided in 23 number of operation zones and 48 nos. DMAs covering all 51 wards. The capacity of OHTs required in each zone has been worked out by the mass balancing method of assessing the difference between supply and demand patterns. Some of the existing reservoirs have been utilized in the system. Additionally 19 new OHTs have been proposed.

184. Existing Utilities: Telephone lines, electric poles and wires, water lines within the existing rights-of-way (ROW) may have a potential risk of damage. To mitigate the adverse impacts due to relocation of the utilities, PMC/DSC will (i) identify and include locations and operators of these utilities in the detailed design documents to minimise disruption of services during the construction phase; and (ii) require the Contractor to prepare a contingency plan to include actions to be done in case of unintentional interruption of services.

185. Water Supply: A different but no less significant impact is the effect on people and communities if water supplies are closed down for extended periods when work is conducted on the network. This would be inconvenient in the short term, and there could be health risks if the water supply was unavailable for several successive days or longer. It will therefore be important to take the necessary measures to avoid such a situation. This will require the IA and BMC and the appointed Contractor to:

- (i) Organise a structured and sustained communications program to inform the residents about the disruption of services and the alternate arrangements made to minimise the inconvenience;
- (ii) Plan the construction program to keep the cessation of water supplies to the minimum possible (in both area and duration);
- (iii) In coordination with BMC, provide alternative potable water to affected households and businesses for the duration of the shut-down; and
- (iv) Liaise with affected persons to inform them of any cessation in advance, and to ensure that they are provided with an alternative supply.

186. **Social and Cultural Resources:** There is a risk that any work involving ground disturbance can uncover and damage archaeological and historical remains. For this subproject, excavation will occur in and around existing rights-of-way (ROWs) and specified government land, so it could be that there is a low risk of such impacts. Nevertheless, the PMC/DSC will before the commencement of construction:

- Consult Archaeological Survey of India (ASI) to obtain an expert assessment of the archaeological potential of the site;
- Consider alternatives if the site is found to be of medium or high risk;
- Include state and local archaeological, cultural and historical authorities, and interest groups in consultation forums as project stakeholders so that their expertise can be made available; and
- Develop a protocol for use by the Contractor in conducting any excavation work, to ensure that any chance finds are recognised and measures are taken to ensure they are protected and conserved.

187. **Site selection of construction work camps, stockpile areas, storage areas, and disposal areas.** Priority is to locate these near the subproject locations. However, if it is deemed necessary to locate elsewhere, sites to be considered will not promote instability and result in destruction of property, vegetation and drinking water supply systems. Thickly populated residential areas will not be considered for setting up camps to protect the human environment (i.e., to curb accident risks, health risks due to air and water pollution and dust, and noise, and to prevent social conflicts, shortages of amenities, and crime). Extreme care will be taken to avoid disposals near the forest, water bodies or in areas which will inconvenience the community. All locations would be included in the design specifications and on plan drawings. Locations are selected without impacting the local habitation. **Appendix 7** shows site management plan for water storage reservoir sites.

188. **Site selection for equipment lay-down and storage area.** Improper selection will affect local environment and inconvenience to public. Possible mitigation measures are,

- Choice of location for equipment lay-down and storage areas must take into account distances to adjacent land uses, general onsite topography and water erosion potential of the soil. Impervious surfaces must be provided where necessary.
- Storage areas shall be secure so as to minimize the risk of crime. They shall also be safe from access by children / animals etc.
- Residents living adjacent to the construction site must be notified of the existence of the hazardous storage area.
- Equipment lay-down and storage areas must be designated, demarcated and fenced if necessary.
- Fire prevention facilities must be present at all storage facilities.
- Proper storage facilities for the storage of oils, paints, grease, fuels, chemicals and any hazardous materials to be used must be provided to prevent the migration of spillage into the ground and groundwater regime around the temporary storage areas.
- These storage facilities (including any tanks) must be on an impermeable surface that is protected from the ingress of storm water from surrounding areas in order to ensure that accidental spillage does not pollute local soil or water resources.
- Fuel tanks must meet relevant specifications and be elevated so that leaks may be easily detected.

- Staff dealing with these materials / substances must be aware of their potential impacts and follow the appropriate safety measures.

189. **Site selection of sources of materials.** Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution. To mitigate the potential environmental impacts, locations of quarry site/s and borrow pit/s (for loose material other than stones) would be included in the design specifications and on plan drawings. Mining Department approved sites would be selected first. If other sites are necessary, these would be located away from population centers, drinking water intakes and streams, cultivable lands, and natural drainage systems; and in structurally stable areas even if some distance from construction activities. It will be the construction contractor's responsibility to verify the suitability of all material sources and to obtain the approval of Urban Local Body. If additional quarries will be required after construction is started, then the construction contractor shall use the mentioned criteria to select new quarry sites, with written approval of PIU/PMU/PMC.

190. **Maintaining Core Labour Standard.** The Contractor and PMU are responsible for ensuring that international CLS³ –as reflected in national labour laws and regulations are adhered to. PMU is ultimately responsible for monitoring compliance with national labour laws and regulations, provided that these national laws are consistent with CLS. ADB will carry out due diligence – during loan review missions - to ensure that executing and implementing agencies and contractors comply with applicable (national) core labour standards and labour laws. PMU/PIU will ensure that bidding and contract documents include specific provisions requiring contractors to comply with all: (i) applicable labour laws and core labour standards on: (a) prohibition of child labour as defined in national legislation for construction and maintenance activities; (b) equal pay for equal work of equal value regardless of gender, ethnicity or caste; and (c) elimination of forced labour; and (ii) the requirement to disseminate information on sexually transmitted diseases including HIV/AIDS to employees and local communities surrounding the project sites. These will be monitored as part of the project's safeguards reporting requirements.

B. Construction Phase

191. **Table 16** presents an indication of what activities and facilities are likely to be undertaken during construction of the subproject, including the associated inputs and outputs.

Table 16: Summary of Activities and Facilities, Resource Use, and Produced Outputs during Construction Phase

Activities and Facilities	Inputs/Resource Use	Outputs/Waste Production
<ul style="list-style-type: none"> • Construction camp and its associated facilities (including lay-down areas) • Storage camps and lay-down areas <ul style="list-style-type: none"> – Materials and equipment stockpiles – Handling and storage of 	<ul style="list-style-type: none"> • Bitumen • Cement • Chemical additives used in concrete • Aggregate (sand and stone) • Gravel (fill material and selected material for sub-base and base layers) 	<ul style="list-style-type: none"> • Old asphalt (removed from road carriageway during laying of pipelines)⁴ • Waste concrete and other construction rubble • Waste bitumen⁵ • Used fuels, lubricants, solvents and other hazardous

³ Core Labor Standards (CLSs) are a set of four internationally recognized basic rights and principles at work: (i) freedom of association and the right to collective bargaining; (ii) elimination of all forms of forced or compulsory labor; (iii) effective abolition of child labor; and (iv) elimination of discrimination in respect of employment and occupation.

⁴ The water supply improvement works affecting roads may involve the stripping and demolition of old asphalt layers. Ideally, old asphalt shall be reused during construction of the new road in order to avoid large quantities of waste being produced. However, depending on the availability and cost of virgin aggregate in the area through which the road is aligned, reusing the old asphalt may be more costly than using virgin aggregate.

⁵ Bitumen has relatively low levels of polycyclic aromatic hydrocarbons (PAHs) and is largely inert. However, certain other potentially hazardous chemical may be added to the bitumen or to the aggregate during the construction process in order to render the compound more workable. The objective is to use the least hazardous chemicals available and to locate asphalt plants, aggregate stockpiles and mixing areas where they do not pose a significant environmental risk.

Activities and Facilities	Inputs/Resource Use	Outputs/Waste Production
<p>hazardous materials including chemicals additives, gravel, cement, concrete and lubricants</p> <ul style="list-style-type: none"> • Source of water • Vegetation clearance • Excavation • Drilling • Movement of construction staff, equipment and materials • Importation of selected materials for construction. • Temporary bypass • Noise and vibrations • Dust suppression • Waste production and temporary storage/disposal i.e. used fuels, waste concrete and bitumen, spoil materials and general waste • Use of bitumen/asphalt • Erosion prevention particularly at hill areas • Concrete batching plant (and associated storage and mixing areas, chemicals) • Rehabilitation of disturbed areas • Interaction between construction workforce and local communities • Management of the passing pedestrians and points of congestion • Implementation of the Resettlement Plan (as per R & R policy) prior to start of construction • Reminders to affected people of construction with timeframes 	<ul style="list-style-type: none"> • Water <ul style="list-style-type: none"> - Drinking, cooking and sanitation at construction camps - Water for dust suppression - Water applied to base and sub-base layers during compaction - Water for application to sub-base and base layers prior to compaction • Petrochemicals • Other chemicals/lubricants/paints • Construction vehicles, machinery and equipment • Temporary energy supply to construction camps • Labour <ul style="list-style-type: none"> - Recruitment of construction workforce - Skills training • Public movement control <ul style="list-style-type: none"> - need barriers (not just caution/danger tape) to protect people from trenches during construction 	<p>waste</p> <ul style="list-style-type: none"> • General waste • Contaminated soil <ul style="list-style-type: none"> - Soil contaminated with bitumen - Soil contaminated with petrochemicals (i.e. oils and lubricants) and other chemicals • Sewage and grey water (temporary construction camp sanitation) • Spoil material (excess soil removed during excavations for rehabilitation) • Noise and vibrations (construction vehicles and machinery operation) • Lighting at construction camps, equipment yards and lay-down areas • Smoke and fumes <ul style="list-style-type: none"> - Burning of vegetation cover - Fires used for cooking and space heating (construction camps) - Vehicle exhaust emissions • Dust <ul style="list-style-type: none"> - Vehicle & equipment movement

1. Screening of No Significant Impacts

192. The construction work is expected not to cause major negative impacts, mainly because:

- (i) Most of the activities will be on the built-up areas of Bhagalpur city thus could be constructed without causing impacts to biodiversity;
- (ii) All the sites are located on an government-owned land which is not occupied or used for any other purpose;
- (iii) Overall construction program will be relatively short and is expected to be completed in 42 months with activities to conducted by small teams and specified location so most impacts will be localized and short in duration; and

- (iv) Most of the predicted impacts associated with the construction process are produced because the process is invasive, such as involving excavation for pipe laying and construction of reservoirs. However the routine nature of the impacts means that most can be easily mitigated and the impacts are clearly a result of the construction process rather than the design or location, as impacts will not occur if excavation or other ground disturbance is not involved.

193. As a result, there are several aspects of the environment which are not expected to be affected by the construction process and these can be screened out of the assessment at this stage as required by ADB procedure. These are shown in **Table 17**. These environmental factors are screened out presently but will be assessed again before starting of the construction activities.

Table 17: Fields in which construction is not expected to have significant impacts

Field	Rationale
Topography, Drainage, and Natural Hazards	Activities are not large enough to affect these features.
Geology, Geomorphology, Mineral Resources, and Soils	Activities are not large enough to affect these features. No mineral resources in the subproject sites.
Climate	Activities are not large enough to affect this feature.
Air Quality	Short-term production of dust is the only effect on atmosphere
Geo-hydrology and Groundwater	Activities will not be large enough to affect these features
Protected Areas	No impact is anticipated Vikramshila Gangetic Dolphin Sanctuary as there will be no construction activity in Ganga River as part of this subproject (BWSP1).
Flora	No rare or endangered species.
Land Use	No change in land use.
Socio-economic	Subproject site is mostly located on government-owned land so there is no need major acquisition of land
Commerce, Industry, and Agriculture	Activities are not large enough to affect these features
Population	Activities are not large enough to affect this feature.
Health and education facilities	Activities are not large enough to affect this feature.
Historical, Archaeological, Paleontological, or Architectural sites	No scheduled historical, archaeological, paleontological, or architectural sites

2. Construction Method

194. Distribution mains will be buried in trenches adjacent to roads using available rights-of-way (ROW). In some areas occupied by drains or edges of shops and houses, trenches may be dug into the edge of the road to avoid damage to utilities and properties.

195. Trenches will be dug using a backhoe digger, supplemented by manual digging where necessary. Excavated soil will be placed alongside, and the pipe bedding will be prepared with the sand from local quarries placed manually in the trench and the pipes (brought to site on trucks and stored on pre-identified yards) will be placed in the trench by hand or using a small rig for the larger Ductile Iron (DI) pipes. Pipes will be joined by hand, after which sand will be shovelled into the trench around the pipe for support and protection. Soil will then be replaced manually on top of the pipe and compacted in layers by a vibrating compactor. Where trenches are dug into an existing roadway, the bitumen or concrete surface will be broken by hand- held pneumatic drills, after which the trench will be excavated by backhoe, and the appropriate surface will be reapplied on completion.

196. Pipes are normally covered by 1.0 m of soil, and a clearance of 300 mm is left between the pipe and each side of the trench to allow backfilling.

197. New pipes and connections to the distribution main will be provided to house connections, and these will run to individual dwellings in small hand-dug trenches, or on the surface. New consumer meters will be located within the property boundary, attached to a wall or set onto the ground to ensure safety of equipment against theft or sabotage. In slum areas efforts will be made by involving the community to encourage individual private water connections, and in situations where laying a distribution rider main is not permissible, shared taps would be provided duly identifying the respective owners for such shared taps.

198. New OHTs will be built on at various locations in the town. The foundations for the ground level and overhead reservoirs will be excavated by backhoe, with soil being loaded onto trucks for disposal. Aggregate and plain cement concrete will be tipped into each void to create the foundations and floor, after which steel reinforcements will be fabricated to create the outline of the walls of the ground reservoir and the vertical supporting columns or shafts for the overhead reservoir. Sections of reinforcing will then be encased in wooden shuttering and cement concrete will be poured in, and this process will be repeated to gradually create each structure from reinforced cement concrete (RCC), including the tank of the overhead reservoir and the above-ground portion of the ground reservoir. Surfaces will be smoothed and finished where necessary by hand.

199. Chlorination rooms will be built in brick masonry in the Barari Water Works. The foundation will be dug and aggregate and concrete poured in to create the floors, after which the brick walls and roof materials will be added by hand. Chlorine cylinders and other equipment (including flow-meters) will be brought in on trucks and offloaded and installed by hand. A sump and trenches for pipe-work will also be dug, and the sump will be constructed from concrete and brick for safety against chlorine leaks.

3 Anticipated Impacts and Mitigation Measures

200. Although construction of the subproject components involves quite simple techniques, the invasive nature of excavation, and in this case the relatively large size and length of the pipes, means that there will be quite a lot of physical disturbance in the built-up areas of Bhagalpur town where there are a variety of human activities. Physical impacts will be reduced by the method of working, whereby the trenches will be (i) constructed by small teams working on short lengths at a time; (ii) refilled and compacted after pipes are installed; and (iii) if trenching is done on roads, repaired to pre-construction conditions.

201. **Climatic Impact.** Potential impacts during construction are,

- The nature and intensity of rainfall events in an area, has implications for storm water management.
- Smoke from burning activities could be wider spread on windy days especially when dust could be blown off site.

Mitigation measure:

- ✓ Seasonal climatic variations will be considered during scheduling of construction activities in the area.
- ✓ Consideration of suitable season (non monsoon /lean period) for major construction activity
- ✓ Excavations and other clearing activities will only be done during agreed working times and permitted weather conditions.
- ✓ Storm water control (through drainage, diversion) during construction phase as per the method approved by the Engineer.

202. **Sources of Materials.** A significant amount of gravel, sand, and cement will be required for this subproject. Approximately 8000 m³ of sand, 15000 m³ of stone chips and 3000 MT of cement will be brought to site during construction. The construction contractor will be required to:

- (i) The material sources permitted by government;
- (ii) Verify suitability of all material sources and obtain approval of PIU & DSC; and
- (iii) If additional quarries will be required after construction has started, obtain written approval from PMU; and
- (iv) Submit to DSC on a monthly basis documentation of sources of materials.

203. **Air Quality.** Emissions from construction vehicles, equipment, and machinery used for excavation and construction will induce impacts on the air quality in the construction sites. Anticipated impacts include dusts and increase in concentration of vehicle-related pollutants such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons) but temporary and during construction activities only. To mitigate the impacts, construction contractors will be required to:

- (i) Consult with DSC/PIU on the designated areas for stockpiling of clay, soils, gravel, and other construction materials;
- (ii) Damp down exposed soil and any stockpiled on site by spraying with water when necessary during dry weather;
- (iii) Avoiding the need to stockpile on site;
- (iv) Use tarpaulins to cover sand and other loose material when transported by trucks;
- (v) Fit all heavy equipment and machinery with air pollution control devices which are operating correctly and regular servicing of the vehicles & equipments off site in order to limit gaseous emissions; and
- (vi) Excess earth and other windblown loads in transit will be kept covered

204. **Surface Water Quality:** Construction activities will be conducted throughout the town even near the drains flowing to *nallahs* and water bodies. Mobilization of settled silt materials, run-off from stockpiled materials, and chemical contamination from fuels and lubricants during construction works can contaminate surface water quality. These potential impacts are temporary and of short-term duration only, and to ensure these are mitigated, the Contractor will be required to:

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

205. **Noise Levels:** There are no health facilities, religious sites (temples and churches), scheduled or unscheduled historical, archaeological, paleontological, or architectural sites near the construction sites. However, construction works will be near residential areas, schools and areas with small-scale businesses. The sensitive receptors are the general population in these areas. Increase in noise level may be caused by earth-moving and excavation equipment, and the transportation of equipment, materials, and people. Impact is negative, short-term, and reversible by mitigation measures. The Contractor will be required to:

- (i) Plan activities in consultation with DSC/PIU so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance;
- (ii) Require horns not be used unless it is necessary to warn other road users or animals of the vehicle's approach;
- (iii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor;
- (iv) Ensure that machinery is in a good state of maintenance.
- (v) Monitor noise levels in potential problem areas, and
- (vi) Maintain maximum sound levels not exceeding 80 decibels (dbA) when measured at a distance of 10 m or more from the vehicle/s.

206. **Generation of Spoil and disposal.** In case of disposal of the earth within the water body turbidity will be increased.

207. The following measures should be taken up,

- (i) Not to dispose any construction materials in water body which may pollute the surface water and aquatic fauna
- (ii) Spoil Disposal Management Plan (SDMP) prepared and implemented to minimize the potential effects of sediment plumes on terrestrial and aquatic system. Spoil management plan is attached as **Appendix 9**.
- (iii) Details of the proposed Water Quality Monitoring Program will be included in the environment management plan

208. Under 1st phase of project execution spoil will be generated. Estimated amount is as follows.

Quantification of Spoil materials

Description	For 50 Km Pipe Line	For 3 Nos. OHSR	Total
Total Excavation	22000 Cum	7200 Cum	29200 Cum.
Refilling of Trenches (70%)	15400 Cum.	5040 Cum	20440 Cum.
Disposal of Balance Materials	6600 Cum.	2160 Cum	8760 Cum.

209. Spoil will be transported by dumper after covering with tarpaulin. Disposal site is selected near Barari WTP as suggested and recommended by BMC. Detail enclosed in **Appendix 9**.

210. **Existing Infrastructure and Facilities.** Excavation works can damage existing infrastructure located alongside roads, in particular water supply pipes. It will be particularly important to avoid damaging existing water pipes. It is therefore important that construction contractors will be required to:

- (i) Utility shifting (if required) will be undertaken prior to commencing construction works.
- (ii) Keep construction related disturbances to a minimum.
- (iii) Consult with affected service providers regarding impacts on access to infrastructure and services and alternatives.
- (iv) Consult with affected communities or businesses prior to foreseeable disruptions, for example notifying residents of a temporary interruption of water supply.
- (v) Provide backup or alternative services during construction-related disruptions,
- (vi) Provide access points to infrastructure and services.
- (vii) Monitor complaints by the public

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

- (i) Prepare and implement Waste Management Plan;
- (ii) Storage areas will be properly fenced off;
- (iii) Avoid stockpiling of excess excavated soils;
- (iv) Top soil needs to be utilised by farmers for nutrient value;
- (v) Coordinate with DSC-PIU for beneficial uses of excess excavated soils or immediately dispose to designated areas;
- (vi) Recover used oil and lubricants and reuse or remove from the sites;
- (vii) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas for improvement of aesthetic environment;
- (viii) Remove all wreckage, rubbish, or temporary structures which are no longer required; and
- (ix) Request DSC/PIU to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.

212. Preliminary estimates indicate, overburden earth quantity (including road dismantling)

- road cutting for distribution pipe K7 pipes :78482 m³
- For 19 OHSR quantity: 33651 m³

Total waste- excavated earth & dismantling waste: 112133m³. Excess earth after testing will be generally utilized for landfilling at water reservoir sites and disposal to approved sites.

213. **Surface and Groundwater Quality.** Another physical impact that is often associated with excavation is the effect on drainage and the local water table if groundwater and surface water collect in the voids. To ensure that water will not pond in pits and voids near subproject location, the construction contractor will be required to conduct excavation works on non-monsoon season.

214. **Ecological resources –Terrestrial.** There is one protected area, the Vikramshila Gangetic Dolphin Sanctuary, located in Bhagalpur District of Bihar, India. The sanctuary is a 50 km stretch of the River Ganga from Sultanganj to Kahalgaon. Designated in 1991, it is the main protected area for the endangered Gangetic Dolphins. The Gangetic dolphins (*Platanista gangetica gangetica*) have been declared as the National Aquatic Animal of India. Gangetic Dolphins (known as Soons by locals) are Classified as Endangered on the 2006 IUCN Red List of Threatened Species and included in Schedule- I of the Indian Wildlife Protection Act, 1972. No construction activities are planned as part of the BWSP1 (Tranche 1) subproject within the Vikramshila Gangetic Dolphin Sanctuary. However, to ensure that there is no impact on account of project related construction activities it will be ensured that no construction waste is disposed in the River Ganga during rehabilitation of the existing Barari Water Works and associated facilities Felling of the trees (21 nos.) will affect terrestrial ecological balance. Following mitigation measures will be applied,

- Minimize removal of vegetation and disallow cutting of trees as far as possible through design modification;
- If tree-removal will be required, obtain tree-cutting permit /NOC from concerned agency;

- Require to plant three (3) native trees for every one (1) that is removed; and
- Prohibit employees from poaching wildlife, bird hunting, and cutting of trees for firewood.
- Non removal of trees of religious importance

215. **Traffic & Accessibility.** Hauling of construction materials and operation of equipment on-site can cause traffic problems. Road safety concerns due to slow moving construction vehicles are also an impact.. Traffic flow within the vicinity will be affected. The temporary road closure will result in a decrease in overall network performance in terms of queuing delay, travel times/ speeds. Also pedestrian movements will be affected by the temporary road closure or traffic diversion.

216. Potential impact is negative but short term and reversible by mitigation measures. The construction contractor will be required to:

- (i) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites;
- (ii) Schedule transport and hauling activities during non-peak hours;
- (iii) Locate entry and exit points in areas where there is low potential for traffic congestion;
- (iv) Keep the site free from all unnecessary obstructions;
- (v) Drive vehicles in a considerate manner;
- (vi) Coordinate with Govt. Traffic Department for temporary road diversions and with for provision of traffic aids if transportation activities cannot be avoided during peak hours; and
- (vii) Notify affected sensitive receptors by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.

217. In 1st Phase of execution (approx. 50 Km length) roads are mostly having 4.5 m. width with both side earthen shoulder. The roads are Factory Road, Baniya Toli Lane, Barari Road, Feri Road, Vikarmshila Setu Road, Burning Ghat Road, Rahmat Hussain lane, Surya Mohan Path, Pani Kal Road, Janta Flat Road, MIG Road etc. The Pipe will be layed in earthen shoulder of the road not in RCC Road / Bituminous road. Traffic rule will be followed and execution will be started after getting the permission from authority.

218. Traffic Management Plan is attached as **Appendix 10.**

219. **Social, Socio-Economic Including Income.** The subproject components will be located in Government land. Construction works will impede the access of residents to specific site in limited cases. The potential impacts are negative and moderate but short-term and temporary. The construction contractor will be required to:

- (i) Contractor's activities and movement of staff to be restricted to designated construction areas.
- (ii) Conduct of the construction staff when dealing with the public or other stakeholders shall be in a manner that is polite and courteous at all times.
- (iii) Leave spaces for access between mounds of soil;
- (iv) Provide walkways and metal sheets where required to maintain access across for people and vehicles;
- (v) Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools;

- (vi) Consult businesses and institutions regarding operating hours and factoring this in work schedules; and
- (vii) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.
- (viii) Contractor shall submit to Engineer the confirmation obtained from the business/shop owner that such access was provided during project execution on the specified format titled "Confirmation from Operator of Commercial establishment/shop for provision of temporary Access by Contactor". This format is appended as **Appendix 11**.
- (ix) Lighting on the construction site shall be pointed downwards and away from oncoming traffic and nearby houses.
- (x) The site must be kept clean to minimize the visual impact of the site.
- (xi) Notice of particularly noisy activities must be given to residents / businesses adjacent to the construction site. Examples of these include:
 - noise generated by jackhammers, diesel generator sets, excavators, etc.
 - drilling
 - dewatering pumps
- (xii) Noisy activities must be restricted to the times given in the Project Specification or General Conditions of Contract
- (xiii) A complaints register (refer to the Grievance Redressal Mechanism) shall be housed at the site office.

220. **Socio-Economic – Employment.** Manpower will be required during the 42-months construction stage. This can result to generation of contractual employment and increase in local revenue. Thus potential impact is positive and long-term. The construction contractor will be required to:

- (i) Employ at least 50% of the labour force, or to the maximum extent, local persons within the 2-km immediate area if manpower is available; and
- (ii) Secure construction materials from local market.

221. **Occupational Health and Safety.** Workers need to be mindful of the occupational hazards which can arise from working in height and excavation works. Potential impacts are negative and long-term but reversible by mitigation measures. World bank Environmental, Health, and Safety (EHS) Guidelines - EHS Guidelines for water & sanitation will be followed(<http://www.ifc.org/wps/wcm/connect/e22c050048855ae0875cd76a6515bb18/Final%2B-%2BWater%2Band%2BSanitation.pdf?MOD=AJPERE>). The construction contractor will be required to:

- ✓ Designate a safeguard focal person and undertake safeguards orientation by PMC/ DSC
- ✓ Develop and implement site-specific Health and Safety (H and S) Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use Personal Protective Equipment; (c) H and S Training⁶ for all site personnel; (d) documented procedures to be

⁶ Some of the key areas that may be covered during training as they relate to the primary causes of accidents include (i) slips, trips and falls; (ii) personal protective equipment; (iii) ergonomics, repetitive motion, and manual handling; (iv) workplace transport; and (v) legislation and responsibilities. Training can provide the foundations of competence but it does not necessarily result in a competent worker. Therefore, it is essential to assess staff competence to ensure that the training provided is relevant and effective. Supervision and monitoring arrangements shall be in place to ensure that training has been effective and the worker is competent at their job. The level of supervision and monitoring required is a management decision that shall be based on the risks

followed for all site activities; and (e) documentation of work-related accidents (approval will be required from PMC before implementation);

- ✓ Strict compliance of H&S plan and requirements of wearing personal protective equipment (PPE) during work hours;
- ✓ Provide specific guidance for suitable PPE for every on-site work assignment.
- ✓ Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site;
- ✓ Provide medical insurance coverage for workers;
- ✓ Secure all installations from unauthorized intrusion and accident risks;
- ✓ Provide supplies of potable drinking water;
- ✓ Provide clean eating areas where workers are not exposed to hazardous or noxious substances;
- ✓ Provide H and S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers;
- ✓ Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted;
- ✓ Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;
- ✓ Ensure moving equipment is outfitted with audible back-up alarms;
- ✓ Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate; and
- ✓ Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.

222. There should be official notification related to penalties for non compliance of safety issues.

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

- (i) Plan routes to avoid times of peak-pedestrian activities.
- (ii) Liaise with DSC- PIU in identifying risk areas on route cards/maps.
- (iii) Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.
- (iv) Provide road signs and flag persons to warn of dangerous conditions, in case of location near the road.

associated with the job, the level of competence required, the experience of the individual and whether the worker works as part of a team or is a lone worker.

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

224. **Work Camps.** Operation of work camps can cause temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants. Potential impacts are negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

- (i) Consult with DSC-PIU before locating project offices, sheds, and construction plants;
- (ii) Minimize removal of vegetation and disallow cutting of trees;
- (iii) Provide water and sanitation facilities for employees;
- (iv) Prohibit employees from poaching wildlife and cutting of trees for firewood;
- (v) Train employees in the storage and handling of materials which can potentially cause soil contamination;
- (vi) Recover used oil and lubricants and reuse or remove from the site;
- (vii) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;
- (viii) Remove all wreckage, rubbish, or temporary structures which are no longer required; and
- (ix) Request DSC to report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.

225. **Social and Cultural Resources.** For this subproject, excavation will occur at specific isolated location and along the roads, so it could be that there is a moderate risk of such impacts. Nevertheless, the construction contractor will be required to:

- (i) Strictly follow the protocol for chance finds in any excavation work;
- (ii) Request DSC- PIU or any authorized person with archaeological/historical field training to observe excavation; and
- (iii) Stop work immediately to allow further investigation if any finds are suspected; State Department of Archaeology will be contacted if any heritage resources or objects, defined in the Act, be discovered and all activities will be ceased until further notice.

C. Operation and Maintenance Phase

226. **Table 18** presents an indication of what activities and facilities are likely to be undertaken during operation and maintenance of the subproject, including the associated inputs and outputs.

Table 18: Summary of Activities and Facilities, Resource Use, and Produced Outputs during Operation and Maintenance Phase

Activities and Facilities	Inputs/Resource Use	Outputs/Waste Production
<ul style="list-style-type: none"> • Signages • Safety barriers • Noise and vibrations • Litter collection • Maintenance activities <ul style="list-style-type: none"> - Repairing and maintenance of pipelines, pumps and machinery of WTP, - Maintenance of OHTs, and pipelines 	<ul style="list-style-type: none"> • Control of vegetation species • Labour • Control of quality of supplied water • Vehicles and equipment used for inspections and maintenance • Aggregate and other material used during repairing of WTP, pump & 	<ul style="list-style-type: none"> • Vehicle exhaust emissions • Dust • Potential for water resource contamination • Visual exposure of water supply infrastructure • Waste/worn out material removed during maintenance • Noise and vibrations

Activities and Facilities	Inputs/Resource Use	Outputs/Waste Production
<ul style="list-style-type: none"> • Eradication and control of invasive vegetation species • Auxiliary activities and Infrastructure <ul style="list-style-type: none"> - Markets and shops • Ground water quality monitoring during operation and maintenance. Parameters as per Indian standard 	<p>machinery and OHT.</p>	

1. Screening out areas of no significant impact

227. Because a water supply system should operate without the need for major repair and maintenance, there are several environmental sectors which should be unaffected once the system begins to function. These are identified in **Table 19** below, with an explanation of the reasoning in each case. These factors are thus screened out of the impact assessment and will not be mentioned further.

Table 19: Fields in which Operation and Maintenance of the Water Supply Component is not Expected to have Significant Impacts

Field	Rationale
Climate	No impact expected
Wildlife, forests, rare species, protected areas	There are no wildlife, forests, rare species, and protected areas.
Coastal resources	Bhagalpur is not located in a coastal area.
Industries	The water supplied by the new system will not be for industrial use

2. Operation and Maintenance of the Improved Water Supply System

228. O & M of the water supply system will be the responsibility of the Contractor. A small number of people will be employed to operate and maintain the WTPs, existing intake wells and pumping stations, and OHT sites. The Contractor will employ local contractors to conduct network repairs, and contractors should be required to operate the same kinds of H & S procedures as used in the construction phase to protect workers and the public.

229. The system have a design life of 30 years, during which shall not require major repairs or refurbishments and should operate with little maintenance beyond routine actions required to keep the pumps and other equipment in working order. The stability and integrity of the system will be monitored periodically to detect any problems and allow remedial action if required. Any repairs will be small-scale involving manual, temporary, and short-term works involving regular checking and recording of performance for signs of deterioration, servicing and replacement of parts.

230. The main requirement for maintenance of the transmission main and distribution system will be for the detection and repair of leaks. The generally flat topography and the usage of good quality DI pipes should mean that pipeline breaks are kept to a minimum, and that leaks are mainly limited to joints between pipes. The repair of household connections and the provision of new connections to slums and developing areas to increase the number of people supplied should reduce the incidence of illegal connections, which are often a major source of leaks.

231. During the operation of the water treatment plant a large volume of physical and chemical sludge will be generated. Sludge quality has been analysed and tentative management plan is shown in **Appendix 12**.

3. Anticipated Environmental Impacts and Mitigation Measures

232. **General.** If trenches are will be dug to locate and repair leaks or remove and replace lengths of pipe or illegal connections, the work will follow the same procedures during the construction stage. BMC needs to require its O and M contractor to:

- Refill and re-compact trenches soil and backfilled sand will be removed to expose the leaking junction or pipe;
- Conduct work during non-monsoon period; and
- Cover or wet excavated material to prevent dusts.

233. **Health & safety issues.** Adverse impacts on the appearance of surrounding environment and exposure of workers to hazardous debris. Improvement of water supply system is expected to significantly enhance the quantity and quality of the supplied water. Reduction in leakages will ensure adequate supply of potable drinking water minimizing contamination risks with corresponding reduction in health risks to the citizens.

234. Mitigation measure include, Follow World bank EHS guidelines during operation phase

- Undertake regular monitoring and maintenance of water supply infrastructure.
- Regular chemical & biological testing of from supply sites. Parameters are as per Indian standard

235. **Storage of Common salt as chemical used in water treatment at Intake well site.** The impact associated with loss of chemical due to poor storage. Mitigation measures include,

- Storage should be in dry place
- Storage should be minimum
- Material safety data sheet to be maintained at chlorine/ common salt storage area
- Regular laboratory testing for dosing and residual chlorine
- Chlorination in water will be done as per CPHEEO manual and ensure residual chlorine within permissible limit.
- Trained workers will be depute for selected dosage of chlorine to be added in the water supply

236. **Ecological Resources.** During operation of the improved water supply system, for protection of aquatic fauna particularly dolphins, measures considered during construction/rehabilitation will be continued. This includes in particular no disposal of waste material in the River Ganga and limiting withdrawal of water during dry periods with due consideration of the Sanctuary Management and Dolphin Conservation Plans. BWSP1 is related to construction of water treatment plant, enhancement of storage capacity and distribution of water in the town particularly at uncovered areas; therefore no such impact is expected on Dolphin and other aquatic animal.

237. **Economic Development.** There are no major anticipated economic development impacts during O and M of the facilities. Nevertheless BMC needs to require its DBO contractor to:

- (i) Inform all residents, businesses and sensitive receptors about the nature and duration of any work well in advance so that they can make preparations if necessary;
- (ii) Consult city authorities regarding any such work so that it can be planned to avoid traffic disruption as far as possible, and road diversions can be organised if necessary.

238. The provision of an improved and expanded water supply system is not expected to have direct economic benefits for business or industry, as connections will only be provided to domestic users. However businesses will almost certainly benefit from the expected improvement in the health and well-being of their workforce as this should result in fewer days lost through illness, and overall increased productivity.

239. **Social and Cultural Resources.** Although there is a medium risk of excavation in the city discovering material of historical or archaeological importance, there will be no need to take precautions to protect such material when areas are excavated to repair.

240. Repair works could cause some temporary disruption of activities at locations of social and cultural importance such as schools, hospitals, temples, tourist sites etc, so the same precautions as employed during the construction period should be adopted. BMC needs to require its O and M contractor to:

- (i) Consult the city authorities to identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity;
- (ii) Complete work in these areas quickly;
- (iii) Consult municipal authorities, custodians of important buildings, cultural and tourism authorities and local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals.

241. The citizens of the Bhagalpur city will be the major beneficiaries of the improved water supply, as they will be provided with a constant supply of better quality water, piped into their homes. In addition to improved environmental conditions, the subproject will improve the over-all health condition of the town as diseases of poor sanitation (such as diarrhoea and dysentery) will be reduced.

242. **Appendix 13** depicts Indian Standards for Drinking Water - Specification (Bureau of Indian Standard, BIS 10500: 2012). The standard indicates desirable and permissible limit of drinking water under Indian condition.

V. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

A. Project Stakeholders

243. The primary stakeholders are:

- (i) Residents, shopkeepers and businesspeople who live and work alongside the roads in which improvements will be provided and near sites where facilities will be built;
- (ii) Custodians and users of socially and culturally important buildings in affected areas;
- (iii) State and local authorities responsible for the protection and conservation of archaeological relics, historical sites and artefacts; and

244. The secondary stakeholders are:

- (i) Urban Development Housing Department (UDHD) as the Executing Agency and Bihar Urban Infrastructure Development Corporation Ltd (BUIDCo) as implementation agency;
- (ii) Other government institutions whose remit includes areas or issues affected by the subproject (state and local planning authorities such as PHED, BMC);

- (iii) Forest Department, ASI, State archeological department;
- (iv) Non-government organizations (NGOs) and community-based organizations (CBOs) working in the affected communities;
- (v) Other community representatives (prominent citizens, religious leaders, elders, women's groups);
- (vi) The beneficiary community in general; and
- (vii) ADB, Gol, GoB and Ministry of Finance.

B. Public participation during the preparation/updation of the IEE

245. The public participation process included identifying interested and affected parties (stakeholders); informing and providing the stakeholders with sufficient background and technical information regarding the proposed development; creating opportunities and mechanisms whereby they can participate and raise their viewpoints (issues, comments and concerns) with regard to the proposed development; giving the stakeholders feedback on process findings and recommendations; and ensuring compliance to process requirements with regards to the environmental and related legislation.

246. The following methodologies have been used for carrying out public consultation:

- Local communities, individuals affected and owners and employees of affected commercial establishments who are directly or indirectly affected were given priority while conducting public consultation.
- Walk-through informal group consultations in the proposed subproject area.
- The local communities had been informed through public consultation with briefing on project interventions including its benefits.
- The environmental concerns and suggestions made by the participants were listed out, discussed and suggestions were accordingly incorporated in the EMP.

247. Different techniques of consultation with stakeholders were used during project preparation (interviews, official meeting, public meetings etc). Questionnaire was designed and environmental information was collected. Apart from this, a series of public consultation meetings were conducted during the subproject preparation. Various forms of public consultations (consultation through adhoc discussions on site) have been used to discuss the subproject and involve the community in planning the subproject design and mitigation measures.

248. **Table 20** show the person consulted during preparation and updation of IEE, information collection and capturing their views.

Table 20: List of Official person consulted during preparation of IEE

S.No	Name	Designation	Place	Date	Issue Discuss	Remarks
1	Dr Atul Kumar Verma	Director Archaeology, State of Bihar	Secretariat, Patna	30.12.2013	On archaeological protected site within the project area of Bhagalpur	No site within the project area
2	Mr. Madan Singh Chouhan	Superintending Archaeologist	Central Archaeology Department, ASI, Patna	20.12.2013	On archaeological protected site within the project area of Bhagalpur	Suggested to discussed with State Dept.
3	Mr. S. N. Jaiswal	Scientist	Pollution Control Board, Patna, Bihar	02.01.2014	Secondary/ published Data of Air, Water, Noise for Bhagalpur and CTE/CTO for existing WTP Barari	Suggested for CTE and CTO online proposal submitted to BSPCB
4	Mr. Anil Kumar	Environment Engineer	Pollution Control Board,	02.01.2014	CTE proposal Bhagalpur	Suggested for Online submission

			Patna, Bihar			
5	Mr Hareram	Ex. En,BMC	BMC/WTP Bhagalpur	04.06.2015	Consent for WTP and sludge disposal site	Selection of sludge disposal site at Govt. land
6	Mr Mahesh Kumar,	CSI,BMC	BMC	04.06.2015	Land for sludge disposal and he told that site shall be purchased for the purpose of solid waste disposal of entire municipal area.	If Govt. land not available, selection of pvt. land is required
7	Chitraketu Jha	Head assistant cum record in charge, BMC	MBC	04.06.2015	WTP Land paper, with Map	Layout plan is prepared as per land ownership

249. Also discussion was held with the local people during site visit. Issues discussed are:

- Awareness and extent of knowledge about the subproject.
- Information on the benefits of the subproject in terms of economic and environmental enhancement.
- Information on perceived losses from the proposed subproject during execution stage in terms of temporary disturbance like loss of access to residences, commercial establishments/shops, institutions, etc., traffic problem and increase in air and noise pollution, etc. during construction.
- Drinking water and other problems encountered if any
- Necessity of tree felling etc. at project sites
- Labour availability in the Project area or requirement of outside labour involvement
- Presence of any historical/cultural site in the vicinity.
- Presence of any protected area/wetland in or adjoining the construction site.
- Information on economic development in terms of creation of an important urban facility and generation of direct employment during the execution of the subproject.

250. Public consultations and group discussion meetings were conducted by PMC and PIU during 23rd to 26th Nov 2015, at Bhagalpur. The objectives were to appraise the stakeholders about the program's objectives and safeguard issues. The Project inception Meeting in Bhagalpur was also concluded on 31st of October 2013 for inculcate a common understanding about the Project within the BMC officials and elected members. Minutes of the meeting and local level consultations are attached as **Appendix 14 and 15** respectively. The major issues raised are related to possible dust and noise problems during construction phase movement of vehicle/ machinery and construction activity. Other comments include construction vehicles creating some disturbances to the local people daily activities, necessity of proper safety arrangements. The issues and comments have been considered and incorporated in the design of the subproject and mitigation measures for the potential environmental impacts raised during the public consultations.

C. Future Consultation and Disclosure

251. Program Management Unit of BUIDCo extended and expanded the consultation and disclosure process significantly during implementation of BUDIP. They are in the process of appointing an experienced NGO to handle this key aspect of the program. The NGO continuously (i) conducts a wide range of activities in relation to all subprojects in the city; and (ii) ensures the needs and concerns of stakeholders are registered and are addressed in proposed subproject design.

252. For this subproject, the NGO/Public Relationship and Community Development Specialist will develop, in close coordination with PMU and safeguard specialists of PMC, a public consultation and disclosure program which is likely to include the following:

- (i) Consultation during detailed design:
 - (a) Focus-group discussions with affected persons and other stakeholders (including women's groups, NGOs and CBOs) to hear their views and concerns, so that these can be addressed in subproject design where necessary; and
 - (b) Structured consultation meetings with the institutional stakeholders (government bodies and NGOs) to discuss and approve key aspects of the project.
- (ii) Consultation before start of construction activity:
 - (a) Public meetings with affected communities (if any) to discuss and plan work program and allow issues to be raised and addressed once construction has started; and
 - (b) Smaller-scale meetings to discuss and plan construction work with individual communities to reduce disturbance and other impacts, and provide a mechanism through which stakeholders can participate in subproject monitoring and evaluation;
- (iii) Project disclosure
 - (a) Communications strategy is of vital importance in terms of accommodating traffic during road closure, if any. Local communities will be continuously consulted regarding location of construction camps, access and hauling routes and other likely disturbances during construction. The road closure, if any, together with the proposed detours will be communicated via advertising, pamphlets, road signages, etc. Public information campaigns via newspaper/radio/TV, etc. wherever required, to explain the subproject details to a wider population. Public disclosure meetings at key project stages to inform the public of progress and future plans.

253. For the benefit of the community the summary of IEE will be translated in the local language and made available at: (i) BUIDCo office; (ii) District Magistrate Office; and, (iii) PIU/BMC. It will be ensured that the hard copies of IEE are kept at such places which are conveniently accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. Electronic version of the IEE will be placed in the official website of the BUIDCo and the official website of ADB after approval of the IEE by ADB. The PIU will issue Notification on the locality-wise start date of implementation of the subproject. The notice will be issued by the PIU in local newspapers one month ahead of the implementation works. Copies of the IEE will be kept in the PMU/PIU office and will be provided to any person willing to consult the IEE.

VI. GRIEVANCE REDRESSAL MECHANISM

254. A common Grievance Redress Mechanism (GRM) put in place to redress social, environmental or any other project and/or subproject related grievances. The GRM described below has been developed in consultation with stakeholders, including affected persons and NGOs. Customer Service Centres (CSC) proposed in each town, including a central CSC will serve as the focal points for registration of grievances. The APs will also be encouraged to lodge their complaints through phone or email or post and seek a complaint registration number either through the CSCs or directly, through the project grievance redress cell at PIU

255. The Grievance Redress Mechanism provides an accessible, inclusive, gender-sensitive and culturally appropriate platform for receiving and facilitating resolution of affected persons' grievances related to the project. A Grievance Redress Cell established at PIU; the safeguards officer of PIU, supported by the social safeguards expert and social mobilisers of DSC will be responsible for conducting periodic community meetings with affected communities to understand their concerns and help them through the process of grievance redressal including translating the complaints into Hindi or English from the local language, recording and registering grievances of non-literate affected persons and explaining the process of grievance redress mechanism. All expedient and minor grievances will be resolved at project level; should the PIU fail to resolve any grievance within the stipulated time period, the PMU will be consulted and suggested actions by PMU taken by PIU with DSC support, within specified time. PIU will also be responsible for follow-through for each grievance, periodic information dissemination to complainants on the status of their grievance and recording their feedback (satisfaction/dissatisfaction and suggestions).

256. The GRM aims to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the project. All grievances – major or minor, will be registered. In case of grievances that are immediate and urgent in the perception of the complainant, the contractor, and supervision personnel from the PIU supported by DSC will try to successfully resolve them. In case of larger issues, they will seek the advice and assistance of the PMU.⁷ Grievances not redressed through this process within/at the project level within stipulated time period will be referred to the City Level Committee/Grievance Redress Committee. GRC notification at state level has been issued on 27.05.2015.

257. City Level committees will be set up to monitor project implementation in each town. In its role as a Grievance Redress Committee (GRC), the CLC will meet every month (if there are pending, registered grievances), determine the merit of each grievance, and resolve grievances within specified time upon receiving the complaint-filing which the grievance will be addressed by the state-level Project Steering Committee (PSC). The PSC will resolve escalated/unresolved grievances received. Grievances related to land acquisition, rehabilitation and resettlement remaining unresolved by PSC will be referred by affected persons to the Land Acquisition, Rehabilitation and Resettlement Authority, if constituted during the project period in the state, or, to appropriate courts of law.⁸ The multi-tier GRM for the project is outlined below (**Figure 17**), each tier having time-bound schedules and with responsible persons identified to address grievances and seek appropriate persons' advice at each stage, as required. The GRC will continue to function throughout the project duration. The PMU has issued a notification to tranche 1 and 2 project towns to establish the respective city level GRCs, with details of composition, process of grievance redress to be followed, time limit for grievance redress at each level, etc.

258. In the event that the established GRM is not in a position to resolve the issue, the affected person also can use the ADB Accountability Mechanism through directly contacting (in writing) the Complaint Receiving Officer (CRO) at ADB headquarters or the ADB India Resident Mission (INRM). The complaint can be submitted in any of the official languages of ADB's DMCs. The ADB Accountability Mechanism information will be included in the PID to be distributed to the affected communities, as part of the project GRM.

259. **Composition of GRC and PSC:** The CLC, acting as GRC will have District Magistrate (Chairperson), Mayor, Municipal Commissioner, Head, PIU (Convener), and City Level Heads of relevant departments (such as BRJP, Road Construction Department, PHED, Electricity Board, State Pollution Control Board, Police, etc. and departments such as Forest Department,

⁷ The grievance redress mechanism cannot address expropriation related issues. Grievances related to the award of compensation can be addressed by the district collector's office and court of law.

⁸ The land acquisition, rehabilitation and resettlement authority is required to be set up in every state as per LARR Act, 2013. The authority is not in place in Bihar yet. Until such time that the authority is constituted in the state, aggrieved parties will be able to directly approach the courts of law at any stage.

Railways etc.); Chairpersons of the concerned Municipal Corporation's Standing Committee; ULB officials including Municipal Engineer, Town Planning Officer, Medical and Health Officer; representatives from the affected village panchayat and / or community, if any, eminent citizens, CBOs and NGOs. The GRC/CLC must have a minimum of two women members. In case of any indigenous people impacts in future subprojects, the GRC/CLC must have representation of the affected indigenous people community, including at least one female indigenous person, the chief of the tribe or a member of the tribal council's traditional arbitrator (to ensure that traditional grievance redress systems are integrated) and an NGO working with indigenous people groups.

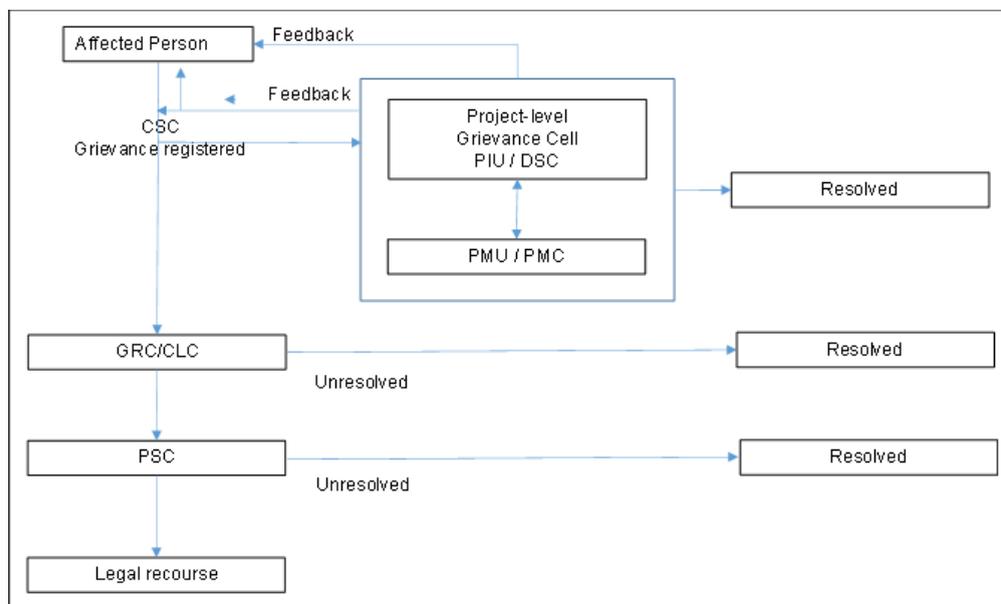


Figure 17: Grievance Redress Mechanism Process

CLC=city level committee, CSC=customer service center, GRC=grievance redress committee; GRM=grievance redress mechanism, PIU= project implementation unit, PMU =project management unit, PSC=project steering committee

260. The PSC will include the Minister for Urban Development (Chairperson), State Chief Secretary (Vice Chairperson), and Ministers, Directors and/or representatives of other relevant government ministries and departments, e.g., Finance, Planning, PHED, Roads, BRJP, etc., Mayors of respective municipal corporations and the project director (Member Secretary and Convener) as members.

261. **Areas of Jurisdiction:** The areas of jurisdiction of the GRC—headed by the District Magistrate will be (a) all locations/sites within the district where sub-project facilities are proposed, or (b) their areas of influence within the District. The PSC shall have jurisdictional authority across the State (i.e., areas of influence of sub-project facilities beyond district boundaries, if any).

262. **Consultation Arrangements:** This will include regular group meetings and discussions, at least twice during resettlement plan preparation, with affected persons by the social safeguards personnel of DSC and PIU. During the first year of RP implementation, such meetings will take place on a quarterly basis, while in subsequent years; these meetings will be held at least twice a year. The consultation arrangement thus envisaged is intended to address both general and/or specific individual grievances through a participatory approach. Besides, the consultative process is meant to be flexible to provide timely mitigation of grievances of the APs. The most complex cases will be dealt with through one-to-one consultation with particular APs by a host of actors comprising social safeguard expert of DSC and Resettlement Officer, PIU, with the support of PMU and PMC as and when required.

DSC will be responsible for ensuring that non-literate affected persons and/or vulnerable affected persons are assisted to understand the grievance redress process as well as for encouraging them to register complaints and follow-up with relevant authorities at different stages in the process.

263. **Recordkeeping:** Records of all grievances received, including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions and the date these were effected and final outcome will be kept by PIU(with the support of CSCs and DSC) and submitted to PMC.

264. **Information Dissemination Methods of the GRM:** The PIU, assisted by DSC will be responsible for information dissemination to affected persons on grievance redressal procedure. ULB-wide public awareness campaigns will ensure that awareness on grievance redress procedures is generated through the consultation and participation plan. Public awareness campaign will be conducted to ensure that awareness on the project and its grievance redress procedures is generated. The PIU environment and social safeguard officers will be assisted by design and supervision consultant (DSC) safeguards specialists with information/collateral/awareness material etc. and in conducting project awareness campaigns. The campaign will ensure that the poor, vulnerable and others are made aware of grievance redress procedures and entitlements per project Resettlement Framework including. who to contact and when, where/ how to register grievance, various stages of grievance redress process, time likely to be taken for redressal of minor and major grievances, etc. Grievances received and responses provided will be documented and reported back to the affected persons. The number of grievances recorded and resolved and the outcomes will be displayed/disclosed in the PMU and PIU offices, ULB/concerned local panchayat notice boards and on the web, as well as reported in the semi-annual environmental monitoring reports to be submitted to ADB. A Sample Grievance Registration Form has been attached in **Appendix 16**.

265. **Review and Documentation: Periodic review and documentation of lessons learned.** The PMU safeguard officers will periodically review the functioning of the GRM and record information on the effectiveness of the mechanism, especially on the PIU's ability to prevent and address grievances

266. **Costs:** All costs involved in resolving the complaints (meetings, consultations, communication and reporting / information dissemination) will be borne by the PMU.

VII. ENVIRONMENTAL MANAGEMENT PLAN

267. The EMP will guide the environmentally-sound construction of the subproject and ensure efficient lines of communication between the DSC (Engineer), contractors, and PIU/ PMU/ PMC. The EMP identifies three phases of development as: (i) site establishment and preliminary activities; (ii) construction phase; and (iii) post construction/operational phase.

268. The purpose of the EMP is to ensure that the activities are undertaken in a responsible non-detrimental manner with the objectives of: (i) providing a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on site; (ii) guiding and controlling the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iii) detailing specific actions deemed necessary to assist in mitigating the environmental impact of the subproject; and (iv) ensuring that safety recommendations are complied with.

269. A copy of the EMP must be kept onsite during the construction period at all times. The EMP will be made binding on all contractors operating on the site and will be included in the Contractual Clauses. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance. It shall be noted that the Supreme Court of

India⁹ mandates that those responsible for environmental damage must pay the repair costs both to the environment and human health and the preventive measures to reduce or prevent further pollution and/or environmental damage. (The polluter pays principle).

270. The Contractor is deemed not to have complied with the EMP if:

- within the boundaries of the site, site extensions and haul/ access roads there is evidence of contravention of clauses;
- if environmental damage ensues due to negligence;
- the contractor fails to comply with corrective or other instructions issued by the Engineer/PMU/PIU within a specified time; and
- the Contractor fails to respond adequately to complaints from the public.

A. Institutional Arrangement

271. The main agencies involved in managing and implementing the subproject are:

- (i) UDHD is responsible for management, coordination, and execution of all activities funded under the loan;
- (ii) BUIDCo, PMU is responsible for coordinating construction of subprojects across all towns, and for ensuring consistency of approach and performance;
- (iii) PMC assists PMU in managing the program and assures technical quality of design and construction;
- (iv) DSCs design the infrastructure, manage tendering of Contractors and supervise the construction process;
- (v) PIUs appoint and manage the Contractor to design, build and operate elements of the infrastructure in a particular town;
- (vi) A Program Steering Committee (PSC)¹⁰ assists UDHD in providing policy guidance and coordination across all towns and subprojects; and
- (vii) City/Town Level Committees¹¹ (C/TLCs) have also been established in each program town/city to monitor project implementation in the town and provide recommendations to the PIU where necessary.

272. **PMU's Role in Safeguards.** The PMU within BUIDCo have an Environmental and Social Management Coordinator (ESMC) who address environmental and social safeguards issues with assistance from Program Management Consultants (PMC). Environment Engineer of PMU will responsible of supervision and management of environment issues related to engineering aspects of the project. The PMC includes an Environmental Specialist and a Social Safeguards Specialist engaged. The ESMC will ensure that the EARF, resettlement framework, and IPPF are followed during subproject implementation as well as the environmental management plan and resettlement plan prepared for different Tranches. The ESMC through the PMC also lead preparation of safeguards documents for future Tranches with inputs from PIU/ DSC.

273. **The Project Management Consultants (PMC)** has an Environmental Specialist (ES) and Resettlement/Social Development Specialist who are responsible for the preparation/

⁹ Writ petition no 657 of 1995. The Supreme Court, in its order dated 4 February 2005, that "The Polluter Pays Principle means that absolute liability of harm to the environment extends not only to compensate the victims of pollution, but also to the cost of restoring environmental degradation. Remediation of damaged environment is part of the process of sustainable development."

¹⁰PSC: The PSC will include the Minister for Urban Development (Chairperson), State Chief Secretary (Vice Chairperson), and Ministers, Directors and/or representatives of other relevant government ministries and departments, e.g., Finance, Planning, PHED, Roads, BRJP, etc., Mayors of respective municipal corporations and the project director (Member Secretary and Convener) as members.

¹¹ CLC: The CLC, acting as a Grievance Redress Committee (GRC) will have District Magistrate (Chairman), Municipal Commissioner\Executive Officer (Member Secretary), Executive Engineer (Respective ULB), Line Agencies representative (Respective district) and NGO\civil society of respective district.

update of IEE/EIA and RP/IPP reports respectively. The Environment Specialist and Resettlement/Social Development Specialist of PMC will review and finalize all reports in consultation with the ESMC of PMU. The Environmental Specialist (ES) and Resettlement/Social Development Specialist of PMC will submit periodic monitoring and implementation reports to PMU, who will take follow-up actions, if necessary.

274. The ESMC of PMU will endorse/submit periodic monitoring reports received from PMC to the Program Director, PMU who will then submit these to ADB. The monitoring report will focus on the progress of implementation of the IEE/EIA and EARF, RP/RF and IPP/IPF, issues encountered and measures adopted, follow-up actions required, if any, as well as the status of compliance with subproject selection criteria, and relevant loan covenants. The PMU will seek GoB clearance for submission and disclosure of the environmental and social monitoring report to ADB.

275. **PIU's Role in Safeguards.** The PIU is primarily tasked with the day-to-day implementation of safeguards plans. PIU field offices in program towns will have a Safeguard Officer who will be responsible for data collection for IEE/EIA and RP/IPP preparation and implementation. PIU field offices will obtain right of way clearances and prepare progress reports with respect to IEE/EIA and RP/IPP implementation. PIU will be responsible for obtaining statutory clearances and obtaining NOCs from government agencies/other entities and entering into agreements with them for use of their land. It will also co-ordinate for obtaining right of way clearances with related State and National agencies.

276. **The Contractor**

This individual/agency:

- complies with all applicable legislation, is conversant with the requirements of the EMP, and briefs staff about the requirements of same;
- ensures any sub-contractors/ suppliers, who are utilized within the context of the contract, comply with the environmental requirements of the EMP. The Contractor will be held responsible for non-compliance on their behalf;
- supplies method statements for all activities requiring special attention as specified and/or requested by the Engineer or Environmental Specialist during the duration of the Contract;
- provides environmental awareness training to staff;
- bears the costs of any damages/ compensation resulting from non-adherence to the EMP or written site instructions;
- conducts all activities in a manner that minimizes disturbance to directly affected residents and the public in general, and foreseeable impacts on the environment.
- ensures that the Engineer is informed in a timely manner of any foreseeable activities that will require input from the Environmental Specialist
- appoints one full time Environment & Safety Officer for implementation of EMP, community liaison, reporting and grievance redressal on day to day basis.
- receives complaints/grievances from the public, immediately implements the remedial measures and reports to the Engineer (DSC) and PIU within 48 hours.

277. Summary of responsibility,

✓ **Responsible for carrying out mitigation measures**

- During construction and operations stages, implementation of mitigation measures is the Contractor's responsibility.

- To ensure implementation of mitigation measures during the construction period, contract clauses for environmental provisions will be part of the civil works contracts.
 - Contractors' conformity with contract procedures and specifications during construction will be carefully monitored by the Safeguard Officer of PIU.
- ✓ **Responsible for carrying out monitoring measures**
- During construction, PMC's Environmental Specialist and the Safeguard Officer of PIU will monitor the Contractor's environmental compliance.
 - During the operation stage, monitoring of the Contractor's environmental compliance will be the responsibility of the PMC and PIU/PMU
- ✓ **Responsible for reporting**
- UDHD (EA)/BUIDCo (PMU- IA) will submit to ADB semi annual reports on implementation of the EMP and will permit ADB to field annual environmental review missions which will review in detail the environmental aspects of the subproject. Any major accidents having serious environmental consequences will be reported immediately.

278. Report format for semi - annual report is attached as **Appendix 17**.

279. Safeguard implementation arrangement for the program is shown below.

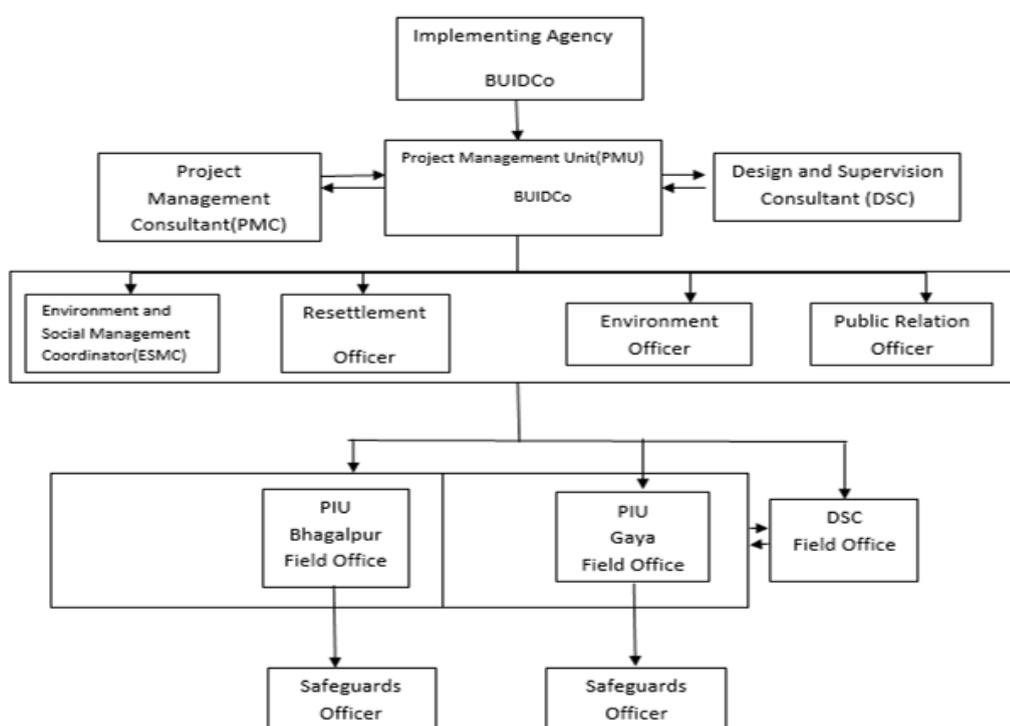


Figure 18: Safeguards Implementation Arrangement

B. Capacity Building

280. Training and orientation program shall be organized by the Environmental Specialist of PMC and PMU for the contractors, laborers, and technical and office staff of the contractors, site engineers of DSC and the relevant staff of the PIU for building their capacity with regards to principles and procedures of environmental management, pollution abatement measures, public consultation and participation, health and safety measures, grievance redressal mechanism and implementation of EMP.

Table 21: Training Program for Environmental Management

Program	Description	Participants	Form of Training	Duration/ Location	Conducting Agency
A. Pre-Construction Stage					
Module 1- Sensitization Workshop	<p>INTRODUCTION TO ENVIRONMENT ISSUES- Sensitization Workshop</p> <ul style="list-style-type: none"> ✓ Basic Concept of Environment & Environmental consideration of development project ✓ Explanation on ADBs SPS 2009 Guidelines, what are the different safeguard documents required to be prepared by the Project – Environment Assessment & Review Framework, EIA/IEE, Environment Management Plan (EMP) ✓ Environmental Regulations and Statutory requirements as per Government of India, Government of Bihar and ADB 	Secretaries, Chief Engineer, Superintendent Engineers of PHED, ULB, PMU; Project Manager, ESMC of PMU, Safeguard Officer of PIU, Concerned Engineers of DSC	Workshop	¼ Working Day	PMC / ADB Environment Safeguard Specialist
Module 2	<p>Season 1</p> <p>Environmental Considerations in Urban Development Projects</p> <ul style="list-style-type: none"> ✓ Environmental components affected by urban development in construction and operation stages- BUDIP case ✓ Rules and Regulations need to comply for implementation of BUDIP ✓ Activities causing pollution during construction and operation stages – BUDIP case ✓ Environmental Management Good Practices in Urban Infrastructure Projects – BUDIP case 	<ul style="list-style-type: none"> ▪ PIU/PMU ▪ DSC ▪ Concerned Engineers from PHED, ULB and relevant dept. 	Lecture	¼ th Day	Environmental Specialist of PMC
	<p>Season 2</p> <p>Review of EIA/ IEE and its Integration into Designs</p> <ul style="list-style-type: none"> ✓ EIA/ IEE 	<ul style="list-style-type: none"> ▪ PIU/PMU ▪ DSC ▪ Concerned Engineers from 	Lecture	¼ th Day	Environmental Specialist of PMC

Program	Description	Participants	Form of Training	Duration/ Location	Conducting Agency
	<p>Methodology</p> <ul style="list-style-type: none"> ✓ Environmental Provisions in the EMPs ✓ Identification of mitigation measures and study of alternatives. ✓ Implementation Arrangements ✓ Methodology of Assessment of Pollution Monitoring ✓ Methodology for site selection of borrow areas, waste disposal areas etc. ✓ Incorporation of mitigating measures in the project design and contracts, co- ordination between the safeguard specialists and the design team, to ensure site visits are conducted by the design team and safeguard specialists. 	<p>ULB and relevant dept.</p>			
	<p>Season 3 Improved Coordination with other Departments Overview of the Project Environmental Impacts Statutory Permissions Procedural Requirements Cooperation and Coordination with other Departments</p>	<p>PIU/PMU DSC Concerned Engineers from PHED, ULB and relevant dept.</p>	<p>Lecture</p>	<p>¼ th Day</p>	<p>Environmental Specialist of PMC</p>
	<p>Season 4 Special Issues in the Project</p> <ul style="list-style-type: none"> ✓ Bio-Diversity Assessment and Conservation ✓ Statutory Permissions (specifically for the project)– Procedural Requirements ✓ Consultation and Counseling- Public consultation – sharing the project details and getting the opinion of the people especially in the case of displacement, 	<ul style="list-style-type: none"> ▪ PIU/PMU ▪ DSC ▪ Concerned Engineers from PHED, ULB and relevant dept. 	<p>Lecture</p>	<p>¼ th Day</p>	<p>Environmental Specialist of PMC</p>

Program	Description	Participants	Form of Training	Duration/ Location	Conducting Agency
	incorporating the suggestions of the people in design as feasible and minimization of environmental impact. ✓ Grievance redressal mechanism – institutional arrangements				
Module 3	Role during Construction Roles and Responsibilities of officials/contractors/consultants towards protection of environment Implementation Arrangements	1. PIU/PMU 2. DSC 3. Construction contractor	¼ th Day	Lecture	Environmental Specialist of PMC
	If a half day site visit can be organized to a site where good practice has been adopted by the project to avoid impact, it will be a case study for the participants		½ Day	Field visit	Environmental Specialist of PMC, ESMC PMU
	Group Exercise – to discuss the issues identified during the field visit and how to address it, followed by an open house for questions		¼ th Day	Group Discussion	Environmental Specialist of PMC, ESMC PMU, Safeguard officer of PIU, Engineer of DSC, Construction contractor
	Monitoring and Reporting System		¼ th Day	Lecture	Environmental Specialist of PMC

281. Environmental Management Plan is prepared for pre construction, construction and post construction stages.

282. **Table 22** outlines the site establishment and preliminary activities.

283. **Table 23** outlines management of construction activities and workforce.

284. **Table 24** outlines the post-construction activities.

Table 22: Generic EMP: Site Establishment and Preliminary Activities - Design phase

Sr. No	Activity	Management/Mitigation	Responsible for Mitigation /	Responsible for Monitoring and supervision	Frequency
1.	Legislation, permits and agreements	In all instances- covering Environment & Forest, BUIDCo, implementation agency, contractors and consultants must remain in compliance with relevant local and national legislation.	SO- PIU, E-DSC	ES- PMC, ESMC- PMU, EE- PMU	Prior to moving onto site and Quarterly during construction

Sr. No	Activity	Management/Mitigation	Responsible for Mitigation /	Responsible for Monitoring and supervision	Frequency
		Proof of compliance to Air Act & Noise Act must be forwarded by the contractor to PMU/PMC/PIU (in relation to hot mixing, batch mix plants, stone crushers, diesel generators, etc. if any)	SO-PIU, E-DSC, Contractor	ES- PMC, ESMC-PMU, EE-PMU	Prior to moving onto site and Quarterly during construction
		Forest land clearance, NOC from BMC. for tree cutting	SO-PIU, DSC	ES- PMC, ESMC-PMU, EE-PMU	Prior to moving onto site and Quarterly during construction for compliance
		A copy of the EMP must be kept on site during the construction period	SO-PIU, E-DSC, Contractor	ES- PMC, ESMC-PMU, EE-PMU	At all times
2.	Access to site ¹²	Access to site at all water storage reservoir and WTP location will be via existing roads. The Contractor will need to ascertain the existing condition of the roads and repair damage due to construction. Site management plan and alignment of approach road to site needs to be followed	SO-PIU, E-DSC, Contractor	ES- PMC, EE- PMU	Prior to moving onto site and monthly
		The Local Traffic Department must be informed at least a month in advance if the traffic in the area will be affected (if any)	SO-PIU, E-DSC, Contractor	ES- PMC, EE- PMU	Prior to moving onto site and quarterly
		The location of all affected services must be identified and confirmed.	SO-PIU, E-DSC, Contractor	ES- PMC, EE- PMU	Prior to moving onto site and quarterly
		All roads for construction access must be planned and approved by the Engineer and its Environmental Specialist ahead of construction activities. They shall not be created on an ad-hoc basis.	SO-PIU, E-DSC, Contractor	ES- PMC, EE- PMU	Prior to moving onto site and during construction - quarterly
		No trees, shrubs or groundcover may be removed or vegetation stripped without the prior permission of the Engineer/Environmental Specialist	SO-PIU, E-DSC, Contractor	ES- PMC, ESMC-PMU, EE-PMU	Before and during construction- semi annually
3.	Setting up of construction camp ¹³	Choice of site for the Contractor's camp requires the Engineer's/ ES permission and must take into	SO-PIU, E-DSC,	ES- PMC, ESMC-	During surveys and preliminary

¹² Access to site and traffic management shall be done in accordance to the directions of Engineer

¹³ Careful planning of the construction camp can ensure that time and costs associated with environmental management and rehabilitation are reduced.

Sr. No	Activity	Management/Mitigation	Responsible for Mitigation /	Responsible for Monitoring and supervision	Frequency
		account location of local residents, businesses and existing land uses, including flood zones and slip / unstable zones. A site plan must be submitted to the Engineer for approval.	Contractor	PMU, EE-PMU	investigations and prior to moving onto the site
		The construction camp may not be situated on a floodplain or on slopes greater than 1:3 (Horizontal : Vertical ratio). Preferable slope 1:1 (plain land) or 1:2 (marginal slope)	SO-PIU, E-DSC, Contractor	ES- PMC, EE- PMU	During surveys and preliminary investigations and prior to moving onto the site- quarterly monitoring
		Private land needs to be avoided. If no option NOC from pvt party will be required	SO-PIU, E-DSC, Contractor	ES- PMC, EE- PMU	During site establishment and ongoing – monthly inspections
		In most cases, on-site accommodation will not be required. The construction camp can thus be comprised of: <ul style="list-style-type: none"> • site office • designated first aid area • separate eating areas • storage areas • batching plant (if required) • refueling areas (if required) • maintenance areas (if required) • crushers (if required) 	SO-PIU, E-DSC, Contractor	ES- PMC, ESMC-PMU, EE-PMU	During set-up and monthly
		The camp must be properly fenced and secured	SO-PIU, E-DSC, Contractor	ES- PMC, EE- PMU	During site establishment and ongoing – monthly inspections
		The Contractor shall make adequate provision for temporary toilets (gender specific) for the use of their employees during the Construction Phase. Such facilities, which shall comply with local authority regulations, shall be maintained in a clean and hygienic condition. Their use shall be strictly enforced.	SO-PIU, E-DSC, Contractor	ES- PMC, EE- PMU	During site establishment and ongoing – weekly inspections
		Bins shall be provided at convenient intervals for disposal of waste within the construction camp.	SO-PIU, E-DSC, Contractor	ES- PMC, EE- PMU	During site set-up and ongoing- weekly
		4.	Establishing equipment lay-down	Choice of location for equipment lay-down and storage areas must take into account distances to	SO-PIU, E-DSC,

Sr. No	Activity	Management/Mitigation	Responsible for Mitigation /	Responsible for Monitoring and supervision	Frequency
	and storage area ¹⁴	adjacent land uses, general onsite topography and water erosion potential of the soil. Impervious surfaces must be provided where necessary.	Contractor	PMU	
		Storage areas shall be secured so as to minimize the risk of crime. They shall also be safe from access by children / animals etc.	SO-PIU, E-DSC, Contractor	ES- PMC, EE- PMU	During site set-up and monthly
		Residents living adjacent to the construction site must be notified of the existence of the hazardous storage area.	SO-PIU, E-DSC, Contractor	ES- PMC, ESMC-PMU, EE-PMU	During site set-up and monthly
		Equipment lay-down and Storage areas must be designated, demarcated and fenced if necessary.	SO-PIU, E-DSC, Contractor	ES- PMC, EE- PMU	During site set-up and monthly
		Fire prevention facilities must be present at all storage facilities.	SO-PIU, E-DSC, Contractor	ES- PMC, EE- PMU	During site set-up and monthly
		Proper storage facilities for the storage of oils, paints, grease, fuels, chemicals and any hazardous materials to be used must be provided to prevent the migration of spillage into the ground and groundwater regime around the temporary storage areas.	SO-PIU, E-DSC, Contractor	ES- PMC, EE- PMU	During site set-up and monthly
		These storage facilities (including any tanks) must be on an impermeable surface that is protected from the ingress of storm water from surrounding areas in order to ensure that accidental spillage does not pollute local soil or water resources.	SO-PIU, E-DSC, Contractor	ES- PMC, EE- PMU	During site set-up and monthly
		Fuel tanks must meet relevant specifications and be elevated so that leaks may be easily detected.	SO-PIU, E-DSC, Contractor	ES- PMC, EE- PMU	During site set-up and monthly
		Staff dealing with these materials / substances must be aware of their potential impacts and follow the appropriate safety measures.	SO-PIU, E-DSC, Contractor	ES- PMC, EE- PMU	During site set-up and monthly
5.	Materials management – sourcing ¹⁵	Prioritize sites already permitted by the Mining Department	SO-PIU, E-DSC, Contractor	ES- PMC, ESMC-PMU, EE-	On receipt of natural materials

¹⁴ Storage areas can be hazardous and unsightly and can cause environmental pollution if not designed and managed carefully.

Sr. No	Activity	Management/Mitigation	Responsible for Mitigation /	Responsible for Monitoring and supervision	Frequency
				PMU	
		Contractors shall prepare a source statement indicating the sources of all materials (including sands, natural gravels, crushed stone, asphalt, clay liners, etc), and submit these to the Engineer for approval prior to commencement of any work.	SO-PIU, E-DSC, Contractor	ES- PMC, ESMC-PMU, EE-PMU	On award of contract and continued quarterly
		If other sites are necessary, inform construction contractor that it is their responsibility to verify the suitability of all material sources and to obtain the approval of DSC	SO-PIU, E-DSC, Contractor	ES- PMC, ESMC-PMU, EE-PMU	On receipt of natural materials and continued quarterly
6.	Education of site staff on general and environmental conduct ¹⁶	Ensure that all site personnel have a basic level of environmental awareness training.	SO-PIU, E-DSC, Contractor	ES- PMC, ESMC-PMU, EE-PMU	During staff induction and ongoing monthly monitoring
		Staff operating equipment (such as excavators, loaders, etc.) shall be adequately trained and sensitized to any potential hazards associated with their task.	SO-PIU, E-DSC, Contractor	ES- PMC, ESMC-PMU, EE-PMU	During staff induction, followed by ongoing weekly
		All employees must undergo safety training and wear the necessary protective equipments (e.g helmets, gloves, gumboots, nose mask, ear plugs as per type of work) and clothing.	SO-PIU, E-DSC, Contractor	ES- PMC, ESMC-PMU, EE-PMU	During staff induction, followed by monthly monitoring
		A general regard for the social and ecological well-being of the site and adjacent areas is expected of the site staff. Workers need to be made aware of the following general rules: <ul style="list-style-type: none"> • no alcohol/drugs on site; • prevent excessive noise; • construction staff are to make use of the facilities provided for them, as opposed to ad hoc alternatives (e.g. fires for cooking, the use of surrounding bushes as a toilet facility); • no fires permitted on site; • trespassing on private/commercial properties adjoining the site is forbidden; • other than pre-approved 	SO-PIU, E-DSC, Contractor	ES- PMC, ESMC-PMU, EE-PMU	During staff induction, followed by ongoing monthly monitoring

¹⁵ Materials must be sourced in a legal and sustainable way to prevent offsite environmental degradation.

¹⁶ These points need to be made clear to all staff on site before the subproject begins.

Sr. No	Activity	Management/Mitigation	Responsible for Mitigation /	Responsible for Monitoring and supervision	Frequency
		<p>security staff, no workers shall be permitted to live on the construction site; and</p> <ul style="list-style-type: none"> no worker may be forced to do work that is potentially dangerous or that he/she is not trained to do. 			
7.	Social impacts ¹⁷	Open liaison channels shall be established between the contractors and interested and affected parties such that any queries, complaints or suggestions can be dealt with quickly and by the appropriate person(s).	SO-PIU, E-DSC, Contractor	ES- PMC, ESMC-PMU, EE-PMU	Prior to moving onto site and ongoing monthly
		Road closure (if any) together with the proposed detour needs to be communicated via advertising, pamphlets, radio broadcasts, road signage, etc.	SO-PIU, E-DSC, Contractor	ES- PMC, ESMC-PMU, EE-PMU	Prior to moving onto site and ongoing monthly
		Advance road signage indicating the road detour and alternative routes (if required). Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/ complaints.	SO-PIU, E-DSC, Contractor	ES- PMC, ESMC-PMU, EE-PMU	Prior to moving onto site and ongoing monthly
		Storage facilities and other temporary structures on site shall be located such that they have as little visual impact on local residents as possible.	SO-PIU, E-DSC, Contractor	ES- PMC, ESMC-PMU, EE-PMU	During surveys and preliminary investigations and site set-up. Monthly monitoring
8.	Conservation of the natural environment ¹⁸	No vegetation may be cleared without prior permission from the Engineer.	SO-PIU, E-DSC, Contractor	ES- PMC, ESMC-PMU, EE-PMU	During site setup and quarterly
		Trees that are not to be cleared shall be marked beforehand with danger tape. The PIU/ES-PMC /Engineer (DSC) must be given a chance to mark vegetation that is to be conserved before the Contractor begins clearing the site.	SO-PIU, E-DSC, Contractor	ES- PMC, ESMC-PMU, EE-PMU	During site set-up and as per requirement
9	Set-up of waste management	The excavation and use of rubbish pits on site is forbidden.	SO-PIU, E-DSC,	ES- PMC, EE- PMU	Monthly monitoring

¹⁷It is important to take notice of the needs and wishes of those living or working adjacent to the site. Failure to do so can cause disruption to work.

¹⁸ Alien plant encroachment is particularly damaging to natural habitats and is often associated with disturbance to the soil during construction activities. Care must be taken to conserve existing plant and animal life on and surrounding the site.

Sr. No	Activity	Management/Mitigation	Responsible for Mitigation /	Responsible for Monitoring and supervision	Frequency
	procedure		Contractor		
		Burning of waste is forbidden.	E- DSC, Contractor	ES- PMC, EE- PMU	Monthly monitoring
10	Social and Cultural Resources	(i) Consult Archaeological Survey of India (ASI) or concerned dept. of Tripura Govt. to obtain an expert assessment of the archaeological potential of the site; (ii) Consider alternatives if the site is found to be of medium or high risk; (iii) Develop a protocol for use by the construction contractors in conducting any excavation work, to ensure that any chance finds are recognised and measures are taken to ensure they are protected and conserved.	SO-PIU, E-DSC, Contractor	ES- PMC, ESMC-PMU, EE-PMU	During site set-up and ongoing quarterly
11	Core Labour Standard (CLS)- safety and compliance	Monitoring compliance with national labor laws and regulations, provided that these national laws are consistent with CLS. DSC will ensure that bidding and contract documents include specific provisions requiring contractors to comply with all: (i) applicable labor laws and core labor standards on: (a) prohibition of child labor as defined in national legislation for construction and maintenance activities; (b) equal pay for equal work of equal value regardless of gender, ethnicity or caste; and (c) elimination of forced labor; and (ii) the requirement to disseminate information on sexually transmitted diseases including HIV/AIDS to employees and local communities surrounding the project sites.	SO-PIU, E-DSC, Contractor	ES- PMC, ESMC-PMU, EE-PMU	During site set-up and ongoing quarterly
12	Occupational health & safety	Comply with IFC EHS Guidelines on Occupational Health and Safety-ref. (www.ifc.org/ifcext/enviro.nsf/Content/ Environmental Guidelines) Mitigation measures as mentioned during construction phase to be followed	Contractor	SO-PIU, ES- PMC, ESMC-PMU, EE-PMU	During site set-up and ongoing monthly.
13.	Security and safety	Lighting on site is to be set out to provide maximum security and to enable easier policing of the site,	SO-PIU, E-DSC,	ES- PMC, EE- PMU	During site set-up and continued

Sr. No	Activity	Management/Mitigation	Responsible for Mitigation /	Responsible for Monitoring and supervision	Frequency
		without creating a visual nuisance to local residents or businesses.	Contractor		monthly
		Material stockpiles or stacks, such as, pipes must be stable and well secured to avoid collapse and possible injury to site workers / local residents.	SO-PIU, E-DSC, Contractor	ES- PMC, EE- PMU	Monthly
		Flammable materials shall be stored as far as possible from adjacent residents / businesses.	SO-PIU, E-DSC, Contractor	ES- PMC, EE- PMU	Monthly
		All interested and affected parties shall be notified in advance of any known potential risks associated with the construction site and the activities on it. Examples are: <ul style="list-style-type: none"> • stringing of power lines • earthworks / earthmoving machinery on steep slopes above houses / infrastructure • risk to residences along haulage roads / access routes 	SO-PIU, E-DSC, Contractor	ES- PMC, EE- PMU	Week prior to activity and monthly to be continued

DSC: Design and Supervision Consultant, E: Engineer, EE: Environmental Engineer, ES: Environment Specialist, ESMC: Environment & Social Management Coordinator, PIU: Project Implementation unit, PMC: Project Management Consultant, PMU: Project Management Consultant, SO: Safeguard Officer

Table 23: Generic EMP: Management of Construction and Workforce Activities- Construction phase

	Issues	Management/Mitigation	Responsible for Mitigation	Responsible for Monitoring/ Supervision	Frequency
1	Climatic impact	<ul style="list-style-type: none"> ✓ Seasonal climatic variations will be considered during scheduling of construction activities in the area. ✓ Consideration of suitable season (non monsoon /lien period) for major construction activity ✓ Excavations and other clearing activities will only be done during agreed working times and permitted weather conditions. ✓ Storm water control (through 	E- DSC, Contractor	SO-PIU/ ES-PMC, ESMC-PMU, EE – PMU	Quarterly monitoring

	Issues	Management/Mitigation	Responsible for Mitigation	Responsible for Monitoring/Supervision	Frequency
		drainage, diversion) during construction phase as per the method approved by the Engineer.			
2.	Maintenance of construction camp and work site	The Contractor must monitor and manage drainage of the camp site to avoid standing water and soil erosion.	E- DSC, Contractor	SO-PIU/ ES-PMC, ESMC-PMU, EE – PMU	Weekly inspection
		Run-off from the camp site must not discharge into neighbors' properties.	E- DSC, Contractor	SO-PIU/ ES-PMC, ESMC-PMU, EE – PMU	Weekly inspection
		Toilets are to be maintained in a clean state and shall be moved to ensure that they adequately service the work areas.	Contractor	SO-PIU/ ES-PMC, ESMC-PMU, EE – PMU	Weekly inspection
		Drinking water facility needs to be maintained at camp and work site	Contractor	SO-PIU/ ES-PMC, ESMC-PMU, EE – PMU	Weekly inspection
		The Contractor is to ensure that open areas or the surrounding bushes are not being used as toilet facility.	Contractor	SO-PIU/ ES-PMC, ESMC-PMU, EE – PMU	Weekly inspection
		The Contractor shall ensure that all litter is collected from the work and camp areas daily.	Contractor	SO-PIU/ ES-PMC, ESMC-PMU, EE – PMU	Weekly inspection
		Bins and shall be emptied regularly and waste shall be disposed of at the pre-approved site.	Contractor	SO-PIU/ ES-PMC, ESMC-PMU, EE – PMU	Weekly inspection
		Eating areas shall be regularly serviced and cleaned to ensure the highest possible standards of hygiene and cleanliness.	Contractor	SO-PIU/ ES-PMC, ESMC-PMU, EE – PMU	Weekly inspection
		The Contractor shall ensure that his camp and working areas are kept clean at all times.	E- DSC, Contractor	SO-PIU/ ES-PMC, ESMC-PMU, EE – PMU	Weekly monitoring
3.	Staff conduct	The Contractor must monitor the performance of construction workers to ensure that the points relayed during their induction have been properly understood and are being followed.	Contractor	SO-PIU/ ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring.
		The rules that are explained in the worker conduct section, must be followed at all times	Contractor	SO-PIU/ ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring.

	Issues	Management/Mitigation	Responsible for Mitigation	Responsible for Monitoring/Supervision	Frequency
4.	Dust and air pollution ¹⁹	Consult with DSC/PIU on the designated areas for stockpiling of clay, soils, gravel, and other construction materials;	Contractor	SO-PIU/ ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring.
		Damp down exposed soil and any stockpiled on site by spraying with water when necessary during dry weather;	Contractor	SO-PIU/ ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring.
		Avoiding the need to stockpile on site	Contractor	SO-PIU/ ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring.
		Use tarpaulins to cover sand and other loose material when transported by trucks	Contractor	SO-PIU/ ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring.
		Fit all heavy equipment and machinery with air pollution control devices which are operating correctly and regular servicing of the vehicles& equipments off site in order to limit gaseous emissions	Contractor	SO-PIU/ ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring.
		Excess earth and other windblown loads in transit will be kept covered	Contractor	SO-PIU/ ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring.
		No fires are allowed on site	Contractor	SO-PIU/ ES-PMC, ESMC-PMU, EE – PMU	Ongoing monthly monitoring.
5	Noise Level	<ul style="list-style-type: none"> ➤ Plan activities in consultation with DSC/PIU so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance; ➤ Require horns not be used unless it is necessary to warn other road users or animals of the vehicle's approach; ➤ Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, 	Contractor	SO-PIU/ ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring

¹⁹ Main causes of air pollution during construction are dust from vehicle movements and stockpiles, vehicle emissions and fires.

	Issues	Management/Mitigation	Responsible for Mitigation	Responsible for Monitoring/Supervision	Frequency
		<p>and portable street barriers the sound impact to surrounding sensitive receptor;</p> <ul style="list-style-type: none"> ➤ Ensure that machinery is in a good state of maintenance. ➤ Monitor noise levels in potential problem areas, and ➤ Maintain maximum sound levels not exceeding 80 decibels (dbA) when measured at a distance of 10 m or more from the vehicle/s. 			
6	Storm water	Earth, stone and rubble is to be properly disposed of so as not to obstruct natural water pathways over the site i.e. these materials must not be placed in storm water channels, drainage lines	Contractor	SO-PIU/ ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring
		During construction, unchanneled flow must be controlled to avoid soil erosion.	E- DSC, Contractor	SO-PIU/ ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring
7	Water quality ²⁰	Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets	Contractor	SO-PIU/ES-PMC, EE – PMU	Regular monitoring - monthly
		Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with BMC/PIU on designated disposal areas	Contractor	SO-PIU/ES-PMC, EE – PMU	Regular monitoring - monthly
		Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies	Contractor	SO-PIU/ES-PMC, EE – PMU	Regular monitoring - monthly
		Place storage areas for fuels and lubricants away from any drainage leading to water bodies	Contractor	SO-PIU/ES-PMC, EE – PMU	Regular monitoring - monthly
		Dispose any wastes generated by construction activities in designated sites	Contractor	SO-PIU/ES-PMC, EE – PMU	Regular monitoring - monthly
		Conduct surface quality inspection according to the Environmental Management	Contractor	SO-PIU/ES-PMC, EE – PMU	Quarterly monitoring

²⁰Water quality is affected by the incorrect handling of substances and materials. Soil erosion and sediment is also detrimental to water quality. Mismanagement of polluted run-off from vehicle and plant washing and wind dispersal of dry materials into rivers and watercourses are detrimental to water quality.

	Issues	Management/Mitigation	Responsible for Mitigation	Responsible for Monitoring/Supervision	Frequency
		Plan (EMP)			
8.	Conservation of natural environment – terrestrial flora	As the work front progresses the Contractor is to check that vegetation clearing has the prior permission of the DSC/PIU Engineer and Environmental Specialist of PMC.	E- DSC, Contractor	SO-PIU/ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring
		Minimize removal of vegetation and disallow cutting of trees (particularly at Customer service area at Barari) as far as possible through design modification	Contractor	SO-PIU/ ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring
		Require to plant three (3) native trees for every one (1) that is removed	Contractor	SO-PIU/ ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring
		Prohibit employees from poaching wildlife, bird hunting, and cutting of trees for firewood	Contractor	SO-PIU/ ES-PMC, ESMC-PMU, EE – PMU	Ongoing monitoring. Monthly monitoring
		Non removal of trees of religious importance	Contractor	SO-PIU/ ES-PMC, ESMC-PMU, EE – PMU	Quarterly monitoring.
9.	Materials management	Stockpiles shall not be situated such that they obstruct natural water pathways.	E- DSC, Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring. Location as directed by the engineer
		Stockpiles shall not exceed 2m in height unless otherwise permitted by the concerned Engineer.	E- DSC, Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring Location as directed by the engineer and ES- PMC
		All concrete mixing must take place on a designated, impermeable surface.	Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring.
		Verify suitability of all material sources and obtain approval of PIU & DSC	Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring
10.	Landscape and Aesthetics including Waste management	Refuse must be placed in the designated skips / bins which must be regularly emptied.	Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring.
		Prepare and implement Waste Management Plan	Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring.
		In addition to the waste facilities within the construction camp, provision must be made for waste	Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring

	Issues	Management/Mitigation	Responsible for Mitigation	Responsible for Monitoring/Supervision	Frequency
		receptacles to be placed at intervals along the work front.			
		Littering on site is forbidden and the site shall be cleared of litter at the end of each working day.	Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring
		Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas for improvement of aesthetic environment. Recycling is to be encouraged by providing separate receptacles for different types of wastes (including demolition waste) and making sure that staff is aware of their uses.	Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring
		All waste must be removed from the site and transported to a disposal site or as directed by the Engineer.	E-DSC and Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring.
		Waste from toilets shall be disposed of regularly and in a responsible manner.	Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Weekly monitoring.
		Hazardous waste disposal must be carried out by the Contractor in a responsible manner	E- DSC and Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring.
		Storage areas will be properly fenced off	E- DSC and Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring.
		Top soil needs to be utilised by farmers for nutrient value	E- DSC and Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring.
		Coordinate with DSC-PIU for beneficial uses of excess excavated soils or immediately dispose to designated areas	E- DSC and Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring.
		Recover used oil and lubricants and reuse or remove from the sites	E- DSC and Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring.
		Request DSC/PIU to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work	E- DSC and Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring.
11	Occupational Health and Safety	World bank Environmental, Health, and Safety (EHS) Guidelines - EHS Guidelines for water & sanitation will be followed. Specifically,	E-DSC and Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Ongoing Weekly

	Issues	Management/Mitigation	Responsible for Mitigation	Responsible for Monitoring/Supervision	Frequency
		<p>(i) Develop and implement site-specific Health and Safety (H and S) Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use Personal Protective Equipment like helmet, gumboot, safety belt, gloves, nose musk and ear plugs; (c) H and S Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents;</p> <p>(ii) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site;</p> <p>(iii) Provide medical insurance coverage for workers;</p> <p>(iv) Secure all installations from unauthorized intrusion and accident risks;</p> <p>(v) Provide supplies of potable drinking water;</p> <p>(vi) Provide clean eating areas where workers are not exposed to hazardous or noxious substances;</p> <p>(vii) Provide H and S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers;</p> <p>(viii) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted;</p> <p>(ix) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;</p> <p>(x) Ensure moving equipment</p>			

	Issues	Management/Mitigation	Responsible for Mitigation	Responsible for Monitoring/Supervision	Frequency
		is outfitted with audible back-up alarms; (xi) 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 (xii) Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.			
12	Community Health & Safety	Plan routes to avoid times of peak-pedestrian activities.	E-DSC and Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Ongoing Weekly
		Liaise with DSC- PIU in identifying risk areas on route cards/maps	E-DSC and Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Ongoing Weekly
		Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.	E-DSC and Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Ongoing Weekly
		Provide road signs and flag persons to warn of dangerous conditions, in case of location near the road.	E-DSC and Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Ongoing Weekly
		Provide protective fencing around open trenches, and cover any open trench with metal planks during non-construction hours	E-DSC and Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Ongoing Weekly
		Maintaining accident register and arrangement of emergency response plan for community	E-DSC and Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Ongoing Weekly
13	Traffic accessibility & impact	Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of	Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring

	Issues	Management/Mitigation	Responsible for Mitigation	Responsible for Monitoring/Supervision	Frequency
		<p>delivery sites; Schedule transport and hauling activities during non-peak hours; Locate entry and exit points in areas where there is low potential for traffic congestion; Keep the site free from all unnecessary obstructions; Drive vehicles in a considerate manner; Coordinate with Govt. Traffic Department for temporary road diversions and with for provision of traffic aids if transportation activities cannot be avoided during peak hours; and Notify affected sensitive receptors by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints</p>			
14	Social impacts ²¹	<p>Contractor's activities and movement of staff to be restricted to designated construction areas.</p>	PIU, Contractor	PIU/ ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring
		<p>The conduct of the construction staff when dealing with the public or other stakeholders shall be in a manner that is polite and courteous at all times.</p>	PIU, Contractor	PIU/ ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring
		<p>Disruption of access for local residents, commercial establishments, institutions, etc. must be minimized and must have the Engineer's permissions.</p>	PIU, Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring
		<p>The work plan for the construction and laying of pipelines will be devised in such a way to ensure that the construction period is minimized. Affected persons will be assisted in moving to the other side of the road and returning after construction work is completed. Where they are not required to shift, their access road will be ensured by the contractor. The construction period will be</p>	PIU, Contractor	PIU/ ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring

²¹ Regular communication between the Contractor and the interested and affected parties is important for the duration of the contract.

	Issues	Management/Mitigation	Responsible for Mitigation	Responsible for Monitoring/Supervision	Frequency
		minimized and is estimated to be less than 30 days per section of work. Compensation will be provided to impacted person (all deals under Resettlement Plant)			
		Provide walkways and metal sheets where required to maintain access for people and vehicles.	Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring
		Increase workforce in front of critical areas such as educational institutions, places of worship, business establishment and health care establishments to shorten the duration of impacts.	Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring
		Consult businesses and institutions regarding operating hours and factoring this in work schedules.	PIU, Contractor	PIU/ES-PMC, EE – PMU	At least 1 week prior to the activity taking place. Monthly monitoring
		The Contractor is to inform neighbors in writing of disruptive activities at least a week beforehand.	PIU, Contractor	PIU/ES-PMC, EE – PMU	At least a week prior to the activity taking place. Monthly monitoring
		Lighting on the construction site shall be pointed downwards and away from oncoming traffic and nearby houses.	Contractor	PIU/ES-PMC, EE – PMU	Monthly
		The site must be kept clean to minimize the visual impact of the site.	Contractor	PIU/ES-PMC, EE – PMU	Weekly monitoring.
		Machinery and vehicles are to be kept in good working order for the duration of the project to minimize noise nuisance to neighbors.	Contractor	PIU/ES-PMC, EE – PMU	Monthly monitoring.
		Notice of particularly noisy activities must be given to residents / businesses adjacent to the construction site. Examples of these include: <ul style="list-style-type: none"> • noise generated by jackhammers, diesel generator sets, excavators, etc. • drilling • dewatering pumps 	PIU, Contractor	PIU/ES-PMC, EE – PMU	Monthly monitoring
		A complaints register (refer to the Grievance Redressal Mechanism) shall be housed	E- DSC, Contractor	PIU/ES-PMC, ESMC-PMU, EE –	Monthly monitoring.

	Issues	Management/Mitigation	Responsible for Mitigation	Responsible for Monitoring/Supervision	Frequency
		at the site office.		PMU	
15	Cultural environment	All the staff and labourers of the Contractor be informed about the possible items of historical or archaeological value	E- DSC, ES-PMC, contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring
		If something of this nature be uncovered, ASI or State Department of Archaeology shall be contacted and work shall be stopped immediately.	E- DSC, ES-PMC, Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Monthly monitoring
16	Environment Safeguard/safety Officer	Contractor shall appoint one Environment Safeguard/ Safety Officer who shall be responsible for assisting contractor in implementation of EMP, community liaison, consultations with interested/affected parties, reporting and grievance redressal on day-to-day basis.	Contractor	PIU/ES-PMC, ESMC-PMU, EE – PMU	Person to be appointed before start of construction activities and remain available throughout the project duration.

Monitoring method- Through field check, document check, visual observation, generation of air, water & noise level data

ASI = Archeological Survey of India, BSPCB= Bihar State Pollution Control Board,

DSC: Design and Supervision Consultant, E: Engineer, EE: Environmental Engineer, ES: Environment Specialist, ESMC: Environment & Social Management Coordinator, PIU: Project Implementation unit, PMC: Project Management Consultant, PMU: Project Management Consultant, SO: Safeguard Officer

Table 24: Generic EMP- Post Construction Activities and Operation

	Activities	Management/Mitigation	Responsible for Mitigation	Responsible for Monitoring/Supervision	Frequency
1.	Construction camp	All structures comprising the construction camp are to be removed from site or handed over to the property owner/ community as per mutual agreement (if established on private/community land).	Contractor	SO - PIU, ES-PMC, EE –PMU	Subproject completion
		The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc. and these shall be cleaned up.	Contractor	SO - PIU, ES-PMC, EE –PMU	Subproject completion
		The Contractor must arrange the cancellation of all temporary services.	Contractor	SO - PIU, ES-PMC, EE –PMU	Subproject completion
		All vegetation that has been cleared (as per requirement) during construction is to be removed from site or used as much as per the re-vegetation specification	Contractor	SO - PIU, ES-PMC, EE –PMU	Subproject completion
		The Contractor is to water and maintain all planted vegetation	Contractor	SO - PIU, ES-PMC, EE	Subproject completion

	Activities	Management/Mitigation	Responsible for Mitigation	Responsible for Monitoring/ Supervision	Frequency
		until the end of the defects liability period and is to submit a method statement regarding this to the Engineer.		-PMU	
3.	Land rehabilitation	All surfaces hardened due to construction activities are to be ripped and imported materials thereon removed.	Contractor	SO - PIU, ES-PMC, ESMC- PMU	Subproject completion
		All rubble is to be removed from the site to an approved disposal site. Burying of rubble on site is prohibited.	Contractor	SO - PIU, ES-PMC, ESMC- PMU	Subproject completion
		The site is to be cleared of all litter.	Contractor	SO - PIU, ES-PMC, ESMC- PMU	Subproject completion
		Surfaces are to be checked for waste products from activities such as concreting or asphaltting and cleared in a manner approved by the Engineer.	Contractor	SO - PIU, ES-PMC, ESMC- PMU	Subproject completion
		The Contractor is to check that all watercourses are free from building rubble, spoil materials and waste materials.	Contractor	SO - PIU, ES-PMC, ESMC- PMU	Subproject completion
4.	Materials and infrastructure	Fences, barriers and demarcations associated with the construction phase are to be removed from the site unless stipulated otherwise by the Engineer.	Engineer- DSC, Contractor	SO - PIU, ES-PMC, EE -PMU	Subproject completion
		All residual stockpiles must be removed to spoil or spread on site as directed by the Engineer.	Engineer- DSC, Contractor	SO - PIU, ES-PMC, EE -PMU	Subproject completion
		The Contractor must repair any damage that the construction work has caused to neighboring properties.	Contractor	SO-PIU, ES-PMC	As directed by the Engineer.
5.	General	A meeting is to be held on site between the Engineer, ES-PMC and the Contractor to approve all remediation activities and to ensure that the site has been restored to a condition approved by the Engineer.	Engineer- DSC, SO-PIU, ES-PMC, Contractor	PIU, ES-PMC, ESMC- PMU	On completion of the construction and maintenance phases- monthly monitoring
		Temporary roads must be closed and access across these blocked.	Engineer- DSC, SO-PIU, ES-PMC, Contractor	SO - PIU, ES-PMC, EE -PMU	On completion of construction
		Refill and re-compact trenches soil and backfilled sand will be removed to expose the leaking junction or pipe	Engineer- DSC, SO-PIU, ES-PMC, Contractor	PIU, ES-PMC, ESMC- PMU	On completion
		Cover or wet excavated	Engineer- DSC	SO - PIU,	Monthly

	Activities	Management/Mitigation	Responsible for Mitigation	Responsible for Monitoring/ Supervision	Frequency
		material to prevent dusts	and Contractor	ES-PMC, EE –PMU	monitoring
		All areas where temporary services were installed are to be rehabilitated to the satisfaction of the Engineer	Engineer- DSC and Contractor	SO – PIU, ES-PMC, EE –PMU	On completion of construction
6	Hazardous chemical & waste management	Store of common salt, dry, and dark conditions for no more than one month	Engineer- DSC and Contractor	SO – PIU, ES-PMC, EE –PMU	Monthly during Operation
		Use equipment constructed of corrosion-resistant materials	Engineer- DSC and Contractor	SO – PIU, ES-PMC, EE –PMU	Monthly during Operation
		Minimize the amount of disinfection materials for using in chlorinator	Engineer- DSC and Contractor	SO – PIU, ES-PMC, EE –PMU	Monthly during Operation
		Material safety data sheet to be maintained at chlorine/ common salt storage area	Engineer- DSC and Contractor	SO – PIU, ES-PMC, EE –PMU	Monthly during Operation
		Regular laboratory testing for dosing and residual chlorine	Engineer- DSC and Contractor	SO – PIU, ES-PMC, EE –PMU	Monthly during Operation
		Develop and implement a prevention program that includes identification of potential hazards, written operating procedures, training, maintenance, and accident investigation procedures	Engineer- DSC and Contractor	SO – PIU, ES-PMC, EE –PMU	During Operation – quarterly
		Disposal of WTP sludge at approved location	Engineer- DSC and Contractor	SO – PIU, ES-PMC, EE –PMU	During Operation – monthly
7	Water quality assessment and maintained – Health & safety	<ul style="list-style-type: none"> Undertake regular monitoring and maintenance of water supply infrastructure. Quality of drinking water will be checked regularly at WTP locations and water storage sites 	Contractor, SO-PIU	ES-PMC, EE –PMU	Monthly monitoring - During Operation
8	Social and Cultural Resources	<ul style="list-style-type: none"> Consult the city authorities to identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity; Complete work in these areas quickly; Consult municipal authorities, custodians of 	Contractor, SO-PIU	ES-PMC, EE –PMU	Monthly monitoring during operation

Activities	Management/Mitigation	Responsible for Mitigation	Responsible for Monitoring/Supervision	Frequency
	important buildings, cultural and tourism authorities and local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals			

ASI = Archeological Survey of India, BSPCB= Bihar State Pollution Control Board, DSC: Design and Supervision Consultant, E: Engineer, EE: Environmental Engineer, ES: Environment Specialist, ESMC: Environment & Social Management Coordinator, PIU: Project Implementation unit, PMC: Project Management Consultant, PMU: Project Management Consultant, SO: Safeguard Officer

C. Environmental Monitoring Program

285. **Table 25** outlines the environmental monitoring program to ensure implementation of the management and mitigation measures specified in the EMP. The table shall be read within the context of the body of the entire EMP.

Table 25: Environmental Monitoring Program

Aspect	Parameter	Standards	Location	Duration / frequency	Implementation	Monitoring &Supervision
1. Site establishment and preliminary activities						
Legislation, permits and agreements	Consent for Establishment and Consent to Operate (in relation to hot mixing, wet mixing, batching plant, stone crushers, and diesel generators, etc. if any)	Air Act Water Act Noise Act	-	Prior to moving onto site and during construction	Contractor, PIU	Engineer of DSC / ESMC-PMU/EE-PMU/ ES-PMC
	Tree cutting NOC from concerned dept.	Forest Act	-	NA	Contractor, PIU	Engineer of DSC / ESMC-PMU/EE-PMU/ ES-PMC
	Copy of EMP	EARF and ADB SPS	Subproject site, offices, website, library, etc.	At all times	Contractor, Engineer of DSC &SO- PIU	ESMC- PMU/EE- PMU/ ES-PMC
Access to site	Existing conditions	EMP	All access and haul roads	Prior to moving onto site	Contractor, Engineer of DSC &SO- PIU and ES- PMC	ES- PMC /EE-PMU
	Road closures and traffic rerouting if required	EMP	All affected roads	One week in advance of the activity	Contractor, Engineer of DSC &SO- PIU	ESMC- PMU/EE- PMU/ ES-PMC
	Notifications and road signages	EMP	All affected roads	One week in advance of	Contractor, Engineer of DSC	ESMC- PMU/EE- PMU/ ES-

Aspect	Parameter	Standards	Location	Duration / frequency	Implementation	Monitoring & Supervision
				the activity	&SO- PIU	PMC
Construction camp	Approval of location and facilities	EMP	As identified	Prior to moving onto site	Contractor, Engineer of DSC &SO- PIU	ESMC- PMU/ EE- PMU/ ES- PMC
Equipment lay-down and storage area	Approval of location and facilities	EMP	As identified	Prior to moving onto site and during site set-up	Contractor, Engineer of DSC &SO- PIU	ESMC- PMU/ EE- PMU/ ES- PMC
Materials management – sourcing	Approval of sources and suppliers	EMP	As identified	Prior to procurement of materials	Contractor, Engineer of DSC &SO- PIU	EE- PMU/ ES- PMC
Education of site staff	Awareness level training - Environment - Health and safety	EMP and records	-	During staff induction, followed by schedule as determined	Contractor, ES- PMC	ESMC- PMU/ EE- PMU/ ES- PMC
Social impacts	Public consultations, information disclosure, communication strategy	EARF, ADB SPS and EMP	Subproject site	Prior to moving onto site and ongoing	Contractor, Engineer of DSC &SO- PIU	ESMC- PMU/ EE- PMU/ ES- PMC
	GRM register	EMP	Subproject site	Prior to moving onto site and ongoing	Contractor, SO- PIU	ESMC- PMU/ ES- PMC
Noise quality	Baseline data for noise level in dB(A) L _{eq}	National noise standards	Once before start of construction works at all the project locations as identified by ES- PMC	Once prior to site set-up	Contractor with the help of National Accreditation Board for Testing and Calibration Laboratories	SO- PIU, EE- PMU/ ES- PMC
WTP sludge quality	Baseline data for CTE/CTO	Waste water standard	Once before start of construction works at WTP location as identified by ES- PMC	Once	Contractor with the help of National Accreditation Board for Testing and Calibration Laboratories	SO- PIU, EE- PMU/ ES- PMC
Air quality	Baseline ambient data for particulate matters 10 and 2.5 (PM ₁₀ , PM _{2.5}), sulfur dioxide (SO ₂), nitrogen dioxide (NO ₂)	National ambient air quality standards	Once before start of construction works at all the project locations as identified by ES- PMC	Once prior to site set-up	Contractor with the help of National Accreditation Board for Testing and Calibration Laboratories	SO- PIU, EE- PMU/ ES- PMC
Storm water	Storm water management measures	EMP	As identified by the engineer	During site set-up and throughout the duration of the subproject-monthly	SO-PIU,EE- PMU/ ES- PMC	EE- PMU/ ES- PMC
Conservation of natural	Existing conditions	EMP	Subproject sites	Prior to site set-up-then	Contractor & ES- PMC	ESMC- PMU/ EE- PMU/ ES-

Aspect	Parameter	Standards	Location	Duration / frequency	Implementation	Monitoring & Supervision
environment				monthly		PMC
Waste management procedure	Disposal sites	EMP	As determined	Prior to site set-up and ongoing throughout the subproject-monthly	Contractor, ES-PMC	EE- PMU/ ES-PMC
Cultural environment	Chance finds	ASI Act and EMP	As determined	Prior to site set-up and ongoing throughout the subproject-monthly	Contractor with Engineer-&SO-PIU	EE- PMU/ ES-PMC
Security & safety arrangement	Arrangement at working sites	EMP	Subproject sites	Prior to site set-up and ongoing throughout the subproject	Contractor with Engineer-&SO-PIU	EE- PMU/ ES-PMC
Occupational Health & safety	Compliance with IFC EHS Guidelines of World Bank	EMP, Guidelines	Subproject sites	Prior to site set-up and ongoing throughout the subproject	Contractor with Engineer-&SO-PIU	EE- PMU/ ES-PMC
2. Construction phase						
Access to site	Qualitative characteristics	Pre-subproject condition and EMP	All access and haul roads	Refer to EMP (table on management of construction and workforce activities)	Contractor	EE- PMU/ SO-PIU/ ES- PMC
Construction camp	Qualitative characteristics	Pre-subproject condition and EMP	Camp site	Prior to site set-up and ongoing throughout the subproject-weekly monitoring	Contractor	EE- PMU/ SO-PIU/ ES- PMC
Staff conduct	Site records (accidents, complaints)	EMP	Subproject sites	Ongoing-monthly monitoring	Contractor	EE- PMU/ SO-PIU/ ES- PMC
Air quality	PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂	National ambient air quality standards	Covering at all the project locations as identified by Engineer.	Once in every six months at water reservoir sites, pipe laying areas, during subproject execution	Contractor with the help of National Accreditation Board for Testing and Calibration Laboratories	EE- PMU/ SO-PIU/ ES- PMC
Storm water	Soil erosion	EMP	Subproject	Ongoing-	Contractor	EE- PMU/ SO-

Aspect	Parameter	Standards	Location	Duration / frequency	Implementation	Monitoring & Supervision
	management measures		sites	monthly		PIU/ ES- PMC
Water quality	Protection from contamination	EMP, Water quality standard	Subproject sites	Ongoing-monthly	Contractor	EE- PMU/ SO-PIU/ ES- PMC
Conservation of natural resources	Vegetation conditions	EMP	Subproject sites	Ongoing-monthly	Contractor	EE- PMU/ SO-PIU/ ES- PMC
Materials management	Qualitative characteristics	EMP	Subproject sites	Ongoing-monthly	Contractor	EE- PMU/ SO-PIU/ ES- PMC
Landscape and Aesthetics including Waste management	Qualitative characteristics	EMP	Subproject sites	Ongoing-monthly	Contractor	EE- PMU/ SO-PIU/ ES- PMC
	Disposal manifests	EMP	Subproject sites	Ongoing-monthly	Contractor	EE- PMU/ SO-PIU/ ES- PMC
Social impacts	Public consultations, information disclosure, communication strategy	EARF, ADB SPS and EMP	Subproject sites	Ongoing-monthly	Contractor with the Engineer, DSC, SO- PIU	EE- PMU/ ES- PMC
	GRM register	EMP	Subproject sites	Ongoing-monthly	Contractor with the Engineer, DSC, SO- PIU	EE- PMU/ ES- PMC
Occupational Health and Safety	World bank Environmental, Health, and Safety (EHS) Guidelines	EMP	Subproject sites	Ongoing-weekly	Contractor with the Engineer, DSC, SO- PIU	EE- PMU/ ES- PMC
Cultural environment	Chance finds	ASI Act and EMP	Subproject sites	Ongoing-monthly	Contractor	EE- PMU/ SO-PIU/ ES- PMC
Noise quality	Noise level in dB(A) _{Leq}	National noise standards	Covering at all the project locations as identified by Engineer.	Once in every six months at water reservoir sites, pipe laying areas, during subproject execution	Contractor with the help of National Accreditation Board for Testing and Calibration Laboratories	EE- PMU/ SO-PIU/ ES- PMC
WTP sludge quality	Waste water and sludge analysis	Waste water standard	WTP location	Ongoing-monthly	Contractor	EE- PMU/ SO-PIU/ ES- PMC
Community Health & Safety	Safety arrangement during construction	EMP	Subproject sites	Ongoing-weekly	Contractor	EE- PMU/ SO-PIU/ ES- PMC
Traffic accessibility impact	Arrangement and follow up rules related to traffic safety	EMP	Subproject sites	Ongoing-monthly	Contractor	EE- PMU/ SO-PIU/ ES- PMC
3. Post-construction activities						
Construction camp	Pre-existing conditions	EMP	Construction camp	Subproject completion	Contractor	EE- PMU/ ES- PMC
Vegetation (if felled)	Pre-existing conditions	EMP	Subproject sites	Subproject completion	Contractor	EE- PMU/ ES- PMC
Land rehabilitation	Pre-existing conditions	EMP	Subproject sites	Subproject completion	Contractor	ESMC- PMU/ EE- PMU/ ES- PMC
Materials and	Pre-existing	EMP	Subproject	Subproject	Contractor	EE- PMU/

Aspect	Parameter	Standards	Location	Duration / frequency	Implementation	Monitoring & Supervision
infrastructure	conditions		sites	completion		ES- PMC
General	Records	EMP	Subproject sites	Subproject completion	Contractor with Engineer- DSC & SO- PIU and ES-PMC	ESMC- PMU/ EE- PMU/ ES- PMC
Social and Cultural Resources	Pubic complaint	EMP	Subproject sites	During operation	Contractor	EE- PMU/ ES- PMC
4. Operation and maintenance						
Water Quality	As per national standard	Central Pollution Control Board standards	Once at all constructed OHTs, and WTP location	Once in 6 months	Contractor with the help of National Accreditation Board for Testing and Calibration Laboratories	ESMC- PMU/ EE- PMU/ ES- PMC
Noise quality	Noise level in dB(A) L_{eq}	As per national noise standards	Once at WTP	Once in 6 months	Contractor with the help of National Accreditation Board for Testing and Calibration Laboratories	ESMC- PMU/ EE- PMU/ ES- PMC
Hazardous chemical & waste management	Storage and use	Safety data sheet EMP	At WTP	Monthly monitoring	Contractor	ESMC- PMU/ EE- PMU/ ES- PMC
WTP sludge quality	Waste water and sludge analysis	Waste water standard	WTP location	Ongoing- quarterly	Contractor	EE- PMU/ SO- PIU/ ES- PMC

DSC: Design and Supervision Consultant, E: Engineer, EE: Environmental Engineer, ES: Environment Specialist, ESMC: Environment & Social Management Coordinator, PIU: Project Implementation unit, PMC: Project Management Consultant, PMU: Project Management Consultant, SO: Safeguard Officer

D. Environmental Management and Monitoring Cost

286. The Contractor's cost for site establishment, preliminary activities, construction, and defect liability activities will be incorporated into the contractual agreements, which will be binding on him for implementation. The air quality and noise level monitoring at construction phase and water quality at operation and maintenance phase will be conducted by the contractor.

287. The operation phase mitigation measures are again of good operating practices, which will be the responsibility of implementing agency (BUIDCo) with the help of DBO contractor and program Consultant. The water quality monitoring during the operation and maintenance phase will be conducted by the hired recognized environmental laboratory.

288. The activities identified in environmental monitoring program mainly includes site inspections and informal discussions with workers and local people and this will be the responsibility of PMU and PMC with the assistance of DSC's Engineer, costs of which are part of project management.

289. The remaining actions in the EMP are the various environmental monitoring activities to be conducted by the Environmental Monitoring Specialist. These have not been budgeted elsewhere, and their costs are shown in **Table 26**. The figures show that the total cost of environmental management and monitoring for the subproject BWSP 1 as a whole is INR 3.17 million, i.e., about USD 48,846.

Table 26: EMP Implementation Cost

Component	Description	Number	Cost per Unit (INR)	Cost (INR)	Source of Funds
Legislation, Permits and Agreements	Consent to Establish and Consent to Operate for plants and machinery of the contractor.	As required	Not Applicable	Not Applicable	These consents are to be obtained by contractor on his own cost.
Consent to establish and consent to Operate for WTP	For WTP Refurbishment work	Once	As per norms	10,00,00	Cost by BUIDCo
Public consultations and information disclosure	Information disclosure and consultations during preconstruction and construction phase.	As required	Lump sum	50,000	Project Cost-PMU
NOC from forest dept. for tree cutting and temporary impact	For construction of OHSR and customer service centre Trees need to compensate against each tree cutting	As per project requirement	Lump sum for all activities	50,000	Project Cost
Providing access to commercial establishments and properties.	Providing access, in case of access disruptions, to affected properties.	As per requirement	Contractor's liability	Not applicable	Covered under engineering cost
Dust Suppression at subproject sites	Application of dust suppression measures during construction phase.	As required	Lump sum	2,00,000	Covered under engineering design and cost – by contractor
Traffic management	Safety Signboards, delineators, traffic regulation equipments, flagman, temporary diversions, etc	Wherever required throughout subproject corridor	Contractor's liability	Not applicable	Covered in engineering cost
Baseline Monitoring Site preparation and preliminary activities					
Air	Once before start of construction work at all the water reservoir locations, WTP and pipe laying locations as identified by Engineer of DSC & Environmental Specialist of PMC	Approx. 20 samples	10,000 per sample	2,00,000	Covered under engineering design and cost- by contractor

Component	Description	Number	Cost Unit (INR)	per	Cost (INR)	Source of Funds
Noise	Once before start of construction work at all the water reservoir locations, WTP and pipe laying locations as identified by Engineer of DSC & Environmental Specialist of PMC	Approx. 20 samples	1500 sample	per	30,000	Covered under engineering design and cost- by contractor
Construction Monitoring						
Air	Once in six months during construction works at all the water reservoir locations.WTP location and pipe laying locations as identified by Engineer of DSC & Environmental Specialist of PMC	Approx. 80 samples	10,000 sample	per	8,00,000	Covered under engineering design and cost- by contractor
Noise	Once in six months during construction works at all the water reservoir locations, WTP location and pipe laying locations as identified by Engineer of DSC & Environmental Specialist of PMC	Approx. 80 samples	1500 sample	per	1,20,000	Covered under engineering design and cost- by contractor
Sludge Monitoring	Once in six months during construction work at WTP barari	Approx 50 samples	2000 samples	per	1,00,000	Covered under engineering design and cost by contractor
Tree plantation at Barari WTP	As per BSPCB norms				1,00000	Covered under engineering design and cost by contractor
Operation phase						
Water Quality	At all constructed OHTs, and WTP, as per drinking water standard parameters	Approx. 60 numbers	12,000 sample	per	7,20,000	Covered under O & M cost – by contractor
Noise quality	Once in six months during the operation phase – WTP site	Approx. 30 samples	1500 sample	per	45,000	Covered under O & M cost – by contractor

Component	Description	Number	Cost per Unit (INR)	Cost (INR)	Source of Funds
Sludge Quality Analysis	Once in six months during the operation period at WTP Barari	30 samples	2000 per sample	60000	Covered under O & M cost – by contractor
CTO Renewal	As per BSPCB norms		25000 per year	1,00,000	Cost by BMC/BUIDCO
Any unanticipated impact due to subproject implementation	Mitigation of any unanticipated impact arising during construction phase and O & M phase	Lump sum	-	5,00,000	Project cost
TOTAL (INR)				31,75,000.00	
TOTAL (USD)				48,846	

E. Monitoring and Reporting

290. Prior to commencement of any civil work, the contractor will submit a compliance report to PMU/PMC/PIU ensuring that all identified pre-construction environmental impact mitigation measures as detailed in the EMP will be undertaken. PMC will review the report and thereafter PMU will allow commencement of civil works.

291. PMC will organize an induction course for the training of contractors preparing them on:

- I. EMP/approved Site Specific EMP implementation including environmental monitoring requirements related to identified mitigation measures;
- II. and taking immediate actions to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation.

292. During the construction phase, results from internal monitoring by the contractor will be reflected in their monthly EMP implementation reports to the PMC. These monthly report will be retained in PMC / PIU office for reference.

293. Monthly report will be prepared by PMC summarizing compliance with monitoring requirements, details on any noncompliance, remedial actions taken and additional environmental mitigation measures if necessary.

294. Environmental monitoring activities involving measurements will require engagement of external agencies and will be organized by contractor. Based on monthly reports and measurements, PMC will draft a 6-monthly EMP implementation report.

295. The PMU will review, approve and submit to ADB the 6 monthly (semi annual) EMP implementation progress report. Once concurrence from the ADB is received the report will be uploaded in the Project website.

296. Based on review of environmental monitoring results, future modifications in the EMP could be undertaken with the concurrence of the ADB. These will be generally undertaken, if required, upon review of the 6-monthly EMP progress reports submitted by the PMU to ADB following agreed procedures and mechanisms.

297. For Projects likely to have anticipated adverse environmental impacts during operation, monitoring may continue at the minimum on an annual basis during the operation phase. Monitoring reports will be posted in a location accessible to the public.

VIII. RECOMMENDATIONS AND CONCLUSIONS

298. The process described in this document has assessed the environmental impacts of all elements of the infrastructure proposed under the Bhagalpur Water Supply Project 1 (BWSP1). Potential negative impacts were identified in relation to both construction and operation of the improved infrastructure. In the current subproject no construction works are planned in the River Ganga. Hence no impact on the Vikramshila Gangetic Dolphin Sanctuary is anticipated. Mitigation measures have been developed for all the identified adverse impacts to bring the impacts to acceptable levels. These were discussed with specialists responsible for the engineering aspects, and as a result some measures have already been included in the outline designs for the infrastructure. This means that the number of impacts and their significance has already been reduced by amending the design.

299. Regardless of these and various other actions taken during the IEE process and in developing the project, there will still be impacts on the environment when the infrastructure is built and when it is operating. This is mainly because of the invasive nature of trenching and other excavation, and because the distribution network is located in an ancient town where there are moderately populated areas and sites of tourism interest.

300. During the construction phase, impacts mainly arise from the need to dispose of large quantities of waste soil, dried sludge and import a similar amount of sand to support the pipes in the trenches, and from the disturbance of residents, businesses, traffic and important buildings by the construction work. These are common impacts of construction in urban areas, and there are well developed methods for their mitigation.

301. One field in which there may be less routine impacts is archaeology, and here a series of specific measures have been developed to avoid damaging important remains.

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

303. Once the system is operating, most facilities (WTP, pump house, OHTs) will operate with routine maintenance, which should not affect the environment. Leaks in the distribution network will need to be repaired from time to time, but environmental impacts will be much less than those of the construction period as the work will be infrequent, affecting small areas only. It will also be conducted in areas that have already been excavated, so there will be no need to protect archaeological material.

304. The main impact of the operating water supply system will be beneficial as the citizens of Bhagalpur will be provided with a continuous pressurized supply of safe water, which will serve a greater proportion of the population, including the urban poor and other disadvantaged communities. This will improve the quality of life of people especially improving public health in particular and improving the environment in general. This will reduce the incidence of disease associated with poor quality of water supply and sanitation. This will also lead to economic gains as people will have a reliable and secure water supply available all the time relieving their efforts in coping with intermittent water supply, and the time thus saved would result in an increase in their income and savings in medical care costs.

305. Mitigation will be assured by a program of environmental monitoring conducted during construction and operation to ensure that all measures are implemented, and to determine whether the environment is protected as intended. This will include observations on- and off-site, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported to the PMU. There will also be longer-term surveys to monitor the expected improvements in the quality of domestic water and the health of the population.

306. Finally, stakeholders were involved in developing the IEE through face-to-face discussions on site and a large public meeting held in the town, after which views expressed

were incorporated into the IEE and the planning and development of the subproject. The IEE will be made available at public locations in the town and will be disclosed to a wider audience via the ADB website. The consultation process will be continued and expanded during project implementation.

307. The subproject's Grievance Redressal Mechanism will provide the citizens with a platform for redressal of their grievances and describes the informal and formal channels, time frame and mechanisms for resolving complaints about environmental performance.

308. The EMP will guide the environmentally-sound construction of the subproject and ensure efficient lines of communication between the DSC (Engineer), contractors, PIU and PMU/PMC. The EMP will (i) ensure that the activities are undertaken in a responsible non-detrimental manner; (ii) provide a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on site; (iii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iv) detail specific actions deemed necessary to assist in mitigating the environmental impact of the subproject; and (v) ensure that safety recommendations are complied with.

309. A copy of the EMP will be kept on site during the construction period at all times. The EMP will be made binding on all contractors operating on the site and will be included within the Contractual Clauses. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

310. The subproject is unlikely to cause significant adverse impacts. The potential adverse impacts that are associated with design, construction, and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures.

311. Therefore, as per ADB SPS, the subproject is classified as Environmental Category B and does not require further Environmental Impact Assessment.

Appendix 1 Rapid Environmental Assessment (REA) Checklist

Instructions:

- (i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (RSES) for endorsement by the Director, RSES and for approval by the Chief Compliance Officer.
- (ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.
- (iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project title: India/ Bihar Urban Development Project

Sector division: Water Supply- Bhagalpur , BWSP1

Screening questions	Yes	No	Remarks
a. Project siting Is the project area			
▪ Densely populated?	√		Bhagalpur is not densely populated
▪ Heavy with development activities?		√	No such heavy development activity is noted at Bhagalpur
▪ Adjacent to or within any environmentally sensitive areas?	√		Vikramshila Gangetic Dolphin Sanctuary is located in Bhagalpur District of Bihar, India. The sanctuary is a 50 km stretch of the Ganga River from Sultanganj to Kahalgaon. Designated in 1991, it is the only protected area for the endangered Gangetic Dolphins in Asia. Other than existing raw water intake wells none of the subproject activities are impinging on the dolphin sanctuary. Existing intake wells were constructed prior to Notification of Vikramshila Gangetic Dolphin Sanctuary and have been operational for more than 100 years.
• Cultural heritage site		√	Few religious places are located within Bhagalpur town. No cultural heritage site is located nearby the project area
• Protected area	√		Vikramshila Gangetic Dolphin Sanctuary – protected area close to existing Barari water works A protected forest area called Sundarban is located within 100 m of Barari Water Works. As per the Forest Dept. there are no animals in Sundarban, and only tree species are protected.

Screening questions	Yes	No	Remarks
• Wetland		√	A number of ponds exist within Bhagalpur but no designated wetland near the project location
• Mangrove		√	Not applicable
• Estuarine		√	Not applicable
• Buffer zone of protected area	√		Existing raw water intake wells are within the core and buffer zone of Vikramshila Gangetic Dolphin Sanctuary. Under this package no intake well work is considered
• Special area for protecting biodiversity	√		Vikramshila Gangetic Dolphin Sanctuary is the special protected area for Gangetic Dolphins One forest area called Sundarban (declared for conservation of species in the year 1981) is located at the buffer zone of WTP. No impact on forest tree is expected
• Bay		√	Not applicable
b. Potential environmental impacts will the project cause...			
▪ Pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture, and soil erosion runoff?		√	Not expected as per site conditions
▪ Impairment of historical/cultural monuments/areas and loss/damage to these sites?		√	No impact expected. No cultural monuments and historical sites near project location
▪ Hazard of land subsidence caused by excessive ground water pumping?		√	Water from the river as well as existing tube wells is to be used, and with no risk of land subsidence
▪ Social conflicts arising from displacement of communities?		√	Project area is in government land and no displacement of communities is planned.
▪ Conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?		√	River water is already being pumped for water supply. The flow in the River Ganga at the existing intake wells is high and extraction will have negligible effect on other water users.
▪ Unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)?		√	Water testing should be done before treatment and after treatment
▪ Delivery of unsafe water to distribution system?		√	Regular water quality surveillance will be done so the delivery of unsafe water will be prevented.
▪ Inadequate protection of intake works or wells, leading to pollution of water supply?		√	Proper design criteria will be implemented.
▪ Over pumping of ground water, leading to salinization and ground subsidence?		√	As the project area is within the mid Ganga basin there is no risk of salinization or ground subsidence.

Screening questions	Yes	No	Remarks
▪ Excessive algal growth in storage reservoir?		√	The storage reservoirs are covered on top and the raw water is subjected to pre- chlorination and the treated water is subjected to post chlorination and hence the risk of algal growth is mitigated. Continuous hydraulic modelling would be ensured to simulate water quality and sufficient water safety planning will be ensured by the Contractor.
▪ Increase in production of sewage beyond capabilities of community facilities?		√	This risk will be addressed by BMC and EA in planning for a sewerage system in the city.
▪ Inadequate disposal of sludge from water treatment plants?		√	Sludge will be disposed from the treatment unit after adopting suitable sludge management plan
▪ Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?		√	A green belt area will be developed surrounding the boundary wall of the treatment plant. Trees with thick canopy will be planted in order to reduce the noise levels reaching the nearby surroundings.
▪ Impairments associated with transmission lines and access roads?	√		Transmission and feeder lines are not included in the subproject (BWSP1)
▪ Health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.		√	Chlorine dosing will be done through chlorinator and chlorine safety measures and facilities are proposed to be implemented as part of the subproject as per MSIHC rules, 1989 and its amendment in 2010.
▪ Health and safety hazards to workers from the management of chlorine used for disinfection and other contaminants?		√	Proper arrangement will be made for handling and storage of chlorine gas. Adequate measures will be taken to prevent the exposure of workers to chlorine gas.
▪ Dislocation or involuntary resettlement of people		√	There are no habitations at the construction sites and resettlement issues will not arise Preference will be given to the local workers in order to minimize the chances of such conflicts.
▪ Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		√	No impact expected.
▪ Noise and dust from construction activities?	√		Noise and dust emissions will be limited as per the nature of the work. Adequate mitigation measures will be taken to further minimize it.
▪ Increased road traffic due to interference of construction activities?	√		A temporary phase of disturbance can arise during the construction activities. A traffic management plan will be prepared before the construction activities at site.
▪ Continuing soil erosion/silt runoff from construction operations?		√	The excavated soil will be stockpiled at appropriate locations and will be used for refilling with better compaction.

Screening questions	Yes	No	Remarks
<ul style="list-style-type: none"> Delivery of unsafe water due to poor O&M treatment processes (especially mud accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems? 		√	A qualified Contractor with required experience is proposed to be selected through a competitive bidding process to ensure prudent industry standards for delivery of wholesome water to the customers. The Contractor shall prepare an O&M manual for approval of the Employer and training will be given to the staff operating the plant to ensure proper O&M.
<ul style="list-style-type: none"> Delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals? 		√	Online monitoring of process water is proposed as part of the subproject and ensured by the Contractor.
<ul style="list-style-type: none"> Accidental leakage of chlorine gas? 		√	Chlorine dosing will be done with the help of chlorinators of reputed makes. Continuous training in chlorine handling will be ensured for the operating staff. Adequate measures will be taken to prevent the exposure of workers to chlorine gas. Regular monitoring will be done to ensure the implementation of EMP in an efficient manner.
<ul style="list-style-type: none"> Excessive abstraction of water affecting downstream water users? 		√	Water availability at the existing intake wells in River Ganga is high and sustainable during all seasons and hence extraction will not affect any downstream users.
<ul style="list-style-type: none"> Competing uses of water? 		√	No as such impact is expected
<ul style="list-style-type: none"> Increased sewage flow due to increased water supply 	√		Sewage (wastewater) volume will definitely increase with the increase in water supply from new areas and continuous supply; but will decrease over time as users adjust.
<ul style="list-style-type: none"> Increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant 	√		BMC will put in place advance plans to improve the drainage in the city to meet the increased discharge of sullage. The scope of the present work does not involve wastewater treatment plant
<ul style="list-style-type: none"> Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)? 		√	Renovation of existing facility and laying of pipeline is not a big construction. Hardly 20-30 labourers will be work during construction, therefore temporary burden to social infrastructure is insignificant In case of setting up of labour camp permission will be obtained from BMC. Water supply and sanitation arrangement will be made as per hygienic norms
<ul style="list-style-type: none"> Social conflicts if workers from other regions or countries are hired? 		√	Preference will be given to the local workers in order to minimize the chances of such conflicts.
<ul style="list-style-type: none"> Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during operation and construction? 		√	No explosive will be used. Fuel and chemicals will be stored as per storage and import of hazardous chemical rules 1989 and safety norms

Screening questions	Yes	No	Remarks
<ul style="list-style-type: none"> Community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning? 		√	<p>No such impact is anticipated, in case of the proposed sub-project</p> <p>In case of pipe laying community safety will be considered as per EMP</p> <p>All structural design will be as per standard design for earthquake hazard zone III</p>

A Checklist for Preliminary Climate Risk Screening

Country/Project Title: India/ Bihar Urban Development Investment Program

Sector: Urban Development

Subsector: Water Supply

Division/Department: Urban Development and Housing Department

Screening Questions		Score	Remarks ²²
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather related events such as floods, droughts, storms, landslides?	0	
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc)?	0	
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	0	
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s) ?	0	
Performance of project outputs	Would weather/climate conditions, and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	0	

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1
Very Likely	2

²² If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response, will be categorized as high risk project.

Result of Initial Screening (Low, Medium, High): Low Risk



BIHAR STATE POLLUTION CONTROL BOARD
 BELTROAD Bhawan, Bhawan Nagar, Patna - 800 022

Ref. No. PT (NOC)-2470/15/

Patna, dated:-

'CONSENT-TO-ESTABLISH' (NOC)

UNDER SECTIONS 25/26 OF THE WATER (PREVENTION AND CONTROL OF POLLUTION) ACT, 1974 AND 21 OF THE AIR (PREVENTION AND CONTROL OF POLLUTION) ACT, 1981

REFERENCE:

- (i) Name and address of the Proponent: Additional Program Director, ADB Project, BUIDCo, 303, Maurya Tower, 84th Marg, Patna on behalf of Municipal Commissioner, Bhagalpur Municipal Corporation (Project-M/s Barari Water Treatment Plant) Bhagalpur; and
- (ii) Application No.38949, dated: 01.12.2015 of the proponent for refurbishment of existing Barari Water Treatment Plant on the Plot No-1062, 1100, Khata No-863, Mauza-Mayaganj, P.O.-Barari, Dist-Bhagalpur for capacity: 20,000 MT/day, with D.G. Sets. Raw water shall be withdrawn from intake point, Barari Water Works at Ganga River.

AFTER CONSIDERING

- (i) The facts stated in their application;
- (ii) Bihar State Pollution Control Board's Notification No. 26 dated 08.11.2003;
- (iii) Provisions of the Water (Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act, 1981.

NOC IN FAVOUR OF THE PROPONENT AT THE SAID SITE IS HEREBY ACCORDED SUBJECT TO THE FOLLOWING CONDITIONS:

- (i) The proponent shall obtain 'Consent-to-Operate' under section 25 & 26 of The Water -Act, 1974 and Section 21 of The Air Act, 1981 prior to commissioning of the plant from Bihar State Pollution Control Board. They shall also comply with the provisions of the Water Cess (Prevention and Control of Pollution) Rules, 1977;
- (ii) They shall comply with the provisions (whichever applicable) made under The Environment (Protection) Rules, 1986 and notifications issued there under;
- (iii) The effluent (Domestic or Trade) and emission shall conform to the standard prescribed under The Rules;
- (iv) Ground water shall not be abstracted without prior permission of competent authority: Central Ground Water Board;
- (v) They shall ensure maximum utilization of the backwash water in the process to minimize quantity of discharge;
- (vi) They shall submit sludge management plan with chemical characteristics and the potential risk to human and environment, specially in respect of heavy metals, volatile organic compounds and pesticides;
- (vii) The Proponent shall procure D.G. Set with a valid Type Approval Certificate and conformity of Production Certificate from the

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manufacturer as specified in the Environment (Protection) Amendment Rule, 2003, vide G.S.R. 520(E), dated 1st July, 2003;

- (vi) The D.G. Set should be provided with an integral acoustic enclosure and the maximum permissible sound pressure level for new D.G. set shall be 75 dB(A) at 1 meter from the enclosure surface;
They shall meet the noise level outside the premises, within the Ambient Air quality standards;
- (ix) The minimum height of stack for exhaust emission to be provided with D.G. Set shall be as prescribed by CPCB guidelines; and
- (x) Green belt around the plant shall be provided and developed to maintain the ecology of the area.

NOTE:

1. Bihar State Pollution Control Board reserves the option to revise or add other conditions, if necessary, for protection of Environment in general and for Pollution Control in particular;
2. The present NOC should not be construed as an assurance for the grant of 'Consent-to-Operate' the proposed plant but shall be subject to compliance of all the conditions indicated above;
3. The NOC, granted, shall be valid for a period of six months from the date of issue; and
4. Issued under the instructions of the Competent Authority;

Sd/-
(A. K. Ojha)
Member Secretary

Memo No. - 7-26/9 Patna, dated: 29.2.18
Copy forwarded to: Additional Program Director, ADB Project, GUIDCo, 303, Maurya Tower, Budh Marg, Patna / Municipal Commissioner, Bhagalpur Municipal Corporation (Project-M/s Barani Water Treatment Plant), Bhagalpur (Regional Officer, Begusarai / Concern ABE, Patna for favour of information and necessary action.


(A. K. Ojha)
Member Secretary

Environment Audit – Water Treatment Plant**A. Executive Summary**

Environment Audit has been conducted for existing Barari water treatment plants under the project. The treatment plants are old and not functioning properly. Environment concern mainly related to poor sludge management and unsatisfactory disinfection process. Moreover required environment compliance particularly “Consent Management”, stipulation of Pollution Control Board has not been taken care. Manpower analyses indicate that there is requirement of inclusion of Chemist and safety person at WTP. Also it is noted that O & M cost for running of the plants will increase almost 2 times after rehabilitation of WTPs.

B. Facilities Description

The Barari water treatment plants have been taken up for renovation under the project.

Present statuses of Water Treatment Plants are,

Water Treatment Plant at Barari:

WTPs. WTP 1 was constructed in 1886 and is known as a Patterson Filter. Initially a slow sand filter was used to filter the raw water which was later modified to an alum dosing and clariflocculator system followed by rapid sand filter some 70 to 80 years back. Rated capacity is 5.455 MLD. In the 1930s another 2.728 MLD mechanical filter (WTP 2) was built. The last plant known as a Jewel Filter (or WTP 3) was constructed about 50 years back having capacity 9.092 MLD. Total design capacity is therefore about 17.3 MLD.

Inlet and outlet pipelines of these three WTPs are now interconnected. However, the chemical dosage systems (alum for clariflocculation, lime for pH adjustment, and bleaching powder for disinfection) are separate for each WTP. Almost all pipeline works in these WTPs are of CI and more than a hundred years old.

Alum and Lime Dosing. Alum and lime dosing in each of these plants is done manually. Alum cakes are kept in the water channel and are gradually dissolved by continuous flow of water. The current method of application is crude and purely based on the experience of the operators.

Flocculation and Clarification. WTPs 1 and 2 have rectangular clariflocculator but without any flocculating blades or any scrapper assembly for sludge collection. WTP 3 has a circular clariflocculator with clearly demarcated flocculation and clarification zones. It also has a scrapper assembly which is in working condition. Currently, underflow from all clariflocculators is drained to nearby drainage channels and there is no system of recycling settled sludge water.

Filtration. The slow sand filters are now abandoned. WTP 1 was modified with two rectangular rapid sand filters. Two mechanical filters of equal size are also provided in the open air at the downstream side of the clariflocculator in WTP 2. WTP 3 also has two filter beds in the new filter house building. The backwash is normally done once in a day. There are also air compressors for cleaning of beds by air-scouring which is normally done once in a week.

Disinfection. Currently disinfection of treated water is done by adding bleaching powder directly into the flowing raw water with alum/lime dosing.

Clear water storage. Clear water from both WTP 1 and WTP 2 is stored in an old underground reservoir (Sump 1) constructed in brick masonry with guiding baffle walls to reduce short-circuiting of flow. This reservoir is at a higher elevation and is connected to two other clear water reservoirs (Sump 2 and Sump 3) at lower level adjacent to the old clear water pump house. Total capacity of the

underground sumps is 8,200 m³. Out of this, 5,400 m³ is available to store treated water from WTP 1 and 2,700 m³ for treated water from WTP 2. Treated water is pumped to the city by two separate transmission mains, 300 mm and 350 mm diameters, both originating from the old clear water pump house.

Treated water from WTP 3 is conveyed by one 400 mm diameter CI line and stored in a separate sump (Sump 4) of capacity 9,100 m³ with adjoining new clear water pump house. Sump 4 is located at a higher elevation and connected by a gravity line of 300 mm diameter (with a sluice valve) to Sump 1 for operational flexibility. All these underground sumps are provided with either access stairs or hatches and air vents. Except Sump 1, none of the sumps are said to have any baffle wall to avoid short circuiting of flow and give the incoming treated water adequate travel time for disinfection following addition of bleaching powder.

The intake arrangement at Barari consists of:

The existing raw water intakes (two jack well-type) are located at the Barari water treatment works on a subsidiary channel of the Ganga River which remains dry for a considerable part of the year. BMC has to periodically dredge the channel to bring water to the intakes. River water quality is a cause of concern due to effluent from the Champa nala which drains much of the city's wastewater just upstream of Barari head works. The existing water supply system in town consists of the Barari Water Treatment Works on the River Ganga, 61 tube wells, and transmission and distribution networks covering different parts of the town. Water is being extracted from two existing intake wells located at the confluence of the Champa Nala and the River Ganga. Champa Nala is also locally known as Jamania Nala. The water treatment plant is on the southern bank of the River Ganga flowing on the northern fringe of the town.

Treatment Units: The treatment plant comprises of the following treatment units: Clariflocculator, Jewel filter, new clear water pump house, Mechanical filter, Peterson filter Old pump house .

There are no flash mixers or similar units, and much of the mixing of chemicals is manually. pre-sedimentation tank provided to reduce the suspended solids count is in use. Due to use of high concentration of liquid chlorine, which is infused as pre-chlorination, the concrete in the raw water channel to clarifloccualtor is heavily corroded. The raw water channels of concrete need to be repaired. The environmental concern is poor disinfection of treated water since chlorinator is through manually. Same time due to direct use of high dose of liquid chlorine during pre chlorination process, clariflocculator is get corroded.

At Barari Clariflocculator is not working due to some mechanical problem.

Moreover, there is no sludge collection system at WTP. Sludge in form of slurry directly discharge into river Ganga at the upstream (sludge from mechanical and Peterson filter) and downstream (sludge from Jewel filter) point of intake well.

C. Regulatory Setting

Environmental regulations, state and national levels are,

Environmental Regulations

Applicability of Acts/Guidelines	Compliance Criteria
The EIA notification, 2006 (and its subsequent amendments in 2009) provides for categorization of projects into category A and B, based on extent of impact	The sub project is not covered in the ambit of the EIA notification as this is not covered either under Category A or Category B of the notification. As a result, the categorization, and the subsequent environmental assessment and clearance requirements, either from the state or the central

Applicability of Acts/Guidelines	Compliance Criteria
	Government is not triggered. Environmental Clearance is not required for the proposed sub project
Wild Life (Protection) Act 1972, Amendment Act, 1993 and 2002 and Wildlife (Protection) Rules, 1995	The wildlife protection act is not applicable for the proposed project work
The Indian Forest Act, 1927; Forest (Conservation) Act, 1980, amended 1988; Forest (Conservation) Rules, 1981 amended 1992 and 2003	No forest land is involved. Not applicable
Ancient Monuments and Archaeological Sites and Remains Rules, 1959, provide guidance for carrying out activities, including conservation, construction and reuse in and around the protected monuments.	There is no requirement of clearance from ASI, Govt. of India or State. Not applicable
Water (Prevention and control of pollution) Act, 1974, as amended Air (prevention and control of pollution) Act, 1981, as amended and Noise Pollution (Regulation and Control) Rules, 2000, as amended.	Consent to Establish (CTE) and Consent to Operate (CTO) from the Bihar State Pollution Control Board for renovation of WTP and for setting up of hot mix plants, wet mix plants, stone crushers and diesel generators. To be obtained prior to construction.

In Summary: As per Govt. of India Regulation no environment clearance is required for renovation of Water Treatment Plant. But as per Bihar State Pollution Control Board (BSPCB), before renovation of water treatment plants Consent for Establishment (CFE) will be required. Also Consent for Operation (CFO) will be necessary prior to operation of the water treatment plants. Earlier there was no Consent to Operate for water treatment plant. Now Consent to Establish (NOC) is received on 09.3.2016. Consent to operate will be applied for running plant. Since the project will be funded under ADB loan and as per state regulation environment compliance is necessary.

D. Audit and Site Investigation Procedure

Audit has been conducted through site visit, collection of information and discussion with DSC site Engineer, Contractor site Engineer. Present problem related to management of plant and environment issues have been noted down.

Before distribution water quality of treated water is generally checked at least 3 times for Barari water treatment plant. Sample water quality testing result is attached as **Appendix 8** of this IEE Report.

E. Findings and Areas of Concern

Areas of concern for both the treatment plant pointed below,

Barari WTP: Some of the issues that need immediate and urgent attention at Jewel filter

- Outlet pipe leakage and tree growth outside the building

- Daily filter backwash and weekly disposal of sludge in the river ganga
- Pre chlorination through manually .chlorinator not in use.
- Chemical storage is not in a proper way. Alum is store in access area. which is used 500 kg per day
- Lime store is not in good condition (75Kg lime per day use)
- Liquid chlorine (180 kg per day use) manually used.
- Clariflocculator cleaning required but presently cleaning once in 6 months by contractor.
- Clariflocculator capacity is 9 mld but used only 5 mld
- After use of chemicals the Chemical bags throw in the plant, not disposal mechanism followed.
- Backwash Water and sludge directly discharge into the river

New Clear Water Pump House-

- 3 pump operator working in three shift
- Noise Monitoring Data will be required
- Open electrical wire near the pump house

Barari WTP: Some of the issues that need immediate and urgent attention at Mechanical filter

- Chemical storage under open shade
- Alum 150 KG per day, Lime 50 Kg per day and liquid chlorine 130 Kg per day (pre) post 45 kg per day used
- Bleaching Powder 50 Kg per day used
- Daily filter backwash and weekly disposal of sludge in the river ganga
- Backwash and sludge directly discharge into the river
- filter media will be required toping
- PUMP House-Operator is not using Safety devices

Barari WTP: Some of the issues that need immediate and urgent attention at Peterson filter

- Backwash overhead tank Leakage urgent required attention
- Alum 22-25 KG per day, Lime 50-75 Kg per day and liquid chlorine pre 90 Kg per day post 60 kg per day used
- Bleaching Powder 50 Kg per day used
- Chemical storage not in a proper way.

Some of the other points that need immediate and urgent attention are:

- Storage capacity:_The present storage capacity is only 4.8 Lakh Gallons.

- Protection of WTP in the form of boundary wall: The existing Treatment plant is not bounded on all sides

In summary, at Barari problems related to, (i) Back wash tank and (ii) Damage of civil structure and (iii) Poor functioning of mechanical and electrical equipment and Sludge disposal in the river

One of the environment concerns Barari treatment plants is improper storage of Chlorine and Alum, both are hazardous chemicals. Normal storage of Alum at Barari are 1.92 MT and 4.5 MT respectively. It is recorded that at a time storage of chlorine in form of Bleaching powder is about 1.5 MT, which is not risky. Lime storage is 1.5 MT which is max 6 days for alum ,lime and bleaching and 4 days for Liquid chlorine.

As per plant in-charge, since electro chlorinator became non-functioning, storage of bleaching powder as disinfectant is temporary. After renovation of plant chlorine salt like hypochlorite will be used in electro- chlorinator.

However water quality testing result as attached in **Appendix 8** of the IEE report indicates that supply water quality conform the prescribed national standard.

It is noted that manpower distribution in both the plants are follows,

At Barari WTP

Temporory person -41 nos

J. Engg:= 1 nos.

Permanent -25 nos.

Clerical – 1

Timekeeper 2 nos

Filter charginman-1 no

Shift charge man 4 nos

pump operator 12 nos

work shop-3 nos

Group D staff -2nos

It is noted that there is no Chemist available in Brari WTP and no Laboratory is there for raw and clear water analysis and chlorine dosing. There is requirement of inclusion of Chemist at WTP for proper analyses and interpretation of results as well as controlling of chemical use. There is no plant safety person within WTP. Presence of health and safety Engineer will be required for controlling of all environment and health related problem including proper sludge management.

F. Corrective Action Plan, Costs and Schedule (CAP)

As per proposed project scope proposal have been finalized for the Barari WTP and Proposals for Improvement of WTP

Rehabilitation of Barari Water Works

Certain rehabilitation works have been listed below as a minimum requirement with a basic

aim to deliver a minimum 9 mld up to the design year 2032 based primarily on operation of WTP 3. However, if the operation of all three plants can be optimized then production can be expected to be 18.3 mld or more. The existing intake is expected to be utilized until 2017 to feed these three existing plants with raw water. After that, raw water will be conveyed from a new intake and raw water rising main.

- a. Introduction of open flash mixer separately in each of the three plants for chemical mixing with all necessary civil works, stirring arrangement, mechanical equipment, staging over ground if required, etc., with all interconnections with existing pipes and channels.
- b. Alum dosing system with necessary arrangements, solution preparation stirrers for all tanks, stand by solution preparation tanks, dosing pumps, metering device, equipment, all piping works inside and outside, etc. Only existing civil structure for solution preparation tank can be used. Standby dosing tanks to be constructed and housed inside the respective filter plants. Three separate systems for three separate plants to be provided. (Each with 1 working and 1 standby).
- c. Lime dosing system with necessary arrangements, solution preparation stirrers for all tanks, stand by solution preparation tanks, dosing pumps, metering device, equipment, all piping works inside and outside, etc. Only existing civil structure for solution preparation tank can be used. Standby dosing tanks to be constructed and housed inside the respective filter plants. Three separate systems for three separate plants to be provided. (Each with 1 working and 1 standby).
- d. Vacuum type chlorine dosing system (for both pre-chlorination and post-chlorination at each of the three plants; with 1 working and 1 standby) with necessary arrangements, chlorine cylinders, chlorinators, chlorinator handling facilities, dosing pumps, metering device, equipment, alarm, all protection devices, all piping works inside and outside (to the dosing points), etc.
- e. Construction of two separate chlorine blocks/houses (one for the Jewel plant and one for the Patterson and mechanical plants) to house the chlorine dosing systems and toners (for one month storage), handling facilities, and all other dosing and metering equipment and pipe works, with proper ventilation, access roads, lighting, and all other facilities.
- f. Actuator operated valve operational arrangement (replacement of entire valve assembly) for all valves related to Jewel plant.
- g. Complete and exhaustive servicing of existing equipment (clariflocculator, gear box, blades, scraper assembly, and drives) of the Jewel plant, to make these good and adequate to run for the stipulated loading and capacity.
- h. Painting of various parts and renovation to existing civil structure (as required).
- i. Leakage control, pipe and valve replacement, reorganization of piping works (as required).
- j. Connection pipelines from service water storage tanks to solution preparation tanks for dissolution of various chemicals with all fittings, valves, etc.
- k. Providing necessary land-scaping and/ or gardening, wherever and as necessary to suit the aesthetic requirement.

Installation, Testing, Trial Run and Commissioning

The Scope of work for rehabilitation of the existing water treatment plants also includes installation, testing, trial run, and commissioning of the equipment and facilities, followed by operation and maintenance of the plants.

Electrical, Mechanical and Instrumentation Works

Mechanical Work

Out of the 5 nos. horizontal centrifugal pumping units at the old clear water pumping station, 2 nos. are proposed to be replaced with units of 250 m³/hr discharge and 70 m head. These new pumping units will be of the same capacity as existing pumping units in the new clear water pumping station; hence the bidder is required to verify the actual details of these pumps. Also the existing piping and fittings in individual suction, individual delivery and

common header inside the pump house are to be replaced with required DF piping, DF sluice valves, DF non return valves, DF bends, DF radial tees, DF dismantling joints etc.

It is proposed that 1 standby unit is to be provided in each WTP complete with all required accessories, electric motor, DF piping, DF valves, flow meter etc., along with acoustic enclosure for all existing and new air blowers.. There is sufficient space in Patterson and Mechanical plants but in the case of Jewel plant a new room is required.

Chemical Mixing

a. There are 2 nos. alum and lime mixing tanks in each of the 3 nos. WTPs. The existing mixing systems are to be replaced by new units, complete with all motors, piping, valves and accessories;

b Alum and lime dosing systems (metering pumps) 1 working + 1standby are to be provided in each WTP, complete with all motors, piping, valves, fittings, accessories; and

c. The existing system is to be made functional by rehabilitating/providing water supply including connecting pipeline from service water storage tanks with all fittings, valves, etc., solution delivery system and other piping and valves etc.

Flash Mixing System: No flash mixing system exists in any of the WTPs and 1 no. new system shall be provided in each WTP, complete in all respects, including required sluice gates and complete electrical system.

Filter Units: Existing rate of flow controller arrangements in filter beds are to be replaced completely

Chlorinating System: Vacuum feed type chlorinators (1 working + 1standby) of required capacity for pre-chlorination as well for post chlorination, shall be provided in each WTP along with all accessories, motive water pumps, motors, piping and valves, including connecting pipeline from service water storage tanks with all fittings, valves, etc., electrically operated 3 tons mono rail crane complete with all required accessories, chlorine cylinder weighing system, and safety equipment. The system shall be complete with electrical system and ventilation system for chlorinator's room and chlorine cylinder room for each WTP.

Electrical Works:

Electrical Sub-station: Presently, one 11 kV feeder is available in the WTP campus which is being stepped down to 0.433 kV by using 6 nos. of 11kV/0.433 kV transformers of different capacities for different pumping stations. This existing system is to be replaced by installing a dedicated 33 kV feeder and one 33 kV/0.433 kV sub-station.

Instrumentation Works:

pumping station Flow Measuring System, Water level measuring system through Ultrasonic, digital type water level measuring systems with indicator etc. for measuring water levels in intake wells and clear water reservoirs

Chlorinators

a. Chlorine gas leakage detection systems; and

b. Online residual chlorine monitoring system in each WTP.

Table below indicates corrective action, capital and O & M cost (existing & proposed)

Present problem	Corrective action	Capital cost	Present annual Operation and Maintenance cost	Proposed annual Operation and Maintenance cost
Barari WTP- (i) Clarifloulator not working (ii) Alum mixing chamber (iii) intake well machinery old (iv) All channels + supporting RCC (v) Plaster fall structure (vi) Peterson filter unit Backwash overhead tank Leakage (vii) Chemical storage not in a proper way Back wash tank	<ul style="list-style-type: none"> • WTP refurbishment • Intake arrangement at new intake • Water treatment plant rehabilitation • Clear water pump house – mechanical and electrical job • Sludge management • Separate Laboratory • Rehabilitation - mechanical and electrical for intake • Clear water pump augmentation and clear water reservoir • Sludge management 	1253.13 Lakh	35 lakh/month	10.00 lakh/month

Implementation arrangement for the work as mentioned above, as follows,

Sr. No.	Phase of Work	Expansion and rehabilitation of WTP
1	Issuance of Bid	August 2013
2	Submission of Bid	October 2013
3	Completion of Bid Evaluation	April 2014
4	Award of Contract	July 2014
5	Completion of Works	September 2016

Existing scenario at Barari Water Works

 <p>Lime-Storage-Jewel filter</p>	 <p>Lime mixing unit -old</p>	 <p>Clear water control 1 -Roof top damage</p>
 <p>Alum Storage in the access</p>	 <p>Clear water control 2-Roof top damage</p>	 <p>Liquid chlorine & Plastics</p>
 <p>Bleaching Store</p>	 <p>Chloriflulator</p>	 <p>Dosing arrangement</p>
 <p>Liquid chlorine</p>	 <p>Plastics Bags disposal</p>	 <p>New clear water Pump house</p>



Open electric wire near outside of pump house



Mechanical Filter



Chemical Store at Mechanical filter



Chlorine storage at Mechanical filter



Sludge at mechanical filter



Pump house Mechanical filter



Safety device



Peterson filter-Storage of chemical



Lime store



Leakage of backwash overhead tank



Chemical Store-Alum

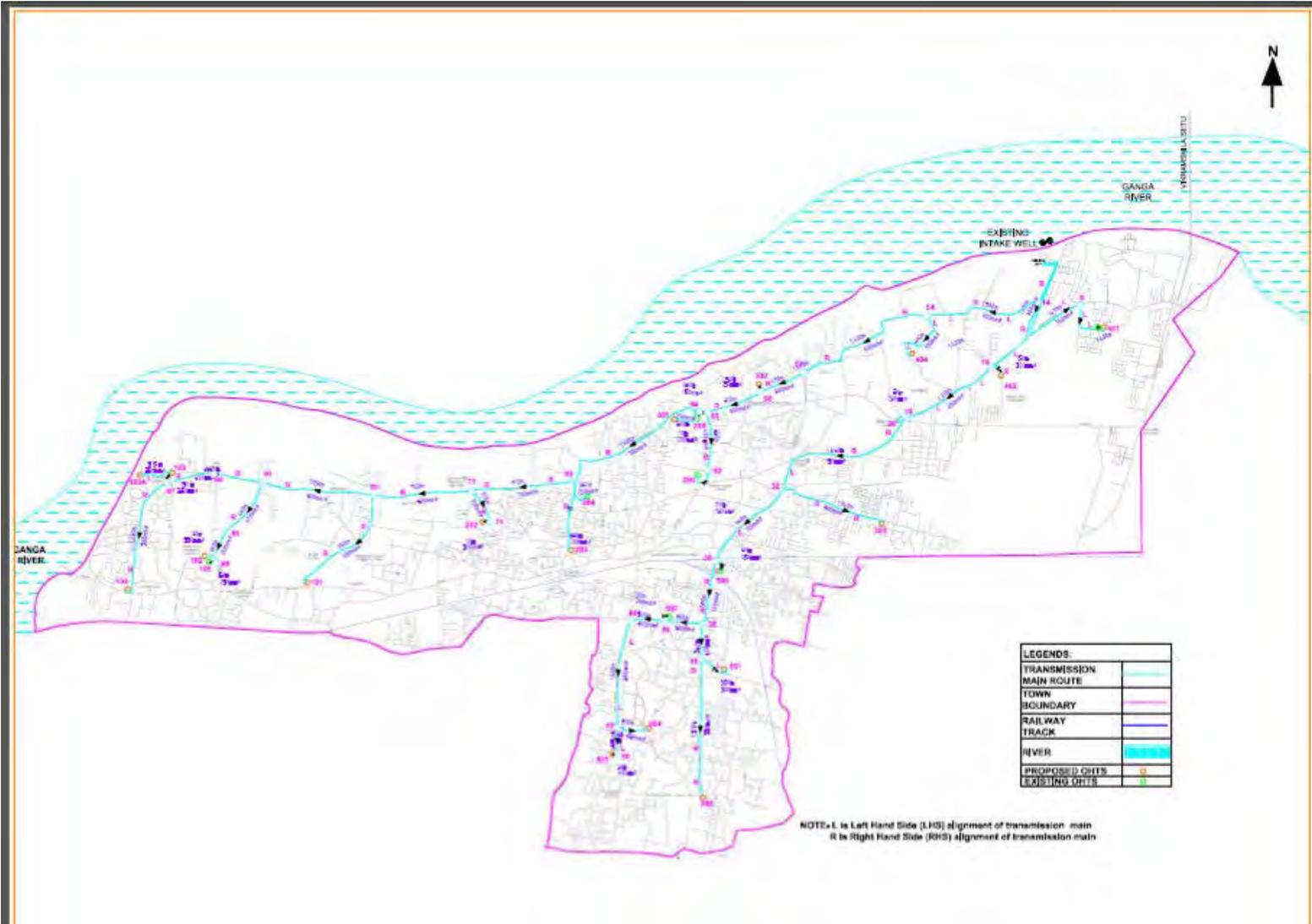


Sludge disposal in the river

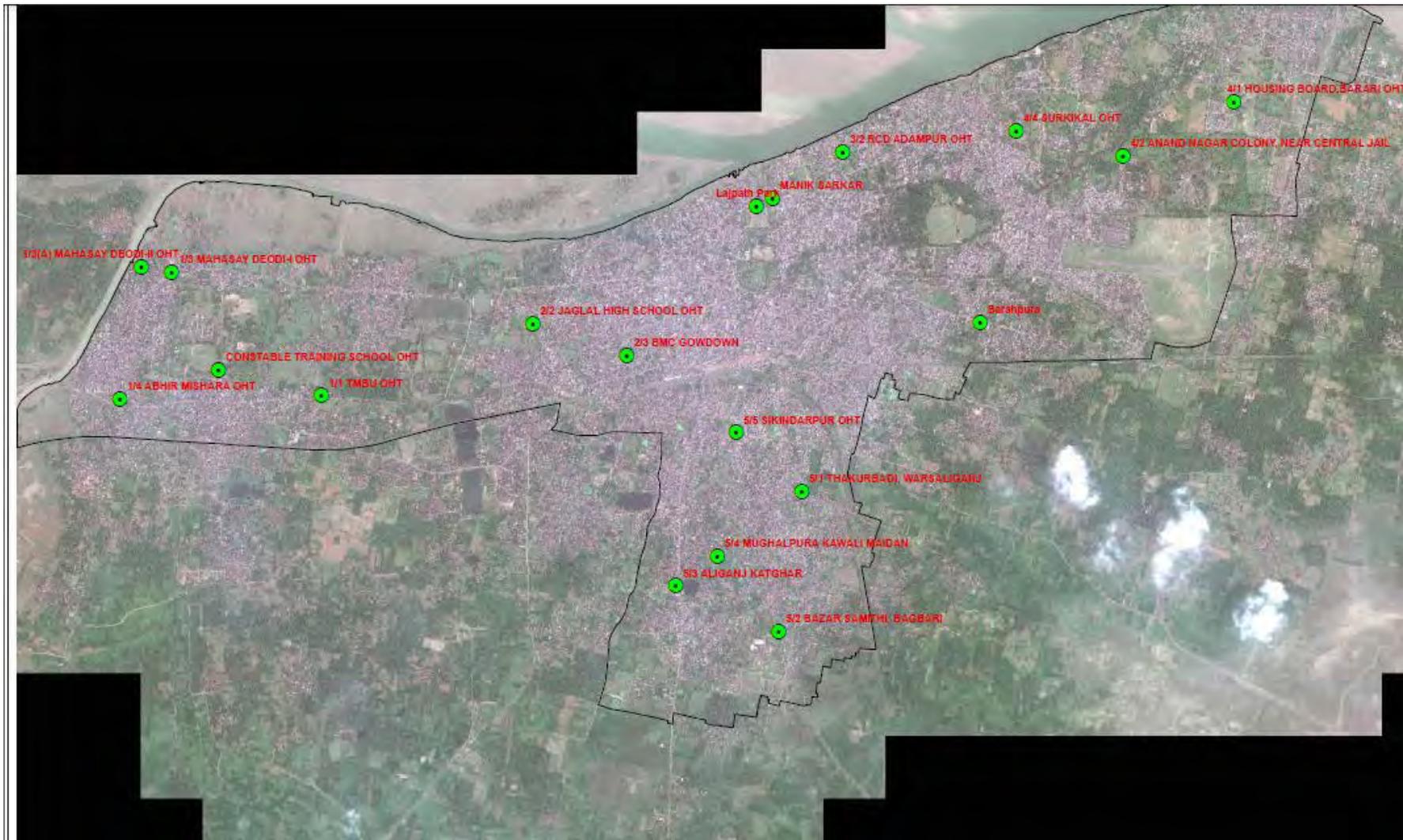
Appendix 4: Location and maps of proposed project components



Map showing location of project area



Location of proposed water storage reservoirs at Bhagalpur – Google map

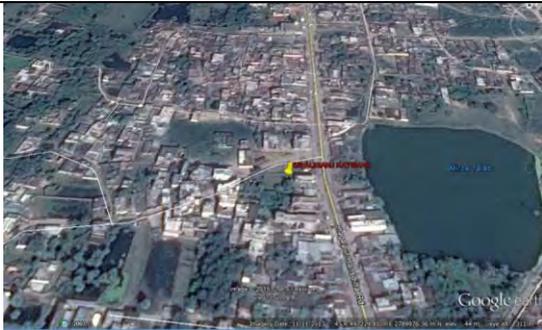


Appendix 5: Photo illustration – project locations

Proposed OHT location shown in Google map

S.No.	Name of Site	Latitude/ Longitude	Ownership	Photograph	Google map
1	1/3(A) MAHASAY DEODI-II OHT	493121.744454294 /2792540.1777343	Private Land		
2	1/3(A) MAHASAY DEODI-II OHT	492871.334339422 /2792584.8076379 1	Private Land		

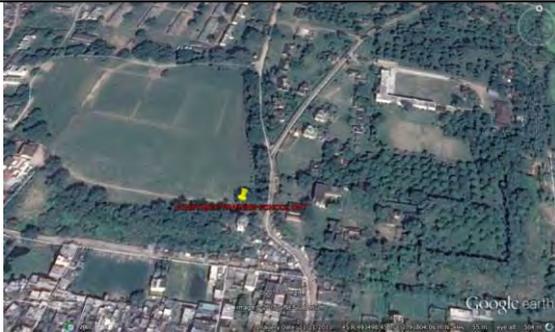
S.N o.	Name of Site	Latitude/ Longitude	Ownership	Photograph	Google map
3	1/4 ABHIR MISHARA OHT	492693.934397285 /2791502.29902659	Govt Land		
4	TMBU	494358.656022771 /2791529.40355521	Govt Land		
5	2/2 JAGLAL HIGH SCHOOL OHT	496100.345845243 /2792122.24770859	Govt Land		

S.No.	Name of Site	Latitude/ Longitude	Ownership	Photograph	Google map
6	2/3 BMC GOWDOWN	496874.222574311 /2791862.0377782 4	Govt Land		
7	5/5 SIKINDAR PUR OHT	497778.837153908 /2791225.2565714 7	Govt Land		
8	5/3 ALIGANJ KATGHAR	497281.142966507 /2789969.5074414 5	Govt Land		

S.N o.	Name of Site	Latitude/ Longitude	Ownership	Photograph	Google map
9	5/2 BAZAR SAMITHI, BAGBARI	498130.08168526/ 2789594.37124967	Govt Land		
10	5/4 MUGHALP URA KAWALI MAIDAN	497624.930064341 /2790210.2290870 4	Trustee Land		
11	5/1 THAKURB ADI, WARSALIG ANJ	498319.54903196/ 2790745.85269458	Trustee Land		

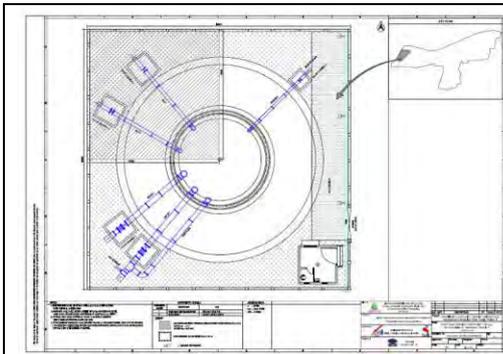
S.No.	Name of Site	Latitude/ Longitude	Ownership	Photograph	Google map
12	4/2 ANAND NAGAR COLONY, NEAR CENTRAL JAIL	500968.557609354 /2793494.9262897	Govt Land		
13	4/1 HOUSING BOARD, BARRARI OHT	501884.279211328 /2793942.4371802 9	Govt Land		
14	4/4 SURKIKAL OHT	500086.036211121 /2793700.4914023	Govt Land		

S.No.	Name of Site	Latitude/ Longitude	Ownership	Photograph	Google map
15	3/2 RCD ADAMPUR OHT	498656.275094695 /2793530.3139135 5	Govt Land		
16	Lajpath Park	497944.45041709/ 2793080.78583906	Govt Land		
17	Barahpura	499789.803/27921 26.6	Govt Land		

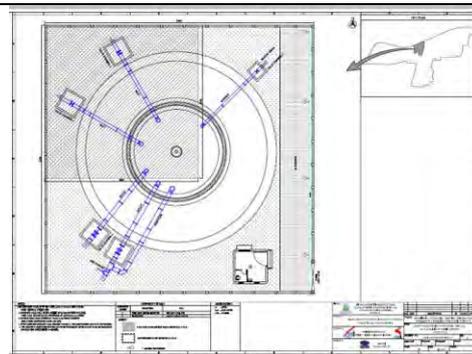
S.No.	Name of Site	Latitude/ Longitude	Ownership	Photograph	Google map
18	CONSTABLE TRAINING SCHOOL OHT	493509.708043757 /2791742.7568732 1	Govt Land		
19	MANIK SARKAR	498077.676848278 /2793150.1641315 3	Govt Land		
Customer Service Centre					

S.No.	Name of Site	Latitude/ Longitude	Ownership	Photograph	Google map
1	New Customer service centre at Barari	25°15'57.02"N /87° 0'49.41"E	BMC Land		 <p>Customer service centre</p>

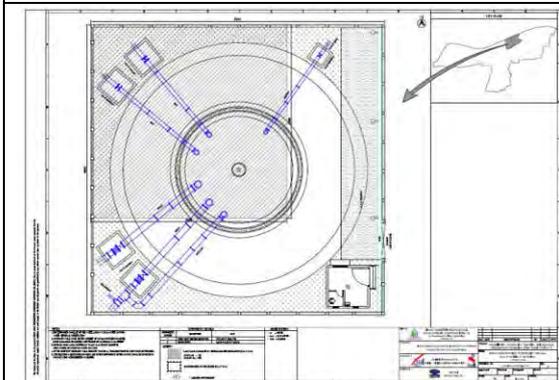
Site Management Plan for water storage reservoir locations



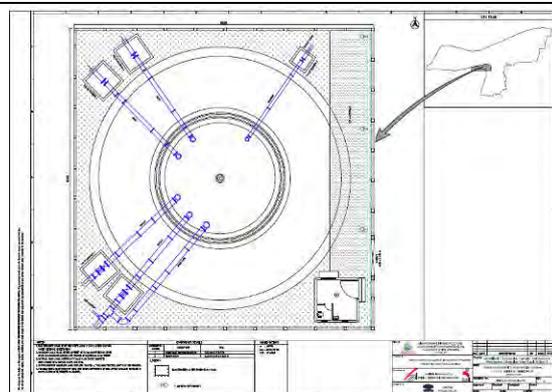
Mahashshay deodi 2



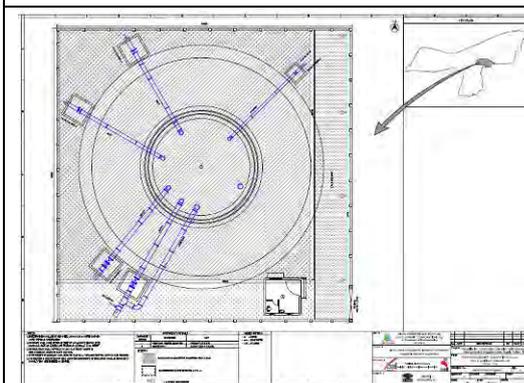
Manik Sarkar



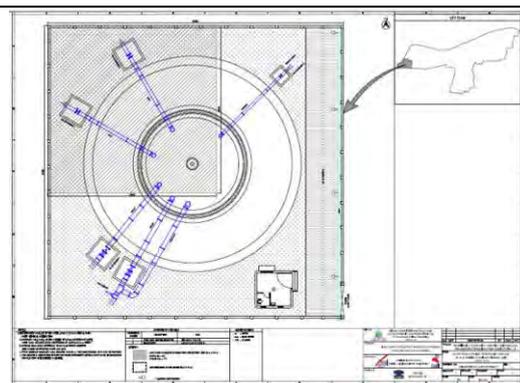
Surkikal



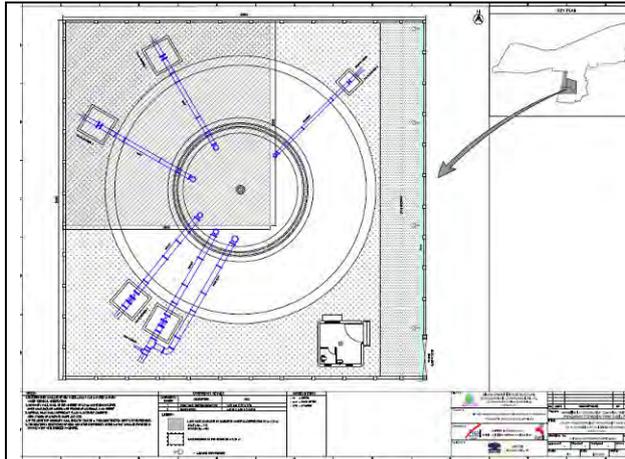
Sikindarpur



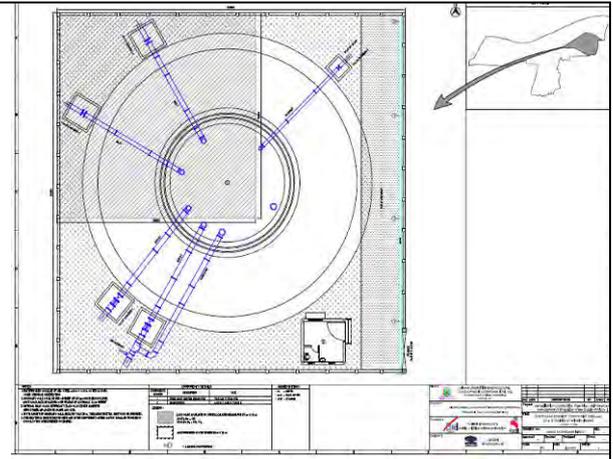
Barahpura



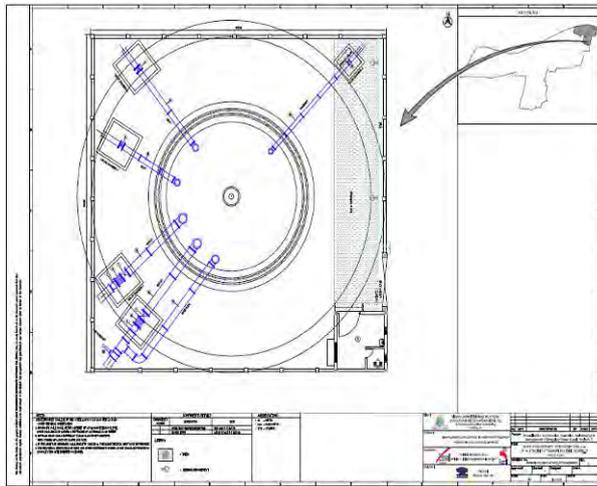
Abihar Mishra Lane



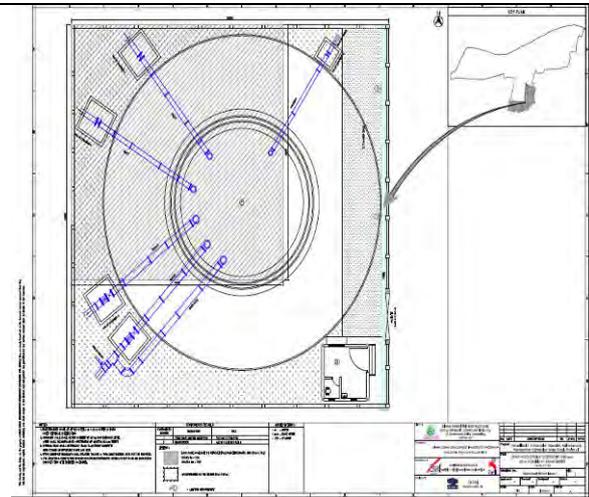
Aliganj Katghar



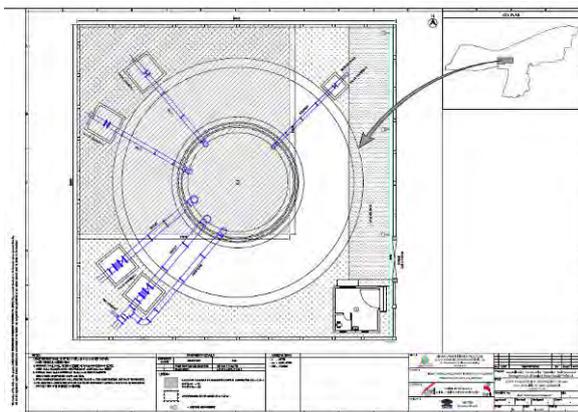
Anand Nagar



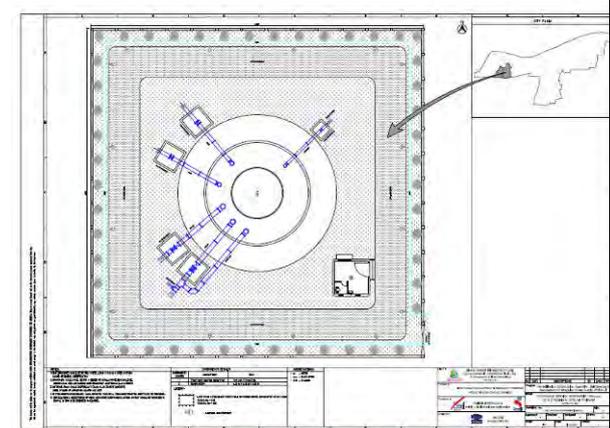
Housing Board



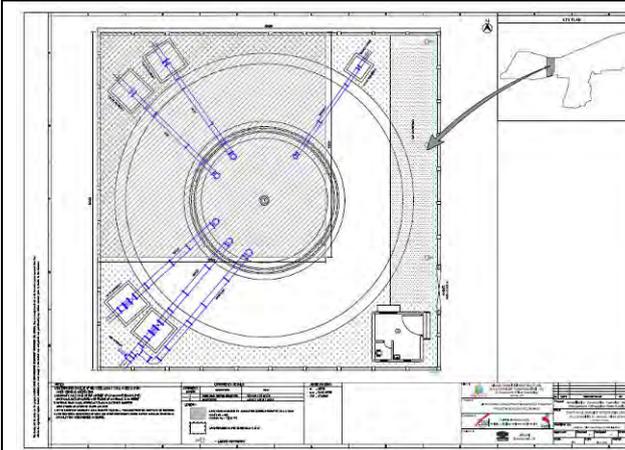
Bazar Samiti



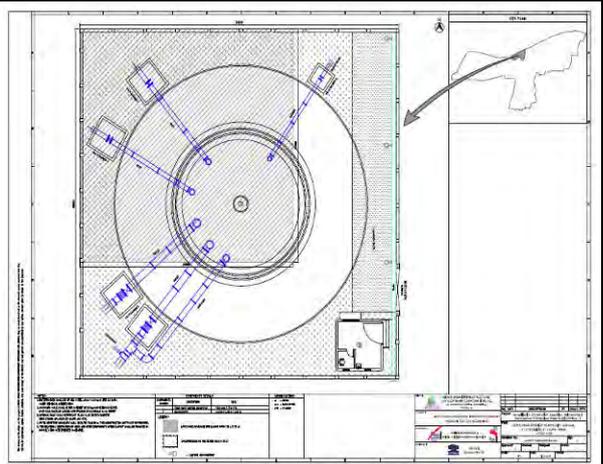
BMC Godown



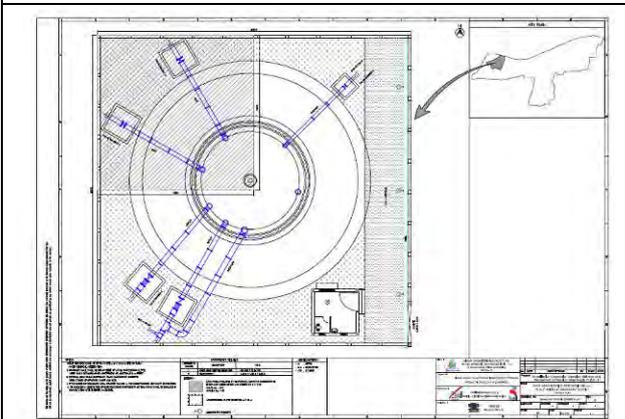
CTS



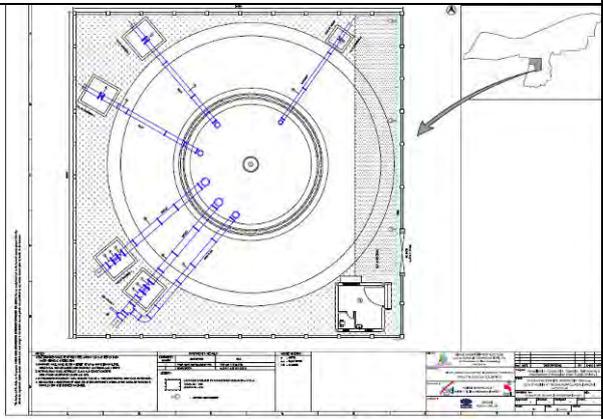
Jaglal High school



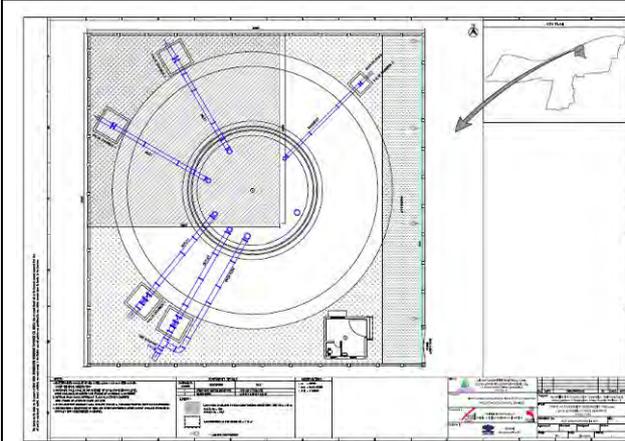
Lajpat Park



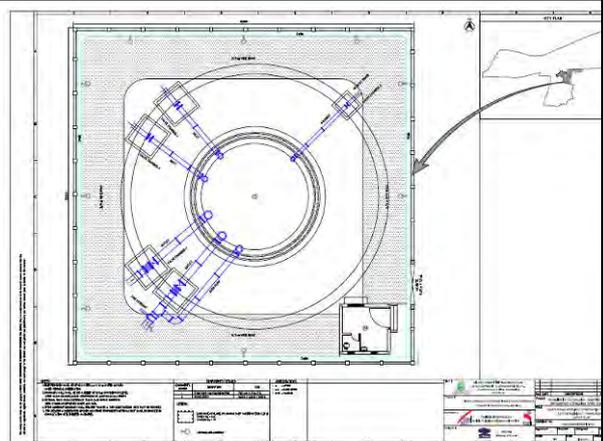
Mahashshay deodi 1



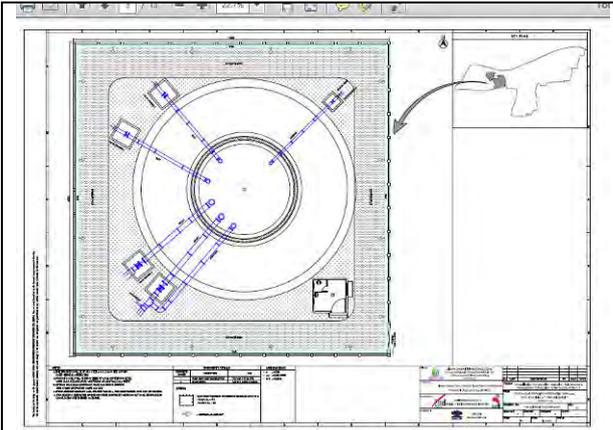
Mugulpura Quali maidan



RCD

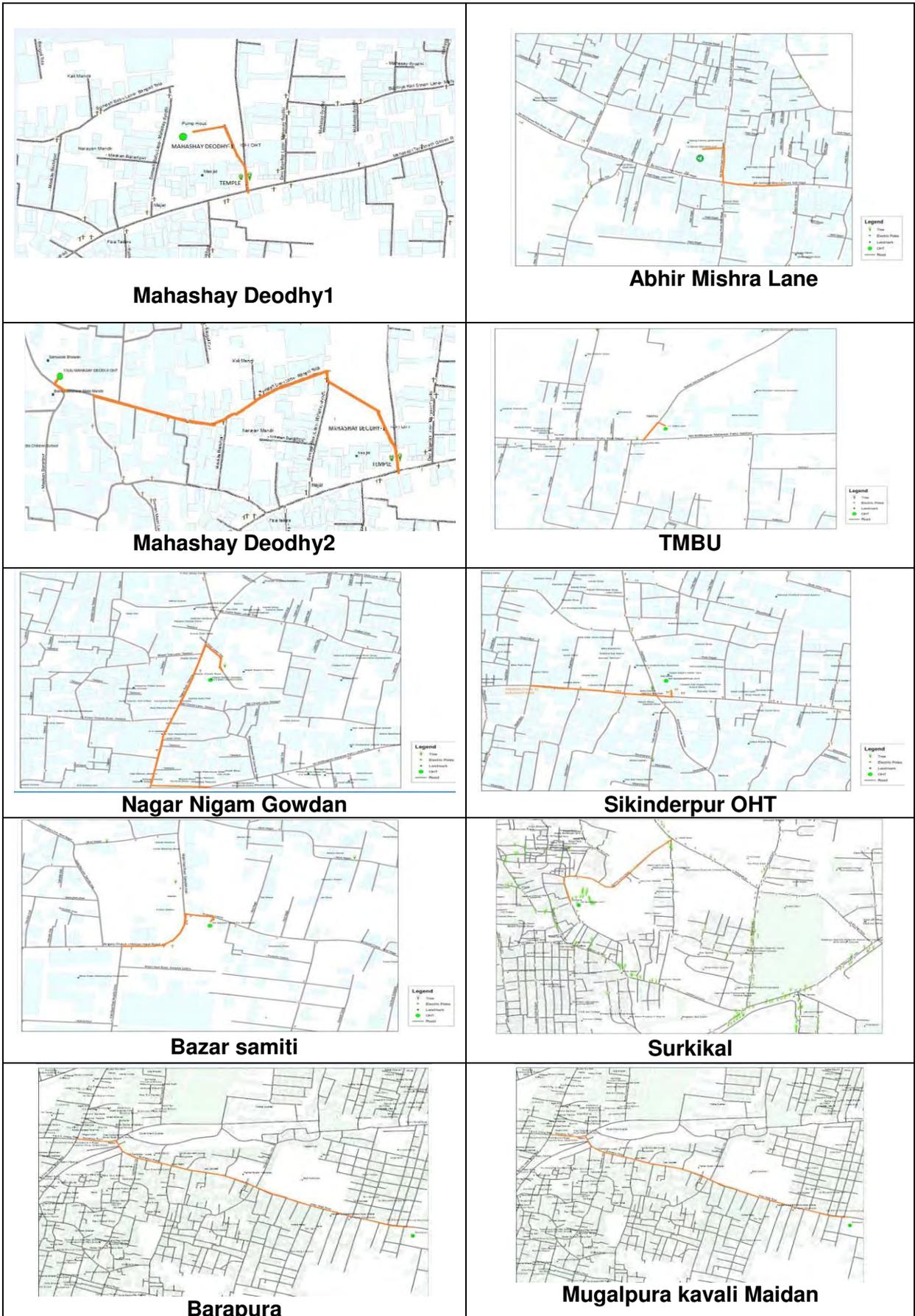


Thakurbari



TNB University

Approach road At water storage reservoir locations





Aliganj



Constable training School



Maniksarkar/Lajpat park



Housing Board



Anand Nagar

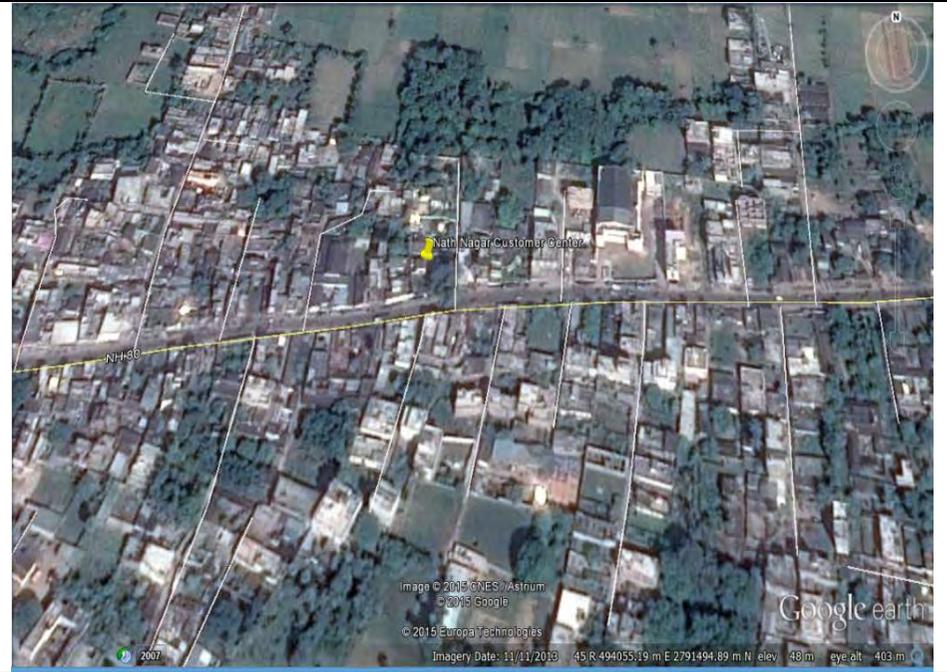


Thakurbari

Proposed Customer Service Centre at Barari –layout plan



Existing Customer service centre at BMC



Existing Nath Nagar Customer service centre

Appendix 8

Surface & Ground water quality of Bhagalpur

Sr. No.	Parameters	Unit	Limits		Location								
			Acceptable	Cause for rejection	Intake well -1	Intake well -2	Ganga River	WTP					
								After Primary Settlement		After Secondary Settlement	Filtered Water		
											Patterson	Mechanical	Jewel
1	Colour	Units on Platinum cobaltsscale	5	15	20	20	1	20	20	15	-	-	-
2	Odour		Unobjectionable	Objectionable	A	A	A	A	A	A	A	A	A
3	Taste		Unobjectionable	Objectionable	A	A	A	A	A	A	A	A	A
4	pH		7.0-8.5	< 6.5 or > 9.2	7.6	7.0	7.6	7.0	7.1	7.3	7.3	7.4	7.3
5	Total Hardness (as Caco3)	mg/L	200	600	112	94	176	88	102	94	104	102	100
6	Dissolved Solids	mg/L	500	2000	105	101	261	102	102	102	11	117	111
7	Total Solids	mg/L	-	-	10.4	9.8	-	9.6	7.2	9.6	7.6	7.8	7.4
8	Dissolved Oxygen	mg/L	4	6	6	6.4	-	6.8	7.6	6.8	6.4	6.8	6.4
9	Nitrates (as No3)	mg/L	45	45	0.043	0.043	5	0.043	0.044	0.042	0.041	0.041	
10	Calcium (as Ca)	mg/L	75	200	24.6	24.5	40	23.6	23.7	22.7	20.5	22.8	
11	Fluorides (as F)	mg/L	1	1.5	0.33	0.27	0.1	0.310	0.3	0.23	0.11	0.09	
12	Arsenic (as As)	mg/L	0.01	0.05	0	0.005	0	0	0	0	0	0	
13	Iron (as Fe)	mg/L	0.1	1.0	0.0169	0.0172	0.04	0.0195	0.0196	0.0274	0.0084	0.0076	

Source: Service Improvement Plan for Bhagalpur, 2015 (Date of sampling: 20.09.2014), A: Acceptable

Ground Water Quality in and around Bhagalpur

Sr. No.	Location	Colour	Odour	Taste	pH	Turbidity	Total Hardness	Dissolved Solids	Total Solids	Nitrate	Calcium	Fluoride	Arsenic	Iron	E.Coliform	Total Coliform
	Units	Units on Platinum cobalt scale				NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100ml	MPN/ 100 ml
1	Sacchidanad Nagar	10	ok	ok	7	11.2	242	327	9.8	0.04	32.9	0.31	0	0.01	Nil	4700
2	Mundi chak	10	ok	ok	7	10.6	208	386	11.3	0.04	21.2	1.25	0	0.01	Nil	Nil
3	Mahadeo Talab	10	ok	ok	7.5	10.3	106	280	6.4	0.04	17.3	1.77	0	0.01	Nil	330
4	Rekabganj Urdu Bazar	10	ok	ok	6.9	9.6	226	527	13.6	0.04	15.3	1.75	0	0.01	Nil	7000
5	Kotwali PS	5	ok	ok	7.2	9.2	204	378	8.2	0.04	13.2	2.13	0	0.01	Nil	1400
6	IshakChak New	5	ok	ok	7.3	9.7	216	336	5.5	0.04	12.3	0.39	0	0.01	Nil	8
7	Sahebganj	5	ok	ok	7.2	8.4	246	443	5.5	0.04	15.3	0.39	0	0.01	Nil	1700
8	Champanagar	5	ok	ok	7.5	8.1	200	336	6.5	0.05	17.8	1.24	0	0.01	Nil	Nil
9	Nathnagar-1	5	ok	ok	7.3	5.2	196	378	5.3	0.04	16.9	0.78	0	0.01	Nil	Nil
10	Kabirpur	5	ok	ok	7.1	6.1	390	988	2.7	0.04	23.9	0.63	0	0.01	Nil	Nil
11	TNB College	1	ok	ok	7.4	0.1	436	672	-	15	62	0.4	0	0.18	Nil	Nil
12	Manikpur	1	ok	ok	7.35	0.1	424	668	-	14	60	0.4	0	0.17	Nil	Nil
13	Maheshpur	1	ok	ok	7.31	0.1	416	580	-	13	58	0.4	0	0.14	Nil	Nil
14	Housing Board	1	ok	ok	7.21	0.1	312	496	-	12	56	0.3	0	0.14	Nil	Nil
15	Sarai	1	ok	ok	7.22	0.1	408	580	-	12	56	0.4	0	0.17	Nil	Nil
16	CTS New	1	ok	ok	7.24	0.1	424	600	-	14	64	0.4	0	0.15	Nil	Nil
17	MahashayDeodi	1	ok	ok	7.24	0.1	448	686	-	16	66	0.4	0	0.19	Nil	Nil
18	Discon Road	1	ok	ok	7.34	0.1	432	668	-	15	64	0.4	0	0.12	Nil	Nil
19	Lajpath Park	1	ok	ok	7.38	0.1	408	516	-	14	58	0.4	0	0.12	Nil	Nil
20	DevibabuDhar arnshala	1	ok	ok	7.26	0.1	464	790	-	18	68	0.5	0	0.24	Nil	Nil
21	Boodhanath	1	ok	ok	7.34	0.1	272	468	-	13	30	0.2	0	0.09	Nil	Nil
22	Maulana Chowk	1	ok	ok	7.25	0.1	428	668	-	15	64	0.4	0	0.22	Nil	Nil
23	H'badThakurbadi	1	ok	ok	7.51	0.1	448	692	-	15	64	0.4	0	0.21	Nil	Nil
24	Sikandarpur	1	ok	ok	7.39	0.1	456	876	-	17	65	0.4	0	0.24	Nil	Nil
	Standard	15	Unobjectionable	Unobjectionable	< 6.5 or > 9.2	10	600	2000	-	45	200	1.5	0.05	.1	Not detectable in any 100ml sample	- Not detectable in any 100ml sample

Source: Service Improvement Plan for Bhagalpur, 2015 (Date of sampling: 26.12.2015)

Spoil Management Plan (SMP)

Sites should be located and prepared before the need for disposal areas arise. The spoil should be disposed of in a way that will prevent erosion. Disposal sites should be maintained periodically, depending on the season and type of material. Temporary disposal sites, or stockpiles, are useful when materials can be reused for other maintenance or construction activities. Stockpiles also require periodic maintenance to ensure no discharge into the stream system.

The primary Goals for this are:

- Maintain public safety and open roads for the traveling public.
- Prevent or minimize delivery of sediment and chemicals to streams.
- Prevent or minimize the interruption of normal runoff into streams.
- Protect aquatic and riparian habitat.

Spoil Disposal:

Spoil disposal includes site selection, site permitting, maintaining the site to control erosion, and the temporary or final closure of the disposal site. This is having three parameters like Site

Selection, Disposal Site Maintenance and Disposal Site Closure

This action involves disposing excess materials from excavations, others at designated long-term disposal sites. Once the materials are properly disposed of, the site should be maintained on a regular basis.

PIRH Best Spoil Management Practices:

- Avoid placing excess spoils into stream courses and adjacent riparian zones where it could potentially result in sediment delivery to streams.
- Drain spoil piles to prevent the concentration of flow and to prevent rill and gully erosion.
- Spread material not to be re-used in compacted layers and generally conforming to the local topography.
- Separate organic material (e.g., roots, stumps) from the dirt fill and store separately. Place this material in long-term, upland storage sites, as it cannot be used for fill. Leave all organic material that can safely remain in adjacent riparian zones. Make stored woody debris available to others as large wood for placement in streams for habitat improvement.
- Store “clean” material in a short-term disposal site (stockpile) if it will likely be re-used for fill or shoulder widening projects. Verify if material can be used for shoulder widening.
- Where feasible, recycle asphalt material in embankments and shoulder backing. Place these materials where they will not enter the stream system. Asphalt that is 5 years old is considered “inert” (that is, all oils washed off).

- Encourage stockpiling and reusing concrete materials when possible.

Quantification of Spoil materials – 1st phase,

Description	For 50 Km Pipe Line	For 3 Nos. OHSR	Total
Total Excavation	22000 Cum	7200 Cum	29200 Cum.
Refilling of Trenches (70%)	15400 Cum.	5040 Cum	20440 Cum.
Disposal of Balance Materials	6600 Cum.	2160 Cum	8760 Cum.

Transportation of Spoil Materials: Transportation will be done by dumper fully covered with tarpaulin.

Disposal Site: Disposal site is near Barari WTP as suggested and recommended by BMC / Client. The following is the detail of disposal site:

Sr. No.	Name of Site	Latitude/Longitude	Ownership	Photographs	Google Map
1.	Barari near WTP	25.26407310111203/ 87.01335673825383	Govt. Land		

Traffic Management Plan (TMP)

All construction traffic travelling to either of the proposed way or directly to the pipeline working area via the routes described. These preferred routes have been determined to limit the impact of the construction traffic on the surrounding area and in particular to ensure that there is no detrimental impact on the town of Bhagalpur. Local residents in Bhagalpur Town will be kept informed of construction programming and progress. Regular contact with local residents will be maintained during the mobilisation, construction and demobilisation periods.

Where possible construction traffic will be controlled to ensure that deliveries to the way and to the pipeline working area will be spread across the day to minimise the impact of traffic to local residents, in particular during the highway peak hours. Construction site workers will be carried from the chosen compound to the pipeline working area by minibus to reduce the number of vehicle trips and these trips will be undertaken outside of the highway peak with workers taken from the compound to the pipeline working area. There may be a small number of trips made to the pipeline working area and associated for the purpose of inspection and maintenance. Where possible these visitors will be transported from the compound by minibus / cars / jeeps, but where this is not possible there may be an occasion where these trips are made directly to the pipeline working area by private motor vehicle.

Parking management plan will be developed to include the following features:

- Parking restrictions on all areas outside of the specified designated parking zones.
- Preferential parking for vehicles carrying more than one occupant; and
- The establishment of a car share database within the parking permit system;

Local Signage Strategy

Temporary signs will be erected during the mobilisation, construction and demobilisation periods to direct construction traffic along the assigned routes and staff and the construction traffic drivers will be thoroughly briefed on the route that they are required to use to avoid inappropriate use of local roads by construction traffic.

On both main road approaches to the chosen signs to the Traffic Signs Regulations and General Directions (Side Road Ahead) and (Works Access) will be erected. Where appropriate these signs will also be erected on local roads adjacent to pipeline working area where construction traffic is required to enter to drop off materials during the construction phase of the pipeline.

In 1st Phase (i.e. 50 Km length) the mostly road is having 4.5 mtr. Width with both side earthen shoulder mainly are Factory Road, Baniya Toli Lane, Barari Road, Feri Road, Vikarmshila Setu Road, Burning Ghat Road, Rahmat Hussain lane, Surya Mohan Path, Pani Kal Road, Janta Flat Road, MIG Road etc.

The Pipe line will be executed in earthen shoulder on bank of the road i.e. RCC Road / Bituminous road. The PIRH will follow the traffic rule and execution will be started after getting

the permission from authority. The following segments will be follow during execution of pipe line.

MAINTENANCE OF DIVERSIONS AND TRAFFIC CONTROL DEVICES

Signs, lights, barriers and other traffic control devices, as well as the riding surface of diversion shall be maintained in a satisfactory condition till such time they are required as directed by the PIRH. The temporary travelled way shall be kept free of dust by frequent applications of water, if necessary. PIRH will follow the typical traffic diversion and typical signage as below during execution of work.

- Barricading
- Men at work
- Keep Left
- Go slow
- Flag men
- Narrow signs
- Lantern(Amber Blinker)
- Traffic control Lights
- Cones

Safety jackets and helmets should be provided to all the workers/ Engineers working on the road. Fixed mobile solid barricades must be placed between the workmen and traffic or pedestrian and traffic.

Examples of some good practice in traffic control during construction are shown in the figures below.

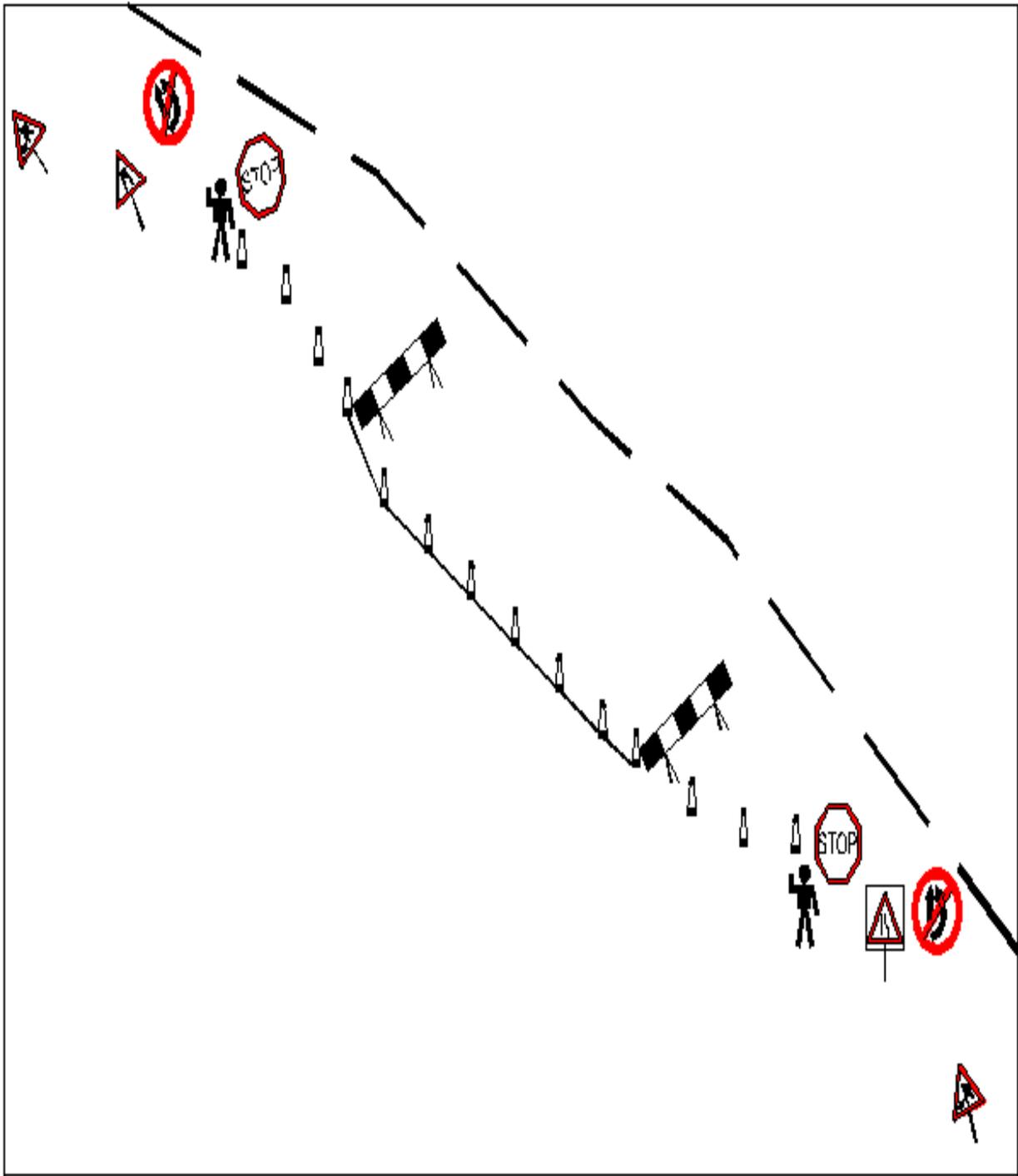


Figure: Work on shoulder or parking lane & Shoulder or parking lane closed on divided road

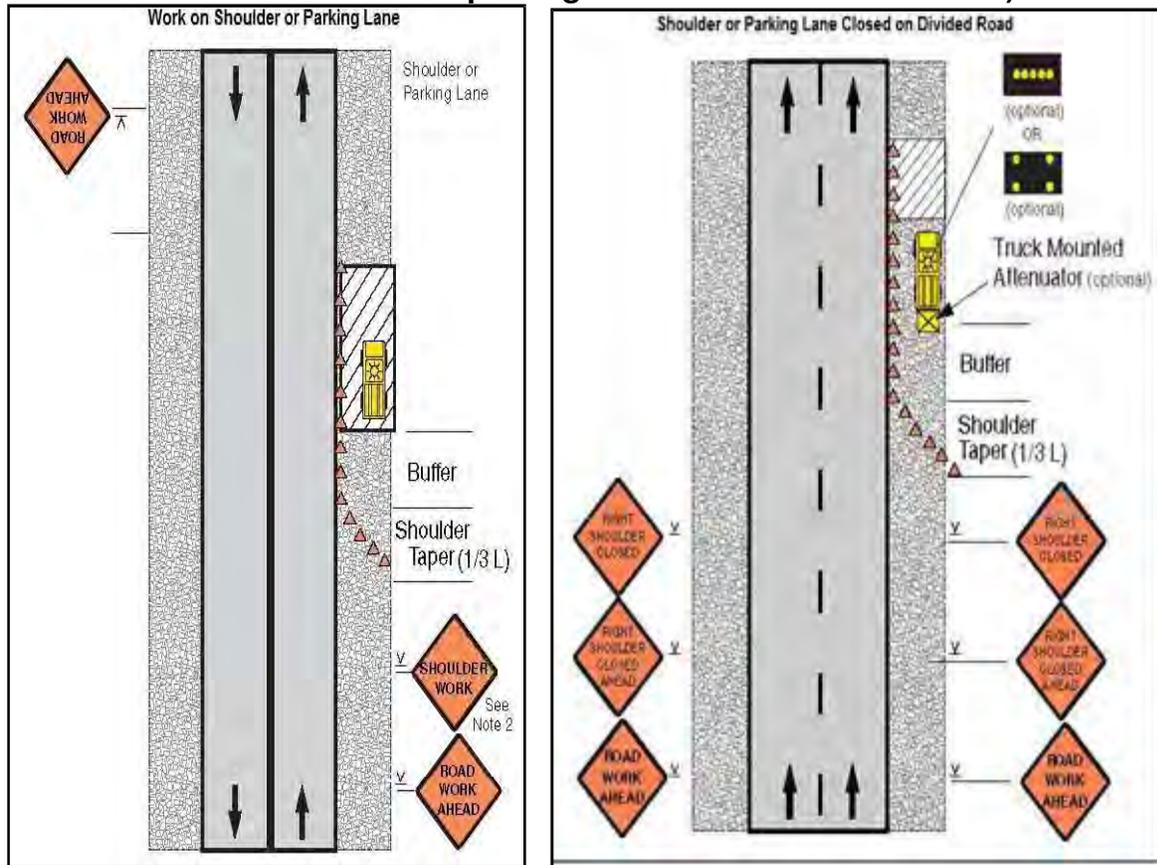


Figure: Work in Travel lane & Lane closure on road with low volume

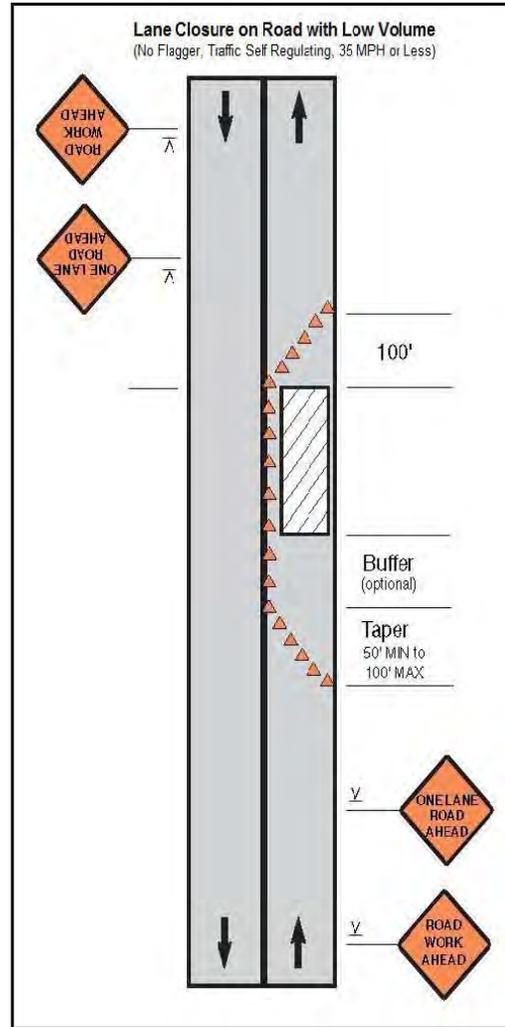
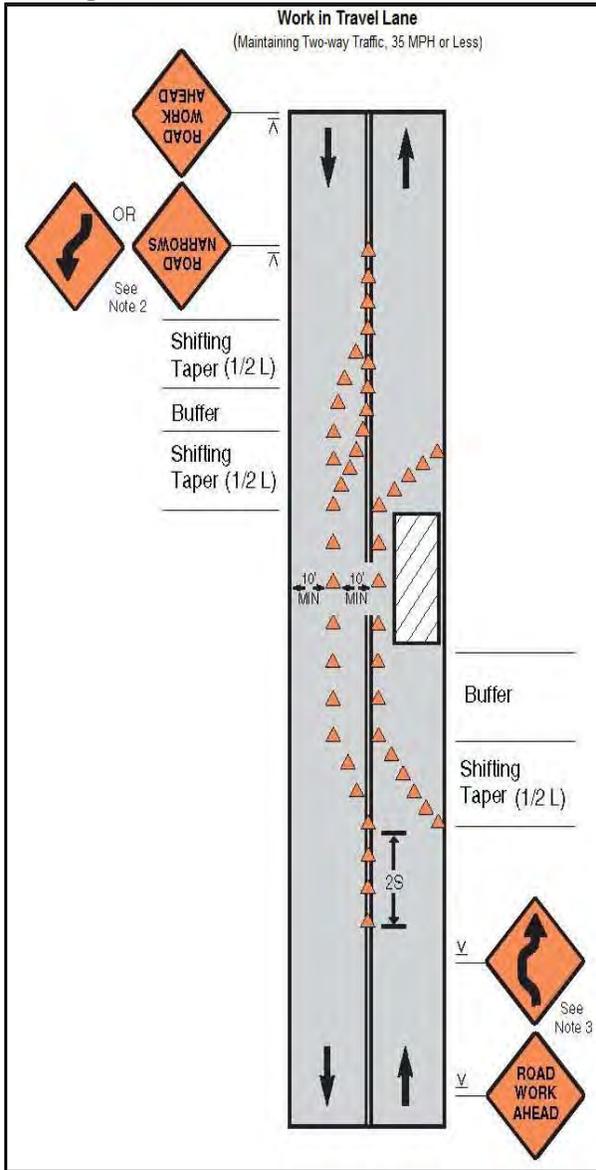


Figure: Lane closure on a two-line road with low volume (with yield sign) & Lane closure on a two-line road with low volume (one flagger operation)

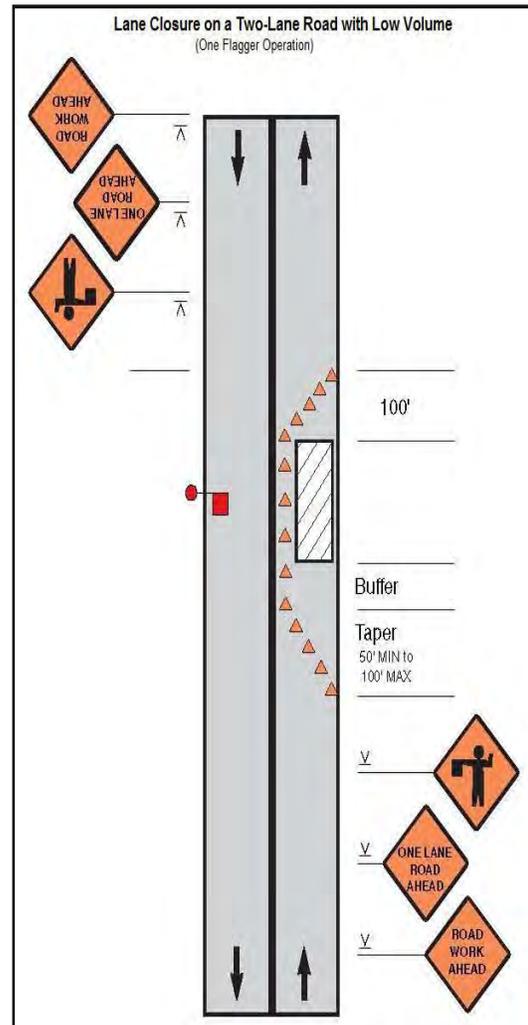
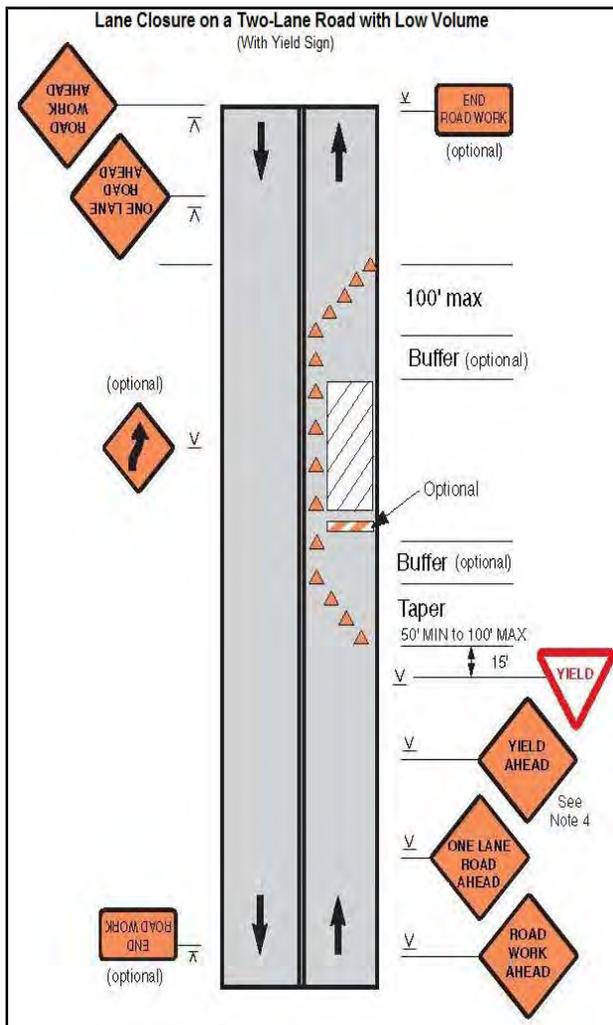


Figure: Lane closure on a two lane road (two flagger operation) & Lane closure on a four lane undivided Road

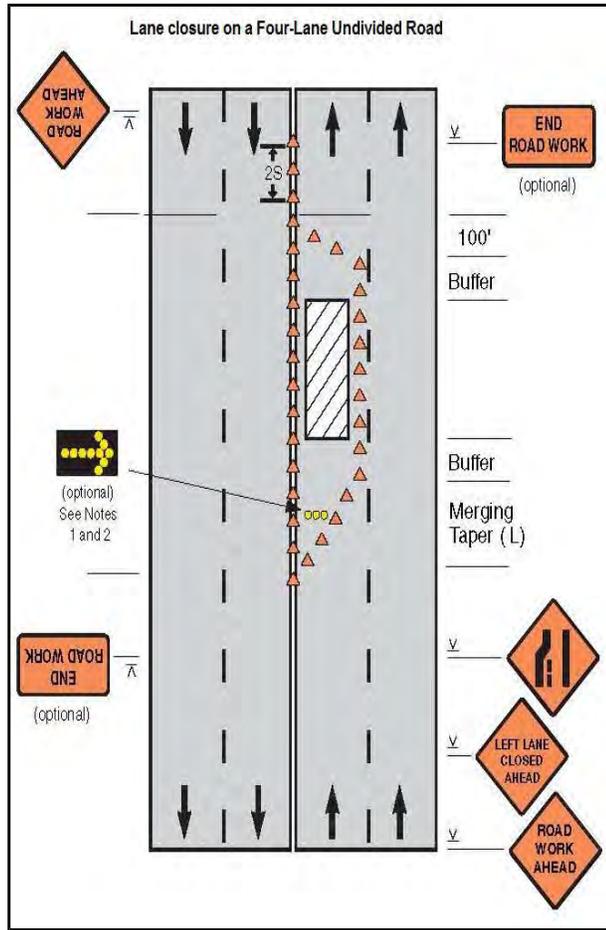
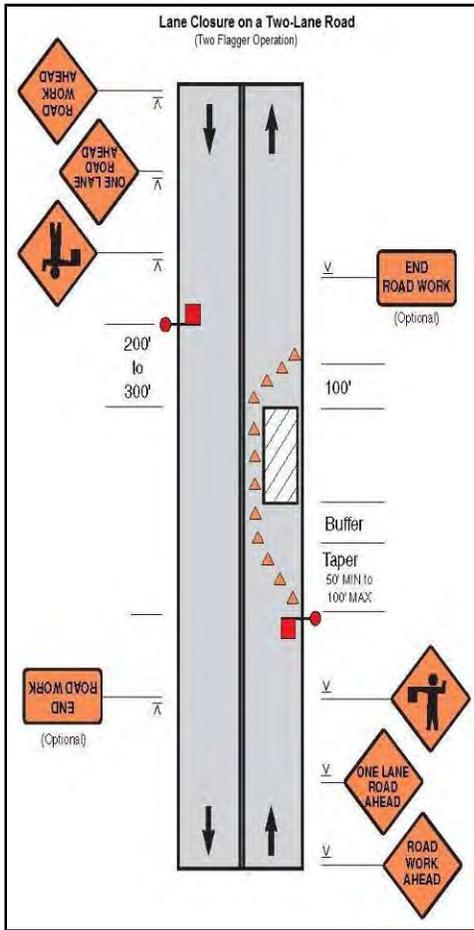


Figure: Lane closure on divided roadway & Half road closure on multi-lane roadway

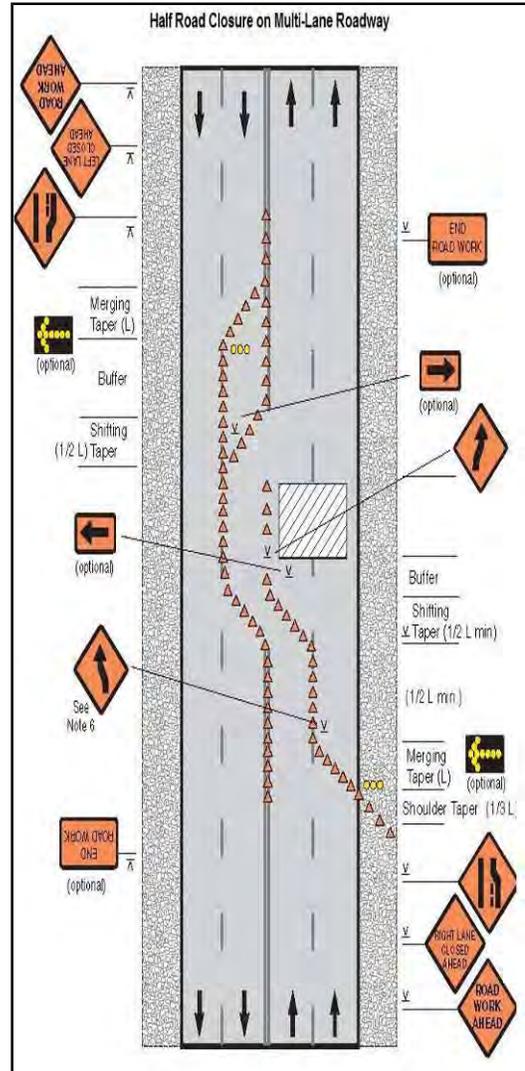
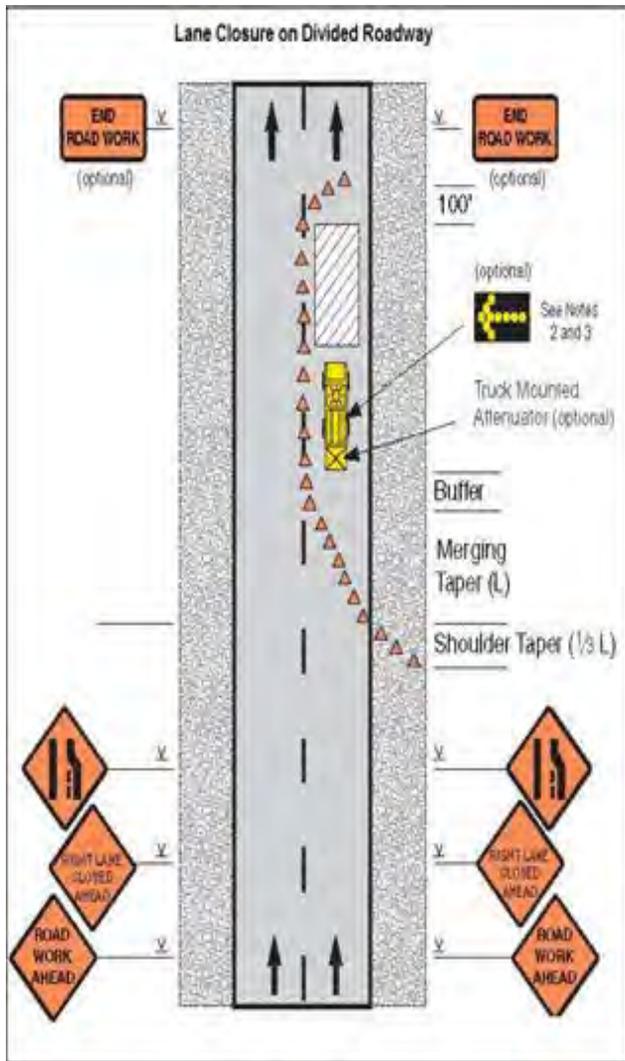
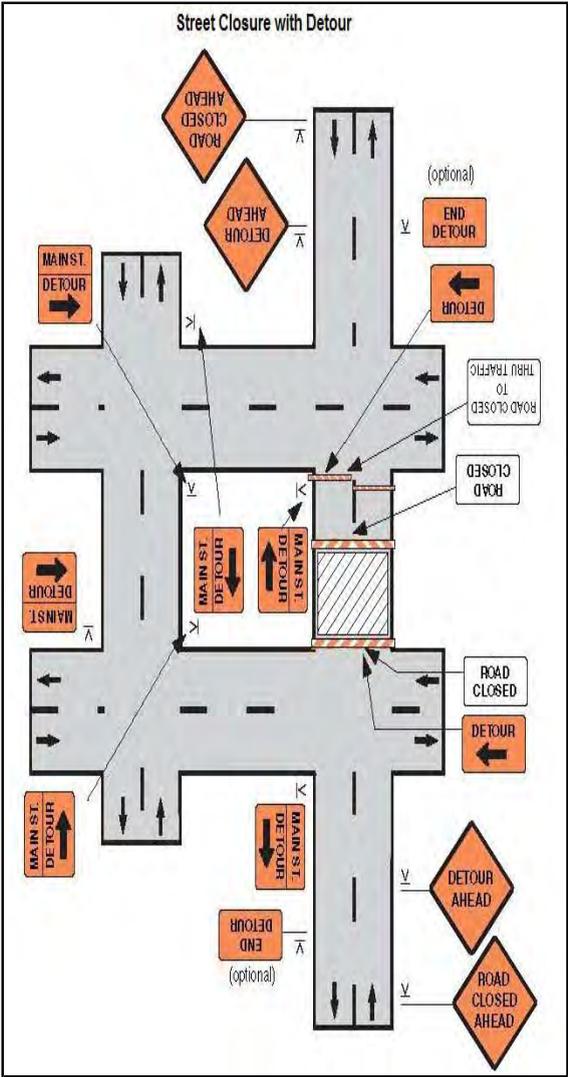


Figure: Street closure with detour



Format

Confirmation from Operator of Commercial establishment/shop for provision of temporary Access by Contactor

Name of Subproject : _____
 Name of Contractor : _____
 Name of the Affected Person : _____
 Nature of Establishment : _____
 Location of Establishment : _____
 Nature of Access Disruption : _____
 Nature of Alternate Access : _____
 Provided by Contractor : _____
 Duration & Date of Disruption : _____ days from _____ to _____

I hereby confirm that access disruption caused to my property as per the duration and the dates mentioned above was effectively mitigated by provision of alternate access by contractor. Provision of alternate access ensured no closure or loss of clientage to my commercial establishment.

Signature of Affected person

Signature of Contractor's representative

Sludge Management

Testing results for WTP sludge and backwash water : physico- chemical properties

S. No	Parameters	Location		Standard : IS 10500:2012	
		1. Sludge water from the Jewel Clarifier	2. Jewel filter backwash water	Acceptable	Permissible
	Physicochemical			Acceptable	Permissible
1	pH	7.65	7.32	5.5	9.0
2	Colour in Hazen unit-----	30	25		
3	Temperature	30.6	30.1		
4	TSS mg/L	6562.0	554.8		100
5	DO mg/L	5.2	4.8		
6	TDSmg/L	178.7	167.1		
7	BOD(27°C for3days)mg/L	38.8	5.0	-	30
8	CODmg/L	151.0	21	-	250
9	Oil andGrease mg/L	BDL(DL: 2)	BDL(DL:2)		
10	AmoniacalNitrogenasN mg/L	7.9	<0.1		
11	ChlorideasClmg/L	22.0	18.4		
12	TotalPhosphatesasPO ₄ mg/L	BDL(DL: 0.25)	BDL(DL:0.25)		
13	NitrateasNO ₃ mg/L	5.08	4.61		
14	SulphatesasSO ₄ mg/L	43.5	30.3		
15	Residualfree Chlorine mg/L	BDL(DL: 0.1)	BDL(DL:0.1)		
16	FluorideasF mg/L	0.7	0.3		
17	Arsenic asAs mg/L	BDL(DL: 0.005)	BDL(DL:0.005)		
18	Mercury as Hg mg/L	0.0200	0.0030		
19	Total ChromiumasCr mg/L	1.33	0.18		2.0
20	Cu mg/L	0.130	0.020		3.0
21	Pb mg/L	0.107	0.019		0.01
22	N img/L	0.18	0.04		
23	Selenium as Semg/L	BDL(DL: 0.01)	BDL(DL:0.01)		
24	Barium as Bamg/L	0.88	0.16		
25	Silver as Ag mg/L	BDL(DL: 0.01)	BDL(DL :0.01)		
26	Cd mg/L	BDL(DL: 0.01)	BDL(DL :0.01)		
27	Boron as mg/L	3.48	0.55		
28	Zinc Mg/L	0.39	0.12		5.0
29	Sodium as Na	11.97	13.00		

S. No	Parameters	Location		Standard : IS 10500:2012	
		1. Sludge water from the Jewel Clarifier	2. Jewel filter backwash water		
30	Total solids(fixed or inorganic)	6144.0	596.0		
31	Phenolic compound as C6H5OH	0.49	BDL(DL:0.05)		
32	Cyanide as CN	BDL(DL:0.05)	BDL(DL:0.05)		
33	Sulphide as S	BDL(DL:2)	BDL(DL:2)		
34	Hexavalent chromium as Cr6	BDL(DL:0.02)	BDL(DL:0.02)		

The existing Barari water Sludge summary is given below

Filter	Backwash water Disposal	Sludge disposal	Remarks	
			Present	Proposed
Jewel Filter	400 MT/Day Backwash Water	50 MT/Day Chlarifaculator Sludge	Disposal in the river directly	After settling sludge cake will be disposed
Peterson Filter	350 MT/Day Backwash Water	2000MT/ 6 month clarifier sludge	Disposal in the river directly	
Mechanical Filter	150 MT/Day Backwash Water	400 Mt// 6 month clarifier sludge	Disposal in the river directly	

Sludge Cake will be disposed at disposal site (1.42 Acre). Disposal site is nearby Barari WTP. Site Photographs are given



Sludge disposal site near Barari

The proposed Backwash water is 2000MT /d and sludge and cake will be 0.75 MT/d .As per the requirement Backwash water will be recycled and sludge will be disposed in the form of Cake.

**Indian Standards for Drinking Water - Specification (Bureau of Indian Standard, BIS
10500: 2012)**

Sl.No	Substance or Characteristic	Requirement (Desirable Limit)	Permissible Limit in the absence of Alternate source
Essential characteristics			
1.	Colour, (Hazen units, Max)	5	25
2.	Odour	Unobjectionable	Unobjectionable
3.	Taste	Agreeable	Agreeable
4.	Turbidity (NTU, Max)	5	10
5.	pH Value	6.5 to 8.5	No Relaxation
6.	Total Hardness (as CaCO ₃) mg/lit.,Max	300	600
7.	Iron (as Fe) mg/lit,Max	0.3	1.0
8.	Chlorides (as Cl) mg/lit,Max.	250	1000
9.	Residual, free chlorine, mg/lit, Min	0.2	--
Desirable Characteristics			
10.	Dissolved solids mg/lit, Max	500	2000
11.	Calcium (as Ca) mg/lit, Max	75	200
12.	Magnesium (as Mg)mg/lit, Max.	30	100
13.	Copper (as Cu) mg/lit, Max	0.05	1.5
14.	Manganese (as Mn)mg/lit ,Max	0.10	0.3
15.	Sulfate (as SO ₄) mg/lit, Max	200	400
16.	Nitrate (as NO ₃) mg/lit, Max	45	100
17.	Fluoride (as F) mg/lit, Max	1.0	1.5
18.	Phenolic Compounds (as C ₆ H ₅ OH) mg/lit, Max.	0.001	0.002
19.	Mercury (as Hg)mg/lit, Max	0.001	No relaxation
20.	Cadmium (as Cd)mg/lit, Max	0.01	No relaxation
21.	Selenium (as Se)mg/lit,Max	0.01	No relaxation
22.	Arsenic (as As) mg/lit, Max	0.05	No relaxation
23.	Cyanide (as CN) mg/lit, Max	0.05	No relaxation
24.	Lead (as Pb) mg/lit, Max	0.05	No relaxation
25.	Zinc (as Zn) mg/lit, Max	5	15
26.	Anionic detergents (as MBAS) mg/lit, Max	0.2	1.0
27.	Chromium (as Cr ⁶⁺) mg/lit, Max	0.05	No relaxation
28.	Polynuclear aromatic hydrocarbons (as PAH) g/lit, Max	--	--
29.	Mineral Oil mg/lit, Max	0.01	0.03
30.	Pesticides mg/l, Max	Absent	0.001
31.	Radioactive Materials		
	i. Alpha emitters Bq/l, Max	--	0.1
	ii. Beta emitters pci/l,Max	--	1.0
32.	Alkalinity mg/lit. Max	200	600
33.	Aluminium (as Al) mg/l,Max	0.03	0.2
34.	Boron mg/lit, Max	1	5

Project inception Meeting Minutes

The Kick-off Meeting in Bhagalpur was concluded on 31st October 2013 at Regional Commissioner's Conference Room from 1300 hrs. to 1600 hrs.

Objective:

Inculcate a common understanding about the Project within the BMC officials and elected members.

Approach:

The meeting was devised to create a better understanding thus it adopted a mixed off tools viz. class room model and participatory approach.

Details:

The meeting was facilitated by Mr. A. K. Raja. First all the participants from both sides introduced themselves. This was preceded by the opening speech by the PM – BUDIP Mr. V. K. Sharma. He elaborated the overall objectives and the output of the project; he told that the program is devised for the sustainable growth through improved quality of life. He also told that he will arrange for the water supply in 3 towns and sewerage system in 1 town viz. Bhagalpur, Gaya, Darbhanga and Muzaffarpur respectively. Further he introduced all the BUDIP Partner agencies involved in the project as well as discussed the investment ratio of the project.

In context to timeline of the project he elaborated the project tenure specifying the construction period as well as O & M Period. He also consoled the participant "though the project designing took a good span of time as its required and now we are here on the ground and further we will ensure that all goes as per the timeline. He also said the cooperation and coordination is highly solicited from the BMC.

After that the Team Leader – PMC, Mr. Butter Jaap started with the presentation. The presentation was designed to create a better understanding. The presentation was leaded by Mr. Jaap Butter and duly participated by the thematic experts viz. Water Supply, Social & Environment, and PR during the course of their part.

The program was concluded by the Closing Speech by Hon. Mayor Mr. Deepak Bhuwaniya. He elaborated his understanding and ensured that all the required support for the successful completion of the project will be dully extended by the BMC Officials and elected representatives.

The Executive secretary offered the vote of Thanks.

Achievement:

The program was felt to be a successful event and it is understood so by the facial expression and active participation during the session. The participants were in well noting the concepts as well as putting up the relevant queries in context. The attraction of the session was that the deliberation of the team leader Mr. Jaap Butter was duly interpreted to the participants in Hindi.

Way Ahead:

During the session suggestions from all came to arrange a meeting next meeting which will include Local reputed personalities, All Parshads, NGOs, relevant Line Departments etc. after the contract award as Program Launch function.

Venue: Conference Room Municipal Corporation Bhagalpur

Date & Time: Thursday October 31, 2013 . 13.00 hrs.

Question – Answers during the open session

1. Pipe laid but not charged. It means that though the pipe will be laid in the first phase but water will not be there. What will happen?

Ans.: -Strengthening of distribution system will be done, Leakage of pipes will be repaired, broken pipes will be replaced & accordingly there will be less loss of water and water supply will be improved.
2. Who will give the connection? BMC or Contractor.

Ans.: - The Contractor, in consultation with BMC.

3. Duration of Bhagalpur Water Supply Phase-1 and 2, to be defined whether they will run simultaneously or not?

Ans.: - The work of Phase 1 is likely to start by the end of Feb' 14, whereas that of Phase 2 from Sept '14 , so the work will be done simultaneously.

4. Can stand posts be metered?

Ans.:- Yes, that is the plan. The contractor will make technical and financial proposals. Policies on how people will pay for water at the stand post are to be determined by BMC.

5. So many tube wells are being operated at present some of which are in good condition and some not performing well. How this problem will be tackled?

Ans.:- Efforts will be made to rehabilitate the non performing tube wells. If not, they will be abandoned.

6. There was one suggestion that giving the water connection from the main pipe line should be strictly prohibited.

Ans.:- Yes of course. House connection will not be given from the main pipe line. The distribution net work will be extended into lanes and by-lanes.

7. Can BPL families in all wards be exempted for giving the charges for water connection?

Ans.:- BMC shall develop a policy on this issue.

8. Whether 18 numbers of overhead tanks will full fill the requirement of the town?

Ans.:- The required numbers have been determined by a scientific analysis of the distribution network and water storage requirements.

No elected member has been proposed in the town committee which is not desirable. Matter should be looked into?

Ans.:- The constitution of the Town Committee is as per loan/project agreement between GoB and ADB.

10. Water level in the existing intake gets very low during the period Feb to July as the river moves away to about 2 km from the bank and accordingly the water supply is reduced from 17 MLD to only 4 MLD, leading to water scarcity in the town. Some solution for this needs to be found out.

Ans.:- The contractor in the design period will see to it. Advice from BMC and BRJP is solicited.

11. So many water pipe lines are existing. It has to be strengthened in the 1st phase. What would be the strategy for existing pipe lines and laying of new pipe lines.

Ans.:- In the contract there is provision to rehabilitate all existing pipeline and extend the network to all urban areas. Contractor to make strategy during design phase.

12. Bhagalpur Water Supply Project should start as soon as possible.

Ans.:-The technical bids are going to be opened on 13-11-13 and the work order (LoA) is likely to be issued to the Contractor by end of Feb 14.

13. It is a big Project and definitely difficulties, bottlenecks will come. All ward representatives will cooperate to get the issues resolved. The Project Team to remain in touch with the local councillors /ward representatives.

Ans.:-Yes. The Project Team will remain in constant touch with the local councillors /ward representative.

List of the Participant

<u>Organizing Committee</u>		
Sl. No.	Name	Designation and Organization
1.	Vijay Kumar Sharma	Project Manager, PMU – BUDIP
2.	Ashish Kumar	Resettlement Officer, PMU – BUDIP
3.	Jaap Butter	Team Leader, PMC – BUDIP
4.	Akabar Hussain	PPMS Specialist, PMC – BUDIP
5.	Jitendra Kumar Singh	Water Supply Specialist, PMC – BUDIP
6.	Dr. Ardhendu Mitra	Environmental Specialist, PMC – BUDIP
7.	Prashant Kumar Sahu	Social Specialist, PMC – BUDIP
8.	Dr. Anil Kumar Patni	Environment Expert, PMC – BUDIP
9.	Aruni Kumar Raja	Public Relation Officer, PMC – BUDIP
10.	P. V. Gopinathan	Dy. T L, DSC – BUDIP
11.	Vijay Kumar Singh	Design Support, DSC – BUDIP
12.	S. K. Rishi	DSC – BUDIP
<u>Invitees</u>		
13.	Deepak Bhuwaniya	Mayor, Bhagalpur
14.	Priti Shekhar	Dy. Mayor, Bhagalpur
15.	Devendra Suman	Executive Secretary
16.	Sanjay Kumar	Executive Engineer
17.	ShankaraCharya Upadhayay	OiC, Jal Kal Dept.
18.	Keshav Narayan Chaudhary	Pipeline Supervisor, Jal Kal Dept.
19.	Ajay Sharma	Planning Assistant, BMC
20.	Devendra Prasad Yadav	Jal Kal Dept.
21.	Kokali Banerjee	Ward Councillor
22.	Md. Nasimmuddin	Ward Councillor
23.	Amar Kant Mandal	Ward Councillor
24.	Sanjay Kumar Jha	Ward Councillor
25.	Krishan Prasad	S.W.W
26.	Santosh Kumar	Ward Councillor
27.	Md. Miraz	Ward Councillor
28.	Tarun Kumar	Hindustan Hindi Daily
29.	Jawahar Taanti	
30.	Hare Ram Chaudhary	Superintendent Water Supply
31.	Baij Nath Prasad	Jr. Eng. WSTP, Barari
32.	Om Prakash Yadav	P.LL WSTP, Barari
33.	Jawahar Tanti	P.LL WSTP, Barari

Appendix-15: Summary of local level consultations at Bhagalpur

RECORDS OF PUBLIC CONSULTATION-Bhagalpur

Subproject: Improvement of Water supply system in Bhagalpur City

Date & Time: 24.11.2015 From 9.30-00 AM to 5-00 PM & 27.11.2015

Various issues related to the proposed subproject were discussed at various locations of the subproject area. Discussions were held with the parties directly and indirectly affected by the subproject execution as well as the general public of the subproject area. The problems faced by them along with their suggestions/concerns were recorded and the same have been given due consideration during formulation of the project design, IEE and EMP.

The participants, in general were in favour of the upcoming subproject. However, they were concerned about the permanent and temporary impacts which are expected to arise during construction stage such as traffic related issues, loss of access and increase in air pollution due to dust emissions. People are ready to extend all types of support during execution of the project. The details of the public consultation are detailed below:

Issues discussed-Housing Board

- Water quality issue was discussed which is good as per people informed
- Related to health and safety measures of the people during construction
- People are interested to do work on project area during construction
- Sensitive receptors issued was discussed with the people because a temple near corner of approach road exist

Issues discussed-Surkikal (ward 26)

- Water quality issue was discussed. impurities in the PHED supplied water
- Safety issued of children
- What precaution will be taken on health and safety of the people during construction
- People are interested to do work on project area during construction
- Sensitive receptors issued was discussed with the people because a temple near boundary of OHT site

Issues discussed-TM University

- Health and safety issue of workers will be considered.
- People are interested to do work on project area during construction
- Sensitive receptor (Temple near the corner) issued was discussed with people.

Issues discussed- Thakurbari, Warsaliganj

- Access road is narrow and used for general public so what safety measures will be taken during construction
- Water quality issue was discussed. As per public view water quality is good
- Drainage through *nalla* which is cleaned by Nagar Nigam
- Air pollution issue was also discussed for nearby area
- People are interested to do work on project area during construction
- Sensitive receptors (OHT is located on the temple trust land) near the OHT issued was also discussed with Trust member.

Issues discussed-WTP Barari

- Health & Safety measures issued
- Water quality issue was discussed. As per public view water quality is good
- No Drainage system in the surrounding area
- Air pollution issue was also discussed for nearby area
- People are interested to do work on project area during construction

Issues discussed-Distribution area, Adampur

- Access road is narrow and used for general public so what safety measures will be taken during construction
- Water quality issue was discussed. As per public view water quality is not good
- Drainage through *nalla* which is cleaned by Nagar Nigam
- Air pollution issue was also discussed for nearby area
- People are interested to do work on project area during construction

Consultation 1

Location –Housing Board (Proposed work: Construction of New OHT)

Date & Time: 24.11.2015, From 10.00 AM to 11-30 AM

Sr. No.	Key Issues/Demands	Perception of community	Action to be Taken
1	Awareness of the project – including coverage area	Local people are not much aware on components of the project.	Awareness program at different project locations related to project components is essential
2	In what way locals may associate with the project	At the construction phase some people can work as labourers.	Atleast 50% local labour will be engaged
3	Presence of historical/ cultural/ religious sites nearby	No	
4	Unfavourable climatic condition	Winters are generally cold, summers are hot and dry, and the monsoon season is characterized by moist heat and oppressive nights	Scheduling of work will be planned as per climatic condition
5	Occurrence of flood	No as such	
6	Drainage problem facing	No Drainage problem	
7	Access road to project Site	Yes <i>pucca</i> road available	
8	Present drinking water problem – quantity and quality	People have their own boring system or obtained from supply water Water quality good	After completion of project treated water will be supply
9	Availability of labour during construction time	Yes, labours are easily available nearby the site	Local labours will be engaged
10	Dust and noise pollution and disturbances during construction work	Request for arresting of dust and protection of habitation from noise pollution	Mitigation measures will be applied as per EMP
11	Setting up worker camp site within the village/ project locality	Project area is having sufficient space for workers camp. Local people will allow to set up labour camp	Prior setting up site office and labour camp NOC needs to be obtained from local authority
12	Safety of residents during construction phase and plying of vehicle for construction activities	Local requested for safety arrangement particularly where excavation is being planned near main city road.	Mitigation measures will be applied as per EMP



Consultation 2

Date & Time: 24.11.2015 From 11.30 AM to 12-30 PM

Location –Surkikal ward 26 (Proposed work: Construction of New OHT)

Sr. No.	Key Issues/Demands	Perception of community	Action to be Taken
1	Awareness of the project – including coverage area	Local people are aware on components of the project.	Awareness program at different project locations related to project components is completed under PR Activity
2	In what way they may associate with the project	At the construction phase some people can work as labourers, after completion water supply to nearby areas shall be improved	Atleast 50% local labour will be engaged
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	Temple near the boundary of OHT site	A transformer will be shifted from the site No impact on religious places
4	Occurrence of flood	No	
5	Drainage problem facing	Project site with drainage system. Which is not working properly	Improvement of drainage system will be taken up through separate funding
6	Present drinking water problem – quantity and quality	Water quality good some time impurities seen in the water	Requirement of sufficient water supply from PHED
7	Access road to project Site	Yes <i>pucca</i> road available	
8	Perception of locals On tree felling and afforestation	No tree cutting required	
9	Dust and noise pollution and disturbances during construction work	Request for arresting of dust and protection of habitation from noise pollution	Mitigation measures will be applied as per EMP
10	Setting up worker camp site within the village/ project locality	Project area is having sufficient space for workers camp. Local people will allow to set up labour camp	Prior setting up site office and labour camp NOC needs to be obtained from local authority
11	Safety of residents during construction phase and plying of vehicle for construction activities	Local requested for safety arrangement particularly where excavation is being planned near main city road.	Mitigation measures will be applied as per EMP
			

Consultation 3

Date & Time: 24.11.2015, From 12.30 to 1-30 PM

Location-TMU (Proposed work: Construction of New OHT)

Sr. No.	Key Issues/Demands	Perception of community	Action to be Taken
1	Awareness of the project – including coverage area	Local people are aware on components of the project.	Awareness program at different project locations related to project components was undertaken in PR activity
2	In what way they may associate with the project	Locals only need good and sufficient water	Outside labourers will be engaged. Quality water will be supplied after completion of project
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	No	
4	Drainage problem facing	No Drainage system present	Improvement of drainage system will be taken up through separate funding
5	Present drinking water problem – quantity and quality	Water quality good and insufficient	Under the project good quality water will be supplied
6	Access road to project Site	Narrow road	
7	Perception of locals On tree felling and afforestation	People are agreed for tree cutting for water supply project	Three Litchi tree on the project area. Plantation against tree cutting will be required as per rule
8	Dust and noise pollution and disturbances during construction work	Request for arresting of dust and protection of habitation from noise pollution	Mitigation measures will be applied as per EMP
9	Safety of residents during construction phase and plying of vehicle for construction activities	Local requested for safety arrangement particularly where excavation is being planned	Mitigation measures will be applied as per EMP
  			

Consultation 4

Date & Time: 24.11.2015, From 1-45 PM to 4-00 PM

Location-Thakurbari (Proposed work: Construction of New OHT)

Sr. No.	Key Issues/Demands	Perception of community	Action to be Taken
1	Awareness of the project – including coverage area	Local people are aware on components of the project.	Awareness program at different project locations related to project components was undertaken in PR activity
2	Occurrence of flood	Not reported at site	
3	Drainage problem facing	Drainage system present	As per discussion public required a proper drainage system
4	Present drinking water problem – quantity and quality	Boring water supply from the temple trust area and water quality is good	
5	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	Temple near the boundary of OHT site	
6	Availability of labour during construction time	Yes, labours are easily available nearby Area	Local labours will be engaged
7	Access road to project Site	Approach road narrow	
8	Dust and noise pollution and disturbances during construction work	Request for arresting of dust and protection of habitation from noise pollution	Mitigation measures will be applied as per EMP
9	Setting up worker camp site within the village/ project locality	Project area having space for workers camp	Prior setting up site office and labour camp NOC needs to be obtained from local authority
			

Consultation 5

Location –WTP Barari (Proposed work: Refurbishment of existing WTP)

Date & Time: 27.11.2015, From 10.00 AM to 12-00

Sr. No.	Key Issues/Demands	Perception of community	Action to be Taken
1	Awareness of the project – including coverage area	Local people are aware on components of the project.	Awareness program at different project locations related to project components is given by PR team
2	In what way locals may associate with the project	At the construction phase some people can work as labourers.	Atleast 50% local labour will be engaged
3	Presence of historical/ cultural/ religious sites nearby	No	

4	Unfavourable climatic condition	Winters are generally cold, summers are hot and dry, and the monsoon season is characterized by moist heat and oppressive nights	Scheduling of work will be planned as per climatic condition
5	Occurrence of flood	No as such	
6	Drainage problem facing	No Drainage problem	
7	Access road to project Site	Yes <i>pucca</i> road available	
8	Present drinking water problem – quantity and quality	People obtained water from supply water Water quality good	After completion of project treated water will be supply
9	Availability of labour during construction time	Yes, labours are easily available nearby the site	Local labours will be engaged
10	Dust and noise pollution and disturbances during construction work	Request for arresting of dust and protection of habitation from noise pollution	Mitigation measures will be applied as per EMP
11	Setting up worker camp site within the village/ project locality	Project area is having sufficient space for workers camp. Local people will allow to set up labour camp	Prior setting up site office and labour camp NOC needs to be obtained from local authority
12	Safety of residents during construction phase and plying of vehicle for construction activities	Local requested for safety arrangement particularly where excavation is being planned near main city road.	Mitigation measures will be applied as per EMP
			
			

Consultation 6

Location –Distribution Network area ,Adampur (Proposed work: Distribution Network)

Date & Time: 27.11.2015, From 03.00 PM to 05-00 PM

Sr. No.	Key Issues/Demands	Perception of community	Action to be Taken
1	Awareness of the project – including coverage area	Local people are aware on components of the project.	Awareness program at different project locations related to project components is given by PR team
2	In what way locals may associate with the project	At the construction phase some people can work as labourers.	Atleast 50% local labour will be engaged
3	Presence of historical/ cultural/ religious sites nearby	No	
4	Unfavourable climatic condition	Winters are generally cold, summers are hot and dry, and the monsoon season is characterized by moist heat and oppressive nights	Scheduling of work will be planned as per climatic condition
5	Occurrence of flood	No as such	
6	Drainage problem facing	No Drainage problem	

7	Access road to project Site	Yes <i>pucca</i> road available	
8	Present drinking water problem – quantity and quality	People obtained water from supply water Water quality good	After completion of project treated water will be supply
9	Availability of labour during construction time	Yes, labours are easily available nearby the site	Local labours will be engaged
10	Dust and noise pollution and disturbances during construction work	Request for arresting of dust and protection of habitation from noise pollution	Mitigation measures will be applied as per EMP
11	Safety of residents during construction phase and plying of vehicle for construction activities	Local requested for safety arrangement particularly where excavation is being planned near main city road.	Mitigation measures will be applied as per EMP
			

Summary of General and specific discussion – Feedback & action taken

1. Issues: Problems faced due to absence of the proposed facility under the subproject
 - ✓ Feedback:
 - The quality and quantity of the water supplied at present is not adequate. Supply from tube well is expected at few locations
 - New settlements mostly in the peripheries of the town lack proper water production and water storage infrastructure.
 - ✓ Remarks
 - The participants in general were of the view that the proposed augmentation is the definite need and welcomed the subproject and ensured their full support.
2. Issues: Awareness and extent of knowledge about the subproject
 - ✓ Feedback
 - Local people are not much aware on components of the project.
 - ✓ Remarks
 - Public consultation in different forms like one to one consultation, circulations of questionnaire, group discussions, etc. need to be a continuous process and IA will ensure this process throughout the project execution.
3. Issues: Information on the perceived benefits of the subproject in terms of economic and environmental enhancement
 - ✓ Feedback:
 - General benefits perceived by the people are summarized as follows:
 - Improvement in the water supply scenario will solve the issues and problems related to the unsatisfactory quantity and quality of the water supplied.
 - It is hoped that adequate provisions will be made for satisfactory and standardized filtration and purification of the water which will be supplied in future.

- The improvement in the water supply will provide safety to the people as they will be not at the risk of water borne diseases.
 - Areas of new settlements will get highly benefited with the proposed subproject.
 - Proposed infrastructure will ensure overall health and hygiene of the people in the subproject area.
 - ✓ Remarks
 - People impacted directly or indirectly due to subproject implementation should be adequately compensated.
 - During implementation, maximum efforts should be made to minimize hindrances of public access by providing alternative access to roads, streets and homes.
 - The work should be carried out at a fast pace so that the duration of access disruption is minimized.
 - People suggested an efficient operation and maintenance system after the completion of the project
4. Issues: Information on perceived losses from the proposed subproject during execution stage in terms of disruptions in traffic, temporary access disruptions during execution and air and noise pollution, etc.
- ✓ Feedback:
 - People opined that potential temporary impacts of access disruption for residences, shops/commercial establishments, and institutions, etc. should be mitigated through good construction practices and an effective environment and contractors construction plan which should ensure providing walkways and metal sheets to maintain access across trenches, increasing the workforce in front of shops/commercial establishments, consulting business and institutions regarding operating hours and factoring this in work schedules, providing advance information on works to be undertaken including appropriate signages etc.
 - ✓ Remarks
 - Effective mitigation measure should be in place so that problems related to traffic disruptions; air and noise pollution are minimized.
5. Issues: Presence of any historical/cultural site in the vicinity
Presence of any protected area in or adjoining the construction site.
- ✓ Feedback:
 - There is no historical/cultural site in the corridor of the subproject.
 - There is no protected area in the corridor of the subproject.
 - ✓ Remarks
 - There are some sensitive receptors which include few educational institutions, health centers, religious places etc. in the project area for which proper mitigation measures relevant to the location and nature of the receptor will be kept in place during project execution and same will be part of EMP.

All Feedback and actions (remarks) considered in design

List of the Participants in Public Consultation

Subproject Name:

Location of Meeting/Consultation: Housing Board.

Date & Time: 24/11/15 @ 10:15 am

Sl. No	Name & Address	Occupation	Signature
1.	Mithlesh Kumar	Student	Mithlesh Kumar
2.	Asha Devi	Housewife	Asha Devi
3.	Hemant Singh		Hemant Singh
4.	Ashu Kumar	Engineer	Ashu Kumar
5.	Dilip K Singh		Dilip K Singh
6.	Naveet Kaur 7549664834	emp.	Naveet Kaur
7.	U.R. Singh	Housewife	U.R. Singh
8.	Praveen Kumar	Advocacy	Praveen Kumar
9.			

List of the Participants in Public Consultation

Subproject Name: k

Location of Meeting/Consultation: Sukikal

Date & Time: 24/11/2015 11:30

Sl. No	Name & Address	Occupation	Signature
1	Bantay Kumar	Job	Bantay
2	शंभु देवी		शंभु देवी
3	विनीत 214		विनीत 214
4	शोभा देवी	Housewife	शोभा देवी
5	शंभु देवी	Housewife	शंभु देवी
6	रंजीतदेरि	Contractor	रंजीतदेरि
7	सविता देवी	Housewife	सविता देवी
8	चम्पा देवी	Housewife	चम्पा देवी
9	कल्पना देवी	" "	कल्पना देवी
10	ज्योति देवी	" "	ज्योति देवी
11	पवन कुमार	Student	पवन कुमार
12	आरजीत कुमार	Student	आरजीत कुमार

Zoom in (Ctrl+Plus)

List of the Participants in Public Consultation

Subproject Name:

Location of Meeting/Consultation: P.M. University

Date & Time: 24/11/15 @ 12:30 P.m

Sl. No	Name & Address	Occupation	Signature
1	रवि	विक्रेता	रवि
2	पिता कुमार	विद्यार्थी	पिता
3	सुनील कुमार	विद्यार्थी	Sunny
4	शिव कुमार	सहकर्मी	शिव
5	मनोज कुमार		मनोज
6	सुनील कुमार		सुनील
7	सुनील कुमार	विद्यार्थी	सुनील
8	अनुराज कुमार	self owner - फुड्स	अनुराज
9	रवि	विद्यार्थी	रवि
10	पंकज देव		पंकज देव
11	Anuraj Raj	student	Anuraj Raj
12			
13			

List of the Participants in Public Consultation

Subproject Name: BWSP

Location of Meeting/Consultation: Warsaliganj Thakurbari

Date & Time: 24/11/2015 1:45 PM

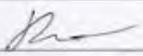
Sl. No	Name & Address	Occupation	Signature
1	रेखा देवी	House wife	रेखा देवी
2	अमरा देवी	//	अमरा देवी
3	सुमित्रा देवी	//	सुमित्रा देवी
4	सुनी देवी	//	सुनी देवी
5	देवी देवी	//	देवी देवी
6	हासना सुमारे	Student	हासना सुमारे
7	महेसा पंडित		महेसा पंडित
8	हासना सुमारे	Student	हासना सुमारे

List of the participants in Public Consultation

Subproject Name: BWSP

Location: Customer Call Centre, W.T.P - Balesar

Date: 27-11-15

Sl. No.	Name & Address	Occupation	Signature
1	Ram Niwas	Self Emp.	
2	Raj Malhotra	Self Emp.	
3	शिव शर्मा	Shop keeper	शिव शर्मा
4	Suresh Roy	Job Private	Suresh Roy.
5	शिव शर्मा	Labor	शिव
6	Awadesh Kumar	shop	अवदेश
7	शिव शर्मा	Thilawala	
8	Sita Devi	Home Wife	
9	Saurav Sah	Private Job	
10	शिव शर्मा	Private Job	शिव
11	Pushpendu Yadav	Labor	
12	Jai Ram		जय राम
13	शिव शर्मा	Private Job	
14	शिव शर्मा	Labor	

List of the participants in Public Consultation

Subproject Name: BWS P

Location: Distribution Network Area, Adampur

Date: 27-11-15

Sl. No.	Name & Address	Occupation	Signature
1	Ajay Saw	former	अजय साह
2	Kailash Kumar Sah-	Self Emp.	कैलाश
3	Vinod Sah-	Shop.	विनोद
4	रविशंकर शर्मा	Labor	
5	अमित कुमार	Shopkeeper	अमित
6	दिनेश सिंह	Labor	
7	Ajeet Singh	Private Job	आजैत
8	Chhanshyam Singh	Labor	
9	रमेश	Labor	
10	अनिल	Labor	
11	Pradeep Kumar	Private Job	प्रादीप
12	नरेश कुमार	mechanical operator	Nandu
13	अमित कुमार	Labor	
14	राज शर्मा	Thekewala	

Appendix 16: Sample Grievance Registration Form

(To be available in Hindi, Urdu and English or local language, if any)

The **Bihar Urban Development Investment Program (BUDIP)** welcomes complaints, suggestions, queries and comments regarding project implementation. We encourage persons with grievance to provide their name and contact information to enable us to get in touch with you for clarification and feedback.

Should you choose to include your personal details but want that information to remain confidential, please inform us by writing/typing ***(CONFIDENTIAL)*** above your name. Thank you.

Date		Place of registration			
Contact Information/Personal Details					
Name		Gender	Male	Female	Age
Home Address					
Village / Town					
District					
Phone no.					
E-mail					
Complaint/Suggestion/Comment/Question Please provide the details (who, what, where and how) of your grievance below:					
If included as attachment/note/letter, please tick here:					
How do you want us to reach you for feedback or update on your comment/grievance?					

FOR OFFICIAL USE ONLY

Registered by: (Name of official registering grievance)	
If – then mode:	
<input type="checkbox"/> Note/Letter <input type="checkbox"/> E-mail <input type="checkbox"/> Verbal/Telephonic	
Reviewed by: (Names/Positions of Official(s) reviewing grievance)	
Action Taken:	
Whether Action Taken Disclosed:	<input type="checkbox"/> Yes <input type="checkbox"/> No
Means of Disclosure:	

GRIVENCES RECORD AND ACTION TAKEN

Sr. No.	Date	Name and Contact No. of Complainer	Type of Complain	Place	Status of Redress	Remarks

परिशिष्ट 8: नमूनाशिकायतपंजीकरणफार्म

(हिंदी, उर्दू और अंग्रेजी या स्थानीय भाषा में उपलब्ध हो, यदि कोई हो,)

बिहार शहरी विकास निवेश कार्यक्रम

(BUDIP)

शिकायतें,

सुझाव,

प्रश्नों और परियोजना के कार्यान्वयन के बारे में टिप्पणियों का स्वागत करता हूँ। हम लोगों को शिकायत के साथ उनके नाम और संपर्क

जानकारी प्रदान करने के लिए प्रोत्साहित करते हैं ताकि हम स्पष्टीकरण और प्रतिक्रिया के लिए आपके साथ संपर्क कर सकें। 1

आपको अपने व्यक्तिगत विवरण शामिल करने चाहिए लेकिन उस जानकारी को गोपनीय रखा जायगा। 1 आपका नाम ऊपर

(गोपनीय) * लेखन / टाइपिंग द्वारा हमें सूचित करें धन्यवाद

तारीख			पंजीकरण का स्थान		
संपर्क करने संबंधी जानकारी / व्यक्तिगत विवरण					
नाम		लिंग	पुरुष महिला	आयु	
घर का पता					
गांव / शहर					
जनपद					
फोन नं.					
ईमेल					
शिकायत / सुझाव / टिप्पणी / प्रश्न नीचे अपनी शिकायत का विवरण (जो, क्या, कहां और कैसे) प्रदान करें:					
सलगनक / नोट / पत्र के रूप में, शामिल हैं, कृपया यहाँ टिक करें					
हम आप तक प्रतिक्रिया के लिए कैसे पहुँच सकते हैं या अपनी टिप्पणी / शिकायत पर नवीनीकरण?					

केवल कार्यालय उपयोग के लिए

द्वारा पंजीकृत: (सरकारी पंजीकरण शिकायत का नाम)	
यदि - फिर विधि:	
<input type="checkbox"/> नोट / पत्र <input type="checkbox"/> ईमेल <input type="checkbox"/> मौखिक / टेलीफोन	
सेसमीक्षित: (नाम / अधिकारी की पोजिशन समीक्षा शिकायत)	
की गई कार्रवाई:	
की गई कार्रवाई का खुलासा:	<input type="checkbox"/> हां <input type="checkbox"/> नहीं
प्रकटीकरण का मतलब:	

शिकायत रिकॉर्ड और की गई कार्रवाई

क्रम संख्या	तारीख	नाम और complainer का संपर्क नंबर	शिकायत के प्रकार	जगह	निवारण की स्थिति	टिप्पणियाँ

Semi-Annual Environmental Reporting Format

I. INTRODUCTION

- Overall project description and objectives
- Description of subprojects
- Environmental category of the sub-projects
- Details of site personnel and/or consultants responsible for environmental monitoring
- Overall project and sub-project progress and status

No.	Sub-Project Name	Status of Sub-Project				List of Works	Progress of Works
		Design	Pre-Construction	Construction	Operational Phase		
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

Compliance status with National/ State/ Local statutory environmental requirements

No.	Sub-Project Name	Statutory Environmental Requirements	Status of Compliance	Action Required

Compliance status with environmental loan covenants

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

II. COMPLIANCE STATUS WITH THE ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

- Provide the monitoring results as per the parameters outlined in the EMP. Append supporting documents where applicable, including Environmental Site Inspection Reports.
- There should be reporting on the following items which can be incorporated in the checklist of routine Environmental Site Inspection Report followed with a summary in the semi-annual report send

to ADB. Visual assessment and review of relevant site documentation during routine site inspection needs to note and record the following:

- (i) What are the dust suppression techniques followed for site and if any dust was noted to escape the site boundaries?
- (ii) If muddy water was escaping site boundaries or muddy tracks were seen on adjacent roads;
- (iii) Adequacy of type of erosion and sediment control measures installed on site, condition of erosion and sediment control measures including if these were intact following heavy rain;
- (iv) Are there designated areas for concrete works, and re-fuelling?
- (v) Are there spill kits on site and if there are site procedures for handling emergencies;
- (vi) Is there any chemical stored on site and what is the storage condition?
- (vii) Is there any dewatering activities if yes, where is the water being discharged;
- (viii) How are the stockpiles being managed?
- (ix) How is solid and liquid waste being handled on site?
- (x) Review of the complaint management system;
- (xi) Checking if there are any activities being under taken out of working hours and how that is being managed.

Summary Monitoring Table –Water supply subproject

A. Pre-construction Stage

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
Legislation, permits and agreements	Proof of compliance to Air Act & Noise Act must be forwarded by the contractor to PMU/PMC/PIU (in relation to hot mixing, batch mix plants, stone crushers, diesel generators, etc. if any)					
	Proof of tree felling and clearance					
	A copy of the EMP must be kept on site during the construction period					
Access to site	Access to site will be via existing roads. The Contractor will need to ascertain the existing condition of the roads and repair damage due to construction.					
	The Local Traffic Police Department shall be involved in the planning stages of the road closure					
	The Local Traffic Department must be informed at least a week in advance if the traffic in the area will be affected					
	The location of all affected services must be identified and confirmed.					
	All roads for construction access must be planned and approved by the Engineer and its Environmental Specialist ahead of construction activities.					
	No trees, shrubs or groundcover may be removed or vegetation stripped without the prior permission of the Engineer/Environmental Specialist					
	Contractors shall construct formal drainage for all temporary haulage roads in the form of side drains to prevent erosion and discharge of run-off.					
Setting up of construction camp	Choice of site for the Contractor's camp requires the Engineer's/ ES permission and must take into account					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	location of local residents, businesses and existing land uses, including flood zones and slip / unstable zones. A site plan must be submitted to the Engineer for approval.					
	The construction camp may not be situated on a floodplain or on slopes greater than 1:3.					
	In case of camp site on private land, contractor must get prior permission from both the Engineer/ ES and the landowner.					
	The construction camp comprised of: <ul style="list-style-type: none"> • site office • designated first aid area • eating areas • storage areas • batching plant (if required) • refueling areas (if required) • maintenance areas (if required) • crushers (if required) 					
	Cut and fill must be avoided where possible during the set up of the construction camp.					
	The camp must be properly fenced and secured					
	The Contractor shall make adequate provision for temporary toilets (gender specific) for the use of their employees during the Construction Phase.					
	Surrounding bushes not to be used as a toilet facility.					
	Bins shall be provided at convenient intervals for disposal of waste within the construction camp.					
	Recycling and the provision of separate waste receptacles for different types of waste					
Establishing equipment lay-down and storage area	Choice of location for equipment lay-down and storage areas must take into account distances to adjacent land uses, general onsite topography and water erosion potential					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	of the soil. Impervious surfaces must be provided where necessary.					
	Storage areas shall be secure so as to minimize the risk of crime.					
	Residents living adjacent to the construction site must be notified of the existence of the hazardous storage area.					
	Equipment lay-down and Storage areas must be designated, demarcated and fenced if necessary.					
	Fire prevention facilities must be present at all storage facilities.					
	Proper storage facilities for the storage of oils, paints, grease, fuels, chemicals and any hazardous materials to be used					
	These storage facilities (including any tanks) must be on an impermeable surface that is protected from the ingress of storm water from surrounding areas in order to ensure that accidental spillage does not pollute local soil or water resources.					
	Staff dealing with these materials / substances must be aware of their potential impacts and follow the appropriate safety measures.					
Materials management – sourcing	Contractors shall prepare a source statement indicating the sources of all materials (including sands, natural gravels, crushed stone, asphalt, clay liners, etc), and submit these to the Engineer for approval prior to commencement of any work.					
	Prioritize sites already permitted by the Mining Department					
	If other sites are necessary, inform construction contractor that it is their responsibility to verify the suitability of all material sources and to obtain the approval of DSC					
	Where possible, a signed document from the supplier of natural materials shall be obtained confirming that they have					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	been obtained in a sustainable manner and in compliance with relevant legislation (e.g Consent to operate by crusher)					
Education of site staff on general and environmental conduct	Ensure that all site personnel have a basic level of environmental awareness training.					
	Staff operating equipment (such as excavators, loaders, etc.) shall be adequately trained and sensitized to any potential hazards associated with their task.					
	All employees must undergo safety training and wear the necessary protective equipments (e.g helmets, gloves, gumboots, nose mask, ear plugs as per type of work) and clothing.					
	<p>A general regard for the social and ecological well-being of the site and adjacent areas is expected of the site staff. Workers need to be made aware of the following general rules:</p> <ul style="list-style-type: none"> • no alcohol/drugs on site; • prevent excessive noise; • construction staff are to make use of the facilities provided for them, as opposed to ad hoc alternatives (e.g. fires for cooking, the use of surrounding bushes as a toilet facility); • no fires permitted on site; • trespassing on private/commercial properties adjoining the site is forbidden; • other than pre-approved security staff, no workers shall be permitted to live on the construction site; and • no worker may be forced to do work that is potentially dangerous or that he/she is not trained to do. 					
Social impacts	Open liaison channels shall be established between the contractors and interested and affected parties such that any queries, complaints or suggestions can be dealt with quickly and by the appropriate person(s).					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	Road closure (if any) together with the proposed detour needs to be communicated via advertising, pamphlets, radio broadcasts, road signage, etc.					
	Advance road signage indicating the road detour and alternative routes (if required). Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/ complaints.					
	Storage facilities and other temporary structures on site shall be located such that they have as little visual impact on local residents as possible.					
Noise impacts	Construction vehicles are to be fitted with standard silencers prior to the beginning of construction.					
	Equipment that is fitted with noise reduction facilities (e.g. side flaps, silencers, etc) will be used as per operating instructions and maintained properly during site operations					
Conservation of the natural environment	No vegetation may be cleared without prior permission from the Engineer.					
	Trees that are not to be cleared shall be marked beforehand with danger tape.					
Set-up of waste management procedure	The excavation and use of rubbish pits on site is forbidden.					
	Burning of waste is forbidden.					
Social and Cultural Resources	Consult Archaeological Survey of India (ASI) or concerned dept. to obtain an expert assessment of the archaeological potential of the site; Consider alternatives if the site is found to be of medium or high risk; Develop a protocol for use by the construction contractors in conducting any excavation work, to ensure that any chance finds are recognised and measures are taken to ensure they are protected and conserved.					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
Occupational health & safety	Comply with IFC EHS Guidelines on Occupational Health and Safety					
	Develop comprehensive site-specific health and safety (H&S) plan.					
	Provide medical insurance coverage for workers					
Security and safety	Lighting on site is to be set out to provide maximum security and to enable easier policing of the site, without creating a visual nuisance to local residents or businesses.					
	Material stockpiles or stacks, such as, pipes must be stable and well secured to avoid collapse and possible injury to site workers / local residents.					
	Flammable materials shall be stored as far as possible from adjacent residents / businesses.					
	All interested and affected parties shall be notified in advance of any known potential risks associated with the construction site and the activities on it. Examples are: <ul style="list-style-type: none"> • stringing of power lines • earthworks / earthmoving machinery on steep slopes above houses / infrastructure • risk to residences along haulage roads / access routes 					
Core Labour Standard (CLS)- safety and compliance	Monitoring compliance with national labor laws and regulations, provided that these national laws are consistent with CLS. DSC will ensure that bidding and contract documents include specific provisions requiring contractors to comply with all: (i) applicable labor laws and core labor standards on: (a) prohibition of child labor as defined in national legislation for construction and maintenance activities; (b) equal pay for equal work of equal value regardless of gender, ethnicity or caste; and (c) elimination of forced labor; and (ii) the requirement to disseminate information on sexually transmitted diseases including HIV/AIDS to employees and local communities surrounding the project sites.					

B. Construction Stage

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
Climatic impact	<ul style="list-style-type: none"> ✓ Seasonal climatic variations will be considered during scheduling of construction activities in the area. ✓ Consideration of suitable season (non monsoon /lien period) for major construction activity ✓ Excavations and other clearing activities will only be done during agreed working times and permitted weather conditions. ✓ Storm water control (through drainage, diversion) during construction phase as per the method approved by the Engineer. 					
Maintenance of construction camp and work site	The Contractor must monitor and manage drainage of the camp site to avoid standing water and soil erosion.					
	Run-off from the camp site must not discharge into neighbors' properties.					
	Toilets are to be maintained in a clean state and shall be moved to ensure that they adequately service the work areas.					
	Drinking water facility needs to be maintained at camp and work site					
	Open areas or the surrounding bushes are not being used as toilet facility.					
	All litter is collected from the work and camp areas daily.					
	Bins shall be emptied regularly and waste shall be disposed of at the pre-approved site.					
	Eating areas shall be regularly serviced and cleaned to ensure the highest possible standards of hygiene and cleanliness.					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	Camp and working areas are kept clean at all times.					
Staff conduct	Performance of construction workers to ensure that the points relayed during their induction have been properly understood and are being followed.					
	The rules that are explained in the worker conduct section, must be followed at all times					
Dust and air pollution	Consult with DSC/PIU on the designated areas for stockpiling of clay, soils, gravel, and other construction materials					
	Damp down exposed soil and any stockpiled on site by spraying with water when necessary during dry weather					
	Avoiding the need to stockpile on site					
	Use tarpaulins to cover sand and other loose material when transported by trucks					
	Fit all heavy equipment and machinery with air pollution control devices which are operating correctly and regular servicing of the vehicles& equipments off site in order to limit gaseous emissions					
	Excess earth and other windblown loads in transit will be kept covered					
	No fires are allowed on site					
Noise Level	Plan activities in consultation with DSC/PIU so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance; Require horns not be used unless it is necessary to warn other road users or animals of the vehicle's approach; Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor;					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	Ensure that machinery is in a good state of maintenance. Monitor noise levels in potential problem areas, and Maintain maximum sound levels not exceeding 80 decibels (dbA) when measured at a distance of 10 m or more from the vehicle/s.					
Storm water	Earth, stone and rubble is to be properly disposed off so as not to obstruct natural water pathways over the site					
	During construction, un-channeled flow must be controlled to avoid soil erosion.					
Water quality	Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets;					
	Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with BMC/PIU on designated disposal areas					
	Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies					
	Place storage areas for fuels and lubricants away from any drainage leading to water bodies;					
	Dispose any wastes generated by construction activities in designated sites					
	Conduct surface quality inspection according to the Environmental Management Plan (EMP).					
Conservation of natural environment	As the work front progresses the Contractor is to check that vegetation clearing has the prior permission of the DSC/PIU Engineer and Environmental Specialist of PMC.					
	Minimize removal of vegetation and disallow cutting of trees as far as possible through design modification					
	Require to plant three (3) native trees for every one (1)					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	that is removed					
	Prohibit employees from poaching wildlife, bird hunting, and cutting of trees for firewood					
	Non removal of trees of religious importance					
Materials management	Stockpiles shall not be situated such that they obstruct natural water pathways.					
	Stockpiles shall not exceed 2m in height unless otherwise permitted by the concerned Engineer.					
	All concrete mixing must take place on a designated, impermeable surface.					
	No vehicles transporting concrete to the site may be washed on site.					
Landscape and Aesthetics including Waste management	Refuse must be placed in the designated skips / bins which must be regularly emptied.					
	Prepare and implement Waste Management Plan					
	In addition to the waste facilities within the construction camp, provision must be made for waste receptacles to be placed at intervals along the work front.					
	Littering on site is forbidden and the site shall be cleared of litter at the end of each working day.					
	Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas for improvement of aesthetic environment. Recycling is to be encouraged by providing separate receptacles for different types of wastes (including demolition waste) and making sure that staff is aware of their uses.					
	All waste must be removed from the site and transported to a disposal site or as directed by the Engineer.					
	Waste from toilets shall be disposed of regularly and in a responsible manner.					
	Hazardous waste disposal must be carried out by the Contractor in a responsible manner					
	Storage areas will be properly fenced off					
	Top soil needs to be utilised by farmers for nutrient					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	<p>value</p> <p>Coordinate with DSC-PIU for beneficial uses of excess excavated soils or immediately dispose to designated areas</p> <p>Recover used oil and lubricants and reuse or remove from the sites</p> <p>Request DSC/PIU to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work</p>					
Occupational Health and Safety	<p>World bank Environmental, Health, and Safety (EHS) Guidelines - EHS Guidelines for water & sanitation will be followed. Specifically,</p> <p>(i) Develop and implement site-specific Health and Safety (H and S) Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use Personal Protective Equipment like helmet, gumboot, safety belt, gloves, nose musk and ear plugs; (c) H and S Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents;</p> <p>(ii) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site;</p> <p>(iii) Provide medical insurance coverage for workers;</p> <p>(iv) Secure all installations from unauthorized intrusion and accident risks;</p> <p>(v) Provide supplies of potable drinking water;</p> <p>(vi) Provide clean eating areas where workers are not exposed to hazardous or noxious substances;</p> <p>(vii) Provide H and S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective</p>					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	<p>protection, and preventing injuring to fellow workers;</p> <p>(viii) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted;</p> <p>(ix) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;</p> <p>(x) Ensure moving equipment is outfitted with audible back-up alarms;</p> <p>(xi) 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</p> <p>(xii) Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.</p>					
Community Health & Safety	Plan routes to avoid times of peak-pedestrian activities.					
	Liaise with DSC- PIU in identifying risk areas on route cards/maps					
	Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.					
	Provide road signs and flag persons to warn of dangerous conditions, in case of location near the road.					
	Provide protective fencing around open trenches, and cover any open trench with metal planks during non-					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	construction hours					
Traffic & accessibility impact	<p>Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites;</p> <p>Schedule transport and hauling activities during non-peak hours;</p> <p>Locate entry and exit points in areas where there is low potential for traffic congestion;</p> <p>Keep the site free from all unnecessary obstructions;</p> <p>Drive vehicles in a considerate manner;</p> <p>Coordinate with Govt. Traffic Department for temporary road diversions and with for provision of traffic aids if transportation activities cannot be avoided during peak hours; and</p> <p>Notify affected sensitive receptors by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints</p>					
Social impacts	The conduct of the construction staff when dealing with the public or other stakeholders shall be in a manner that is polite and courteous at all times.					
	Disruption of access for local residents, commercial establishments, institutions, etc. must be minimized and must have the Engineer's permissions.					
	The work plan for the construction and laying of pipelines will be devised in such a way to ensure that the construction period is minimized. Compensation will be provided to impacted person					
	Provide walkways and metal sheets where required to maintain access for people and vehicles.					
	Increase workforce in front of critical areas such as educational institutions, places of worship, business					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	establishment and health care establishments to shorten the duration of impacts.					
	Consult businesses and institutions regarding operating hours and factoring this in work schedules.					
	The Contractor is to inform neighbors in writing of disruptive activities at least 24 hours beforehand.					
	Lighting on the construction site shall be pointed downwards and away from oncoming traffic and nearby houses.					
	The site must be kept clean to minimize the visual impact of the site.					
	Machinery and vehicles are to be kept in good working order for the duration of the project to minimize noise nuisance to neighbors.					
	Notice of particularly noisy activities must be given to residents / businesses adjacent to the construction site. Examples of these include: <ul style="list-style-type: none"> • noise generated by jackhammers, diesel generator sets, excavators, etc. • drilling • dewatering pumps 					
	Noisy activities must be restricted to the times given in the Project Specification or General Conditions of Contract.					
	A complaints register (refer to the Grievance Redressal Mechanism) shall be housed at the site office.					
	Interested and affected parties' need to be made aware of the existence of the complaints book and the methods of communication available to them.					
	Contractor shall immediately take the necessary					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	remedial action on any complaint/grievance received by him					
Cultural environment	All the staff and labourers of the Contractor be informed about the possible items of historical or archaeological value					
	If something of this nature be uncovered, ASI or State Department of Archaeology shall be contacted and work shall be stopped immediately.					
Environment Safeguard/safety Officer	Contractor shall appoint one Environment Safeguard/ Safety Officer who shall be responsible for assisting contractor in implementation of EMP, community liaison, consultations with interested/affected parties, reporting and grievance redressal on day-to-day basis.					

C. Defects Liability Stage

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
Construction camp	All structures comprising the construction camp are to be removed from site or handed over to the property owner/ community as per mutual agreement					
	The area that previously housed the construction camp is to be cleaned up.					
	The Contractor must arrange the cancellation of all temporary services.					
Vegetation	All areas that have been disturbed by construction activities must be cleared of alien vegetation.					
	All vegetation that has been cleared during construction is to be removed from site					
	The Contractor is to water and maintain all planted vegetation until the end of the defects liability period					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
Land rehabilitation	All surfaces hardened due to construction activities are to be ripped and imported materials thereon removed.					
	All rubble is to be removed from the site to an approved disposal site.					
	The site is to be cleared of all litter.					
	Surfaces are to be checked for waste products from activities such as concreting or asphaltting and cleared in a manner approved by the Engineer.					
Materials and infrastructure	Fences, barriers and demarcations associated with the construction phase are to be removed from the site					
	All residual stockpiles must be removed to spoil or spread on site					
	All leftover building materials must be returned to the depot or removed from the site.					
	The Contractor must repair any damage that the construction work has caused to neighboring properties.					
General	A meeting is to be held on site between the Engineer, ES-PMC and the Contractor to approve all remediation activities and to ensure that the site has been restored to a condition approved by the Engineer.					
	Temporary roads must be closed and access across these blocked.					
	Refill and re-compact trenches soil and backfilled sand will be removed to expose the leaking junction or pipe					
	Cover or wet excavated material to prevent dusts					
	All areas where temporary services were installed are to be rehabilitated to the satisfaction of the Engineer					
Hazards chemical and waste management	Store of common salt, dry, and dark conditions for no more than one month					
	Use equipment constructed of corrosion-resistant materials					
	Minimize the amount of disinfection materials for using in chlorinator					
	Material safety data sheet to be maintained at chlorine/common salt storage area					
	Regular laboratory testing for dosing and residual chlorine					
	Develop and implement a prevention program that includes identification of potential hazards, written operating					

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring
	procedures, training, maintenance, and accident investigation procedures					
	Store of common salt, dry, and dark conditions for no more than one month					
Water quality assessment and maintained – Health & safety	<ul style="list-style-type: none"> Undertake regular monitoring and maintenance of water supply infrastructure. Quality of drinking water will be checked regularly at supply points and water storage sites 					
Social and Cultural Resources	<ul style="list-style-type: none"> Consult the city authorities to identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity; Complete work in these areas quickly Consult municipal authorities, custodians of important buildings, cultural and tourism authorities and local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals 					

Overall Compliance with CEMP/ EMP

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

III. Training Orientation program details – Date, Venue, Participants, Subjects

IV. APPROACH AND METHODOLOGY FOR ENVIRONMENTAL MONITORING OF THE PROJECT

Brief description on the approach and methodology used for environmental monitoring of each subproject

- Monitoring of environmental IMPACTS on PROJECT SURROUNDINGS (ambient air, water quality and noise levels)
- Brief discussion on the basis for monitoring
- Indicate type and location of environmental parameters to be monitored
- Indicate the method of monitoring and equipment to be used
- Provide monitoring results and an analysis of results in relation to baseline data and statutory requirements

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

Air Quality Results

Site No.	Date of Testing	Site Location	Parameters (Monitoring Results)		
			PM10 µg/m ³	SO ₂ µg/m ³	NO ₂ µg/m ³

Water Quality Results

Site No.	Date of Sampling	Site Location	Parameters (Government Standards)					
			pH	Conductivity µS/cm	BOD mg/L	TSS mg/L	Turbidity in NTU	TP mg/L

Noise Quality Results

Site No.	Date of Testing	Site Location	LAeq (dBA) (Government Standard)	
			Day Time	Night Time

V. SUMMARY OF KEY ISSUES AND REMEDIAL ACTIONS

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

VI. APPENDIXES

Photos

Summary of consultations

Copies of environmental clearances and permits

Sample of environmental site inspection report

Others