Initial Environmental Examination

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IND: Bihar Urban Development Investment Program — Gaya Water Supply Phase 1 (GWSP1) Subproject

Prepared by Urban Development and Housing Department, Government of Bihar for the Asian Development Bank.

ABBREVIATIONS

ADB	—	Asian Development Bank
BOQ	—	bill of quantity
BPLE	—	Bihar Public Land Encroachment Act
BSPCB	—	Bihar State Pollution Control Board,
BUIDCo	—	Bihar Urban Infrastructure Development Corporation
BUDIP	—	Bihar Urban Development Investment Program
C & P	—	consultation and participation
CBO	—	community-based organization
CFE	—	Consent for Establishment
CFO	—	Consent for Operation
CGWB	—	Central Ground Water Board
CITES	—	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS	—	Convention on Migratory Species of Wild Animals
CWR	—	clear water reservoir
DFO	—	Divisional Forest Officer
DSC	—	design and supervision consultants
EAC	—	Expert Appraisal Committee
EARF	—	environmental assessment and resettlement framework
EIA	—	environmental impact assessment
EMP	—	environmental management plan
EPA	—	Environmental Protection Agency
FAM	—	facility administration memorandum
GLSR	—	ground level storage reservoir
GMC	—	Gaya Municipal Corporation
GRC	—	grievance redress committee
GSHAP	—	Global Seismic Hazard Assessment Program
H & S	—	health and safety
IEE	—	initial environmental examination
IUCN	—	International Union for Conservation of Nature and Natural Resources
JNNURM	—	Jawaharlal Nehru National Urban Renewal Mission
MFF	—	multitranche financing facility
MOEFCC	—	Ministry of Environment, Forests and Climate Change
NAAQS	—	National Ambient Air Quality Standards
NGO	—	nongovernment organization
NOC	—	no objection certificate
NRRP	—	National Resettlement and Rehabilitation Policy
NRW	—	nonrevenue water
O & M	—	operation and maintenance
OHSA	—	Occupational Health and Safety Administration
OHSR	—	overhead storage reservoir
OHT	—	overhead tank

OMC	—	operations and maintenance contractor
PHED	—	Public Health Engineering Department
PIU	—	project implementation unit
PMC	—	project management consultant
PMU	—	project management unit
ROW	—	right of way
SEAC	—	State Environment Assessment Committee
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
ULB	—	urban local body
USEPA	—	United States Environmental Protection Agency
WTP	—	water treatment plant

WEIGHTS AND MEASURES

cm	–	centimeter
crore	–	100 lac = 10,000,000
cumec	–	cubic meter per second
lac	–	100 thousand = 100,000
Kanal	–	505.39 square meter
km	–	kilometer
kph	–	kilometer per hour
lpcd	–	liters per capita per day
lpd	–	liters per day
m	–	meter
m^2	–	square meter
m^3	–	cubic meter
mg/l	–	milligrams per liter
ML	–	million liters
MLD	–	million liters per day
mm	–	millimeter
msl	–	mean sea level
µ	–	10^{-6} meter
$\mu g/m^3$	–	micrograms per cubic meter

NOTES

In this report, "$" refers to US dollars.
“INR” refers to Indian rupees

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EXECUTIVE SUMMARY

1. The first loan under the program, Tranche 1 or Loan 2861-IND, amounting to $65 million, was signed on 25 March 2013 and became effective on 6 June 2013.[1] Project 1, supported by Tranche 1 of Bihar Urban Development Investment Program (BUDIP), included subprojects for improvement of infrastructure, operations and sustainability of water supply in Bhagalpur. The project has four outputs: (i) water supply infrastructure rehabilitated and newly constructed in Bhagalpur, (ii) staffing and skills for water supply operations improved in Bhagalpur, (iii) systems for water supply service delivery management improved in Bhagalpur, and (iv) subproject implemented on time within the budget in a transparent manner.

2. The proposed Project 2, will include physical and non-physical investments in water supply improvements in Bhagalpur and Gaya. Bhagalpur and Gaya were selected for financing under Project 2 based on the implementation capacity, project readiness and sector priorities of the Government, in accordance with the agreed framework financing agreement (FFA) for BUDIP. Project 2 is aligned with improved environment and well-being of residents in the program cities as defined by the Investment Program. It aims to improve access to sustainable water supply services in Gaya and Bhagalpur.

3. **Scope of Initial Environmental Examination**. Project 2 consists of two water supply subprojects in Gaya city. One of these is the Gaya Water Supply Phase 1 (GSWP1) Subproject. This draft Initial Environmental Examination (IEE) covers the GWSP1 subproject, which includes the following components: (i) refurbishment of 29 tube wells, with 68 MLD combined capacity; (ii) installation of around 37 flow meters; (iii) construction of 16.5 km transmission/ rising mains; (iv) construction of 447.8 km of distribution network (v) demolition of 5 pump houses and construction of 9 new pump houses; (vi) connection and metering of around 75,000 households (HHs); (vii) provision of 200 stand posts; (viii) construction of 32 monitoring stations; (ix) construction of 6 new overhead storage tanks of 10.95 ML capacity and 3 ground level storage reservoirs of total 11.88 ML; and (x) construction and management of 5 customer service centers.

4. **Screening and Categorization.** An environmental assessment of the GWSP1 subproject was conducted using ADB's Rapid Environmental Assessment (REA) checklist for Water Supply (Appendix 1). Results of the assessment show that the subproject and its components are unlikely to cause significant adverse environmental impact. Thus, GWSP1 subproject is categorized as environmental category B as per ADB SPS, 2009 and this draft IEE has been prepared in accordance with ADB SPS requirements for environment category B projects. Based on the Government of India EIA Notification 2006, GWSP1 subproject does not require an environmental clearance from the government**.**

5. This draft IEE has been prepared using the preliminary detailed design Therefore, this draft IEE will be finalized during detailed design stage to reflect any changes and the final detailed design. This IEE primarily: (i) provides information on the project and its environmental requirements; (ii) provides the necessary baseline conditions of the physical, ecological, physical cultural and socio-economic environments and/or resources in and surrounding the project's area of influence; (iii) identifies and assesses potential impacts arising from the implementation of the project on these environments and/or resources; (iv) recommends

[1] Upon request from Government of Bihar and Government of India, savings from Tranche 1 of $8 million were cancelled from Tranche 1 in December 2014.

measures to avoid, mitigate, and compensate for the adverse impacts; (v) presents information on stakeholder consultations and participation during project preparation (vi) recommends a mechanism to address grievances on the environmental performance of the project; and (vii) provides an EMP which includes an environmental monitoring program, and the responsible entities for mitigation and monitoring. In particular, 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. The IEE will be made binding on all GWSP1 contractors and a copy is required to be kept on site always.

6. **Institutional and Implementation Arrangements**. The Urban Development and Housing Department (UDHD) of the state government of Bihar is the executing agency, which is responsible for management, coordination, and execution of all activities funded under the loan. A Program Steering Committee (PSC) will assist UDHD in providing policy guidance and coordination across all towns and subprojects. Bihar Urban Infrastructure Development Corporation (BUIDCo) will serve as the implementing agency and Project Management Unit (PMU) of the subproject. The Project Management Consultant (PMC) and the Design and Supervision Consultants (DSC) will assist the PMU on various tasks under the subproject. The project implementation unit (PIU) will be formed within Gaya city level which will oversee the day-to-day implementation of the subproject, including implementation of the safeguards plans. The PIU will have a Safeguards Officer who will be responsible for (i) data collection for IEE and other safeguard document preparation and implementation, (ii) obtaining right of way clearances and prepare progress reports with respect to IEE implementation, and (iii) obtaining statutory clearances and no-objection certificates (NOCs) from government agencies/other entities and entering into agreements with them for use of their land. The Contractor will be responsible for the following: (i) compliance with all applicable legislation and the requirements of the Environmental Management Plan (EMP), (ii) ensuring that 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, (iii) supplying 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, (iv) providing environmental awareness training to staff, (v) shouldering the costs of any damages/ compensation resulting from non-adherence to the EMP or written site instructions, (vi) conducting all activities in a manner that minimizes disturbance to directly affected residents and the public in general, and foreseeable impacts on the environment, (vii) ensuring that the engineer is informed in a timely manner of any foreseeable activities that will require input from the Environmental Specialist, (viii) appointing one full time Environment & Safety Officer for implementation of EMP, community liaising, reporting and grievance redressal on day to day basis, and (ix) receiving complaints/grievances from the public, immediately implementing the remedial measures and reporting to the Engineer (DSC) and PIU within 48 hours.

7. **Environmental Management Plan.** The EMP forms part of this IEE. It will guide the environmentally-sound construction of the subproject and ensure efficient lines of communication among 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.

8. 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.

9. Anticipated impacts during planning stage include impact on sensitive receptors including common property resources due to planning of distribution mains and rising mains. Mitigation has been considered after review of design and modification.

10. **Consultation, Disclosure and Grievance Redress**. 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. The IEE includes the activities undertaken during project design to engage the stakeholders; and planned information disclosure measures and process for carrying out consultation with affected people and facilitating their participation during project implementation.

11. The subproject's Grievance Redressal Mechanism provides 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.

12. **Monitoring and Reporting.** The PMU and PMC will be responsible for environmental monitoring and reporting. During the construction phase, the Contractor will undertake internal monitoring and submit monthly EMP implementation reports to PMC and PIU. These reports will be used by PMC/PIU in preparing the semi-annual environmental monitoring reports for ADB. PMC/PIU will forward the draft report to PMU and subsequently, PMU will submit the final draft semi-annual environmental monitoring reports to ADB. PMU/PIU will disclose the reports on the project website and ADB will also disclose said reports on its website.

13. **Recommendations and Conclusions**. The process described in this document has assessed the environmental impacts of all elements of the proposed GWSP1 subproject. Potential negative impacts were identified in relation to pre-, construction and operation of the improved infrastructure, but no environmental impacts were identified. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. The public participation processes undertaken during project design ensured stakeholders are engaged during the preparation of the IEE. The planned information disclosure measures and process for carrying out consultation with affected people will facilitate their participation during project implementation. 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.

14. 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.

15. Based on the findings of this IEE and as per ADB SPS 2009, the subproject's environmental category "B" is confirmed. Therefore, the subproject does not require any further study or detailed Environmental Impact Assessment.

I. INTRODUCTION

1. The first loan under the program, Tranche 1 or Loan 2861-IND, amounting to $65 million, was signed on 25 March 2013 and became effective on 6 June 2013.[2] Project 1, supported by Tranche 1 of Bihar Urban Development Improvement Program (BUDIP), included subprojects for improvement of infrastructure, operations and sustainability of water supply in Bhagalpur. The project has four outputs: (i) water supply infrastructure rehabilitated and newly constructed in Bhagalpur, (ii) staffing and skills for water supply operations improved in Bhagalpur, (iii) systems for water supply service delivery management improved in Bhagalpur, and (iv) sub-project implemented on time within the budget in a transparent manner.

2. The proposed Project 2, supported by the proposed tranche 2 of BUDIP, will include physical and non-physical investments in water supply improvements in Bhagalpur and Gaya. Bhagalpur and Gaya were selected for financing under Project 2 based on the implementation capacity, project readiness and sector priorities of the Government, in accordance with the agreed framework financing agreement (FFA) for BUDIP. Project 2 is aligned with improved environment and well-being of residents in the program cities as defined by the Investment Program. It aims to improve access to sustainable water supply services in Gaya and Bhagalpur.

3. The impact will be increased access to better quality and sustainable urban infrastructure and services by the people, especially vulnerable households, in Bhagalpur and Gaya. The expected outcome will be water supply infrastructure operations and sustainability is improved in Bhagalpur and Gaya.

4. Project 2 will have three outputs: (i) water supply infrastructure constructed and rehabilitated; (ii) staffing and skills for water supply operations improved; and (iii) systems for water supply service delivery management improved.

5. Under Output 1, Project 2 includes the following works packages: (i) Gaya Water Supply Project, Package 1 (GWSP 1); (ii) Gaya Water Supply Project, Package 2 (GWSP 2); and (iii) Bhagalpur Water Supply Project 2 (BWSP 2). The detailed description and outputs from Project 2 are as follows:

6. **Water supply subproject in Gaya**. Under the first output on “water supply infrastructure constructed and rehabilitated”, Project 2 includes the Gaya Water Supply Project (GWSP). The overall objective of GWSP is to deliver a continuous, pressurized supply of safe water to the entire population of Gaya. The GWSP will be executed under two separate contracts for two packages, namely: Gaya Water Supply Project, Package 1 (GWSP1) and Gaya Water Supply Project, Package 2 (GWSP2).

7. Infrastructure component of GWSP1 includes rehabilitation of the existing water source works and construction of water distribution system including transmission mains and distribution network, storage reservoirs, standpipes and metered household connections. Infrastructure component of GWSP2 will provide new water source works and transmission

[2] Upon request from Government of Bihar and Government of India, savings from Tranche 1 of $8 million were cancelled from Tranche 1 in December 2014.

mains for the supply of bulk water to the Gaya water distribution system. The construction periods of Packages 1 and 2 are expected to be coterminous, such that bulk water extracted from the new water source works under Package 2 will be supplied to the water supply system developed under Package 1. As a part of the Package 1 works, certain supply points are identified to connect to the Package 2 transmission.

8. **Scope of Initial Environmental Examination**. This draft Initial Environmental Examination (IEE) covers the GWSP1 subproject, which includes rehabilitation of the existing water source works with the following components: (i) refurbishment of 29 tube wells, with 68 MLD combined capacity; (ii) installation of around 37 flow meters; (iii) construction of 16.5 km transmission/ rising mains; (iv) construction of 447.8 km of distribution network (v) demolition of 5 pump houses and construction of 9 new pump houses; (vi) connection and metering of around 75,000 households (HHs); (vii) provision of 200 stand posts; (viii) construction of 32 monitoring stations; (ix) construction of 6 new overhead storage tanks of 10.95 ML capacity and 3 ground level storage reservoirs of total 11.88 ML; and (x) construction and management of 5 customer service centers.

9. **Screening and Categorization.** An environmental assessment of the GWSP1 subproject was conducted using ADB's Rapid Environmental Assessment (REA) checklist for Water Supply (Appendix 1). Results of the assessment show that the subproject and its components are unlikely to cause significant adverse environmental impact. Thus, GWSP1 subproject is categorized as environmental category B as per ADB SPS, 2009 and this draft IEE has been prepared in accordance with ADB SPS requirements for environment category B projects.

10. This IEE was prepared based on preliminary designs therefore, is required to be updated during the detailed design stage, to reflect any changes, or amendments to the subproject. This IEE primarily: (i) provides information on the project and its environmental requirements; (ii) provides the necessary baseline conditions of the physical, ecological, physical cultural and socio-economic environments and/or resources in and surrounding the project's area of influence; (iii) identifies and assesses potential impacts arising from the implementation of the project on these environments and/or resources; (iv) recommends measures to avoid, mitigate, and compensate for the adverse impacts; (v) presents information on stakeholder consultations and participation during project preparation (vi) recommends a mechanism to address grievances on the environmental performance of the project; and (vii) provides an environmental management program (EMP) which includes an environmental monitoring program, and the responsible entities for mitigation and monitoring. In particular, 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. The IEE will guide the environmentally sound detail design, construction and operation and maintenance of the subproject. It will ensure efficient lines of communication between the project management unit (PMU), project implementation unit (PIU) in Gaya, consultant teams, and contractors. The IEE will be made binding on all GWSP1 contractors and a copy is required to be kept on site always.

II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. ADB Policy

11. 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 and loans involving financial intermediaries and private sector loans.

12. **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.

13. **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.

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

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

B. National and State Laws

15. The implementation of the subprojects will be governed by Government of India 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.

16. **Environmental Impact Assessment Notification.** The government's Environmental Impact Assessment (EIA) Notification of 2006, which replaces the EIA Notification of 1994, requires environmental clearance for certain defined activities/projects[3]. This Notification classifies the projects or activities that require environmental clearance into 'A' and 'B' categories depending on the impact potential and/or scale of project. For both category projects, prior environmental clearance is mandatory before any construction work, or preparation of land except for securing the land, is started. Clearance provisions are as follows:

(i) Category 'A' projects require prior environmental clearance from the Ministry of Environment Forest and Climate Change (MoEFCC)[4];

(ii) Category 'B' projects require prior environmental clearance from the State Environmental Impact Assessment Authority (SEIAA)[5].

17. This Notification provides that, any project or activity specified in Category 'B' will be treated as Category A, if located in whole or in part within 10 km from the boundary of: (i) protected areas notified under the Wild Life (Protection) Act, 1972, (ii) critically polluted areas as notified by the CPCB from time to time, (iii) notified eco-sensitive areas, (iv) inter-state boundaries and international boundaries. In the case where an SEIAA does not exist, Category B project will be reviewed by the MoEFCC and reclassified as Category A.

18. The proposed subproject is not listed in the EIA Notification of 2006 "Schedule of Projects Requiring Prior Environmental Clearance". Thus, environmental clearance is not required.

19. **Water (Prevention and Control of Pollution) Act of 1974, Rules of 1975, and amendments.** This Act covers any component of the subprojects having the potential to generate sewage or trade effluent. Under Section 25 of the Act, such subprojects have to obtain from State Pollution Control Board (SPCB) (i) Consent for Establishment (CFE) before starting implementation, and (ii) Consent for Operation (CFO) before commissioning the facility. The Water Act also requires the occupier of such subprojects to adopt measures for abating any possible pollution of receiving water bodies. The following types of projects require CFE and CFO from SPCB:

(i) New or augmentation of water treatment plants;
(ii) New or augmentation of sewage treatment plants.

20. The proposed subproject is not included in the lists of activities requiring CFE and CFO under the Water Act. Emissions and discharges shall comply with standards notified by the

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[3] EIA Notification of 2006 —Schedule of Projects Requiring Prior Environmental Clearance

[4] Category A projects - based on preliminary details provided by the project proponent, the MoEFCC Expert Appraisal Committee (EAC) will determine comprehensive terms of reference (TOR) for the EIA studies. This TOR will be finalized within 60 days. On the recommendation of the EAC based on EIA studies, MoEFCC provides the environmental clearance.

[5] Category B projects – to be further divided by State Level Expert Appraisal Committee (SEAC) into B1 (require EIA studies) and B2 (do not require EIA studies). The SEAC will determine TOR for EIA studies for B1 projects within 60 days. On the recommendation of the SEAC based on EIA studies, SEIAA provides the environmental clearance.

Central Pollution Control Board.

21. **The Air (Prevention and Control of Pollution) Act 1981, amended 1987 and The Air (Prevention and Control of Pollution) Rules, 1982.** This Act covers any component of the subprojects having potential to emit air pollutants into the atmosphere. Under Section 21 of the Act, such subprojects have to obtain from SPCB (i) CFE before starting implementation, and (ii) CFO before commissioning the facility. The Air Act also requires the occupier of the project or facility to adopt necessary air pollution control measures for abating air pollution. Application for CFE and CFO can be done online through the website[6] of SPCB. The following types of emission sources require CFE and CFO from SPCB:

(i) Diesel generators; and
(ii) Hot mix plants, wet mix plants, stone crushers etc., if installed for construction.

22. Emissions and discharges shall comply with standards notified by the CPCB.

23. **Noise Pollution (Regulation and Control) Rules, 2000, as amended.** This Rules states that the State Government shall take measures for abatement of noise including noise emanating from vehicular movements and ensure that the existing noise levels do not exceed the ambient air quality standards specified under the Rules. All development authorities, local bodies, and other concerned authorities, while planning developmental activity or carrying out functions relating to town/city and country planning, shall take into consideration all aspects of noise pollution as a parameter of quality of life to avoid noise menace and to achieve the objective of maintaining the ambient air quality standards in respect of noise. Based on the Rules, an area comprising not less than 100 meters around hospitals, educational institutions and courts may be declared as silence areas/zones.

24. **The Indian Forest Act of 1927.** This Act empowers State of Bihar to declare any forest land or waste-land, which is the property of government or over which the government has proprietary rights or to the whole or any part of the forest produce of which the government is entitled, a reserved forest or protected forest. State of Bihar may assign to any village-community the rights of the government over a reserved forest - called the village-forest. The Forest Act also allows government control over forests and lands not owned by the government.

25. For reserved forests and village-forests, activities like clearing or breaking up of any land for cultivation or for any other purpose, damage to vegetation/trees and quarrying or removing any forest produce are prohibited. For protected forests, State of Bihar makes rules to regulate activities like cutting of trees and removal of forest produce; clearing or breaking up of land for cultivation or any other purpose; and for protection and management of any portion of protected forest.

26. **Forest (Conservation) Act of 1980 (amended in 1988).** This Act restricts the deforestation of forests for use for non-forest purposes. Accordingly, State of Bihar requires prior approval of MoEFCC for the use of forest land for non-forest purposes (which means the breaking up or clearing of any forest land) or for assigning lease to any private person or agency not controlled by government. The Forest (Conservation) Rules of 2003 issued under this Act provides specific procedures to be followed for conversion of forest land for non-forest purposes.

27. Conversion of forest lands that are part of National Parks or Sanctuaries and Tiger

[6] http://bhocmms.nic.in/.

Reserve areas (notified under Indian Wildlife [Protection] Act of 1972) is not permitted. In exceptional case, State of Bihar requires consent of the Indian Board of Wildlife for obtaining approval of the State Legislature for de-notification of the area as a sanctuary. The State or National Wildlife Board under MoEFCC is the authority which will grant a No Objection Certificate (NOC) for any construction within a sensitive area. Every user agency, which proposes to use any forest land for non-forest purposes and use buffer zone of the wildlife protected areas for other purposes, must apply for forest and/or wildlife clearance.

28. **The Bihar Forest (Amended) Act, 1990 and Bihar Public Land Encroachment Act, 1956 (BPLE).** This Act provides that encroachment of forest land is a cognizable and non-bailable offense. 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.

29. **Ancient Monuments and Archaeological Sites and Remains Rules, 1959.** This Rules designates areas within a radius of 100 meters and 300 meters from a "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.

30. **World Bank Environmental, Health, and Safety Guidelines –** The General Environmental, Health, and Safety (EHS) Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines which provide users on EHS in specific industry sectors[7]. Whereas, the EHS Guidelines for Water and Sanitation provides information relevant and specific to the operation and maintenance of (i) potable water treatment and distribution systems, and (ii) collection of sewage in centralized systems (such as piped sewer collection networks) or decentralized systems (such as septic tanks subsequently serviced by pump trucks) and treatment of collected sewage at centralized facilities[8]. Project 2 will follow these World Bank EHS Guidelines.

31. 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:

(i) Eliminating the hazard by removing the activity from the work process. Examples include substitution with less hazardous chemicals, using different manufacturing processes, etc;

(ii) Controlling the hazard at its source through use of engineering controls. Examples include local exhaust ventilation, isolation rooms, machine guarding, acoustic insulating, etc;

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[7] https://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final+-+General+EHS+Guidelines.pdf?MOD=AJPERES

[8] http://www.ifc.org/wps/wcm/connect/e22c050048855ae0875cd76a6515bb18/final+-+water+and+sanitation.pdf?mod=ajperes

(iii) 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.

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

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

C. Conventions, Treaties and Protocols

33. In addition to national and state rules and regulations, Government of India is a party and signatory to international conventions such as the International Union for Conservation of Nature and Natural Resources, Convention on Migratory Species of Wild Animals, Convention on International Trade in Endangered Species of Wild Fauna and Flora, and Ramsar Convention on Wetlands of International Importance are applicable in the selection and screening of some subprojects under BUDIP. However, these international environmental agreements are not applicable for GWSP1 subproject.

34. 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 subproject is not covered by the EIA notification as this is not covered under either Category A or Category B of the notification. Environmental Clearance is not required for the proposed GSWP1 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 required for construction of water reservoirs at two locations, namely: Ramshilla hill and Brahmayoni hill, both within a protected forest. For any activity (even for rehabilitation of old reservoirs located in the forest) within a forest area, NOC needs to be obtained from state forest department before implementation of the project. Murli hill is also under forest area. For any renovation work, NOC needs to be obtained from DFO Gaya. Clearance from Forest department for cutting of trees, if any.
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.	Some part of the sub-project area is located within and nearby the state protected monuments area like Vishnupad Temple, Ramshilla hill, and Brahmayoni hill. NOC needs to be obtained from State Museum & Archeological Directorate under Art, Culture and Youth Dept. Govt. of Bihar before commencement of the work. On date status is shown in Table 2 below.

Applicability of Acts/Guidelines	Compliance Criteria
	Clearance from ASI, Govt. of India is not required for the subproject.
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 for Establishment (CFE) and Consent for Operation (CFO) from the Bihar Pollution Control Board for setting up of hot mix plants, wet mix plants, stone crushers and diesel generators (if any). To be obtained by the Contractor, prior to construction.

35. Status and target date for getting all NOCs except land allotment (dealt with separately under the Resettlement Plan) is given in Table 2 below.

Table 2: Detail of requirement of NOC and status

Sr. No	NOC/ Department	Purpose	Responsibility	Timeframe
1	State Forest Department	GLSR at Ramshilla hill and Brahmayoni hill	PMU with PMC	1st level of forest clearance obtained from Forest Dept. on 24 August 2015. Final clearance to be obtained after submission of fees and fulfillment of other conditions (Letter attached as Appendix 2) Expected completion of entire process by December 2015
3	State Museum & Archaeological Directorate under Art, Culture and Youth Dept. Govt. of Bihar-	Construction /Renovation work near Vishnupad Temple, Ramshilla hills, Brahmayoni hill	PMU with PMC	NOC received from State Museum & Archaeological Directorate on 1 September 2015 (Letter attached as Appendix 3)
2	DFO Gaya	Renovation work on Ramshilla Hill, Bramayoni Hill, Murli hill	PMU with PMC	Process initiated on 25 March 2015 (Letter attached as Appendix 4)
4	Utilities	Telephone lines, electric poles and wires, water pipe (old) existing within right-of-way (ROW) may be damaged.	Contractor-PIU/DSC	2 months (after commencing of contract and followed by confirmatory survey)
5	Transport Dept.	During construction work Traffic Management Plan	Contractor-PIU/DSC	1 month (As per requirement during implementation of the project)

6	GMC	Entire work in city area	Contractor-PIU/DSC	1 month
7	PHED/PWD	Old pipeline renovation and road cutting during construction	Contractor-PIU/DSC	2 months (before construction)
8	Forest Dept.-DFO Gaya	For tree cutting at Ramshila hill Bramayoni Hill, Budva Mahadev	PMU-PMC	3 months before specific construction. Application will be sent after getting complete forest clearance
9	Temple trust	Staircase are used as Access road at Ramshila Hill	PMU-PMC	NOC received on 24 August 2015 (Appendix 5)

III. DESCRIPTION OF THE PROJECT

A. The Project Area

36. Gaya is the district headquarter city in the Gaya District located in the southern part of Bihar State. The city is situated at the banks of Phalgu river. The city is located at an altitude of about 110 meters above the MSL.

B. Existing Conditions

37. **Water Sources.** The water sources of Gaya consist of underground water extracted through tube wells located on both sides of the Phalgu river, Manpur and Gaya main. The Phalgu river divides Gaya city into two parts, Manpur and Gaya main. There are 39 tube wells in the city at present, of which two are in standby, three are not yet commissioned and two are not working. The tube wells are distributed in four locations, namely: Manpur side, Dandibagh side, Panchayati Akhara side, and the main city area. The tube wells in Manpur, Dandibagh and Panchayati Akhara areas are bored in the bed/bank of Phalgu river and the other tube wells are bored at various locations in the city away from the river bank. The water from tube wells in Manpur side is being pumped directly to the distribution system in Manpur area. The water from tube wells in Dandibagh side is being pumped to the reservoirs located on Brahmayoni hills. The water from tube wells in Panchayati Akhara is being pumped to the reservoirs located on Ramshila hills and Murli hills. The water from the tube wells in the city area is being pumped directly to the distribution system in the city.

38. The Design and Supervision Consultant (DSC) has performed flow measurements at all tube wells in Gaya and the results indicate that expected total yield of water from all running tube wells is 61 MLD. However, it has been further assessed that actual total volume of water received from the tube wells is less compared to the expected total yield due to low voltage, power supply interruptions and old pumping machineries.

39. The tube wells are also not equipped with measuring instruments (e.g. ampere meters, volt meters, pressure gauges, flow meters, water level measuring instruments, etc.). In the absence of these instruments, the present level of production and performance level of electro-mechanical equipment are not known.

40. The water district zones and wards of Gaya are shown in Figure 1.

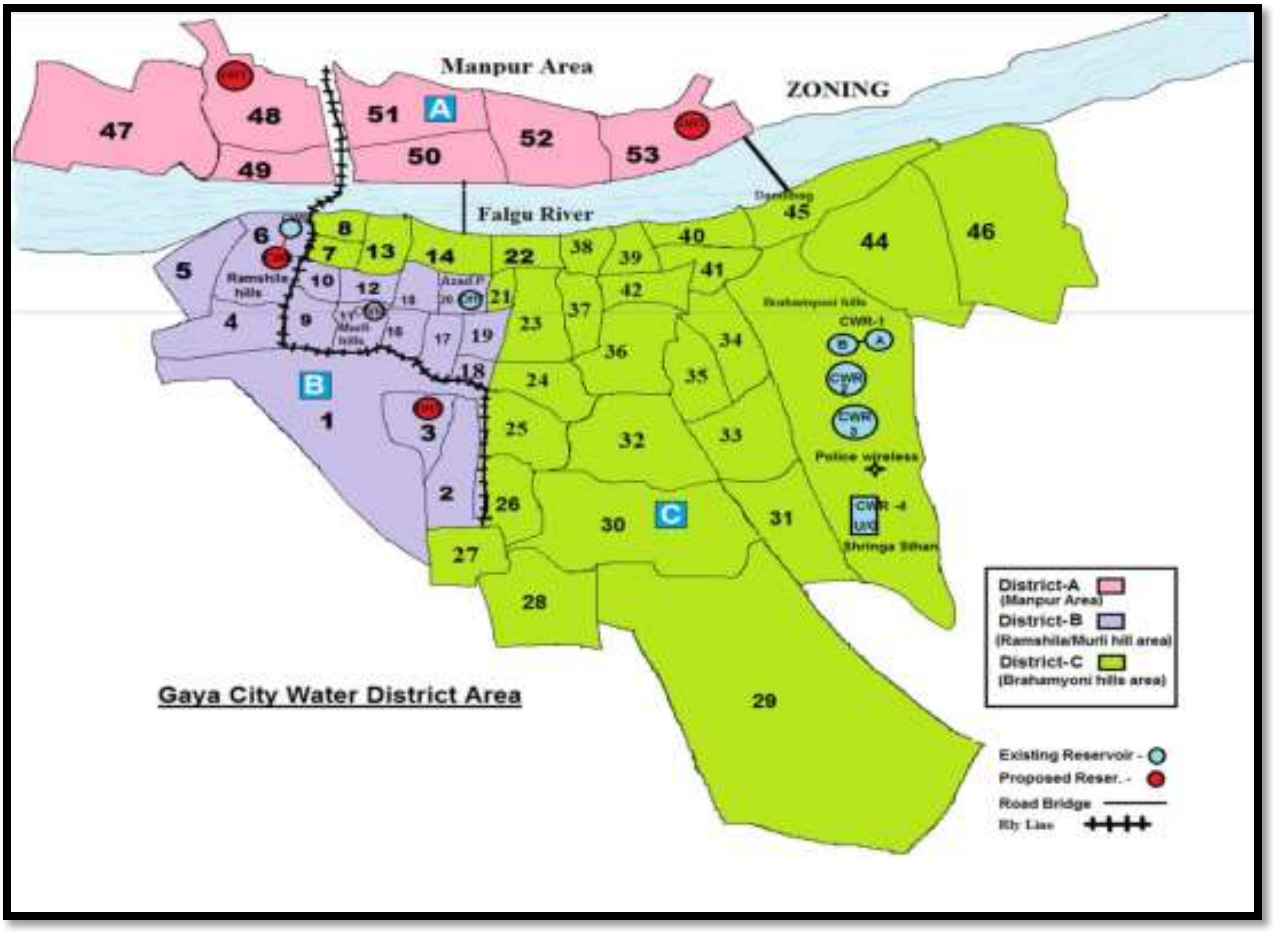


Figure 1: Ward wise Gaya city Water District Area

41. **Existing Water Distribution System**. The existing distribution system does not conform to basic engineering design and best practices. One part of system consists of transmission mains raising the water to one overhead tank (OHT) and seven ground level storage reservoirs (GLSR). Whereas, another part of the system does not have storage capacity wherein it operates by pumping the water from the tube wells directly to the distribution network.

A.

42. **Transmission / Rising Mains.** There are three cast iron rising mains with 350 mm, 50 mm and 600 mm in diameters. Each of these rising mains has length of 3 km which extends from Dandibagh to Brahmayoni Hills reservoirs. There is also one DI rising main with 450 mm in diameter and length of 3.1 km which has been laid recently under the augmentation project of the 12th Finance Commission program.

43. **Water Storage Reservoir.** At present, there are seven GLSR and one OHT being utilized in the main city area. The total capacity of the reservoirs is 17,747 m^3. See details in Table 3 below.

Table 3: Existing Storage Reservoirs

No.	ID	Location/Name	Type of storage	Capacity [m³]	Staging	Present condition
1	7	Ramshila Hills	GLSR	227	No	50+ years old Needs replacement
2	9	Murli Hills	GLSR	1630	No	50+ years old. Roof and inside wall in very bad condition
3	10	Azad Park	OHT	454	12.2 m	Needs slight repair from inside
4	11a	Brahmayoni	GLSR	1816	No	70+ years old. Roof and inside wall in very bad condition
5	11b	Brahmayoni	GLSR	1816	No	70+ years old. Roof and inside wall in very bad condition
6	12	Brahmayoni	GLSR	3632	No	Needs slight repair from inside
7	13	Brahmayoni	GLSR	3632	No	Needs slight repair from inside
8	14	Shringh Sthan	GLSR	4540	No	Although recently constructed, it leaks from various places
Total						

Note: The ID corresponds to the marking on the Drawing mentioned above
Source: DPR for Gaya water supply

44. The GLSRs constructed on Ramshila hills, Murli hills and OHT at Azad Park are not functional at present due to lower capacity of the pumping stations compare to available storage capacity. Also, the water coming from some tube wells is already being pumped directly to the distribution network.

45. **Distribution Network.** Table 4 summarizes the length of the existing distribution network sorted by pipe diameter.

Table 4: Existing Distribution Network Data

Description	Length [km]	Dia. [mm]	Length [m]
PHED		100	39,684
		150	16,422
		200	15,788
		250	2,050
		300	981
		350	2,140
		400	5,235
	85	450	2,594
		Sub-Total	84,894= Approx. 85 km
Before 1982		50	436
		63	3,930
		75	10,952
		100	8,065
		125	9,166
		150	12,790
		175	2,633
		200	6,986
		225	253
		250	3,811
		300	2,728
		400	2,325
	65	600	645
		Sub-Total	64,722= Approx. 65 km

Description	Length [km]	Dia. [mm]	Length [m]
Total	**150**		**149,616 = Approx. 150 km**

46. There is no zoning for the existing distribution system. Areas connected from one reservoir are served all together at the same time. The existing tube wells which are not connected to any reservoir provide simultaneous feed to the distribution system. Meaning, both the source and distribution system do not have an adequate control system in place. Further, there is no chlorination system that is functioning to disinfect the water being supplied, resulting to high health risk.

47. A part of the pipelines laid under the supervision of Public Health Engineering Department (PHED) is presently being used, but has not been handed over to the Gaya Municipal Corporation (GMC). It is expected that after its completion, the pipeline project will be transferred to the management of GMC. GMC will then be the owner of the distribution system and PHED will execute any civil works on behalf of GMC.

48. At present there are 1,074 public stand posts in the city, from which people (and households) who do not have water service connections get their drinking water. However, not all of these public stand posts are functional. After completion of the subproject, all stand posts will be transferred to the management of GMC.

49. **Service Connections.** There are around 12,500 registered consumers in the area. However, there is a large number of unauthorized and unidentified consumers connected to the existing distribution system. According to the information collected from Wards Counselors, the total number of connections is about 29,000. There is no metering of water supplied to consumers and there is no water billing system as well. Water charges are levied as part of the Holding Tax on properties by GMC.

50. **Recent and Ongoing Construction Work.** In 2007, Government of India sanctioned a project under the 12th Finance Commission program to augment water supply of the town. The project involved construction of a battery of tube wells on the bank of Phalgu river near Dandibagh and in various parts of the town. The aim was to increase water production by 16 MLD and provide distribution system for the newly developed areas like Manpur and AP Colony, among others. The work on the project is being executed by PHED on behalf of GMC, and is now at advanced stage of completion. The highlights of the works as communicated by PHED are as follows:

(i) Transformers – out of total five installed three are complete
(ii) Eight nos. of tube wells – completed
(iii) Eight nos. of Pump houses – completed
(iv) Pumps and motors – eight nos. provided, one currently working
(v) Rising Mains – laying of 2,500m completed
(vi) Gravity Mains – completed laying of 3,433m out of total 4,000m, the works of Sluice Valves and sluice valve chambers are 50% complete
(vii) Service reservoir – completed
(viii) Distribution Network – out of proposed total 59,335m, the length laid is 47,966m. Large portion of the total length laid was not commissioned to GMC.

51. The existing Gaya water supply system, particularly tube wells, rising mains, and reservoirs are shown in following figure. **Appendix 6** shows photographs of existing reservoirs and pumping stations.

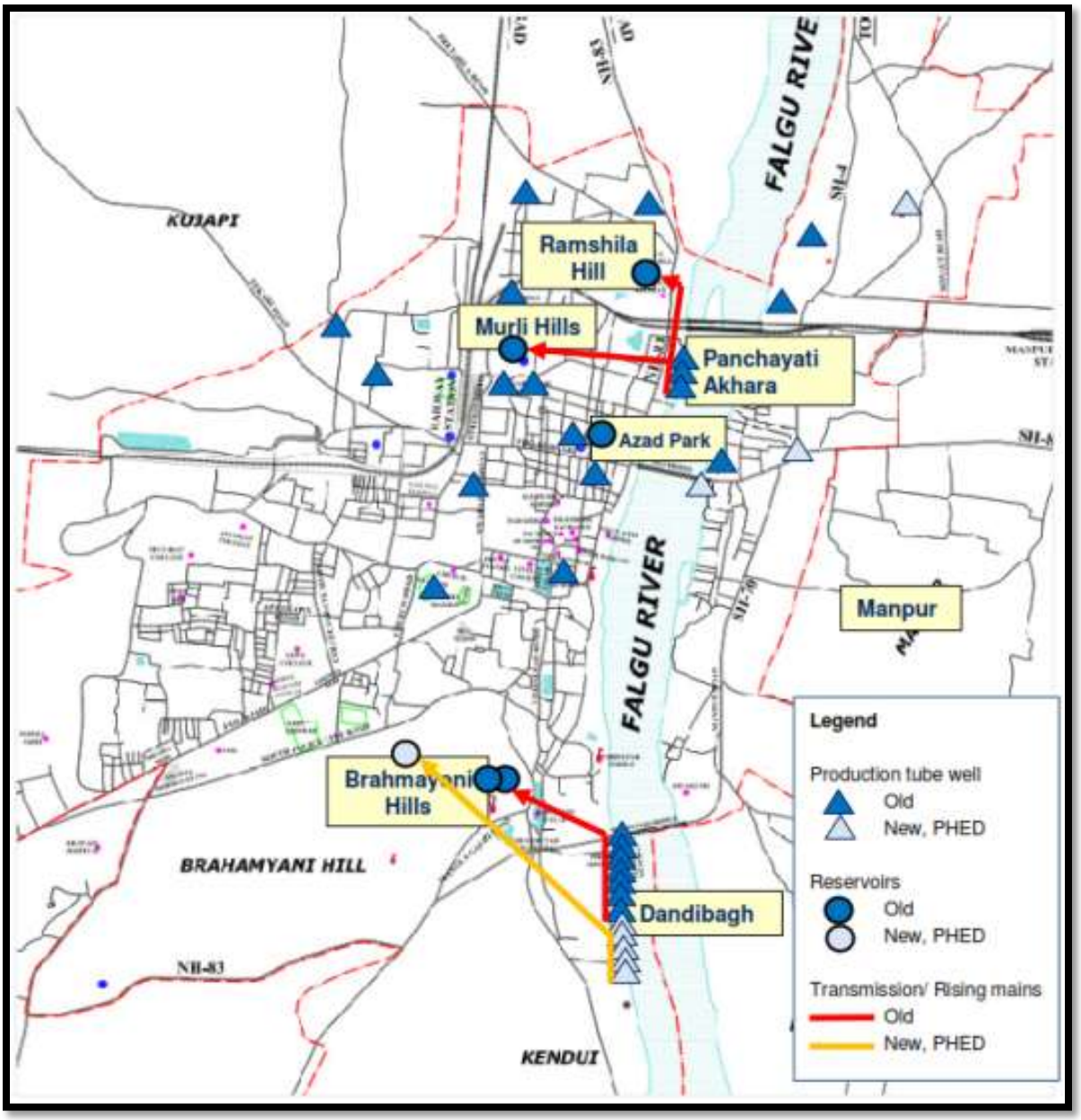


Figure 2: Gaya existing water supply system: wells, rising mains, reservoirs

C. Justification of the proposed GWSP

52. The proposed GWSP has been planned after analyzing the present situation in Gaya and justifying its need. In particular, GWSP1 subproject is necessary because the present water supply system of Gaya is inadequate for the needs of the growing population. Per capita supply is low at 40 lpcd which is below the required 135 lpcd. The unaccounted for water (UFW) is at 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 Gaya. Therefore, the objective of GWSP1 subproject is to provide continuous (24x7), pressurized, and safe water to the entire population at 135 lpcd through household connections, where feasible, at the required minimum pressure head. In other words, the water service will aim to meet the Indian National Service Level Benchmarks.

D. Proposed Subproject and Components

53. **Water sustainability**. Hydrogeological study has been conducted at Gaya in the year 2014. Based on the hydrogeological assessment studies of the ground water potential zone of Gaya, it is observed that present ground water abstraction of 24,000 m^3/day for 75 days (when the Phalgu river is dry) is hardly 31.50 % of the total sub-surface water storage (5.70 mcm) within 2 meters of aquifer in 14.25 km^2 of the ground water potential zone during summer months.

54. Similarly, with the ground water abstraction of 124 MLD for 75 days of 9.30 mcm from the sub-surface water storage of 25 m thick aquifer of 53.43 mcm will be 17.40 % and it will lower the water level by 4.35 meters, still keeping the aquifer thickness of 20.65 meters which is considered as sufficient to sustain the yield of tube wells.

55. It is concluded from the study that despite lowering of water level by 4.35 meters during summer months, the tube wells will sustain the yield and will restore original yield as soon as Phalgu river starts flowing after the first rainfall in mid -June.

56. The impact of pumping 124 MLD during the summer months (75 days) can be further reduced if the well fields are increased instead of having only one well field of Dandibagh. Two more well fields can be developed, one near village Kendui and another near Kendua on the left bank and fourth near Manpur - Buniyadgunj on the right bank. By having four different well fields, there will be less pumping from a small area of a well field, thereby creating a small ground water depression and less lowering of water level around it.

57. **Appendix 7** shows section related to water sustainability study and impact related to water abstraction from Phalgu river bed.

58. The design of the subproject has been developed considering the future demand based on the population projections. **Table 5** shows the total water demand and water balance up to year 2048.

Table 5: Demand Projection

Description	**2013 (Present)**	**2018**	**2021**	**2033**	**2048**
Total Demand [MLD]	*55.84*	89.26	103.92	126.05	163.21
Total Demand [l/s]	*646.28*	1,033.08	1,202.82	1,458.88	1,889.02
Needed Water Production [MLD]	*68*	90	104	130	165
NRW [%] of production	*33%*	15%	19%	19%	23%
(+) Water Balance [MLD]	*12.16*	**0.74**	**0.08**	**3.95**	**1.79**

In the above table the figures in the row containing the "**Water Production**" are based on the assumption that **water sources** are or **will be made available** for the respective target year. Producing (pumping) higher volumes of water will result in the increase of the NRW.
Source: DPR for Gaya water supply

59. There are 31 tube wells (one kept for use in fire fighting and another is defunct) of GMC and eight tube wells constructed by PHED which are yet to be transferred to GMC. The condition of tube wells of GMC is not very good as they are quite old (ranging from 6 years to 50 years). It would be appropriate to undertake redevelopment of these tube wells to improve their

efficiency and ensure the discharge of sand-free water. It was decided that after commissioning of the tube wells, these will be transferred to GMC for operation & maintenance.

Table 6: Status of Existing Tube Wells and Appurtenances

		Transformer		In	Remark
ID	Name	kVA	Available	Operation	
1	Dandibagh No. 1*	500 & 300	Yes	Yes	Pump no 1 will be installed after replacing with 125 hp pump-2
2	Dandibagh No. 2*			Yes	Will be changed with 125 hp motor, No room for pump
3	Dandibagh No. 3*			Yes	Poor condition of electrical equipment, No room for pump
4	Dandibagh No. 4*			Yes	Poor condition of electrical equipment
5	Dandibagh No. 5*			Yes	Poor condition of electrical equipment
6	Panchayati Akhara No. 1*	200	Yes	Yes	Needs maintenance(new starters provided of electrical systems)
7	Panchayati Akhara No. 2*			Yes	Needs maintenance(new starters provided) of electrical system
8	Azad Park*	200	Yes	Yes	Below overhead reservoir, needs maintenance of electrical system
9	Dhobighat*	100	Yes	Yes	Poor condition of Electric system
10	Central School*	200	No	Yes	Poor condition of Electric system
11	Nigam Store*	200	Yes	Yes	Valve not visible, no proper approach
12	Gurudwara*	100	Yes	Yes	Poor condition of Electrical system
13	Fire Station	200	No	Yes	Poor condition of Electric system
14	New Godown*	100	Yes	Yes	No proper approach, needs maintenance
15	Baba Dyalunath*	250	Yes	Yes	Needs maintenance for electrical equipment
16	Delha*	63	No	Yes	Poor Condition of Electrical system
17	Panchayati Akhara No. 3*	63	Yes	No	Poor Condition, Pump out of order
18	Janata Colony*	200	No	Yes	Needs maintenance of Electric system
19	Janata Colony*	100	No	Yes	New constructed, cabling laid above floor
20	Pilgrim Hospital*	100	Yes	Yes	Poor condition of Electrical system
21	Visnupad*	63	Yes	Yes	Needs maintenance
22	Bypass*	100	Yes	Yes	Needs maintenance for stators & pumps
23	Bairagi Powerganj*	63	Yes	Yes	Poor condition of electrical system
24	Bageshwari Pachim*	63	Yes	Yes	Needs maintenance
25	Pitamaheshwar*	100	Yes	Yes	Needs maintenance
26	Kauvasthan*	63	Yes	Yes	Poor condition of Electric system
27	Hata Godown*	200	No	Yes	Poor condition of Electric system
28	Manpur*	100	Yes	Yes	Pumps operated by local people also.
29	Manpur - Buniydiganj*	100	Yes	Yes	Pump house to be repaired

		Transformer		In	Remark
ID	Name	kVA	Available	Operation	
30	Khadigramodyog Lakhibagh*	300	Yes	Yes	Needs maintenance
31	Cotton Mill				Non functional
32	New TW Kirloskar-1			Yes	
33	New TW Kirloskar-2		Yes	Yes	
34	New TW Kirloskar-3	300	Yes	No	
35	New TW Kirloskar-1	500	Yes	Yes	Newly constructed
36	New TW Kirloskar-2			Yes	Newly constructed
37	New TW Kirloskar-3			No	Not commissioned
38	New TW Kirloskar-4			No	Not commissioned
39	New TW Kirloskar-5	63	Yes	No	Not commissioned

(Note: Marked * -29 tube wells considered for refurbishment)

60. The pumping machinery installed on tube wells is generally old and frequently experiencing breakdowns. There are also no measuring devices installed on the delivery pipelines (e.g. flow meters, pressure gauges, depth gauges and non return valves).

61. The proposed GWSP1 subproject comprises of 10 components, with descriptions in **Table 7** below:

Table 7. Summary of GWSP1 Subproject Components

Components	Description
Component 1:	(i) Replacement of pumping sets on all the old 29 tube wells with 68 MLD combined capacity (ii) Installation of one electro-magnetic type flow meter with AMR facility in the delivery pipe of each tube well for flow measurement, along with one pressure gauge, one non return valve, and butterfly valve. (iii) Installation of a new electric panel in each tube well pump room with an air break Star Delta starter with necessary protection relay, meters and level indicating meter. (iv) Provision of two 1000 KVA 11/0.415 KV transformers (1Working+1Stand by) with necessary protections through 11 KV VCB, LAs and ACB on LT with proper cabling. (v) Construction of a control room at Dandibagh campus for housing all switchgear and panels for centralized operation of all the 5 Tube Wells. (vi) Provision of one electro chlorinator at each tube well capable of producing 1kg/hour chlorine for disinfection at source. The raw material required in these chlorinators will be common salt. Provision for power supply required for the electro chlorinator has been made in the proposed electrical panel.
Component 2:	Installation of around 37 flow meters.
Component 3:	Approximate proposed length of the pipeline (DI pipe) is 16.5 km with diameter from 125 - 600 mm. Existing pipeline length is 7.854 km. Hence total length will be 24.354 km. Gaya will be divided into District Metered Areas (DMAs). The water from the tube wells will be pumped through dedicated rising/transmission mains to the respective water storage facilities.

Components	Description
Component 4:	Laying of new pipes with aggregate length of about 447.8 km. The types of pipes will be a combination of ductile iron and HDPE. **Table 8** shows the diameters and lengths of the proposed distribution pipeline. As a general policy, all existing pipelines installed after 1982, with an estimated length of 72.9 km, shall be kept in service and included in the DMAs based on the operation of the system and in the subsequent proof of performance as may be required. All pipelines installed before 1982 in the system, with an estimated length of 64.7 km, shall be replaced by new pipes (without disturbing old pipes, only laying of parallel new pipeline) and decommissioned to the satisfaction of the Engineer and according to procedures approved by the Engineer.
Component 5:	Demolition of five old pump houses, and construction of nine new pump houses. **Table 9** shows the location of these pump houses.
Component 6:	Connection and metering of around 75,000 households.
Component 7:	Provision of 200 stand posts.
Component 8:	Construction of 32 monitoring stations.
Component 9:	Construction of six new overhead storage tanks of 10.95 ML capacity and three ground level storage reservoirs of total 11.88 ML The water distribution system has been designed with formation of DMAs. The DMAs will be connected to nearest storage reservoirs. **Table 10** shows the location, the capacity, and the DMAs served.
Component 10:	Construction and management of 5 customer service centers (CSCs). The location of each CSC, including a central CSC is proposed to be identified, post commencement of DMA work. CSCs are proposed to be located on government land or within existing government buildings or rented space.

Table 8: Proposed Water Distribution Pipeline- DI K-7 & HDPE pipe

Diameter (mm)	Length (m)
DI K-7 pipe	
150	662,354
200	29,631
250	18,919
300	9,131
350	6,321
400	5,077
450	5,376
500	2,226
600	4,897
700	2,141
	146,073
HDPE pipes of PE-100 & PN-6	
110	301,002
Total	**447,075, i.e. approx 447 km**

Source: BID document Gaya water supply

Table 9: Location of refurbishment & construction of new pump houses

Refurbishment of pump house	Demolishing of existing pump house	Construction of new pump house with chlorine room in place of demolished structure	Construction of new pump house with chlorine room- where no existing room
12 locations namely, • Khadigramodyog Lakhibagh • Dandibagh Type –I • Dandibagh Type – II • Bypass • Dhobi ghat • Panchyati Akhara • New Godown • Pilgrim Hospital • Bairagi Powerganj • Bageshwari Pachim • Kauvasthan • Cotton mill	5 locations namely, • Central school • Gurdwara • Delha • Janata colony • Hata Godown	5 locations namely, • Central school • Gurdwara • Delha • Janata colony • Hata Godown	Dandibagh – 4 nos.

Table 10: Details of the Water Storage Reservoirs

ID No.	Reservoir Location	Capacity (ML)	Type	Land requirement	DMA No.	Action
1	Near Joda Masjid	2.15	OHSR	30 m x 30 m	2 & 3	Phase-I- New
3	Budva mahadev	1.0	OHSR	30 m x 30 m	1	Phase-I- New
4	Mastalipur	2.0	OHSR	24m x 37.5m	4,5	Phase-I- New
5	Bhusunda Mela	2.15	OHSR	30m x 30m	6, 7	Phase-I- New
6 & 7	Ramshila Hill	0.22 + 2.6	GLSR	24 m x 40m	8,9	Existing (one additional GLSR 2.6MLto be provided- Phase 1 new) *Phase I - Refurbishment of existing GLSR*
8	Murli Hills	1.63+ 1.4	GLSR	-	10	Existing *Phase I - Refurbishment of existing GLSR*
9	Ajad Park	0.45	OHSR		Ward 15, DMA 13	Existing *Phase I - Refurbishment of existing OHSR*
10a	Brahmayoni Hills	1.86	GLSR		11, 13, 14, 17,21,22, 23, 24,25, 26,27	Existing *Phase I - Refurbishment of existing OHSR*
10b	Brahmayoni Hills	1.86	GLSR			Existing *Phase I - Refurbishment of existing OHSR*
11	Brahmayoni Hills	3.60	GLSR			Existing *Phase I - Refurbishment of existing OHSR*
12	Brahmayoni Hills	3.60	GLSR			Existing *Phase I - Refurbishment of existing OHSR*

ID No.	Reservoir Location	Capacity (ML)	Type	Land requirement	DMA No.	Action
10c	Brahmayoni Hills	4.64	GLSR	45 m x 90m		Phase-I- New
10d	Brahmayoni Hills	4.64	GLSR			Phase-I- New
13a + 13 b	Shring Sthan	4.54+ 3.7	GLSR	45 m x 45 m	15, 16, 18, 19, 20	Existing (Additional storage 3.7ML to be provided in Gaya phase 2, i.e. GWSP2
14	Behind Delha PS 1A	1.5	OHSR	30 m x 30m	29	Phase-I- New
16	Behind Delha PS A	2.15	OHSR	36 m x 34.5m	28, 30	Phase-I- New

Source: DPR Gaya water supply

62. As per present design, proposed GWSP1 subproject will involve relocation of nine dwelling units including one Gaya Municipal Corporation (GMC) staff quarter at one project location (Ramshilla hill). Also, the implementation of the subproject will impact six households. Rehabilitation & resettlement issues will be dealt with separately under a Resettlement Plan.

63. **Appendix 8** shows project location and maps of the proposed project components**.**

64. **Appendix 9** shows photo illustration and location details of project components.

65. **Appendix 10** shows site management plan drawing for all water storage reservoirs and major working areas.

66. The design standards adopted under this sub-project are from 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 11** below.

Table 11: Design features of the subproject

S. No:	Design features	Descriptions
Refurbishment - Rehabilitation/ replacement of worn-out machineries and electrical devices in tube wells Arrangement of chlorinator in tube well		
1	Working hours of tube wells	23 hours a day
2	Power	7.5 to 105 HP
3	Efficiency of pumps	80% minimum
4	Type of pumps	Multi-stage submersible pumps and vertical turbine pumps for tube wells.
5	Incoming power supply	1000 KVA 11/0.415 KV transformers (1Working+1Stand by) with necessary protections through 11 KV VCB, LAs and ACB on LT with proper cabling.
6	Earthing System	Solidly earthed
Construction of overhead tanks and ground level reservoirs		
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	22.83 MLD additional
6	Minimum storage capacity	20% of the average daily demand
7	Supply hours	24 hours

S. No:	Design features	Descriptions
8	Location	Referred above Table
Laying and Replacement of distribution pipeline		
1	Subproject area	Gaya City
2	Design period	30 years
3	Pipe diameter range	110 to 700 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 K 7& HDPE
7	Location	Throughout the city except newly laid area

Source: DPR Gaya water supply

E. Implementation Schedule

67. The proposed sequence of the works implementation under Gaya Water Supply Project is as given in the **Figure 3.**

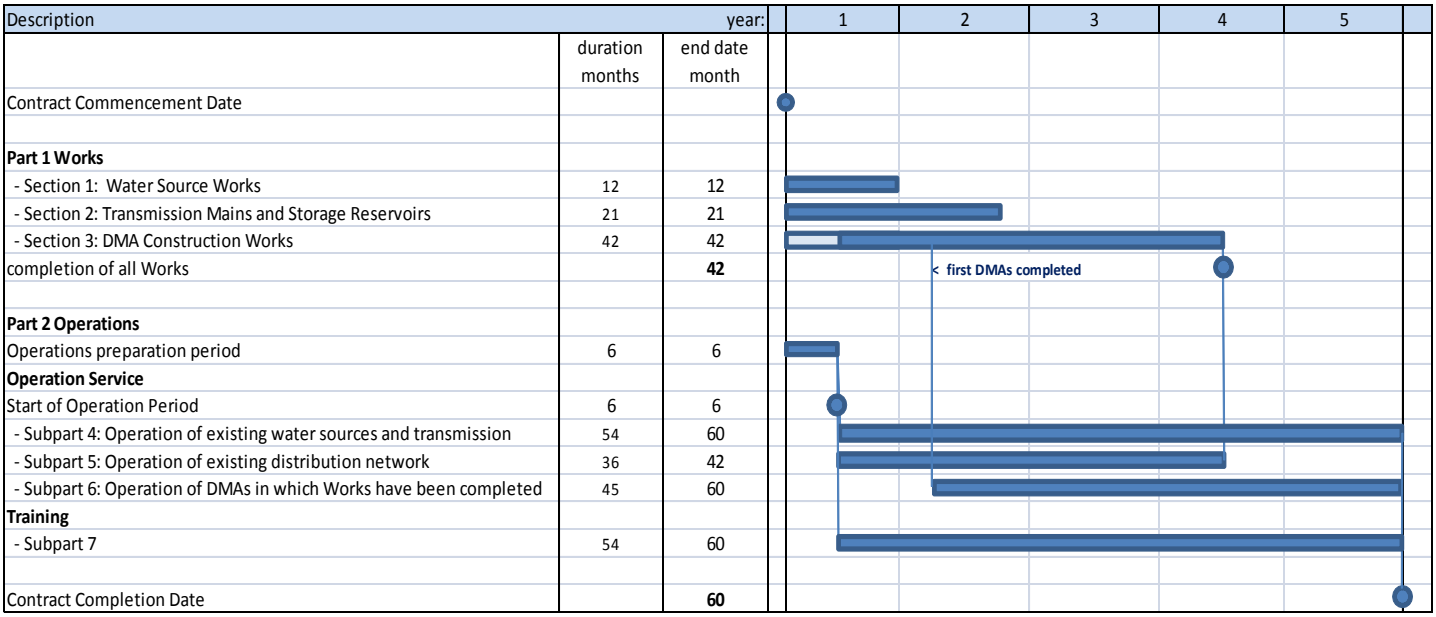


Figure 3: Implementation Schedule

68. **Training -** 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 classroom training activities to be conducted for the project. The Training Program shall be finalized and approved within six (6) months from the commencement date. Implementation of the Training Program shall be finalized at least six (6) months before the contract completion date. Commencing at least 6 months before the contract completion date, the GMC deputed managers (Operations Manager, Technical Manager, Financial Manager and Customer's Manager), who are still under the supervision of the Contractor by that time will take over water supply and maintenance duties. The Training Program will comprise both on-the job training as well as class room training. On the job training will be provided to staffs who are seconded and assigned under the supervision of the Contractor for prolonged periods. If the contractor is unsatisfied with the performance of a seconded staff member, the Contractor will inform GMC. If the unsatisfactory situation continues, the contractor is allowed to reject further secondment of

the staff concerned and the GMC may nominate a replacement. The contractor will provide hands-on training to the deputed GMC 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 GMC staff in administrative, financial and customer affairs.

IV. DESCRIPTION OF THE ENVIRONMENT

A. Physical Resources

1. Administrative Boundaries

69. Gaya is located in south central Bihar on the banks of the River Phalgu, between 84.4^{0}and85.5^0 east longitude and 24.5^0 and 25.1^{0}north latitude. It is the district headquarters City of Gaya District and is situated at about 100 km south of State Capital Patna (**Figure 4**).Gaya is a prominent and most important religious center for Hindus. The City is well connected by road and railways with the State Capital Patna and other Cities in the State. Bodh Gaya, situated at 13 km south of Gaya, is a world famous Buddhist Center, which attracts significant number of international tourists. Gaya has an airport to serve for this purpose.

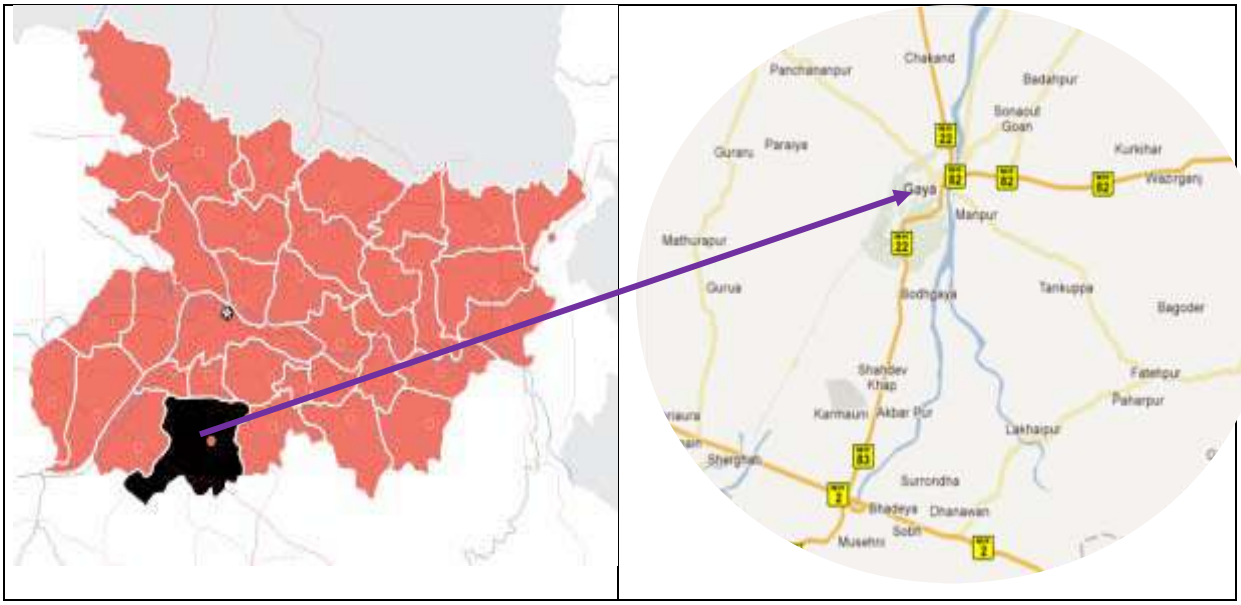


Figure 4: Location of Gaya in Bihar

70. Gaya is a Municipal Corporation with an area of 50.17 sq km. It is divided into 53 wards and had a population of 4, 63,454 (Census 2011). The gross population density of the city is 78 persons per hectare. **Figure 5** shows Gaya city map.

Figure 5: Gaya City

2. Topography, Drainage, and Natural Hazards

71. **Topography.** The historical City of Gaya is developed along the banks of River Phalgu, a tributary of River Punpun, which in turn is a tributary of River Ganga. The elevation of the area on an average is 110 m above MSL (Mean Sea Level). Gaya is located in the transit region between the uplands of Chhotanagpur Plateau and Gangetic plains of South Biharextending from Patna. There are a ring of hills around the City in the north (known as Ramshila), west (Katari Hill), and south (Brahmyoni). Except these hilly areas, topography of the City is flat, and gently slopes and drains into the River Phalgu, flowing from south to north. City is mostly developed on western side of the river, while new development is seen on the eastern side.

72. **Drainage**. General topography of the Gaya city is flat with some small hillocks in and around the city. River Phalgu divides the city into two parts. The portion located on the west bank of the river is much larger comparing to the portion located on the eastern bank of the river. Natural gradient of the Gaya Municipal Corporation (GMC) area is such that the portion of the GMC area on the west bank, slopes from west to east and south to north whereas the portion on the east bank of the river slopes from east to west and from south to north. As a result, storm runoff from both sides of the river normally flows towards the River Phalgu which flows along south-north direction. Average annual rainfall of the region is about 1150mm.The existing storm water drainage system of the Gaya is based on gravity flow. Depending on the existing topographical features, the city is divided into four drainage zones namely Central,

North-Western, Western and Eastern zones. The existing drains are mostly outfall to the River Phalgu or open lands at Katari and Kondinava and Kujapee drain. Partial flow of Kujapee drain is leading to Jamune River that flows parallel to the river Phalgu, through the western fringe of Gaya, about 6 km from municipal boundary. Remaining flow of Kujapee drain finds its way to agricultural land. About 80 percent of the GMC area is covered under drainage network. Most of these drains were constructed during the period from 1932 to 1944.

73. **Natural Hazards**.

(i) Earthquake. Earthquake hazard map of India (**Figure 6)** and Bihar shows that Gaya district falls in Seismic Zone III, which is a moderate risk zone and an earthquake up to a magnitude of 7.0 on Richter scale has the potential to hit the area. Thus Gaya Municipal Area is an earthquake hazard prone area and falls in moderate damage risk zone.

(ii) Wind hazard. The wind hazards map of Bihar shows that Gaya districts falls in moderate damage risk zone with cyclonic wind velocities around 39 m/s. Thus Gaya Municipal Area is a moderate wind hazard prone area.

(iii) Floods. The flood hazard map of Bihar shows that Gaya district is not susceptible to any major flooding. It is evident that Gaya city located in Gaya district is susceptible to natural hazards with moderate risk or probability of occurrence of a moderate intensity earthquake and wind. A map (**Figure 7**) showing flood zone in Bihar is shown below. It indicated that Gaya district does not come under flood zones.

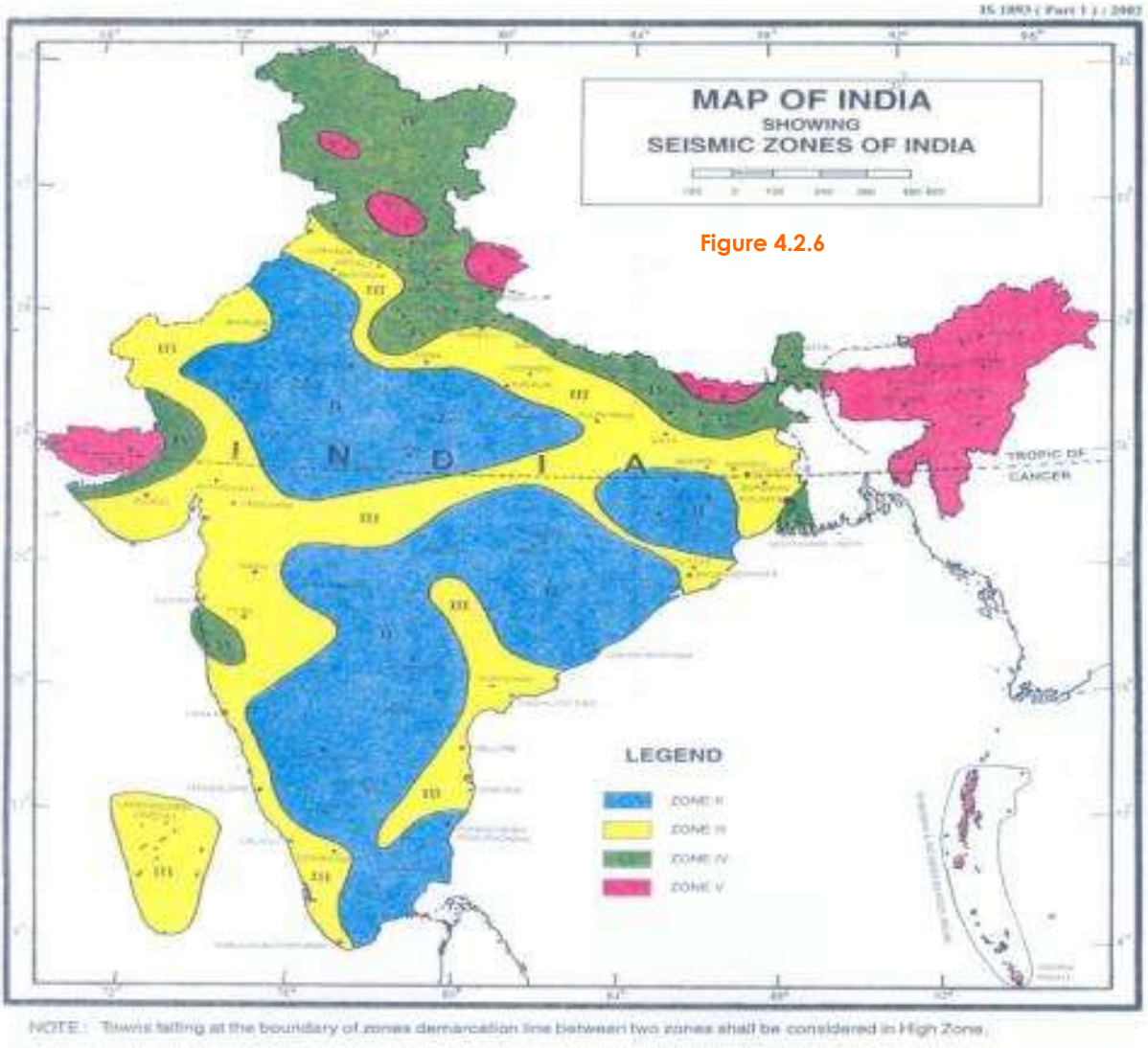


Figure 6: Earthquake zone map of India

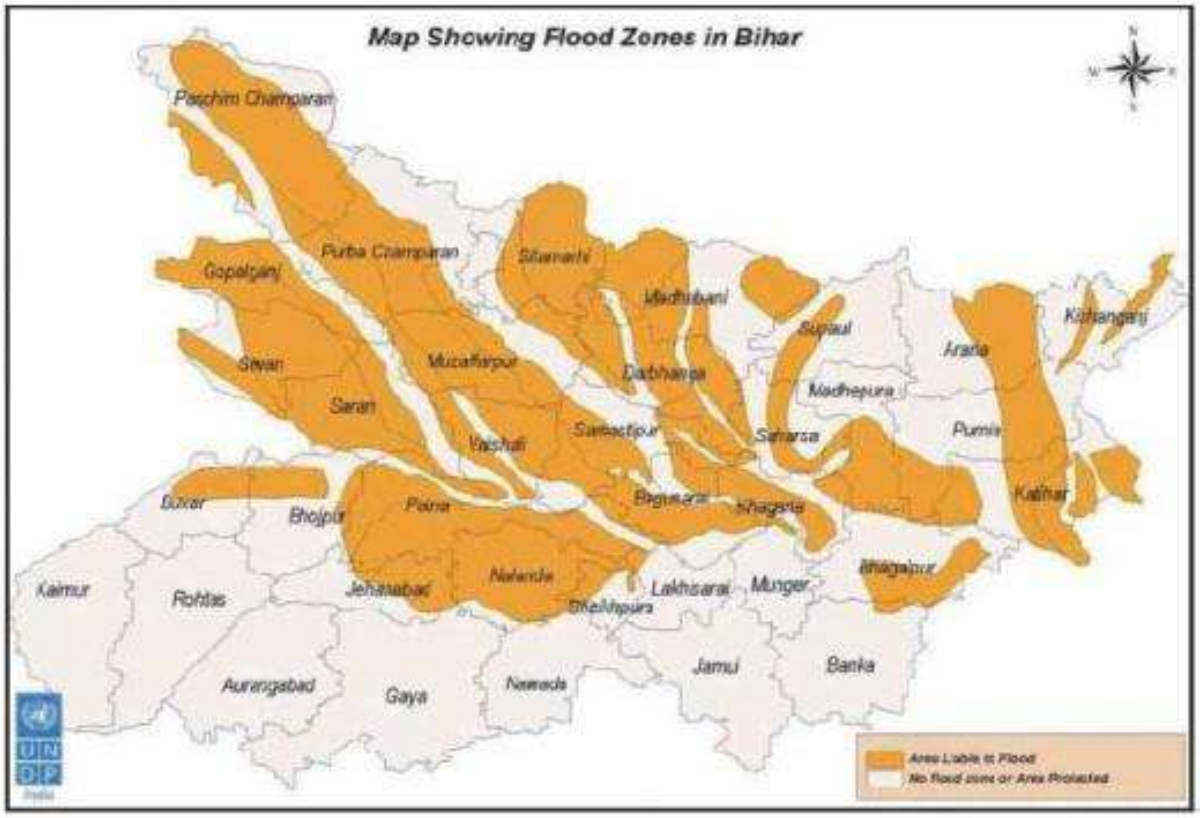


Figure 7: Flood zone of Bihar

Source: State Environment Report, Bihar (2007)

3. Geology, Geomorphology and Soils

74. **Geology and Geomorphology**. The main geological formation of the region is of Quaternary age. The area is mostly covered by unconsolidated sediments which is known as Alluvial deposits followed by consolidated deposits of Satpura range. Few areas are also characterized by units of Archaean ages. The Satpura range mainly exposed in Gaya hills and Rajgir hills comprises low grade supracrustals – Schists, ferruginous phyllite, quartzites and phyllitic slate.

75. The Archeans are the oldest rock formation in the area. The most predominant rock type is gneisses and granites with basic intrusives and pegmatoides.

76. **Soils.** Gaya is covered with reverine Alluvium of both old and recent. It consists of a thick alluvial mantle of drift origin. This wide alluvial plain is part of Gangetic depressions with alluvial deposits of immense depth, and is broken by groups of low ranges of hills or isolated peaks arising abruptly from the plains. Soils in the region are deep and excessively drained that are formed in eolian sands over lacustrine deposits derived from mixed rocks. Five main types of soils present in the region: sandy loam, loamy soil, sandy loam, black soil and red soil.

4. Climate

77. The climate of Gaya is generally tropical and has three distinct seasons: winter season from November to middle of March, summer season from mid-March to mid-June and rainy

season from mid-June to October. Winters are generally cold, summers are hot and dry, and the monsoon season is characterized by moist heat and oppressive nights. The cold weather commences early in November and temperatures (both day and night) decrease rapidly with the advance of the season. January is the coldest month. Temperature increases rapidly from middle of March till May. With the onset of monsoon in the month of June, the temperature starts decreasing. In the hot season Gaya is very unpleasant.

78. Rainfall in the region is mainly from southwestern monsoon during the period of June mid to early October. Rainfall also occurs due to northeast monsoon in January and February although its contribution is very limited. Monthly rainfall pattern is tabulated in **Table 12**. Annual rainfall during this period fluctuated between as low as 683 millimeter (mm) to 1260 mm. Monthly rainfall shows that about 90 percent of annual rainfall is received during the monsoon period of June to October.

Table 12: Monthly Rainfall Pattern (2008-2014) in mm

Month	2008	2009	2010	2011	2012	2013	2014
January	95.4	8.4	0.2	6.0	19.9	0.0	20
February	13.4	0.0	3.4	3.0	4.4	10.7	20
March	0.6	0.4	0.0	0.1	10.8	0.9	13
April	13.3	2.4	0.0	32.9	21.2	32.1	8
May	40.3	73.7	25.8	18.2	25	91.8	20
June	404.9	68.4	97.8	393.3	109.6	47.8	137
July	283.5	194.8	202.7	133.2	236	80.3	315
August	209.6	152.5	202.9	419.8	392.6	168.3	328
September	48.9	269	50.3	244.7	134.2	127.1	206
October	0.0	17	91.0	8.5	66.9	158.5	53
November	0.0	11.8	6.4	0.0	34.3	0.0	10
December	0.0	2.3	2.8	0.0	0.0	0.0	3
Total	**1,109.9**	**800.7**	**683.3**	**1,259.7**	**1,054.9**	**717.5**	**1,133**

Source-India Meteorological Department

79. Maximum and minimum temperatures during summers are: 43°C and 21°C and during winters: 20°C and 6°C. Normally lowest temperature is recorded in the month of January while the highest is in the month of May/June. During the summer the humidity is much lower (about 30-40 percent) due to the hot and dry westerly winds. With the onset of monsoon humidity increases and it is generally in the range of 80 to 84 percent in July and August. Predominantly winds blow from east and west. Westerly winds usually prevail from the beginning of January to the end of March. Then onwards till middle of June the east and west winds are nearly balanced. From middle of June to end of July winds are predominantly easterly. From end of July to the end of August westerly winds prevail. Then onwards till the end of October east winds prevail. In November and December east and west winds are nearly balanced.

5. Air Quality

80. Earlier there was no fixed monitoring air quality stations at Gaya, which was also not subject to monitoring by the Bihar State Pollution Control Board (BSPCB) as there are no major industries. Gaya is located in the transition zone between the fertile alluvial plains and hills of Chhotanagpur Plateau, and generally dry weather prevails. During summers it experiences very dry and hot weather. Traffic is the only significant air pollution source, so levels of oxides of sulphur and nitrogen are likely to be well within the National Ambient Air Quality Standards (NAAQS). Due to dry weather, poor road conditions and traffic particulate matter is likely to be

high, particularly during summers. In the year 2014 ambient air quality monitoring has been conducted at Gaya. Monitoring station is located at Gaya Collectorate office corner. Month wise result is given in the **Table 13.** Result shows that at all the months concentration PM_{10} is above the standard. Except few months concentration of NO_2 was above the national standard.

Table 13: Recent ambient Air Quality of Gaya city

Status of Ambient Air Quality of Gaya – Collectorate office											
		Main Pollutants & BTX Parameters 2014 (µg/m^3)									
S. No	Year 2014	CO	SO_2	NO	NO_2	NOx	O_3	PM_{10}	Benzene	Toluene	Xylene
		Avg	*Avg*	*Avg*	*Avg*	*Avg*	*Avg*	*Avg*	*Avg*	*Avg*	*Avg*
1	March	1.56	6.9	25.4	93.8	119.2	17.7	239.5	3.05	11.4	7.8
2	April	2.99	6.6	34.2	113.4	147.6	34.9	270.5	2.76	11.3	4.82
3	May	2.61	6.1	16	51.5	67.5	46.8	198.2	1.98	7.7	3.08
4	June	3.00	5.7	12.1	58.3	70.4	42.2	165.9	1.94	7.3	2.82
5	July	1.77	5.2	15.8	40.5	56.4	18	83.9	1.78	8.1	3.55
6	Aug	1.38		16.9	33.4	50.2	16.9	73.5	1.57	6.1	2.81
7	Sept	2.45		16.5	25.5	42	10.2	75.9	1.51	6.3	3.23
8	Oct	3.84		24.9	25.5	50.4	12.4	196.8	1.89	7.5	4.38
9	Nov	4.63		53.2	49.8	103	15.1	324.2	2.7	9.8	6.8
Standard – Annual average		**2000**	**50**	**-**	**40.0**	**-**	**100**	**60.0**	**5.0**	**-**	**-**

Source-Bihar State Pollution Control Board (BSPCB)2015, BTX: Benzene Toluene Xylene

6. Ambient noise levels

81. The Bihar State Pollution Control Board (BSPCB) measures the noise level across the Gaya city during 2004-05. Data shows that day time noise levels are high at all locations, exceeding the ambient noise standards. Presently primary noise level data is generated from the BUDIP project. Result presented in the following **Table 14**, the noise levels at silence, residential and commercial zones exceeding the standards, attributed mainly to the vehicular traffic.

Table 14: Noise Levels in Gaya city

Location	Noise Level (day time)	Noise Zone	Standard (day time)
	dB(A) Leq		*dB(A) Leq*
PanchayatiAkhara	82.2	Residential	55
PanchayatiAkhara-Tutwari Road	81.5	Residential	55
Near Ramshila	90.0	Commercial	65
Azad Park Near Temple	87.5	Commercial	65
Tikari road	85.4	Commercial	65
GhantaGhar	95.0	Commercial	65
Rammana road	94.0	Commercial	65
GB road	93.8	Commercial	65
SP road	87.7	commercial	65
DM office	90.5	commercial	65

Jai Prakash Narayan Hospital	87.6	silence	50
Prabhat hospital	70.9	silence	50
Zilashool gate	99.5	silence	50
Brabmayoni hill	84.5	silence	50
Near manglagauri	84.6	silence	50
Dandibagh	85.0	silence	50

82. On comparison of noise quality data with the limits specified for different types of the areas in the ambient noise quality standards {under schedule to the Noise Pollution (Regulation and Control) Rules, 2000 of Government of India}, it is evident that the noise level values at most of the sites are higher than the permissible standards. This may be attributed to the commercial activities and traffic movement especially with frequent traffic jams and honking of horns in the subproject areas.

7. Water Resources

83. **Surface Water.** Gaya city is situated along the banks of River Phalgu. This river is formed by the merger of two streams of Nilanjan and Mohana about 15 km south of Gaya city, and flows south to north through the heart of Gaya District. The width of river in Gaya is about 900 m. The famous Vishnupad Temple is located on the banks of the River and there are a number of ghats (bathing and worshipping) developed for the pilgrims. This river is a tributary of River Punpun, which joins River Ganga near Patna.

84. Phalgu is a seasonal river, and flows only during monsoon and partly in post monsoon (mid-June to November/December). During the rainy season, the river carries very high flows but in the other seasons of year it is nearly dry. Due to a good monsoon season in 2006, the river overflowed and flooded the nearby localities. No damage to human lives or property was reported.

85. Gaya city does not have any sewerage system in place. All generated wastewater is discharged into the storm water drainage system, which ultimately ends and pollutes River Phalgu.

86. **Geohydrology and Groundwater.** Gaya is located in the transition region between the uplands of Chhotanagpur Plateau and Gangetic plains of South Bihar extending from Patna. The extensive and deep aquifer of south Bihar Plains starts from Nepal Border, where depth is said to be about 2,000 m, and gradually decreases southwards to around 650 m in Patna and becomes shallower in further south to about 60 m in Gaya. In Gaya City, the aquifer thickness is still shallower. There is a thick clay bed of about 5-6 m on the top underlain by coarse sand mixture with gravel predominating to a depth of 20-30 m, from where generally hard rock is encountered.

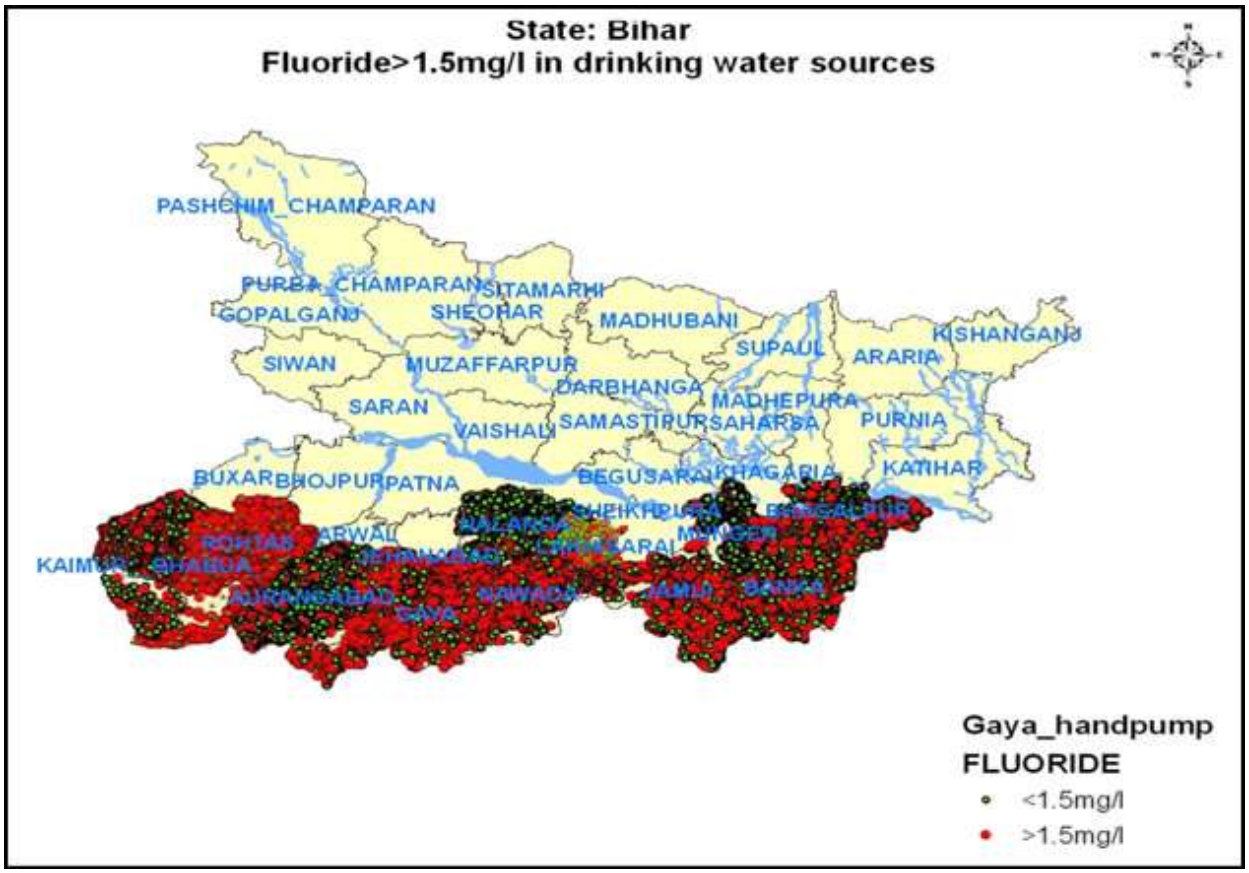
87. Underground aquifer is presently tapped along the River Phalgu for Gaya water supply. The city is surrounded by hills on three sides and ground water near these hills is not available as depth of sand strata is quite less. Aquifer, particularly away from hills and along the river has moderate yield of 15,000 to 80,000 liters per hour. Though there were no ground water studies conducted in Gaya, local officials of the CGWB are of the view that depth of aquifer and its yield is relatively higher along the river. They are also of the view that groundwater resource in Gaya is limited, and therefore a proper study or investigation is required to establish the sustainability of resource.

88. **Groundwater Quality:** Although groundwater is used for domestic water supply, no regular water quality monitoring is conducted. Discussion with the local people and officials indicates that the water supplied from Panchayat Akhada well field, located downstream side of the city, at times contain color and odor. This may be due to a polluted groundwater caused by the disposal of untreated waste into the river. Moreover, many people in the city use septic tanks, which at many times do not function properly, leading to seepage to the groundwater table. Comparatively, water supplied from the Dandibag well field, located upstream side of the city, is good.

89. As far as chemical contents in ground water are concerned, Gaya district is one of the six fluorides affected districts. A report shows that fluoride level up to 6.8 ppm has been detected against the permissible limit of 1.5 ppm in the ground water of Nawada District, a neighbor district of Gaya. However Gaya district is not covered within 16 arsenic affected districts in Bihar. **Figure 8a and Figure 8b** show the Fluoride map of Bihar and Gaya.

Source:IndiaWaterPortal

Figure 8a: Fluoride enriched area of Bihar



Source: PHED, Govt. of Bihar

Figure 8b: Fluoride enriched area of Bihar

90. Secondary data of supplied water at Gaya have been collected from Public health engineering dept. at Patna. Results are depicted in **Table 15** below. It is noted that the concentration level of all the parameters (except turbidity) is within the acceptable standards of surface water quality. One occasion concentration of iron is above the desirable limit.

Table 15: Physico-chemical analyses data of Gaya supply water

S. N.	Location Details	Physico - Chemical and Bacteriological Parameters														
		pH	Turbidity (NTU)	EC	Total Dissolved Solids (mg/l)	Total Hardness (mg/l)	Ca (mg/l)	Mg (mg/l)	Cl (mg/l)	Alkalinity (mg/l)	Fe (mg/l)	NO_3 (mg/l)	SO_4 (mg/l)	F (mg/l)	As (mg/l)	Total Coliform (no/ 100 ml)
1	P/W Supply Scheme Dandibag	7.7	4.0	190	123	84	25.65	4.86	22.72	40.0	0.17	0.36	0.29	0.43	BDL	ND
2	P/W Supply Scheme AP Colony-1	7.9	7.00	170.0	110	84	27.25	3.88	19.88	20.0	0.25	0.76	0.09	0.53	BDL	ND
3	P/W Supply Scheme AP Colony-2	8.0	5.00	160.0	104	88	17.63	10.7	56.80	140	0.79	0.95	0.19	0.14	BDL	ND
Desirable		**6.5-**	**1**	**-**	**500**	**200**	**75**	**30**	**250**	**200**	**0.3**	**45**	**200**	**1**	**0.01**	**-**

limit*	**8.5**														
Permissible limit* in absence of alternate source	**NR**	**5**	**-**	**2000**	**600**	**200**	**100**	**1000**	**600**	**NR**	**NR**	**400**	**1.5**	**0.05**	****

(Source: Physico - Chemical and Bacteriological Parameters (Report no. PHE/Patna DW-26359- 6361/R/Gay/12-13, dated 2/06/2012.)

Note: *****(1) Drinking Water Specification IS: 10500- 2012

(2) BDL = Below Detection Limit,

(3) Testing Methods are taken by APHA 20th Edition.

(4) NR = No Relaxation, ND= Not detected

**(a) Throughout any year, 95% of the samples should not contain coliform organisms in 100ml,

(b) No sample should contain more than 10 coliform organisms per 100ml,

(c) Coliform organisms should not be detected in 100ml of any two consecutive samples.

91. A second set of data is also available from PHED and dates from March 2014. Testing results are shown in **Table 16.** The production tube wells at Azad Park and Delha tap the aquifer under the city. Especially Delha scores badly with values above acceptable levels in 6 counts. Although use of the water for drinking is permissible, it indicates the type of contamination mostly due to local discharge of household wastewater and unlined drain near water source. Conclusion is that the water from this aquifer would not be first priority for use in public water supply. Only after treatment at source and storage water can be supply for the public.

92. Alarming is the positive bacteria count in the Panchayatiya Akhara tube well. It makes it unfit for drinking. The well is not tapping the larger aquifer under the city but is located in the Phalgu River bed.

Table 16: Physico-chemical and Biological test report

S.No	Parameters	In Phalgu bed			In aquifer under city		Indian Standards IS: 10,500-2012 Acceptable/ Permissible level
		Dandibagh Pump-1	Panchayatiya Akhara	Manpur	Azad Park	Delha	
1	PH	7.84	7.03	7.64	8.07	7.40	6.5-8.5
2	Turbidity (NTU)	1	2	3	1	1	1/5
3	Conductivity ((µS/cm)	379	650	650	925	2350	-
4	TDS (mg/l)	249	**1000**	**1000**	**1400**	**1525**	500/2000
5	Total Hardness(mg/l)	140	168	200	**244**	**544**	200/600
6	Calcium(mg/l)	40.08	70.04	59.20	**84.8**	**188.8**	75/200
7	Magnesium (mg/l)	9.72	25.34	21.31	**30.52**	**67.96**	30/100
8	Chloride(mg/l)	36.87	140	124	184	**472**	250/1000
9	Alkalinity(mg/l)	**220**	**220**	**216**	**321**	**448**	200/600
10	Iron(mg/l)	0.09	0.10	0.10	0.10	0.10	0.3/0.3
11	Nitrate(mg/l)	37	25	25	25	25	45/45
12	Sulphate(mg/l)	8.75	10	10	25	75	200/400
13	Fluoride(mg/l)	0.25	0.59	0.36	0.40	0.66	1/1.5

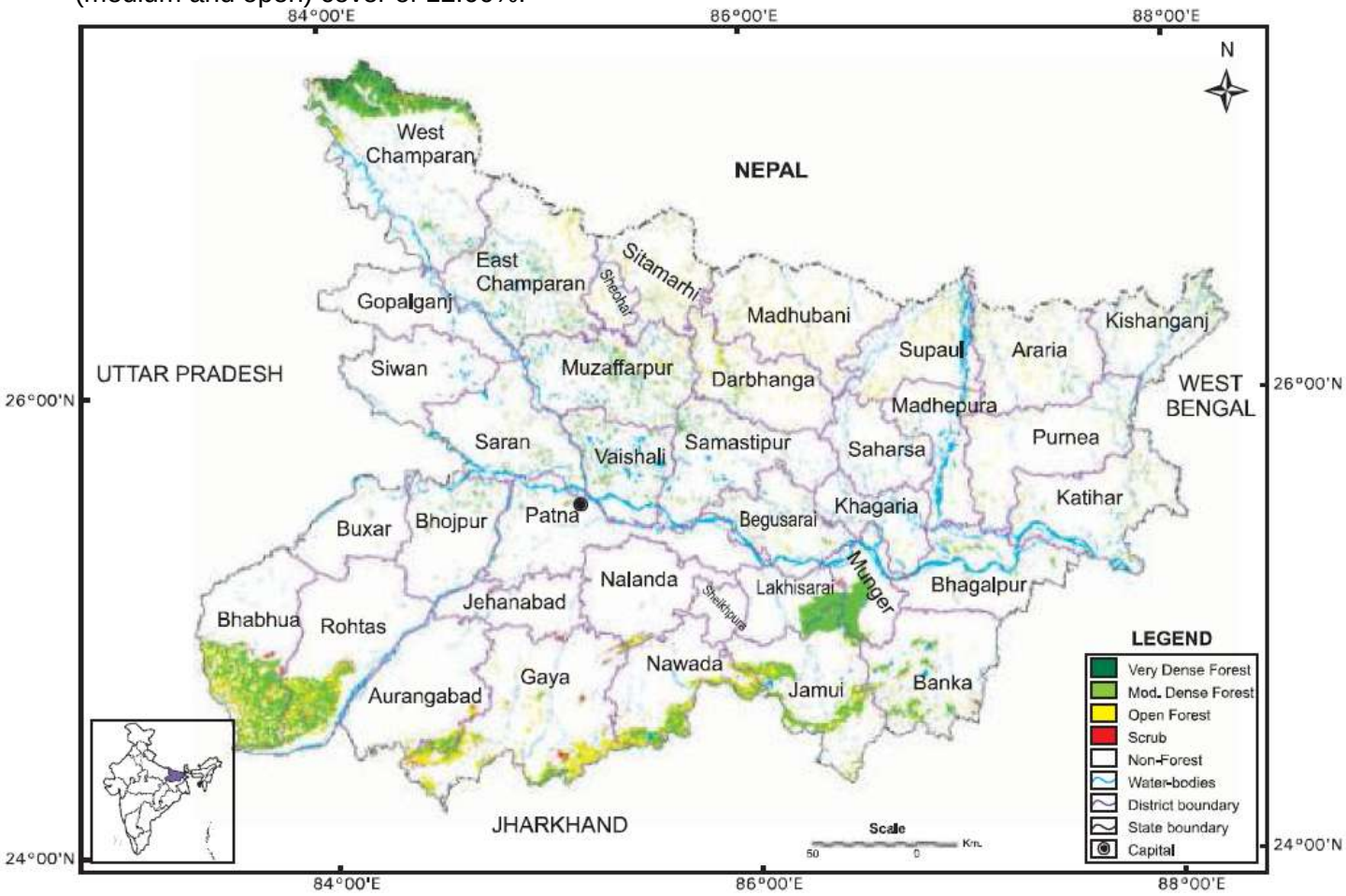
14	Bacteria(+,-)	<5.1	Positive(not safe for drinking)	Negative	Negative	Negative	Not detectable in any 100 ml sample

Source-Public Health Engineering Department-PHD Testing Lab-Gaya, 20-03-2014
Bold value – above the acceptable –desirable limit

93. As part of the hydrogeological investigations of 2014, carried out by the project, water of 10 wells throughout the study area were sampled and analyzed. The results are presented in **Appendix 11**. The wells include both hand-pumped wells and production tube wells. The hand-pumped wells are located in the larger aquifer around and under the city, the production wells tap their water from or near to the Phalgu bed.

A. Ecological Resources

94. Forest cover map of Bihar is shown below. Total forest coverage of the state is 7.27% out of the state geographical coverage. As per 2011 assessment, Gaya district has forest (medium and open) cover of 12.66%.



Source: India state of Forest Report 2011

Figure 9: Forest Map of Bihar

95. Gaya city was developed along the western banks of the River Phalgu, in the transition between fertile Gengetic alluvial plains extending from Patna, and Chhotanagapur Plateau. Lands surrounding the city, especially on the northern side, are cultivated extensively. With the

growing population, the city is grown to the present size occupying the surrounding land that was under agricultural use. There is no natural habitat in the city, and the flora is limited to artificially planted trees and shrubs, and the fauna comprises domesticated animals (cows, goats, pigs and chickens), plus other species able to live close to man (urban birds, rodents and some insects).

96. There is no wildlife sanctuary, national park or sensitive environmental areas in or near the city. Nearest protected area is Gautam Budha Wildlife Sanctuary located at a distance of 50 km south of Gaya.

97. No wild animals are reported in and around the subproject corridor as the same are located mostly in the city area. Acquisition of forest land will be required for construction of water reservoirs at Ramshilla hills and Brahmayoni hills, both are under protected forest.

98. No rare or endangered animal or plant species are reported in the subproject impact zone.

99. **Table 17** below indicates type and approximate number of tree felling. During implementation of project saving of trees will be considered through judicial construction design.

Table 17: Plant species within the reservoir and approach road areas

S.No	Name of site	Name of Tree	Remarks
1	Budva Mahadev	*Albizia Saman* and few scrub (*Junglee*) plant	Need of 2 nos. Tree cutting, NOC from forest Dept., transfer charges to forest Dept. for felling and transportation of trees
2	Mastalipur	Small Nursery plant *Moringa oleifera* plant	80 small nursery plants needs to be replanted at other sites- NOC from Gram Panchyat Dept.,Gaya Access road side 2-3 plants needs to be cut
3	Ramshilla hill	*Azadirachta indica,*	Tree cutting permission from DFO Gaya. Forest land acquisition proposal already sent to state forest department and 1st level of clearance obtained. Approx. 4 nos. of trees need to be cut.
4	Brahmayoni Hill	Tad tree	Permission for tree cutting from DFO Gaya. Number will be finalized by forest dept.

B. Economic Development

100. Gaya has a large number of household industries like production of agarbattis, production of tilkut and lai, power looms and hand looms. Gaya functions as a service center for the surrounding towns and villages. Commercial activities are located along the important roads of the city. The main vegetable market in the city is the Kedarnath Market. In addition, the city has a large number of informal shops. On account of Gaya being an important center for religious tourism, the city has a large number of affordable accommodations.

101. **Land use Pattern**. The existing land-use distribution of Gaya Municipal Area based on the primary survey is tabulated in Table below.

Table 18: Existing Land Use of Gaya Municipal Area

Land Use Categories	Area in Ha		Area in Percentage
Residential		1170	23.4
Commercial		36	0.64
Industrial		59	1.17
Public Semi Public		27	2.53
Transportation		164	3.27
Parks/Open spaces (including Orchards)		108	2.15
Sub Total		1664	33.2
Area undeveloped/ natural features	Agricultural & Vacant Land	2699	53.79
	Water bodies (including river)	356	7.1
	Hills	298	5.93
Sub Total		3353	66.8
Total Area under Gaya Municipal Corporation		**5017**	**100**

Source: Gaya Master Plan vision 2027

102. The land use in the project corridor comprises of built up areas consist of residential complexes, government/private offices and buildings, educational institutes, religious places and commercial establishments such as shops, hotels, restaurants, etc. The transportation area constitutes of existing roads in the subproject area.

103. **Commercial Activities**. The subproject area is located within Gaya city and the predominant activities in the impact zone are of mixed type including, residential, commercial and institutional houses.

104. Commercial activity will be impacted due to the implementation of the subproject components for laying of distribution mains and rising mains. The new mains will be laid within the available right of way (ROW) of existing road (in shoulders). It has been found through the transect walks along with a team of water supply design engineers that on an average available ROW including the dedicated pedestrian walkway in selected category of roads in Gaya city. The improvement work will be carried out within the ROW in road shoulders. The maximum required width for laying down of different categories of pipeline will be 1.2 m. However, at certain junctions there may be some temporary impacts which may disrupt some business activities in terms of temporary impact on the access. The exact nature of temporary impacts will be known at the time of drawing up of the construction schedule of the Contractor which will be documented and mitigated at the time of construction[9] as per the entitlement matrix of the resettlement plan and resettlement framework on case by case basis. To determine the extent of temporary impacts due to the laying of distribution and rising main pipelines within the city, transect walks were undertaken along the proposed networks with focus on the nature of the existing ROW, density of commercial and residential structure, etc.

105. The partial blocking of road will follow particularly in narrow stretch during the time string of action of excavation followed by laying of pipeline, testing of water supply, backfilling of

[9] The excavation of trenches for primary lines will last for a maximum of 1 to 2 days. The construction will be scheduled in such a way as to minimize disruption.

excavated trenches and road restoration. The access to these shops, residences and institutions will be affected for a maximum of 1-2 days.

106. Potential temporary impacts of access disruption for all these shops/commercial establishments can be mitigated through good construction practices which will be the responsibility of construction Contractors. Measures are identified in the IEE and include: (i) providing walkways and metal sheets to maintain access across trenches, (ii) increasing the workforce in front of shops/commercial establishments/ sensitive receptors so as to reduce the period of impact, (iii) consulting business and institutions regarding operating hours and factoring this in work schedules, (iv) providing advance information on works to be undertaken including appropriate signages etc. The project Contractor will ensure that there is provision of alternate access during the construction so that there is no closure of these shops or any loss of clientage. Moreover, as per the contract provisions, the Contractor will be required to put back the road to its original condition after the pipe laying.

107. In case, the loss of access to the shops during construction is not effectively mitigated by provision of alternate access by project Contractors same may cause temporary loss of income during the construction for which provision for livelihood allowances have been made in the resettlement plan. There could be temporary disruption of business during working days for which affected persons will be provided assistance for this transitional period on a case-to-case basis as per the provisions of the Entitlement Matrix in agreed resettlement framework. A lump sum budgetary provision has been kept in the Resettlement plan for same. The payment of assistance will be made for days of closure, and will be subject to the production of requisite documents in support of the claim. Cash assistance will be released after proper verification of documents[10].

108. A detailed Resettlement Plan has been prepared for rehabilitation and resettlement of parties affected by execution of proposed subproject.

109. The proposed augmentation of water supply system will ensure adequate availability of potable water to various areas in Gaya city.

110. **Industrial Development**. There is no major industrial development in and around Gaya in general. Small scale industries like production of agarbattis, production of tilkut and lai, power looms and hand looms are common. There are few agro-based industries in the city. Tourism is a most important economic activity in the city.

111. **Agriculture**. State is predominantly an agriculture based economy with fertile lands. Gaya region is also rich in agricultural produce, crops like rice, wheat, maize, jowar and other pulses are cultivated here.

112. **Infrastructure Facilities**. Since, the subproject is spread over portions of Gaya City; the infrastructure facilities like schools, hospitals, colleges, electricity and communication in the subproject area are satisfactory.

113. During execution of the proposed subproject, there will be no impact on the main building of any department/ facility, therefore no impact on any educational, administrative or

10 Income certificate or income tax return certificate or any other document proving their income from affected commercial establishment.

medical service is anticipated.

114. **Water supply.** Piped water supply system in Gaya was introduced in 1924, with Phalgu River as a source. Later on in 1954-55, due to inadequate flow in the river during summers and to cope with the growing water demand, a groundwater based source at Dandibag on the bank of River Phalgu was developed. The water supply system was expanded to different parts of the City from time to time. The present water system is based on groundwater, and 61 MLD of water is supplied every day at the rate of 40 liters per capita per day (LPCD), much less than the stipulated norm of 135 LPCD. Water distribution system consists of 150 km with 50-600 mm Dia. Due to old system leakages are frequent, and the system losses are as high as 40% of the water supply. About 60% of population have access to water supply and remaining population depends on in house own tube wells and hand pumps provided by the GMC and PHED. The PHED is currently implementing a project to expand the water supply system to some uncovered areas. This will augment the supply by additional 16 MLD.

115. **Sewerage and Drainage System**. Gaya has no separate sewerage system to carry the wastewater. Existing drainage system was developed in 1930's and is a combined system to carry both wastewater and storm runoff. This drainage system covers 80% of the City area, and consists of open and as well as underground drains: of the 80 km length, 65 km drains are open drains and remaining 15 km are underground closed drains. There is no defined drainage system in southwestern and southern parts of the City. Due to lack of sewerage system, about 75% of the households depend on individual septic tanks and remaining 25% depend either on public toilets or resort to open defecation. Effluent from the septic tanks joins the drainage system. Owing to the topography, the drainage system is gravity based, and drains mostly into Phalgu River. Since there is no treatment facility, wastewater is directly discharged into the river without any treatment.

116. The drainage of Gaya is influenced by the hills surrounding it on three sides – Mangla Gauri, Shringa Sthan, Ramshila and Brahmayoni – and the River Phalgu on the remaining side. The road to the west of the Collectorate divides the drainage into two zones – western and eastern. Gaya's drainage network is 60kms long – covering 40% of the road network – with 46 km of the drains being pucca and 16km kutcha. The main drains in the western zone include Kujapi, Karimganj and Katari Hill Road Nallah and these discharge effluents at various places like the Gandhi Maidan, near the Railway Station etc. The main drains in the eastern zone include Mansarva, Mashanghat and Nadraganj Nallah and these discharge effluents into the River Phalgu. The area to the north of Dhobi Road Nallah to Katari Hill Road Nala, Gandhi Maidan to Kujapi Nallah and newly developed colonies in Manpur, Ghughari, Monapur, and Kumar Colony have no drainage and are prone to water logging.

117. **Solid Waste**. Gaya generates about 250 tons of municipal solid waste per day. The GMC collects about 60 percent of the waste generated through its solid waste management system. At present there is no door-to-door collection system. The waste collected through community dustbins (about 100 in Nos.) is transported to the disposal sites using tractors and open dumper trucks. Street littering is prevalent, and solid waste is mostly deposited on the side of the roads and vacant lands. At present no specific MSW disposal site exists in the City. Part of the solid waste collected is dumped along the roadsides at Gagri Tand area, 7 km from the City. Remaining waste is dumped in vacant plots, along the roads, drains and low-lying lands in and around the City.

118. **Transportation**. Gaya is well connected by road, rail and air. Two National Highways pass through the City: NH-83 running north-south connects Gaya to Patna in the north and

Dobhi in the south; and NH-82 running east-west connects Gaya to Bihar Shariff and Mokama in the east and Dudnagar in the west. A bypass runs on the southern side of the City, connectingNH-82 and NH-83. There are three State Highways (SH) passing through Gaya. Gaya is well connected by railways. Main railway line connecting Kolkata in the east and Delhi and the west passes through the City. Gaya also has an airport. Gaya has a well developed internal road network. The total length of roads in Gaya is 105km, of which 67% are municipal roads and remaining are State and National Highways. Most of the roads in the City are narrow, congested and carries traffic exceeding its capacity. The average road width is 5.5m which is further reduced to 3.5m due to encroachments. There is no organized public transport system. There is heavy dependence on para-transit facilities: auto and cycle rickshaws and tongas (horse-drawn vehicles).

119. **Power Supply.** Thermal power is the main source of energy in Bihar, contribution of hydro power is negligible. State-owned Bihar State Electricity Board is responsible for power generation, transmission and distribution of electricity. Power is supplied from the central grid by overhead cables carried on metal and concrete poles, mainly located in public areas alongside roads. The power supply is erratic and there are frequent outages in warmer months, and large fluctuations in voltage.

C. Social and Cultural Resources

120. **Demography.** Based on 2011 census, Gaya City population was 463,454, up from 291,675 in 1991,registering a decadal growth of around 33%. Average population density is 10,963persons/sq. km. Sex ratio (females per 1000 males) was 886 which is lower than the State and the national average of 919 and 929 respectively. Overall literacy rate is reported at 85.74% with 90.49 % for males and 80.35 % for females (the corresponding State figures are 63.82%, 73.39% and 53.33 % respectively).Overall work participation rate (WPR) in the City is 24.5 %, reported at 39.8% for males and 7.3% for females. Occupational pattern shows that 82.6% of the persons are engaged in industrial and service sector (organized and unorganized, excluding the workers engaged in household industry and agriculture). Around 7.2 % workers are engaged in agricultural activities and the rest 10.2% in household industries.. Majority of the people are Hindus and the remainder are mainly Muslims. Other religious communities like Sikhs, Christians, Jains and Buddhists also found in the City but in few numbers. Main languages spoken in the City are Hindi, Magahi (dialect), Bhojpuri and Urdu. Among the total population 9.6% comprise scheduled castes (SC) population; around 0.2% of population belong to Scheduled Tribes (ST) category - but these are all part of the mainstream population. Demographic status as per 2011 census is shown in Table below.

Table 19: Demographic status of Gaya city

Gaya City	Total	Male	Female
Population	**463,454**	245,764	217,690
Literates	**346,747**	194,377	152,370
Children (0-6)	**59,015**	30,966	28,049
Average Literacy (%)	**85.74**	90.49	80.35
Sex ratio	**886**		

Gaya City	Total	Male	Female
Child Sex ratio	**906**		

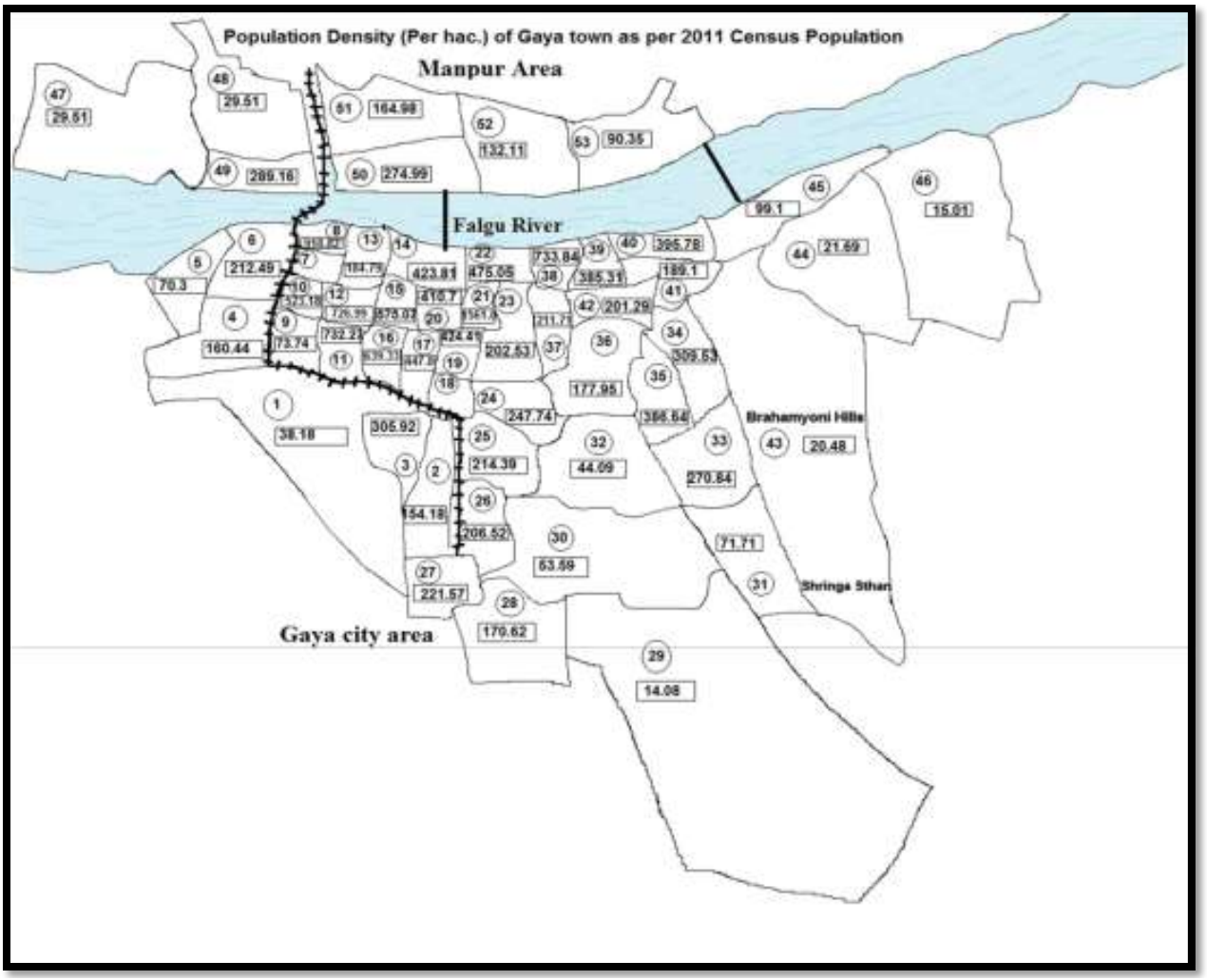


Figure 10: Ward wise population density at Gaya

121. **Educational and Health Facilities.**

(i) Education*:* There are at present about 117 primary schools, 52 middle schools, 15 inter schools and 3 district level schools in the city. The availability of basic educational institutions appears to be fairly adequate at the city level as the average population served is well within the norms for the same. The Magadh University established in 1962, is located at Bodhgaya, which is comfortably accessible from Gaya. Gaya has several colleges, the well known ones include Gaya College, Anugrah Memorial College, Jagjivan College, Mirza Ghalib College, and Gautam Buddha Mahila College for women.Anugraha Narayan Magadh Medical College and Hospital (ANMMCH) located here is a renowned institution in the field. There are also few private engineering colleges in the city. Gaya also has an Industrial Training Institute for vocational education located on Bodhgaya Thus, in respect of educational facilities, the availability of basic facilities appears fairly adequate though, spatial distribution has not uniformly

facilitated their accessibility.

(ii) Health. At present there are six major hospitals, which caters to the patients from the entire region. In addition to these, there are a number of allopathic, ayurvedic and homeopathic and other dispensaries and private nursing homes of various specializations in Gaya. Thus, in terms of quantitative requirement, the availability of medical facilities appears to be quite adequate as of now, while the accessibility is not uniform, in view of the location of these facilities only in selected areas.

122. **History, Culture, and Tourism**. Gaya, located in Mahadh Region, is a historic and a most important religious center for Hindus. The world famous Buddhist center of Bodh Gaya is located 13 km south of Gaya. The history of Gaya has a unique place in the evolution and development of Hindu civilization. According to the religion of Puranaas, it is incumbent on every Hindu to visit Gaya and make offerings for the souls of his ancestors. Gaya is believed to be the one of the oldest exiting cities in the World, and it presents a nucleus of several religions (Hinduism, Buddhism, Jainism etc) and its effects.

(i) History: Magadh history goes back to Sisunaga Dynasty (600 BC); however, it was during the time of Bimbisara (545 BC), the Magadh Region and the Gaya came into prominence. During his reign Gautama Buddha came to Gaya, and spent time in contemplation on a rocky crest, now known as Brahmayoni Hill (it is now a declared monument of the State Government) before he passed on to Bodh Gaya. After Bimbisara, his son Ajatasatru became the King. Ajatasatru was succeeded by Udayi, and then the Nanda Dynasty took over the Magadga Region. Thereafter, Magadh Region came under the rule of the famous Maurya Dynasty. Mauryan King Ashoka (272 BC – 232 BC) embraced Buddhism; he visited Gaya and built the first temple at Bodh Gaya to commemorate Prince Gautama's attainment of supreme enlightenment. Gaya came under the reign of Muhamaddan rulers in the 12th century with Muhammad Bakhtiyar Khilji invading the region. The region came into British Rule after the battle of Buxar in 1764.

(ii) Places of importance and Tourism. Gaya City is divided into two parts: the old City of Gaya popularly known as Andar Gaya, and the new City of Sahebganj. Andar Gaya is one of the most ancient inhabited areas. The main attractions of this old City are the sacred shrines, which attract Hindu pilgrims from all over the world. Vishnupada temple is main temple in and around Gaya. **Table 20** presents a list of monuments/sites declared as protected by the Government of Bihar. People mainly visit Gaya for offering Pind Dan (oblations) for salvation of soul of one's ancestors. There are 360 Vedis (places where offerings are made)located within Pancha Kosi Gaya. Thousands of pilgrims visit Gaya throughout the Year. Pitrapaksha Mela (fair), organized for 15 days as per the Hindu calendar every year in Gaya is a very important Hindus. Few hundred thousands of people visit Gaya during this period.

Table 20: Ancient Monuments, Historical and Tourism Places in Gaya

S.No	Name	Features
1	Vishnupad Temple	This is the main temple in Gaya dedicated to Lord Vishnu. This is located along the Phalgu River, marked by a footprint of Vishnu and Buddha incised into a block of basalt. The present day temple was rebuilt by Devi Ahilya Bai Holkar, the ruler of Indore, in the 18th century. There is a gold flag and couple of Kalash made of gold has been embedded at the top of the temple which use to always glitter

S.No	Name	Features
2	Brahmyoni Hill	It was at Brahmayoni hill that Buddha preached the Fire Sermon (Adittapariyaya Sutta) to one thousand former fire-worshipping ascetics, who all became enlightened while listening to this discourse. At that time, the hill was called Gayasisa.
3	Ramshila Hill	Ramshila Hill is situated 5 km from Vishnupad Temple. One of the most sacred hills, with considerable antiquity, the hill is dotted with numerous stone sculptors. It is closely associated with Lord Ram and takes its name after him.
4	Pratishila Hill	Pratishila Hill is situated at Gaya is about 10 km from Ramshila Hill. There is a lake known as Brahma Kund just below this hill, where people take bath and offer Pind Dan. There is a beautiful temple at its top known as Ahilya Bai Temple, built by the queen of Indore in 1787. The unique architecture and magnificent sculptures make the temple an important tourist attraction

Source:http://asi.nic.in/asi_protected_monu_bihar.asp

123. **Sensitive Environmental Receptors.** The sensitive environmental receptors existing along the alignment of proposed sub-project include religious places, educational institutions, health care centers, community property resources, etc. The details of the existing sensitive environmental receptors near distribution mains are given in the **Table 21** below. These sensitive receptors will not be affected.

124. It is noted from the Table below that 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 minimize 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. As per present design proposed construction project involves relocation of nine dwelling units including one Gaya Municipal Corporation (GMC) staff quarter at one site (Ramshilla hill). Also there will be partial impact on 6 households. Rehabilitation & resettlement issue deals separately under Resettlement Plan.

125. Transmission pipelines need to be laid within and nearby the state protected monuments area like Vishnupad Temple, Ramshilla hills, Brahmayoni hill. As per State Archeological Directorate NOC needs to be obtained from State Museum & Archeological Directorate under Art, Culture and Youth Dept. Govt. of Bihar before commencement of the work. NOC is already obtained from State Museum & Archeological Directorate. Practically no historic or religious structure will be impacted during pipe laying only during implementation of project mitigation measures like permission for concerned dept. and their condition will be maintained.

Table 21: Sensitive environmental receptors along distribution mains

S.No	Zone	School/college	Temple	Masjid/ Church	Pump House	Water Body/water tank	Hospital	Petrol Pump	Angan badi (Rural education center)
1	Zone-01	5	17	8	6	1	Nil	1	
2	Zone 02	4	14	1		1		1	1
3	Zone 03	1	3	1		1	1		
4	Zone 04		1						
5	Zone 05	4	15			1			
6	Zone 06	1	5	1		1	1		
7	Zone 7	4l	11	2	2	8	2		
8	Zone 7A	20	6				1	2	
9	Zone 8		3			3			
10	Zone 09	4	9	6		1	1		

V. ANTICIPATED IMPACTS AND MITIGATION MEASURES

126. This section of the IEE reviews possible subproject-related impacts, in order to identify issues requiring further attention and screen out issues of no relevance. ADB SPS (2009) require that impacts and risks will be analyzed during pre-construction, construction, and operational stages in the context of the subproject's area of influence. As defined previously, the primary impact areas are (i) the sites for tube well, water storage reservoir, distribution and transmission/ rising mains; (ii) main routes/intersections which will be traversed by construction vehicles; and (iii) quarries and borrow pits as sources of construction materials. The secondary impact areas are: (i) entire Gaya city outside of the delineated primary impact area; and (ii) entire Gaya district in terms of overall environmental improvement.

127. This sub project is covered by an item rate contract and not a DBO contract. Design has been finalized by DSC. In case of any change in location and scope, this IEE report will be updated by PMC and submit to ADB for review and disclosure.

128. **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.

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

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

A. Pre construction - Planning and Design Phase

131. 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 of drinking water supply at the user end; (iv) enhancing the efficiency of existing tube wells; (v) providing adequate infrastructure facilities for storage and distribution of water in deficient areas; (vi) most suitable construction methodology; and (vii) site constraints.

132. **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, Government of India. The same criteria are followed by PHED, the line department. Salient design features are presented in **Table 22.**

Table 22: Salient design features of the subproject

Parameter	Design Consideration
Refurbishment - Rehabilitation/ replacement of worn-out machineries and electrical devices in tube wells Arrangement of chlorinator in tube well for disinfection	
Working hours of tube wells	23 hours a day
Power	7.5 to 105 HP
Efficiency of pumps	80% minimum
Type of pumps	Multi-stage submersible pumps and vertical turbine pumps for tube wells
Incoming power supply	1000 KVA 11/0.415 KV transformers (1Working+1Stand by) with necessary protections through 11 KV VCB, LAs and ACB on LT with proper cabling.
Construction of overhead tanks and ground level reservoirs	
Foundation	Open type Reinforced Cement Concrete (RCC) raft
Super structure	RCC cylindrical shaft for overhead
Water tank	RCC cylindrical type
Material of construction of over head tanks	RCC (M30)
Total storage capacity	22.83 MLD Additional
Minimum storage capacity	20% of the average daily demand
Supply hours	24 hours
Laying and Replacement of distribution pipeline	
Design period	30 years
Pipe diameter range	110 to 700 mm dia.
Net per capita water supply (excluding losses)	135 liters per capita per day
Distribution losses (allowable)	15%
Material of construction for distribution mains and laterals	DI K7 & HDPE pipes
Location	Throughout the Gaya city
Climatic Conditions	Rainfall and its run off in the subproject area may cause disruption/damage to works under execution and public inconvenience. Furthermore, climatic conditions play an important role during dispersion of noise and air pollutants. Seasonal climatic conditions have been considered for scheduling of construction activities. Materials will be used for construction of water storage reservoirs with consideration of extreme weather condition like flood hazard. DI and HDPE pipes will be utilized for distribution main. Those pipes will be not affected from extreme climatic condition like higher temperature and rainfall,
Air Quality[11]	During Construction phase some emissions of dust are anticipated during various transportation, excavation and construction activities. Certain volumes of dust and gaseous

[11]Roadside pollution is often localized and generally only affects a narrow band of roads along the sides of the road. The major source of roadside pollutants is vehicle exhaust emissions. Other pollution sources emanate from combustion of hydrocarbon fuels in air producing carbon dioxide (CO_2) and secondary pollutants such as hydrocarbons (HC), nitrogen oxides (NOx), carbon monoxide (CO) and sulphur dioxide (SO_2). Emissions depend on the volume of traffic, the type of vehicle (including age, technology, and maintenance levels of the vehicle), fuel consumption and quality, engine temperature and road geometry. The highest emission rates are encountered in congested, slow moving traffic, and whenever vehicles shift gears, decelerate, accelerate or travel over steep gradients (hill slopes). There is also a tendency for emission rates to increase at high speeds.

Parameter	Design Consideration
	emissions will also be generated during the construction period from construction machineries like excavators, vehicles engaged in transportation of construction materials, etc. Pollutants of primary concern at this stage include Respirable Suspended Particulate Matter (PM_{10} and $PM_{2.5}$) and gaseous emissions. However, transportation of construction materials will be confined to adequate trips per day depending upon extent of construction activity. Proper mitigation methods will be adopted to control obnoxious gases and dust generated, if any.
Drainage and hydrology	The subproject components are not expected to have any negative impact on the drainage and hydrology of the area. Runoff from the subproject will produce a highly variable discharge in terms of volume and quality and in most instances will have no discernible environmental impact. As per record the area of Gaya has surplus exploitable ground water potential. Detail hydrological investigation carried out for final conclusion (Ref chapter 10 of hydrological study attached as **Appendix 7**.
Ecological diversity	The subproject is situated within an existing built up area of Gaya City except 2 new locations of water storage reservoirs within hills and forest. No areas of ecological diversity occur within the subproject location. Due to the nature and locality of the subproject, it is unlikely to have any impacts on biodiversity within the area. Only at forest area of Ramshilla hill tree felling will be required. No wildlife are present nearby the project location
Land use and livelihoods	The land use in the project corridor comprises of built up area and transportation area. There are few vacant areas in hill. The built up areas consist of residential complexes, government/private offices and buildings, educational institutes, religious places and commercial establishments such as shops, hotels and restaurants. The transportation area constitutes of existing roads in the subproject area. The key efforts undertaken to minimize impacts are: (i) before the preparation of engineering design, a detailed survey of the properties was conducted with regard to their ownership with the objective that minimum proprietary land is utilized for the subproject; (ii) utilizing available state land in possession of government departments for construction of OHSRs & GLSRs, aligning water supply pipelines towards the available government land to minimize impact on private properties and (iii) aligning water supply pipelines in commercial areas wherever possible to avoid any physical displacement or temporary impact. A Resettlement Plan has been prepared to address all involuntary resettlement impacts. No vulnerable people will be affected.
Traffic flow and access	Due to the location and nature of the subproject, there will be no as such interference with accesses to the adjoining properties. A communications strategy is of vital importance in terms of accommodating traffic during temporary road closure. Local communities will be continuously consulted regarding location of construction camps, access and hauling routes and other likely disturbances during construction. The road closure together with the proposed detours will be communicated via advertising, pamphlets, road signages, etc. The implementation of the road detours will also be dependent on advance road signages indicating the road detour and alternative routes. Template for Traffic Management plan is shown as **Appendix 12**
Infrastructure and services	There are a number of existing infrastructure and services (roads, telecommunication lines, power lines and water pipelines) within the vicinity of the subproject. To mitigate the adverse impacts due to relocation of the utilities, DSC will (i) identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase; and (ii) require construction Contractors to prepare a contingency plan.
Noise and vibrations	During construction phase, some noise and vibration will be generated from the various construction activities like construction works, operation of construction equipment and vehicles engaged in transportation of construction materials. However, these will be confined to the work sites only and will be temporary in nature occurring mostly during daytime.
Aesthetics, landscape character, and sense of	The subproject is considered to be compatible with the surrounding landscape and is not expected to negatively impact the existing visual quality or landscape character of the area.

Parameter	Design Consideration
place[12]	Construction waste, spoil materials will be disposed as per Spoil Management Plan (Template shown in **Appendix 13**)

DI=ductile iron; GLSR=ground level service reservoir; OHT= overhead tank; MLD= million liter per day; RCC=reinforced cement concrete
Source: As per DPR

133. **Design Period:** Different components of the proposed subproject are designed with design periods as under:

(i) The design period for distribution network is 30 years.
(ii) The design period for pumps and electrical equipment is 15 years.
(iii) The design period for civil works is 30 years.
(iv) The design capacity for storage system is 30 Years (135 lpcd +15% for distribution losses).

134. **Basis of design.** Design population and coverage of the project is given below:

Table 23: Design basis of the Subproject

Design feature	Description
Base Year (2018)	524,297
Mid-Design Year (2033)	675,237
Design Year (2048)	848,200
Coverage	53 municipal wards of GMC
Project area	50.17 sq km

Source: DPR Gaya Water supply

135. The Gaya city will be subdivided in 30 DMAs. The designs considered the demands for the year 2018, 2033, and 2048 and available production for the DMAs. The capacity of water storage reservoirs required in each zone has been worked out using the mass flow curve specified in the Indian Manual on Water Supply and Treatment. Similarly water distribution is being planned.

136. **Utilities.** Telephone lines and wires, water lines within the proposed subproject locations may require to be shifted in few cases. The mitigate the adverse impacts due to relocation of the utilities, DSC will (i) identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase; and (ii) require construction Contractors to prepare a contingency plan to include actions to be done in case of unintentional interruption of services.

[12]Aesthetics refer to the visual quality of an area as imparted by the physical properties of an area, such as scale, colour, texture, landform, level of enclosure, and in particular, the land use occurring within an area. Landscape character refers to an area's intrinsic appeal and is not dependent on its visual quality but rather on its specific situation as determined by the following: its level of accessibility or remoteness, level of naturalness, lack of disturbance, current and potential use, rarity, cultural or historic importance, and potential value to people. The landscape character determines the extent of visual compatibility of the water supply structures with its immediate surroundings. Impacts are not restricted to the vicinity but the entire viewshed (area from where the infrastructure will be visible). The spirit, or sense of place (Genius Loci), can be defined as the extent to which a person can recognise or recall a place as being distinct from other places and as having a vivid, or unique, or at least a recognizable character. It is indicates the intrinsic value that a community places on the aesthetic, therapeutic or emotional qualities and character of an area. Aesthetics, landscape character and sense of place are all subjective concepts that are often influenced by individuals' perceptions.

137. **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 PIU,GMC and appointed Contractor during construction period to:

(i) Plan the construction program to keep the cessation of water supplies to the minimum possible (in both area and duration);
(ii) In coordination with PHED, provide alternative potable water to affected households and businesses for the duration of the shut-down; and
(iii) Liaise with affected persons to inform them of any cessation in advance, and to ensure that they are provided with an alternative supply.

138. **Encroachment into private properties, forestland and cutting of trees and damage to vegetation**. Construction works in the Gaya city area, distribution pipe and rising main lines are to be laid on or along the roads in the un-used vacant land adjacent to the roads within the ROW. In narrow roads where there is no vacant land adjoining road, pipeline will be buried within the roadway. However, considering the narrow and busy lanes, temporary impacts are likely during construction stage.

139. No private land acquisition is required for construction of water storage reservoirs and allied components.

140. At 2 locations transfer of forest land will be required. 1st level of clearance has been obtained from DFO Gaya. In case of tree felling permission will be taken up from forest dept.

141. Gaya district falls in Seismic Zone III, which is a moderate risk zone and an earthquake up to a magnitude of 7.0 on Richter scale has the potential to hit the area. As per the seismic design philosophy laid in IS: 1893, 2002, the structure are designed such a way that it can withstand all Design Basis Earthquake (DBE) which are basically minor and medium ground slaking and it should not collapse but have cracks which are reparable during Maximum Considered Earthquake (MCE) which are basically major slaking. Thus as per the provision of the seismic code the structure are designed in such a way that in no case it will collapse. The present structures are also designed in line with the above provision of the IS 1893.

142. **Social and Cultural Resources.** Gaya is an area of large numbers of temples(some of them are historic) and other religious sites, so there is a risk that any work involving ground disturbance can uncover and damage archaeological and historical remains. For this subproject (construction of water storage reservoirs and laying of pipeline), excavation will occur in open area, so it could be that there is a medium risk of such impacts. Nevertheless, DSC/PMU/PMC will:

(i) Consult GMC to obtain an expert assessment of the archaeological potential of the site;
(ii) Consider alternatives if the site is found to be of high risk;
(iii) 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
(iv) Develop a protocol for use by the construction Contractors in conducting any excavation work, to ensure that any chance finds are recognized and measures are taken to ensure they are protected and conserved.

143. **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 10** shows site management plan for water storage reservoir sites.

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

(i) 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.
(ii) Storage areas shall be secure so as to minimize the risk of crime. They shall also be safe from access by children / animals etc.
(iii) Residents living adjacent to the construction site must be notified of the existence of the hazardous storage area.
(iv) Equipment lay-down and Storage areas must be designated, demarcated and fenced if necessary.
(v) Fire prevention facilities must be present at all storage facilities.
(vi) 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.
(vii) 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.
(viii) Fuel tanks must meet relevant specifications and be elevated so that leaks may be easily detected.
(ix) Staff dealing with these materials / substances must be aware of their potential impacts and follow the appropriate safety measures.

145. **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 to be located away from population centers, drinking water intakes and streams, cultivable lands, and natural drainage systems; and in structurally stable areas even if some distance from construction activities. 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.

146. **Maintaining Core Labor Standard**. The Contractor and PMU are responsible for ensuring that international Core Labor Standards (CLS)[13] –as reflected in national labor laws and regulations are adhered to. PMU is ultimately responsible for monitoring compliance with national labor 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) CLS and labor laws. PMU/PIU will ensure that bidding and contract documents include specific provisions requiring Contractors to comply with all: (i) applicable labor laws and CLS 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. These will be monitored as part of the project's safeguards reporting requirements.

B. Construction Phase

147. **Table 24** 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 24: Summary of Activities and Facilities, Resource Use, and Produced Outputs during Construction Phase

Activities and Facilities	Inputs/Resource Use	Outputs/Waste Production
• Construction camp and its associated facilities (including lay-down areas) • Storage camps and lay-down areas − Materials and equipment stockpiles − Handling and storage of hazardous materials including chemicals additives, gravel, cement, concrete and lubricants • Source of water • Vegetation clearance • Excavation • Drilling	• Bitumen • Cement • Chemical additives used in concrete • Aggregate (sand and stone) • Gravel (fill material and selected material for sub-base and base layers) • Water − 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	• Old asphalt (removed from road carriageway during laying of pipelines)[14] • Waste concrete and other construction rubble • Waste bitumen[15] • Used fuels, lubricants, solvents and other hazardous waste • General waste • Contaminated soil − Soil contaminated with bitumen − Soil contaminated with petrochemicals (i.e. oils and lubricants) and other chemicals • Sewage and grey water

[13] 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.

[14] 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.

[15] 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
• 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	sub-base and base layers prior to compaction • Petrochemicals • Other chemicals/lubricants/paints • Construction vehicles, machinery and equipment • Temporary energy supply to construction camps • Labor − Recruitment of construction workforce − Skills training • Public movement control − need barriers (not just caution/danger tape) to protect people from trenches during construction	(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 − Burning of vegetation cover − Fires used for cooking and space heating (construction camps) − Vehicle exhaust emissions • Dust − Vehicle & equipment movement

1. Screening of No Significant Impacts

148. 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 Gaya 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.

149. 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 25**. These environmental factors are screened out presently but will be assessed again before starting of the construction activities.

Table 25: 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 location.
Climate	Activities are not large enough to affect this feature.
Air Quality	Short-term production of dust is the only effect on atmosphere
Geohydrology and Groundwater	Activities will not be large enough to affect these features
Protected Areas	No protected areas nearby the Gaya city and project locations
Flora and Fauna	No rare or endangered species reported at project site
Land Use	No change in major land use.
Socio-economic	Subproject site is within govt. Land. No socio economic impact
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 or unscheduled historical, archaeological, paleontological, or architectural sites

2. Construction method

150. Rehabilitation of tube well will be done through replacement of mechanical and electrical equipment manually.

151. Renovation of water reservoirs will be done as per scope of work. All construction waste will be disposed after taking permission from the GMC. Simple civil construction method will be applicable for new reservoir.

152. Distribution mains and rising/ transmission mains will be buried in trenches adjacent to roads un-used RoWs. 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.

153. Trenches will be dug using a backhoe/manual, supplemented by manual digging where necessary. Excavated soil will be placed alongside, and the pipes (brought to site on trucks and stored on unused land nearby) will be placed in the trench by hand or using ropes for the ductile iron (DI) pipes. Pipes will be joined by hand, after which filling will be done with the excavated soil manually up to the ground level and compacted by a vibrating compressor. 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.

154. Pipes are normally placed by approximately 1 m below the existing ground level/road level and a clearance of 200 mm is left between the pipe and each side of the trench to allow

backfilling. Trenches will be smaller for the distribution main (minimum of 1m deep and 1 m wide)

155. 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 outside houses, attached to a wall or set onto the ground.

3. Anticipated Impacts and Mitigation Measures

156. Although construction of the subproject components involves quite simple techniques of civil work, the invasive nature of excavation and the subproject locations in the built-up areas of Gaya city where there are a variety of human activities, will result to impacts to the environment and sensitive receptors such as residents, businesses, and the community in general. These anticipated impacts are temporary and for short duration. Physical impacts will be reduced by the method of working and scheduling of work, whereby the project components will be (i) constructed by small teams working at a time; (ii) refilled and compacted after pipes are installed; (iii) if trenching done on roads, repaired to pre-construction conditions and (iv) any excavation done near sensitive area like school, religious places and house will be protected as per standard norms[16]. **Table 26** below outlines the anticipated impacts and mitigation measures during construction phase.

[16] Occupational Health and Safety of employees working only in factories and mines have been specifically covered in GOI laws. However, the Constitution of India has provisions to ensure that the health and well-being of all employees are protected and the State has the duty to ensure protection. For this subproject, the mitigation measures were based on the World Bank Environmental, Health, and Safety (EHS) Guidelines.

Table 26. Anticipated Impacts and Mitigation Measures During Construction Phase

Fields/Issues	Impacts	Management/Mitigation
Climatic impact	The nature and intensity of rainfall events in an area has implications for storm water management. Dust could be blown off site.	✓ 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	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 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 ✓ The Contractor is to ensure that open areas or the surrounding bushes are not being used as toilet facility. ✓ The Contractor shall ensure that all litter is collected from the work and camp areas daily. ✓ Bins and 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. ✓ The Contractor shall ensure that his camp and working areas are kept clean at all times.
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. ✓ The rules that are explained in the worker conduct section, must be followed at all times

Fields/Issues	Impacts	Management/Mitigation
Dust and air pollution[17]	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.	✓ 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	There are no health facilities, scheduled or unscheduled historical, archaeological, paleontological, or architectural sites within the construction impact zones. However, construction works will be on settlements, along and near 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 excavation equipment, and the transportation of equipment, materials, and people. Impact is negative, short-term, and reversible by mitigation measures.	✓ 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; ✓ 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.

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

Fields/Issues	Impacts	Management/Mitigation
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 ✓ During construction, un-channeled flow must be controlled to avoid soil erosion.
Water quality[18]	Mobilization of settled silt materials, run-off from stockpiled materials, and chemical contamination from fuels and lubricants during construction works can contaminate stream or river water. These potential impacts are temporary and short-term duration only. Generation of Spoil and disposal. In case of disposal of the earth within the water body turbidity will be increased.	✓ 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 GMC/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). ✓ Not to dispose any construction materials in water body which may pollute the surface water and aquatic fauna ✓ Spoil Disposal Management Plan (SDMP) will be prepared and implemented to minimize the potential effects of sediment plumes on aquatic habitats. Sample spoil management plan is attached as **Appendix 13**. ✓ Details of the proposed Water Quality Monitoring Program will be included in the environment management plan

[18]Water 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.

Fields/Issues	Impacts	Management/Mitigation
Conservation of natural environment – terrestrial flora	Felling of the trees (if any) will affect terrestrial ecological balance.	✓ 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 (particularly at forest area of Ramshilla hill and Brahmayoni hill) as far as possible through design modification ✓ Require to plant three (3) native trees for every one (1) 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	Significant amount of gravel, sand, and cement will be required for this subproject. This could obstruct passage ways.	✓ 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. ✓ Verify suitability of all material sources and obtain approval of PIU & DSC

Fields/Issues	Impacts	Management/Mitigation
Landscape and Aesthetics including Waste management	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.	✓ 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 utilized by farmers for nutrient value ✓ Coordinate with DSC-PIU for beneficial uses of excess excavated soils or immediately dispose to designated areas ✓ Recover used oil and lubricants and reuse or remove from the sites ✓ Request DSC/PIU to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work
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. Specifically, (i) Develop and implement site-specific Health and Safety (H and S) Plan which will include measures such as: (a) excluding

Fields/Issues	Impacts	Management/Mitigation
		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; (ii) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site; (iii) Provide medical insurance coverage for workers; (iv) Secure all installations from unauthorized intrusion and accident risks; (v) Provide supplies of potable drinking water; (vi) Provide clean eating areas where workers are not exposed to hazardous or noxious substances; (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; (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; (ix) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas; (x) Ensure moving equipment 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.

Fields/Issues	Impacts	Management/Mitigation
Community Health & Safety	Hazards posed to the public, specifically in high-pedestrian areas may include traffic accidents and vehicle collision with pedestrians. In most of the cases location of project sites at isolated area, hence health and safety risk to community is minimum. Potential impact is negative but short-term and reversible by mitigation measures.	✓ 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-construction hours
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.	✓ Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of 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 ✓ Sample Traffic Management Plan is attached as **Annexure 12**

Fields/Issues	Impacts	Management/Mitigation
Social impacts[19]	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.	✓ Contractor's activities and movement of staff to be restricted to designated construction areas. ✓ 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. 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 14** ✓ 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 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. ✓ 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. ✓ 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 a week 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.

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

Fields/Issues	Impacts	Management/Mitigation
Cultural environment	excavation will occur at specific isolated location and along the roads, so it could be that there is a moderate risk of such impacts	✓ All the staff and laborers 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. Operation and Maintenance Phase

157. **Table 27** presents an indication of what activities and facilities are likely to be undertaken during operation and maintenance (O&M) phase of the subproject, including the associated inputs and outputs.

Table 27: Summary of Activities and Facilities, Resource Use, and Produced Outputs during Operation and Maintenance Phase

Activities and Facilities	Inputs/Resource Use	Outputs/Waste Production

• Signages
• Safety barriers
• Noise and vibrations
• Litter collection
• Maintenance activities
  − Repairing and maintenance of pipelines, pumps and machinery of tube wells,
  − Maintenance of OHTs, GLSRs and pipelines
• Eradication and control of invasive vegetation species
• Auxiliary activities and Infrastructure
  − Markets and shops
• Ground water quality monitoring during operation and maintenance. Parameters as per Indian standard
	• Control of vegetation species
	• Labor
	• Control of quality of supplied water
	• Vehicles and equipment used for inspections and maintenance
	• Aggregate and other material used during repairing of pump & machinery of tube wells, pipelines, machinery and maintenance of OHTs, GLSRs
		• 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

1. Screening out areas of no significant impact

158. 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 28** below, with an explanation of the reasons for each case. Thus, these factors have been screened out of the impact assessment and will not be mentioned further.

Table 28: 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	Gaya 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

159. O&M of the water supply system will be the responsibility of GMC. A small number of

people will be employed to operate and maintain the tube wells, reservoirs and pipelines. GMC will employ local Contractors to conduct repairs, and Contractors should be required to operate the same kinds of Health and Safety procedures as used in the construction phase to protect workers and the public.

160. 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 good working condition. 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, including regular checking and recording of performance for signs of deterioration, servicing and replacement of parts.

161. The main O&M activities of the refurbished infrastructure will be detection and repair of leaks and pipe bursts. However, these are likely minimal as proper design and selection of good quality pipe material have been considered upfront. Leak repair work will be similar to the pipe laying work as earlier explained. Trenches will be dug to reveal the leaking area and the pipe will be removed and replaced, if necessary.

3. Anticipated Environmental Impacts and Mitigation Measures

162. **General.** If trenches are to 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. GMC will need to require its O&M Contractor to:

(i) Refill and re-compact trenches soil and backfilled sand will be removed to expose the leaking junction or pipe;
(ii) Conduct work during non-monsoon period;
(iii) Cover or wet excavated material to prevent dusts; and
(iv) Other mitigation measures as may be needed.

163. **Health and 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.

164. Mitigation measures include:

(i) Follow World Bank's EHS guidelines during operation phase;
(ii) Undertake regular monitoring and maintenance of water supply infrastructure;
(iii) Regularly test the quality of water for both chemical & biological parameters as per Indian standard; and
(iv) Treat sewage in STP before discharge into environment.

165. **Storage of common salt as chemical used in water treatment at tube well site.** The impact is associated with the loss or leakage of the chemical due to poor storage. In this case, the mitigation measures will include:

(i) Storage of the chemicals should be in dry place;
(ii) Volume of chemicals to be stored should be kept at minimum;

(iii) Material safety data sheet to be maintained at chlorine/common salt storage area;
(iv) Regular laboratory testing for dosing and residual chlorine;
(v) Chlorination in water will be done as per CPHEEO manual and ensure residual chlorine is within permissible limit; and
(vi) Dosing of chlorine (to the water) will only be administered by trained personnel.

166. **Ecological Resources.** There are no significant ecological resources in or around the city as well as project location, so any repairs or maintenance work can be conducted without ecological impacts.

167. **Economic Development.** There are no major anticipated economic development impacts during O & M of the facilities. Nevertheless, GMC will need to require its O & M Contractor to:

(i) Inform all residents, businesses and sensitive receptors about the nature and duration of any work 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, and provide road diversions or re-routing if necessary.

168. 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.

169. **Social and Cultural Resources.** Although excavation works pose medium risk of damaging resources with historical or archaeological importance, extreme precautions will be observed to protect such resources.

170. 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. GMC will need to require its operation and maintenance Contractor to:

(i) Consult the city authorities to identify any buildings at risk from damage due to vibration and avoid use of pneumatic drills or heavy vehicles in the vicinity;
(ii) Complete any work in these areas quickly; and
(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 during religious and cultural festivals.

D. Cumulative Environmental Impacts

171. As per present scope of work refurbishment of existing tube wells, construction of new OHTs and GLSRs, and laying of new rising mains and distribution pipelines will ensure adequate supply of potable water to the water deficient areas and low pressure area. Also, water loss will be checked through development of the project, which will save energy. The proposal for rehabilitation of water supply facilities goes a long way in achieving some of the goals of a good urban water supply system. Cumulative impact is positive, which involves

development of the city with better water supply system. At the same time, there will also be a reduction of health risks associated with contaminated water due to leakages in water supply pipelines. Metering of connections shall substantially reduce the non revenue water losses in the selected areas. All these are considered positive cumulative impact towards the development of the city.

172. **Table 29** presents the cumulative impacts which are impacts that result from the incremental impact of the subproject activity on a common resource when added to the impacts of other past, present, or reasonably foreseeable future activities. Cumulative impacts are identified, predicted in the same level of detail as the impacts discussed above.

E. Assessment of No-Go or No Build Option

173. **Table 30** outlines potential impacts associated with the “No-Go” option. The No-Go option involves no additional commitment of resources. Choosing the No-Go option has the same effect as if the decision never occurred.

Table 29: Summary of Anticipated Potential Cumulative Environmental Impacts

Environmental Aspect	Summary of Implications and Mitigation	
	Potential Impacts	Mitigation
Significant enhancement in water production and storage facilities in water deficient areas of Gaya.	• Refurbishment of existing tube wells, construction of new OHTs & GLSR and replacement of old pipes and laying of new rising mains and distribution pipelines shall ensure adequate supply of potable water to the water deficient areas and low pressure area	• Refer to tables above
Significant reduction in water losses due to leakage in distribution pipe lines.	• Laying of new distribution mains and replacement of old pipelines through laying of new parallel pipeline shall ensure significant reduction in water losses. • This will also reduce the health risks associated with contamination of water due to leakages in water supply pipelines.	• Refer to tables above
The rationalization and reorganization of water supply system	• It is important to provide better water supply facilities so as to ensure adequate supply of potable water to the user end. • The proposal for rehabilitation of water supply facilities goes a long way in achieving some of the goals of a good urban water supply system.	• Refer to tables above
Minimization of non revenue water losses	• Metering of connections shall substantially reduce the non revenue water losses in the selected areas.	• Refer to tables above
Landuse	• It is expected that improvement in the water supply system of the water deficient areas will act as a catalyst for overall development of the area.	• Refer to tables above

Table 30: Summary of Anticipated Potential Environmental Impacts of the No Build Options

Environmental Aspect	Summary of Implications and Mitigation	
	Potential Impacts	Mitigation
Climate	• No obvious impacts	• n/a
Air Quality	• Will remain the same • No impacts on sensitive receptors during construction	• None
Geology	• No obvious impacts	• n/a
Drainage and hydrology	• No obvious impacts	• n/a
Land Use	• The water-deficient areas shall continue facing the same impacts and their development shall be hindered.	• None
Traffic	• No obvious impact	• n/a
Health and Safety	• Subproject areas will continue facing health risks owing to degradation in water quality due to leakages in pipelines and storage reservoirs	• None

Environmental Aspect	Summary of Implications and Mitigation	
	Potential Impacts	**Mitigation**
Noise and dust Pollution	• Noise and dust pollution will remain the same. • No impacts on sensitive receptors during construction.	• None
Aesthetics, Landscape Character and sense of place	• Likely to deteriorate as sanitation of the area depends largely on availability of water supply.	• None

VI. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

A. Project Stakeholders

174. 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 artifacts; and

175. The secondary stakeholders are:

(i) UDHD as the executing agency and 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, GMC);
(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, Government of India, State Government of Bihar and Ministry of Finance.

B. Public participation during the preparation of the Initial Environmental Examination

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

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

(i) 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.
(ii) Walk-through and informal group consultations in the proposed subproject area.
(iii) The local communities had been informed through public consultation about the project and its benefits.
(iv) The environmental concerns and suggestions made by the participants were listed and discussed. The suggestions were incorporated in the EMP.

178. 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.

179. **Table 31** shows the persons consulted during preparation of IEE, including the information and issues discussed.

Table 31: 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 Gaya and procedure to get NOC	Bramiyoni hill, Pretshilla, Ramshilla and Vishnupad temple these are state archaeological protected sites within Gaya city. List of Archaeological sites in Bihar collected from the Dept. Application for getting NOC needs to be submitted after finalization of design
2	Mr. Madan Singh Chouhan	Superintending Archaeologist	Central Archaeology Department, ASI, Patna	20.12.2013	About the place of Gaya under archaeology Dept and procedure for getting NOC	Suggested to get NOC from State Dept
3	Mr. S. N. Jaiswal	Scientist	Pollution Control Board, Patna, Bihar	02.01.2014	Secondary/ published Data of Air, Water, Noise for Gaya	Water and Air data provided
4	Mr. A. K Srivastava	Water Lab Incharge	Pollution Control Board, Patna, Bihar	02.01.2014	Water Quality Data for Gaya	Dandibagh ground Water Data Received. Understanding of contamination of ground water.
5	Mr. Arun Kumar	Air Lab In-charge	Pollution Control Board, Patna, Bihar	02.01.2014	Air quality Data for Gaya	Air Data received. Understanding air pollution status
6	Mr. Dipak Kumar	Executive Engineer	Gaya Municipal Corporation	09.01.2014	About the pipeline which was laid down by Kriloskar and regarding advantage of proposed project	Information on present status of pipeline as laid down by Kirloskar
7	Mr. Sailendra Kumar	Chemist	PHED, Gaya	13.11.2013	Groundwater quality	Collection of Ground Water Data
8	Mr. K. P. Sharma	Retd. Executive Engineer	SPUR	09.01.2014	About the existing water supply system and water quality. Discussed specifically about Ward 53	Existing water supply information map data provided
9	Mr. T.P. Sharma	Retd. Ex. En	SPUR	09.01.2014	About the existing water supply system	Existing water supply information map data

					and water quality. Discussed specifically about Ward 53	provided
10	Mr. K. Nesamani	Divisional Forest Officer	Divisional Forest Office, Gaya Forest Division	10.01.2014	About the forest area of Gaya and procedure for getting NOC from State Forest Dept.	After finalization of design form will be filled up and submitted to state forest Department

180. Public consultations and group discussion meetings were conducted by PMC and PMU during 9 to 11 January 2014, 5 to 6 February 2015, 23 February 2015 and 6 March 2015 at Gaya. The objectives were to appraise the stakeholders about the program's objectives and safeguard issues. Prior to these consultations, on 5 December 2013, a kick-off meeting was conducted with the GMC officials and elected members. Minutes of the kick off meeting and local level consultations are attached as **Appendix 15** and **Appendix 16,** respectively**.** 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 Consultations and Disclosure

181. BUIDCo extended and expanded the consultation and disclosure process significantly during implementation of BUDIP. It is in the process of appointing an experienced NGO to handle this key aspect of the program. The NGO will continuously (i) conduct a wide range of activities in relation to all subprojects in the city; and (ii) ensure that the needs and concerns of stakeholders are registered and are addressed in the proposed subproject design.

182. 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.

183. Information, Education and Communication (IEC) materials for the sub project will be developed using mass-media techniques. Design of the systems and delivery of the messages will be responsibility of the NGO in consultation with the PMU/PMC. The process will include:

(i) Preparing education and awareness materials such as posters, billboards and streamers for community display;
(ii) Developing Leaflets and stickers for general awareness of all community members;
(iii) Television spots/messages of about 30 seconds duration;
(iv) Discuss with the PR team at PMU/PMC on the 'key messages' to be disseminated (indicated in table below);
(v) Videos;
(vi) Newspaper advertisements; and
(vii) Any other suitable modern techniques

Key Messages to Specific Target Groups		
Sl.No.	Target Group	Key Message
1	All Citizens	○ Good citizens are those who pay bills on time, have legal connection, & avoid water wastage. ○ Only good citizens can demand good services.
2	Slum Dwellers	○ Safe storage of water; seek individual HH Legal connections.
3	Middle/Upper Class	○ Pay bills on time; give up illegal connections.
4	Business Centers/ Councilors	○ Discourage illegal connections; exhort to pay bill on time; ○ Participate in planning process by ULB & PHED.
5	Municipal Officers/ Municipal Supervisors/ Workers	○ Support to water supply project, PHED to facilitate improved services; ○ Communicate link between improper services & water or vector borne diseases.
6	Water Supply Dept. Workers, PHED Staffs	○ Support to water supply project; ○ Good water services means better work environment; ○ To meet with the state level norms
7	Media	○ Good water services are good for families; it attracts more business & industry
8	School Teachers / Students	○ Clean water means healthier lives & better education.

184. 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/GMC. It will be ensured that the hard copies of IEE are kept at such places which are conveniently accessible to citizens. 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 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.

VII. GRIEVANCE REDRESS MECHANISM

185. A common Grievance Redress Mechanism (GRM) has been 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 (APs) and NGOs.[20] Customer Service Centers (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.

186. The GRM provides an accessible, inclusive, gender-sensitive and culturally appropriate platform for receiving and facilitating resolution of APs' grievances related to the project. A Grievance Redress Cell will be established at PIU. The safeguards officer of PIU, supported by the social safeguards expert and social mobilizers of DSC, will be responsible for conducting periodic community meetings with affected communities to understand their concerns and help them get through the process of grievance redressal, including translating the complaints from the local language to Hindi or English, recording and registering grievances of non-literate APs, and explaining the process of GRM. 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 will act upon 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).

187. 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 and DSC will try to successfully resolve them. In case of larger issues, they will seek the advice and assistance of the PMU.[21] Grievances not redressed through this process within/at the project level within stipulated time period will be referred to the City Level Committee (CLC) / Grievance Redress Committee (GRC). GRC notification at state level has been issued on 27 May 2015.

188. The CLC will be set up to monitor project implementation. In its role as a 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, failing which the grievance will be addressed by the state-level Project Steering Committee (PSC). The

[20] The draft Grievance Redress Process has been circulated and discussed with the following Bihar-based NGOs and research institutes working on environment, social and gender issues, for comments: Asian Development Research Institute, Participatory Research in Asia, Nav Manas Kalyan Samiti and Taru Mitra.

[21] 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.

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.[22] The multi-tier GRM for the project is outlined below (**Figure 11**), 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.

189. The maximum time period of 30 days of redressing grievances at the project level will include the following specific actions and timeframes based on the date of receipt of the complaint or grievance: (i) acknowledge the letter of complaint or grievance within 5 days; (ii) issue a notice of meeting to the GRM panel within 10 days; (iii) hold GRM panel meeting and agree on a decision within 15 days; (iv) issue the decision within 20 days; (v) meet with the complainant to deliver the decision within 27 days; and (vi) allow complainant to respond within 3 days from receipt of the decision.

190. 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 at ADB Headquarters or the ADB India Resident Mission. 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.

191. **Composition of GRC and PSC:** The CLC, acting as GRC, will have the District Magistrate (as 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, Forest Department, Railways etc.); Chairpersons of the concerned Municipal Corporation's Standing Committee, ULB officials including Municipal Engineer, Town Planning Officer, Medical and Health Officer; and 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 impacts to indigenous peoples in future subprojects, the GRC/CLC must have representation of the affected indigenous peoples community, including at least one female indigenous person, the chief of the tribe or a member of the tribal councilas traditional arbitrator (to ensure that traditional grievance redress systems are integrated) and an NGO working with indigenous peoples groups.

[22] 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.

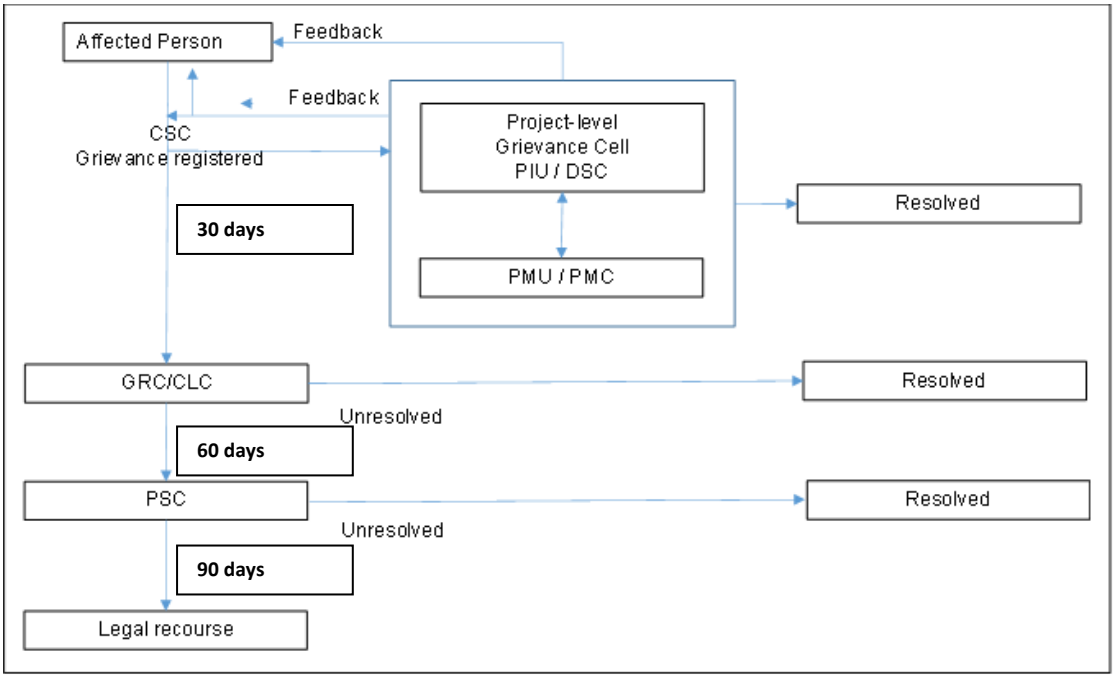


Figure 11: Grievance Redress Mechanism Process

A maximum time period of **30 days** for project level grievance, **60 days** for the GRC/CLC and **90 days** for the PSC. 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

192. The PSC will include: (i) Minister for Urban Development (as chairperson), (ii) State Chief Secretary (as vice chairperson), and (iii) 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).

193. **Areas of Jurisdiction:** The areas of jurisdiction of the GRC (as 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).

194. **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.

195. **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.

196. **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 the DSC safeguards specialists in conducting public 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 information on (i) who to contact and when, where and how to register grievance, (ii) various stages of grievance redress process, and (iii) time likely to be taken for redressal of minor and major grievances, among others. 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 (i) displayed/disclosed in the PMU and PIU offices, ULB/concerned local panchayat notice boards and on the web, and (ii) reported in the semi-annual environmental monitoring reports to be submitted to ADB. A Sample Grievance Registration Form has been attached in **Appendix 17**.

197. **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.

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

VIII. ENVIRONMENTAL MANAGEMENT PLAN

199. The EMP will guide the environmentally-sound construction of the subproject and ensure efficient lines of communication among 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.

200. 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.

201. 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 India[23] 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).

202. The Contractor is deemed not to have complied with the EMP if:
   (i) within the boundaries of the site, site extensions and haul/ access roads there is evidence of contravention of clauses;
   (ii) if environmental damage ensues due to negligence;
   (iii) the Contractor fails to comply with corrective or other instructions issued by the Engineer/PMU/PIU within a specified time; and
   (iv) the Contractor fails to respond adequately to complaints from the public.

A. Institutional Arrangement

203. The Urban Development and Housing Department (UDHD) of Government of Bihar is the Executing Agency (EA) for the Project, which will receive strategic directions from a state-level Steering Committee. During the course of implementation of the program, ADB and BUIDCo agreed to change the PMU from UDHD to BUIDCo and to merge PMU and PIU since BUIDCo is currently the single window for all national and external assistance to Bihar's urban sector, and manages various urban sector projects. PMU has been headed by MD of BUIDCo, who works closely with and reports to the Principal Secretary of UDHD. UDHD, on the other hand, will implement the institutional reform component under the investment program and coordinate with (i) national and state agencies to resolve any inter-departmental issues, and (ii) BUIDCo and city ULBs for implementation of physical investment activities.

204. 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)[24] assists UDHD in providing policy guidance and coordination across all towns and subprojects; and
   (vii) City/Town Level Committees[25] (C/TLCs) have also been established in each

[23] 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."

[24] PSC: 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.

25 CLC: The CLC, acting as a Grievance Redress Committee (GRC) will have District Magistrate (Chairman),

program town/city to monitor project implementation in the town and provide recommendations to the PIU where necessary.

205. **PMU's Role in Safeguards.** The PMU within BUIDCo has an Environmental and Social Management Coordinator (ESMC) who addresses environmental and social safeguards issues with assistance from Program Management Consultants (PMC). Environment Engineer of PMU will be responsible for supervision and management of environmental 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 leads preparation of safeguards documents for future tranches with inputs from PIU or DSC.

206. The ESMC of PMU will:

(i) coordinate with PIUs' Safeguards Officers for the day-to-day monitoring of subproject implementation

(ii) ensure overall compliance with all government rules and regulations regarding site and environmental clearances, as well as any other environmental requirements (e.g., location clearance certificates, environmental clearance certificates, etc.), as relevant;

(iii) confirm existing IEEs are updated based on detailed designs and that new IEEs/EMPs are prepared in accordance with the EARF and subproject selection criteria related to safeguards;

(iv) confirm IEEs are included in bidding documents and civil works contracts;

(v) for DBO contract/s, coordinate with contractor/s in the updating of the draft IEE once detailed design is available;

(vi) provide oversight on environmental management aspects of subprojects and ensure EMPs are implemented by the contractors;

(vii) establish a system to monitor environmental safeguards of the project including monitoring the indicators set out in the monitoring plan of the EMP;

(viii) facilitate and confirm overall compliance with all Government rules and regulations regarding site and environmental clearances as well as any other environmental requirements (e.g., No Objection Certificates, Consent for Establishment, Forest Clearance, Consent for Operations, etc.), as relevant; All necessary environmental clearances should be obtained prior to contract awards to avoid delay in physical progress of relevant subprojects;

(ix) approve contractor's including subcontractor/s site environmental plans (SEPs);[26]

Municipal Commissioner\Executive Officer (Member Secretary), Executive Engineer (Respective ULB), Line Agencies representative (Respective district) and NGO\civil society of respective district.

[26] The contractor will be required to submit to PIU, for review and approval, a site environmental plan (SEP) including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; (iii) monitoring

(x) supervise and provide guidance to the contractors to properly carry out the environmental monitoring and assessments as per approved IEEs, EMPs and SEPs;

(xi) review, monitor and evaluate the effectiveness with which the EMPs and SEPs are implemented, and recommend necessary corrective actions to be taken as necessary;

(xii) consolidate monthly environmental monitoring reports from contractors and submit semi-annual monitoring reports to ADB;

(xiii) ensure timely disclosure of final IEEs in locations and form and language accessible to the public and local communities; and

(xiv) address any grievances brought about through the Grievance Redress Mechanism (GRM) in a timely manner;

(xv) ensure adequate measures for climate change adaption and mitigation are incorporated in the detailed engineering design and implementation; and

(xvi) organize an induction course for the contractors covering, including among others, EMP implementation, health and safety, grievance redressal, and community protection.

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

208. 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.

209. **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 and RP/IPP preparation and implementation. PIU field offices will obtain right of way clearances and prepare progress reports with respect to IEE 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. The Safeguards Officers will:

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program as per SEP; and (iv) budget for SEP implementation. No works are allowed to commence prior to approval of SEP. A copy of the EMP/approved SEP will be kept on site during the construction period at all times. The EMP included in the bid and contract documents. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

(i) oversee day-to-day implementation of SEPs by contractors, including contractors' compliance with all government rules and regulations;

(ii) take necessary action for obtaining right of ways;

(iii) approve contractors and subcontractors SEPs;

(iv) supervise implementation of SEPs including environmental monitoring by contractors;

(v) take corrective actions when necessary to ensure no environmental impacts;

(vi) conduct continuous public consultation and awareness;

(vii) address any grievances brought about through the GRM in a timely manner;

(viii) ensure contractors attend safeguards induction course prior to mobilization;

(ix) organize workshops/ seminars on EMP implementation, environmental monitoring requirements related to mitigation measures, and on taking immediate action to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation;

(x) consolidate monthly environmental monitoring reports; and

(xi) Ensure timely disclosure of final IEEs in locations and form accessible to the public.

210. **The Contractor**
This individual or entity:

(i) complies with all applicable legislation, is conversant with the requirements of the EMP, and briefs staff about the requirements of same;

(ii) 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;

(iii) 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;

(iv) provides environmental awareness training to staff;

(v) bears the costs of any damages/ compensation resulting from non-adherence to the EMP or written site instructions;

(vi) conducts all activities in a manner that minimizes disturbance to directly affected residents and the public in general, and foreseeable impacts on the environment;

(vii) ensures that the Engineer is informed in a timely manner of any foreseeable activities that will require input from the Environmental Specialist;

(viii) appoints one full time Environment & Safety Officer for implementation of EMP, community liaison, reporting and grievance redressal on day to day basis; and

(ix) receives complaints/grievances from the public, immediately implements the remedial measures and reports to the Engineer (DSC) and PIU within 48 hours.

211. Summary of responsibilities is as follows:

(i) **Responsible for carrying out mitigation measures**

a. During construction and operations stages, implementation of mitigation measures is the Contractor's responsibility.
b. To ensure implementation of mitigation measures during the construction period, contract clauses for environmental provisions will be part of the civil works contracts.
c. Contractors' conformity with contract procedures and specifications during construction will be carefully monitored by the Safeguard Officer of PIU.

(ii) **Responsible for carrying out monitoring measures**

a. During construction, PMC's Environmental Specialist, Biodiversity Expert and the Safeguard Officer of PIU will monitor the Contractor's environmental compliance.
b. During the operation stage, monitoring of the Contractor's environmental compliance will be the responsibility of the PMC and PIU/PMU

(iii) **Responsible for reporting**

a. 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.

212. Report format for semi-annual environmental monitoring report is attached as **Appendix 18.**

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

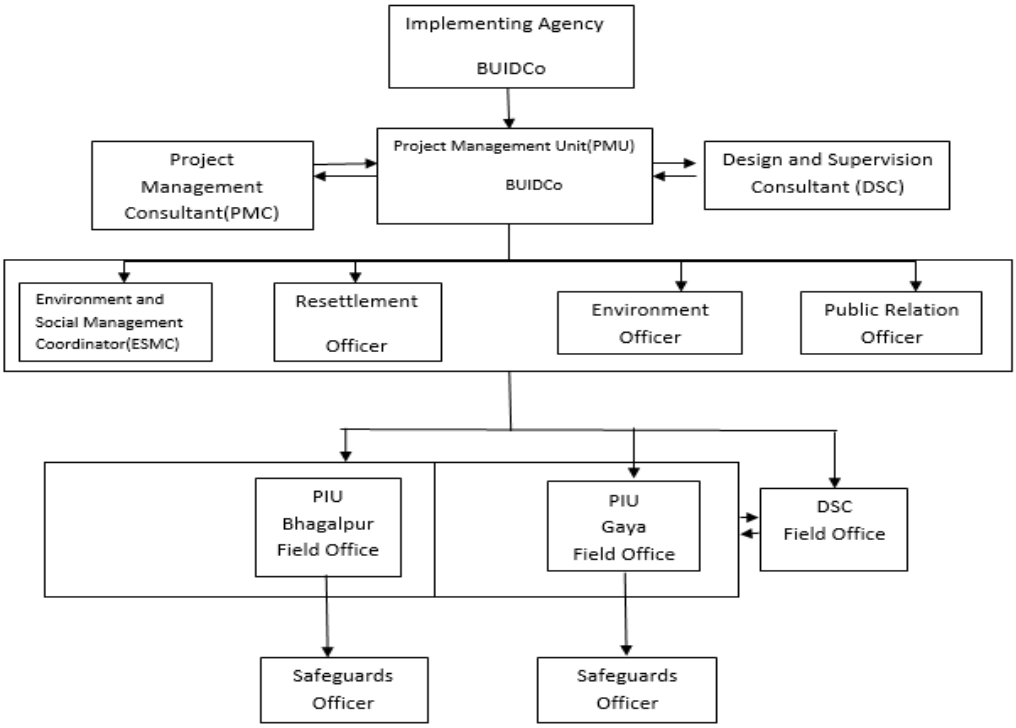


Figure 12: Safeguards Implementation Arrangement

B. Capacity Building

214. Training will be provided to PMU, PIUs and contractors. Typical modules will include: (i) sensitization; (ii) introduction to environment and environmental considerations in water supply projects; (iii) review of IEEs and integration into the project detailed design; and (iv) monitoring and reporting systems. Specific modules customized for the available skill set will be devised after assessing the capabilities of the target participants and the requirements of the program. The contractors will be required to conduct environmental awareness and orientation of workers prior to deployment to work sites.. The proposed training program, along with the frequency of sessions, is presented in **Table 32**.

Table 32: Training Program for Environmental Management

Description	Contents	Schedule	Participants
Pre-construction stage			
Orientation program .	- BUDIP Environmental safeguard requirements - Implementation arrangement -monitoring & reporting -Corrective actions	½ day orientation workshop - at the start of the program	BUIDCo, PMU, and PIU – all senior and mid-level officials and engineers involved in BUDIP

Description	Contents	Schedule	Participants
Training program on EMP implementation & monitoring	Module 1 – Orientation - ADB SPS; - Government of India Environmental Laws and Regulations. Module 2 – Environmental Assessment Process. - Environmental process, identification of impacts and mitigation measures, formulation of an EMP, implementation, and monitoring requirements; - Review & approval of environmental assessment reports Module 3: EMP Implementation, monitoring & reporting - Incorporation of safeguard clauses and EMP in bid and contract documents -Pollution prevention and abatement (IFC EHS Guidelines) -.Monitoring & evaluation - Formulation of corrective action plans (CAP) -Reporting Module 4: Consultation & disclosure - Grievance redress mechanism	2 day training program	PMU & PIUs staff
Construction stage			
Orientation program	- Contractual requirements -Legal & regulatory requirements -EHS requirements -Site Environment Plan (SEP) preparation, EMP implementation and reporting -roles and responsibilities	½ day orientation course to during mobilization	Contractors and PIU, PMC supervising staff
Training program/ workshop for contractors and supervisory staff.	- Environmental issues during construction; - Site specific SEP - EMP Implementation - Day to day monitoring - Periodic ambient monitoring - Reporting -Consultation & grievance redress	1 day workshop immediately after mobilization	Contractors and PIU, PMC supervising staff
Periodic refresher training workshop	Same as above	½ day workshop thrice a year	Contractors and PIU, PMC supervising staff
Stakeholder workshop Experience and best practices sharing.	- Experience of EMP implementation – issues and challenges; - Best practices followed.	½ day workshop Once in a year during implementation	PMU, PIU, and stakeholder agencies PWD, Municipal Corporation, Patna Police

Description	Contents	Schedule	Participants
			etc.,)

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

216. **Table 33** outlines the site establishment and preliminary activities.

217. **Table 34** outlines management of construction activities and workforce.
218. **Table 35** outlines the post-construction activities.

Table 33: 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	Prior to moving onto site and Quarterly during construction
		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	Prior to moving onto site and Quarterly during construction
		Forest land clearance, NOC from forest Dep. for renovation work, clearance from State Museum & Archaeological Directorate	SO-PIU, DSC	ES- PMC, ESMC- 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	At all times
2.	Access to site[27]	Access to site at all water storage reservoir and tube well locations 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 plant and alignment of approach road to site needs to be followed	SO-PIU, E- DSC, Contractor	ES- PMC, ESMC- 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, ESMC- 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, ESMC- 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	SO-PIU, E- DSC, Contractor	ES- PMC ESMC- PMU	Prior to moving onto site and during construction - quarterly

[27] Access to site and traffic management shall be done in accordance to the directions of Engineer

Sr. No.	Activity	Management/Mitigation	Responsible for Mitigation /	Responsible for Monitoring and supervision	Frequency
		construction activities. They shall not be created on an ad-hoc basis.			
		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	Before and during construction- semi annually
3.	Setting up of construction camp[28]	Choice of site for the Contractor's camp requires the Engineer's/ ES permission and must take into 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.	SO-PIU, E- DSC, Contractor	ES- PMC, ESMC-PMU	During surveys and preliminary 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 !:2 (marginal slope)	SO-PIU, E- DSC, Contractor	ES- PMC, ESMC-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, ESMC-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: • 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	During set-up and monthly
		The camp must be properly fenced and	SO-PIU, E- DSC,	ES- PMC, ESMC-	During site establishment and

[28] 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
		secured	Contractor	PMU	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, ESMC-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, ESMC-PMU	During site set-up and ongoing- weekly
4.	Establishing equipment lay-down and storage area[29]	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.	SO-PIU, E- DSC, Contractor	ES- PMC, ESMC-PMU	During site set-up
		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, ESMC-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,	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, ESMC-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	SO-PIU, E- DSC, Contractor	ES- PMC, ESMC-PMU	During site set-up and monthly

[29] 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
		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.	SO-PIU, E- DSC, Contractor	ES- PMC, ESMC-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, ESMC-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, ESMC-PMU	During site set-up and monthly
5.	Materials management – sourcing[30]	Prioritize sites already permitted by the Mining Department	SO-PIU, E- DSC, Contractor	ES- PMC, ESMC-PMU	On receipt of natural materials
		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	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	On receipt of natural materials and continued quarterly
6.	Education of site staff on general and	Ensure that all site personnel have a basic level of environmental awareness training.	SO-PIU, E- DSC, Contractor	ES- PMC, ESMC-PMU	During staff induction and ongoing monthly monitoring
		Staff operating equipment (such as	SO-PIU, E- DSC,	ES- PMC, ESMC-	During staff induction, followed

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

Sr. No.	Activity	Management/Mitigation	Responsible for Mitigation /	Responsible for Monitoring and supervision	Frequency
	environmental conduct[31]	excavators, loaders, etc.) shall be adequately trained and sensitized to any potential hazards associated with their task.	Contractor	PMU	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	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: • 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.	SO-PIU, E- DSC, Contractor	ES- PMC, ESMC-PMU	During staff induction, followed by ongoing monthly monitoring
7.	Social impacts[32]	Open liaison channels shall be established between the contractors and interested	SO-PIU, E- DSC, Contractor	ES- PMC, ESMC-PMU	Prior to moving onto site and ongoing monthly

[31] These points need to be made clear to all staff on site before the subproject begins.
[32] It 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.

Sr. No.	Activity	Management/Mitigation	Responsible for Mitigation /	Responsible for Monitoring and supervision	Frequency
		and affected parties such that any queries, complaints or suggestions can be dealt with quickly and by the appropriate person(s).			
		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	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	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	During surveys and preliminary investigations and site set-up. Monthly monitoring
8.	Conservation of the natural environment[33]	No vegetation may be cleared without prior permission from the Engineer.	SO-PIU, E- DSC, Contractor	ES- PMC, ESMC-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	During site set-up and as per requirement
9	Set-up of waste management procedure	The excavation and use of rubbish pits on site is forbidden.	SO-PIU, E- DSC, Contractor	ES- PMC, ESMC-PMU	Monthly monitoring
		Burning of waste is forbidden.	E- DSC, Contractor	ES- PMC, ESMC-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	SO-PIU, E- DSC, Contractor	ES- PMC, ESMC-PMU,	During site set-up and ongoing quarterly

[33] 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
		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 recognized and measures are taken to ensure they are protected and conserved.			
11	Core Labor 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	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	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, without creating a visual nuisance to local residents or	SO-PIU, E- DSC, Contractor	ES- PMC, ESMC-PMU	During site set-up and continued monthly

Sr. No.	Activity	Management/Mitigation	Responsible for Mitigation /	Responsible for Monitoring and supervision	Frequency
		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.	SO-PIU, E- DSC, Contractor	ES- PMC, ESMC-PMU	Monthly
		Flammable materials shall be stored as far as possible from adjacent residents / businesses.	SO-PIU, E- DSC, Contractor	ES- PMC, ESMC-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: • 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, ESMC-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
Note: PIU, E- DSC: daily & weekly monitoring; and ES-PMC, ESMC-PMU, EE-PMU: fortnightly, monthly & quarterly monitoring or as per requirement & overall supervision

Table 34: EMP: Management of Construction and Workforce Activities- Construction phase

	Issues	Management/Mitigation	Responsible for Mitigation	Responsible for Monitoring/ Supervision	Frequency
1	Climatic impact	✓ 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.	E- DSC, Contractor	SO-PIU/ ES-PMC, ESMC- PMU	Quarterly monitoring

	Issues	Management/Mitigation	Responsible for Mitigation	Responsible for Monitoring/ Supervision	Frequency
		✓ Storm water control (through 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,	Weekly inspection
		Run-off from the camp site must not discharge into neighbors' properties.	E- DSC, Contractor	SO-PIU/ ES-PMC, ESMC- 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,	Weekly inspection
		Drinking water facility needs to be maintained at camp and work site	Contractor	SO-PIU/ ES-PMC, ESMC- 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	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,	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	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,	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,	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,	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,	Monthly monitoring.

	Issues	Management/Mitigation	Responsible for Mitigation	Responsible for Monitoring/ Supervision	Frequency
4.	Dust and air pollution[34]	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	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	Monthly monitoring.
		Avoiding the need to stockpile on site	Contractor	SO-PIU/ ES-PMC, ESMC- PMU	Monthly monitoring.
		Use tarpaulins to cover sand and other loose material when transported by trucks	Contractor	SO-PIU/ ES-PMC, ESMC- PMU	Monthly monitoring.
		Fit all heavy equipment and machinery with air pollution control devices which are operating correctly and rregular servicing of the vehicles& equipments off site in order to limit gaseous emissions	Contractor	SO-PIU/ ES-PMC, ESMC- PMU	Monthly monitoring.
		Excess earth and other windblown loads in transit will be kept covered	Contractor	SO-PIU/ ES-PMC, ESMC- PMU	Monthly monitoring.
		No fires are allowed on site	Contractor	SO-PIU/ ES-PMC, ESMC- PMU	Ongoing monthly monitoring.
5	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	Contractor	SO-PIU/ ES-PMC, ESMC- PMU	Monthly monitoring

[34] 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
		equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor; ➢ 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	Monthly monitoring
		During construction, un-channeled flow must be controlled to avoid soil erosion.	E- DSC, Contractor	SO-PIU/ ES-PMC, ESMC- PMU	Monthly monitoring
7	Water quality[35]	Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets	Contractor	SO-PIU/ES-PMC ,ESMC- PMU	Regular monitoring - monthly
		Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with GMC/PIU on designated disposal areas	Contractor	SO-PIU/ES-PMC, ESMC- PMU	Regular monitoring - monthly
		Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies	Contractor	SO-PIU/ES-PMC, ESMC- PMU	Regular monitoring - monthly

[35]Water 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
		Place storage areas for fuels and lubricants away from any drainage leading to water bodies	Contractor	SO-PIU/ES-PMC, ESMC- PMU	Regular monitoring - monthly
		Dispose any wastes generated by construction activities in designated sites	Contractor	SO-PIU/ES-PMC, ESMC- PMU	Regular monitoring - monthly
		Conduct surface quality inspection according to the Environmental Management Plan (EMP)	Contractor	SO-PIU/ES-PMC, ESMC- PMU	Quarterly monitoring
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,	Monthly monitoring
		Minimize removal of vegetation and disallow cutting of trees (particularly at forest area of Ramshilla hill and Brahmayoni hill) as far as possible through design modification	Contractor	SO-PIU/ ES-PMC, ESMC- PMU	Monthly monitoring
		Require to plant three (3) native trees for every one (1) that is removed	Contractor	SO-PIU/ ES-PMC, ESMC- PMU	Monthly monitoring
		Prohibit employees from poaching wildlife, bird hunting, and cutting of trees for firewood	Contractor	SO-PIU/ ES-PMC, ESMC- PMU	Ongoing monitoring. Monthly monitoring
		Non removal of trees of religious importance	Contractor	SO-PIU/ ES-PMC, ESMC- 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	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	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	Monthly monitoring.
		Verify suitability of all material sources and obtain approval of PIU & DSC	Contractor	PIU/ES-PMC, ESMC-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	Monthly monitoring.
		Prepare and implement Waste Management Plan	Contractor	PIU/ES-PMC, ESMC-PMU	Monthly monitoring.

	Issues	Management/Mitigation	Responsible for Mitigation	Responsible for Monitoring/ Supervision	Frequency
		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.	Contractor	PIU/ES-PMC, ESMC-PMU	Monthly monitoring
		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	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	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	Monthly monitoring.
		Waste from toilets shall be disposed of regularly and in a responsible manner.	Contractor	PIU/ES-PMC, ESMC-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	Monthly monitoring.
		Storage areas will be properly fenced off	E- DSC and Contractor	PIU/ES-PMC, ESMC-PMU	Monthly monitoring.
		Top soil needs to be utilized by farmers for nutrient value	E- DSC and Contractor	PIU/ES-PMC, ESMC-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	Monthly monitoring.
		Recover used oil and lubricants and reuse or remove from the sites	E- DSC and Contractor	PIU/ES-PMC, ESMC-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	Monthly monitoring.

	Issues	Management/Mitigation	Responsible for Mitigation	Responsible for Monitoring/ Supervision	Frequency
11	Occupational Health and Safety	World bank Environmental, Health, and Safety (EHS) Guidelines - EHS Guidelines for water & sanitation will be followed. Specifically, (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; (ii) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site; (iii) Provide medical insurance coverage for workers; (iv) Secure all installations from unauthorized intrusion and accident risks; (v) Provide supplies of potable drinking water; (vi) Provide clean eating areas where workers are not exposed to hazardous or noxious substances; (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; (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; (ix) Ensure the visibility of workers through	E-DSC and Contractor	PIU/ES-PMC, ESMC-PMU	Ongoing Weekly

	Issues	Management/Mitigation	Responsible for Mitigation	Responsible for Monitoring/ Supervision	Frequency
		their use of high visibility vests when working in or walking through heavy equipment operating areas; (x) Ensure moving equipment 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	Ongoing Weekly
		Liaise with DSC- PIU in identifying risk areas on route cards/maps	E-DSC and Contractor	PIU/ES-PMC, ESMC-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	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	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	Ongoing Weekly

	Issues	Management/Mitigation	Responsible for Mitigation	Responsible for Monitoring/ Supervision	Frequency
		Maintaining accident register and arrangement of emergency response plan for community	E-DSC and Contractor	PIU/ES-PMC, ESMC-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 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	Contractor	PIU/ES-PMC, ESMC-PMU	Monthly monitoring
14	Social impacts[36]	Contractor's activities and movement of staff to be restricted to designated construction areas.	PIU, Contractor	PIU/ ES-PMC, ESMC-PMU	Monthly monitoring
		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.	PIU, Contractor	PIU/ ES-PMC, ESMC-PMU	Monthly monitoring
		Disruption of access for local residents, commercial establishments, institutions, etc. must be minimized and must have the Engineer's permissions.	PIU, Contractor	PIU/ES-PMC, ESMC-PMU	Monthly monitoring
		The work plan for the construction and laying of pipelines will be devised in such a way to	PIU, Contractor	PIU/ ES-PMC, ESMC-PMU	Monthly monitoring

[36] 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
		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 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	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	Monthly monitoring
		Consult businesses and institutions regarding operating hours and factoring this in work schedules.	PIU, Contractor	PIU/ES-PMC, ESMC-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,	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, ESMC-PMU	Monthly
		The site must be kept clean to minimize the visual impact of the site.	Contractor	PIU/ES-PMC, ESMC-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, ESMC-PMU	Monthly monitoring.
		Notice of particularly noisy activities must be given to residents / businesses adjacent to the	PIU, Contractor	PIU/ES-PMC, ESMC-PMU	Monthly monitoring

	Issues	Management/Mitigation	Responsible for Mitigation	Responsible for Monitoring/ Supervision	Frequency
		construction site. Examples of these include: • noise generated by jackhammers, diesel generator sets, excavators, etc. • drilling • dewatering pumps			
		A complaints register (refer to the Grievance Redressal Mechanism) shall be housed at the site office.	E- DSC, Contractor	PIU/ES-PMC, ESMC-PMU	Monthly monitoring.
15	Cultural environment	All the staff and laborers of the Contractor be informed about the possible items of historical or archaeological value	E- DSC, ES- PMC, contractor	PIU/ES-PMC, ESMC-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,	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,	Person to be appointed before start of construction activities and remain available throughout the project duration.

PIU* - for field level monitoring for all the cases, ES-PMC** , ESMC- PMU** - Responsible for supervision/ document check/ occasional field visit and necessary advise to PIU (at least quarterly),

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, ES: Environment Specialist**,** ESMC: Environment & Social Management Coordinator, PIU: Project Implementation Unit, PMC: Project Management Consultant**,** PMU: Project Management Unit, SO: Safeguard Officer

Table 35: 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	Contractor	SO - PIU, ES-PMC ESMC- PMU	Subproject completion

	Activities	Management/Mitigation	Responsible for Mitigation	Responsible for Monitoring/ Supervision	Frequency
		per mutual agreement (if established on private/community land).			
		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, ESMC-PMU	Subproject completion
		The Contractor must arrange the cancellation of all temporary services.	Contractor	SO - PIU, ES-PMC, ESMC-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, ESMC-PMU	Subproject completion
		The Contractor is to water and maintain all planted vegetation until the end of the defects liability period and is to submit a method statement regarding this to the Engineer.	Contractor	SO - PIU, ES-PMC, ESMC-PMU	Subproject completion
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 asphalting 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	Engineer- DSC, Contractor	SO - PIU, ES-PMC	Subproject completion

	Activities	Management/Mitigation	Responsible for Mitigation	Responsible for Monitoring/ Supervision	Frequency
		stipulated otherwise by the Engineer.			
		All residual stockpiles must be removed to spoil or spread on site as directed by the Engineer.	Engineer- DSC, Contractor	SO – PIU, ES-PMC	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	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 material to prevent dusts	Engineer- DSC and Contractor	SO – PIU, ES-PMC	Monthly 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	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, ESMC-PMU	Monthly during Operation
		Use equipment constructed of corrosion-resistant materials	Engineer- DSC and Contractor	SO – PIU, ES-PMC, ESMC-PMU	Monthly during Operation
		Minimize the amount of disinfection materials for using in chlorinator	Engineer- DSC and Contractor	SO – PIU, ES-PMC, ESMC-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, ESMC-PMU	Monthly during Operation
		Regular laboratory testing for dosing and	Engineer- DSC and	SO – PIU, ES-	Monthly during

	Activities	Management/Mitigation	Responsible for Mitigation	Responsible for Monitoring/ Supervision	Frequency
		residual chlorine	Contractor	PMC, ESMC-PMU	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, ESMC-PMU	During Operation – quarterly
7	Water quality assessment and maintained – Health & safety	• Undertake regular monitoring and maintenance of water supply infrastructure. • Quality of drinking water will be checked regularly at tube well locations and water storage sites • Sewage water will be treated in STP (which is under design stage) before discharge.	Contractor, SO- PIU	ES-PMC, ESMC-PMU	Monthly monitoring - During Operation
8	Social and Cultural Resources	• 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	Contractor, SO- PIU	ES-PMC, ESMC-PMU	Monthly monitoring during operation

ASI = Archeological Survey of India, BSPCB= Bihar State Pollution Control Board,
DSC: Design and Supervision Consultant, E: 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

219. **Table 36** 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 36: 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/ ES-PMC
	Forest land clearance, NOC from forest Dep. for renovation work, clearance from State Museum & Archaeological Directorate	Forest Act Act related to protection of Archeological objects	-	Prior to moving onto site and during construction	Contractor, PIU	Engineer of DSC / ESMC- 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/ 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
	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/ ES-PMC

Aspect	Parameter	Standards	Location	Duration / frequency	Implementation	Monitoring &Supervision
	Notifications and road signages	EMP	All affected roads	One week in advance of the activity	Contractor, Engineer of DSC &SO- PIU	ESMC- PMU/ ES-PMC
Construction camp	Approval of location and facilities	EMP	As identified	Prior to moving onto site	Contractor, Engineer of DSC &SO- PIU	ESMC- 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/ ES-PMC
Materials management – sourcing	Approval of sources and suppliers	EMP	As identified	Prior to procurement of materials	Contractor, Engineer of DSC &SO- PIU	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/ 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/ 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, / 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, / ES- PMC
Storm water	Storm water management measures	EMP	As identified by the engineer	During site set-up and throughout the duration of the	SO-PIU,EE- PMU/ ES-PMC	ESMC- PMU/ ES-PMC

Aspect	Parameter	Standards	Location	Duration / frequency	Implementation	Monitoring &Supervision
				subproject-monthly		
Conservation of natural environment	Existing conditions	EMP	Subproject sites	Prior to site set-up- then monthly	Contractor & ES- PMC	ESMC- PMU/ ES-PMC
Waste management procedure	Disposal sites	EMP	As determined	Prior to site set-up and ongoing throughout the subproject- monthly	Contractor, ES-PMC	ESMC- 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-DSC &SO-PIU	ESMC- 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-DSC &SO-PIU	ESMC- 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-DSC &SO-PIU	ESMC- 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	ESMC- 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	ESMC- PMU/ SO- PIU/ ES- PMC
Staff conduct	Site records (accidents, complaints)	EMP	Subproject sites	Ongoing- monthly monitoring	Contractor	ESMC- 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	Contractor with the help of National Accreditation Board for Testing and Calibration Laboratories	ESMC- PMU/ SO- PIU/ ES- PMC

Aspect	Parameter	Standards	Location	Duration / frequency	Implementation	Monitoring &Supervision
				subproject execution		
Storm water	Soil erosion management measures	EMP	Subproject sites	Ongoing- monthly	Contractor	ESMC- PMU/ SO- PIU/ ES- PMC
Water quality	Protection from contamination	EMP, Water quality standard	Subproject sites	Ongoing- monthly	Contractor	ESMC- PMU/ SO- PIU/ ES- PMC
Conservation of natural resources	Vegetation conditions	EMP	Subproject sites	Ongoing- monthly	Contractor	ESMC- PMU/ SO- PIU/ ES- PMC
Materials management	Qualitative characteristics	EMP	Subproject sites	Ongoing- monthly	Contractor	ESMC- PMU/ SO- PIU/ ES- PMC
Landscape and Aesthetics including Waste management	Qualitative characteristics	EMP	Subproject sites	Ongoing- monthly	Contractor	ESMC- PMU/ SO- PIU/ ES- PMC
	Disposal manifests	EMP	Subproject sites	Ongoing- monthly	Contractor	ESMC- 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	ESMC- PMU/ ES- PMC
	GRM register	EMP	Subproject sites	Ongoing- monthly	Contractor with the Engineer, DSC, SO- PIU	ESMC- 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	ESMC- PMU/ ES- PMC
Cultural environment	Chance finds	ASI Act and EMP	Subproject sites	Ongoing- monthly	Contractor	ESMC- PMU/ SO- PIU/ ES- PMC
Noise quality	Noise level in dB(A) L_{eq}	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	ESMC- PMU/ SO- PIU/ ES- PMC
Community Health & Safety	Safety arrangement during construction	EMP	Subproject sites	Ongoing- weekly	Contractor	ESMC- PMU/ SO- PIU/ ES- PMC
Traffic & accessibility impact	Arrangement and follow up rules related to traffic safety	EMP	Subproject sites	Ongoing- monthly	Contractor	ESMC- PMU/ SO- PIU/ ES- PMC
3. Post-construction activities						

Aspect	Parameter	Standards	Location	Duration / frequency	Implementation	Monitoring &Supervision
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 infrastructure	Pre-existing conditions	EMP	Subproject sites	Subproject completion	Contractor	EE- PMU/ 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	ESMC- PMU/ ES-PMC
4. Operation and maintenance (defect liability period)						
Water Quality	As per national standard	Central Pollution Control Board standards	Once at all constructed OHTs, GLSR and tube well locations	Once in 6 months	Contractor with the help of National Accreditation Board for Testing and Calibration Laboratories	ESMC- PMU/ ES-PMC
Noise quality	Noise level in dB(A) L_{eq}	As per national noise standards	Once at all tube well pumping areas	Once in 6 months	Contractor with the help of National Accreditation Board for Testing and Calibration Laboratories	ESMC- PMU/ ES-PMC
Hazardous chemical & waste management	Storage and use	Safety data sheet EMP	At tube well water treatment site	Monthly monitoring	Contractor	ESMC- PMU/ ES-PMC

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

Note: PIU & contractor: Daily & weekly mitigation, monitoring; and ES-PMC, ESMC-PMU: Fortnightly, Monthly & Quarterly monitoring or as per requirement & overall supervision

D. Environmental Management and Monitoring Cost

220. The costs for site establishment, preliminary activities, construction, and defect liability activities will be incorporated into the contractual agreements with the Contractor, wherein these costs will be borne by the Contractor. As well, the costs of air quality and noise level monitoring at construction phase and water quality (tube well water) at defect liability phase will be the responsibility of the Contractor.

221. The operation phase mitigation measures will be the responsibility of implementing agency with the help of program Consultant. The water quality monitoring during the operation and maintenance phase will be conducted by a hired government-recognized environmental laboratory.

222. 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 Engineer, costs of which will be borne by the PMU.

223. **Table 37** presents the estimated costs to implement the EMP.

Table 37: Indicative Cost for EMP Implementation

Component	Description	Number	Cost per Unit (INR)	Cost (INR)	Source of Funds
Legislation, Permits and Agreements	Consent for Establishment and Consent for Operation for plants and machinery of the Contractor.	As required	Not Applicable	Not Applicable	These consents are to be obtained by Contractor at its own cost.
Public consultations and information disclosure	Information disclosure and consultations during preconstruction and construction phase.	As required	Lump sum	50,000	Project Cost- PMU
Forest land acquisition at Ramshilla hill and Brahmayoni hill and NOC from forest dept. for tree cutting and temporary impact	Acquisition of forest land for construction of water reservoir and laying of transmission pipeline. Trees need to compensate against each tree cutting	As per project requirement	Lump sum for all activities	700,000	Project Cost- PMU
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 – by Contractor
Dust Suppression at subproject sites	Application of dust suppression measures during construction phase.	As required	Lump sum	200,000	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 – by Contractor
Baseline Monitoring Site preparation and preliminary activities					
Air	Once before start of construction work at all the water reservoir locations and pipe laying locations as identified by	Approx. 20 samples	10,000 per sample	200,000	Covered under engineering design and cost- by Contractor

Component	Description	Number	Cost per Unit (INR)	Cost (INR)	Source of Funds
	Engineer of DSC & Environmental Specialist of PMC				
Noise	Once before start of construction work at all the water reservoir locations and pipe laying locations as identified by Engineer of DSC & Environmental Specialist of PMC	Approx. 20 samples	1500 per sample	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 and pipe laying locations as identified by Engineer of DSC & Environmental Specialist of PMC	Approx. 80 samples	10,000 per sample	800,000	Covered under engineering design and cost- by Contractor
Noise	Once in six months during construction works at all the water reservoir locations and pipe laying locations as identified by Engineer of DSC & Environmental Specialist of PMC	Approx. 80 samples	1500 per sample	120,000	Covered under engineering design and cost- by Contractor
Defect Liability Period					
Water Quality	At all constructed OHTs, GLSR and selected tube well locations, as per drinking water standard parameters	Approx. 60 numbers	12,000 per sample	720,000	Covered under O & M cost – by Contractor
Noise quality	Once in six months during the defect liability period at selected tube well locations	Approx. 30 samples	1500 per sample	45,000	Covered under O & M cost – by Contractor
Any unanticipated impact due to subproject implementation	Mitigation of any unanticipated impact arising during construction phase and defect liability period.	Lump sum	-	500,000	Project cost
TOTAL (INR)				**3,365,000**	
TOTAL (USD) at exchange rate or $1.00 = INR62.00				**54,274**	

IX. MONITORING AND REPORTING

223. 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 have been undertaken. PMC will review the report and if acceptable, the PMU will allow commencement of civil works.

224. 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; and

(ii). taking immediate actions to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation.

225. 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 reports will be retained in PMC / PIU office for reference.

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

227. 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 semi-annual environmental monitoring report, which includes progress of EMP implementation.

228. The PMU will review, approve and submit to ADB the semi-annual environmental monitoring report which includes progress of EMP implementation. Once concurrence from ADB is received, the report will be disclosed on the project website.

229. Based on review of environmental monitoring results, the EMP may be updated or modified to incorporate any changes needed to make it more efficient and responsive. Any modification or updating of the EMP may be undertaken in consultation with ADB.

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

X. RECOMMENDATIONS AND CONCLUSIONS

231. The process described in this document has assessed the environmental impacts of all elements of the proposed subproject for improvement of water supply system in Gaya City. Potential negative impacts were identified in relation to pre-, construction and operation of the improved infrastructure, but no environmental impacts were identified as being due to either the subproject design or location. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. These were discussed with specialists responsible for the engineering aspects, and as a result some measures have already been included in the designs for the infrastructure. This means that the number of impacts and their significance has already been reduced by amending the design.

232. The public participation processes undertaken during project design ensured stakeholders are engaged during the preparation of the IEE. The planned information

disclosure measures and process for carrying out consultation with affected people will facilitate their participation during project implementation.

233. The subproject's GRM 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.

234. The EMP will guide the environmentally-sound construction of the subproject and ensure efficient lines of communication among 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.

235. The IEE will be made binding on all GWSP1 contractors and a copy is required to be kept on site always.

236. 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.

237. 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.

238. 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:

A. **(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- Gaya**

Screening questions	Yes	No	Remarks
a. Project siting Is the project area			
▪ Densely populated?	√		Gaya is densely populated
▪ Heavy with development activities?		√	No such heavy development activity is noted at Gaya
▪ Adjacent to or within any environmentally sensitive areas?	√		Gaya is a historic and a most important religious center for Hindus. History of Gaya has a unique place in the evolution and development of Hindu civilization. According to the religion of Puranaas, it is incumbent on every Hindu to visit Gaya and make offerings for the souls of his ancestors. There are a number of temples in the town; a large number of pilgrims visit the town. Vishnupad Temple, Brahmyoni Hill and Ramshila Hill are the environmentally sensitive areas (State Archeological notified area) located nearby the project area
• Cultural heritage site		√	World famous Buddhist center of Bodh Gaya is located 13 km of Gaya. In 2002, Mahabodhi Temple, located in Bodh Gaya, became a UNESCO World Heritage Site.
• Protected area		√	Water storage reservoirs at Ramshila hill and Brahmayoni hill are located within state protected forest. Forest land acquisition and NOC will be obtained from State Forest Dept. Only few project components (water reservoirs and pipelines) located near to Vishnupad Temple, Brahmyoni Hill, Ramshila Hill. Those are Bihar state protected museum
• Wetland		√	Not applicable
• Mangrove		√	Not applicable
• Estuarine		√	Not applicable
• Buffer zone of protected area		√	None of the subproject component sites are within buffer zone of protected area.

Screening questions	Yes	No	Remarks
• Special area for protecting biodiversity		√	None of the subproject component sites are in special area for protecting biodiversity.
• 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?		√	No such impact is anticipated. The water source for tube wells is underground water in deep water aquifers. Exploitation of surface water sources is not in the scope of the subproject.
▪ Impairment of historical/cultural monuments/areas and loss/damage to these sites?		√	There will be no impact on the cultural monuments as the proposed project will include construction of new/ renovation of water storage reservoirs, replacement of tube well machinery and laying of pipeline
▪ Hazard of land subsidence caused by excessive ground water pumping?		√	Water from the existing tube wells is to be used, and with no risk of land subsidence
▪ Social conflicts arising from displacement of communities?		√	No such impact is anticipated. In case of resettlement requirement (at one overhead tank location social impact is being noted) R & R plan deals the requirement
▪ Conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?		√	No such conflicts are anticipated. Abstraction of surface water for distribution is not proposed under this subproject. The ground water is not being tapped for any other purpose except drinking in the project area.
▪ Unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)?		√	Ground water obtained from the tube wells is normally free from pathogens and will be supplied after disinfection. Regular water quality monitoring is carried out by the line department (PHED) to minimize threat to public health. Further, the tube wells will be deep and sufficiently away from any possible source of ground water contamination.
▪ Delivery of unsafe water to distribution system?		√	Ground water will be treated before delivery Moreover regular monitoring of water distribution will be done so the delivery of unsafe water will be unexpected
▪ Inadequate protection of intake works or wells, leading to pollution of water supply?		√	No such situation is anticipated in present case as raw water withdrawal is proposed from ground.
▪ Over pumping of ground water, leading to salinization and ground subsidence?		√	No such impact is anticipated. The ground water abstraction has been planned after ensuring adequate availability in the ground water aquifer for withdrawal. Hydro-geological assessment study under progress
▪ Excessive algal growth in storage reservoir?		√	The storage reservoirs shall be covered on top and the water in such reservoirs shall be regularly disinfected, hence no algal growth in the reservoirs is anticipated.
▪ Increase in production of sewage beyond capabilities of community facilities?		√	No such impact is anticipated. Sewage volumes shall undoubtedly increase but this increase will not be beyond the existing community facilities. Moreover, the additional volume of water finding its way into the sewage shall dilute the actual concentration of contaminants.
▪ Inadequate disposal of sludge from water treatment plants?		√	Not Applicable as per scope of work

Screening questions	Yes	No	Remarks
▪ Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?		√	Not Applicable as per scope of work
▪ Impairments associated with transmission lines and access roads?	√		Temporary impairments with transmission lines and access roads are anticipated during laying of new and replacement of worn out pipes in the subproject area.
▪ 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
▪ Health and safety hazards to workers from the management of chlorine used for disinfection and other contaminants?		√	Proper arrangement will be made for storage of common salt, which will be used in chlorinator
▪ Dislocation or involuntary resettlement of people	√		As per present design proposed construction project involves relocation of nine dwelling units including one Gaya Municipal Corporation (GMC) staff quarter and 6 partial impacts at one project location (Ramshilla hill) has been recorded. Rehabilitation & resettlement issue deals separately under Resettlement Plan.
▪ Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		√	No such impact is anticipated.
▪ Noise and dust from construction activities?	√		The noise and the dust emissions will be insignificant 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?	√		Construction will be managed as to allow traffic to maintain through access. There is no expected considerable increased in road traffic due to construction activities. Consultation with traffic police authority will be undertaken.
▪ Continuing soil erosion/silt runoff from construction operations?		√	No soil erosion is anticipated. Trenches will be filled back and restored to original conditions after completion of day‘s work. The land below overhead tanks will be leveled properly after completion of construction works.
▪ 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?		√	O&M manual will be prepared and followed. Training will be given to the staffs operating the plant to ensure proper O&M. User agency will establish lab system of regular collection and analysis of water samples for preventing any such impact.
▪ Delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals?		√	Not applicable as per chemical use

Screening questions	Yes	No	Remarks
▪ Accidental leakage of chlorine gas?		√	Not applicable. No chlorine gas will be used
▪ Excessive abstraction of water affecting downstream water users?		√	No such impact is anticipated as water source for the sub-project is ground water.
▪ Competing uses of water?		√	Ground water is not used for any other purpose except for drinking water supply in the project area.
▪ Increased sewage flow due to increased water supply	√		An increase in sewage flow is anticipated due to increase in water supply. However, the additional volume of water finding its way into sewage shall be beneficial, as it shall dilute the actual concentration of contaminants. As per plan STP will be constructed for treatment of raw sewage of Gaya. Project will be funded under different program. Funding agency for waste water management will be finalized by BUIDCo. Work will be completed before completion of entire Gaya water supply project work (including water source augmentation).
▪ Increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant	√		A slight increase in the volume of sullage is expected due to increased water supply. However, the actual concentration of contaminants shall get diluted with this increase in water supply.
▪ Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		√	Construction and laying of distribution and rising mains are not a big construction. Hardly 30-40 laborers will be work during construction, therefore temporary burden to social infrastructure is insignificant In case of setting up of labor camp permission will be obtained from GMC. Water supply and sanitation arrangement will be made as per hygienic norms
▪ 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.
▪ 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
▪ 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?		√	No such impact is anticipated, in case of the proposed sub-project, as the structural elements of the sub-project are away from community habitations. In case of pipe laying for distribution and rising community safety will be considered as per EMP All structural design will be as per standard design for earthquake hazard zone III

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[37]
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	Materials as selected for the project will be not affected from extreme climatic condition.
	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

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

[37] 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.

Appendix 2: Conditional NOC from State Forest Department (for GLSR at Ramshilla Hill and Brahmayoni Hill) received on 24 August 2015

बिहार सरकार
पर्यावरण एवं वन विभाग
कार्यालय : प्रधान मुख्य वन संरक्षक, बिहार, पटना।
(कैम्पा एवं वन संरक्षण संभाग)

तृतीय तल अरण्य भवन, शहीद पीर अली खाँ मार्ग, पटना–800 014
संख्या–

प्रेषक,

एस० के० सिंह, भा०व०से०
अपर प्रधान मुख्य वन संरक्षक (कैम्पा)
–सह–नोडल पदाधिकारी (वन संरक्षण),
बिहार, पटना।

सेवा में,

वन संरक्षक,
गया अंचल, गया।

पटना–14, दिनांक–...../...../2015

विषय : गया जिलान्तर्गत रामशीला एवं ब्रह्मयोनी पहाड़ी पर जलापूर्ति परियोजना के निर्माण हेतु वन (संरक्षण) अधिनियम, 1980 के तहत 0.6956 हे० वन भूमि "जेनरल मैनेजर (वर्क), बुडको, पटना के पक्ष में" अपयोजन के प्रस्ताव की सैद्धान्तिक स्वीकृति।

महाशय,

उपर्युक्त विषयक वन संरक्षक, गया अंचल, गया से प्राप्त प्रस्ताव पर वन (संरक्षण) अधिनियम, 1980 की धारा–2 के तहत भारत सरकार, पर्यावरण एवं वन मंत्रालय के पत्रांक 11-9/98 FC दिनांक 13.05.2011 एवं बिहार सरकार, पर्यावरण एवं वन विभाग, के पत्रांक 474 दिनांक 30.08.2012 द्वारा प्रदत्त शक्तियों के आलोक में नोडल पदाधिकारी (वन संरक्षण), बिहार, पटना द्वारा निम्नांकित शर्तों के साथ गया जिलान्तर्गत रामशीला एवं ब्रह्मयोनी पहाड़ी पर जलापूर्ति परियोजना के निर्माण हेतु 0.6956 हे० वन भूमि अपयोजन की सैद्धान्तिक सहमति प्रदान की जाती है–

(i) अपयोजन हेतु प्रस्तावित वन भूमि का वैधानिक स्वरूप यथावत् रहेगा।

(ii) अपयोजित होने वाली 0.6956 हे० वन भूमि का NPV प्रयोक्ता एजेंसी द्वारा बिहार सरकार के संकल्प संख्या 513 (ई०) दिनांक 27.11.2008 द्वारा निर्धारित दर पर देय होगा। इसके तहत 6.26 लाख रू० प्रति हे० की दर पर कुल रू० 4,35,446/– (चार लाख पैंतीस हजार चार सौ छियालीस) मात्र की राशि जमा की जायेगी।

(iii) प्रयोक्ता एजेंसी द्वारा अपयोजित होने वाली 0.6956 हे० वन भूमि के समतुल्य गया जिलान्तर्गत बांकेबाजार अंचल, मौजा एवं थाना नं० नागोवार, 230, खाता सं० 24 खेसरा सं० 109 में चिन्हित गैर वन भूमि पर्यावरण एवं वन विभाग के पक्ष में क्षतिपूरक वनीकरण हेतु उपलब्ध कराया जायेगा। इस निमित्त प्रयोक्ता एजेंसी द्वारा उक्त भूमि पर क्षतिपूरक वनरोपण के लिये तात्कालिक मजदूरी दर पर प्राक्कलित राशि पर्यावरण एवं वन विभाग को 7–10 वर्ष के रखरखाव के साथ उपलब्ध कराई जायेगी। इसका मांग पत्र वन प्रमंडल पदाधिकारी, गया द्वारा निर्गत किया जायेगा।

(iv) प्रयोक्ता एजेंसी द्वारा क्षतिपूरक वनीकरण के लिये उपलब्ध कराये गये गैर वन भूमि को पर्यावरण एवं वन विभाग के पक्ष में हस्तानान्तरण एवं दाखिल–खारिज कराया जायेगा।

(v) प्रयोक्ता एजेंसी द्वारा चिन्हित गैर वन भूमि पर सर्वे एवं रेखांकन के पश्चात 4 फीट उंचाई का स्थाई, पीलर का निर्माण कर क्षतिपूरक वनीकरण के लिये उपलब्ध कराया जायेगा। इस

d...@gmail.com

भूमि का 1:50,000 स्केल के मानचित्र में GPS कोर्डिनेट दर्शाते हुए मार्क कराकर सत्यापित किया जायेगा।

(vi) प्रयोक्ता एजेंसी द्वारा Net Present Value (NPV) और सभी अन्य राशि Compensatory Afforestation Fund Management and Planning Authority (CAMPA) के Ad-hoc Body के बचत खाता लेखा संख्या SB01025201 जो Corporation Bank CGO, Complex, Phase-1, लोदी रोड, नई दिल्ली 110003 (RTGS/IFSC No. CORP0000371) में धारित है या बचत खाता संख्या 344902010105410 जो Union Bank of India, Sunder Nagar, नई दिल्ली 110003, (RTGS/IFSC No. UBIN0534498) में धारित है, में RTGS/NEFT Mode से फंड ट्रांस्फर कर जमा कराई जायेगी, जैसा कि भारत सरकार, पर्यावरण, वन एवं जलवायु परिवर्त्तन मंत्रालय, नई दिल्ली के पत्रांक 12-2/2010-CAMPA दिनांक 13.5.2011 एवं दिनांक 24.06.2011द्वारा संसूचित किया गया है। उक्त जमा की गयी राशि की सूचना इस कार्यालय को संबंधित बैंक द्वारा प्रदत्त UTR No. एवं दिनांक की मूलप्रति के साथ दी जायेगी।

(vii) प्रयोक्ता एजेंसी को इस आशय की वचनबद्धता देनी होगी कि NPV के दर में वृद्धि होने पर उनके द्वारा अतिरिक्त/अन्तर की राशि जमा की जायेगी।

(viii) प्रयोक्ता एजेंसी द्वारा परियोजना निर्माण के क्रम में मात्र 4 वृक्षों से अधिक का पातन नहीं किया जायेगा एवं आस-पास के वन क्षेत्र के वन विकास को क्षति नहीं पहुँचा जायेगा।

(ix) वन भूमि का उपयोग मिट्टी कटाई अथवा किसी भी निर्माण सामग्री निकालने के लिये नहीं किया जायेगा, और न ही अपशिष्ट निर्माण सामग्री को वन भूमि पर फेंका जायेगा।

(x) प्रयोक्ता एजेंसी द्वारा परियोजना खर्च पर परियोजना निर्माण के उपरान्त खाली जगहों पर क्षतिपूरक वनीकरण के अतिरिक्त पौधा रोपण का कार्य करेंगे।

(xi) आकस्मिक स्थिति में पर्यावरण एवं वन विभाग को नर्सरी एवं अन्य कार्यों के लिये जल की उपलब्धता प्रयोक्ता एजेंसी द्वारा सुनिश्चित की जायेगी।

(xii) वन क्षेत्र के अन्दर निर्माण सामग्री की ढुलाई के लिये अतिरिक्त अथवा नये पथ का निर्माण नहीं किया जायेगा।

(xiii) वन क्षेत्र के भीतर मजदूरों का निवास स्थान (Labour Camp) नहीं बनाया जायेगा।

(xiv) वन क्षेत्र से बाहर निवास कर रहे परियोजना कार्य में शामिल मजदूरों को ईंधन आपूर्त्ति का दायित्व प्रयोक्ता एजेंसी का होगा प्रयोक्ता एजेंसी के क्षेत्रीय निरीक्षक/स्थानीय वन पदाधिकारी यह सुनिश्चित करेंगे कि वन एवं वन्य प्राणियों को प्रयोक्ता एजेंसी अथवा उनके द्वारा नियोजित मजदूर/कार्य एजेंसी किसी प्रकार से नुकसान नहीं पहुँचा रहे हैं।

(xv) वन भूमि का उपयोग प्रस्तावित कार्य के अतिरिक्त अन्य किसी कार्य के लिए नहीं किया जायेगा।

(xvi) प्रयोक्ता एजेंसी द्वारा पर्यावरण (संरक्षण) अधिनियम, 1986 एवं अन्य सुसंगत अधिनियम/नियमावली के प्रावधान जो इस परियोजना के कार्यान्वयन से संबंधित होगा के तहत अलग से स्वीकृति प्राप्त की जायेगी एवं अन्तिम स्वीकृति के प्रस्ताव के साथ समर्पित किया जायेगा।

(xvii) प्रयोक्ता एजेंसी द्वारा उन सभी अन्य शर्त्तों का अनुपालन किया जायेगा, जो समय-समय पर वनों की सुरक्षा, संरक्षण एवं प्रबंधन के लिये भारत सरकार अथवा राज्य सरकार द्वारा

(xviii) उपर्युक्त शर्त्तों में से किसी एक का भी अनुपालन नहीं होने की स्थिति में संबंधित वन प्रमंडल पदाधिकारी इस कार्यालय को प्रतिवेदित करेंगे।

(xix) यदि इस विषय पर पर्यावरण सुरक्षा के हित में कोई अन्य शर्त्तें आवश्यक होगी तो कालान्तर में इसे अधिरोपित किया जा सकेगा एवं प्रयोक्ता एजेंसी के लिये यह बाध्यकारी होगा।

(xx) उपभोक्ता अभिकरण [इस मामले में जेनरल मैनेजर (वर्क), बुडको, पटना] अपयोजित वन भूमि, किसी भी अन्य व्यक्ति, प्राधिकार विभाग आदि को किसी भी प्रकार से आवंटन/हस्तान्तरण/अभ्यर्पण (assignment) नहीं करेगी।

अपयोजन स्वीकृति का यह आदेश राज्य के वामपंथी उग्रवाद प्रभावित जिलों के लिये भारत सरकार द्वारा 5.00 (पाँच) हे० वन भूमि के अपयोजन की शक्ति राज्य सरकार को देने तथा इस क्रम में राज्य सरकार द्वारा नोडल पदाधिकारी (वन संरक्षण) को यह शक्ति प्रत्योजित करने के आलोक में निर्गत किया जाता है।

उपर्युक्त शर्त्तों का अनुपालन प्रतिवेदन वन संरक्षक, गया के माध्यम से प्राप्त होने के पश्चात विवर्णांकित परियोजना के लिये वन (संरक्षण) अधिनियम 1980 की धारा–2 के तहत अन्तिम स्वीकृति प्रदान की जायेगी। नोडल पदधिकारी (वन संरक्षण), बिहार द्वारा वन भूमि अपयोजन की अन्तिम स्वीकृति आदेश निर्गत करने के पश्चात ही उक्त वन भूमि पर गैर वानिकी कार्य किया जायेगा।

विश्वासभाजन,

ह०/–

(एस० के० सिंह)

अपर मुख्य वन संरक्षक (कैम्पा)

–सह–नोडल पदाधिकारी (वन संरक्षण),

बिहार, पटना।

ज्ञापांक– (F.C) ..... दिनांक .....

प्रतिलिपि: अपर प्रधान मुख्य वन संरक्षक (केन्द्रीय), भारत सरकार, पर्यावरण एवं वन मंत्रालय, क्षेत्रीय कार्यालय, राँची/वन महानिरीक्षक–सह–मुख्य कार्यकारी पदाधिकारी, एड–हॉक कैम्पा, भारत सरकार, पर्यावरण एवं वन मंत्रालय, नई दिल्ली को सूचनार्थ एवं आवश्यक कार्रवाई हेतु प्रेषित।

ह०/–

(एस० के० सिंह)

अपर मुख्य वन संरक्षक (कैम्पा)

–सह–नोडल पदाधिकारी (वन संरक्षण),

बिहार, पटना।

ज्ञापांक– (F.C) 168 दिनांक 24/08/2015

प्रतिलिपि: प्रधान सचिव, पर्यावरण एवं वन विभाग, बिहार सरकार, पटना/वन प्रमंडल पदाधिकारी, गया/जेनरल मैनेजर (वर्क), बुडको, पटना को सूचनार्थ एवं आवश्यक कार्रवाई हेतु प्रेषित।

24/8/15

(एस० के० सिंह)

अपर मुख्य वन संरक्षक (कैम्पा)

–सह–नोडल पदाधिकारी (वन संरक्षण),

बिहार, पटना।

English Translation

Government of Bihar
Environment and Forest Department
(Office of the Chief forest conservator, Bihar, Patna)
[Campa and forest conservation segment]
Third floor, Arnay Bhawan, Peer Ali Khan Marg, Patna-800014

Letter No…… dated …….

From,

S.K. Singh, I.F.S.
Additional Chief Forest Conservator (Campa)
-cum-Nodal Officer (forest conservation),
Bihar, Patna.

To,

The Forest Officer,
Gaya Circle, Gaya.

Subject :- Formal approval of 0.6956 Hectare of forest land under forest conservation Act, 1980 in favour of General Manager Work, B.U.D.C.O., Patna on the Ramshila and Brahamyoni hill in Gaya District for the purpose of Water Supply Scheme.

Sir,

With reference to proposal received through D.F.O., Gaya, the formal consent has been given by Nodal Officer Forest Conservation, Patna with following conditions for utilization of 0.6956 hectare forest land for construction of Water Supply Scheme on the Ramshila and Brahamyoni hill of Gaya District under the forest conservation Act, 1980 and in the light of power conferred vide letter No. 11-9-90 FC dated 13.05.2011 of Ministry of Environment and Forest, Government of India and letter No. 474 dated 30.08.2012 of the Environment and Forest Department of the Government of Bihar.

(i) The legal status of forest land proposed for utilization will remain unchanged.

(ii) The N.P.V. of 0.6956 of the forest land proposed to be utilized will be given by executive agency at the rate prescribed by Resolution No. 353 (E) dated 27.11.2008 of Bihar Government and for the same the executive agency will pay Rs. 4,35,466/- at the rate of 6.26 lacs per hectare.

(iii) The Executive Agency will provide non-forest land equivalent to the proposed 0.6956 hectare land in favour of Environment and
Forest Department located in Bankey Bazar, Mauza and Thana Nagovar, Khata No. 24, Khesra No. 109 in the Gaya District for compensatory afforestation. For the same Executive Agency will provide required amount with current labour rate to the Department of Environment and Forest for the period of 7-10 years with maintenance cost. The letter of demand for the same will be issued by Divisional Forest Officer, Gaya.

(iv) The Executive Agency will transfer non-forest land to the Department of Environment and Forest, Government of Bihar, for compensatory afforestation after proper process of transfer of land and mutation.

(v) The Executive Agency will construct a permanent pillar of 4 fit height on the non-forest land after survey and maping and will be handed over for compensatory afforestation. The same will be displayed on the map of land scale 1:50,000 after showing the DGPS coordinates.

(vi) The fund transfer related to N.P.V. and all the amounts related to compensatory afforestation fund management and planning authority

(Campa) will be deposited in the saving A/C No. SB 01025201 which is maintained in the Corporation Bank, CGO Complex, Phase No.-1, Lodi Road, New Delhi-11003 [RTGS/IFSC No.-CORP0000371] or in the saving A/C of Union Bank of India, Sundar Nagar, New Delhi-11003 [RTGS/IFSC No.-UBI No.-534498 through RTGS/NEFT mode as communicated by letter No. 12-2/2010-Campa dated 13.05.2011 and 24.06.2011 by the Ministry of Environment and Forest, New Delhi. The information regarding fund transfer will be given to this office with original copy of UTR No. with date of the concerned Bank.

(vii) The executing authority will have to promise that when the rate of NPV will increase, the additional amount or differences amount will be deposited by him.

(viii) The executive authority will not cut more than four trees during construction of the scheme and also will not harm the development of forest area surrounding to the scheme.

(ix) The utilization of forest area will neither be used for excavation of the soil or any thing nor any construction and also the useless materials will not be thrown out on the forest land.

(x) The executing agency after the completion of the scheme in addition to compensatory afforestation, will do plantation on the residual land at the scheme cost.

(xi) The executing agency will ensure to make available water to meet out the exigency for the nursery and other works of the Environment and Forest Department.

(xii) No new roads will be constructed in the forest area for carrying the materials for construction.

(xiii) There shall be no labour camp in side the forest area.

(xiv) The liability to provide cooking fuel to the labour residing out side the forest area will lie on the executing agency. The regional inspector/local forest officer will ensure that the forest or the wild animals are not being harmed either by executing agency or the labour appointed by him.

(xv) No forest land will be used other than the proposed work.

(xvi) The executing authority will get approval under the Act, 1986 and relevant Act/Rules of Environment protection Act, 1986 which will relate for the executing of the scheme and the same will be furnished with the final approval of the scheme.

(xvii) The executing authority will have to follow all the terms and conditions which are fixed either by the Government of India or the State Government time to time.

(xviii) If the aforesaid terms and conditions are not being compliedwith, the Divisional Forest Officer will send report in this regard.

(xix) That if some terms and conditions will be essentially required for the protection of environment, it will be imposed in the space of time and it will be obligatory for the executing agency.

(xx) The consumer authority, [General Manager (work), BUDCO in this case] will not allot/transfer/assign the utilized forest land to any other person, authorities and departments by any mode.

This utilization order is issued under the power conferred by Government of India to the State Government and thereupon power delegated to the Nodal Officer (forest conservation) for the utilization of 5 hectare forest land to the nuxalite terrorist affected Districts of the State.

That after getting the compliance report on the above conditions from the forest conservator, Gaya the final approval will be given for the project in reference under section 2 of the forest conservation Act, 1980.

That after issuing final approval order by Nodal Officer (forest conservation), Bihar, the non-forest work will be done on the same land.

faithfully,
Sd/-
S.K.Singh
Additional Chief forest conservator (Campa)-cum-Nodal Officer (forest conservator),
Bihar, Patna.

Memo (FC) ……. dated ……..

Copy forwarded Additional Chief Forest Conservator (Central), Government of India, Ministry of Environment and Forest/Regional Office, Ranchi/Inspector General forest cum Chief officiating officer ad-hoc campa, Government of India environment and forest Ministry, New Delhi for information and necessary action.

Sd/-
Additional Chief forest conservator (Campa)-cum-Nodal Officer (forest conservator),
Bihar, Patna.

Memo (FC) 168 dated 24.08.2015

Copy forwarded to the Principal Secretary, Environment and Forest Department, Government of Bihar, Patna/Forest Divisional Officer, Gaya/General Manager (work) BUDCO Patna for information and necessary action.

Sd/-
Additional Chief forest conservator (Campa)-cum-Nodal Officer (forest conservator),
Bihar, Patna.

Stage 1 Clearance- District Forest Officer (DFO) sent a conditional NOC Letter to BUIDCo

कार्यालयः वन प्रमण्डल पदाधिकारी, गया वन प्रमण्डल, गया।

सेवानगर, न्यू करीमगंज, गया (फोन/फैक्स नं0 0631-2220406,मो0-7541820902,ई-मेल: gayadfo@gmail.com)

पत्रांक– गया–823001, दिनांक–

प्रेषक

डा0 वेसामणि के0, भा0व0से0
वन प्रमण्डल पदाधिकारी,
गया वन प्रमण्डल, गया।

सेवा में,

जेनरल मैनेजर(वर्क्स),
बिहार शहरी आधारभूत संरचना विकास निगम लि0
(बुडको),303 तीसरा तल्ला, मौर्या टावर, मौर्यालोक कम्पलेक्स,
बुद्धमार्ग, पटना–800001

विषय– गया जिलान्तर्गत रामशीला एवं ब्रह्मयोनि पहाड़ी पर जलापूर्ति परियोजना के निर्माण हेतु वन(संरक्षण) अधिनियम 1980 के तहत 0.6956 हेक्टर वन भूमि आपके पक्ष में अपयोजन के प्रस्ताव की सैद्धान्तिक स्वीकृति।

प्रसंग– अपर प्रधान मुख्य वन संरक्षक(कैम्पा)–सह–नोडल पदाधिकारी(वन संरक्षण) बिहार पटना का ज्ञापांक–FC 168 दिनांक 24.08.2015

महाशय,

उपर्युक्त विषय के संबंध में सूचित करना है कि गया जिलान्तर्गत रामशीला एवं ब्रह्मयोनि पहाड़ी पर जलापूर्ति परियोजना निर्माण हेतु वन(संरक्षण) अधिनियम 1980 के तहत 0.6956 हेक्टर वन भूमि का अपयोजन के प्रस्ताव की सैद्धान्तिक स्वीकृति प्रासंगिक पत्र द्वारा प्रदान की गयी है। उक्त पत्र की छाया प्रति पुनः संलग्न कर भेजते हुए अनुपालन आपसे अपेक्षित की जा रही है।

1. कण्डिका–2 के अनुपालन हेतु NPV मद में **4,36,446/–रू0** एवं कण्डिका–3 के अनुपालन में अपयोजित होने वाले वन भूमि के बदले समतुल्य गया जिलान्तर्गत बाँकेबाजार अंचल मौजा एवं थाना–मामीचार, थाना नं0 230 खाता संख्या–24 खेसरा संख्या–109 में चयनित गैर वन भूमि में पर्यावरण एवं वन विभाग के पक्ष में क्षतिपूरक वनरोपण हेतु उपलब्ध किये जाने के क्रम में उक्त भूमि पर क्षतिपूरक वनरोपण हेतु तत्कालीन मजदूरी दर पर प्राक्कलित कुल राशि 13,33,661/–रू0 (छाया प्रति संलग्न)मात्र प्रसंगाधीन पत्र के कण्डिका–8 में दिये गये शर्तों के अनुसार आपके द्वारा अलग–अलग Ad-hoc Body of Compensatory afforestation fund Management and Planning Authority (CAMPA) in A/C Name CAF Bihar of A/C No. SBO1025201 in Corporation Bank CGO, Complex, Phase-1 Lodi Road, New Delhi 11003 (RTGS/IFSC No. CORP0000371) अथवा SB A/c No. 344902010105410 of Union Bank of India, Sunder Nagar, New Delhi 110003 (RTGS/IFSC No. UBIN0534498) के द्वारा RTGS/NEFT Mode द्वारा फण्ड ट्रान्सफर कर जमा कराया जाय तथा उक्त जमा की गयी राशि की सूचना अपर प्रधान मुख्य वन संरक्षक(कैम्पा)–सह–नोडल पदाधिकारी(वन संरक्षण) बिहार पटना को संबंधित बैंक द्वारा प्रदत्त UTR No. एवं दिनांक की मूल प्रति देते हुए उसकी प्रति एवं सूचना इस कार्यालय को दिया जाय।
2. कण्डिका–4 के अनुपालन में प्रयोक्ता एजेन्सी के द्वारा क्षतिपूरक वनीकरण के लिए उपलब्ध करायी गयी गैर वन भूमि को पर्यावरण एवं वन विभाग के पक्ष में हस्तानान्तरण एवं दाखिल खारिज कराकर इसकी प्रति मूल रूप में उपलब्ध कराया जाय।
3. कण्डिका–5 के अनुपालन में चयनित गैर वन भूमि पर सर्वे एवं रेखांकन के पश्चात चार फिट ऊंचाई का स्थाई पिलर का निर्माण कर क्षतिपूरक वनीकरण के उपलब्ध कराया जायेगा। इस भूमि को 1:50000 के स्केल पर मानचित्र पर डी0जी0पी0एस0 कॉर्डिनेट दर्शाते हुए मार्क कराकर समर्पित किया जायेगा।
4. कण्डिका–8 के अनुपालन में आपके द्वारा निर्माण के क्रम में प्रस्तावित चार वृक्षों का पातन के उपरान्त पुनः नापी, लौट निर्माण अभिलेख संधारण, निलामी एवं सुरक्षा कार्य हेतु अलग से विभाग द्वारा मांग नहीं करने के कारण औसत 2 घनमीटर का प्रति घनमीटर 600/–रू0 के दर से कुल 1200/–रू0 मात्र वन प्रमण्डल पदाधिकारी, गया वन प्रमण्डल,गया के पदनाम से बैंक ड्राफ्ट बनाकर इस कार्यालय में समर्पित किया जाय।

अतः अनुरोध है कि अविलम्ब 20 शर्तों का अनुपालन करते हुए प्रतिवेदन शीघ्र भेजने की कृपा की जाय। ताकि अन्तिम स्वीकृति हेतु अग्रेत्तर कार्रवाई किया जा सकें।

उपरोक्त शर्तों के अनुपालन प्रतिवेदन प्राप्त होने के उपरान्त प्रस्तावित परियोजना के लिए वन संरक्षण अधिनियम 1980 की धारा–2 के तहत अन्तिम स्वीकृति प्रदान की जायेगी। नोडल पदाधिकारी(वन संरक्षण) बिहार द्वारा वन भूमि की अपयोजन हेतु अन्तिम स्वीकृति आदेश निर्गत करने के पश्चात ही उक्त वन भूमि पर गैर वानिकी कार्य किया जायेगा।

अनुलग्नक–यथोक्त।

विश्वासभाजन,
ह0
वन प्रमण्डल पदाधिकारी
गया वन प्रमण्डल,गया

ज्ञापांक– दिनांक–

प्रतिलिपि वन संरक्षक, गया अंचल,गया को प्राक्कलन की एक प्रति के साथ सूचनार्थ एवं आवश्यक कार्रवाई हेतु समर्पित।

ह0
वन प्रमण्डल पदाधिकारी
गया वन प्रमण्डल,गया।

ज्ञापांक–5497 दिनांक– 01/09/15

प्रतिलिपि समाहर्ता, गया को सैद्धान्तिक स्वीकृति की एक छाया प्रति संलग्न करते हुए अनुरोध है कि अधिकृत प्रयोक्ता एजेन्सी के अनुपालन प्रतिवेदन समर्पित करने हेतु अपने स्तर से निर्देशित करना चाहेंगे तथा कण्डिका–3 एवं 4 के अनुपालन में अपयोजित होने वाले वन भूमि के बदले समतुल्य गैर वन भूमि आपके पत्रांक–2218/गा0 दिनांक 07.07.2015ई0 के माध्यम से गया जिलान्तर्गत बांकेबाजार अंचल मौजा एवं थाना–नागोवार, खाता नं0 230 खाता संख्या–34 खेसरा संख्या–109 रकबा– 1.74 एकड़ में चयनित प्रस्तावित गैर वन भूमि की पर्यवेक्षण एवं वन विभाग के पक्ष में क्षतिपूरक वनरोपण हेतु हस्तान्तरण एवं दाखिल खारीज कराकर इसकी प्रति मूल रूप में उपलब्ध कराने की कृपा की जाय।

ह0
वन प्रमण्डल पदाधिकारी
गया वन प्रमण्डल,गया।

English Translation

Office of the Divisional forest Officer, Gaya Forest Division, Gaya

Seva Nagar new Karimganj, Gaya Phone/Fax No.-0631-2220406, Mobile-7541820902 E.mail-gayadfo@gmail.com

Letter No……. Gaya-823001 dated …….

From,

Dr. Nesha Mani K, I.F.S.
Regional Forest Officer,
Gaya Forest Division, Gaya.

To,

The General Manager (works)
Bihar Urban Infrastructure Development
Corporation Ltd.
BUD Co, 303 3rd floor, Mourya Tower,
Mourya lok Complex, Budh Marg, Patna-800001.

Subject :- Formal approval of proposal of utilization 0.6956 Hectare forest land in favour of yourself for the construction of Water Supply Project located at Ramshila and Brahamyoni hill of Gaya District under the forest conservation Act, 1980.

Reference :- Letter Memo No.-FC 168 dated 24.08.2015 of Additional Chief of conservator of forest (campa)-cum-Nodal Officer, Bihar, Patna.

Sir,

With reference to above subject this to inform that the formal approval has been granted for utilization 0.6956 Hectare forest land in favour of yourself for the construction of Water Supply Project located at Ramshila and Brahamyoni hill of Gaya District under the forest conservation Act, 1980 vide letter in reference. The same is being annexed herewith and it is expected for compliance upon your part.

1. That in compliance of Para 2 for deposit Rs. 4,35,446 under N.P.V. fund and in compliance of Para-3, the land utilized in lien of the same deposite estimated wages cost of Rs. 13,33,881/- in favour of the department of Environment and Forest for compensatory afforestation in Bankey Bazar, Anchal, Thana and Mouza Nagobar thana No. 230, Khata No. 24 and Khesra No. 109 separately in

accordance with the terms and conditions referred in para 6 of the letter in reference and the mode of transfer of fund would be through RTGS/NEFT in favour of adhoc body of compensatory afforestation fund management and planning authority (CAMPA) in A/C Name-CAFBIHAR of A/C No.-SBO 1025201 in corporation Bank CGO complex Phase-I, Lodi Road, New Delhi 11003 (RTGS/IFSC No.-CORP0000371) or SB A/C No.-344902010105410 of Union Bank of India, Sundar Nagar, New Delhi-110003 (RTGS/IFSC No.-UBION 0534498). The transfer of fund may be communicated to the Additional Chief Conservator of forest (campa)-cum-Nodal Officer (forest conservation), Bihar, Patna through the depositing UTR (in original) given by the concerned Bank and a copy of the same can be sent to this office too.

2. In compliance of the Para 4, the Excuting Agency is desired that records related to the transfer of land and mutation of the non forested land provided for compensatory afforestation may be deposited (in original) in favour of the department of Environment and Forest.
3. In compliance of Para 5, after the survey and demarcation on the selected non forested land, the same will be made available for a compensatory afforestation with a permanent pillar of a height of 4 fit. The same will be deposited after displaying D.G.P.S. coordinate on the map of the land scale of 1:50,000/-.
4. In compliance of Para-8 in the process of construction after cutting four proposed trees, in absence of demand regarding re-measurement, lot construction record, auction and safety works, you have to pay total Rs. 1200 as an additional cost at the average rate of Rs. 600/- per two cubic meter in favour of Divisional forest officer, Gaya Division, Gaya through Bank draft, the same would be submitted in this office.

Therefore, it is requested to submit report immediately after complying the 20 points terms and conditions, so that action may be taken for final approval.

After receipt of compliance report, final approval will be given about the project in question under section 2 of the forest conservation Act, 1980.

That after issuance of the final approval of utilization of forest land by Nodal Officer (conservation of forest), Bihar Nonforest work will be done on the said land.

Sd/-
Divisional Forest Officer

Memo No. ……/ dated ……

Copy forwarded to forest conservator Gaya Circle Gaya, with a copy of estimate, for information and necessary action.

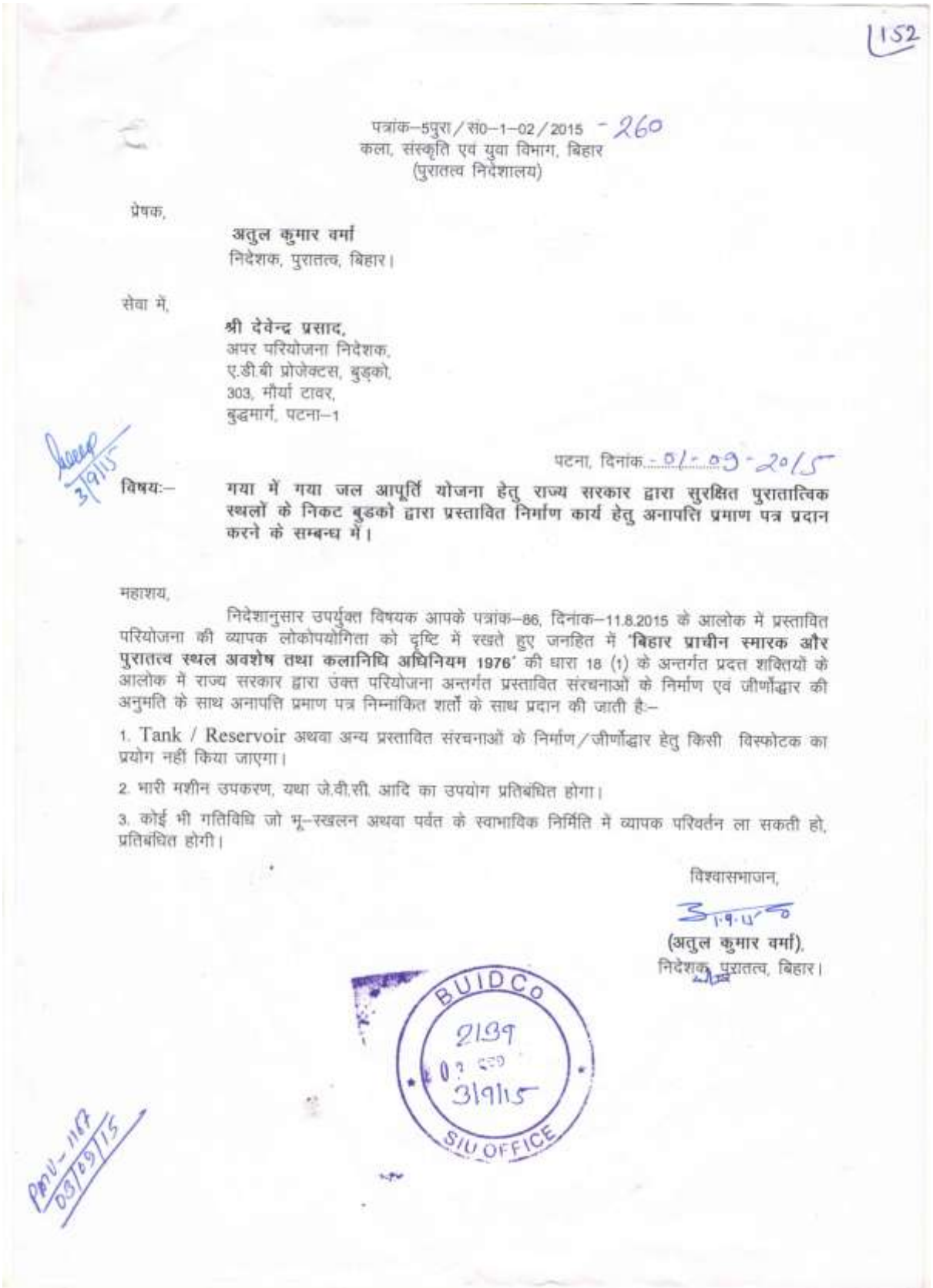
Sd/-
Divisional Forest Officer

Memo No.-5477 dated 01.09.2015

Copy forwarded to District Magistrate, Gaya, with a copy of formal approval with request to him to direct the excuting agency by his own level to submit his compliance report with further request to make available in original after due compliance of para 3 and 4 with reference to your letter No. 2218 dated 07.07.2015 through that under Bankey Bazar, Anchal Mauza and Thana-Nagobar, Thana No. 230, Khata No. 24 and Khesra No. 109 Area-1.74 acre of land selected/proposed the non forest land after transfer get mutation of the same land.

Sd/-
Forest Divisional Officer, Gaya
Forest Division, Gaya

Appendix 3: No Objection Certificate from State Museum and Archaeological Directorate



1152

पत्रांक–5पुरा / सं0–1–02 / 2015 - 260
कला, संस्कृति एवं युवा विभाग, बिहार
(पुरातत्व निदेशालय)

प्रेषक,

अतुल कुमार वर्मा
निदेशक, पुरातत्व, बिहार।

सेवा में,

श्री देवेन्द्र प्रसाद,
अपर परियोजना निदेशक,
ए.डी.बी प्रोजेक्टस, बुडको,
303, मौर्या टावर,
बुद्धमार्ग, पटना–1

पटना, दिनांक- 01-09-2015

विषयः– **गया में गया जल आपूर्ति योजना हेतु राज्य सरकार द्वारा सुरक्षित पुरातात्विक स्थलों के निकट बुडको द्वारा प्रस्तावित निर्माण कार्य हेतु अनापत्ति प्रमाण पत्र प्रदान करने के सम्बन्ध में।**

महाशय,

निदेशानुसार उपर्युक्त विषयक आपके पत्रांक–86, दिनांक–11.8.2015 के आलोक में प्रस्तावित परियोजना की व्यापक लोकोपयोगिता को दृष्टि में रखते हुए जनहित में **'बिहार प्राचीन स्मारक और पुरातत्व स्थल अवशेष तथा कलानिधि अधिनियम 1976'** की धारा 18 (1) के अन्तर्गत प्रदत्त शक्तियों के आलोक में राज्य सरकार द्वारा उक्त परियोजना अन्तर्गत प्रस्तावित संरचनाओं के निर्माण एवं जीर्णोद्धार की अनुमति के साथ अनापत्ति प्रमाण पत्र निम्नांकित शर्तों के साथ प्रदान की जाती है:–

1. Tank / Reservoir अथवा अन्य प्रस्तावित संरचनाओं के निर्माण / जीर्णोद्धार हेतु किसी विस्फोटक का प्रयोग नहीं किया जाएगा।

2. भारी मशीन उपकरण, यथा जे.वी.सी. आदि का उपयोग प्रतिबंधित होगा।

3. कोई भी गतिविधि जो भू–स्खलन अथवा पर्वत के स्वाभाविक निर्मिति में व्यापक परिवर्तन ला सकती हो, प्रतिबंधित होगी।

विश्वासभाजन,

3.9.15

(अतुल कुमार वर्मा),
निदेशक, पुरातत्व, बिहार।

BUIDCo
2139
31/9/15
SIU OFFICE

English Translation

NOC from State Museum & Archaeological Directorate under Art, Culture and Youth Dept., Govt. of Bihar.

Letter-5 pura/No.-1-02/2015-260
Art, Culture and Youth Department, Bihar.
(Archaeological Directorate)

From,

Atul Kumar Verma,
Director, Archaeology, Bihar.

To,

Devendra Prasad,
Additional Planning Director,
A.D.B. Projects BUDCO,
303, Mourya Tower,
Budhmarg, Patna-1.

Patna, dated 01.09.2015

Subject-Issuance of no objection certificate for proposed construction work of Water Supply Scheme in Gaya District by BUDCO near reserved Archaeological places by the State Government-Regarding.

Sir,

I am directed to say that in the light of your letter No. 86 dated 11.08.2015, keeping in view the large public utility of the proposed scheme, the State Government has decided to grant permission with no objection certificate regarding proposed construction and renovation of proposed structures under section 18(1) of Bihar ancient Monuments and Archaeological places ruins and Art assets Act 1976, with following conditions :-

(i) No explosive articles will be used for construction of Tank/reservoir or other proposed construction of structure/renovation.

(ii) Use of heavy machines tools i.e. J.B.C. etc. will be prohibited.

(iii) Any activity which can cause landslide or can bring a major change in natural structure of hills, will be prohibited.

Your Sincerely,
Sd/-
(Atul Kumar Verma)
Director, Archaeology, Bihar.

Appendix 4: Letter to DFO for granting NOC for renovation work of storage reservoirs at Gaya

बिहार शहरी आधारभूत संरचना विकास निगम लि०
Bihar Urban Infrastructure Development Corporation Ltd.
303, मौर्या टावर / Maurya Tower, बुद्ध मार्ग / Buddh Marg, पटना / Patna- 800 001
दूरभाष / Phone : +91-612-2210101, फैक्स नं० / Fax No. : +91-612-2210103
E-mail : contact@buidco.in, web : http://buidco.in
BUIDCo
Building Better Tomorrow
ISO 9001:2008, 14001:2004

(67)

पत्र सं/No.: BUIDCO/PMU(ADB Project) – 03/13 (Part - II)- 877 दिनांक/Date : 25/03/15

सेवा में,

जिला वन अधिकारी,
वन विभाग कार्यालय,
समीप – किरेन मेमोरियल हाई स्कूल,
करीम गंज, गया।

विषय –राज्य संरक्षित गया वन क्षेत्राधीन रामशिला, मुरली, ब्रह्मयोनि तथा श्रृंगस्थान पहाड़ियों पर अवस्थित जलाशयों में पेयजल आपूर्ति सम्बन्धित मरम्मति कार्य हेतु अनापत्ति प्रमाण पत्र के संबंध में।

महाशय,

उपर्युक्त विषय के संबंध में कहना है कि नगर विकास एवं आवास विभाग (यू०डी०एच०डी०), बिहार सरकार ने एशियाई विकास बैंक (ए०डी०बी०) द्वारा वित्तपोषित " बिहार शहरी विकास निवेश कार्यक्रम (बुडिप)" प्रारम्भ किया है। इस कार्यक्रम का निष्पादन नगर विकास एवं आवास विभाग, बिहार सरकार के द्वारा तथा कार्यान्वयन " बिहार शहरी आधारभूत संरचना विकास निगम (बुडको)" द्वारा बुडिप की परियोजना प्रबन्धन इकाई के माध्यम से हो रहा है।

D/C

इस परियोजना को चार शहरी निकायों यथा भागलपुर, गया, दरभंगा और मुजफ्फरपुर में कार्यान्वित किया जायेगा। इस पूरे कार्यक्रम का कार्यान्वयन 9 वर्षों की अवधि में 3 या 4 चरणों में होना है, जिसमें से एक उप परियोजना, " गया में पेयजल आपूर्ति व्यवस्था में सुधार " है।

गया पेयजल आपूर्ति उप परियोजना के दो भागों में निम्नलिखित कार्यों को सम्मिलित किया गया है :–

1. नल कूपों की मरम्मति
2. जल संरचना के पाइपों को बिछाना
3. नये जलाशयों का निर्माण
4. जलाशयों की मरम्मति
5. जल वितरण हेतु पाइपों को बिछाना

इस उप परियोजना के कुछ कार्य क्षेत्र राज्य संरक्षित गया वन क्षेत्र में यथा रामशिला, मुरली एवं ब्रह्मयोनि पहाड़ियों पर अवस्थित जलाशयों पर स्थित है, जिसके लिए मरम्मति कार्य (परिशिष्ट 1) प्रारंभ करने से पूर्व आपके विभाग से अनापत्ति प्राप्त करना आवश्यक है। इन मरम्मति कार्यों से संरक्षित वन क्षेत्र का कोई भाग प्रभावित नहीं होगा।

अतः अनुरोध है कि संबंधित सिविल कार्यों (अधिकांशतया मरम्मति) के लिए अनापत्ति प्रमाण पत्र प्रदान करने की कृपा की जाय, जिससे कि इस महत्त्वकांक्षी योजना को पूरा कराया जा सकें।

अनुलग्नक – यथोक्त।

विश्वासभाजन,

(दया शंकर मिश्रा)
महाप्रबंधक (कार्य)

ज्ञापांक– 877 दिनांक – 25/03/15.

प्रतिलिपि– मुख्य वन–संरक्षक, सह नोडल पदाधिकारी, (वन–संरक्षण), बिहार, पटना को सादर सूचनार्थ एवं आवश्यक कार्रवाई हेतु प्रेषित।

महाप्रबंधक (कार्य)

English Translation

BUIDCO/PMU(ADBProject)-03/13(Part-II)-877
Dated 25/03/15

Divisional Forest Officer,
Forest Division Office
Near Creane Memorial High School
Karim Ganj , Gaya

Subject: No Objection Certificate (NOC) for drinking water supply Renovation workson existing Ramshila Hill GLSR, Murli Hill GLSR, Brahmayoni hill GLSR and ShringhSthan GLSRunder State Protected forest Area of Gaya

Dear Sir,

Urban Development & Housing Department (UDHD), Government of Bihar has undertaken a programme named "The Bihar Urban Development Investment Program (BUDIP)", financed by the Asian Development Bank (ADB) through Multi- Tranche Financing Facility (MFF). The Executing Agency is the Urban Development & Housing Department (UDHD) Government of Bihar; and the Implementing Agency is the Bihar Urban Infrastructure Development Corporation (BUIDCo) through the Project Management Unit for BUDIP.

The project will be implemented in four urban areas: Bhagalpur, Darbhanga, **Gaya**, and Muzaffarpur in the state of Bihar. The program is to be implemented in 3-4 tranches over a period of 9 years. One of the Sub project is **"Improvement of water supply for Gaya".**

The subproject Gaya Water Supply package 1 and 2 comprises of

(i) Tube Well refurbishment,

(ii) Laying of rising/ transmission mains

(iii) Construction of new reservoirs

(iv) Renovation of water storage reservoirs

(v) Laying of water distribution pipelines

Some part of the sub-project area is located in the state protected forest area likeexisting Murli Hill GLSR ,Brahmayoni hillGLSR and ShringhSthanGLSRwhich will renovate (Annexure-1) for which NOC needs to be obtained from your dept., before the implementation of the project. As per design during renovation works no protected forest area will be affected.

It is therefore requested you please issue "No objection Certificate" for the concerned civil work (which is mostly renovation) so that we can achieve the project goal.

General Manager (Work)

BUIDCo,Patna

Appendix 5: Temple Trust NOC for Ramshilla Hill for using stairs during construction of GLSR

24 अगस्त 2015

माननीय महोदय,
गया जलापुर्ति योजना
गया

संदर्भ – रामशिला पहाड़ी स्थित टंकी के समीप नई टंकी के निमार्ण से सम्बन्धित ।

उपरोक्त जलापुर्ति योजना के अधिकारियो से वार्ता के सम्बन्ध मे मंदिर प्रंबधकर्ता समिति, टंकी के निमार्ण में लगने वाली निमार्ण सामग्री हेतु सीढियो का उपयोग (पितृपक्ष समय को छोड़ कर) करने पर सहमति प्रदान करता है ।
सीढियो में किसी भी तरह की टुट–फुट होने की स्थिति में पुनः सही करवाने का कष्ट करेगे ।

धन्यवाद,

Laxman Pandey
(लक्ष्मण कुमार पाण्डे)
प्रबंधकर्ता
रामशिला मंदिर
गया

English Translation

NOC from Temple Trust Ramshilla Hill for using stairs during construction of GLSR

24.08.2015

Respected Sir,
Gaya Water Supply Scheme,
Gaya

Ref.-Construction of new tank near old tank situated on Ramshilla Hill- regarding.

After consultation with officers related to Water Supply Scheme, the temple management committee hereby extends its consent for usage of stairs (excluding the period of Pitripaksh) for the construction of materials used for water tank.

It is requested that repair of stairs would be done by the executing Agency in case of any damage of the stairs.

Thanks.

Sd/-

(LaxmanKumar Pandey)
Manager of Ramshilla Temple,
Gaya.

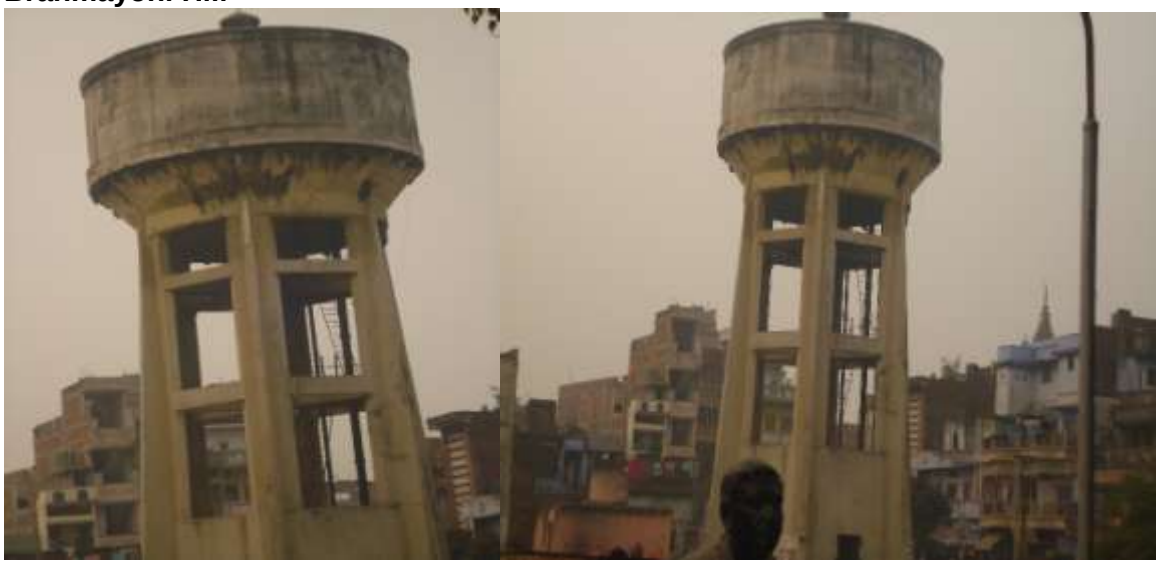
Appendix 6: Photos of existing water storage reservoirs

Murli Hill

Ramshila Hill

Singrasthan

Brahmayoni Hill



Azad Park

Location of existing pump house

1					
S. No.	**Components**	**Nos.**	**Capacity /Quantity**	**Photograph Pump Houses**	**Photograph Pump**
1	**REFURBISHMENT OF TUBE WELLS**	**29**	**Cum/hr.**		
1	Dandibagh No. 1	1	220		
2	Dandibagh No. 2	1	220		
3	Dandibagh No. 3	1	220		
4	Dandibagh No. 4	1	220		
5	Dandibagh No. 5	1	220		
6	Panchayati Akhara No. 1	1	100		
7	Panchayati Akhara No. 2	1	100		
8	Azad Park	1	55		
9	Dhobighat	1	40		

10	Central School	1	75		
11	Nigam Store	1	20		
12	Gurudwara	1	55		
13	New Godown	1	55		
14	Kharkhura	1	40		
15	Delha	1	40		
16	Panchayati Akhara No. 3	1	100		
17	Janata Colony 1	1	40		
18	Janata Colony 2	1	20		

19	Pilgrim Hospital	1	20		
20	Vishnupad	1	130		
21	Bypass	1	75		
22	BairagiPowerganj	1	55		
23	BageshwariPachim	1	20		
24	Pitamaheshwar	1	75		
25	Kauvasthan	1	20		
26	Hata Godown	1	55		
27	Manpur	1	100		

Appendix 7: Geohydrological Study

CHAPTER – X: Geohydrological Study

10.0 EXPLOITABLE SUB-SURFACE WATER POTENTIAL OF PHALGU RIVER & IMPACT OF 124 MLD ABSTRACTION ON ITS POTENTIAL

10.1 Delineation of ground water potential zone

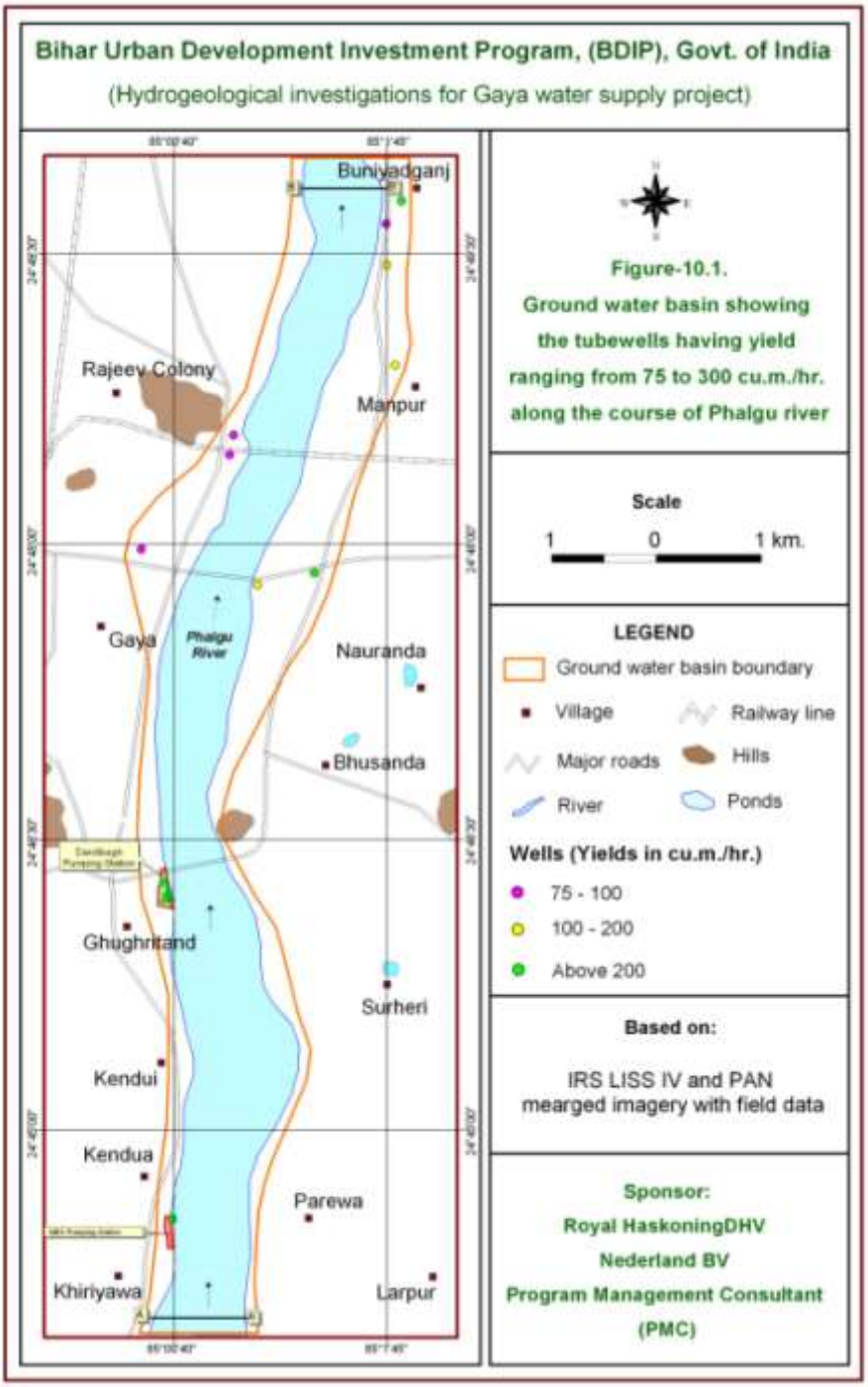
A ground water potential zone has been delineated based on hydro-geomorphological map, findings of resistivity surveys and covering the area where high yielding tube wells have been constructed/operated by GMC/PHED (yield ranging from 75 m^3/hour to 300 m^3/hour). This zone covers an area of 14.25 km^2 **(Figure-10.1)** on the left bank of Phalgu river, part of Manpur area on the right bank and part of Gaya city adjoining the river. Actually, this is the zone having adequate thickness of granular aquifer, deposited by Phalgu river along its present course and palaeo-channels which is most suitable for future ground water exploitation as has been proved by the existence of high yielding tube wells.

It was suggested by the CGWB during the meeting held on 16.05.2014 that ground water potential zone may cover area more than 14.25 km^2 if the lateral area on the left and right banks of Phalgu river are also studied by geoelectrical resistivity surveys. The existing well fields are a part of Phalgu ground water potential zone having the same aquifer thickness as in the river itself and it is likely that it may have similar aquifer thickness in lateral area. The exploitable ground water potential will be accordingly more if additional lateral area on either sides of river gets increased within the Phalgu ground water potential area.

It was also suggested by BUDIP during the meeting that an area of 4 -6 km downstream and 20 km upstream of Gaya town may also be studied along Phalgu river and it may provide additional ground water resources to plan for the 30 years water requirement.

10.2 Present status of ground water abstraction on sub-surface water of Phalgu river.

It has been observed that the present total ground water abstraction of 24,000 m^3/day considering 6-8 tube wells of Dandibagh well field (18,000 m^3/day), 4 tube wells of Manpur area (4,000 m^3/day), three tube wells of Gaya city (2,000 m^3/day) near the river and 3 tube wells of MES (1000 m^3/day) is recharged directly by the surface flow and during summer , it is tapping from the sub-surface water storage when the Phalgu river goes completely dry or with surface flow less than a cumec. The maximum lowering of water level in Phalgu river bed is less than 2 meters near the Dandibagh well field, which is being heavily pumped. This lowering is due to recharge provided by the sub-surface water of Phalgu river when a hydraulic gradient is developed towards the well field due to pumping of 18,000 m^3/day.



Average lowering of water in Phalgu river, from Khiriyawa to Buniyadgunj is less than a meter. However , taking the maximum lowering of two meters of water levels in river bed, the sub-surface water availability amounts to 5.7 mcm or about 76,000 m^3/day taking the specific yield of 20 % (as the upper river bed is loose coarse sand and gravel) within the area of 14.25 km^2 of ground water potential zone.

$$14.25 \times 2 \times 0.20 = 5.70 \text{ mcm}$$

Area of ground water potential zone x aquifer thickness x Specific yield = Ground water availability

It is therefore seen that at present the availability of sub-surface water within the river bed in 2 meters of the saturated river bed is much more than the ground water abstraction of 24,000 m^3/day or 1.80 mcm (considering 75 day of dry river bed) indicating that the lowering of water level in the ground water basin will be less than a meter. The present ground water abstraction is only the 31.50 % of the sub-surface water availability in an area of 14.25 km^2.

Even if the ground water abstraction increases from the existing tube wells for next 5 years or so, there will be no lowering of water level in the river bed of more than 2 meters as there is still surplus of

3.9 mcm in the river bed. The yield of existing tube wells will not be affected as there is still 23 meters of aquifer thickness available to sustain the present yields

10.3 Sub-surface flow of water in Phalgu river during summer months.

10.3.1 Sub-surface inflow

Once the Phalgu river is dry, there is sub-surface water flowing in the river towards the downstream side due north. An attempt has been made to estimate the inflow at the Section AA', near Khiriyawa (MES pumping station), (**Figure-10.1)** considering the hydraulic conductivity (150 m/day), section area of flow (average width of the river and average aquifer thickness) and hydraulic gradient of 1.5 m/km. The quantity of sub-surface flow amounts to 3994 m^3/day or say 4000 m^3/day or 0.3 mcm during the 75 days.

150 x 710 x 25 x 1.5 /1000 = 3994m^3/day

Hydraulic conductivity x width x aquifer thickness x hydraulic gradient = Sub-surface inflow

10.3.2 Sub-surface out flow of water in Phalgu river during summer months.

The sub-surface out flow has been estimated at Section BB' near village Buniyadgunj when the maximum 1,24,000 m^3/day of ground water abstraction will be done by the year 2044 from the ground water basin formed along Phalgu river. With the expected average lowering of water level of 4.35 meters, the outflow will be reduced with aquifer thickness and will be 2950 m^3/day.

150 x 635 x 20.65 x 1.5 /1000 = 2950 m^3/day

Hydraulic conductivity x width x aquifer thickness x hydraulic gradient = Sub-surface outflow

It is not known at this stage that what will be the impact of reduced inflow of river during summer months on the downstream stack holders of Section BB' as the number of irrigation tube wells are not known. However, as the irrigation wells are not operated during the summer months, (after the harvesting of Rabi crops), no major impact is anticipated.

10.4 Impact of ground water abstraction of 124 MLD on sub-surface water of Phalgu river

The sub-surface water storage in the ground water potential zone covering an area of 14.25 km^2 will be 53. 43 mcm taking average specific yield of 15 % for the average aquifer thickness of 25 meters

14.25 x 25 x 0.15 = 53.43 mcm

Area of ground water potential zone x aquifer thickness x Specific yield = Ground water availability

It is proposed that by the year 2044, there will be ground water abstraction of 124 MLD from tube wells located on left and right banks of the river. The ground water abstraction during the 75 days @ 1,24,000 m^3/day will be 9.30 mcm which happens to be 17.40 % of the total sub-surface water storage. So, the water level will be lowered by 4.35 meters, leaving a substantial saturated aquifer thickness of 20.65 meters. It is presumed that entire ground water abstraction will be from sub-surface water storage of Phalgu river and the anticipated lowering of water level in the river bed will be 4.35 meters from an area of 14.25 km^2 of the ground water potential zone. This quantity of water will be derived from the static ground water reserves of the ground water potential zone covering the river bed which have been calculated as 53.43 mcm. In addition, there will inflow of sub-surface water from the upstream side, near Khiriyawa which has been estimated as 4000 m^3/day or 0.30 mcm during 75 days. The sub-surface inflow will provide additional quantity of water for compensating the dewatering of the basin and raising the water level in the summer months. The total water storage including the sub-surface inflow of 0.30 mcm will be 53.73 mcm. The ground water abstraction of 9.30 mcm will be 17.30 % which will create lowering of water level by 4.325 meters, leaving the aquifer thickness of 20.675 meters.

10.5 Discharge of tube well at reduced aquifer thickness during summer

It has been observed that tube wells constructed in Dandibagh well field are yielding around 300 m^3/hour at very low drawdown, less than 3 meters. The average thickness of aquifer is around 25 meters.

Hydro geologically, it is stated that discharge of a tube well is directly proportional to its transmissivity which is hydraulic conductivity x aquifer thickness. Dandibagh, tube wells are yielding around 300 m^3/hour from an aquifer having transmissivity of 3750 m^2/day (K=150 m/day and aquifer thickness of 25 meters).The same tube well with aquifer thickness of 20 meters during summer with and maximum destuartion of 5 meters due to ground water abstraction of 124 MLD, the discharge of the tube well will be 240 m^3/hour at the same drawdown. Generally, tube wells tapping granular aquifer are pumped at normal drawdown of 6 to 8 meters. If the same tube well is pumped at 300 m^3/hour with aquifer thickness of 20 meters, it will yield 300 m^3/hour at drawdown of 6 to 8 meters. Normally, in case of confined aquifer, the discharge is directly proportional to drawdown and a tube well tapping confined aquifer will yield double the discharge at the double value of drawdown but in case of phreatic aquifer, it is not so and by doubling the discharge, the drawdown value becomes more than double due to reduced transmissivity. So, the tube wells will maintain the same yield even in the summer but with increased drawdown by the same capacity of turbine pumps

10.6 Estimation of the period when the river has less surface flow to sustain well fields

While estimating the lowering of water in Phalgu river of 4.325 m for ground water abstraction of 124 MLD , it has been presumed that river will become dry or will have less flow of 2 cumecs for 75 days. (April to Mid –June). This is for period when monsoon fails for prolonged years. A case study has been done for Phalgu river on 18th February, 2014 using Manning equation. During the year 2013, the catchment area of Phalgu river received rainfall of only 574 mm against the normal annual rainfall of 1089 mm (Average of 100 years of IMD data). So, it was much below the average annual rainfall and consequently very much reduced flow. It was observed on 18th February, 2014 that there is average water column of 15 cm in the river in the average width of 30 meters (**Photoplate-2.2).** This much flow is equivalent to 2.5 m^3/s or 0.21 mcm. as per the Manning's equation.

It means that by the 1st week of March, 2014, it will be reduced to 0.124 mcm and the tube wells would start tapping water from the sub-surface water of the river. It is therefore safe to assume that if the rainfall would have been 1089 mm of normal annual rainfall , the river might have had the surface flow of 2 cumecs (0.124 mcm) up to end of April,2014. Under such situation, the dry period of Phalgu river would have been only 45 or 50 days.

The maximum average peak flow of Phalgu river during the flood period has been observed as 3376 cumecs, when the rainfall during any day of the month of July was around 235 mm/day, the maximum rainfall as shown in Iso-pluvial map of IMD **(Figure-2.5)** during last 25 years. The minimum flow during such years of less than 2 cumecs will be either in the 1st week or 2nd week of May for normal rainfall of 1089 mm and 50.47 mm in October. Under such situation, the dry period will be only of 30 days. Accordingly, there will be less drawl of sub-surface water storage of Phalgu river.

10.7 Stream gauging data recorded by Central Water Commission on Phalgu river at Gaya

Central Water Commission (CWC) has set up a stream gauging site on the left bank of Phalgu river, just downstream of road bridge **(Photoplat-10.1)**. This bank gets water when Phalgu river has full flow in its river width and during flood periods. Most of the time when there is no flow of water on the left bank , as seen in **Photoplate-10.2** but there is flow in the river , somewhere in its central part when the flow is more than 2 cumecs.

Efforts were made by HCPL to use the stream gauge data of CWC at Gaya if it could give reliable estimate of the period when the river is completely dry and well fields are tapping sub-surface water storage. But it is observed that gauge heights show no flow while the central part of the river is having flow more than 124 MLD, the water requirement of Gaya town in the year 2044.

Under such situation, there is no other alternative except to take up hydrological modeling of Phalgu river basin.

Photoplate-10.1. Stream gauging station being monitored by CWC

Photoplate-10.2. Flow in Phalgu river in February while the left bank of CWC station shows no flow much earlier

10.8 Conclusions

Based on the hydrogeological assessment studies of the ground water potential zone, it is observed that present ground water abstraction of 24,000 m^3/day for 75 days(when the river is dry) is hardly 31.50 % of the total sub-surface water storage (5.70 mcm) within 2 meters of aquifer in 14.25 km^2 of the ground water potential zone during summer months.

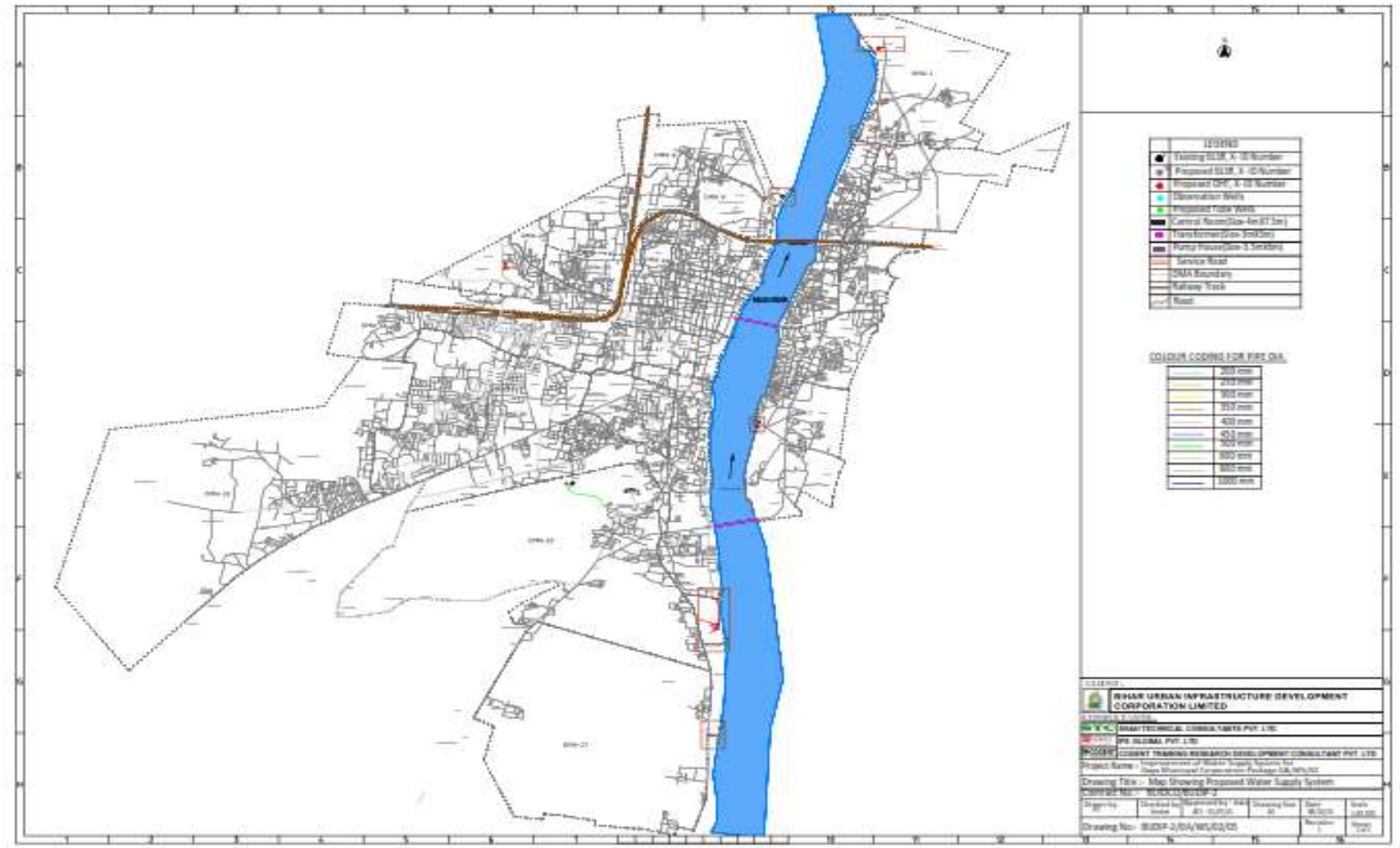
Similarly, with the ground water abstraction of 124 MLD for 75 days of 9.30 mcm from the sub-surface water storage of 25 m thick aquifer of 53.43 mcm will be 17.40 % and it will lower will lower the water level by 4.35 meters, still keeping the aquifer thickness of 20.65 meters which is considered as sufficient to sustain the yield of tube wells.

So, it is concluded that despite lowering of water level by 4.35 meters during summer months, the tube wells will sustain the yield and will restore original yield as soon as Phalgu river starts flowing after getting the first spell of rainfall in mid -June.

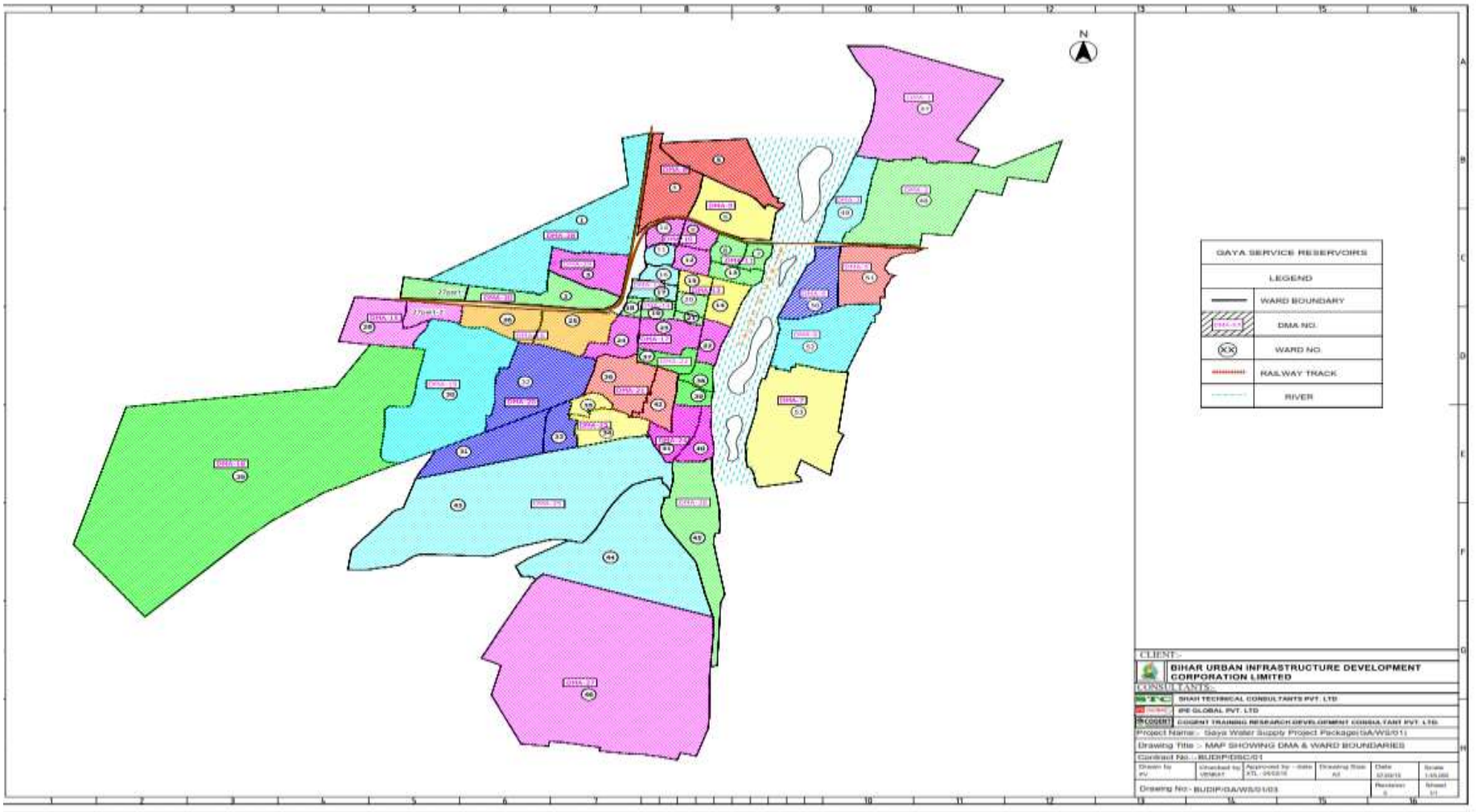
The impact of pumping 124 MLD during the summer months (75 days) can be further reduced if the well fields are increased instead of having only one well field of Dandibagh. Two more well fields can be developed, one near village Kendui and another near Kendua on the left bank **(Figure-9.1)** and fourth near Manpur - Buniyadgunj on the right bank (if investigated by resistivity surveys). By having four different well fields, there will be less pumping from a small area of a well field, thereby creating a small ground water depression and less lowering of water level around it.

Although, it was recommended by DSC during the meeting held on 16.05.2014 that geoelectrical resistivity soundings may be recorded in Manpur area to find out the aquifer thickness and ground water worthy area, PMC suggested that any additional work may now to taken up by DSC and BUIDCo as PMC has done the studies within its allocations.

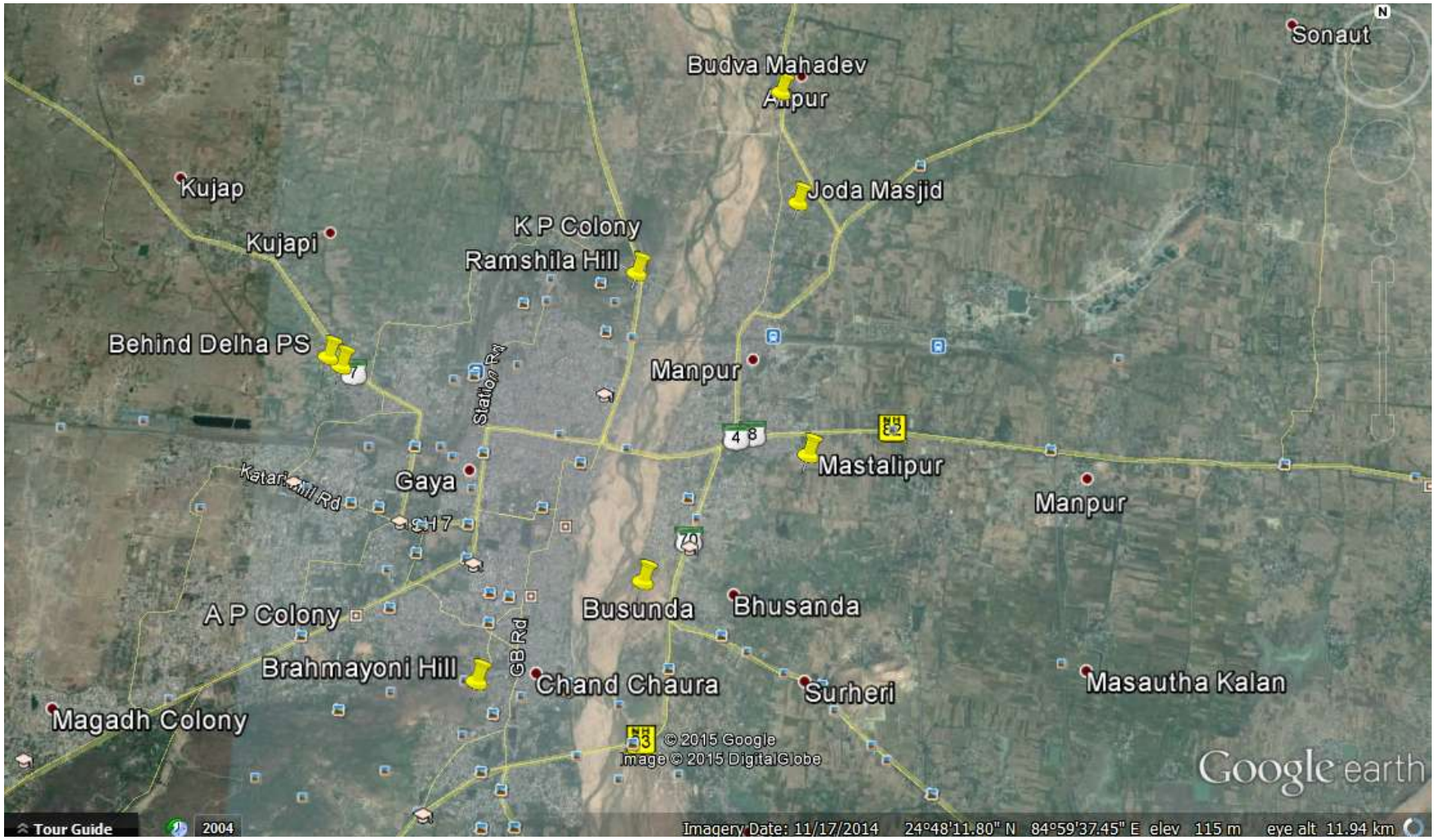
Appendix 8: Location maps of proposed project components



Map showing location of project area



DMA area for water distribution



Location of proposed water storage reservoirs at Gaya – Google map

Appendix 9: Photos of project locations

Proposed OHT and GLSR sites

S.No.	Name of Site	Latitude/ Longitude	Ownership	Photograph	Google map
1	Joda Masjid	24°49'7.37"N/85° 1'50.25"E	Gaya Municipal Corporation		
2	Budhva Mahadev	24°49'48.03"N/85° 1'44.82"E	Govt. of Bihar		
3	Mastalipur	24°47'43.95"N/85° 1'52.39"E	Govt. of Bihar		

S.No.	Name of Site	Latitude/ Longitude	Ownership	Photograph	Google map
4	Bhusunda	24°47'4.03"N/85° 0'55.54"E	Govt. of Bihar		
5	Behind Delha Police Station – 2 nos.	24°48'20.52"N/84° 59'4.72"E	Govt. of Bihar		

S.No.	Name of Site	Latitude/ Longitude	Ownership	Photograph	Google map
6	Ramshila Hills GLSR	24°48'43.50"N/85° 0'52.71"E	State Forest Department		
7	Brahmyoni Hills GLSR (2 Nos.)	24°46'34.57"N/85° 0'1.92"E	State Forest Department		

Tube Well locations under Rehabilitation

Sl. No.	Location of Tube Well	Tube well ID No.	Ward No.	Coordinates	Land
1	Dandi Bagh[38]	01,02, 03,04, 05	45	24.771450, 85.010200	Govt Land
2	Hata Godown 	27	29	24.7999000, 85.004100	Govt Land
3	GMC's Godown (store room)- Nigam store 	11	26	24.80396, 85.0017	Govt Land
4	Gurudwara , Golbagicha Gabda 	12	07	24.80315, 85.00262	Govt Land
5	Panchayati Akhara No.1 	06	07	24.80669, 85.01842	Govt Land
6	Panchayati Akhara No.2 	07	07	24.80669, 85.01842	Govt Land
7	Panchayati Akhara No.3	07	07	24.80669,	Govt Land

38

Dandibagh TW 1	Dandibagh TW 2	Dandibagh TW 3	Dandibagh TW 4	Dandibagh TW 5
				

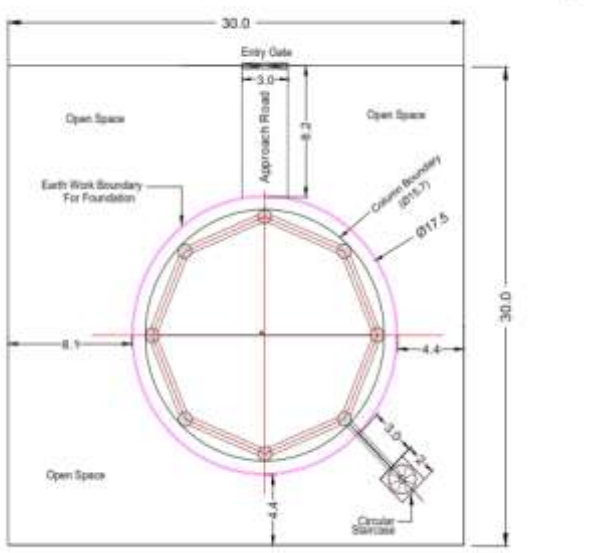
Sl. No.	Location of Tube Well	Tube well ID No.	Ward No.	Coordinates	Land
				85.01842	
8	Pitamaheshwar 	25	19	24.4728, 85.003152	Govt Land
9	Delha 	16	03	24.80922, 84.99069	Govt Land
10	Kauv Sthan 	26	38	24.800670, 85.001380	Govt Land
11	Powarganj Bairagi 	23	10	24.81602, 85.02682	Govt Land
12	Central school 	10	10	24.80928, 85.00498	Govt Land
13	Azad park	8	20	24.799590, 85.008660	Govt Land

Sl. No.	Location of Tube Well	Tube well ID No.	Ward No.	Coordinates	Land
					
14	Janta Colony 1 	18	10	24.80849, 85.00114	Govt Land
15	Janta Colony 2 	19	10	24.80849, 85.00114	Govt Land
16	Bageshwari 	24	10	24.81678, 85.00539	Govt Land
17	Khadi Gramodyog, Lakhi Bagh 	30	52	24.79521, 85.02022	Govt Land
18	Dhobi ghat 	09	06	24.81104, 85.02109	Govt Land
19	Manpur 	28	52	24.79778, 85.02466	Govt Land
20	Pilligram Hospital	20	14	24.799630, 85.009860	Govt Land

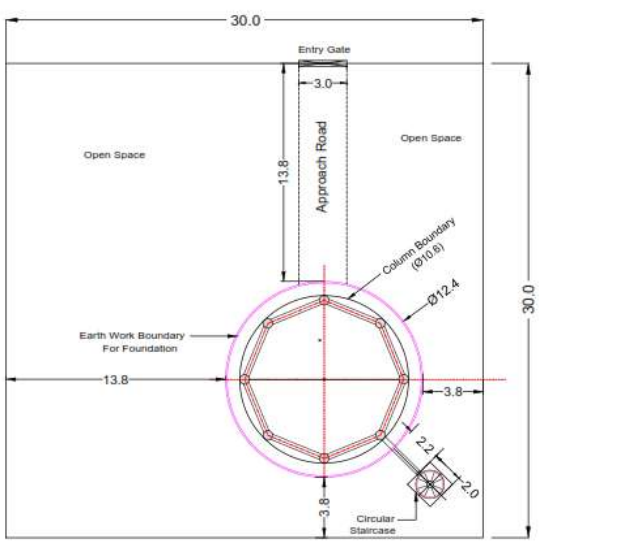
Sl. No.	Location of Tube Well	Tube well ID No.	Ward No.	Coordinates	Land
					
21	Bypass 	22	27	24.46139, 84.0659	Govt Land
22	Baba Dayalunath 	15	01	24.47987 , 84.59439	Govt Land
23	New Godam 	14	13	24.48263 , 85.0587	Govt Land
24	Visnupad Temple 	21	41	24.463654 85.003011	Govt Land
25	Manpur, Buniyadganj 	29	48	24.484254 85.13975	Govt Land

Appendix 10: Site Management Plan per project location

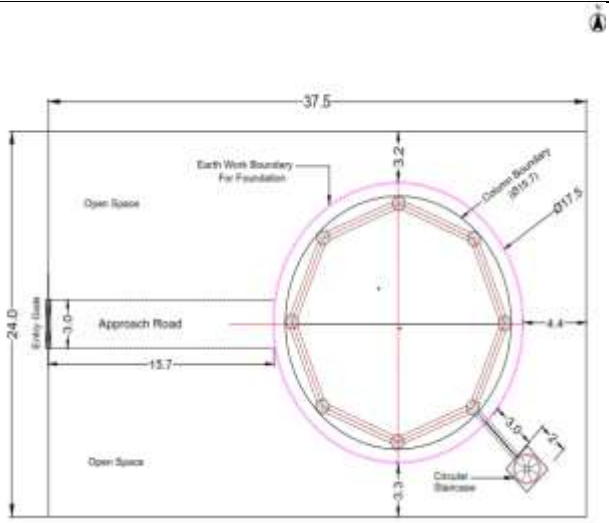
Site Management plan – Project location wise



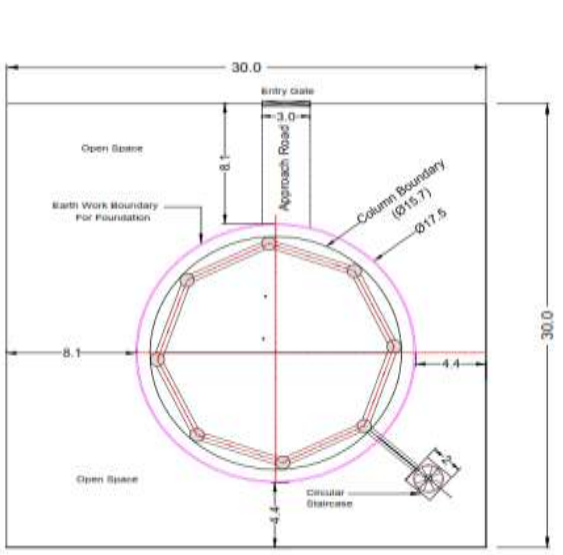
Near Joda Masjid



Budva mahadev



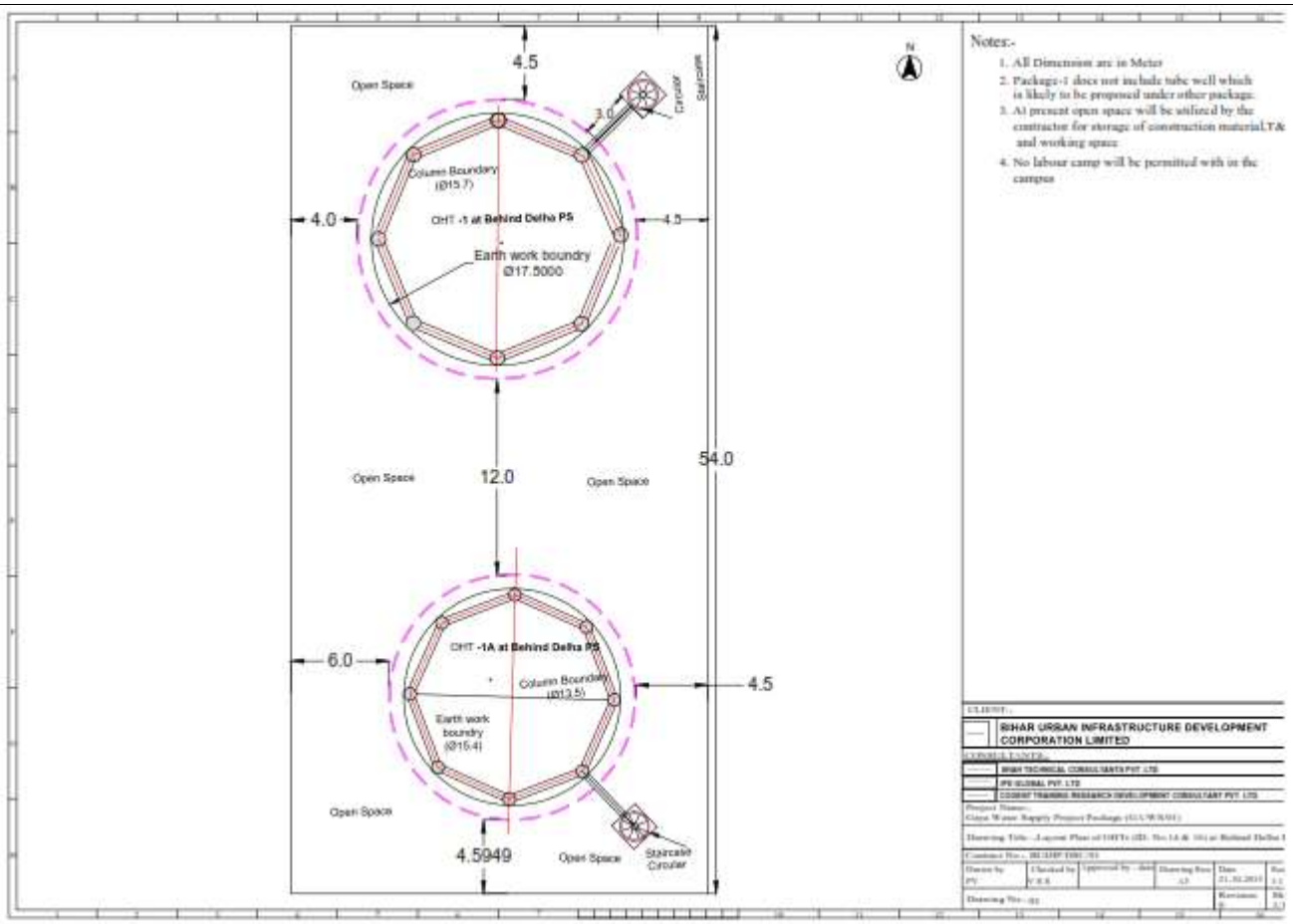
Mastalipur



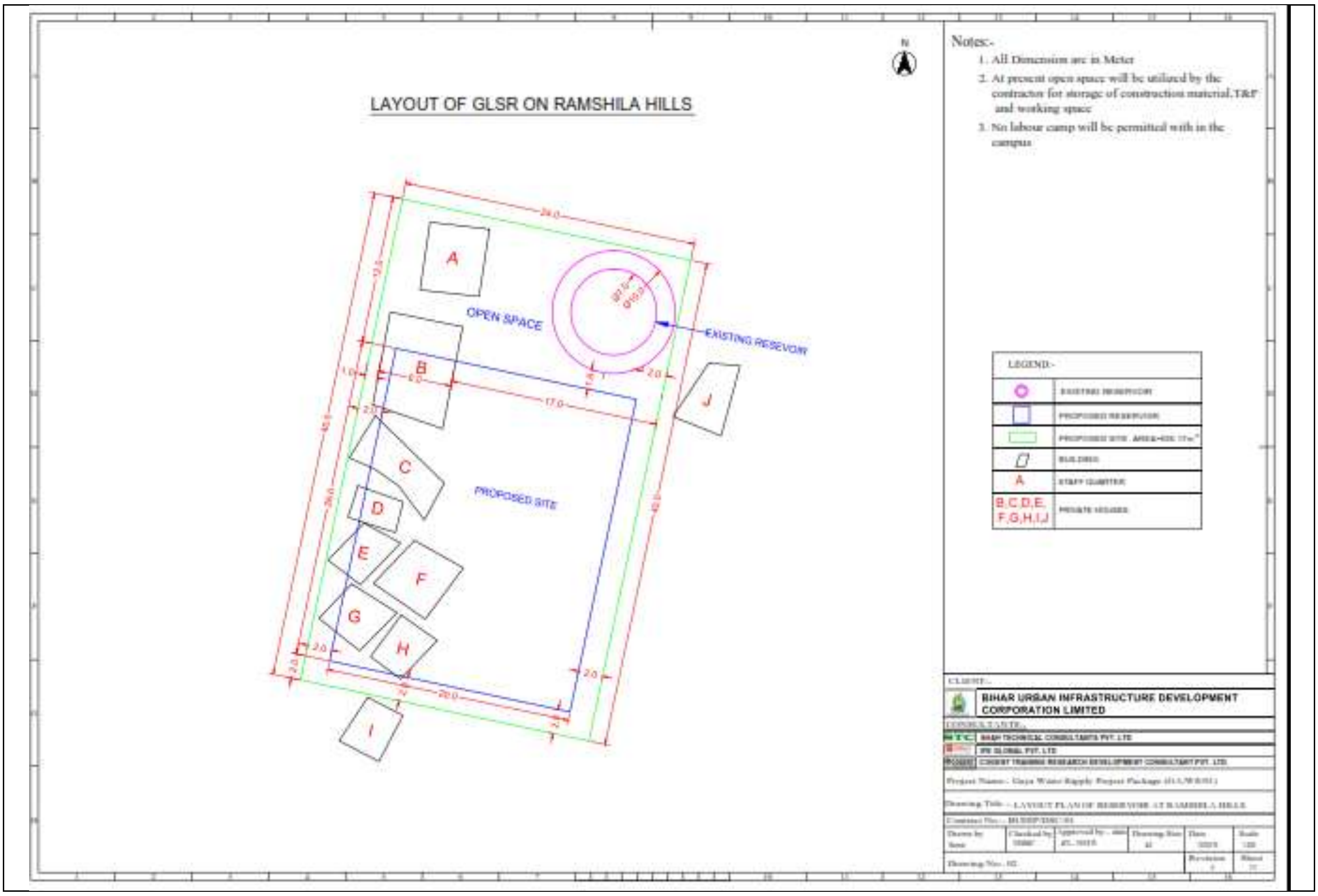
Bhusunda Mela

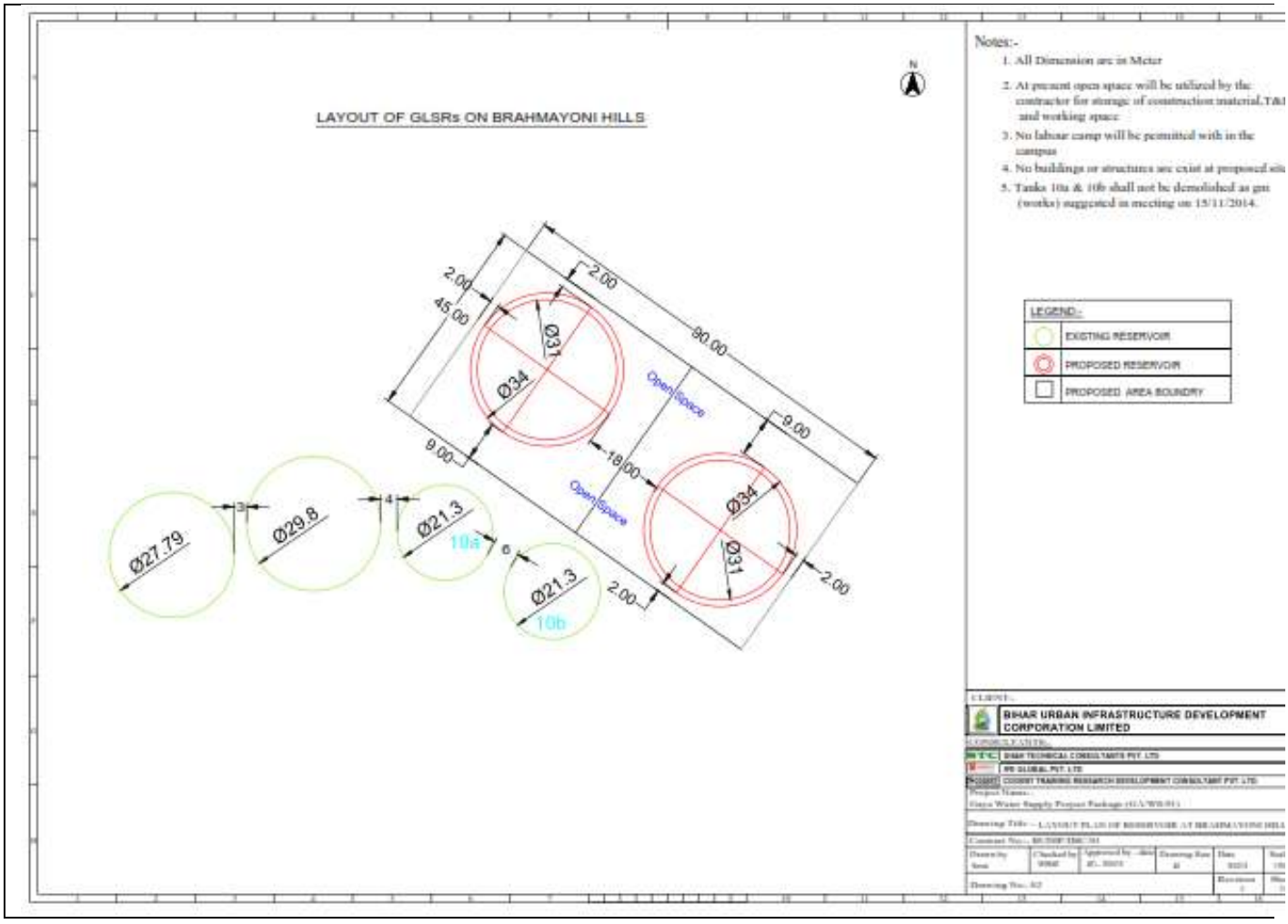
Notes:-

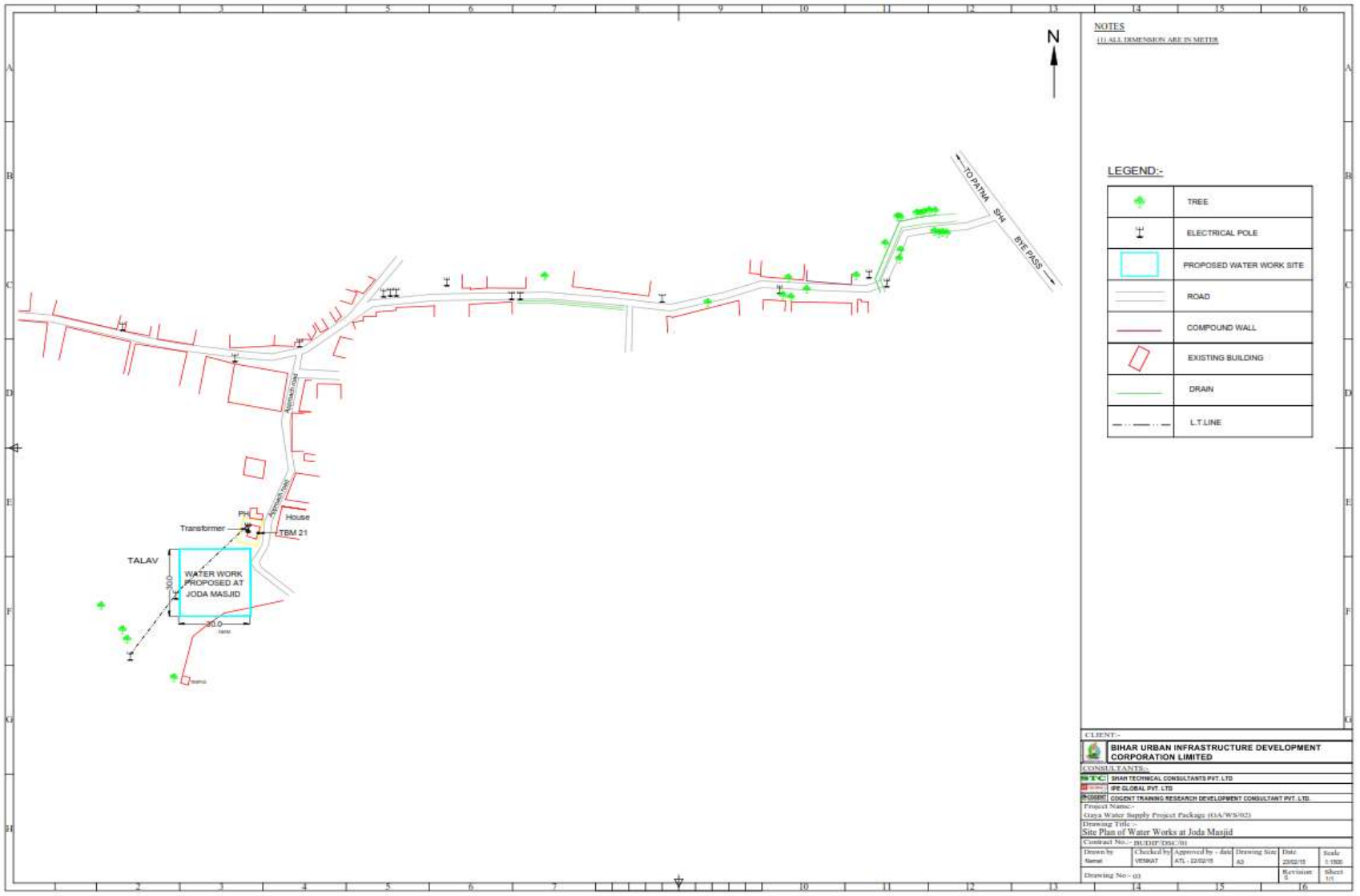
1. All Dimension are in Meter
2. Package-1 does not include tube well which is likely to be proposed under other package.
3. At present open space will be utilized by the contractor for storage of construction material,T&P and working space
4. No labour camp will be permitted with in the campus



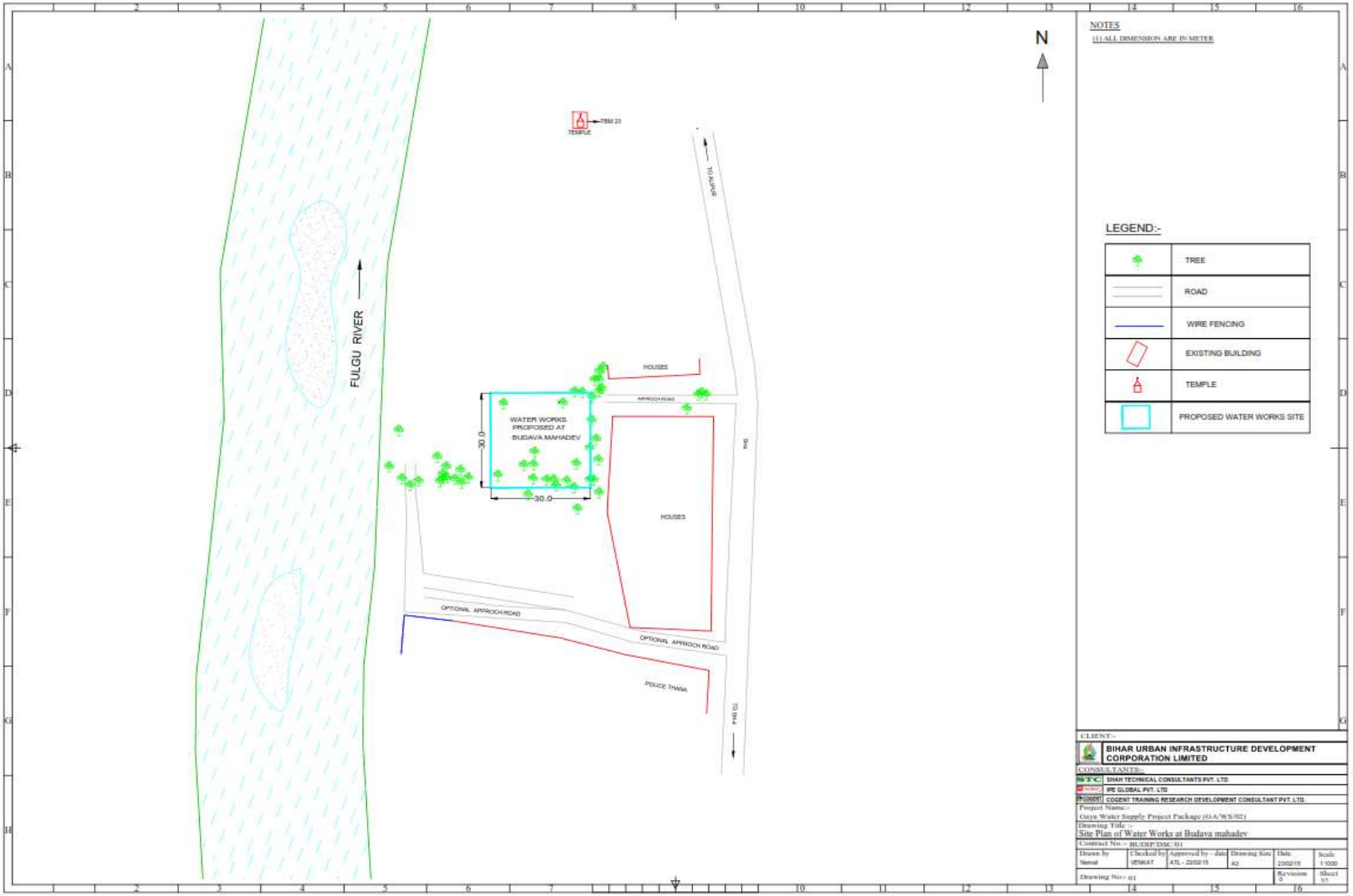
Behind Delha PS


LAYOUT OF GLSR ON RAMSHILA HILLS
N
OPEN SPACE
EXISTING RESEVOIR
PROPOSED SITE
A
B
C
D
E
F
G
H
I
J
Notes:-
1. All Dimension are in Meter
2. At present open space will be utilized by the contractor for storage of construction material, T&P and working space
3. No labour camp will be permitted with in the campus
LEGEND:-
B,C,D,E,
F,G,H,I,J
CLIENT:-
BIHAR URBAN INFRASTRUCTURE DEVELOPMENT CORPORATION LIMITED
CONSULTANTS:-

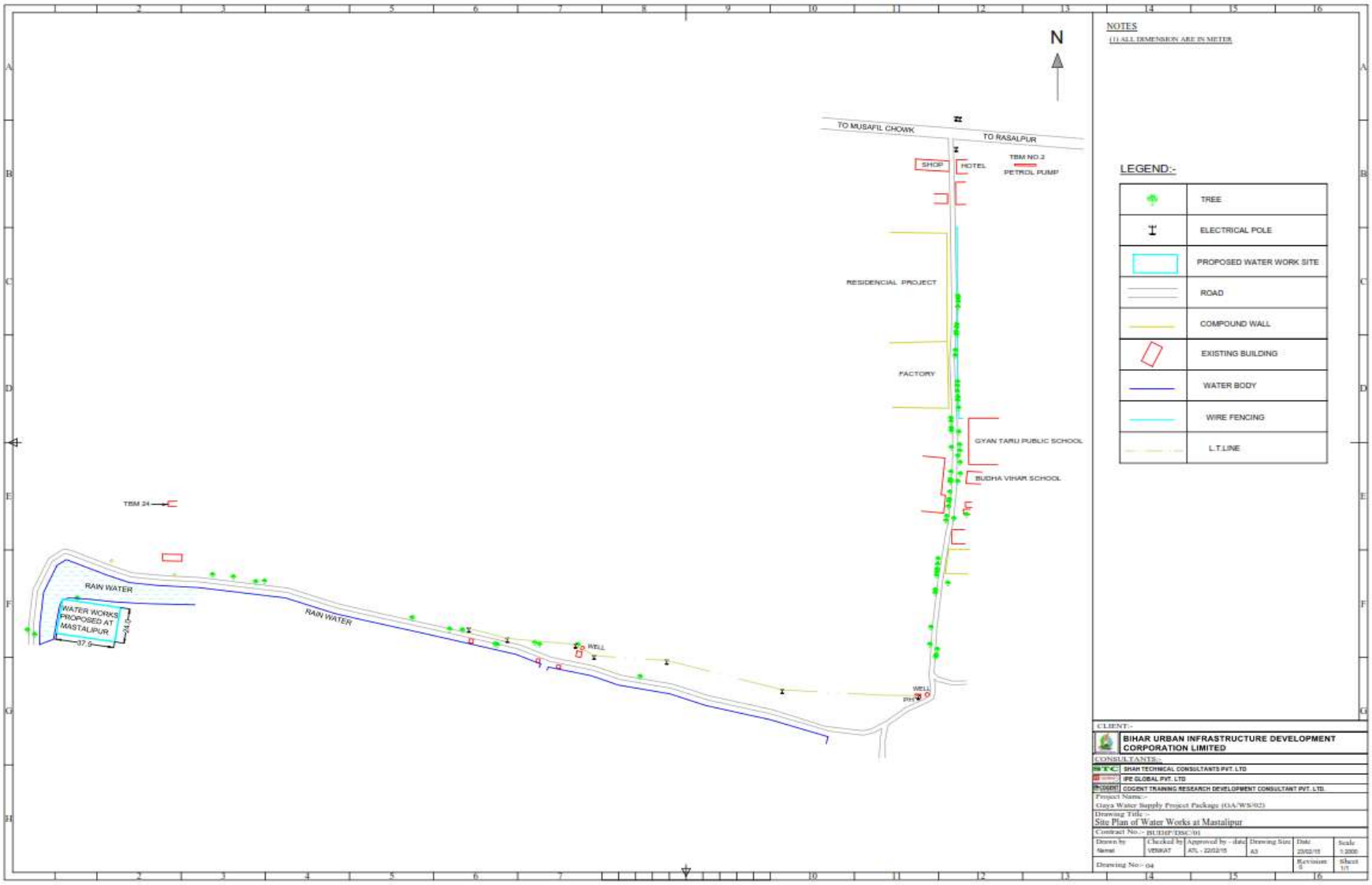

LAYOUT OF GLSRs ON BRAHMAYONI HILLS
N
2.00
45.00
2.00
80.00
Ø31
Ø34
Open Space
9.00
9.00
18.00
Open Space
Ø34
Ø31
2.00
2.00
Ø27.79
3
Ø29.8
4
Ø21.3
10a
6
Ø21.3
10b
Notes:-
1. All Dimension are in Meter
2. At present open space will be utilized by the contractor for storage of construction material,T&I and working space
3. No labour camp will be permitted with in the campus
4. No buildings or structures are exist at proposed site
5. Tanks 10a & 10b shall not be demolished as per (works) suggested in meeting on 15/11/2014.
LEGEND :-
EXISTING RESERVOIR
PROPOSED RESERVOIR
PROPOSED AREA BOUNDRY
BIHAR URBAN INFRASTRUCTURE DEVELOPMENT CORPORATION LIMITED



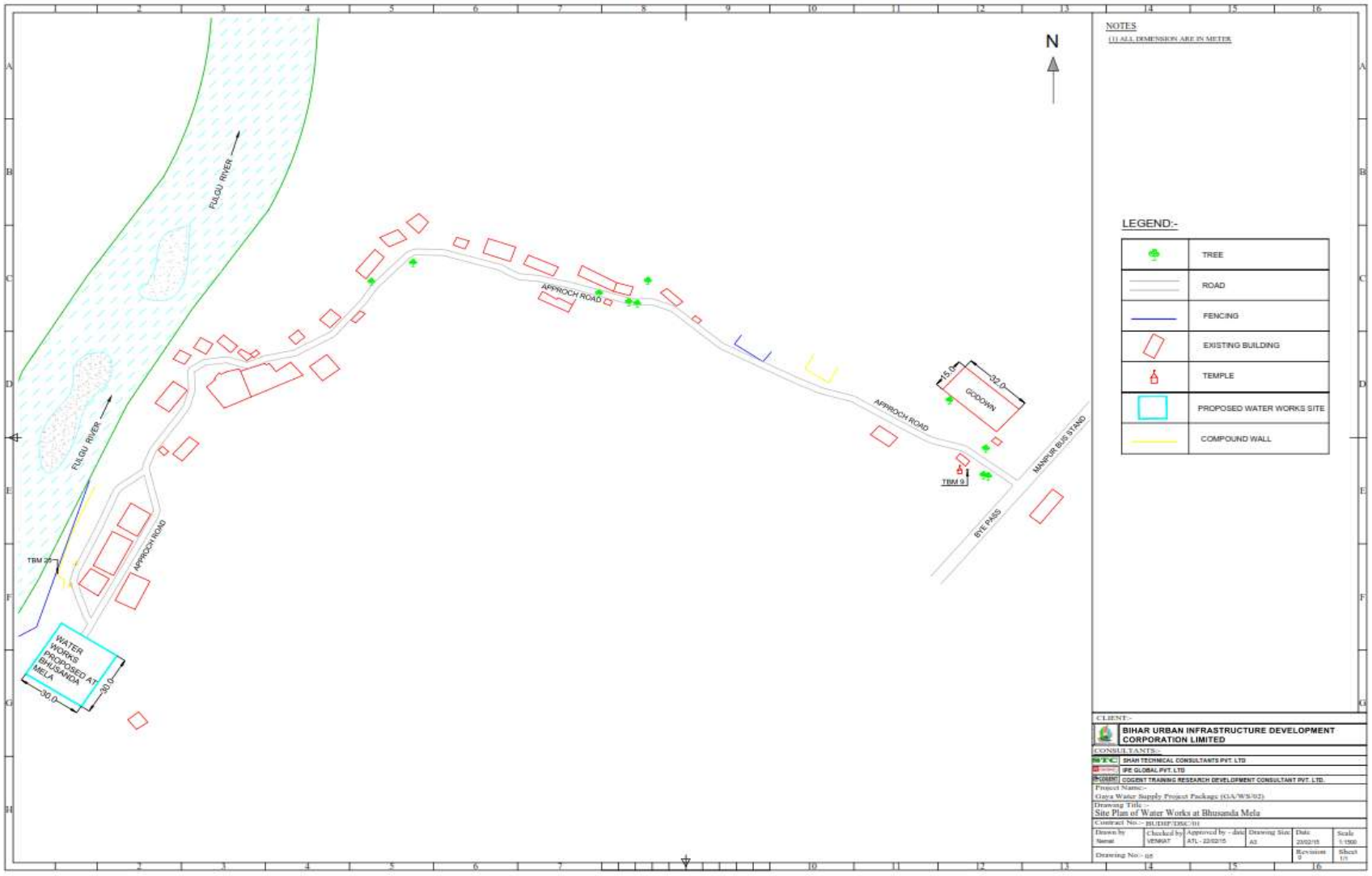
Proposed OHT location and access road at Joda Masjid



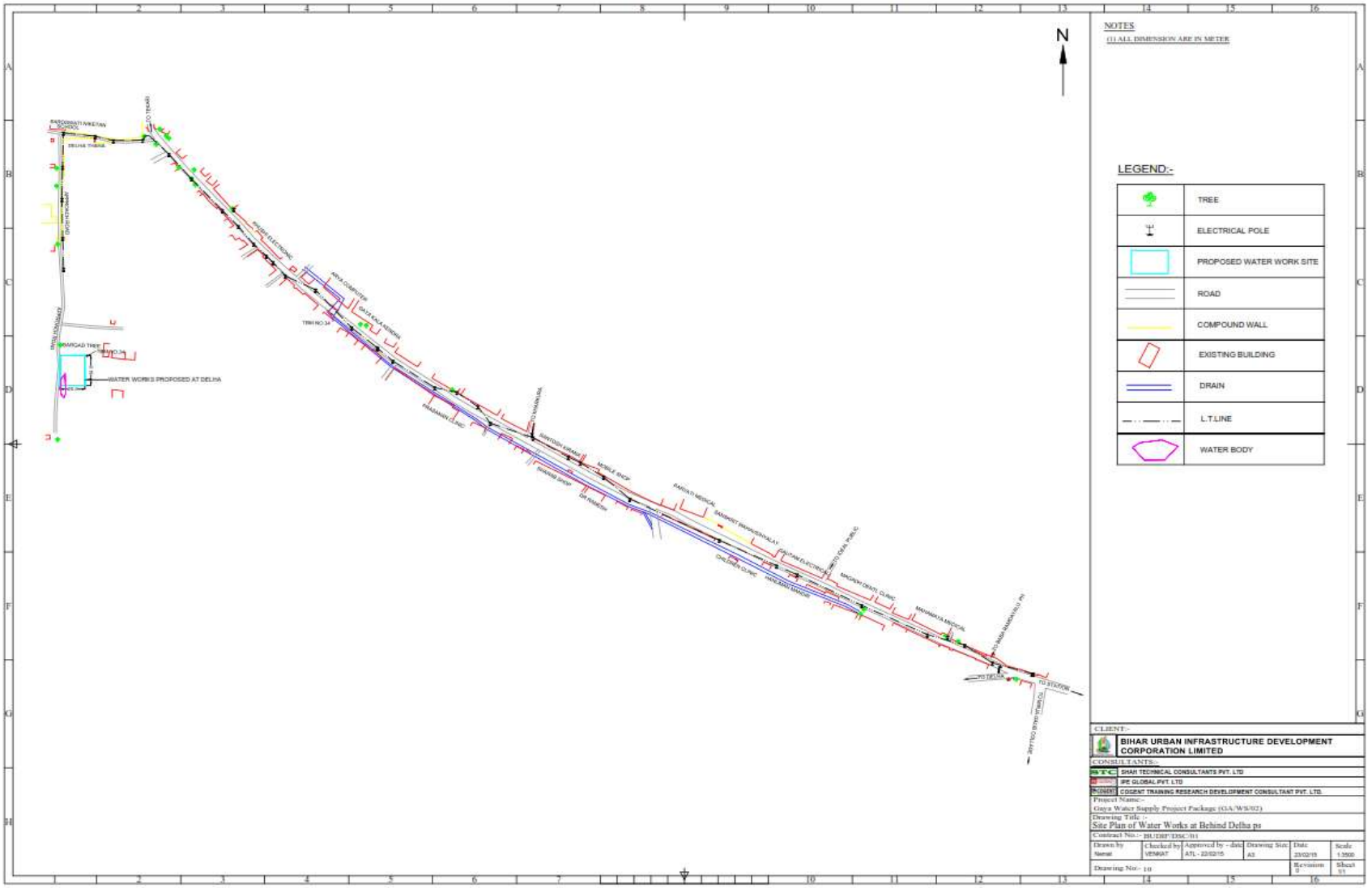
Proposed OHT location and access road at Budva mahadev



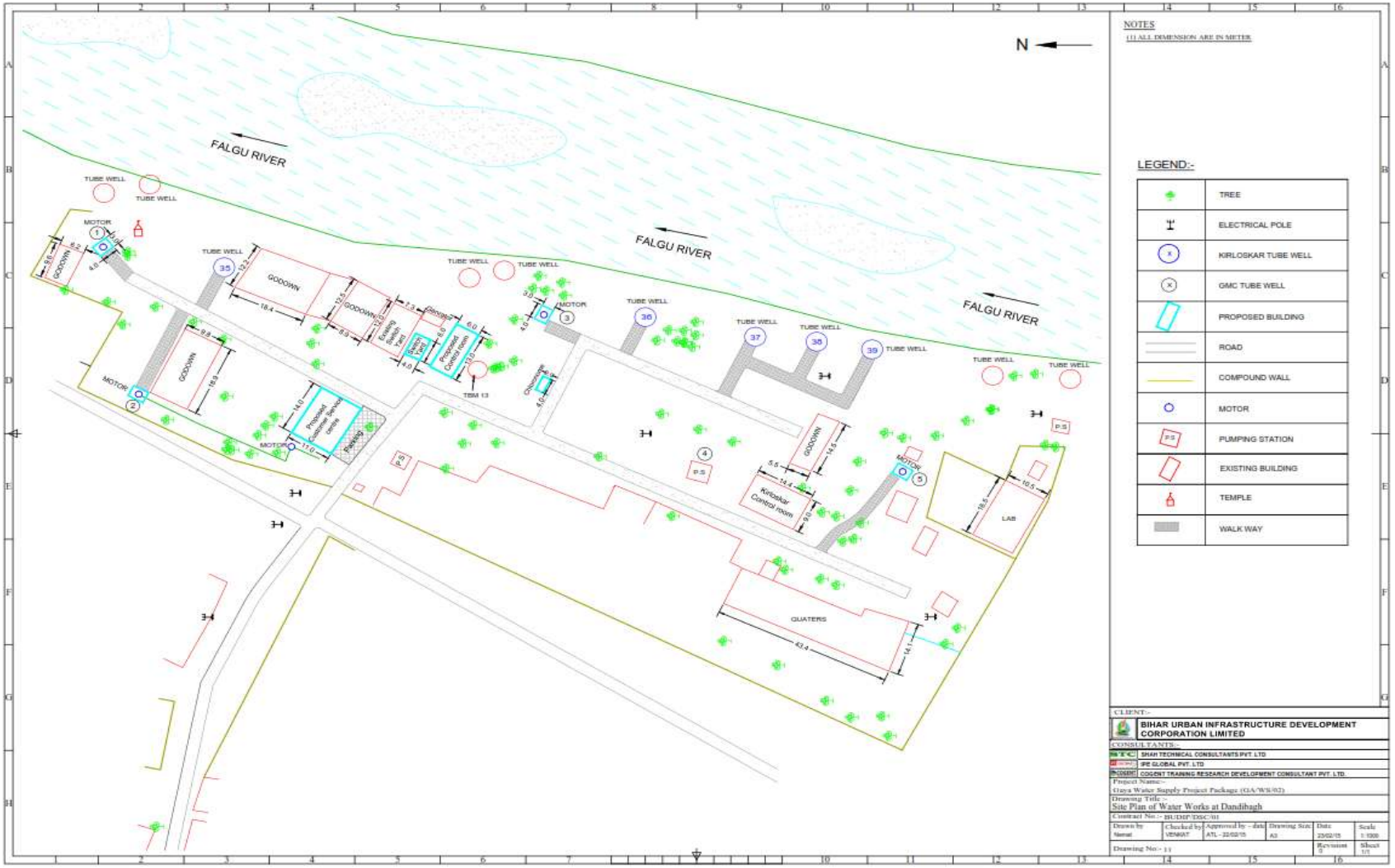
Proposed OHT location and access road at Mastalipur



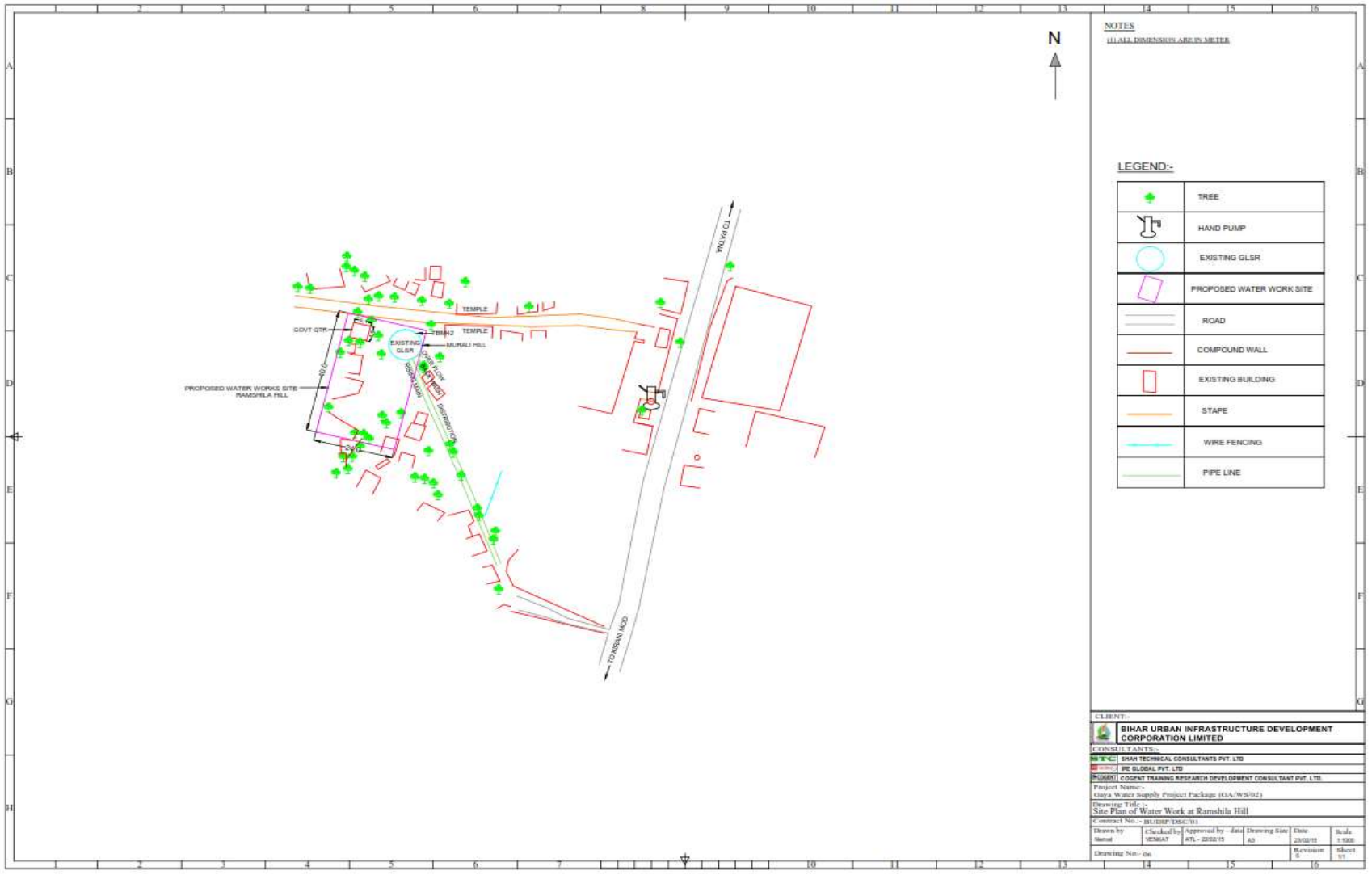
Proposed OHT location and access road at Bhusanda Mela



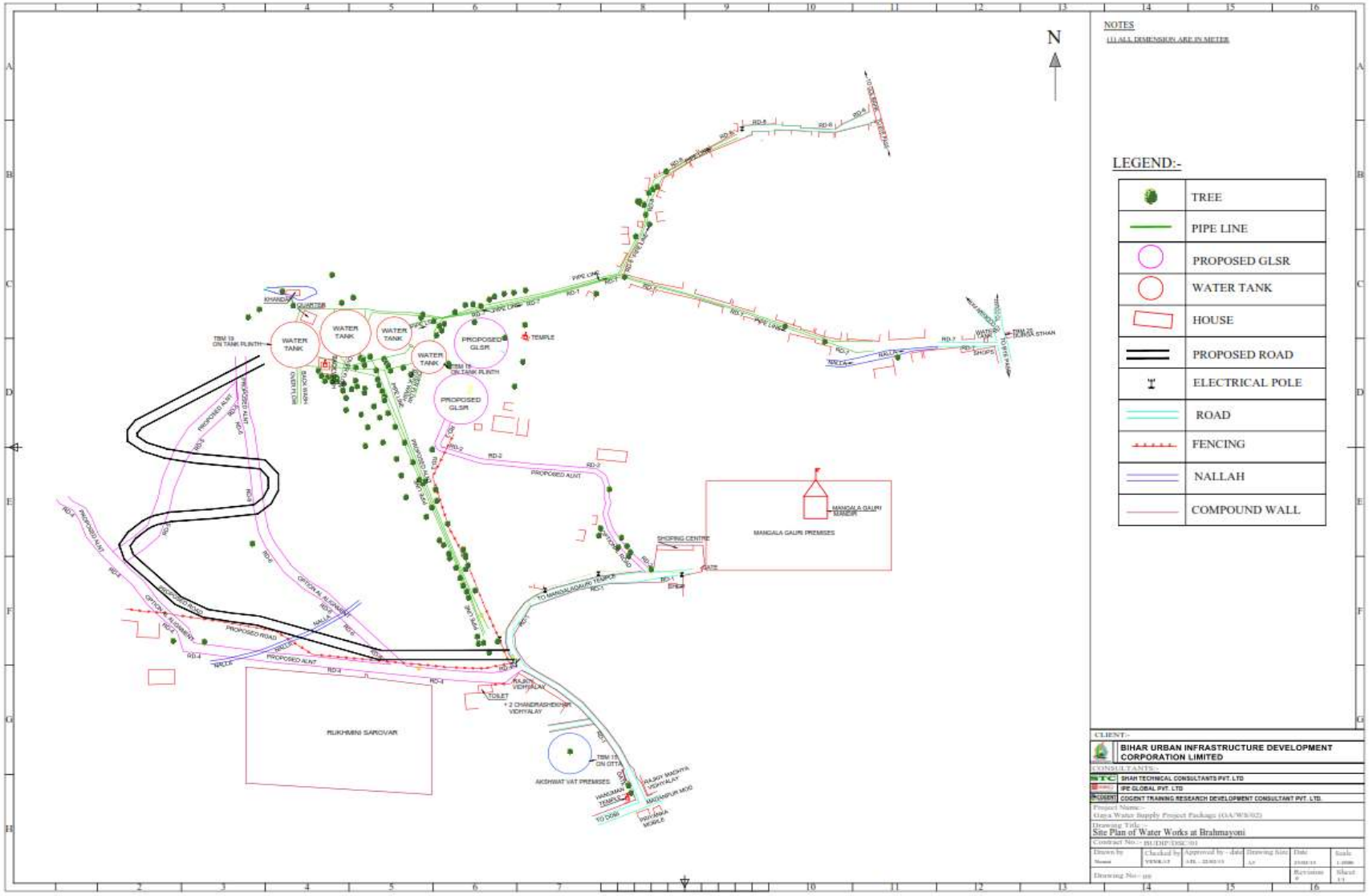
Proposed OHT location and access road at behind Delha Police Station



Water works location at Dandibagh



Proposed GLSR location and access road at Ramshilla Hill



Proposed GLSR location and access road at Brahmayoni hill

Appendix 11: Results of water quality analyses

Details of location, type of source, coordinates and villages from where the water samples were collected and analyzed

S. No.	Water Sample Code	Source	Location/village	Co-ordinates	
				Longitude	Latitude
1.	WS-1	Hand pump	Partapi	85° 1' 47.4"	24° 30' 26.1"
2.	WS-2	Hand pump	Mohanpur	85° 4' 39.0"	24° 34' 53.8"
3.	WS-3	Hand pump	Bakror	85° 0' 03.7"	24° 41' 26.3"
4.	WS-4	Hand pump	Nima	85° 0' 42.4"	24° 39' 56.1"
5.	WS-5	Hand pump	ITI Ghughitand	85° 0' 35.0"	24° 45' 49.0"
6.	WS-6	Tube well	Dandibagh pump house	85° 0' 35.8"	24° 46' 15.2"
7.	WS-7	Hand pump	Khiriyawan	85° 0' 36.5"	24° 44' 37.7"
8.	WS-8	Tube well	Kundua	85° 0' 37.8"	24° 45' 08.6"
9.	WS-9	Tube well	Kundui	85° 0' 17.4"	24° 45' 30.5"
10.	WS-10	Tube well	Janta Colony, Gaya	85° 0' 05.2"	24° 48' 33.9"

Chemical analysis of water sample collected form study area and acceptable limits as per IS-10,500-2012

Parameter Tested	Results					Indian Standards IS: 10,500-2012	
	WS-1	WS-2	WS-3	WS-4	WS-5	Acceptable limit	Permissible limit
Color (Hazen units)	Colorless	Colorless	Colorless	Colorless	Colorless	**5**	**15**
Odor	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	**Agreeable**	**Agreeable**
Turbidity (NTU)	**Nil**	**1**	**Nil**	**Nil**	**2**	**1**	**5**
Taste	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	**Agreeable**	**Agreeable**
pH	7.79	7.74	7.71	7.74	7.72	**6.5-8.5**	**No Relaxation**
Electrical Conductivity at 25^0C in μmhos/cm	595	510	272	518	315	**N.P.**	**N.P.**
TDS (Total Dissolved Solids)	340	285	155	292	175	**500**	**2000**
Calcium	39	33	18	34	19	**75**	**200**
Magnesium	23	20	10	21	12	**30**	**100**
Sodium	46	39	22	38	25	**N.P.**	**N.P.**
Potassium	3	2	1	2	1	**N.P.**	**N.P.**
Chloride	85	78	42	79	46	**250**	**1000**
Carbonate	138	119	61	120	72	**N.P.**	**N.P.**
Bi-Carbonate	-	-	-	-	-	**N.P.**	**N.P.**
Sulphate	46	32	17	34	21	**200**	**400**
Nitrate	17	13	8	15	9	**45**	**No relaxation**
Fluoride	0.37	0.34	0.29	0.34	0.29	**1.0**	**1.5**
Total	192	165	86	171	97	**200**	**600**

Parameter Tested	Results					Indian Standards IS: 10,500-2012	
	WS-1	WS-2	WS-3	WS-4	WS-5	Acceptable limit	Permissible limit
Hardness as $CaCO_3$							
Arsenic	BDL	BDL	BDL	BDL	BDL	**0.01**	**0.05**
E. Coli MPN/ 100 ml	Absent	Absent	Absent	Absent	Absent	**Absent**	**Absent**
Total Coliform MPN/100	0	0	0	0	0		

Contd..

Parameter Tested	Results					Indian Standards IS: 10500-2012	
	WS-6	WS-7	WS-8	WS-9	WS-10	Acceptable limit	Permissible limit
Color (Hazen units)	Colorless	Colorless	Colorless	Colorless	Colorless	**5**	**15**
Odor	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	**Agreeable**	**Agreeable**
Turbidity(NTU)	2	Nil	Nil	Nil	3	**5**	**10**
Taste	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	**Agreeable**	**Agreeable**
pH	7.72	7.71	7.69	7.78	7.70	**6.5-8.5**	**No Relaxation**
Electrical Conductivity at 25^0C in μmhos/cm	310	290	312	326	366	**N.P.**	**N.P.**
TDS (Total Dissolve Solids)	173	165	170	184	214	**500**	**2000**
Calcium	18	17	18	20	22	**75**	**200**
Magnesium	12	10	11	13	14	**30**	**100**
Sodium	26	26	27	25	30	**N.P.**	**N.P.**
Potassium	1	1	1	3	2	**N.P.**	**N.P.**
Chloride	45	44	45	48	51	**250**	**1000**
Carbonate	71	66	71	70	84	**N.P.**	**N.P.**
Bi-Carbonate	-	-	-	-	-	**N.P.**	**N.P.**
Sulphate	21	18	21	23	27	**200**	**400**
Nitrate	8	7	8	9	14	**45**	**100**
Fluoride	0.26	0.27	0.22	0.24	0.28	**1.0**	**1.5**
Total Hardness as	94	84	90	103	112	**200**	**600**

Parameter Tested	Results					Indian Standards IS: 10500-2012	
	WS-6	WS-7	WS-8	WS-9	WS-10	Acceptable limit	Permissible limit
$CaCO_3$							
Arsenic	BDL	BDL	BDL	BDL	BDL	**0.01**	**0.05**
E. Coli MPN/ 100 ml	Absent	Absent	Absent	Absent	Absent	**Absent**	**Absent**
Total Coliform MPN/100	0	0	0	0	0		

BDL- Below detection limit

N.P – Not prescribed

Appendix 12: Traffic Management Plan Template

Traffic Management Plan (TMP) Template

A. Principles

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

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

B. Operating Policies for TMP

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

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

C. Analyze the impact due to street closure, if required

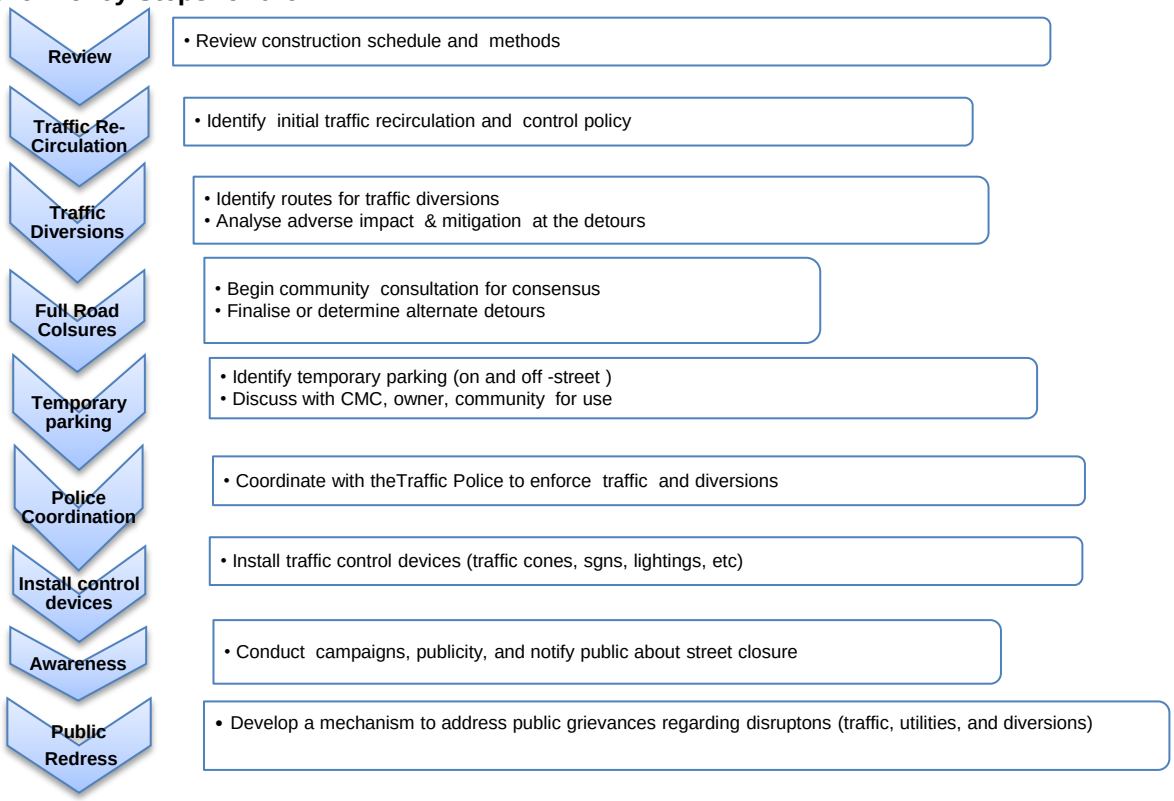
3. Apart from the capacity analysis, a final decision to close a particular street and divert the traffic should involve the following steps:

(i) approval from the PIU, local administration to use the local streets as detours;
(ii) consultation with businesses, community members, traffic police, PWD, etc, regarding the mitigation measures necessary at the detours where the road is diverted during the construction;
(iii) determining of the maximum number of days allowed for road closure, and incorporation of such provisions into the contract documents;
(iv) determining if additional traffic control or temporary improvements are needed along the detour route;
(v) considering how access will be provided to the worksite;
(vi) contacting emergency service, school officials, and transit authorities to determine if there are impacts to their operations; and
(vii) developing a notification program to the public so that the closure is not a surprise. As part of this program, the public should be advised of alternate routes that commuters can take or will have to take as result of the traffic diversion.

4. If full road-closure of certain streets within the area is not feasible due to inadequate capacity of the Detour Street or public opposition, the full closure can be restricted to weekends

with the construction commencing on Saturday night and ending on Monday morning prior to the morning peak period.

Figure: Policy Steps for the TMP



D. Public awareness and notifications

5. As per discussions in the previous sections, there will be travel delays during the constructions, as is the case with most construction projects, albeit on a reduced scale if utilities and traffic management are properly coordinated. There are additional grounds for travel delays in the area, as most of the streets lack sufficient capacity to accommodate additional traffic from diverted traffic as a result of street closures to accommodate the works.

6. The awareness campaign and the prior notification for the public will be a continuous activity which the project will carry out to compensate for the above delays and minimize public claims as result of these problems. These activities will take place sufficiently in advance of the time when the roadblocks or traffic diversions take place at the particular streets. The reason for this is to allow sufficient time for the public and residents to understand the changes to their travel plans. The project will notify the public about the roadblocks and traffic diversion through public notices, ward level meetings and city level meeting with the elected representatives.

7. The PMC/DSC will also conduct an awareness campaign to educate the public about the following issues:

(i) traffic control devices in place at the work zones (signs, traffic cones, barriers, etc.);
(ii) defensive driving behavior along the work zones; and
(iii) reduced speeds enforced at the work zones and traffic diversions.

8. It may be necessary to conduct the awareness programs/campaigns on road safety during construction.

9. The campaign will cater to all types of target groups i.e. children, adults, and drivers. Therefore, these campaigns will be conducted in schools and community centers. In addition, the project will publish a brochure for public information. These brochures will be widely circulated around the area and will also be available at the PIU, and the Contractor's site office. The text of the brochure should be concise to be effective, with a lot of graphics. It will serve the following purpose:

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

E. Vehicle Maintenance and Safety

10. A vehicle maintenance and safety program shall be implemented by the construction Contractor. The Contractor should ensure that all the vehicles are in proper running condition and it comply with roadworthy and meet certification standards of Bihar Govt./ GoI. All vehicles to be used shall be in perfect condition meeting pollution standards of Bihar Govt./ GoI. The vehicle operator requires a pre state of shift checklist. Additional safety precautions will include the requirement for:

- Driver will follow the special code of conduct and road safety rules of Government of India
- Drivers to ensure that all loads are covered and secured drivers to ensure operation equipment can't leak materials hauled
- Vehicles will be cleaned and maintained in designed places.

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

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

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

11. Procedures for installing traffic control devices at any work zone vary, depending on road configuration, location of the work, construction activity, duration, traffic speed and volume, and pedestrian traffic. Work will take place along major roads, and the minor internal roads. As such, the traffic volume and road geometry vary. The main roads carry considerable traffic; internal roads in the new city areas are wide but in old city roads very narrow and carry considerable traffic. However, regardless of where the construction takes place, all the work zones should be cordoned off, and traffic shifted away at least with traffic cones, barricades, and temporary signs (temporary "STOP" and "GO").

12. The work zone should take into consideration the space required for a buffer zone between the workers and the traffic (lateral and longitudinal) and the transition space required for delineation, as applicable. For the works, a 30 cm clearance between the traffic and the

temporary STOP and GO signs should be provided. In addition, at least 60 cm is necessary to install the temporary traffic signs and cones.

13. Traffic police should regulate traffic away from the work zone and enforce the traffic diversion result from full street closure in certain areas during construction. Flaggers/ personnel should be equipped with reflective jackets at all times and have traffic control batons (preferably the LED type) for regulating the traffic during night time.

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

15. The PMC/ DSC and Contractor will coordinate with the local administration and traffic police regarding the traffic signs, detour, and any other matters related to traffic. The Contractor will prepare the traffic management plan in detail and submit it along with the EMP for the final approval.

Appendix 13: Sample Outline of Spoil Management Plan

1.0 Purpose and application:

SMP is to describe how the project will manage the spoil generated and reuse related to design and construction works. This is an integral part of EMP. The objective of SMP is to reuse of spoil from works in accordance with the spoil management hierarchy outlined in this document.

2.0 Objectives of SMP:

The objectives of SMP are:

- To minimize spoil generation where possible
- Maximize beneficial reuse of spoil from construction works in accordance with spoil management hierarchy
- Mange onsite spoil handling to minimize environmental impacts on resident and other receivers
- Minimize any further site contamination of land, water, soil
- Manage the transportation of spoil with consideration of traffic impacts and transport related emissions

3.0 Structure of SMP:

Section 1: Introduction of SMP
Section 2: Legal and other requirements
Section 3: Roles and responsibilities
Section 4: Identification and assessment of spoil aspects and impacts
Section 5: Spoil volumes, characteristics and minimization
Section 6: Spoil reuses opportunities, identification and assessment
Section 7: On site spoil management approach
Section 8: Spoil transportation methodology
Section 9: Monitoring, Reporting, Review, and Improvements

4.0 Aspects and Potential Impacts

The key aspects of potential impacts in relation to SMP are listed in table below

Aspects	Potential Impacts
Air Quality	Potential for high winds generating airborne dust from the stock piles
Sedimentation	Potential for sediment laden site runoff from spoil stockpiles and potential for spillage of spoil from truck on roads
Surface and Groundwater	Contamination of water (surface and ground water)
Noise	Associated with spoil handling and haulage and storage
Traffic	Impacts associated with spoil haulage
Land Use	Potential for spoil to be transported to a receivable site that doesn't have permission for storage/disposal
Design specifications	Limitations on opportunities to minimize spoil generation
Sustainability	Limited sites for storage, reuse opportunities

5.0 Spoil volumes, characteristics and minimization

5.1 Spoil volume calculations: Estimate the volumes of spoils produced from each of the construction sites.

5.2 Characterization of spoil: Based on the type of spoil; characterization is done (sand stone, mud mix materials, reusable materials)

5.3 Adopt Spoil Reduce, Reuse Opportunities

An overview of the assessment methodology to be used is mentioned below.

- Consideration of likely spoil characteristics
- Identification of possible reuse sites
- Screening of possible reuse opportunities

5.4 Identification of possible safe disposal sites for spoil: Those spoils which can't be reuse shall be properly disposed in designated areas, such disposal areas should be identified in project locations. Such disposal areas should be safe from environmental aspects and there should be any legal and resettlement related issues. Such areas need to be identified and prior cliental approval should be obtained to use it as spoil disposal area. The local administration must be consulted and if required permission should be obtained from them.

5.5 Storage and stock piling

5.6 Transportation and haulage route

6.0 Based on the above, the Contractor will prepare a SMP as an integral part of EMP and submit it to the DSC for their review and approval.

Appendix 14: Format for confirmation from operator of commercial establishment or shop for provision of temporary access by contractor

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**

Appendix 15: Minutes of kick-off meeting

Gaya Kick-off Introductory Meeting Minutes

The Kick-off Meeting in Gaya was concluded on 5th of December 2013 at Hotel Garv, Gaya from 1500 hrs. to 1800 hrs.

Objective:

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

Approach:

The meeting was devised to create a better understanding thus it adopted a mixed 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 (Refer Annex 2: List of Participants). Every individual from the organizing team introduced themselves also. This was followed 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 the program 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.

In context to timeline of the project he elaborated the project tenure specifying the construction period as well as O & M Period. He discussed the present project status of the GMC elaborating that firstly we will prepare the DPR; which will be an exhaustive report. He explicitly mentioned that the project will undergo the planning phase initially expectedly for another 1 year. He also told that our experts are investigating the water availability and alternate sources. He also said the cooperation and coordination is highly solicited from the GMC.

After that the Team Leader – PMC, Mr. Butter Jaap started with the presentation (refer Annex 3). The presentation was designed to create a better understanding. The presentation was led 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 further made an open session for query handling of the participants (refer Annex 1.). The open session was facilitated by Mr. A. K. Raja and the query was duly responded by the respective expert.

The program was concluded by the Closing Speech by Hon. Dy. Mayor Mr. Akhoury Onkar Nath. He elaborated his understanding and ensured that all the required support for the successful completion of the project will be dully extended by the GMC Officials and elected representatives. He also put in his acknowledge to the Government, ADB, and Program Consultants that they had selected Gaya to implement the project out of 28 ULB considering the Growth Chart and potential etc. He also presented his personal analysis over the socio – economic and geographical status of the Gaya and the basis he gave his suggestions and recommendations too

The presentation was an interactive session and a regular attempt was made to make it both way communicable.

Achievement:

The program was felt to be a successful event and it was 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. The GMC has ensured the cooperation in total activities from inception to research and execution.

Way Ahead: During the session suggestions from all came to arrange a next meeting which will include Local reputed personalities, All Parshads, NGOs, and relevant Line Departments etc. once the DBO Contractor is finalized as Program Launch function.

Annex 1: **BUDIP Kick – off Meeting: Question – Answers during the open session**

1. As of now, the Holding Tax includes water charges. If the water charges are introduced, one will require to pay the metered water charges as well as the holding Tax includes water charges?

Ans. Mr. Yasir Sahid replied: The UDHD has already issued an order stating that 9 % will be the only holding tax which won't include the service charge for sewerage and water supply. The charges for water supply will be based mere on the usages.

2. The river Phalgu is going barren and all the sewerage waste is discharge in it, what is the plan for sewerage system, will it be incorporated within the GMC Water Supply Plan? If the water is inducted from the river how it will ensure the quality of water. He also suggested incorporating the rain water harvesting within our plan.

Ans. Mr. V. K. Sharma replied: An alternate plan for proper sewerage is hereby being prepared under another project and it will take due care of it. A proper time for the research and study for the source (Quality and Quantity) of water has been allocated in the project; the study is going on. After its completion we will be in the position to give comment over it, and further decisions will be made for maintaining the quality and the quantity of the water and / or alternate plan.

3. There are 7 wards lying on the other side of the Phalgu River, is those area are included the project?

Ans. Mr. J. K. Singh replied: All the urban area has been duly incorporated in the plan including both side of the banks.

4. Mr. Mayor pointed out the following issues to be considered while preparing the GMCWS Plan:

a. Presently we are able serve 40 % of the population only with drinking water service rest of the 60 % are left with their own arrangements.

b. I had arranged to conduct Satellite GIS Mapping of Gaya City in coordination with Patna and it states that the water is blocked on the south side of the river as the inner ground level is slope towards south.

c. The sewerage waste is discharged throughout the northern river without any treatment which makes the river water non-usable.

d. The present distribution line is around 50 years old and it needs to be renovated in complete to avoid wastage and leakage.

e. Geographically deep boring is required to ascertain the ground water but due rocky base it's not possible in around 80 % of the Gaya. It should be duly considered while planning.

f. Presently most of the pumps are directly attached to the transmission line but to have the better plan the pump should be attached to OHT and it should transmit to the households.

g. Lying down of the new transmission line should be considered for the whole area in the first

phase but could be attached through the new proposed Pump later during second phase.

List of the Participant

Sl. No	***Name***	***Department/ Organization***	***Designation***
	Vijay Kumar Sharma	PMU – BUDIP, BUIDCo	PM-PMU
2.	Mr. Akhouri Omkar nath alias Mohan Shrivastava	Gaya Municipal Corporation	Dy. Mayor
3.	Jaap Butter	PMC – BUDIP, BUIDCo	Team Leader, PMC
4.	Bob Bakker	PMC – BUDIP, BUDICo	Utility Operation Expert
5.	Cristian Angelescu	DSC – BUDIP, BUIDCo	Team Leader, DSC
6.	Ashish Kumar	PMU – BUDIP, BUIDCo	R.O
7.	Jitendra Kumar Singh	PMC – BUDIP, BUIDCo	Water Supply Specialist
8.	Sumitabha Ray	PMC – BUDIP, BUIDCo	Financial Specialist
9.	Yaser Shahid	PMC – BUDIP, BUIDCo	UTS
10.	P.K.Sahu	PMC – BUDIP, BUIDCo	Resettlement and Gender Specialist
11.	Jitendra Tyagi	PMC – BUDIP, BUIDCo	Non-key Expert, Water supply
12.	Mohit Kumar	PMC - BUDIP, BUIDCo	Social Expert
13.	Dr. Anil Kumar Patni	PMC - BUDIP, BUIDCo	Non Key Expert, Environment
14.	A.K.Raja	PMC - BUDIP, BUIDCo	PRO
15.	Bibekananda Das	PMC - BUDIP, BUIDCo	Office. Assit
16.	S. Rama Krishnan	DSC – BUDIP, BUIDCo	A. Team Leader
17.	Om Prakash Goyel	DSC – BUDIP, BUIDCo	
18.	Prakash Kumar	GMC, Gaya	City Manager
19.	Dharmendra Kumar	GMC, Gaya	Assistant Engineer
20.	Manoj Kumar	GMC, Gaya	Assist. Engineer
21.	Shailendra Kumar Sinha	GMC , Gaya	Asst. Engineer
22.	Francil Bara	GMC, Gaya	J.E, GMC
23.	Jai Prakash singh	GMC, Gaya	J.E, GMC
24.	Md. Tahir Hasan	PHED, Gaya	SDO
25.	Md. Nihaluddin	BSNL, Gaya	Divisional Engineer

26.	Binod Prajapati	BSPHCL	EEE
27.	Upendra Kumar	GMC, Gaya	Ward - 11
28.	Pramod Kumar Navdia	GMC, Gaya	Ward - 11
29.	M.R. Neeraj Kumar Gupta	GMC, Gaya	Ward - 11
30.	Tahir Husain	GMC, Gaya	Ward - 47
31.	Manoj Kumar	GMC, Gaya	Ward - 49
32.	Nand Kishor Gupta	GMC, Gaya	Ward - 51
33.	Santosh Yadav	GMC, Gaya	Ward Councillor
34.	Anita Anu	GMC, Gaya	Ward Councillor
35.	Sarita Devi	GMC, Gaya	Ward Councillor
36.	Shashi Kishore Shashi	GMC, Gaya	Ward Councillor
37.	Rajesh Kumar	GMC, Gaya	Ward Councillor – 02
38.	Jitendra Kumar Verma	GMC, Gaya	Ward Councillor – 03
39.	Brij Bhushan Prasad	GMC, Gaya	Ward Councillor – 18
40.	Lalji Prasad	GMC, Gaya	Ward Councillor – 22
41.	Shamim Ara	GMC, Gaya	Ward Councillor – 24
42.	Arupa Kumar (Representative)	GMC, Gaya	Ward Councillor – 28
43.	Naresh Kmar	GMC, Gaya	Ward Councillor – 30
44.	Representative	GMC, Gaya	Ward Councillor – 31
45.	Om Prakash (Representative)	GMC, Gaya	Ward Councillor – 32
46.	Chitranjan Prasad Verma	GMC, Gaya	Ward Councillor – 36
47.	Rajni Kumari	GMC, Gaya	Ward Councillor – 39
48.	Om Prakash	GMC, Gaya	Ward Councillor – 40
49.	Ajay Kumar Sinha	GMC, Gaya	Ward Councillor – 42
50.	Surendra Prasad	GMC, Gaya	Ward Councillor – 44
51.	Munna Kumar	GMC, Gaya	Ward Councillor – 47
52.	Hajra Khatoon	GMC, Gaya	Ward Councillor – 48
53.	Pramila Devi 49, Patva	GMC, Gaya	Ward Councillor – 49

54.	Kiran Devi	GMC, Gaya	Ward Councillor – 51
55.	Gudiya Devi	GMC, Gaya	Ward Councillor – 52
56.	Ram Lakhan Chaudhary	GMC, Gaya	Ward Councillor – 53
57.	Sanjay Kumar Sinha	Advocate Civil Court, Gaya	Advocate
58.	Suresh Sharma (Representative)	Gaya Nagar Nigam	Counciler
59.	Rakesh kumar	Urban Citizen	Student
60.	Ragini	GMC, Gaya	
61.	Deepak Kumar	Social Worker	
62.	Bumeshar Kumar	Citizen Gaya	

Appendix 16: Summary of public consultations

Summary of local level consultations at Gaya

RECORDS OF PUBLIC CONSULTATION-GAYA

Subproject: Improvement of Water supply system in Gaya City

Date & Time: 09.1.2014 to 11.1.2014; 05.02.15, 06.02.15, 23.02.2015 to 25.02.2015, 06.03.2015
From 9.30-00 AM to 5-00 PM

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 favor 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-Joda Masjid

- Gangi pond issue was discussed. Which is a low laying area and people suggested for filling of land before construction
- Related to health and safety measures of the people during construction
- People are interested to do work on project area during construction

Issues discussed-Budva Mahadev

- People need pure drinking water at earliest
- 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
- Tree cutting needs on project site for which permission needs to be obtained from DFO Gaya.

Issues discussed-Mastalipur

- Access road is very narrow and this is also used for general public so what safety measures will be taken during construction
- Health and safety issue of workers will be considered.
- People are interested to do work on project area during construction
- For cutting of nursery plants discussed with head of nagar Panchyat and MNERGA commissioner

Issues discussed-Delha

- Access road used for general public so what safety measures will be taken during construction
- Air pollution and noise pollution issue was also discussed for nearby area
- People are interested to do work on project area during construction

Consultation Location: Joda masjid, Budva Mahadev, Mastalipur and Delha

RECORDS OF LOCAL LEVEL PUBLIC CONSULTATION- GAYA

Consultation 1
Date & Time: 5.2.2015, From 12.00 to 2-00 PM
Location-Joda masjid(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 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 laborers.	At least 50% local labor will be engaged
3	Presence of historical/ cultural/ religious sites nearby	No	
4	Unfavorable 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	Project site is at Low laying area, Yes Drainage problem	Land filling is required
7	Present drinking water problem – quantity and quality	People have their own boring system or obtained from tube well Water quality not good	After completion of project treated water will be supply
8	Availability of labor during construction time	Yes, labors are easily available nearby the site	Local labors will be engaged
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 labor camp	Prior setting up site office and labor 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 2

Date & Time: 5.2.2015, From 3.00 PM to 5-30 PM , 23.02.2015
Location –Budva Mahadev(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 not much aware on components of the project.	Awareness program at different project locations related to project components is essential
2	In what way they may associate with the project	At the construction phase some people can work as laborers, after completion water supply to nearby areas shall be improved	At least 50% local labor will be engaged
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	Yes 20-25 trees on the project site. No forest land located	Permission will be required from forest dept.
4	Occurrence of flood	No	
5	Drainage problem facing	Project site without drainage system. At lower side drainage system is old	Improvement of drainage system will be taken up through separate funding
6	Present drinking water problem – quantity and quality	Water quality not good	Requirement of sufficient supplied water
7	Access road to project Site	Yes *Kaccha* road available	Haul road will be constructed as per requirement
8	Perception of locals On tree felling and afforestation	On OHT site tree cutting required. People are agreed.	Necessary permission needs to be obtained
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 labor camp	Prior setting up site office and labor camp NOC needs to be obtained from local authority

Consultation 3
Date & Time: 06.2.2015, From 2.30 to 4-00 PM
Location-Mastalipur(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 not much aware on components of the project.	Awareness program at different project locations related to project components is essential
2	In what way they may associate with the project	Locals only need good and sufficient water	Outside laborers 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	MNERGA sponsored nursery plants will be comes under project area	Yes , included in EMP,NOC will be taken from Gram Panchyat
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 not good and insufficient	Under the project good quality water will be supplied
6	Access road to project Site	Narrow and *Kaccha* road	Tree cutting may be required at access road area, permission will be taken from Panchyat or forest department
7	Perception of locals On tree felling and afforestation	People are agreed for tree cutting for water supply project	Plantation against tree cutting
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: 06.2.2015, From 2-.30 PM to 4-00 PM
Location-South east corner of Bargad tree-Delha (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 not much aware on components of the project.	Awareness program at different project locations related to project components is essential
2	Occurrence of flood	Not reported at site	
3	Drainage problem facing	Drainage system not present	As per discussion public required a proper drainage system soon
4	Present drinking water problem – quantity and quality	No water supply at present. People have own boring system and water quality is not good	Under the project good quality water will be supplied
5	Availability of labor during construction time	Yes, labors are easily available nearby Area	Local labors will be engaged
6	Access road to project Site	Yes, *Kaccha* road in most of the cases	Haul road will be constructed as per requirement
7	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
8	Setting up worker camp site within the village/ project locality	Project area having space for workers camp	Prior setting up site office and labor camp NOC needs to be obtained from local authority
			

Consultation 5
Date & Time: 6.2.2015, From 5.00 PM to 6-30 PM, 23.02.2015
Location: Bhusunda mela (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 not much aware on components of the project.	Awareness program at different project locations related to project components is essential
2	Occurrence of flood	No as such	
3	Drainage problem facing	Drainage system not present	As per discussion public require a proper drainage system soon
4	Present drinking water problem – quantity and quality	Yes. No water supply till date. Boring Water used,	Complete supply of water
5	Access road to project Site	*Kaccha* road	Haul road will be constructed as

			per requirement
6	Perception of locals On tree felling and afforestation	Generally not required in most of the cases	
7	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
8	Setting up worker camp site within the village/ project locality	Project area is having sufficient space for workers camp	Prior setting up site office and labor camp NOC needs to be obtained from local authority
			

Consultation Location: Murli Hill ward -5, Ramshilla ward- 6, Brahmayoni ward- 33, Manglagauri ward -44 , Panch Mohalla ward- 40Date – 09.01.14, 10.01.14, 06.03.14

Issues discussed-Murli Hill

- Contaminated water due to Leakage of all old pipes
- 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
- Access road problem

Issues discussed-Ramshilla Hill

- Access road NOC will be needed from mandir trust
- 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
- State Protected forest area on project site which permission will receive from forest department and DFO Gaya.

Issues discussed-Brahmayoni Hill

- Access road
- No land is available for workers camps
- People are interested to do work on project area during constructio**n**
- State Protected forest area on project site which permission will receive from forest department and DFO Gaya.

Issues discussed-Panch Mohalla

- For general public what safety measures will be taken during construction
- Air pollution and noise pollution issue was also discussed nearby site
- Any harmful impact on vishnupad temple during construction

Consultation 6
Date & Time: 09.1.2014, From 4.00 PM to 6-00 PM
Location- Ramshilla Hill and surrounding area Ward-6 (Proposed work: Construction of one GLSR and water pipeline laying work)

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 laborers.	At least 50% local labor will be engaged
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	Forest area nearby the project location	Permission will be required from forest dept. proposal already send to Forest department
4	Presence of historical/ cultural/ religious sites nearby	Yes, Ramshilla hill comes under State Archaeological site	Permission will be required from State Archaeological dept. Before commencement of work
5	Present drinking water problem – quantity and quality	At Higher altitude there is no supply of water. In some cases local complained on presence of insect in supplied water, stingy smell in water, only 3-4 Hr water supply Water tank at Rashilla is old and not functioning Some people have their own boring system	Immediate requirement of sufficient supplied water
6	Access road to project Site	Yes existing bitumen road in most of the cases (below the hill area)	On the project site material will be supplied through head load and NOC will be required from Temple committee
7	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
8	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 labor camp	Prior setting up site office and labor camp NOC needs to be obtained from local authority
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 near main city road.	Mitigation measures will be applied as per EMP



Consultation 7

Date & Time: 10.1.2014, From 9.30-00 PM to 11-30 PM
Location -Brahmayoni Hill and surrounding area Ward-44 (Proposed work: GLSR locations and pipe laying area nearby)

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	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	Forest area nearby the project location	Permission will be required from forest dept. Proposal already send to forest department
3	Presence of historical/ cultural/ religious sites nearby	Yes Brahmayoni hill comes under state archaeological site	Permission will be required from State Archaeological dept. before commencement of work
4	Drainage problem facing	Project site is at height, without drainage system. At lower altitude drainage system is old	Improvement of drainage system will be taken up through separate funding
5	Present drinking water problem – quantity and quality	At Higher altitude there is no supply of water. Below hill area water quality of supplied water is good. Water will be supplied from Dandibagh only 2-3 time in a day	Immediate requirement of sufficient supplied water
6	Access road to project Site	No	For access road construction permission will be required from forest department
7	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
8	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 labor camp	Prior setting up site office and labor camp NOC needs to be obtained from local authority
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 near main city road.	Mitigation measures will be applied as per EMP

Consultation 8
Date & Time: 10.1.2014, From 12.00 Noon to 2-30 PM
Location- Panch Mohalla Andar Gaya, Ward-40 &41(Proposed work: Distribution pipeline laying)

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	Presence of historical/ cultural/ religious sites nearby	Yes. Vishnupad Temple, State Archeologically protected area is located nearby	Permission will be required from State Archaeological dept. Before commencement of work
3	Drainage problem facing	Drainage system present	
4	Present drinking water problem – quantity and quality	Yes supply is less, water quality is not good because water line is cracked and contamination of water in the old line is being reported. Daily 2 times water supply with the duration of half an hour. Supply is from Dandibagh area tube well	Immediate requirement of sufficient supplied water
5	Perception of locals On tree felling and afforestation	Generally not required in most of the cases.	In case of tree felling permission needs to be obtained
6	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
7	Setting up worker camp site within the village/ project locality	Project area is not having sufficient space for workers camp	Arrangement of labor camp at adjacent vacant area nearby the working zone
8	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 9
Date & Time: 06.3.2014, From 8-30 AM to 10-00 AM
Location: Kharkhura Raja Kothi wards -1 (Proposed OHT)

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	Occurrence of flood	No as such	
3	Drainage problem facing	*Nallah*/Open *nallah*	Require of Drainage system. All small nallah joints with big nallah
4	Present drinking water problem – quantity and quality	No water Supply, boring water available. Water quality not good.	Locals requested for immediate arrangement of supply water
5	Access road to project Site	Yes. Bituminous road is existing	
6	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
7	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 labor camp	Prior setting up site office and labor camp NOC needs to be obtained from local authority
8	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.	Public safety arrangement will be considered as per EMP
			

Summary of General and specific discussion

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 new Kirloskar 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.

List of the Participants in Public Consultation

Subproject Name: Gaya Water Supply

Location of Meeting/Consultation: Joda Masjid (OHT)

Date & Time: 5/2/2015

Sl. No	Name & Address	Occupation	Signature
1.	Somnath Kr. At. Head Munpur	teaching	Somnath Kr
2.	Umesh chandra At. [illegible]	teaching	Umesh chandra
3.	जोगेन्द्र तिवारी	[illegible]	जोगेन्द्र तिवारी
4.	अमला राम		अमला राम
5.	रामचन्द्र सोनी		रामचन्द्र सोनी
6.	राजेन्द्र राम		राजेन्द्र राम
7.	कमलेश्वर सोनी	कृषि	कमलेश्वर सोनी
8.	सुनील कुमार	मजदूरी	सुनील कुमार
9.	सुरेन्द्र प्रसाद	[illegible]	सुरेन्द्र प्रसाद
10.	जितेन्द्र सिंह	कृषि	जितेन्द्र सिंह
11.	प्रकाश कुमार गुप्ता	व्यवसायी	प्रकाश कुमार गुप्ता
12.	Tripury Sahi		Tripury Sahi
13.	केदार सोनी		केदार सोनी
14.			

List of the Participants in Public Consultation

Subproject Name: Gaya Water Supply

Location of Meeting/Consultation: Budva Mahadev (OHT)

Date & Time: 5/2/2015 3 PM

Sl. No	Name & Address	Occupation	Signature
1.	मो० कयूम अन्सारी		मो० कयूम अन्सारी
2.	रामाशिष ठाकुर	मजदूरी	रामाशिष ठाकुर
3.	[illegible] रमामुद्दीन	-	[illegible]
4.	Md. Shamim	-	Md-Shamim
5.	Md Sadre	-	Md Sadre
6.	मनहर	सिलाई	
7.			

List of the Participants in Public Consultation

Subproject Name: Gaya Water Supply

Location of Meeting/Consultation: Mastalipur (OHT)

Date & Time: 6/2/2015 12:00 - 2 PM

Sl. No	Name & Address	Occupation	Signature
1.	राजनन्दन वर्मा	समाजसेवा	राजनन्दन वर्मा
2.	सुरेश पासवान	चालक	सुरेश पासवान
3.	फुदमा पासवान	खेती	
4.	बसन्ती देवी	जनता	
5.	Lakshman Chaudhary	janta	Lakshman Chaudhary
6.	नीरु कुमारी		नीरु कुमारी
7.	छोटे लाल माँझी	मजदूरी	
8.	रामचन्द्र शर्मा	दुकान	रामचन्द्र शर्मा

List of the Participants in Public Consultation

Subproject Name: Gaya Water Supply

Location of Meeting/Consultation: Behind Delha Thana

Date & Time: 6|2|2014 4:30 PM 4:00 PM

Sl. No	Name & Address	Occupation	Signature
1.	Dapak Kumar	Study	Deepak kumar
2.	सुनैना	–	सुनैना
3.	Vikash Kumar	–	Vikash Ku.
4.	[illegible] भारती	–	Satish KumR
5.	Abhinash Kumar	–	Abhinash kumar
6.	Nitishkumar	–	Nitishkumar
7.	Mamta Kumari	–	mamta kumari
8.	[illegible]	–	[illegible]
9.	CHHOTU KUMAR	–	CHHOTU Kum
10.	[illegible]	–	[illegible]
11.	[illegible]	–	[illegible]

List of the Participants in Public Consultation

Subproject Name: Gaya Water Supply

Location of Meeting/Consultation: Bhusanda

Date & Time: 6/2/2015 5 PM to 6:30 PM

Sl. No	Name & Address	Occupation	Signature
1.	सत्यनारायण चौधरी	-	सत्यनारायण चौधरी
2.	मीरा देवी	-	मीरा देवी
3.		-	2
4.	रविन्द्र पाण्डेय	-	रविन्द्र पाण्डेय
5.	रेणु देवी	-	रेणु देवी
6.	उषा कुमारी	-	उषा कुमारी
7.	कमलेश	-	कमलेश चौधरी
8.	बिरेन्द्र	-	Birendra Manjhi
9.	सरस्ती देवी	-	सरस्ती देवी
10.	गीता देवी	-	गीता देवी
11.	सोनी कुमारी	-	सोनी कुमारी
12.	सौरभ कुमार	-	सौरभ कुमार दास

List of the Participants in Public Consultation

Subproject Name: Gaya Water Supply

Location of Meeting/Consultation: Bhusunda Mela

Date & Time: 23/2/2015

Sl. No	Name & Address	Occupation	Signature
1.	कमलेश चौधरी	मजदूरी	
2.	कुन्ती देवी	गृहणी	
3.	रामपुजन चौधरी	मजदूरी	Ramphujan
4.	अखीलेश चौधरी	मजदूरी	अखिलेश चौधरी
5.	कृष्णा चौधरी	मजदूरी	
6.	अनील चौधरी	मजदूरी	अनील चौधरी
7.	जय प्रकाश चौधरी	व्यवसाय	Jayprakash Choudhary
8.	सुनीता देवी	व्यवसाय	सुनीता देवी
9.	मंजु देवी	दाई	
10.	वेबी कुमारी	गृहणी	वेबी कुमारी
11.	श्यामा फुल देवी	मजदूरी	
12.	Gita devi	House wife	gita devi
13.	सुनी देवी	गृहणी	सुनीदेवी
14.	मालती देवी	गृहणी	मालती देवी

List of the Participants in Public Consultation

Subproject Name: Gaya Water Supply

Location of Meeting/Consultation: Budva Mahadev

Date & Time: 24/2/2015

Sl. No	Name & Address	Occupation	Signature
1.	अब्दुल कादिर عبدالقادر	[illegible]	عبدالقادر
2.	MD. SUHAIL ALAM	मजदूरी	Md. Suhail Alam
3.	VIRENDRA VERMA	Job	virendra verma
4.	मोहम्मद [illegible]	मिस्त्री	[illegible]
5.	[illegible]	आंगनवाड़ी	
6.	शाकिला	आंगनवाड़ी	
7.	[illegible]	सिलाई	[illegible]
8.	[illegible] आलम	[illegible]	[illegible]
9.	Md Shamim	सिलाई	Md. Shamim
10.	मो जाहिद	टायर पंक्चर	[illegible]
11.	अब्दुल हमीद	राजमिस्त्री	[illegible]
12.			

List of participants in public consultation

Sub project name-

Location of Meeting/Consultation- Ward - 6

Date and Time- 9.1.2014 . 4.00PM

S.No	Name & Address	Occupation	Signature
1	तुलसी प्रसाद	नौकरी [illegible]	तुलसी प्रसाद
2	किरण देवी	मजदूरी	किरण देवी
3	सुनील प्रसाद	[illegible]	सुनील प्रसाद
		[illegible]	
4	उर्मिला देवी	आंगनबाड़ी	उर्मिला देवी
5	देवान्ती देवी	मजदूरी	
6	बरती देवी	गृहकार्य	
7	दिलीप राम	रिक्शा	
8.	प्रमोद प्रसाद	मजदुरि	प्रमोद प्रसाद
9.	सोनु कुमार	मजदूरी	सोनु कुमार
10	ओम प्रकाश	मजदूरी	
11	मालती देवी	आंगनबाड़ी	
12	वेबी देवी	"	वेबी देवी
13	संगीता देवी	आंगनबाड़ी	
14	Gauri Shankar Pandey	Pandey	[signature] 9/1/2014
15	चुन्नु प्रसाद	पुरु?	चुन्नु 9-1-2014
16	राजन कुमार	पान दुकान	Rajan Kumar

LIST OF PARTICIPANTS IN PUBLIC CONSULTATION

SUBPROJECT NAME:

LOCATION OF MEETING/CONSULTATION: Ward No - 44

DATE & TIME: 8 : 30 AM
10/1/2014

S.NO	Name & Address	Occupation	Signature
1	Prem Kumar Murli Hill	Study	Prem Kr
2	दिलीप पासवान, मुरली हील	व्यवसाय, vendor	दिलीप
3	बेनी माधो मालाकार मंगला गौरी मन्दीर	-	बेनी माधो
4	राजेश कुमार मंगला गौरी मन्दिर	व्यवसाय व दुकानदार	Rajesh Kumar
5	बल्लू कुमार	व्यवसाय - दुकानदार	माँ मंगला गौरी
6	Anshu Kumar	दुकानदार	Anshu
7	Mangla gauri Temple (Gaya)	Student	Anshu Kumar
8	ARUN KUMAR YADAV		ARUN KUMAR
9	मऊगा मऊगा	ड्राईवर (सामाजिक कार्यकर्ता) 9852984066	मऊगा मऊगा
10	नरेश यादव	खेती	नरेश
11	प्रदीप कुमार (माडनपुर)	ईंटा दुकान	प्रदीप कुमार
12	Pintoo	Kirana Dukan	Pintoo
13	Ramakant pathak	Busi	[illegible]
14	Vikash anand	Student	Vikash anand
15	Anil Kumar	S. Health	Anil Kumar
	वार्ड 40		
16	दामोदर लाल गोस्वामी	पण्डा जी	दामोदर लाल
17	सुबोध कुमार गुप्ता	व्यवसाय	सुबोध कुमार गुप्ता
18	विनय कुमार गुप्ता	व्यवसाय 9934215738	B. Kupta
19	Ashim kr Chakrabarty	Business	Chakrabarty
20	कैलाशप्रसाद गुप्ता	दवाई दुकान	कैलाशप्रसाद गुप्ता
21	सुरेश प्रसाद	दुकान	सुरेश प्रसाद
22	संजय लाल दुबे	पण्डा जी	संजय लाल दुबे
23	गोपाल पुरोहित	-	गोपाल पुरोहित
24	छोटू प्रसाद	दुकान -	छोटू प्रसाद
25	मनोज कुमार यादव	-	मनोज कुमार
26	शशिभूषण प्रेत	-	शशिभूषण प्रेत

LIST OF PARTICIPANTS IN PUBLIC CONSULTATION

SUBPROJECT NAME:

LOCATION OF MEETING/CONSULTATION: Ward 53

DATE & TIME: 11/1 10:00

S.NO	Name & Address	Occupation	Signature
1	Manoj Kumar	Business	Manoj Kumar
2.	Virendra Singh	Govt Service	[illegible]
3.	मोहम्मद इरफान	सेल्स	मो॰ इरफान
4.	Dhananjay Kumar	Govt Servant	[illegible]
5.	Anil Kumar	Govt Service	[illegible]
6	Bangali Prasad Singh	Agriculture	[illegible]
7	Ajay Sharma	do	[illegible]
8	रामजनम शर्मा	-	रामजनमशर्मा
9	Lalita	house wife	Lalita Sharma
10	दिपक मोती - 47	दुकान	दिपक मोती
11	राकेश कुमार वार्ड 49 अहमद Ward - 48	अहमद	Rakesh
12	विक्की कुमार वार्ड - 48	दुकान	Vicky Kumar
13	रजनी देवी	-	रजनी देवी
14	मो॰ अकील खाँ	दुकानदार	मो॰ अकील खाँ
15	मो॰ [illegible] खान (70 वर्ष)	-	[illegible]
16.	मो॰ इरफान	-	मो॰ इरफान

Location of Meeting: Ward 48 & 49

List of Participants : Date : 11/1/2014 1:00 PM

S.No	Name	Occupation	Address	Sig.
1	मो० अलीम	-	वार्ड 49	मो० अलीम
2	[illegible]	-	,,	[illegible]
3	कारी मो० हनीफ	-	,,	कारी मो० हनीफ मो० हनीफ
4	मो० हनीफ	अगरबत्ती	,,	सोगरा खातून
5	सोगरा खातून	-	,,	[illegible]
	[illegible]	-	,,	
6	[illegible]	-	,,	
7	नरसिंह [illegible]	-		
8	[illegible]	अगरबत्ती	वार्ड 49	
9	शायरा बानो	,,		
10	रफीक	दुकान	,,	रफीक

LIST OF PARTICIPANTS IN PUBLIC CONSULTATION

SUBPROJECT NAME: Gaya Water Supply System

LOCATION OF MEETING/CONSULTATION: Khurkura Rajakothi Ward - 1.

DATE & TIME: 6/3/2014 8:30 - 10 AM

S.NO	Name & Address	Occupation	Signature
1	Ajay Kumar Sinha	Bussiness.	Ajay Kumar Sinha
2	Nitish Kumar ward no-1	Govt Job	Nitish Kumar
3	Suresh singh	Govt job	Suresh Singh
4	Saurabh Kumar Sinha	Student	Saurabh Kumar Sinha
5	Anand Kumar	Student	Anand Kumar
6			
7	गीता देवी	गीता देवी	गीता देवी
8	रीता कुमारी	-	रीता कुमारी
9	अनीता	-	Anita Gupta
10	कुमकुम	-	Kumkum Gupta
11	रिंकी	-	रिंकी

Appendix 17: Sample Grievance Registration Form

(To be available in Hindi 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	
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?	

Gender	**Male** **Female**	**Age**	

FOR OFFICIAL USE ONLY

Registered by: (Name of official registering grievance)	
If – then mode: ■ **Note/Letter** ■ **E-mail** ■ **Verbal/Telephonic**	
Reviewed by: (Names/Positions of Official(s) reviewing grievance)	
Action Taken:	
Whether Action Taken Disclosed:	■ **Yes** ■ **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, उर्दूऔरअंग्रेजीयास्थानीयभाषामेंउपलब्धहो, यदिकोईहो,)

बिहारशहरीविकासनिवेशकार्यक्रम (BUDIP) शिकायतें, सुझाव, प्रश्नोंऔरपरियोजनाकेकार्यान्वयनकेबारेमेंटिप्पणियोंकास्वागतकरताहैं1हमलोगोंकोशिकायतकेसाथउनकेनामऔरसंपर्कजान कारीप्रदानकरनेकेलिएप्रोत्साहितकरतेहैंताकिहमस्पष्टीकरणऔरप्रतिक्रियाकेलिएआपकेसाथसंपर्ककरसकें 1 आपकोअपनेव्यक्तिगतविवरणशामिलकरनेचाहिएलेकिनउसजानकारीकोगोपनीयरखाजायगा1 आपकानामऊपर (गोपनीय) * लेखन / टाइपिंगद्वाराहमेंसूचितकरेंधन्यवाद

तारीख			पंजीकरणकास्थान		
संपर्ककरनेसंबंधीजानकारी / व्यक्तिगतविवरण					
नाम		लिंग	पुरुष महिला	आयु	
घरकापता					
गांव / शहर					
जनपद					
फोननं.					
ईमेल					
शिकायत / सुझाव / टिप्पणी / प्रश्ननीचेअपनीशिकायतकाविवरण (जो, क्या, कहांऔरकैसे) प्रदानकरें: सलगनक / नोट / पत्रकेरूपमें,शामिलहैं,कृपयायहाँटिककरें					
हमआपतकप्रतिक्रियाकेलिएकैसेपहुँचसंकतेहैंयाअपनीटिप्पणी / शिकायतपरनवीनीकरण?					

केवलकार्यालयउपयोगकेलिए

द्वारापंजीकृत:(सरकारीपंजीकरणशिकायतकानाम)	
यदि -फिरविधि: ⌗ नोट / पत्र ⌗ ईमेल ⌗ मौखिक / टेलीफोन	
सेसमीक्षित:(नाम / अधिकारीकीपोजिशनसमीक्षाशिकायत)	
कीगईकार्रवाई:	
कीगईकार्रवाईकाखुलासा:	⌗ हां ⌗ नहीं
प्रकटीकरणकामतलब:	

शिकायतरिकॉर्डऔरकीगईकार्रवाई

क्रमसंख्या	तारीख	नामऔर complainer कासंपर्कनंबर	शिकायतकेप्रकार	जगह	निवारणकीस्थिति	टिप्पणियाँ

Appendix 18: Semi-Annual Environmental Monitoring Report Template

INTRODUCTION

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

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

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

Package Number	Components/List of Works	Contract Status (specify if under bidding or contract awarded)	Status of Implementation (Preliminary Design/Detailed Design/On-going Construction/Completed/O&M)[39]	If On-going Construction	
				%Physical Progress	Expected Completion Date

COMPLIANCE STATUS WITH NATIONAL/STATE/LOCAL STATUTORY ENVIRONMENTAL

[39] If on-going construction, include %physical progress and expected date of completion

REQUIREMENTS[40]

Package No.	Subproject Name	Statutory Environmental Requirements[41]	Status of Compliance[42]	Validity if obtained	Action Required	Specific Conditions that will require environmental monitoring as per Environment Clearance, Consent/Permit to Establish[43]

COMPLIANCE STATUS WITH ENVIRONMENTAL LOAN COVENANTS

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

COMPLIANCE STATUS WITH THE ENVIRONMENTAL MANAGEMENT PLAN (REFER TO EMP TABLES IN APPROVED IEE/S)

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

Package-wise IEE Documentation Status

Package Number	Final IEE based on Detailed Design				Site-specific EMP (or Construction EMP) approved by Project Director? (Yes/No)	Remarks
	Not yet due (detailed design not yet completed)	Submitted to ADB (Provide Date of Submission)	Disclosed on project website (Provide Link)	Final IEE provided to Contractor/s (Yes/No)		

- For each package, provide name/s and contact details of Contractor/s' nodal person/s for environmental safeguards.

---

[40] All statutory clearance/s, no-objection certificates, permit/s, etc. should be obtained prior to award of contract/s. Attach as appendix all clearance obtained during the reporting period. If already reported, specify in the "remarks" column.

[41] Specify (environmental clearance? Permit/consent to establish? Forest clearance? Etc.)

[42] Specify if obtained, submitted and awaiting approval, application not yet submitted

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

Package-wise Contractor/s' Nodal Persons for Environmental Safeguards

Package Name	Contractor	Nodal Person	Email Address	Contact Number

- With reference to approved EMP/site-specific EMP/construction EMP, complete the table below

Summary of Environmental Monitoring Activities (for the Reporting Period)[44]

Impacts (List from IEE)	Mitigation Measures (List from IEE)	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name of Person Who Conducted the Monitoring
Design Phase						
Pre-Construction Phase						
Construction Phase						
Operational Phase						

[44] Attach Laboratory Results and Sampling Map/Locations

Overall Compliance with CEMP/ EMP

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

APPROACH AND METHODOLOGY FOR ENVIRONMENTAL MONITORING OF THE PROJECT

- Briefly describe the approach and methodology used for environmental monitoring of each sub-project.

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

- Discuss the general condition of surroundings at the project site, with consideration of the following, whichever are applicable:
    - Confirm if any dust was noted to escape the site boundaries and identify dust suppression techniques followed for site/s.
    - Identify if muddy water is escaping site boundaries or if muddy tracks are seen on adjacent roads.
    - Identify type of erosion and sediment control measures installed on site/s, condition of erosion and sediment control measures including if these are intact following heavy rain;
    - Identify designated areas for concrete works, chemical storage, construction materials, and refueling. Attach photographs of each area in the Appendix.
    - Confirm spill kits on site and site procedure for handling emergencies.
    - Identify any chemical stored on site and provide information on storage condition. Attach photograph.
    - Describe management of stockpiles (construction materials, excavated soils, spoils, etc.). Provide photographs.
    - Describe management of solid and liquid wastes on-site (quantity generated, transport, storage and disposal). Provide photographs.
    - Provide information on barricades, signages, and on-site boards. Provide photographs in the Appendix.
    - Indicate if there are any activities being under taken out of working hours and how that is being managed.

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

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

Air Quality Results

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

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

Water Quality Results

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

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

Noise Quality Results

Site No.	Date of Testing	Site Location	LA_{eq} (dBA) (Government Standard)	
			Day Time	Night Time

Site No.	Date of Testing	Site Location	LA_{eq} (dBA) (Monitoring Results)	
			Day Time	Night Time

GRIEVANCE REDRESS MECHANISM

- Provide information on establishment of grievance redress mechanism and capacity of grievance redress committee to address project-related issues/complaints. Include as appendix Notification of the GRM (town-wise if applicable).

COMPLAINTS RECEIVED DURING THE REPORTING PERIOD

- Provide information on number, nature, and resolution of complaints received during reporting period. Attach records as per GRM in the approved IEE. Identify safeguards

team member/s involved in the GRM process. Attach minutes of meetings (ensure English translation is provided).

SUMMARY OF KEY ISSUES AND REMEDIAL ACTIONS

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

APPENDIXES

- Photos
- Summary of consultations
- Copies of environmental clearances and permits
- Sample of environmental site inspection report
- all supporting documents including **signed** monthly environmental site inspection reports prepared by consultants and/or Contractors
- Others

SAMPLE ENVIRONMENTAL SITE INSPECTION REPORT

Project Name
Contract Number

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

WEATHER CONDITION:
_____

INITIAL SITE CONDITION:
_____

CONCLUDING SITE CONDITION:

Satisfactory _____ Unsatisfactory _____ Incident _____ Resolved _____ Unresolved _____

INCIDENT:
Nature of incident:
_____

Intervention Steps:
_____

Incident Issues

Resolution

Project Activity Stage	Survey	
	Design	
	Implementation	
	Pre-Commissioning	
	Guarantee Period	

Inspection

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

Site Restored to Original Condition Yes ☐ No ☐

Signature
_____

Sign off

_____ _____

Name **Name**
Position **Position**

SAMPLE CHECKLIST FOR CONSTRUCTUION SAFETY

Sl. No.	Safety Issues	Yes	No	Non compliance	Corrective Action	Penalty	Remarks
1	Appointment of qualified construction safety officers						
2	Approval for construction safety management plan						
3	Approval for traffic management control plan in accordance with IRC SP 55-2001						
4	Maintenance of the existing road stretches handed over to the contractor						
5	Provision of temporary traffic barriers/barricades/caution tapes in construction zones						
6	Provision of traffic and display sign boards						
7	Provision for flags and warning lights						
8	Providing plastic crash barrier						
9	Provision of adequate staging form work and access (ladders with handrails) for works at a height of more than 3 m.						
10	Provision of adequate shoring/bracing/barricading/lighting for all deep excavations						
11	Demarcations (fencing, guarding and watching) at construction sites						
12	Provision for sufficient lighting especially for night time work						
13	Arrangements for controlled access and entry to construction zones						
14	Safety arrangements for road users/pedestrians						
15	Arrangements for detouring traffic to alternate facilities						
16	Regular inspection of work zone traffic control devices by authorised contractor personnel						
17	No excess earth, excavated materials, construction materials at site						
18	Storage of construction materials at proper location						
19	Construction workers safety – Provision of personnel protective equipment						
20	A. Helmets						
	B. Safety shoes						
	C. Dust masks						
	D. Hand gloves						
	E. Safety belts						
	F. Reflective jackets						
	G. Earplugs for labour						

Sl. No.	Safety Issues	Yes	No	Non compliance	Corrective Action	Penalty	Remarks
21	Workers employed for bituminous works, stone crushers, concrete						

	batching plants etc. provided with protective goggles, gloves, gumboots etc.						
22	Workers engaged in welding work shall be provided with welder protective shields						
23	All vehicles are provided with reverse horns						
24	All scaffolds, ladders and other safety devices shall be maintained in safe and sound condition						
25	Regular health check-up for labour/contractor's personnel						
26	Ensuring sanitary conditions and all waste disposal procedures and methods in the camps						
27	The contractor shall provide adequate circuit for traffic flow around construction areas, control speed of construction vehicles through road safety and training of drivers, provide adequate signage banners and flag persons for traffic control						
28	Provision of insurance coverage for the contractor's personnel						

Contractor

Safeguard Monitor