Initial Environmental Examination

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IND: Assam Urban Infrastructure Investment Program — Tranche 2

Package Number: AUIIP/PR-2/GUW/WS/03 (Design, Build and Operate of Laying of Water Distribution Network Pipelines at South East Guwahati)

Prepared by Guwahati Development Department and Urban Development Department, Government of Assam for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 28 August 2017)

Currency unit – Indian rupee (₹)
₹1.00 = $0.01566
$1.00 = ₹64.8615

ABBREVIATIONS

ADB	-	Asian Development Bank
BRT	-	bus rapid transit
CFE	-	Consent for Establishment
CFO	-	Consent for Operation
DMSC	-	Design, management and supervision consultants
EARF	-	environmental assessment and review framework
EIA	-	environmental impact assessment
EMP	-	environmental management plan
GDD	-	Guwahati Development Department
GRC	-	Grievance Redress Committee
GRM	-	grievance redress mechanism
IEE	-	initial environmental examination
MFF	-	multitranche financing facility
PIU	-	project implementation unit
SPS	-	Safeguard Policy Statement
UDD	-	Urban Development Department
ULB	-	urban local bodies

WEIGHTS AND MEASURES

cm	–	centimeter
dbA	–	decibels
dia.	–	diameter
ha	–	hectare
kg	–	kilogram
km	–	kilometer
l	–	liter
m	–	meter
m^2	–	square meter
m^3	–	cubic meter
mg/l	–	milligrams per liter
ml	–	milliliter
MLD	–	million liters per day
mm	–	millimeter
sq. km.	–	square kilometers
sq. m.	–	square meters
$\mu g/m^3$	–	micrograms per cubic meter

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EXECUTIVE SUMMARY

1. The Assam Urban Infrastructure Investment Program (Program) is a key urban infrastructure initiative of the State Government of Assam, and aims to improve the urban environment and quality of life in the cities of Guwahati and Dibrugarh through the delivery of improved water supply, sanitation, solid waste management (SWM), drainage infrastructure, and a sustainable urban transport system such as a bus rapid transit (BRT) corridor. The Program uses a multitranche financing facility (MFF) modality and is being implemented over a 6-year period from 2012 to 2017. Investments under the MFF are being delivered in two tranches. For Guwahati these included water supply, sewerage, and transportation while for Dibrugarh included drainage and solid waste management.

2. The major outputs of the Program include: (i) for Guwahati, improved water supply, sanitation, and urban transport through a BRT corridor; and ii) for Dibrugarh, improved drainage, and comprehensive SWM.

3. The State Government of Assam's Guwahati Development Department is the executing agency. A state-level PMU, headed by a Project Director (PD), established as the Implementing Agency which will be in-charge of overall execution and technical supervision, monitoring, and financial control of all activities under the project. Project implementation units (PIUs) dedicated exclusively to the project would be set up in Guwahati and Dibrugarh. The PIUs will be headed by a senior technical officer and assisted by qualified and experienced officers seconded from urban local bodies (ULBs), finance and other line departments. The PIUs will be responsible for the day-to-day activities of project implementation in the field and will be under the direct administrative control of the PMU.

4. The PMU will have Safeguards Compliance and Monitoring Unit (PMU SCMU) to ensure mitigation of negative environmental and social impacts due to the subproject, if any. The PMU SCMU will have a Safeguards Officer (PMU SO). The PMU assisted by the Design, Management and Supervision Consultants (DMSC). As per DBO contract, contractor will be responsible for revision or updating of IEE. An Environment Specialist as part of the DMSC team will advice the contractor for revision of IEE after finalization of the design. Environmental Management Plan (EMP) will be implemented by contractor with assistance from DMSC and PIU. ADB will review and approve all final IEEs prior to contract award.

5. ADB requires the consideration of environmental issues in all aspects of its operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS), 2009. According to the SPS, environmental assessment is required for all subprojects under a MFF modality.

6. The overall investments for the proposed subproject in Guwahati will be aimed at providing improved quality and regular 24 hours a day water supply to about 510,000 residents in the southeastern zone of Guwahati by 2030[1]. This will involve 1) Expanding water production capacity through water intake works, 98 million liters per day (MLD) water treatment plant, clear water pumping and primary transmission mains, new distribution systems, six service

[1] The Guwahati water supply sub project ensures piped water supply 24 hours a day for nearly 5,10,000 people (by 2030) who presently depend on bore wells and water tankers which would adversely impact the ground water table in the long run and cause negative impacts on the micro-climate of the city. The assured piped water supply to individual houses when the project is completed will reduce wastage of water and transportation of water by tankers and indirectly help climate change in a positive way.

reservoirs, and machinery; and installing bulk and consumer meters.[2] Installation of 100% new distribution pipes; limiting nonrevenue water (NRW) to 15% as per the Ministry of Urban Development's benchmark of 15% and the move from flat to volumetric rate tariffs will result in effective demand management and water conservation. The infrastructure improvements will be supported by awareness campaigns to promote water conservation, sustainability and cost recovery objectives.

7. Initially under Tranche 1 one of the physical works planned was (i) construction of intake works including intake well, raw water pumping stations, raw water mains and other associated works; and (ii) construction of 98 MLD water treatment plant (WTP), pure water pumping station and associated works. Later it was decided by ADB that the package for "Design, build and operation of distribution networks to provide water supply to the uncovered areas" in the South Guwahati East Zone will also be included in the package. It is planned that entire package work will be as DBO contract. Funding for distribution network pipeline laying and operation part will be done from Tranche 2 fund allocation and accordingly separate IEE is prepared for "laying of distribution network pipelines at Guwahati".

8. This IEE is prepared for Guwahati Water Supply Subproject "Design, Build & Operation - Laying of water distribution network pipelines in Guwahati". Construction work will be started completed in 36 months. This IEE is based on preliminary design and specifications. As per DBO contract, contractor will update this IEE and the EMP after finalization of the detailed design. The final detailed implementation schedule will be provided in the updated IEE once the detailed design phase is completed.

9. The subproject sites are located in existing right of ways (ROWs) and government-owned land.

10. The process described in this document has assessed the environmental impacts of the said Guwahati Water Supply Project. Potential negative environmental impacts during the construction and operation phases of the improved infrastructure were identified and found to be not significant. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. These were discussed with specialists responsible for the engineering aspects, and as a result some measures have already been included in the designs of the infrastructure.

11. Locations and siting of the proposed infrastructures were considered to further reduce impacts. These include (i) locating all facilities on government-owned land to avoid the need for land acquisition[3] (ii) laying of pipe in ROWs alongside main/access roads, to reduce acquisition of land and impacts on livelihoods specifically in densely populated areas of the city.

12. Regardless of these actions, there will still be impacts on the environment when the infrastructure is built and when it is operating. This is mainly because of (i) the invasive nature of trenching and excavation; and (ii) pipeline passing along high traffic roads of the city.

13. During the construction phase, impacts mainly arise from (i) need to dispose/utilize significant quantities of waste soil and import a similar amount of sand to support the pipes in the trenches; and (ii) from disturbance of residents, businesses, traffic and important buildings by the

[2] The installation of meters in the project area will facilitate the move from the current flat rate to volumetric tariffs for water supply.

[3] A Resettlement Plan has been prepared in accordance with Government of India laws and ADB SPS 2009 for lands to be acquired from private owners and temporary relocations during construction.

construction work. These are common impacts of construction in urban areas, and there are well developed methods for their mitigation. Measures such as conducting work in lean season and minimizing inconvenience by best construction methods will be employed.

14. The subproject will: (i) employ in the workforce to the extent possible, people who live in the vicinity of construction sites to provide them with a short-term economic gain; and (ii) ensure that people employed in the longer term to maintain and operate the new facilities are residents of nearby communities.

15. Once the system is operating, most facilities will operate with routine maintenance, which should not affect the environment. Leaks in the pipelines will need to be repaired from time to time, but environmental impacts will be much less than those of the construction period as the work will be infrequent, affecting small areas only.

16. From the preliminary design and results of the IEE, it is clear that implementation of the subproject will not have major negative impacts because activities will be localized/site-specific and short in duration. Moreover, the corridors of impact of the subproject will be on public ROWs and construction will be conducted within a relatively small area. The findings will be assessed again during detailed design stage.

17. An Environmental Management Plan (EMP) is proposed as part of this IEE which includes, (i) mitigation measures for significant environmental impacts during implementation, (ii) environmental monitoring program, and the responsible entities for mitigation, monitoring, and reporting; (iii) public consultation and information disclosure; and (iv) grievance redress mechanism. A number of impacts and their significance have already been reduced by amending the designs. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. The EMP will form part of the civil work bidding and contract documents. The contractor will be required to (i) update the IEE during detailed design stage; (ii) establish an operational system for managing environmental impacts (iii) carry out all of the monitoring and mitigation measures set forth in the EMP; (iv) implement any corrective or preventative actions set out in safeguards monitoring reports that the PMU/PIU will prepare from time to time to monitor implementation of this IEE and EMP; and (v) allocate a budget for compliance with these EMP measures, requirements and actions.

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

19. Contractor will do consultation during updating of IEE. Stakeholders are fully engaged in the subproject and have the opportunity to participate in its development and implementation, which is ensured. The stakeholders were involved in developing the IEE through discussions on-site and public consultation after which views expressed were incorporated into the IEE and in the planning and development of the subproject. The IEE will be made available at public locations in the city and will be disclosed to a wider audience via the ADB website. The consultation process will be continued and expanded during project implementation to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation.

20. The most noticeable long-term benefits due to the subproject are: (i) increased access to treated water supply; (ii) reduction in time and cost of collecting water; and (iii) reduction in vulnerability to water borne diseases.

21. From the preliminary design and results of the IEE, the proposed Guwahati Water Supply 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.

22. Based on the findings of the IEE, the classification of the Project as Category “B” is confirmed, and no further special study or detailed environmental impact assessment (EIA) needs to be undertaken to comply with ADB SPS (2009).

I. INTRODUCTION

A. Overview

1. The Assam Urban Infrastructure Investment Program (Program) is a key urban infrastructure initiative of the State Government of Assam, and aims to improve the urban environment and quality of life in the cities of Guwahati and Dibrugarh through the delivery of improved water supply, sanitation, solid waste management (SWM), drainage infrastructure, and a sustainable urban transport system such as a bus rapid transit (BRT) corridor. The Program uses a multitranche financing facility (MFF) modality and is being implemented over a 6-year period from 2012 to 2017. Investments under the MFF are being delivered in two tranches. For Guwahati, these included water supply, sewerage, and transportation while for Dibrugarh included drainage, solid waste management and basic services for the poor were identified.

2. One of the major outputs of the Program is improvement of water supply system in Guwahati.

3. ADB requires the consideration of environmental issues in all aspects of the ADB's operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (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.

4. ADB classified the Project as environment Category B and accordingly initial environmental examination (IEE) is required for all subprojects. This IEE is prepared for Guwahati Water Supply Subproject "Design, Build & Operation **-** Laying of water distribution network pipelines in Guwahati" Construction work will be started and to be completed in 36 months. This IEE is based on preliminary design and specification. As per DBO contract, the contractor will update this IEE and the EMP after finalization of the detailed design.

B. Environmental Compliance Requirements

1. ADB Policy

5. ADB requires the consideration of environmental issues in all aspects of ADB's operations, and the requirements for Environmental Assessment are described in ADB Safeguard Policy Statement (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.

6. **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 impact 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.

7. **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.

8. **Public Disclosure**. The IEE will be put in an accessible place (e.g. local government offices, libraries, community centers, etc.), and a summary translated into Assamese for the project-affected people and other stakeholders. ADB will post the following safeguard documents on its website so affected people, other stakeholders, and the general public can provide meaningful inputs into the project design and implementation:

(i) Final IEE upon receipt; and
(ii) Environmental Monitoring Reports submitted by PMU/PIU during project Implementation upon receipt.

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

2. Applicable Legislations

10. The implementation of the subprojects will be governed by Government of India and State of Assam 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. In addition, subprojects shall also be consistent with ADB SPS. The following legislations are applicable to the subproject:

(i) Environmental (Protection) Act of 1986, its rules and amendments;
(ii) Water(Prevention and Control of Pollution) Act of 1974, its Rules, and Amendments;
(iii) Air (Prevention and Control of Pollution) Act of 1981, its Rules and amendments;
(iv) Central Pollution Control Board (CPCB) Environmental Standards;
(v) Construction & Demolition Waste Management Rules, 2016;
(vi) The Environment Impact Assessment (EIA) Notification, 2006 as amended and Notification of Ministry of Environment and Forest No.L-11011/47/2011-IA.II(M) Dated 18.5.12.
(vii) Forest (Conservation) Act of 1980, its Rules and amendments;
(viii) Assam Forest Regulation of 1891;
(ix) Assam Forest Policy of 2004;
(x) The Assam Ancient Monuments and Records Act 1959; and Rules 1964
(xi) The Ancient Monuments and Archaeological Sites and Remains Act,1958
(xii) The Ancient Monuments And Archaeological Sites Remains (Amendment and Validation) Act,2010

(xiii) Land Acquisition Act of 1894 and as amended in 1985.
(xiv) Master Plan Guwahati Metropolitan Area -2025

11. The Government of India laws cover the occupational health and safety of employees working only in factories and mines. 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 are based on the World Bank Environmental, Health, and Safety (EHS) Guidelines.

3. Environmental Assessment Requirements

12. The Government of India's Environmental Impact Assessment (EIA) Notification of 2006, which replaces the EIA Notification of 1994, requires environmental clearance (EC) for certain defined activities/projects. This Notification classifies the projects/activities that require EC into 'A' and 'B' categories depending on the impact potential and/or scale of project. For both category projects, prior EC is mandatory before any construction work, or preparation of land except for securing the land, is started. The said subproject components i.e. "laying of water distribution pipelines" is not listed in the EIA Notification of 2006 "Schedule of Projects Requiring Prior Environmental Clearance" thus EC is not required. However for all the quarry and mining activities environment clearance certificate is necessary.

4. National Legal Requirements

13. **Water (Prevention and Control of Pollution) Act of 1974, Rules of 1975, and Amendments**. Any component of the subproject having potential to generate sewage or trade effluent will come under the purview of the Water (Prevention and Control of Pollution) Act of 1974, Rules of 1975, and amendments. Such projects have to obtain Consent for Establishment (CFE) under Section 25 of the Act from Assam Pollution Control Board (APCB) before starting implementation and Consent to Operate (CTO) before commissioning. The Water Act also requires the occupier of such subprojects to take measures for abating the possible pollution of receiving water bodies. The following subprojects require CFE and CFO from APCB:

(i) Municipal solid waste management facilities;
(ii) New or augmentation of water treatment plants;
(iii) New or augmentation of sewage treatment plants

14. For the said sub project- laying of water distribution network pipelines no CFE and CFO will be required.

15. **Air (Prevention and Control of Pollution) Act of 1981**, Rules of 1982 and amendments. The subprojects having potential to emit air pollutants into the atmosphere have to obtain CFE under Section 21 of the Air (Prevention and Control of Pollution) Act of 1981 read with rules amendments from APCB before starting implementation and CTO before commissioning the project. The occupier of the project/facility has the responsibility to adopt necessary air pollution control measures for abating air pollution. The following require CFE and CTO from APCB.

(i) All the quarries
(ii) Diesel generators ; and

(iii) Hot mix plants, wet mix plants, stone crushers, if installed for construction.

16. **Forest Legislations**. Government of India and State Government of Assam make rules under the Indian Forest Act to regulate activities like (i) cutting of trees and removal of forest produce; (ii) clearing or breaking up of land for cultivation or any other purpose; and (iii) for protection and management of any portion of forest lands[4]. According to the Act, State Government of Assam requires a Forest Clearance from Government of India MoEFCC for use of a forestland for non-forest purposes (means breaking up or clearing of any forest land). The Forest (Conservation) Rules of 2003 issued under this Act, provide specific procedures to be followed for obtaining the Forest Clearance.

17. Compensatory afforestation is one of the most important conditions stipulated for diversion of forest land. For obtaining approval involving 5 hectares (ha), cost of 10 times the number of trees to be removed, subject to maximum of 2500 trees per ha shall be paid. In case of plain areas, the area of the land required for compensatory afforestation, shall be equal to that of the affected forest land. In case of hills, the area of land required for compensatory afforestation shall be twice or double the area of the affected forest land.

18. In addition, the Assam Forest Regulation of 1891 and Assam Forest Policy of 2004, requires a permit for cutting of trees in non-forest land, regardless of land ownership, from the Assam Environment and Forest Department. Afforestation to the extent of two trees per each tree felled is mandatory. No project components will be located within the forest.

19. **Ancient Monuments and Archaeological Sites and Remains Act, of 1958 and The Ancient Monuments and Archaeological Sites And Remains (Amendments and Validation) Act, 2010**. The Act designate areas within a radius of 100 meters (m) and 300 m from the "protected property" as "protected area" and "controlled area" respectively. For the subproject, there is no Archaeologically Protected Areas located within project influence zone.

20. **Land Acquisition, Rehabilitation and Resettlement Act, 2013.** The Act shall come into force on January 1, 2014 as notified by the Central Government. The Act will replace the Land Acquisition Act, 1894, a nearly 120-year-old law enacted during British rule and lays emphasis on Rehabilitation & Resettlement in cases of land acquisition. Private land acquisition is guided by the provisions and procedures under this Act. Before the acquisition of any land, the Government is required to consult the concerned Panchayat or Municipal Corporation and carry out a Social Impact Assessment in consultation with them. The Act provides a transparent process for land acquisition for industrialization, development of essential infrastructural facilities and urbanization by giving adequate financial compensation to the affected people.

21. The District Collector or any other officer designated will function as the Land Acquisition Officer on behalf of the Government. There is a provision for consent award to reduce the time for processing if the land owners are willing to agree on the price fixed by the Land Acquisition Officer. The option of acquiring lands through private negotiations is also available.

[4] The term 'forest land' mentioned in Section 2 of the Act refers to reserved forest, protected forest or any area recorded as forest in the Government records. Lands which are notified under Section 4 of the India Forest Act would also come within the purview of the Act. (Supreme Court's Judgment in the National Thermal Power Corporation's case). It would also include "Forest" as understood in the dictionary sense (Supreme Court order dated 12.12.1996 in WP No. 202/1995-Annexure-I). All proposals for diversions of such areas to any non-forest purpose, irrespective of its ownership, would require the prior approval of the Central Government.

22. There is no requirement for acquisition of land for laying of distribution pipelines. Temporary disruption of household's activity and business may be affected during pipe laying work. A Resettlement Plan has been prepared in accordance with the Land Acquisition Act and ADB's SPS 2009.

5. Applicable International Environmental Agreements

23. In addition, international conventions such as the International Union for Conservation of Nature and Natural Resources (IUCN)[5], Convention on Migratory Species of Wild Animals (CMS)[6], and Ramsar Convention on Wetlands of International Importance[7] are applicable for selection and screening of subprojects under restricted/sensitive areas. India is a party to these conventions.

24. For the said subproject, (i) animals and plant species found in the subproject sites are not included in the IUCN Red List; (ii) will not alter bird migration; and (iii) sites are not within or adjacent to the Deeporbeel, a permanent freshwater lake and a former channel of the Brahmaputra River in Assam listed under the Ramsar Convention in November 2002.

II. DESCRIPTION OF SUBPROJECT

A. Need for the Subproject

25. The State Government of Assam has envisaged improvements in the water supply sector to provide access to potable water to 100% of the residents of the Guwahati Metropolitan Area (GMA). The City Development Plan (CDP) for Guwahati, prepared under the Jawaharlal Nehru National Urban Renewal Mission (JNNURM), envisions providing safe and sustainable water to its citizens at an appropriate pricing with the ultimate goal of providing 24 hours water across the city. To achieve this objective, the city has been divided into four distribution zones (Figure 1): (i) North Guwahati Zone (ii) South Guwahati West Zone (iii) South Guwahati Central Zone and (iv) South Guwahati East Zone.

[5] The IUCN provides the Red List of Threatened Species (also known as the IUCN Red List or Red Data List) which is a comprehensive inventory of the global conservation status of plant and animal species. The IUCN Red List is set upon precise criteria to evaluate the extinction risk of thousands of species and subspecies. These criteria are relevant to all species and all regions of the world. The aim is to convey the urgency of conservation issues to the public and policy makers, as well as help the international community to try to reduce species extinction.

[6] CMS, also known as the Bonn Convention, recognizes that states must be the protectors of migratory species that live within or pass through their national jurisdictions, and aims to conserve terrestrial, marine and avian migratory species throughout their ranges. Migratory species threatened with extinction are listed on Appendix I of the Convention. CMS Parties strive towards strictly protecting these species, conserving or restoring the places where they live, mitigating obstacles to migration and controlling other factors that might endanger them.

[7] The Convention on Wetlands of International Importance (also called as Ramsar Convention) provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. According to the Ramsar list of wetlands of international Importance, there are 25 designated wetlands in India which are required to be protected. Activities undertaken in the proximity of Ramsar wetlands shall follow the guidelines of the convention

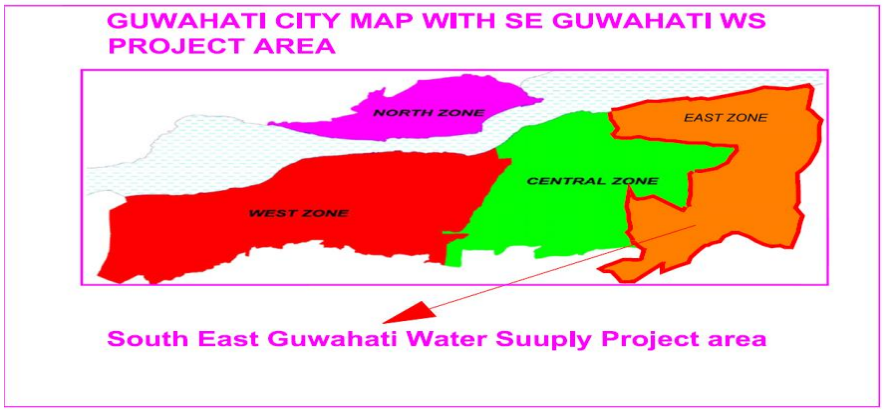

Figure 1: Guwahati Metropolitan Area Water Supply Zones

26. Currently, only 40% of the population has access to central piped water supply system. Lack of adequate water supply is causing inconvenience and hardship in Guwahati. The key issues pertaining to the present systems can be summarized as follows: (i) limited coverage of the system, and dependence on non-potable water sources; (ii) non-uniform distribution, both in terms of quality and quantity of water supplied; (iii) high levels of non revenue water (NRW), and leakages in the distribution system; and (iv) low levels of cost recovery.

27. The present production capacity of 110.85 MLD, actual production of water is 73.4 MLD (66%). Out of around 74 MLD of potable water produced, 72 MLD is drawn from the river Brahmaputra and rest of about 1.5 MLD is pumped from deep tube wells installed at various locations by Guwahati Municipal Corporation (GMC). The present production from all sources (73.4 MLD) is inadequate with respect to present demand of around 150 MLD. Most of the treatment plants are also old and damaged due to which they are running much below their actual capacities. Various components are not functioning and as a result both quantity and quality are not being assured. Intake systems are old and rusted needing immediate repair and replacement. The ADB funded project will add 98 MLD in 2030 and provision for extension up to 147 MLD (2045).

28. The NRW in the Guwahati production and distribution system is estimated to be over 40%, resulting in a per capita availability of only about 65 liters per day with an average supply hours of 2 to 3 hours within those areas where piped water supply is available. The high NRW is because of uncontrolled leakage from the distribution system and transmission line and free flow of water from the street hydrant points. **Table 1** shows the salient features of the present water supply system.

Table 1: Salient Features of the Guwahati Water Supply System

Particulars	Quantities	Quantities
1.	Present population of Guwahati (2011 estimates)	1,246,082
2.	Present production capacity	110.85 MLD
3.	Present actual production	73.4 MLD
4.	Estimated unaccounted for water	40 %
5.	Overall per capita water availability at households	65 lpcd
6.	Maximum supply hours	2-3 hours a day

Notes: MLD = million per liters; lpcd = liters per capita per day

29. The existing distribution system covers only a part of the GMA and is largely limited to the

central part of the city. In most part of the city water supply system is not available. In some of the fringe areas, tube wells are provided although maintenance by the Assam Public Health Engineering Department (APHED), Assam Urban Water Supply and Sewerage Board (AUWSSB) and GMC[8] is very poor. Lack of proper planning leads to laying of undersized distribution pipes which is main reason of low pressure in the consumer end. Major leakage in the distribution system also leads to heavy contamination of water at the supply end. Consequently water borne diseases like diarrhea, dysentery, typhoid are quite common occurrence. Besides these, provisions for elements namely, chlorinators in the distribution system and bulk and consumer metering will also have to be introduced.

30. The present tariff structure for water supply is based on a flat rate charging system. GMC has tried to introduce water meter in the system but still is not fully operational. Present cost of production of GMC water is around Rs 11 per 1,000 liters. Although collection percentage of GMC is around 80% of water tax but the cost recovery is only up to the mark of 13%. The cost of water is quite high because of the fact that GMC has to incur a huge amount in terms of operations and maintenance (O&M) expenditure and establishment charges.

B. Description of Subproject

31. Initially under Tranche 1 one of the physical works planned was (i) construction of intake works including intake well, raw water pumping stations, raw water mains and other associated works; and (ii) construction of 98 MLD water treatment plant (WTP), pure water pumping station and associated works. Later it was decided by ADB that the package for "construction of distribution networks to provide water supply to the uncovered areas" in the South Guwahati East Zone will also be included in the package for construction of intake and WTP. It is planned that entire package work will be as DBO contract basis. Funding for distribution network pipeline laying part will be done from Tranche 2 fund allocation and accordingly separate IEE is prepared for "laying of distribution network pipelines at Guwahati". This IEE is based on preliminary design and specification. As per DBO contract, the contractor will update this IEE and the EMP after finalization of the detailed design. Specific tasks, timeline, for the updating of IEE and implementation of EMP is enclosed in **Appendix 1**.

32. The primary source of water for Guwahati is the Brahmaputra River which has a flow of about 4,500 cubic meters per second. Raw water is drawn from various intake points along the river and supplied after treatment to the other zones.

33. The proposed water intake wells will be located in the Brahmaputra River near IOCL gate near Kharghuli main Road. Two intake wells has been proposed to accommodate required numbers of Vertical Turbine pumps as per design in each well so as to pump 104 MLD during Phase I and additional pumps for 51 MLD during Phase. A surface water based Water Treatment Plant having capacity of 98 MLD (2030) and having design provision for extension up to 147MLD (2045) is to be constructed at Sunsali for South East Zone of Guwahati under Assam Urban Infrastructure Investment Program.

[8] Presently Guwahati Municipal Corporation (GMC), Assam Public Health Engineering Department (APHED) and Assam Urban Water Supply and Sewerage Board (AUWSSB) are responsible for water supply in Guwahati. AUWSSB is mainly supplying water in the central portion of the city. APHED is supplying water to some of the institutional consumers in the South Guwahati eastern zone. GMC has the maximum coverage of residential consumers but not in the eastern zone.

34. **Distribution mains**. Distribution network is proposed to be designed for Design stage population of 836,300. The network zone demands are ranging from minimum 13 ML/day to maximum 50.9 ML/day. The network covers pipes ranging from maximum 1000 mm diameter to minimum 100 mm diameter. As per the design criteria finalized and adopted for similar projects under execution for South Central and North Guwahati (under JICA funded) and South West Guwahati (under JNNURM), Ductile Iron pipes are proposed up to 600 mm diameters and MS pipes for higher diameters. Reservoirs are located on local hills having very narrow approaches with number of turns at short interval. Small hills are also located in the network area of some of the distribution zones. In order to avoid cutting of ductile Iron pipes to adjust with the road alignment on hill slopes, 110 mm diameter (OD) PE pipes are proposed on hill slopes against 100 mm Ductile Iron pipes. Anticipated length of the pipe network covering all the 6 zones is about 535 km.

35. **Table 2** shows the components of the subproject based on the present proposals which are expected to be substantially correct, although certain details may change as per final design under DBO contract. **Figure 2** indicates proposed distribution network pipelines.

Table 2: Description of the Proposed Water Supply Subproject Part for Guwahati City

Component	Function	Description	Location
Water distribution pipeline	Supply of treated water from water storage reservoirs	➢ Total pipeline about – 535 km	• 6 zones of Guwahati (ref. Table 4 below) – North Jyoti Nagar, Gopal Nagar, Kenduguri, Jonaki Nagar, Nabajyoti Nagar Basistha

36. Tentative zone wise distribution coverage from water storage reservoirs is given in **Table 3.** Details of pipeline type and length are given in **Table 4. Appendix 2** shows the photographic illustration of the project location.

Table 3: Tentative Zone wise Coverage of Water Distribution Pipelines

Zone Names	Locations	Coverage Area in sq. km	Length in km & dia of Pipe
North Jyoti Nagar	Krishna Nagar,Ganesh Nagrar,LuitNagar,AnandaNagar,Kailashpur,JanataNagar,SreeNagar,Bijay Nagar	4.831sq. km	Length-54.88 km. Dia-100mm/110mm/150mm/ 200mm/ 250mm/300mm/400mm/ 500mm
Gopal Nagar	Kanchan Nagar, RamNagar,PuranaNagar,AnandaNagar, Ajantanagar, Radha Krishna Nagar,BapujiNagar,ShahidNagar,ChandanNagar,ChayaNagar,DomoioGuri,DhupGuri,Sapaideng,Kharghuli,Salbari,Maya Nagar.	9.74 sq. km	Length-75.365 km. Dia-100mm/110mm/150mm/ 200mm/250mm/ 300mm/400mm/500mm/ 600 mm
Kenduguri	Sapaideng,Rajabari,BakraPara,GhuliGaon,Birkuchi,UjjwalNagar,Taltola	15.378 sq.km	Length-62.88 km. Dia-100mm/110mm/150mm/ 200mm/ 250mm/300mm/400mm/ 600mm
Jonaki Nagar	Satgaon,Gandhinagar,Udyanvihar,,Sudhazaar road, Satgaonkochpara,Kalyankuchi,Bolbari ,Baradungbari,Satgaonambari,Noapara,	14.142 sq.km	Length-84.601 km. Dia-100mm/110mm/150mm/ 200mm/250mm/

Zone Names	Locations	Coverage Area in sq. km	Length in km & dia of Pipe
	Bagharboritiniali,Panjabari ,Ajay nagar,Kabarstenchouk, Batahghuli.		300mm/400mm/500mm/ 600mm/700mm.
Nabajyoti Nagar	Six mile,Bagharboritiniali,Vishnunagar,Panjabaribazar,GPSroad,Batahghuli,East batahghuli,8 th mile A merigog,Milannagar,Trinagar,Beltola,Gsroad,Trinayan path Batahghulipanjabari, Milijuli path batahghulipanjabari,	15.219 sq.km	Length-199.500 km. Dia- 100mm/110mm/150mm/ 200mm/250mm/ 300mm/400mm/500mm/ 600mm/700mm/ 800mm/900mm/1000mm.
Basistha	Barpathar,Indranagar,Basisthamandirpath,baikunthapur,Nabodynagar,Patarkuchi, Latakata, Khanapara.	6.16 sq.km	Length-57.874 km. Dia- 100mm/110mm/150mm/ 200mm/250mm/ 300mm/400mm/500mm/ 600mm/700mm

Table 4: South-East Guwahati Water Supply Project Distribution System Pipe Length- Tentative Subject to Final Design by DBO Contractor

	PE-80, PN-6	DI k-9 pipes								MS pipes, 6 mm thick				Total Length in m
	Diameter of pipe in mm													
Zone Name	110	100	150	200	250	300	400	500	600	700	800	900	1,000	
	Actual pipe lengths (in m) as per the Network designs													
1.Gopalnagar	21,228	38,136	5,247	3,046	3,582	860	2,565	400	301	0	0	0	0	**75,365**
2.North Jyotinagar	23,575	20,331	6,011	2,818	1,194	616	186	156	0	0	0	0	0	**54,887**
3.Kenduguri	13,801	25,135	6,183	6,627	6,839	1,020	1,177	0	2,105	0	0	0	0	**62,887**
4.Jonakinagar	9246	46269	7,756	7353	5498	2528	3185	2391	265	110	0	0	0	**84601**
5.Naba Jyotinagar	16289	137342	18497	9529	8532	3569	1327	696	1190	0	2092	0	437	**199500**
6.Basistha	9174	28370	7436	3105	4061	1342	586	1202	1432	1166	0	0	0	**57874**
Total designed Length	**93,313**	**295,583**	**51,130**	**32,478**	**29,706**	**9,935**	**9,026**	**4,845**	**5,293**	**1,276**	**2,092**	**0**	**437**	**535,114**

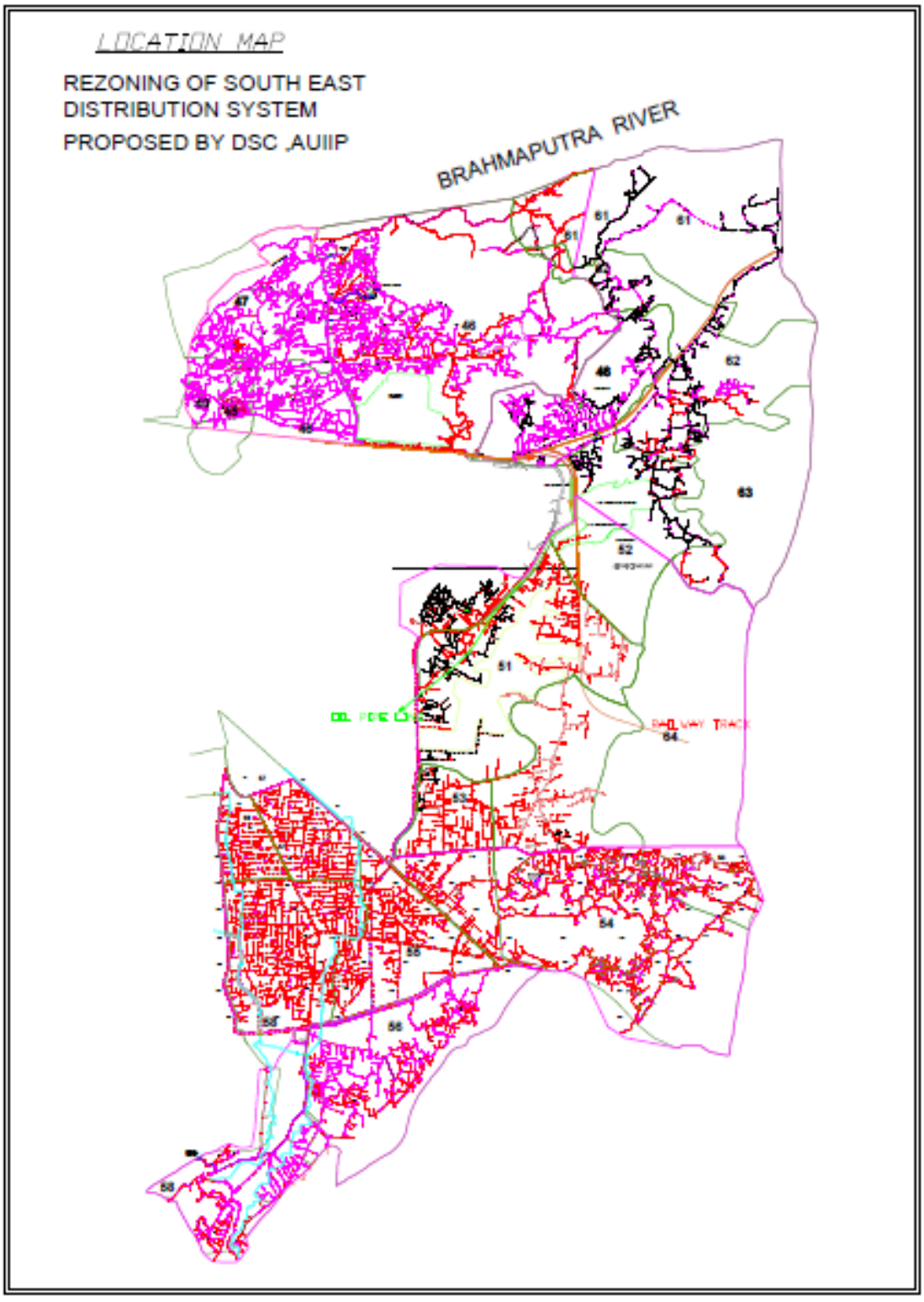

Figure 2: Proposed Distribution Pipeline

III. DESCRIPTION OF ENVIRONMENT

A. Physical Features

1. Location

37. Guwahati district is the capital of State of Assam and is located on the southern bank of Brahmaputra River. The Guwahati Municipal Area (GMA), with a total area of 262 square kilometer (sq km) is located on both banks of Brahmaputra River dividing it into two parts - North Guwahati and South Guwahati. The State Government of Assam has proposed the South eastern zone for assistance under the Project, which covers 71 sq km and a total of 11 wards and some parts of 6 other wards. Map of the Guwahati city and location of wards are shown in **Figure 3 and 4** respectively.

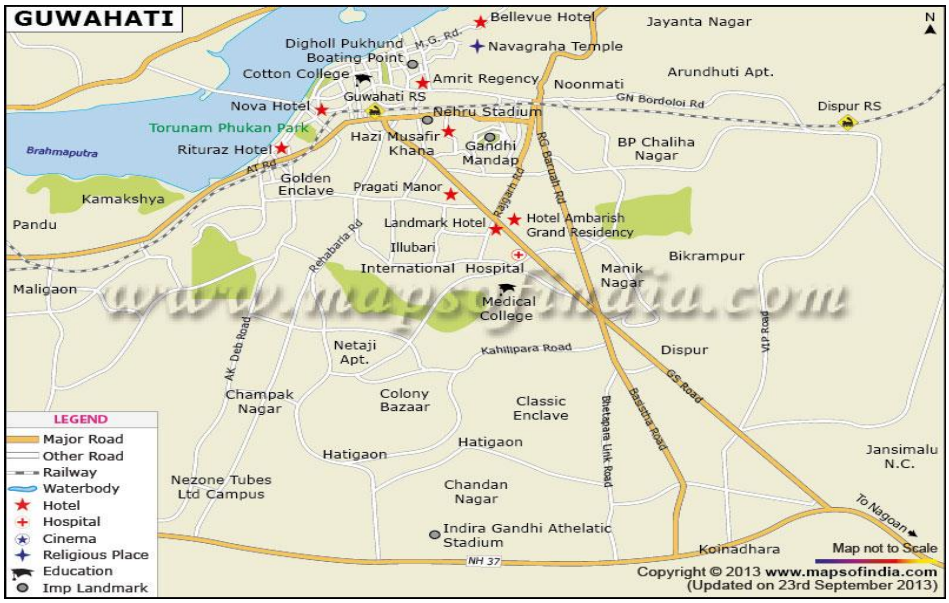

Figure 3: Map of Subproject Area - Guwahati City

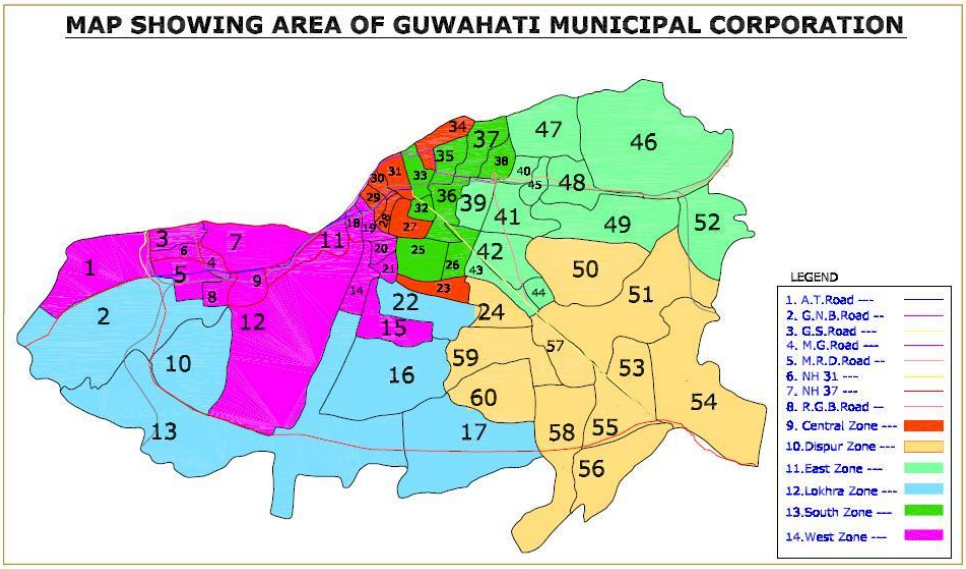

Figure 4: Guwahati Municipal Corporation Area Showing Distribution of Wards

2. Topography

38. Guwahati is located at $26^0$10' N latitude and $91^0$45' E longitude with and altitude varying between 49.5 m to 293 m above mean sea level. The average slope varies from zero degree to 18 degrees. The natural topography of the city guides flow of the rain water towards Bharalu and Basistha Rivers.

39. The physical configuration of Guwahati exhibits a peculiar structure being located within a crescent shaped basin, surrounded by a number of hillocks. As a result, swamps and low- lying areas in between the hillocks have emerged in the landscape. These low-lying areas are often inundated during heavy rainfall.

3. Geology and Seismicity

40. Guwahati is characterized by mostly Precambrian granite gneisses, quartzite forming residual hills and occupying a major part of the landscape. Small-elongated inter montane valleys with varying thicknesses of sediment fill and alluvium form the rest of the areas. There is presence of a number of paleo-channels that are perceived to be old channels linked to the Brahmaputra River towards north.

41. The Brahmaputra valley and its adjoining highlands constitute a highly active seismic zone. Guwahati falls in the Seismic Zone V, where earthquakes of magnitude 8 or more can occur i.e., the zone with highest intensity. Guwahati and its surrounding area are situated on the fringe of hard rock formation. Its vulnerability to the seismic activity[9] is exacerbated due to congestion brought on by topography, with poorly built housing and narrow streets.

[9] Earthquakes measuring up to 8.7 on on the Richter scale occurred here in 1897 and 1950. Between 1920 and 1980 as many as 455 earthquakes of magnitude 5 on the Richter scale were recorded in the region an average of 8 per year

4. Climate

42. Three seasons are witnessed in Guwahati. From February to May, the weather is dry. In the month of March, the northeast wind carries the dry sand from the Brahmaputra River and makes the whole atmosphere dusty. In April and May, local rain along with thunderstorms is a common feature. The maximum and minimum temperature varies from 12° to 31°C during this period. From June to October is the southwest monsoon season with heavy rainfall. The temperature varies from 22° to 32°C in this period. November to January is the cold weather season. The average annual rainfall in Guwahati is 1637.3 mm with 87 average rainy days. About 90% of this rain occurs between April and September and July and August being the maximum rainy months.

5. Drainage

43. The whole GMA area is divided into six drainage basins, which are ultimately drained into the Brahmaputra River either directly or through various drainage channels and reservoirs. These six basins are Bharalu Basin, Dipar Basin, Silsako Basin, Foreshore Basin, North Guwahati Basin, and Kalmoni Basin.

6. Surface Waters

44. **Brahmaputra River**. Brahmaputra River within Assam is almost 700 km long with more than 100 tributaries. It has a total length of 28.67 km, total area of 49 sq km and a major natural feature in Guwahati. Assam Pollution Control Board (APCB) is carrying out continuous water quality monitoring under the National Water Quality Monitoring Program and Monitoring of Indian National Aquatic Resources. Results of monitoring conducted by APCB show coliforms exceed the prescribed Government of India limits. All other parameters are within the prescribed limit. The flow data of the river is given below.

Table 5: Flow Data of Brahmaputra River in Guwahati City

S. No.	Year	River Flow in Guwahati in Season (Cumec)		
		Flood	Winter	Summer
1	2003	31265	9360	6080
2	2004	28657	5659	8196
3	2005	26890	7854	3662
4	2006	21178	3869	4641
5	2007	18723	3647	6554
6	2008	25657	4520	3752
7	2009	20461	4725	11378

Source: Central Water Commission, 2011

45. Brahmaputra River water quality data is shown below.

Table 6: Water Quality of Brahmaputra River
(Location: Brahmaputra River near Chunshali Ferry Ghat)

Parameters	Values
Temperature (^{0}C)	25
pH	7.2
Conductivity (µmhos/cm)	107
Turbidity (NTU)	16
Dissolved Oxygen (mg/l)	7.20

Parameters	Values
Alkalinity as $CaCO_3$ (mg/l)	66.00
Total Hardness as $CaCO_3$(mg/l)	68.00
Calcium as Ca^{2+}(mg/l)	20.00
Magnesium as Mg^{2+}(mg/l)	4.30
Chloride as Cl (mg/l)	12.00
Sulphate as SO_4^{2-} (mg/l)	16.80
Nitrate as SO_4^{2-}(mg/l)	0.14
Residual Chlorine (mg/l)	BDL
Phenolic Compound (mg/l)	BDL
Total Iron as Fe (mg/l)	0.50
Fluoride As F (mg/l)	0.33
Total Dissolved Solids (mg/l)	72.00
Arsenic as As (µg/l)	1.18
Chromium as Cr (VI) (mg/l)	BDL
Lead as Pb (mg/l)	BDL
Zinc as Zn (mg/l)	0.024
Copper as Cu (mg/l)	0.059
Cadmium as Cd (mg/l)	0.005
Mercury as Hg (mg/l)	BDL
Bacteriological Parameters	
Total Coliform (MPN/100 ml)	300
Faecal Coliform (MPN/100 ml)	Nil

BDL: Below Detection Limit (Source: Assam Pollution Control Board for AUIIP, Date of collection of sample: 08/10/2012)

46. **Bharalu River.** The Bharalu River originates as a small stream from the southern range of Khashi Hills and flows through the city gaining momentum in width and depth and ultimately joining Brahmaputra River. Most of the drains directly or indirectly fall into Bharalu River which is an important channel for the drainage of the city. But due to siltation, the bed level of the river has considerably risen. Results of monitoring conducted by APCB show dissolved oxygen, biological oxygen demand, and coliforms exceed the prescribed Government of India limits. All other parameters are within the prescribed limit.

47. Treated supply water quality at Guwahati is shown in **Table 7.** Results show that all parameters are well below the standard.

Table 7: Guwahati Municipal Corporation Supply Water
(Place of Collection - Panbazar Water Treatment Plant, Guwahati After Treatment)

Physical Parameters	Value	Acceptable limit {(BIS)10500,2012}	Standard {(BIS)10500,2012}- Permissible limit in absence of alternative source
Appearance	Almost clear	Agreeable	Agreeable
Colour	Almost clear	Colouless	Agreeable
Odour	Odourless	Agreeable	Agreeable
pH Value	7.98	6.5 – 8.5	6.5 – 8.5
Turbidity (NTU)	<5.0	1.0	Less than 5
Chemical Parameters (mg/L)			
Total Dissolved Solids	158.0	500.0	2000.0
Total Hardness (as CaCO3)	60.0	200.0	600.0

Physical Parameters	Value	Acceptable limit {(BIS)10500,2012}	Standard {(BIS)10500,2012}- Permissible limit in absence of alternative source
Total Alkalinity (as CaCO3)	48.0	200.0	600.0
Total Iron (as Fe)	0.02	0.3	0.3
Chloride (as CI)	4.0	250.0	1000.0
Residual free chlorine	0.20	0.20	1.0
Fluoride (as F)	0.3	1.0	1.5
Nitrate (as NO_3)	BDL	45.0	45.0

BDL: Below Detection Limit (Source: Guwahati Municipal Corporation, Date of collection of sample: 15/09/2012)

7. Groundwater

48. Owing to the inadequacies of piped water supply, Guwahati depends on groundwater from ring/dug wells and tube wells for drinking purposes. Groundwater quality in Guwahati has been studied with special reference to the presence of fluoride. The Brahmaputra River in the north, hills to the east and south, and alluvial soil to the west surround the city. Fluoride, above the guideline values of World Health Organization, has been found in groundwater of the eastern and southern plains of the city. The sources of fluoride and nitrate are suspected to be minerals from the Precambrian granite, which forms the basement of the city and also outcrops at several places in the city.

49. Ground water quality data was collected from secondary published source. Samples were collected near the sub project locations at Khanapara (residential), Ruckmini Gaon (residential), Noonmati (near KV Noonmati) and Chunsali (residential). The maximum and minimum values as noted during monitoring are given below. Results show that in some of the cases concentration of iron was above the limit.

Table 8: Ground water quality in and around Guwahati

S. No.	Parameters	Minimum	Maximum
1	Odour	NS	WS
2	Temperature(^{0}C)	22	22.1
3	Turbidity (NTU)	6.2	8.4
4	pH	7.03	8.41
5	Conductance ms/cm	0.65	7.98
6	Total dissolved solid mg/L	145	225
7	Total suspended solid mg/L	11	20
8	Chloride (mg/L)	34.8	161.88
9	Sulphate (mg/L) as SO_4	5.75	8.1
10	Phosphate (mg/L)	0.31	0.65
11	Fluoride (mg/L)	0.8	1.6
12	Cyanide (mg/L)	BDL	BDL
13	Calcium(mg/L)	44.8	105.8

S. No.	Parameters	Minimum	Maximum
14	Nitrate (mg/L)	0.41	0.5
15	Magnesium (mg/L)	6.81	11.68
16	Sodium(mg/L)	7.1	7.3
17	Potassium (mg/L)	2.8	3.8
18	Manganese (mg/L)	0.03	0.87
19	Zinc (mg/L)	BDL	0
20	Iron (mg/L)	0.11	0.63
21	Copper (mg/L)	BDL	BDL
22	Lead (Pd) (mg/L)	BDL	BDL
23	Chromium $^{+6}$ (mg/L)	BDL	BDL
24	Chromium (Total) (mg/L)	BDL	BDL
25	Cadmium(mg/L)	BDL	0.001
26	Arsenic (µg/L)	BDL	0.01
27	Cobalt (mg/L)	0.006	0.22
28	Nickel (mg/L)	BDL	0.01
29	Phenol (mg/L)	BDL	BDL
30	Total Cali farm (MPN/100 ml)	-	-
31	Faecal Califon (MPN/100ml)	-	-

BDL: Below Detection Limit, (Source: EIA Report INDAdept^{G} Project - Guwahati Refinery)

8. Air Quality

50. Air pollution in Guwahati has increased in recent years due to growth of traffic and other urban activities. The ambient air quality is monitored at six locations under AUIIP. Secondary data near project sites are also collected from Assam Pollution Control Board and from EIA report for suspended particulate matters ($PM_{2.5}$ & PM_{10}), sulfur dioxide (SO_2) and nitrogen oxides (NOx) levels. At all the locations sulfur dioxide and nitrogen oxides are within the limit. **Table 9** below shows the air quality monitoring result.

Table 9: Air Quality Monitoring Result

Locations	Parameters (µg/m^3) (Min- Max)/ Mean			
	SO_2	NO_2	PM_{10}	$PM_{2.5}$
Guwahati Refinery Guest House*	BDL-6.10 (2.40)	BDL-13.6 (5.40)	24.8 – 78.2 (56.8)	24.2-56.2 (40.6)
Guwahati Refinery Township*	BDL-5.4 (2.3)	BDL-14.6 (2.3)	51.7-131.5 (80)	32.2-71.4 (48.4)
Near WTP and intake site at Chunsali*	BDL-6.1 (2. 6)	BDL-6.4 (2,80)	21.1-76.4 (57.3)	21.7-51.3 (34.8)
Beltola- city area*	BDL-7.6 (2.8)	BDL-12.4 (4.9)	61.3-136.2 (85.7)	21.6-64.2 (44.0)

Locations	Parameters (µg/m^3) (Min- Max)/ Mean			
	SO_2	NO_2	PM_{10}	$PM_{2.5}$
Khanapara- city area**	5.50- 7.75	17.75-25.0	43.0 -198.5	-------
Gopalnagar area***	8.0	13.0	37.0	21.0
Jonakinagar area***	8.0	12.0	23.0	17.0
North Jyotinagar area ***	9.0	14.0	34.0	19.0
Navajyoti Nagar***	10.0	17.0	34.0	20.0
Kenduguri***	7.0	16.0	34.0	21.0
Basistha***	9.0	15.0	36.0	23.0
CPCB Standard	**80**	**80**	**100**	**60**

(Source: *EIA Report INDAdept^G Project- Guwahati Refinery, **: Assam Pollution Control Board, ***: Under AUIIP project, baseline monitoring)

51. Results show that the maximum PM_{10} value exceeds the standard limit 100µg/m^3 at Refinery Township, Beltola and Khanapara. The maximum values of $PM_{2.5}$ cross the standard limit of 60µg/m^3 at Guwahati refinery township area and Beltola city area. But the average concentrations of PM_{10} and $PM_{2.5}$ at all the locations are within the standard limit.

9. Noise Level

52. The ambient noise level is being monitored at six locations under AUIIP. Secondary data near project sites are also collected from Assam Pollution Control Board and from EIA report. **Table 10** shows noise level data of the project area.

Table 10: Noise Levels (dBA) in the Project Area
(Day time 6AM to 10 PM; Nighttime from 10 PM to 6 AM)

S. No.	Noise Monitoring Station	Day time SPL(dBA)		Night time SPL (dBA)	
		Leq	Range	Leq	Range
1	Bamunimaidam*	92	71-105	81	47-10
2	Noonmati* (Guwahati Refinery main gate)	72	61-86	64	40-73
3	Noonmati* (Sector-III)	74	51-79	56	44-68
4	Noonmati Public School*(Chunsali)	64	54-81	42	36-66
5	Beltola	88	60-92	68	42-78
6	Gopalnagar area**	42	-	39	-
7	Jonakinagar area**	45	-	38	-
8	North Jyotinagar area **	39	-	38	-
9	Nabjyoti Nagar**	46	-	40	-
10	Kenduguri**	48	-	37	-
11	Basistha **	43	-	39	-

(Source: *EIA Report INDAdept^G Project- Guwahati Refinery, ** Assam Pollution Control Board, *** Under AUIIP project, baseline monitoring)

53. The maximum day time noise level was 92 dBA at Bamunimaidam and maximum night

time noise level (81dBA) was also found at Bamunimaidam. Minimum noise level was recorded at North Jyoti nagar area. Commercial activity at Bamunimaidan area, Noonmati and Beltola area is may be reason of high noise levels at those locations.

B. Ecological features

1. Protected Areas and Reserve Forest

54. There are 9 reserve forests within GMA with a total area of 17,673.93 sq km apart from the Deeporbeel (Ramsar wetland) having an area of 4.14 sq km. **Table 11** presents the names of the reserve forests along with their extents.

55. Part of the distribution pipeline at Jonaki nagar and Basistha areas are located within Hengrabari and Garbhanga resettlement framework, respectively.

Table 11: Reserve Forests in Guwahati Metropolitan Area

S. No.	Name of Reserve Forest	Area (sq. km)
1	Garbhanga	11, 460.95
2	Gotanagar	171.00
3	Fatasil	670.44
4	Hengrabari	498.00
5	Jalukbari	97.70
6	Maliata	325.46
7	Rani	4,372.38
8	Sarania Hills	8.00
9	South Kalapahar	70.00
	Total Area	**17,673.93**

Source: Directorate of Forests, 2007

2. Wetlands

56. Guwahati has a large number of low lying areas and some of them have developed into lakes and water bodies. These wetlands help in mitigating the problems of flash flood, which is a common occurrence during the monsoon season. Larger water bodies are popularly known as *beels*. Those mostly serve as backyard fishing ponds to the residents particularly in rural areas. There are around 7 wetlands in and around Guwahati namely: (i) Deeparbeel; (ii) Borsolabeel; (iii) Sarusolabeel; (iv) Silsakubeel; (v) Zentiabeel; (vi) Kamrangabeel; and (vii) wetlands of Dimoria block. Deeparbeel (Ramsar weltand), Kamrangabeel, and Zentiabeel are favorite sites for the migratory birds while Deeporbeel is the storehouse of more than 170 varieties of fishes and act as the main storm water storage basin of the city. There is no wetland located within the subproject area.

57. Deeporbeel is a former channel of Brahmaputra River located 9 km to the southwest of the city. It is a permanent fresh water lake with abundant aquatic vegetation. The lake and its surrounding swamps, comprising an area of 4.14 sq km, have been (i) declared as a bird sanctuary on 1st January 1989; (ii) included in the Directory of Asian Wetlands; and (iii) included as a Ramsar Site. There are about 170 species of birds, 2 critically endangered, 1 endangered, 5 vulnerable and 4 near threatened recorded in Deeparbeel. No alignment of water distribution pipeline is within or adjacent to this protected wetland.

3. Flora and Fauna

58. Flora and fauna in the subproject alignment are those commonly found in urban and built-up areas. There are no recorded endangered or critical species in the project area. However the common flora and fauna found in Guwahati are given in **Tables 12 & 13** below.

Table 12: Common Flora of Guwahati

S. No.	Plant Species	Family
1.	*Artocarpus chaplasha*	Moraceae
2.	*Alphonsea ventricosa*	Annoanceae
3.	*Castanopsis indica*	Fagaceae
4.	*Canarium spp.*	Burseraceae
5.	Dillenia indica	Dilleniaceae
6.	*Dysoxylum procerum*	Meliaceae
7.	*Magnolia spp.*	Magnoliaceae
8.	*Mesua*	Clusiaceae
9.	*Stereospermum personatum*	Bignoniaceae
10.	*Tetrameles spp.*	Tetramelaceae
11.	*Actinodaphne obovata*	Lauraceae
12.	*Aesculus spp.*	Sapindaceae
13.	*Artocrpus chama*	Moraceae
14.	*Albizia spp.*	Fabaceae
15.	*Anthocephalus chinensis*	Ruhiac,eae
16.	*Duabanga grandiflora*	Lythraceae
17.	*Bauhinia purpurea*	Fabaceae
18.	*Michelia champaca*	Maguoliaceae
19.	*Schima wallichii*	Theaceae
20.	*Trewianudi flora*	Euphorbiaceae
21.	Lageraroemia spp	Lythraceae

(Source: EIA Report – Environment Information Center, New Delhi, 2011)

Table 13: Common Fauna of Guwahati

S. No.	Scientific Name	Common Name	Name of the Family
1.	*Macacamulatta*	Rhesus macaque	Cercopithecidae
2.	M. *assamensis*	Assamese macaque	Cercopithecidae
3.	*Tardigraduscoucang*	Slow Loris	Lorisidae
4.	*Viverrazibetha*	Large Indian civet	Viverridae
5.	A. *binturong*	Binturong	Viverridae
6.	H. *urva*	Crab eating mongo	Herpestidae
7.	*Melogalemoschata*	Ferret badger	Mustelidae
8.	*Arctonyxcollaris*	Hog badger	Mustelidae
9.	*Rhizomyspruinosus*	Hoary bamboo rat	Cricetidae
10.	*Cannomysbadius*	Bay bamboo rat	Spalacidae
11.	*Leptoptilosdubius*	Greater Adjutant Stork	Ciconiidae

(Source: EIA Report – Environment Information Center, New Delhi, 2011)

59. Final construction designing will be done judicially so that no trees need to be cut. In case of requirement of tree felling during implementation of the project permission will be taken from concerned authority. As per DBO contract contractor will be responsible for collection of all NOC like tree cutting permission (if any) after detail design.

C. Economic Development Features

1. Land Use

60. Built up areas in Guwahati accounts for about 50% of the land. Lands categorized as unusable lands and vacant lands are presently categorized as green belt and water bodies/*beels* which accounts for about 30% of the area. Rest of the area is under public/semipublic use, special category lands and open spaces/parks.

61. All areas in the GMA have been designated as one of the 9 use-zones, which are residential, commercial, industrial, public- and semi-public, recreational, transportation, eco-sensitive zone, composite Use I and composite Use II. The Composite Use I includes residential, commercial, and public- and semi-public uses, whereas Composite Use II includes residential, commercial, public- and semi-public and industrial (existing) uses. Proposed land use break up in GMA is shown in **Table 14** and in **Figure 5.** Other than the forest part and vacant hill area distribution pipeline will be laid all along the road within urban residential and commercial set up of Guwahati city.

Table 14: Proposed Land Use Break-up in GMA

S. No.	Land Use Categories	Area in Ha. (excluding New Towns)	% of Developed area	Area in Ha. (including New Towns)	% of Developed area
1	Residential	8,646	31.92%	10,383	31.65%
2	Retail Commercial	360	1.33%	447	1.36%
3	Wholesale Commercial	81	0.30%	417	1.27%
4	Industrial	518	1.91%	918	2.80%
5	Public and Semi-Public	3,270	12.07%	3,606	10.99%
6	Composite Use I	814	3.01%	814	2.48%
7	Composite Use II	300	1.11%	841	2.56%
8	Recreation & Open Space	3,324	12.3%	3,728	11.0%
9	Transportation	2,853	10.53%	3,407	10.39%
10	Eco-Sensitive / Eco Friendly Zone	6,919	25.5%	8,245	26.0%
	Total	**27,085**	**100%**	**32,806**	**100%**

(Source: Master Plan for Guwahati, 2009)

2. Trade and Commerce

62. Guwahati has the largest wholesale and retail market in the North Eastern region. The city has over 57,000 trade establishments (based on 2002 to 2003 data). All the trade establishments are registered by GMC.

3. Major Markets

63. Fancy Bazaar and Paltan Bazaar are the major market centers in the city. Fancy Bazaar is the largest wholesale and retail market in the entire North Eastern Region. All types of commodities from food grains, vegetables, fruits, household grocery items, hardware, and retail goods like clothes and stationeries are sold in this market. Paltan bazaar is the second largest market in Guwahati dealing mainly in automobile parts, tools and machineries, hardware. Besides, it is also the largest transport hub in the North Eastern region, where the Inter State Bus Terminus is located.

4. Industry

64. Guwahati is one of the major industrial centers of Assam and the North Eastern Region. The location of the Northern Frontier Railway Headquarters, Guwahati Oil Refinery at Noonmati and other heavy- and medium-size petrochemical industries have added industrial impetus to the city. Ancillary industries to the refinery like the Assam Carbon and India Carbon have also developed. There are 507 industrial units located in and around Guwahati in the industrial estates. The industrial estates are managed by the Directorate of Industries. The Assam Industrial Development Corporation is located at Banda, Bamunimaidan, North Guwahati, Rani -South and Amingaon areas.

65. Since 1971, Guwahati has also become a tea auction center, the second of its kind in India next to Kolkata.

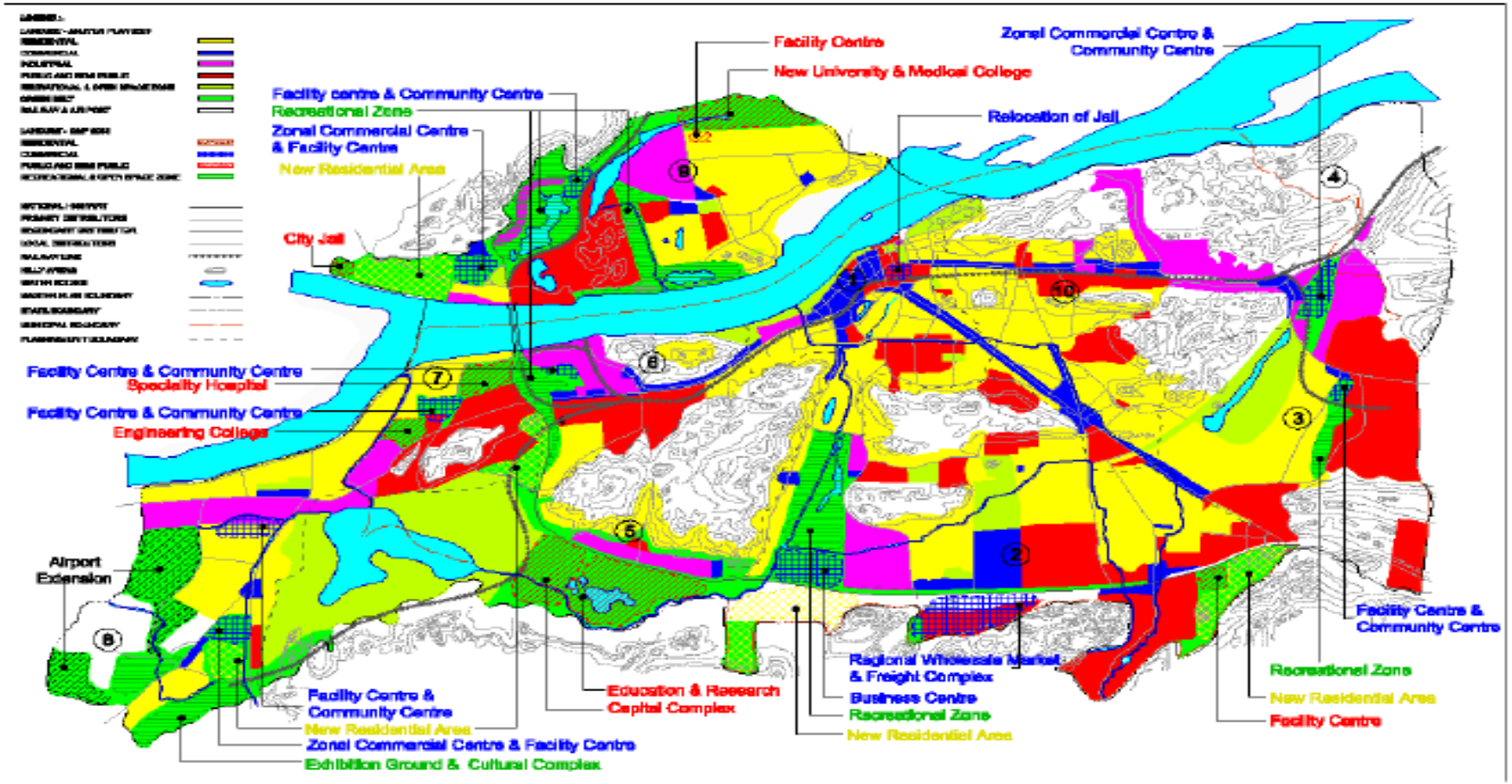

Figure 5: Proposed Land Use Plan of Guwahati

5. Physical Infrastructure

66. **Water Supply**. The primary source of water for Guwahati is the Brahmaputra River, which has flow of about 4,500 cubic meters per second. River Brahmaputra can provide as much as 78.1 billion cubic meters (or 78,100 billion liters/day) of water during monsoon and 56.12 billion cubic meters (or 56,120 billion liters/day) in non-monsoon days. The level of water remains at 48.17 meters above mean sea level for 50% of the monsoon season which lasts around 150 days. The capacity of the proposed South east Guwahati water intakes from the river is about 104 MLD while the proposed WTP capacity under the sub project is 98 MLD. The water supply to the city is provided by the three independent organizations namely the GMC, the APHED and the AUWSSB through their respective systems. Collectively, these systems provide potable water to only 30% of the city population. The total installed capacity water generation under GMC area is around 98 MLD considering the capacities of the treatment plants at Panbazar, Patpabhri and Hengrabari. However, the total water produced is only 79 MLD. The level of service, in terms of per capita water availability varies with 113 lpcd in the eastern part of the city and 60 lpcd in the western part. The remaining parts of GMA are dependent on tube wells, which have reported increase in iron and fluoride concentrations.

67. **Sewerage and Sanitation**. GMA does not have an integrated sewerage system except for certain establishments having their own independent systems such as colonies managed by the railway and defense authorities and the Indian Oil Corporation. In the absence of an organized system, septic tanks with or without soak pits are the most prevalent mode. Given the high subsoil water table in all but the hilly portions of the GMA, the soak pits are non-functional, thereby polluting the groundwater. In the low income areas, specifically in the 26 designated slum areas, most of the wastewater is discharged into the Bharalu River which finally drains into the Brahmaputra River. A drainage canal leading to River Brahmaputra has been noted upstream of the water intake however site inspections conducted in March and May 2011 show that the flow from this drainage is low and insignificant as compared to the flow of the river.

68. **Storm Water Drainage.** GMA can be divided into six drainage basins. The wetlands and other water bodies in GMA collectively act as the receptors of storm water during the monsoons. The natural drainage system in the GMA has been impaired due to unplanned development, encroachment onto natural wetlands and low-lying areas, blocking of the water courses and drainage channels, and compounded by disposal of solid wastes into these systems. Further, during monsoon, the water level of the Brahmaputra River sometimes, is higher than the ground level of the city areas, thereby inhibiting the natural flow of the city storm water into the river, further complicating the drainage problem in the city. The frequent water logging has been attributed to several reasons cited as under: (i) undulating topography;(ii) inadequacy of natural and artificial drains in carrying the storm water due to their narrowness and a rise in their bed level; (iii) encroachments over the low lying areas by new settlers on either side of the natural drains which has blocked the natural flow of the flood water to the drains; (iv) construction of buildings and roads over the manmade drains; (v) indiscriminate cutting and quarrying of hill slopes for filling up of low lying areas results in sheet wash and blockage of channels; (vi) most of the original swamps and natural water reservoirs are filled up for residential, industrial or institutional purposes. Consequently, the rain water spread over the built up areas causes flash flood; and (vii) rising of the ground water table with the rising of the Brahmaputra reduces the rate of percolation.

69. **Solid Waste Management**: Guwahati generates Solid Waste 550 to 600 tons per day @ 436 to 478 gms per capita/day. Guwahati Waste Management Company (P) Ltd at present

manages to collect process & dispose as per Govt. of India Municipal Solid Waste Handing rules (MSWHR, 2000) drawn 90% of the waste generated , are collected. Segregation at source is not done properly. The collected waste include domestic (55%), commercial (18%), street sweeping and drain cleaning (15%) & rest are other dykes of wastes. Street cleaning is done by 800 sweepers covering a total road length of 639 km and 270 workers for drain cleaning. The organic waste processing capacity for the MSW facility is only 50 tons/day which much less than the actually needed i.e. between 150 to 200 ton per day. The number of various equipment used for the facility for collection are, 27 nos, dumper placers, 4 nos open trucks, 3 nos compactor, 58 auto tripper, 2 nos. JCB, 1 no small JCB, 1 no bulldozer, 2 nos EX70, 1 no EX70, 350-Tricycles, and 370 nos. of metal bins and around 1000 sweepers are used for door to door collection.

70. **Transport**. The total road length of Guwahati is 1145.9 km. GMC takes up development of about 20 km of roads every year. This works out to a road density of 43 km/sq.km. There are two major roads within the city with a length of 60 km and has an average width of 20 m. off street parking is found to be inadequate in the city. Pedestrian facilities are found to be poor and there are street vendors blocking the traffic causing congestion. Movement of goods vehicles and non-motorized transport also add to the congestion. Condition of roads for both major and minor are classified to be poor as per ULB and Line Department Survey.

71. Guwahati has public transport system run by private operators since 1961. At present, it operates on 17 routes covering almost the entire city. Eight new routes would be opened shortly. The Assam State Transport Corporation also operates city bus service in Guwahati but it covers the main routes and has limited frequency.

72. While the demand for transportation services in Guwahati has increased rapidly, supply is lagging. The GMA is constrained in terms of road space and alternative routes and as a result, severe traffic congestion problems have developed. Other issues include existence of choke points on the arteries, poor geometry of intersections, overflow of on-street parking onto ROW, presence of bus and truck terminals in densely traveled areas and inadequate attention to traffic management. Public transport system is poor, and there is a lack of mass public transport systems. Absence of a comprehensive traffic and transport plan to identify the sectoral priorities and vision for the sector, that shall enable phasing of the investments required is identified as a major gap.

D. Social and Cultural Features

1. Area and Population

73. The total area of Guwahati under the jurisdiction of GMC boundary is 216 sq km and that of Guwahati Metropolitan Development Authority (GMDA) is 262 sq km. **Table 15** gives the population of Guwahati within and outside the municipal area.

Table 15: Guwahati: Population, 2011

Urban Unit	Details
Within Municipal Limits	1037011
Outside Municipal Limits	216927
Total Master Plan Area	1253938

Source:*Census of India 2011 Assam

2. Population Growth

74. **Table 16** gives the population growth rate in Guwahati. The growth rate after a steep decline in 1981-91 has again shown a rapid increase in 1991-2001.The growth rate of population outside the municipal area has shown a consistent trend.

Table 16: Guwahati: Annual Average Growth Rate of Population (%)

Urban Unit	1971-81	1981-91	1991-01	2001-11
Within Municipal Limits	16.1	0.6	3.3	28.33
Outside Municipal Limits	2.4	3.9	3.2	

Source: Census of India, Rural–Urban Distribution of Population, and Provisional Population Totals of Respective States, 2011

75. A very high proportion of population (24%) in Guwahati is migrants. Being a regional center, all major facilities are housed in this city. It serves as a hinterland to the whole of the North Eastern Region. The literacy rate in Guwahati has shown an improvement from 70.6% in 1991 to 77.8% in 2001. The share of scheduled tribes is comparatively lower as compared to other project cities. The share of Schedule caste (SC) population to total population is 6.3% and of ST is 4.1% as per census.

3. Health

76. With the lack of sanitation facilities, poor coverage of the drinking water supply and stagnant water there are a large number of water borne health risks in Guwahati. Records from the Assam Department of Health illustrate these concerns very well. Often diarrheal diseases go unreported and only the more serious cases merit attention. Even then the patterns identified show the presence of these diseases throughout the year. This could be attributed to the consumption of contaminated water, poor hygiene and unsanitary living conditions as all these reported cases in 2006 shows very high incidence of enteric fevers in June, the period when the monsoon is present in its full fury in the city. This perhaps may also be due to contamination of the drinking water sources with sewage and waste. This is possible in areas where water logging would be leading to contamination of potable water in vulnerable sections of the water supply network. The classification ‘enteric fever’ would include typhoid cases. Contamination of domestic water supplies occurs through many routes. The lack of a proper sewerage system has implications on water quality.

77. According to a study on the North East, of the 16 genera of mosquitoes found in the region 15 are found in Assam. While not all of them may find suitable habitats in Guwahati or be carriers of disease, the present unsanitary conditions can make an appropriate habitat for some of them. Malaria and Japanese encephalitis are the 2 water vector diseases the city authorities are monitoring. There have been a few deaths reported due to malaria.

4. Tourism

78. Guwahati has a number of temples, which are important tourist destinations. Some of these are the (i) Kamakhya temple on top of the Nilachal hills that is an important center for tantric form of Hinduism and Saktism; (ii) Umananda on the peacock island, in the middle of the Brahmaputra; and (iii) Nabagraha and Sukleshwar are notable places of Hindu pilgrimage. Other places of tourist importance in Guwahati are Bhubaneshwari Temple, Vasistha Ashram, Balaji temple, Planetarium, the State Museum, Science Museum, State Zoological Park cum Botanical Garden, and Srimanta Sanakardeva Kalashetra. The number of domestic tourists has increased considerably while foreign tourist inflow has remained constant in the past three

years.

5. Slums

79. There are nine slums in the GMC area, all of which are notified. Four slums are on private lands, and five are on Government lands. All the slums occupy 77,300 sq. meters of lands. About 2% of the city's population resides in slums.

6. Sensitive Receptors

80. There are number of sensitive receptors like religious place, health facility and educational institutes are located nearby the proposed water distribution pipeline. **Table 17** shows the list of sensitive receptors along the pipeline zones. During construction safety arrangement needs to be maintain at those locations.

Table 17: Sensitive Receptors Along Distribution Pipeline Zone

S. No	Alignment of Pipe Line through Reservoir Zones	Areas
1	Gopal Nagar.	1.Kali Mandir 2. Jagannath Mandir 3. Durga Mandir 4. Sani Mandir 5. Shrimanta Sankardev Vidyalaya, Madhabpur 6. Madhabpur Namghar 7. Indian Red Cross Society 8. Indian Oil Corporation Limited 9. Shiv Mandir 10.Nizarapar Namghar 11.DhupGuri Namghar 12. Guwahati Refinery High School 13. Bishnu Mandir 14. Guwahati Refinery Health Centre 15. Guwahati Refinery Hospital 16. Noonmati Prathamik Vidyalaya 17. Janata Hindi Vidyalaya
2	North Jyoti Nagar	1. Kali Mandir 2.Shiv Mandir 3. Sani Mandir 4. jyoti Nagar High School 5. Namghar 6. Primary School
3	Kenduguri	1. ASEB High School 2.Narengi Primary School 3.Namghar
4	Jonaki Nagar	1. E.G. Nursing Home 2. Vidyamandir Junior College 3. Narangi Junior College 4. Narangi Prathamik Vidyalaya 5. Narangi M.E. School 6. Ganesh Mandir 7. Narangi Ansalik Mahavidyalaya 8. Shrimanta Sankardev Namghar 9. Glacier School 10. Kids Planat School

S. No	Alignment of Pipe Line through Reservoir Zones	Areas
		11. Genius Academy 12. Shiv Mandir 13.Hindustan College 14.Namghar 15.Oil India Limited
5	Jonaki Nagar Tapping point to Sixmile tapping point.	1. Pratiksha Hospital 2. Sankardev sisu vidya Niketan 3. Natinal Institute of Film, televission & theatre 4. Institute of Hotel Management 5. Suman Academy 6. Rahman Hospital 7. D. D. Baruah college
6	Sixmile tapping point to storage reservoir at Nabajyoti Nagar.	1. Majjhit 2. Hiteswar Saikia College 3. Kabarsthan 4. Defordhil School 5. Sankardev Kalakhetra 6. Guwahati Psycriatic Hospital 7. P. Baruah Nursing School 8. Saraswati Hindi L.P. & M.E. School 9. Regional Institute of Paramedical Technology
7	Basistha	1. GNRC Hospital 2. Jayanagar Rajahuwa Namghar 3. Agile Hospital 4. North East Regional Institute Of Management 5. Paramount High School 6. Army Institute of Nursing 7. 151 Base Hospital 8. Guwahati Blind High School 9. Army Public School 10. Shri Ram Mandir 11. Govt. college of Arts & Craft, Basistha 12. Siv Mandir

IV. ANTICIPATED IMPACTS AND MITIGATION MEASURES

81. 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) water distribution network pipeline sites; (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 Guwahati area outside of the delineated primary impact area; and (ii) entire Guwahati district in terms of over-all environmental improvement.

82. The ADB Rapid Environmental Assessment Checklist for Water Supply was used to screen the subproject for environmental impacts and to determine the scope of the IEE investigation. The completed Checklist is enclosed in **Appendix 3.** The proposed subproject component will interact physically with the environment. Contractor to reassess findings of the REA upon completion of the detailed design.

83. In the case of this subproject (i) most of the individual elements are relatively small and involve straightforward construction and operation, so impacts will be mainly localized and not greatly significant; (ii) most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving excavation and earth movements; and (iii) mostly being located in the built-up areas of Guwahati city, will not cause direct impact on biodiversity values. The subproject will be in properties held by the local government and access to the sub projects locations is thru public ROW and existing roads.

A. Pre-construction: Location and Design

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

85. Impacts arise from the design of the project including the technology used and scale of operation.

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

87. **Encroachment into private properties, forestland and cutting of trees and damage to vegetation.** Construction works in the Guwahati city area, the pipelines are mostly 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.

88. As mentioned earlier the part of the water distribution pipeline will fall within the forest area. No Objection Certificate (NOC) from the Assam Environment and Forest Department will be required. As per present design PMU with assistance from DMSC is involved in collection of NOC, process has been initiated. In case of revision of design DBO contractor will collect NOC from Forest department. The following measures are to be implemented to minimize any impacts:

(i) Identify and assess the livelihood and resettlement impacts, including temporary impacts, through resettlement planning process. Implement measures as recommended by the resettlement plan;
(ii) Materials required for the work should be stored in proper area and transported to the site as and when required manually; and
(iii) No equipment generating excessive noise shall be used for construction.

89. **Site selection of sources of materials**. Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution. To mitigate the potential environmental impacts, locations of quarry site/s and borrow pit/s (for loose material other than stones) would be included in the design specifications and on plan drawings. Priority would be,

sites already permitted by Mining Department. If other sites are necessary, these would to be located away from population centers, drinking water intakes and streams, cultivable lands, and natural drainage systems; and in structurally stable areas even if some distance from construction activities. It will be the construction contractor's responsibility to verify the suitability of all material sources and to obtain the approval of the GMC. 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 GMC. Selected quarry areas are listed below.

Table 18: Selected Quarry Areas

Name of Quarry	**Material**	**Road**	**Distance in km**		**Total Distance (in km)**	
Barpathar Quarry	Boulder, Stone Aggregate & stone dust	Quarry to Basistha Temple	Surfaced	2.00	Surfaced	22.00
			Unsurfaced	0.00		
			Katcha	0.00		
		Basistha Temple To Site	Surfaced	20.00	Unsurfaced	0.00
			Unsurfaced	0.00		
			Katcha	0.00		
			TOTAL LEAD (km) =			22.00
Name of Quarry	**Material**	**Road**	**Distance in km**		**Total Distance (in km)**	
Nineth Mile Earth Quarry	Soil for roadworks	Quarry to Khanapara	Surfaced	5.00	Surfaced	20.00
			Unsurfaced	0.00		
			Katcha	0.00		
		Khanapara to Site	Surfaced	15.00	Unsurfaced	0.00
			Unsurfaced	0.00		
			Katcha	0.00		
			TOTAL LEAD (km) =			20.00
Name of Quarry	**Material**	**Road**	**Distance in km**		**Total Distance (in km)**	
Saygaon , kukurmara river bank of Bramhaputra	Sand	Kukurmara to Site	Surfaced	70.00	Surfaced	70.00
			Unsurfaced	0.00		
			Katcha	0.00		
			TOTAL LEAD (km) =			70.00
Name of Quarry	**Material**	**Road**	**Distance in km**		**Total Distance (in km)**	
Guwahati paltan Bazar	Cement Steel Pipe,brick	Paltan Bazar to Site	Surfaced	21.00	Surfaced	21.00
			Unsurfaced	0.00		
			Katcha	0.00		
			TOTAL LEAD (km) =			21.00

B. Construction Impacts

90. Construction and operation are the two activities in which the project interacts physically with the environment, so they are the two activities during which the environmental impacts

occur. Construction impacts are associated with site cleaning, earth works, physical construction related materials movements and works, machinery, vehicles and workers. It also includes the erosion, dust, noise, traffic congestion and waste production associated with the construction activities.

1. Construction Method

91. As far as possible, the distribution mains will follow the alignment within the existing ROWs of lanes/roads in densely populated areas. Pipelines following road alignment will be buried in trenches with minimum of 1 meter (m) clear cover within the ROW, on or adjacent to the road. The maximum and minimum trench width will be 1640 mm to 712 mm and depth will be 2190 mm to 1262 mm.

92. The trenches will be excavated using heavy equipment such as soil excavator, backhoes and some time manually (particularly at narrow lane). Excavation in hard surfaces like cement concrete roads will be supplemented by pneumatic drill. Excavated soil will be placed nearby and a bed of sand or gravel - obtained from local quarries, will be placed at the bottom of the trench. Pipes (brought to site on trucks and stored on nearby unused land) will be placed in the trench over the clean soil or sand bedding using a small rig. Pipes will be joined by hand, after which excavated soil will be replaced around and on top of the pipe manually.

2. Construction Impacts

93. **Sources of Materials**. Certain amount of gravel, sand, and cement will be required for this subproject. The construction contractor will be required to:

(i) Use material sources permitted by government;
(ii) DBO contractor select permitted sources for procurement of construction materials. In case of selection of new source approval will be required from DMSC; and
(iii) Submit to DMSC on a monthly basis documentation of sources of materials.

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

(i) Consult with DMSC on the designated areas for stockpiling of clay, soils, gravel, and other construction materials;
(ii) Excavation for pipeline will be carried out along with development of WTP land (presently low land) so that dug/ overburden material is used immediately;
(iii) Avoiding the need to stockpile on site;
(iv) Damp down exposed soil and any stockpiled on site by spraying with water when necessary during dry weather;
(v) Use tarpaulins to cover sand and other loose material when transported by trucks; and
(vi) Fit all heavy equipment and machinery with air pollution control devices which are operating correctly.

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

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

96. **Noise Levels**. There are no health facilities, scheduled or unscheduled historical, archaeological, paleontological, or architectural sites near the construction sites. 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. The construction contractor will be required to:

(i) Plan activities in consultation with DMSC so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance;
(ii) Require horns not be used unless it is necessary to warn other road users or animals of the vehicle's approach; and
(iii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor.

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

(i) Obtain from DMSC the list of affected utilities and operators (line agency); and
(ii) Prepare a contingency plan to include actions to be done in case of unintentional interruption of services.

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

(i) Prepare and implement Waste Management List;

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

99. Preliminary estimate indicates that 134542 cubic meter of excess earth will be generated due to laying of about 535 km distribution pipeline. This amount may be changed after final design, which to be done by DBO contractor.

100. As depth of filling at WTP site (under the same program) is 4 m high covering 28942 sqm areas, so the excavated material from laying of water distribution pipeline, can be used for filling up of land proposed for new WTP. It has been ascertained that the excavated materials will be suitable for reuse and fill in WTP, the site will requires huge filling (112000 m^3).

101. **Landslides**. At some of the areas distribution pipelines will be laid in and within slopes, the excavation activities for laying of pipelines through hills can lead to slope disturbance leading to soil slip and landslide in the affected area if proper protection measures are not taken during construction activities. Excavation of trenches during monsoon season can also add to the problem. However, this can be minimized by observing necessary protection measures as suggested below:

(i) Identify the landslide susceptible areas within the subproject alignment during design stage;
(ii) Avoid excavation in hilly /susceptible areas particularly near overhead water storage reservoir sites of Jonaki Nagar, Kenduguri by aligning the pipeline above the ground; take appropriate protection measures against the landslide/landslip before start of the excavation at steep slopes susceptible to landslide;
(iii) Stagger the work in small sections;
(iv) Ensure safe stacking of the construction materials and excavated earth over flat Surface and provide bund around the stacked area;
(v) Remove the excess soil immediately from the site;
(vi) Minimize on-site storage. Bring construction sand/gravel only when required;
(vii) Do not carry out excavation works during monsoon; and
(viii) Construction of retention wall along the pipe line alignment, which is part of the working components under " overhead storage reservoirs package of Guwahati".

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

103. **Accessibility**. Some of the roads in the subproject sites are narrow thus excavation and trenching works along ROWs, hauling of construction materials and operation of

equipment onsite can cause traffic problems. Potential impact is negative but short term and reversible by mitigation measures. The construction contractor will be required to:

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

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

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

105. **Socio-Economic - Employment**. Manpower will be required during the 36 months construction stage. The final detailed implementation schedule will be provided in the updated IEE once the detailed design phase is completed. This can result to generation of contractual employment and increase in local revenue. Thus potential impact is positive and long-term. The construction contractor will be required to:

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

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

(i) Designate a safeguard focal person and undertake safeguards orientation by PMU/PIU;
(ii) Ensure H&S plan is easily understandable to workers and laborers. Keep

in mind that this plan will be used on-site and workers/laborers may not always understand highly technical terms;

(iii) Develop and implement site-specific Health and Safety (H&S) Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use Personal Protective Equipment; (c) H&S Training[10] for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents;

(iv) Strict compliance of H&S plan and requirements of wearing personal protective equipment (PPE) during work hours;

(v) Provide specific guidance for suitable PPE for every on-site work assignment;

(vi) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site;

(vii) Provide medical insurance coverage for workers;

(viii) Secure all installations from unauthorized intrusion and accident risks;

(ix) Provide supplies of potable drinking water;

(x) Provide clean eating areas where workers are not exposed to hazardous obnoxious substances;

(xi) Provide H&S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers;

(xii) 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;

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

(xiv) Ensure moving equipment is outfitted with audible back-up alarms;

(xv) 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

(xvi) 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.

107. **Community Health and Safety**. Hazards posed to the public, specifically in high pedestrian areas may include traffic accidents and vehicle collision with pedestrians. Potential impact is negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

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

(i) Plan routes to avoid times of peak-pedestrian activities;
(ii) Liaise with DMSC in identifying risk areas on route cards/maps;
(iii) Maintain regularly the vehicles and use of manufacturer-approved Parts to minimize potentially serious accidents caused by equipment malfunction or premature failure;
(iv) Provide road signs and flag persons to warn of dangerous conditions, in case of location near the road;
(v) Provide protective fencing around open trenches, and cover any open trench with metal planks during non-construction hours; and
(vi) Develop and implement a traffic management plan.

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

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

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

(i) Stop work immediately to allow further investigation if any finds are suspected;
(ii) Inform DMSC if a find is suspected and take any action they require ensuring its removal or protection in situ; and
(iii) Request DMSC or any authorized person with archaeological/historical field training to observe excavation.

C. Operation and Maintenance (O&M) impacts

110. Presently three institutions are responsible for water supply in Guwahati City namely GMC, APHED, and AUWS&SB. AUWS&SB is mainly supplying water in the part of the central portion of Guwahati city. In the South Guwahati eastern zone only PHED is supplying water to some of the institutional consumers. GMC has the maximum coverage of residential consumers but not in the eastern zone.

111. The GMC has a Water Works Branch comprising about 155 staff headed by a superintending engineer and supported by a compliment of executive engineers, inspectors,

pump operators, fitters, filter operators, electricians, valve regulators, mechanics, foremen, gang-men and other technical support staff. This represents a staff ratio of about 7 staff per 1,000 connections. However, this does not include the administrative, financial and accounting staff needed to operate and manage the water supply service but assigned in other branches of the local government. The actual staff/connection ratio is probably considerably higher.

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

113. Work will be executed through a Design built operate Contract (DBO) where contractor will do the design & construction of the plant and further operation & maintenance, for a further period of 5 years after defect liability period of 12 months. It is presumed that there will no Environment impacts during the O & M period.

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

D. Cumulative Impact Assessment

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

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

116. The subproject IEE has identified the VCs as air quality, water (surface and Groundwater) quality, noise, traffic management, social- economic and socio-community, and human health. There are no foreseeable projects that will overlap with the subproject. The spatial boundary of the subproject is the area along the alignment and the existing ROWs. The temporal boundary can be considered as the whole Guwahati city.

117. Given the water supply requirement in Guwahati will be met and the source from

Brahmaputra is considered adequate[11], there are no significant cumulative impacts expected on the future water supply.

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

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

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

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

V. INSTITUTIONAL ARRANGEMENTS AND RESPONSIBILITY

A. Implementation Arrangements

122. The State Government of Assam's Guwahati Development Department (GDD) will be the executing agency. A state-level PMU, headed by a Project Director, will be established as the implementing agency which will be in-charge of overall execution and technical supervision, monitoring, and financial control of all activities under the project.

[11] River Brahmaputra can provide as much as 78.1 billion cubic meters (or 78,100 billion liters) of water during monsoon and 56.12 billion cubic meters (or 56,120 billion liters) in non-monsoon days. These quantities are equivalent to 433.9 billion liters per day during monsoon and 311.8 billion liters per day during non-monsoon season.

123. Project Implementation Units (PIUs) dedicated exclusively to the project would be set up in Guwahati and Dibrugarh. The PIUs will be headed by a senior technical officer and assisted by qualified and experienced officers seconded from ULBs, finance and other line departments. The PIUs will be responsible for the day-to-day activities of project implementation in the field and will be under the direct administrative control of the PMU. The PIU in Guwahati will have synergies and a coordination mechanism with the PIUs for JNNURM and JICA projects.

124. The PMU will have a Safeguards Compliance and Monitoring Unit (PMU SCMU) to ensure mitigation of any environmental and social impacts due to the subproject. The PMU SCMU will have a Safeguards Officer (PMU SO) who will have the following responsibilities: (i) address environmental and social safeguards issues; (ii) overall implement of the environmental assessment and review framework (EARF)/resettlement framework/IPF; (iii) monitor physical and on-physical activities under the Project; (iv) overall monitor implementation of safeguards plans; (v) guide the PIUs as and when necessary; and (vi) endorse/submit periodic monitoring reports12 received from DMSC to the PMU PD, who will then submit these to ADB. The PMU will seek State Government of Assam's clearance for submission and disclosure of the environmental and social monitoring report to ADB. It will also coordinate with national and state agencies to resolve inter-departmental issues, if any.

125. The PMU will be assisted by the DMSC Environment and Social Safeguards Specialists. The DMSC specialists will (i) review and finalize all reports in consultation with the PMU SO; (ii) provide project management support, (iii) assure the technical quality of design and construction, (iv) prepare EIA/IEE/resettlement plan/indigenous peoples plan reports; and (iv) provide advice on policy reforms. In addition, the DMSC will assist the PMU on the procurement needs and other project implementation aspects and shall play a central role in ensuring capacity building on environmental management of the PMU, contractors, and line departments through capacity development support and training.

126. As per DBO contract, the environment officer of contractor will be responsible for updating of IEE and field implementation of EMP. DMSC's environment specialist will advise contractor's environment officer during updating of IEE and field implementation of EMP. DMSC's specialist will oversee implementing and monitoring safeguards compliance activities, public relations activities, gender mainstreaming activities and community participation activities. DMSC's specialist will do field monitoring at least fortnightly and advice contractor for additional/ rectification of mitigation measures as per ground condition. DBO contractor will be responsible for obtaining statutory clearances and obtaining NOCs from government agencies /other entities.. PMU/PIU/DMSC will assist contractor in this aspect.

127. Environment Specialists will also be appointed as part of the DMSC teams to (i) assist contractor for updating of IEE in the detailed design stage; (ii) assist contractor in the monitoring of EMP during construction stage; and (iii) prepare EIAs/IEEs for new subprojects, where required to comply with national law and/or ADB procedure. **Figure 6** shows the implementation arrangement for environment and resettlement safeguards.

[12] The monitoring report will focus on the progress of implementation of the IEE/EIA and EARF, resettlement plan/resettlement framework and indigenous peoples plan/indigenous peoples planning framework, 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.

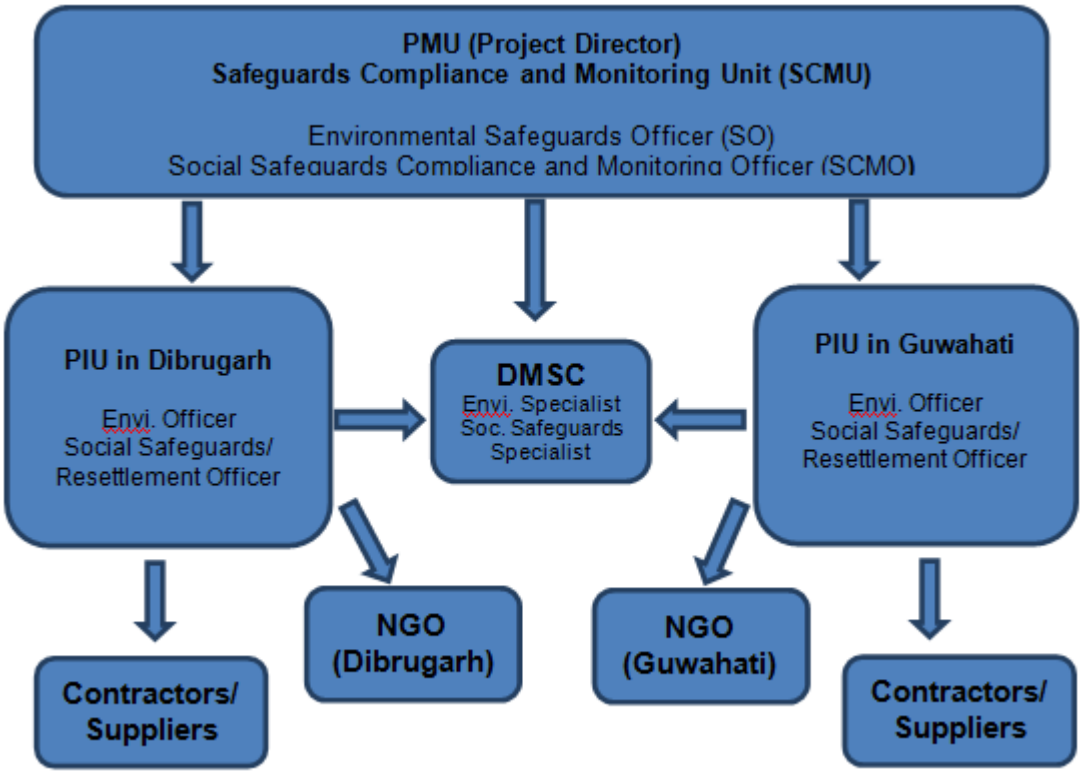

Figure 6: Safeguards Institutional Arrangement

B. Monitoring and Reporting

128. The PMU will monitor and measure the progress of EMP implementation. The monitoring activities will be corresponding with the Project's risks and impacts and will be identified in the EIAs/IEEs for the subprojects. In addition to recording information of the work, deviation of work components from original scope, the PMU, DMSC and PIUs will undertake site inspections for at least fortnightly and document review to verify compliance with the EMP and progress toward the final outcome.

129. DMSC will submit monthly monitoring and implementation reports to PIU, who will take follow-up actions, if necessary. PIU will submit the quarterly monitoring and implementation reports to PMU who will then submit to the PD. The PMU will submit semi-annual monitoring reports to ADB. The suggested monitoring report format is in **Appendix 4.** Project budgets will reflect the costs of monitoring and reporting requirements. For projects likely to have significant adverse environmental impacts during operation, reporting will continue at the minimum on an annual basis. Monitoring reports will be posted in a location accessible to the public.

130. ADB will review project performance against the EA's commitments as agreed in the legal documents. The extent of ADB's monitoring and supervision activities will be commensurate with the Project's risks and impacts. Monitoring and supervising of social and environmental safeguards will be integrated into the project performance management system.

131. ADB will monitor projects on an ongoing basis until a project completion report is issued. ADB will carry out the following monitoring actions to supervise project implementation:

(i) conduct periodic site visits for projects with adverse environmental or social impacts;
(ii) conduct supervision missions with detailed review by ADB's safeguard specialists/officers or consultants for projects with significant adverse social or environmental impacts;
(iii) review the periodic monitoring reports submitted by EA to ensure that adverse impacts and risks are mitigated as planned and as agreed with ADB;
(iv) work with EA to rectify to the extent possible any failures to comply with their safeguard commitments, as covenanted in the legal agreements, and exercise remedies to re-establish compliance as appropriate; and
(v) prepare a project completion report that assesses whether the objective and desired outcomes of the safeguard plans have been achieved, taking into account the baseline conditions and the results of monitoring.

C. Institutional Capacity

132. There is low capacity to implement projects in accordance with ADB safeguard requirements in both project cities. The Guwahati Municipal Corporation (GMC) do not have environmental/ social safeguards personnel, capacity to handle environmental/IR/IP impacts, gender and vulnerability issues. The DMSC will be responsible for training of PMU and PIUs staff on aspects such as environmental planning/resettlement planning/implementation, social protection and gender, including the specific recording, reporting and disclosure requirements.

133. The DMSC's environmental specialist will provide the basic training required for environmental awareness and management in accordance with both ADB and government requirements. Specific modules customized for the available skill set shall be devised after assessing the capabilities of the target participants and the requirements of the Project. The entire training will cover basic principles of environmental assessment and management; mitigation plans and programs, implementation techniques, monitoring methods and tools. Typical modules that will be present for the training session would be as follows: (i) sensitization; (ii) introduction to environment and environmental considerations in urban development projects; (iii) review of IEEs and Integration into the subproject detailed design; (iv) improved coordination within Nodal Departments; (v) monitoring and reporting system. The proposed training program along with the frequency of sessions is presented in **Table 19.**

Table 19: Training Program for Environmental Management

Program	Description	Participants	Form of Training	Duration/ Location	Conducting Agency
A. Pre-Construction Stage					

Program	Description	Participants	Form of Training	Duration/ Location	Conducting Agency
Sensitization Workshop	**Introduction to Environment:** ✓ Basic Concept of environment ✓ Environmental Regulations and Statutory requirements as per Government of India and ADB	Secretaries, Chief Engineer, Superintendent Engineers of PHED and UDD, the Development Commissioner, Chairman, CEO of DMB and Project Director (PD) and PIUs Environmental Officers (EOs)	Workshop	½ Working Day	DMSC Team
Session I					
Module I	**Introduction to Environment:** ✓ Basic Concept of environment ✓ Environmental Regulations and Statutory requirements as per Government of India and ADB	Engineers of, PHED and UDD, GMC, PMU (Technical Unit) and PIUs EOs	Lecture	¼ Working Day	DMSC Team
Module II	**Environmental Considerations in Urban Development Projects:** ✓ Environmental components affected by urban development in construction and operation stages ✓ Activities causing pollution during construction and operation stages ✓ Environmental Management Good Practices in Urban Infrastructure Projects	Engineers of PHED and UDD, GMC, PMU (Technical Unit) and PIUs EOs	Workshop	¼ Working Day	DMSC Team

Program	Description	Participants	Form of Training	Duration/ Location	Conducting Agency
Module III	**Review of IEE and its Integration into Designs:** ✓ IEE Methodology ✓ Requirement of data for updating of design ✓ Environmental Provisions in the EMPs ✓ Implementation Arrangements ✓ Methodology of Assessment of Pollution Monitoring ✓ Methodology for site selection of borrow areas, waste disposal areas etc.	Engineers of, PHED and UDD, GMC, PMU (Technical Unit) and contractor	Lecture and Field Visit	½ Working Day	DMSC Team
Module IV	**Improved Coordination with other Departments:** ✓ Overview of the Project ✓ Environmental and Social Impacts ✓ Statutory Permissions ✓ Procedural Requirements ✓ Cooperation and Coordination with other Departments.	Engineers of PHED and UDD, GMC, PMU (Technical Unit) and DBO contractor	Lecture / Interactive Sessions	½ Working Day	DMSC Team
Module V	**Special Issues in the Project** ✓ Bio-Diversity Assessment and Conservation ✓ Geomorphological Assessment and Slope Protection ✓ Statutory Permissions– Procedural Requirements ✓ Consultation and Counseling	Engineers of PHED and UDD, GMC, PMU (Technical Unit) and PIUs EOs	Lecture	½ Working Day	DMSC Team
B. Construction Stage					
Session II					

Program	Description	Participants	Form of Training	Duration/ Location	Conducting Agency
Module VI	**Role during Construction** ✓ Roles and Responsibilities of officials/ contractors/ consultants towards protection of environment ✓ Implementation Arrangements by DBO contractor ✓ Monitoring mechanisms ✓ Health and Safety issues during project implementation	Engineers of PHED and UDD, GMC, PMU (Technical Unit) and DBO contractor	Lecture / Field visit/ Interactive Sessions	½ Working Day	DMSC Team
Module VII	Monitoring and Reporting System	PMU (Technical Unit) and DBP contractor	Lecture / Interactive Sessions	½ Working Day	DMSC Team

Notes: DMSC – Design, Management and Supervision Consultant, EC – Environmental Clearance, EIA – Environmental Impact Assessment, EMP – Environmental Management Plan, EO- Environment Officer, ES- Environment Specialist, FAM – Facility Administration Memorandum, IEE – Initial Environmental Examination, MoEFCC – Ministry of Environment, Forest and Climate Change, NOC – No Objection Certificate, PHED - Public Health Engineering Department, PIU - Project Implementation Unit, PMU - Program Management Unit, REA – Rapid Environmental Assessment, SS- Safeguard Specialist, UDD - Urban Development Department, ULB - Urban Local Body

VI. CONSULTATION, INFORMATION DISCLOSURE, AND GRIEVANCE REDRESS MECHANISM

A. Public Consultations Conducted

134. A series of consultations were conducted with different categories of stakeholder including (i) the Chairman and ward members; and (ii) local communities, local residents, shopkeepers and businesspeople living and working alongside the roads/lanes, government officials, NGOs, and villagers in the immediate vicinity of the subproject sites. Ad hoc discussions were also held on site with people and communities who could be affected or benefited by the subproject, so that views could be expressed in a less formal setting. The main objective of the public consultation was to identify the stakeholders, to identify additional sources of water, to understand the local needs, preferences of basic infrastructure facilities and to draw up plans to improve the quality of life through better water supply system in Guwahati city. Location wise public consultation details shown in **Appendix 5.**

135. The local people have appreciated the water supply proposal of the government and they have ensured that they will cooperate with the EA during project implementation. They want the project to be started immediately to ensure safe water supply to them. The major issues raised during the public consultations are summarized as follows:

(i) Proposed water supply project should ensure enough supply of drinking water;
(ii) Efforts should be made by the government to maintain the drinking water supply round the clock ;
(iii) Livelihood affected households should be given adequate assistance in the mode of

cash compensation;
(iv) Local people should be employed by the contractor during construction work;
(v) Adequate safety measures should be taken during construction work; and
(vi) Proper arrangements should be made for access to houses and shops during construction throughout the construction period.

136. There is some landslide and subsidence problem which should be addressed properly in design.

B. Future Consultation and Disclosure

137. The public consultation shall be a continuous process and will continue in future also. DBO contractor will do the public consultation and focus group discussion during updating of IEE. During project implementation contractor will do the consultation regularly with affected persons. DMSC/ PIU will advice contractor the requirement and methodology. The PMU/PIU will extend and expand the consultation and disclosure process during implementation. An experienced NGO will be appointed to handle this key aspect of the program, who will conduct a wide range of activities in consultation with contractor/ PIU/DMSC in relation to all subprojects, to ensure that the needs and concerns of stakeholders are registered, and are addressed in project design, construction or operation where appropriate. The stakeholders will be fully engaged in the subproject and have the opportunity to participate in its development and implementation. The program of activities will be developed during the detailed design stage, and is likely to include the following:

1. Consultation during construction:

(i) Public meetings with affected communities to discuss and plan work programmers and allow issues to be raised and addressed once construction has started; and
(ii) 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.

2. Project disclosure:

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

C. Grievance Redress Mechanism

138. A project-specific grievance redress mechanism (GRM) will be established to receive,

evaluate and facilitate the resolution of affected people's concerns, complaints and grievances about the social and environmental performance at the level of the Project. The GRM will aim to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the project. The grievance redress mechanism and procedure is depicted in **Figure 7** below. The project-specific GRM is not intended to bypass the government's own redress process; rather it is intended to address affected people's concerns and complaints promptly, making it readily accessible to all segments of the affected people and is scaled to the risks and impacts of the project.

139. The PMU and PIUs will make the public aware of the GRM through public awareness campaigns. Grievances can be filed in writing using the Complaint Register and Complaint Forms **(Appendix 6)** or by phone with any member of the PMU or PIU. The contact phone number of the respective PIUs and the PMU will serve as a hotline for complaints and will be publicized through the media and placed on notice boards outside their offices and at construction sites. The safeguard documents made available to the public in an accessible version will include information on the GRM and will be widely disseminated throughout the corridor by the safeguards officers in the PMU and PIUs.

140. **First tier of GRM**. The PIU is the first tier of GRM which offers the fastest and most accessible mechanism for resolution of grievances. The Resettlement Officer and Environmental Officer in each PIU will be designated as the key officers for grievance redress. Resolution of complaints will be done within seven working (7) days. At this stage, the Resettlement Officer and Environmental Officer will inform the PMU's Safeguards Compliance and Monitoring Unit (SCMU) for additional support and guidance in grievance redress matters. Investigation of grievances will involve site visits and consultations with relevant parties (e.g., affected persons, contractors, traffic police, etc.). Grievances will be documented and personal details (name, address, date of complaint, etc.) will be included unless anonymity is requested. A tracking number will be assigned for each grievance, including the following elements:

(i) Initial grievance sheet (including the description of the grievance) with an acknowledgement of receipt given to the complainant when the complaint is registered;
(ii) Grievance monitoring sheet with actions taken (investigation, corrective measures); and
(iii) Closure sheet, one copy of which will be handed to the complainant after he/she has agreed to the resolution and signed-off.

141. The updated register of grievances and complaints will be available to the public at the PIU office, construction sites, and other key public offices along the project corridor. Should the grievance remain unresolved it will be escalated to the second tier.

142. **Second Tier of GRM**. The Resettlement Officer and Environmental Officer in each PIU will activate the second tier of GRM by referring the unresolved issue (with written documentation) to the PMU's Safeguards Compliance and Monitoring Unit who will pass unresolved complaints upward to the grievance redress committee (GRC)[13] that is now established. A hearing will be

[13] The GRC consists of the following persons: (i) Project Director; (ii) representative of the affected person(s); (iv) representative of the local Deputy Commissioners office (land); and (v) representative of APCB (for environmental-related grievances). The functions of the local GRC are as follows: (i) resolve problems quickly and provide support to affected persons arising from various environmental issues and including dust, noise, utilities, power and water supply, waste disposal, traffic interference and public safety as well as social and resettlement related issues such as land acquisition (temporary or permanent); asset acquisition; and eligibility for entitlements, compensation and assistance; (ii) reconfirm grievances of displaced persons, categorize and prioritize them and aim to provide solutions

called with the GRC, if necessary, where the affected person can present his/her concern/issues. The process will facilitate resolution through mediation. The local GRC will meet as necessary when there are grievances to be addressed. The local GRC will suggest corrective measures at the field level and assign clear responsibilities for implementing its decision within fifteen (15) working days. At field level contractor will resolve the complain in consultation with DMSC/PIU. If unsatisfied with the decision, the existence of the GRC will not impede the complainant's access to the Government's judicial or administrative remedies.

143. During community consultation formation of Grievance Redress committee and implementation of grievance redress mechanism fully explained. After formation of GRC, information will be disseminating at project influence area in local language.

144. The PMU SCMU officers will be responsible for processing and placing all papers before the GRC, maintaining database of complaints, recording decisions, issuing minutes of the meetings and monitoring to see that formal orders are issued and the decisions carried out.

145. **Third tier of GRM**. In the event that a grievance cannot be resolved directly by the PIUs (first tier) or GRC (second tier), the affected person can seek alternative redress through the union Parishad or ward committees or in the appropriate court of law. The PIUs or GRC will be kept informed by the district, municipal or national authority.

146. The safeguard monitoring reports will include the following aspects pertaining to progress on grievances: (i) number of cases registered with the GRC, level of jurisdiction (first, second and third tiers), number of hearings held, decisions made, and the status of pending cases; and (ii) lists of cases in process and already decided upon may be prepared with details such as Name, ID with unique serial number, date of notice, date of application, date of hearing, decisions, remarks, actions taken to resolve issues, and status of grievance (i.e., open, closed, pending).

147. The GRM notwithstanding, an aggrieved person shall have access to the country's legal system at any stage. This can run parallel to accessing the GRM and is not dependent on the negative outcome of the GRM.

148. In the event that the established GRM is not in a position to resolved the issue, the affected persons can also 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 Developing Member Countries. The ADB Accountability Mechanism information will be included in the Project Information Document to be distributed to the affected communities, as part of the project GRM.

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

within a month; (iii) report to the aggrieved parties about developments regarding their grievances and decisions of the GRC.

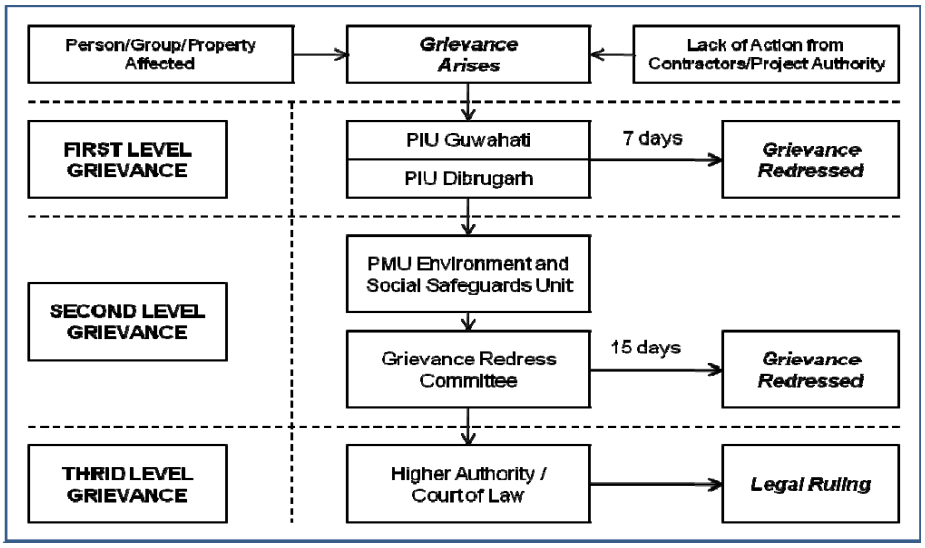

Figure 7: Grievance Redress Mechanism

VII. ENVIRONMENTAL MANAGEMENT PLAN

150. The potential impacts identified and assessed and the mitigation measures formulated to minimize those impacts to acceptable levels identified in the earlier sections are summarized in the following tables. The table also delegates the responsibility of implementing mitigation to various agencies involved in the program implemented as listed above.

151. The EMP will form part of the civil work bidding and contract documents. The contractor will be required to (i) update the IEE during detailed design stage; (ii) establish an operational system for managing environmental impacts (iii) carry out all of the monitoring and mitigation measures set forth in the EMP; (iv) implement any corrective or preventative actions set out in safeguards monitoring reports that the PMU/PIU will prepare from time to time to monitor implementation of this IEE and EMP; and (v) allocate a budget for compliance with these EMP measures, requirements and actions

A. Environmental Mitigation Plan

152. **Tables 20 to 22** show the potential adverse environmental impacts, proposed mitigation measures, responsible parties. This EMP included in the bid documents and will be further reviewed and updated during implementation.

B. Environmental Monitoring Program

153. **Tables 23 to 25** show the proposed environmental monitoring program for this subproject. It includes all relevant environmental parameters, location, method of monitoring, indicators/ standards of monitoring including frequency and responsibility of monitoring. Monitoring activities during the detailed engineering design stage will from part of the baseline conditions of the subproject sites and will be used as the reference for acceptance of restoration works by the construction contractors.

Table 20: Anticipated Impacts and Mitigation Measures – Pre-construction Stage

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
Utilities/ Tree cutting	Telephone lines, electric poles and wires, water lines within proposed project area Trees may be cut (if required) after final design	(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. (iii) Collection of tree cutting permission with assistance DMSC/ PIU	Primary – Contractor Secondary - DMSC	(i) List of affected utilities and operators and revision as per final design; (ii) Tree cutting requirement and permission (iii) Bid document to include requirement for a contingency plan for service interruptions
Water Supply	Health risk due to closure of water supply	(i) Plan the construction program to keep the cessation of water supplies to the minimum possible (in both area and duration); (ii) Design consideration as per CPHEEO Manual on water supply and treatment; and (ii) In coordination with GMC, provide alternative potable water to affected households and businesses for the duration of the shut-down if any	Primary – Contractor Secondary - DMSC	(i) Schedule of closure if any; (ii) delivery of potable water to affected people by GMC
Traffic Management	Impede traffic flow during construction	(i) Prepare a short traffic management schedule during preconstruction phase.	Primary – Contractor Secondary - DMSC	Ensure Traffic Management schedule is finalized before implementation.
Social and Cultural Resources	Ground disturbance can uncover and damage archaeological and historical remains	(i) Consult Archaeological Survey of India (ASI) or concerned department in Guwahati to obtain an expert assessment of the archaeological potential of the site; (ii) Consider alternatives if the site is found to be of medium or high risk; (iii) Develop a protocol for use by the construction contractors in conducting any excavation work, to ensure that any chance finds are recognized and measures are taken to ensure they are protected and conserved.	Primary – Contractor Secondary - DMSC	Chance Finds Protocol

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
Construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas.	Disruption to traffic flow and sensitive receptors	(i) Prioritize areas within or nearest possible vacant space in the subproject location; (ii) If it is deemed necessary to locate elsewhere, consider sites that will not promote instability and result in destruction of property, vegetation and drinking water supply systems; (iii) Do not consider residential areas; and (iv) Take extreme care in selecting sites to avoid direct disposal to water body which will inconvenience the community.	DBO contractor to select locations as per selection criteria / considering mitigation measures. PMU/PIU and DMSC to approve locations prior to construction	List of selected sites for construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas.
Sources of Materials	Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution.	(i) Prioritize sites already permitted by the Mining Department; (ii) 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 PMU/PIU and (iii) If additional quarries will be required after construction is started, inform construction contractor to obtain a written approval from PMU/PIU.	Contractor to prepare list of approved quarry sites and sources of materials	(i) List of approved quarry sites and sources of materials; (ii) Bid document to include requirement for verification of suitability of sources and permit for additional quarry sites if necessary.

CPHEEO = Central Public Health and Environment Engineering Organization, DMSC = Design, Management and Supervision Consultant, PMU = Project Management Unit; PIU = Project Implementation Unit

Table 21: Anticipated Impacts and Mitigation Measures – Construction Stage

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
Sources of Materials	Extraction of rocks and material may cause ground instability	(i) Use quarry sites and sources permitted by government; (ii) Verify suitability of all material sources and obtain approval of Investment PMU/PIU; (iii) If additional quarries will be required after construction has started, obtain written approval from PMU/PIU; and	Construction Contractor	Construction Contractor documentation

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		(iv) Submit to DMSC on a monthly basis documentation of sources of materials.		
Air Quality	Emissions from construction vehicles, equipment, and machinery used for excavation and construction resulting to dusts and increase in concentration of vehicle-related pollutants such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons	(i) Consult with PMU/PIU/DMSC on the designated areas for stockpiling of pipes, soils, gravel, and other construction materials; (ii) Damp down exposed soil and any stockpiled on site by spraying with water when necessary during dry weather; (iii) Use tarpaulins to cover sand and other loose material when transported by trucks; and (iv) Fit all heavy equipment and machinery with air pollution control devices which are operating correctly. (v) Conduct air quality monitoring	Construction Contractor	(i) Location of stockpiles; (ii) Complaints from sensitive receptors; (iii) Heavy equipment and machinery with air pollution control devices
Traffic Management	Impede traffic flow during construction	(i) Implement a traffic management schedule during construction phase.	Construction Contractor	DMSC to ensure traffic management measures are implemented and traffic is not significantly impeded during construction period.
Surface water quality	Mobilization of settled silt materials, run-off from stockpiled materials, and chemical contamination from fuels and lubricants during construction works can contaminate nearby surface water quality.	(i) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets; (ii) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with PMU/PIU/DMSC on designated disposal areas; (iii) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies; (iv) Place storage areas for fuels and lubricants away from any drainage leading to water bodies;	Construction Contractor	(i) Areas for stockpiles, storage of fuels and lubricants and waste materials; (ii) Records of surface water quality inspection; (iii) Effectiveness of water management measures.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		(v) Dispose any wastes generated by construction activities in designated sites; and (vi) Conduct visual surface quality inspection		
Noise Levels	Increase in noise level due to earth-moving and excavation equipment, and the transportation of equipment, materials, and people	(i) Plan activities in consultation with PMU/PIU/DMSC so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance; (ii) Require horns not be used unless it is necessary to warn other road users or animals of the vehicle's approach; (iii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise- reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor, and (iv) Maintain maximum sound levels not exceeding 80 decibels (dbA) when measured at a distance of 10 m or more from the vehicle/s.	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Use of silencers in noise- producing equipment and sound barriers.
Ecological resources –Terrestrial	Felling of the trees – affect terrestrial ecological balance	(i) Minimize removal of vegetation (if any) and disallow cutting of trees; (ii) If tree-removal will be required, obtain tree-cutting permit from Municipal Corporation, (iii) Require to plant three (3) native trees for every one (1) that is removed; and (iv) Prohibit employees from poaching wildlife, bird hunting, and cutting of trees for firewood.	Construction Contractor	(i) Complaints from sensitive receptors; (ii) checking of conservation management plan for tree species
Existing Infrastructure and Facilities	Disruption of service and damage to existing infrastructure at specified project location	(i) Obtain from PMU/PIU/DMSC the list of affected utilities and operators if any; (ii) Prepare a contingency plan to include actions to be done in case of unintentional interruption of service	Construction Contractor	Existing Utilities Contingency Plan

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
Landscape and Aesthetics	The presence of heavy duty vehicles and equipment, temporary structures at construction camps, stockpiles, may result in impacts on aesthetics and landscape character.	(i) Storage areas will be properly fenced off. (ii) Prepare and implement Waste Management List; (iii) Avoid stockpiling of excess excavated soils; (iv) Coordinate with GMC for beneficial uses of excess excavated soils of about 134542 cum or immediately dispose to designated areas- proposed WTP land. The site will requires huge filling (112000 m^3). (v) Recover used oil and lubricants and reuse or remove from the sites; (vi) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; (vii) Remove all wreckage, rubbish; (viii) Retain mature trees on and around the site where possible; (ix) Cluster construction activities on site on a specific area to avoid “sprawl”; (x) Unwanted material and litter will be removed on frequent basis; and (xi) Request PMU/PIU/DMSC to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.	Construction Contractor	(i) Waste Management List; (ii) Complaints from sensitive receptors; (iii) PMU/PIU/DMSC to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.
Accessibility	Traffic problems and conflicts near project locations and haul road	(i) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites; (ii) Schedule transport and hauling activities during non- peak hours; (iii) Locate entry and exit points in areas where there is low potential for traffic	Construction Contractor	(i) Traffic Management Strategy; (ii) Complaints from sensitive receptors; (iii) Number of signages placed at subproject location

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		congestion; (iv) Keep the site free from all unnecessary obstructions; (v) Drive vehicles in a considerate manner; (vi) Coordinate with Guwahati Traffic Office for temporary road diversions and with for provision of traffic aids if transportation activities cannot be avoided during peak hours; (vii) Notify affected sensitive receptors by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints; and (viii) Provide planks across trenches in front of businesses, and ensure works are completed quickly to avoid disruption		
Socio-Economic – Income.	Impede the access of residents and customers to nearby shops	(i) Leave spaces for access between mounds of soil; (ii) Provide walkways and metal sheets where required for people; (iii) Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools; (iv) Consult businesses and institutions regarding operating hours and factoring this in work schedules; and (v) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Number of walkways, signages, and metal sheets placed at subproject location.
Employment Generation	Generation of contractual employment and increase in local revenue	(i) The use of labor intensive construction measures will be used where appropriate; (ii) Employ local (unskilled) labor if possible;	Construction Contractor	(i) Employment records; (ii) records of sources of materials

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		(iii) Training of labor to benefit individuals beyond completion of the subproject; (iv) The training of unskilled or previously unemployed persons will add to the skills base of the area;. and (v) Recruitment of labors will take place offsite.		
Occupational Health and Safety	Occupational hazards which can arise during work	(i) Develop and implement site-specific Health and Safety (H&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, gloves, nose mask and ear plugs; (c) H&S Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents; (ii)Designate a safeguard focal person and undertake safeguards orientation by PMU/PIU; (iii)Ensure H&S plan is easily understandable to workers and laborers. Keep in mind that this plan will be used on-site and workers/laborers may not always understand highly technical terms; (iv)Strict compliance of H&S plan and requirements of wearing personal protective equipment (PPE) during work hours; (v)Provide specific guidance for suitable PPE for every on-site work assignment (vi) Ensure that qualified first- aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the project site; (vii) Provide medical insurance coverage	Construction Contractor	(i) Site-specific Health and Safety (H&S) Plan; (ii) Equipped first-aid stations; (iii) Medical insurance coverage for workers; (iv) Number of accidents; (v) Supplies of potable drinking water; (vi) Clean eating areas where workers are not exposed to hazardous or noxious substances; (vii) record of H&S orientation trainings (viii) personal protective equipment; (ix) % of moving equipment outfitted with audible back-up alarms; (xi) sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		for workers; (viii) Secure all installations from unauthorized intrusion and accident risks; (ix) Provide supplies of potable drinking water at working sites; (x) Provide clean eating areas where workers are not exposed to hazardous or noxious substances; and (xi) Provide H&S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers; (xii) 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; (xiii) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas; (xiv) Ensure moving equipment is outfitted with audible back- up alarms; (xv) 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 (xvi) 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.		

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
Community Health and Safety.	Traffic accidents and vehicle collision with pedestrians during material and waste earth transportation	(i) Plan routes to avoid times of peak-pedestrian activities. (ii) Liaise with PMU/PIU/DMSC in identifying high-risk areas on route cards/maps. (iii) Maintain regularly the vehicles and use of manufacturer- approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure. (iv) Provide road signs and flag persons to warn. (v) Provide protective fencing around open trenches, and cover any open trench with metal planks during non- construction hours. potentially cause soil contamination; (vi) Recover used oil and lubricants and reuse or remove from the site; (vii) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; (vii) Develop and implement a traffic management plan; and (viii) Request PMU/PIU/DMSC to report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.	Construction Contractor	(i) Traffic Management Strategy; (ii) Complaints from sensitive receptors
Camp sites	Temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants	(i) Consult PMU/PIU/DMSC before locating project offices, sheds, and construction plants; (ii) Minimize removal of vegetation and disallow cutting of trees; (iii) Provide water and sanitation facilities for employees; (iv) Prohibit employees from cutting of trees for firewood;	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Water and sanitation facilities for employees ; and (iii) PMU/PIU/DMSC report writing that the camp has been vacated and restored to pre-project

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		(v) Train employees in the storage and handling of materials which can potentially cause soil contamination; (vi) Recover used oil and lubricants and reuse or remove from the site; (vii) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; (viii) Remove all wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required; and (ix) Request PMU/PIU/DMSC to report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.		conditions
Social and Cultural Resources	Risk of archaeological chance finds	(i) Strictly follow the protocol for chance finds in any excavation work; (ii) Request PMU/PIU/DMSC or any authorized person with archaeological field training to observe excavation; (iii) Stop work immediately to allow further investigation if any finds are suspected; and (iv) Inform PMU/PIU/DMSC if a find is suspected, and take any action they require ensuring its removal or protection in situ.	Construction Contractor	Records of chance finds

DMSC = Design, Management and Supervision Management Consultant, H&S = health and safety, RPM = respirable particulate matter, PMU = Project Management Unit; PIU = Project Implementation Unit; SPM = suspended particulate matter, GMC = Guwahati Municipal Corporation

Table 22: Anticipated Impacts and Mitigation Measures – Operation and Maintenance Stage

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
General	General impact	(i) Refill and re-compact trenches soil and backfilled sand will be removed to expose the leaking junction or	Defect liability period – DBO Contractor, Later GMC and	Complaints from sensitive receptors

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
		pipe; (ii) Conduct work during non-monsoon period; and (iii) Cover or wet excavated material to prevent dusts.	O&M Contractors	
Social and Cultural Resources	Temporary disruption of activities	(i) Consult the city authorities to identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity; (ii) Complete work in sensitive areas quickly; (iii) Consult municipal authorities, custodians of important buildings, cultural and tourism authorities and local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals.	Defect liability period – DBO Contractor, Later GMC and O&M Contractors	Complaints from sensitive receptors
Land Uses	• With augmentation of water supply system, the presently water scarce areas can be put to their utmost possible use. • The proposed project is expected to facilitate an integrated development approach to the area thereby improving the overall quality of life. • The proposed development is expected to bring about positive economic benefits in the medium- to long- term.	Regular maintenance of the water supply infrastructure so as to ensure that its functional capacity and efficiency does not reduce.	Defect liability period – DBO Contractor, Later GMC and O&M Contractors	Complaints from sensitive receptors

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation
	• Local businesses and educational facilities, etc. are likely to benefit from the subproject.			
Health and Safety	• 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.	• Undertake regular monitoring and maintenance of water supply infrastructure.	Defect liability period – DBO Contractor, Later GMC and O&M Contractors	Complaints from sensitive receptors

H&S = health and safety, O&M = operation and maintenance, GMC = Guwahati Municipal Corporation

Table 23: Pre-construction Environmental Monitoring Program

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
Utilities/ tree cutting if any	As per site requirement	Primary – Contractor Secondary - DMSC	(i) List of affected utilities if any and operators; (ii) Bid document to include requirement for a contingency plan for service interruptions, and (iii)Collection of tree cutting permission with assistance DMSC/ PIU	Checking of records	(i) List of affected utilities and operators prepared; (ii)Tree cutting requirement and permission; and (iii) Requirement for a contingency plan for service interruptions included in bid documents	Once	PMU/PIU
Water Supply	As per site	Primary –	(i) schedule of	Checking of	(i) Tentative schedule	Once	PMU/PIU,

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
Cessation	requirement	Contractor Secondary - DMSC	closure; ('ii) Design consideration as per CPHEEO Manual on water supply and treatment; and (iii) delivery of GMC of potable water to affected people	records	of closure made known to affective people 2 weeks prior to cessation of water supply; (ii) Coordination with GMC for supply of potable water to 100% affected people		DMSC
Social and Cultural Heritage	As per site requirement	Primary – Contractor Secondary - DMSC	Chance Finds Protocol	Checking of records	Chance Finds Protocol provided to construction contractors prior to commencement of activities	Once	PMU/PIU/DMSC
Traffic flow management strategy	As per site requirement	Primary – Contractor Secondary - DMSC	Traffic Management Strategy	Checking of Traffic Management Strategy	Documents/ maps showing area of intervention and application of management strategy	Quarterly	PMU/PIU/DMSC
Construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas.	As per site requirement	DBO contractor to select locations as per selection criteria / considering mitigation measures. PMU/PIU and DMSC to approve locations prior	List of selected location for construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas.	Checking of records	List of selected sites for construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas provided to construction contractors prior to commencement of works.	Once	PMU/PIU/DMSC

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
		to construction					
Sources of Materials	As per site requirement	Contractor to prepare list of approved quarry sites and sources of materials PMU/ PIU/DMSC will approve after verification	(i)List of approved quarry sites and sources of materials; (ii) Bid document to include requirement for verification of suitability of sources and permit for additional quarry sites if necessary. (iii)Quality pipes needs to be procured after approval of DMSC/PIU	Checking of records	(i) List of approved quarry sites and sources of materials provided to construction contractors (ii) Bid document included requirement for verification of suitability of sources and permit for additional quarry sites if necessary. (iii) BID document provide details of the pipe	Once	PMU/PIU/DMSC

DMSC = Design, Management and Supervision Management Consultant, O&M = operation and maintenance, PMU = Project Management Unit; PIU = Project Implementation Unit

Table 24: Construction Environmental Monitoring Program

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
Sources of Materials	Quarries and sources of other materials	Construction Contractor	Construction Contractor documentation	(i) Checking of records; (ii) visual inspection of sites	(i) Sites are permitted; (ii) Report submitted by construction contractor monthly (until such time there is excavation work)	Monthly submission for construction contractor As needed for DMSC	DMSC
Air Quality	Construction	Construction	(i) Location of	(i) Checking	(i) Stockpiles on	Monthly for	DMSC in

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
	sites and areas designated for stockpiling of materials	Contractor	stockpiles; (ii) complaints from sensitive receptors; (iii) heavy equipment and machinery with air pollution control	of records; (ii) visual inspection of sites	designated areas only; (ii) complaints from sensitive receptors satisfactorily addressed; (iii) air pollution control devices working properly	checking records	coordination with Pollution Control Board
Surface Water Quality	(i) Construction sites; (ii) areas for stockpiles, storage of fuels and lubricants and waste materials	Construction Contractor	(i) Areas for stockpiles, storage of fuels and lubricants and waste materials; (ii) visual observation of surface water quality inspection; (iii) effectiveness of water management measures	Visual inspection	(i) Designated areas only; (ii) no noticeable increase in suspended solids and silt from construction activities	Monthly	DMSC
Noise Levels	(i) Construction sites; (ii) areas for stockpiles, storage of fuels and lubricants and waste materials; (iii) work camps	Construction Contractor	(i) Complaints from sensitive receptors; (ii) use of silencers in noise-producing equipment and sound barriers	(i) Checking of records; (ii) visual inspection	(i) Complaints from sensitive receptors satisfactorily addressed; (ii) silencers in noise-producing equipment functioning as design; and (iii) sound barriers installed where necessary	Monthly	DMSC in coordination with Assam Pollution Control Board

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
Existing Utilities and Infrastructure	Construction sites	Construction Contractor	(i) Existing Utilities Contingency Plan	(i) Checking of records; (ii) visual inspection	Implementation according to Utilities Contingency Plan	As needed	DMSC
Traffic	Construction sites	Construction Contractor	(i) ensure traffic management strategy is part of contract documents and being implemented	(i) Checking of records; (ii) visual inspection	Implementation according to traffic management plan	As needed	DMSC
Landscape and Aesthetics	(i) Construction sites; (ii) areas for stockpiles, storage of fuels and lubricants and waste materials; (iii) work camps	Construction Contractor	(i) Waste Management List; (ii) complaints from sensitive receptors; (iii) PMU/PIU/DMSC to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.	(i) Checking of records; (ii) visual inspection	(i) No accumulation of solid wastes on-site; (ii) implementation of Waste Management List; (iii) complaints from sensitive receptors satisfactorily addressed.	Monthly	DMSC
Accessibility	(i) Construction sites; (ii) traffic haul road	Construction Contractor	(i) Traffic Management Strategy; (ii) complaints from sensitive receptors; (iii) number of signages placed	Visual inspection	(i) Implementation of Traffic Management Strategy, if required; (ii) complaints from sensitive receptors satisfactorily addressed; (iii) signages visible and	Monthly	DMSC

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
			at subproject location.		located in designated areas		
Socio-Economic - Income	Construction sites	Construction Contractor	(i) Complaints from sensitive receptors; (ii) number of walkways, signages, and metal sheets placed at subproject location.	Visual inspection	(i) Complaints from sensitive receptors satisfactorily addressed; (ii) walkways, ramps, and metal sheets provided (iii) signages visible and located in designated areas	Quarterly	DMSC
Socio-Economic - employment	Construction sites	Construction Contractor	(i) Employment records; (ii) records of sources of materials	Checking of records	Number of employees from Guwahati equal or greater than 50% of total workforce	Quarterly	DMSC
Ecological resources – Terrestrial	Construction sites	Construction Contractor	Record related of tree felling if any	(i) Checking of records; (ii) visual inspection	(i)Complaints from sensitive receptors; (ii) checking of conservation management plan for tree species	Quarterly	DMSC
Occupational Health and Safety	Construction sites	Construction Contractor	(i) Site-specific Health and Safety (H&S) Plan; (ii) Equipped first-aid stations; (iii) Medical insurance coverage for workers; (iv) Number of accidents; (v) Supplies of	(i) Checking of records; (ii) visual inspection	(i) Implementation of H&S plan; (ii) number of work-related accidents; (iii) % usage of personal protective equipment; (iv) number of first- aid stations, frequency of potable water delivery, provision of clean eating area, and number of sign	Quarterly	DMSC

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
			potable drinking water; (vi) Clean eating areas where workers are not exposed to hazardous or noxious substances; (vii) record of H&S orientation trainings (viii) personal protective equipments; (ix) % of moving equipment outfitted with audible back-up alarms; (x) sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal.		boards are according to approved plan; (v) % of moving equipment outfitted with audible back-up alarms		
Community Health and Safety	Construction sites	Construction Contractor	(i) Traffic Management Strategy; (ii) complaints from sensitive	Visual inspection	(i) Implementation of Traffic Management Strategy; (ii) complaints from sensitive receptors	Quarterly	DMSC

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
			receptors		satisfactorily addressed		
Work Camps	Work camps	Construction Contractor	(i) Complaints from sensitive receptors; (ii) water and sanitation facilities for employees; and (iii) PMU/PIU/DMSC report in writing that the camp has been vacated	Visual inspection	(i) Designated areas only; (ii) complaints from sensitive receptors satisfactorily addressed	Quarterly	DMSC

BOD = biological oxygen demand, DMSC = Design, Management and Supervision Consultant, H&S = health and safety, RPM = respirable particulate matter, GOI= Government of India, SPM = suspended particulate matter; PMU = Project Management Unit; PIU = Project Implementation Unit

Table 25: Operation and Maintenance Environmental Monitoring Program

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
General Maintenance work	subproject location	Defect liability period – DBO Contractor, Later GMC and O&M Contractors	Complaints from sensitive receptors	Checking of records	Complaints from sensitive receptors satisfactorily addressed	As needed	PMU/PIU
Accessibility	subproject location	Defect liability period – DBO Contractor, Later GMC and O&M Contractors	Complaints from sensitive receptors	Checking of records	Complaints from sensitive receptors satisfactorily addressed	As needed	PMU/PIU
Land Uses	subproject location	Defect liability period – DBO	Complaints from sensitive	Checking of records	Complaints from sensitive receptors	As needed	PMU/PIU

Field	Location	Responsible for Mitigation	Monitoring of Mitigation	Method of Monitoring	Indicators/ Standards	Frequency	Responsible for Monitoring
		Contractor, Later GMC and O&M Contractors	receptors		satisfactorily addressed		
Health and Safety	subproject location	Defect liability period – DBO Contractor, Later GMC and O&M Contractors	Complaints from sensitive receptors	Checking of records	Complaints from sensitive receptors satisfactorily addressed	As needed	PMU/PIU

CPCB = Central Pollution Control Board; O&M = operation and maintenance, GMC = Guwahati Municipal Council PMU = Project Management Unit; PIU = Project Implementation Unit

C. Environmental Management Plan Costs

154. The subproject is assessed to have no design or location impacts, except for that of laying of water distribution pipelines passing through forest areas, which may require no objection from forest department due to temporary impact.

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

156. The monitoring proposed mainly includes site inspections and informal discussions with workers and local people and this will be the responsibility of PMU, costs of which are part of project management. The air quality and noise level monitoring of construction phase will be conducted by the contractor, since this is an additional cost, and therefore it needs to be part of subproject cost. The environmental management and monitoring costs are summarized in **Table 26**.

Table 26: Indicative Cost for Environmental Management and Monitoring

Component	Description	Number	Cost per Unit (₹)	Cost (₹)	Source of Funds
Legislation, Permits and Agreements	Consent to Establish and Consent to Operate for plants and machinery of the contractor.	As required	Not Applicable	Not Applicable	-
Public consultations and information disclosure	Information disclosure and consultations during preconstruction and construction phase.	As required	Lump sum	80,000	Concerned Contractor
Providing access to commercial establishments and properties.	Providing access, in case of access disruptions, to affected properties.	As per requirement	Contractor's liability	Not applicable	Covered under engineering cost
Dust Suppression at subproject sites	Application of dust suppression measures during construction phase.	As required	Lump sum	4,00,000	Concerned Contractor
Traffic management	Safety Signboards, delineators, traffic regulation equipments, flagman,	Wherever required throughout subproject corridor	Contractor's liability	Not applicable	Covered in engineering cost

Component	Description	Number	Cost per Unit (₹)	Cost (₹)	Source of Funds
	temporary diversions, etc				
Baseline Monitoring	**Site preparation and preliminary activities**				
Air	Once before start of construction works at 8 locations near pipeline laying area	8 samples	7,000 per sample	56,000	Covered under engineering design and cost - Concerned Contractor
Noise	Once before start of construction works at 8 locations near pipeline laying area	8 samples	1,000 per sample	8,000	Covered under engineering design and cost - Concerned Contractor
Construction Monitoring					
Air	Quarterly at 8 locations near project sites for at least 2.5 years	72 samples	7,000 per sample	5,04,000	Covered under engineering design and cost - Concerned Contractor
Noise	Quarterly at 8 locations near project sites for at least 2.5 years	72 samples	1,000 per sample	72,000	Covered under engineering design and cost - Concerned Contractor
					Defect Liability Period
Air	Twice at 6 locations near project sites for 1 year	12 samples	7,000 per sample	84,000	Covered under engineering design and cost - Concerned Contractor
Noise	Twice at 6 locations near project sites for 1 year	12 samples	1,000 per sample	12,000	Covered under engineering design and cost - Concerned Contractor
Any unanticipated impact due to subproject implementation (including compensation for tree felling)	Mitigation of any unanticipated impact arising during construction phase and defect liability period.	Lump sum	Lump sum	4,00,000	As per requirement - PMU
TOTAL (₹) Rupees sixteen lakh sixteen thousand only				**16,16,000.00**	
			TOTAL (US$)	**26,933.00**	

VIII. FINDINGS AND RECOMMENDATIONS

157. The Initial Environmental Examination (IEE) assessed the environmental impacts of all components proposed under the Guwahati Water Supply Subproject part. Potential negative impacts were identified related to design, location, construction and operation of the subproject. Negative impacts are assessed to be minimal.

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

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

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

161. The public participation processes which will be undertaken during final 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.

162. 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.

163. The EMP will guide the environmentally-sound construction of the subproject and ensure efficient lines of communication between the DMSC (Engineer), DBO contractors, PIU and PMU/DMSC. 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.

164. 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.

IX. CONCLUSIONS

165. This IEE has assessed all potential environmental impacts associated with the subproject. There are no impacts that are significant or complex in nature, or that need an in-depth study to assess the impact. Thus, the subproject is unlikely to cause significant 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.

166. Based on the findings of the IEE, the classification of the Project as Category “B” is confirmed, and no further special study or detailed EIA needs to be undertaken to comply with ADB SPS (2009). Required permits include “Forest Clearance from Assam Environment and Forest Department for works within the forest areas”.

APPENDIX 1: ACTIVITIES TO BE PERFORM BY DBO CONTRACTOR - TIMELINE, FOR THE UPDATING OF IEE AND IMPLEMENTATION OF EMP

S. No.	Activities	Assistance	Timeline
1	Carry out final design – Water distribution pipeline with consideration of less environmental impact and minimization of mitigation measures	DMSC, PIU	Within 90 days after awarding of contract
2	Generation of base line data- air, water, noise and ecological survey in and around the project locations	DMSC, PIU, Pollution Control Board	Within 6 months after awarding of contract
3	Public consultation, FGD with households, owners of commercial establishment, committee for sensitive receptors like religious place, school, health center within the impact zone	DMSC, PIU	Within 6 months after awarding of contract
4	Updating of IEE and EMP as per revised design and base line data	DMSC	Within 7 months after awarding of contract by the contractor
5	Collection of consent and other permission / NOC from concerned agencies (as per revised design)	DMSC	Within 8 months after awarding of contract by the contractor
6	Orientation training program for contractor	By DMSC	Within 8 months after awarding of contract
7	Application of EMP	DMSC	From staring of work to completion of all activities

APPENDIX 2: PHOTO ILLUSTRATION

Photo 1: Water Distribution Pipeline Laying Area at Gopalnagar

Photo 2: Water Distribution pipeline laying area at Gopalnagar

Photo 3: Water Distribution pipeline laying area at Jonaki nagar

Photo 4: Water Distribution pipeline laying area at North Jyoti Nagar

Photo 5: Water Distribution pipeline laying area at Basistha

Photo 6: Water Distribution pipeline laying area at Kenduguri

APPENDIX 3: RAPID ENVIRONMENTAL ASSESSMENT (REA) CHECKLIST

Guwahati Water Supply Subproject: Laying of Water Distribution Network Pipelines at Guwahati

Screening Questions	Yes	No	Remarks
A. Project siting Is the project area			
• Densely populated?	✓		Built-up area in Guwahati accounts for about 50% of the land. The project will cover South Guwahati's East Zone (total area of 71 km^2) which have a 0.202 million population in 2001 and projected population of 0.64 million by 2040.However, there are no major negative impacts envisaged because the pipe-laying activities will done along sides of existing roads with RoW without causing significant disturbance to houses and commercial establishments. In narrow streets, disruption to road users is likely, and measure like best activity scheduling, alternative routes, prior information to road users, houses and shops will minimize the impacts. These measures will be included in the EMP.
• Heavy with development activities?		✓	The subproject areas cover predominantly residential, commercial, and public and semi-public areas as per the Land Use Zoning Plan 2025 of Guwahati Metropolitan Development Authority (GMDA).
Adjacent to or within any environmentally sensitive areas?		✓	
• Cultural heritage site		✓	
• Protected area		✓	
• Wetland		✓	
• Mangrove		✓	
• Estuarine		✓	
• Buffer zone of protected area		✓	
• Special area for protecting biodiversity		✓	
• Bay		✓	
B. Potential environmental impacts Will the project cause…			
• Pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture, and soil erosion runoff?		✓	Not anticipated. The existing water supply source is the Brahmaputra River. The existing environmental condition of the river is good. No industries/agricultural activities are present upstream of the water intake. As vegetation in the water intake area is good, soil erosion runoff draining towards the water source is insignificant.
• Impairment of historical/cultural monuments/areas and loss/damage to these sites?		✓	Not applicable.

Screening Questions	Yes	No	Remarks
• Hazard of land subsidence caused by excessive ground water pumping?		✓	Not applicable.
• Social conflicts arising from displacement of communities?		✓	Displacement of communities is not required in this subproject. The subproject does not require acquisition of private land. However, during distribution pipe-laying, temporary economic displacement is anticipated. A Resettlement Plan (RP) has been developed to mitigate these temporary impacts.
• Conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?		✓	Not anticipated. The average discharge of the Bhramaputra River is 4,500 m^3/sec and flows nearly full for a considerable length of time. The level of water remains at 48.17 m above mean sea level (MSL) for 50% of the days out of 150 monsoon days. Water quantity is sufficient and additional abstraction from the river will not have significant impact. Groundwater will not be used as source.
• Unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)?		✓	Not anticipated. Findings of water quality tests conducted for the subproject and IEE show no issues.
• Delivery of unsafe water to distribution system?		✓	Not anticipated. Water will be chlorinated prior to distribution. Water quality of treated water will comply with the Indian Standards for Drinking Water/IFC EHS Guideline (most stringent).
• Inadequate protection of intake works or wells, leading to pollution of water supply?		✓	Not applicable.
• Over pumping of ground water, leading to salinization and ground subsidence?		✓	Not applicable.
• Excessive algal growth in storage reservoir?		✓	Not anticipated.
• Increase in production of sewage beyond capabilities of community facilities?	✓		Guwahati Development Department of the State Government of Assam is in the process of improving the existing sewerage system.
• Inadequate disposal of sludge from water treatment plants?		✓	Not applicable.
• Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?		✓	Not applicable.
• Impairments associated with transmission lines and access roads?	✓		Anticipated during construction activities. However, impacts are temporary and short in duration. The EMP includes measures to mitigate impacts.
• Health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.		✓	Not applicable.
• Health and safety hazards to workers from handling and management		✓	Not applicable.

Screening Questions	Yes	No	Remarks
of chlorine used for disinfection, other contaminants, and biological and physical hazards during project construction and operation?			
• Dislocation or involuntary resettlement of people?		✓	Dislocation is not anticipated. However, during pipe-laying work, temporary economic displacement is anticipated. An RP has been prepared to mitigate these temporary impacts.
• Disproportionate impacts on the poor, women and children, indigenous peoples or other vulnerable groups?		✓	Not applicable.
• Noise and dust from construction activities?	✓		Anticipated during construction activities. However, impacts are temporary and short in duration. The EMP includes measures to mitigate impacts.
• Increased road traffic due to interference of construction activities?	✓		Anticipated during construction activities. However, impacts are temporary and short in duration. The EMP ensures measures are included to mitigate impacts. Construction contractors will be required to coordinate with local traffic police.
• Continuing soil erosion/silt runoff from construction operations?		✓	Not anticipated. The construction areas are all flat lands thus soil erosion and silt runoff are least expected except during monsoon months. The EMP includes measures to mitigate impacts. Construction contractors will be required to include silt traps or canalizations where required.
• Delivery of unsafe water due to poor O&M treatment processes (especially mud accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems?		✓	Not anticipated. The O&M Manuals include schedule for regular maintenance and appropriate chemical dosing.
• Delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals?		✓	Not anticipated.
• Accidental leakage of chlorine gas?		✓	Not applicable.
• Excessive abstraction of water affecting downstream water users?		✓	Not applicable.
• Competing uses of water?		✓	Not anticipated.
• Increased sewage flow due to increased water supply	✓		Guwahati Development Department of the State Government of Assam is in the process of improving the existing sewerage system.
• Increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant		✓	Not applicable.

Screening Questions	Yes	No	Remarks
• Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		✓	Not anticipated. Improved water supply management systems through capacity building and institutional development will ensure reduced burden on services and infrastructure.
• Social conflicts if workers from other regions or countries are hired?		✓	Not anticipated. Priority in employment will be given to residents.
• 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?		✓	Not applicable. Construction will not involve use of explosives and chemicals. Trenching will be done manually. Use of chemical during O&M will be limited only on sites.
• Community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?		✓	Not anticipated. Operational area will be clearly demarcated and access will be controlled. Only worker and project concerned members will be allowed to visit the operational sites.

Climate change and disaster risk questions The following questions are not for environmental categorization. They are included in this checklist to help identify potential climate and disaster risks	**Yes**	**No**	**Remarks**
▪ Is the Project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes ?	✓		The area is not subject to floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and localized climate changes. , Guwahati lies in the Zone V (highest earthquake risk). Guwahati has not experienced any major earthquakes in recent past.
▪ Could changes in temperature, precipitation, or extreme events patterns over the Project lifespan affect technical or financial sustainability (e.g., changes in rainfall patterns disrupt reliability of water supply; sea level rise creates salinity intrusion into proposed water supply source)?		✓	No
▪ Are there any demographic or socio-economic aspects of the project area that are already vulnerable (e.g. high incidence of marginalized populations, rural-urban migrants, illegal settlements, ethnic minorities, women or children)?		✓	No

▪ Could the project potentially increase the climate or disaster vulnerability of the surrounding area (e.g., by using water from a vulnerable source that is relied upon by many user groups, or encouraging settlement in earthquake zones)?		✓	No

APPENDIX 4: SEMI-ANNUAL ENVIRONMENTAL MONITORING REPORTING FORMAT (Design, Build and Operate - Laying of Water Distribution Network Pipelines at South east Guwahati)

I. 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	Status of Implementation (Preliminary Design/Detailed Design/On-going	If On-going Construction	
				%Physical Progress	Expected Completion Date

		or contract awarded)	Construction/Completed/O&M)[14]		

II. COMPLIANCE STATUS WITH NATIONAL/STATE/LOCAL STATUTORY ENVIRONMENTAL REQUIREMENTS[15]

Package No.	Subproject Name	Statutory Environmental Requirements[16]	Status of Compliance[17]	Validity if obtained	Action Required	Specific Conditions that will require environmental monitoring as per Environment Clearance, Consent/Permit to Establish[18]

III. COMPLIANCE STATUS WITH ENVIRONMENTAL LOAN COVENANTS

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

IV. 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

[14] If on-going construction, include %physical progress and expected date of completion
[15] 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.
[16] Specify (environmental clearance? Permit/consent to establish? Forest clearance? Etc.)
[17] Specify if obtained, submitted and awaiting approval, application not yet submitted
[18] *Example: Environmental Clearance requires ambient air quality monitoring, Forest Clearance/Tree-cutting Permit requires 2 trees for every tree, etc.*

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.

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)[19]

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						

[19] Attach Laboratory Results and Sampling Map/Locations

Operational Phase						

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

V. APPROACH AND METHODOLOGY FOR ENVIRONMENTAL MONITORING OF THE PROJECT

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

VI. 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

VII. 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).

VIII. 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).

IX. SUMMARY OF KEY ISSUES AND REMEDIAL ACTIONS

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

X. 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

APPENDIX 5: RECORDS OF PUBLIC CONSULTATION

Subproject-: Construction of Distribution mains of Guwahati Water Supply Project

Issues discussed

- Awareness and extent of the project and development components
- Benefits of Project for the economic and social Upliftment of Community
- Labour availability in the Project area or requirement of outside labour involvement
- Local disturbances due to Project Construction Work
- Necessity of tree felling etc. at project sites
- Water logging and drainage problem if any
- Drinking water problem
- Forest and sensitive area nearby the project site
- Movement of wild animal if any
- Other problems, encountered, if any

Consultation 1

Area: Panjabari (In the command area of Nabajyoti nagar) - Public consultation was conducted at Hindi Saraswati LP School.

Date & Time: 17th November, 2013. From 03.00 pm to 04.30 pm.

S. No.	Issues	Perception	Action taken
1	Awareness and extent of the project and development components	Local people are not much aware on components of the project. In 30% cases they have some idea	Awareness program at different project locations related to project components is essential
2	Perceptions and view of the local community on the project–is the project relevant or not?	The people in the project areas agreed on the relevance of the project. They shared that sufficient & quality water is required throughout the day	
3	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	
4	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	The project area is Govt. land for which permission has been granted. There is no wild life or sensitive/ unique environmental components in the project area. The project area is surrounded by residences.	
5	Presence of historical/ cultural/ religious sites nearby	There is no historical / religious site nearby. The regional cultural center “Kalakhetra” is located in the region but this is not going to be effected.	
6	Unfavourable climatic condition	The pick summer is hot and humid and not suitable for continuous work at open area.	
7	Occurrence of flood	No such case is reported. During monsoon, temporary water logging occurs for a very short duration	Drainage project will be designed considering the issue

S. No.	Issues	Perception	Action taken
8	What is the nature of drainage/ solid waste problem in the community at present? What is the view of the people on improving it?	No such problem reported.	
9	Drainage problem facing	No such problem being reported	
10	Present drinking water problem – quantity and quality	In 70% cases local complained on non availability of water, Presence of iron is not reported by 90% of total habitation. In 50% cases people have own arrangement (tube well or dug well) within their premises	
11	Present solid waste collection and disposal problem	As per local people – done properly by GMC.	
12	Availability of labour during construction time	Some local people may work as labor during construction phase.	
13	Access road to project Site	Yes existing bitumen road is noted	
14	Perception of locals On tree felling and afforestation	Generally not required in most of the cases. No tree cutting is required.	If required compensatory plantation will be done as per Govt. rule
15	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
16	Setting up worker camp site within the village/ project locality	Project area does not have sufficient space for workers camp.	
17	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.	

NAME AND POSITION OF PERSONS CONSULTED:

1)Sri Aswani Kr. Barah
2)Sri Bablu Hussian Borbhuyan
3)Sri Nayan Rajbonsi
4)Sri Rintu Das
5)Sri Upen Das
6)Smti Yangam Doley
7)Sri Mahim Das
8)Smti Champa Gogoi
9)Smti Matu Basumatary
10)Smti Beauti Mahanta
11)Sri Milan Doley
12)Sri Pabitra Pegu
13)Sri Amir Ali
14)Sri Saibul Islam
15)Sri Sanjib Das
16)Sri Nareswer Das
17)Md. Ataur Rahamsn
18)Sri Jojen Roy
19)Sri Nabab Ali
20)Sri Samsul Haque
21)Sri Fulsan Ali
22) Sri Ayub Ali
23) Sri Rajan Ali
24)Sri Anil Ali
25)Sri H.Adhikari
26)Sri Banjeet Burman
27)Sri Kiran Kutum
28) Sri Dharmeswar Bhuyan
29)Md. Saifur Rahaman
30)Sri Umesh Patir
31)Sri Anwar Hussian
32)Sri Krishna Prasad Sarma.

Consultation 2

Area: Kenduguri area, Kenduguri Unnyan Samity.

Date & Time: 06.11.2013, From 06.00 pm to 07.30pm.

S. No.	Issues	Perception	Action taken
1	Awareness and extent of the project and development components	Local people are not much aware on components of the project. In 20% cases they have some idea	Awareness program at different project locations related to project components is essential
2	Perceptions and view of the local community on the project–is the project relevant or not?	The people in the project areas agreed on the relevance of the project. They shared that sufficient & quality water is required throughout the day	
3	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	
4	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	The project area is Govt. land for which permission has been granted. There is no wild life or sensitive/ unique environmental components in the project area. The project area is surrounded by residences.	
5	Presence of historical/ cultural/ religious sites nearby	There is no such historical /cultural site nearby. One Namggar is there but this is not going to be effected.	
6	Unfavourable climatic condition	The pick summer is hot and humid and not suitable for continuous work at open area.	
7	Occurrence of flood	No such case is reported. During monsoon, temporary water logging occurs for a very short duration	Drainage project will be designed considering the issue
8	What is the nature of drainage/ solid waste problem in the community at present? What is the view of the people on improving it?	No such problem reported.	
9	Drainage problem facing	No such problem being reported	
10	Present drinking water problem – quantity and quality	There is scarcity of drinking water. The local residents use makeshift well water for other household purposes. Presence iron is not reported in well water.	
11	Present solid waste collection and disposal problem	As per the local people it is disposed in municipal garbage bin	
12	Availability of labour during construction time	Some local people may work as labor during construction phase.	

13	Access road to project Site	There is metallic bituminous and non-bituminous road in the area.	
14	Perception of locals On tree felling and afforestation	Generally the locals are against the tree felling but for distribution network no felling of trees involved.	
15	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
16	Setting up worker camp site within the village/ project locality	Project area has a space for setting labour camp. Local people will allow to set up labour camp.	
17	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.	

NAME AND POSITION OF PERSONS CONSULTED: All persons are the residents of Kenduguri and near by areas and near to the project site.

1) Sri Dilip Taro
2) Sri Jadav Kalita
3) Sri Siva Prasad Borgphain
4) Sri Nirmal Kalita
5) Sri Pankaj Kanti Shome
6) Sri Madan Baruah
7) Sri Sachindra Mazumdar
8) Sri Pranab Barman
9) Sri J.Choudhury
10) Sri Abhi ram Nath
11) Sri Ramendra Kalita
12) Sri Mukut Kalita
13) Sri Pankaj Deka
14) Sri Uma Nath
15) Sri Hementa Choudhury
16) Sri Amiyo Baruah

Consultation 3

Area: Kenduguri-II

Date & Time: 21st. November, 2013. From 5.45 pm to6.45 pm

S. No.	Issues	Perception	Action taken
1	Awareness and extent of the project and development components	Local people are not much aware on components of the project. In 30% cases they have some idea	Awareness program at different project locations related to project components is essential
2	Perceptions and view of the local community on the project–is the project relevant or not?	The people in the project areas agreed on the relevance of the project. They shared that sufficient & quality water needs to be available throughout the day	
3	In what way they may	At the construction phase some	

S. No.	Issues	Perception	Action taken
	associate with the project	people can work as laborers, after completion, water supply to nearby areas shall be improved	
4	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	No forest land at nearby	
5	Presence of historical/ cultural/ religious sites nearby	There is no historical/cultural /religious sites nearby	
6	Unfavourable climatic condition	In the pick summer and in the rainy season it is humid and hot. Not suitable for continuous work.	
7	Occurrence of flood	No such case is reported .	Drainage project will be designed considering the issue
8	What is the nature of drainage/ solid waste problem in the community at present? What is the view of the people on improving it?	No such problem	
9	Drainage problem facing	No such case reported even during monsoon.	
10	Present drinking water problem – quantity and quality	There is scarcity of drinking water. People have own dug well and purchase water from outside for daily needs.	
11	Present solid waste collection and disposal problem	As per the local people it is disposed in municipal garbage bin	
12	Availability of labour during construction time	Some local people may work as labor during construction phase.	
13	Access road to project Site	There is metallic bituminous and non-bituminous road in the area.	
14	Perception of locals On tree felling and afforestation	Generally the locals are against the tree felling but for distribution network no felling of trees involved	Required compensation will be given and required plantation will be done as per Govt. Rule in case of tree felling
15	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
16	Setting up worker camp site within the village/ project locality	Project area has a space for setting labour camp. Local people will allow to set up labour camp.	
17	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.	

NAME AND NUMBER OF PERSONS CONSULTED: All persons are the residents of Kenduguri and nearby areas

1)Smti Himani Nath
2)Smti Jonali Laskar
3)Sri Niranjan Bhattacharjee
4)Smti Nitu Das
5)Smti Archana Dey
6)Smti Urmila Purbe
7)Smti Nirmala Nicad
8)Smti Renu Roy
9)Smti Sita Singh
10) Smti Sunila Devi
11) Smti Sefali Deb
12) Smti Supriti Pal
13)Smti Jamuna Sarkar
14) Smti Junu Mazumder
15) Smti Sucitra Debnath
16) Smti Ritu Dhar
17) Smti Jaya Bishya
18) Smti Uma Boro
19) Smti Saraswati Das
20)Smti Ela Dey
21)Smti Jaya Das
22)Smti Ramala Boro
23)Smti Barnali Barman
24)Smti Nilama Das
25)Smti Mamani Boro
26)Smti Rima Rabha
27)Smti Sujata Sarma
28)Smti Smti Mira Chakraborty
29)Smti Mahamaya Sarma
30)Smti Mahamaya Sarma
31)Smti Gita Bhattacharjee
32)Smti Dipika Chakraborty
33)Smti Asha Baruha
34)Sri Moni Das
35)Smti Tara Mahato
36)Smti Purnima Musahari
37)Smti Rina Das
38)Smti Laksar
39)Smti Dipika Ingti
40)Smti Rinku Mazumdar
41)Smti Santi Baruha
42)Smti Kunjalata Kalita
43)Sri Menan Das
44)Smti Dipali Das
45)Smti Lakhi Das
46)Sri Gopal Das
47)Smti Bandana Bhatta
48)Smti Binu Devi
49)Smti Gori Bhatta
50)Smti Samata Mandal
52)Sri Gautam Debnath
53)Sri Bulu Adhikari
54)Sri Rahul Das
55)Smti Mehurum Nesa
56)Sri Milan Kanti Boro
57)Sri Bimal Orea
58)Sri Dilip Das
59)Smti Mina Das

Consultation 4

Area: Patthar Kuari,Magzine Shiv nagar (Command area of Jonakinagar)

Date & Time: 7th January,2014. From 6.00 to7.00 pm

S. No.	Issues	Perception	Action taken
1	Awareness and extent of the project and development components	Local people are not much aware on components of the project. In 30% cases they have some idea	Awareness program at different project locations related to project components is essential
2	Perceptions and view of the local community on the project–is the project relevant or not?	The people in the project areas agreed on the relevance of the project. They shared that sufficient & quality water needs to be available throughout the day	
3	In what way they may associate with the project	At the construction phase some people can work as laborers	
4	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	No forest land at nearby	
5	Presence of historical/ cultural/ religious sites nearby	There is one Siva temple by the side of the distribution mains but this is not going to be effected	
6	Unfavourable climatic condition	In the pick summer and in the rainy season it is humid and hot. Not suitable for continuous work.	
7	Occurrence of flood	No such case is reported	Drainage project will be designed considering the issue

S. No.	Issues	Perception	Action taken
8	What is the nature of drainage/ solid waste problem in the community at present? What is the view of the people on improving it?	No such problem	
9	Drainage problem facing	No such case reported even during monsoon.	
10	Present drinking water problem – quantity and quality	There is scarcity of drinking water The local residents purchase water for their household purposes.. Presence iron is not reported.	
11	Present solid waste collection and disposal problem	As per the local people it is disposed in municipal garbage bin	
12	Availability of labour during construction time	Some local people may work as labor during construction phase.	
13	Access road to project Site	There is metallic bituminous and non-bituminous road in the area.	
14	Perception of locals On tree felling and afforestation	Generally the locals are against the tree felling but for distribution network no felling of trees involved	Required compensation will be given and required plantation will be done as per Govt. Rule in case of tree felling
15	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
16	Setting up worker camp site within the village/ project locality	Project area does not have sufficient space for setting labour camp.	
17	Safety of residents during construction phase and plying of vehicle for construction activities	Local people requested for safety measures when excavation and construction work will be going on and also for traffic management.	

NAME AND POSITION OF PERSONS CONSULTED: All persons are the residents of Chunsali area and near to the project site.

1)Sri Gangadhar Barua
2)Sri Brajen Chakraborty
3)Sri Upendra Nath Sarma
4)Sri Dharma Kanta Kalita
5)Sri Ramaswer Hazarika
6)Sri Hiren Kr.Sarma
7)Sri Dimbeswar Saikia.
8)Sri Pushat Ch.Deka
9) Sri Abinash Das.
10) Sri Mahertra Kalita
11) Sri Kishore Thapa
12)Smti. Dipa Saikia
21)Smti. Dipa Rabha
22)Smti.Babita Kalita
23)Smti. Namita Deka
24)Smti. Sangita Das
25)Smti.Tutumoni Kowar
26)Smti. Banti Kalita
27)Sri Ranjit Kalita
28)Sri Tarun Ch.Das
29)Sri Dharanidhar Deka
30)Sri Jiten Chakraborty
31)Sri Ranu Bora
32)Sri Golab ch.Kalita

13) Smti Biva Kalita
14) Smti.Nirmali Burman
15)Smti.Gitika Talukdar
16)Smti. Janami Rabha
17)Smti.Praniti Deka
18)Smti.Bindu Phukan
19)Smti.Kalpana Hajong
20)Smti. Swarna Prava Duara
33)Sri Bijoy Deka
34)Sri Pradeep Brahma
35)Sri Hriday Ch.Bayan
36)Sri Biren Brahma
37)Sri Jogeswar Medhi
38)Sri Jitumoni Barua
39)Sri Dhireswar Das

Consultation 5

Area: Gopalnagar
Date & Time: 1st. September, 2013. From 10.30 pm to 11.30pm.

S. No.	Issues	Perception	Action taken
1	Awareness and extent of the project and development components	Local people are not aware of the components of the project. It is understood that 20% of the people have some idea.	Awareness program at different project locations related to project components is essential
2	Perceptions and view of the local community on the project–is the project relevant or not?	The people in the project areas agreed on the relevance of the project. They shared that sufficient & quality water needs to be available throughout the day	
3	In what way they may associate with the project	At the construction phase some people can work as laborers	
4	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	No forest land at nearby	
5	Presence of historical/ cultural/ religious sites nearby	There is one Siva temple by the side of approach road but this is not going to be effected	
6	Unfavourable climatic condition	In the pick summer and in the rainy season it is humid and hot. Not suitable for continuous work.	
7	Occurrence of flood	No such case is reported	Drainage project will be designed considering the issue
8	What is the nature of drainage/ solid waste problem in the community at present? What is the view of the people on improving it?	No such problem	
9	Drainage problem facing	No such case reported even during monsoon.	
10	Present drinking water problem – quantity and quality	There is scarcity of drinking water. There is small drinking water supply scheme catering to the needs of only around 450 people which is also not assured. Presence iron is not reported.	

S. No.	Issues	Perception	Action taken
11	Present solid waste collection and disposal problem	As per the local people it is disposed in municipal garbage bin	
12	Availability of labour during construction time	Some local people may work as labor during construction phase.	
13	Access road to project Site	There is nonmetallic and non-bituminous road.	
14	Perception of locals On tree felling and afforestation	Generally not required. Forest department has already given permission to cut trees.	Required compensation will be given and required plantation will be done as per Govt. Rule
15	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
16	Setting up worker camp site within the village/ project locality	Project area has sufficient space for setting labour camp. Local people will allow to set up labour camp.	
17	Safety of residents during construction phase and plying of vehicle for construction activities	Local people requested for safety measures when excavation and construction work will be going on and also for traffic management.	

NAME AND POSITION OF PERSONS CONSULTED: All persons are the residents of Gopalnagar Siva Mandir Path
1)Sri Rajat Chandra Das.
2)Sri B.K.Sarma.
3)Sri M.Kakati
4)Sri Girish Ch. Sarma.
5)Sri Anil Bora.
6)Sri Anil Kalita.
7)Sri Kamal Talukdar.
8)Sri Deshbandhu Nath.
9)Sri Khagendra Nath Das.
10) Sri Girish Chandra Dutta.
11) Sri Binoy Das.
12)Sri Pradip Deka.
13)Sri Biren Nath.
14)Sri Raj Kumar Niak.
15)Sri Mintu Das.
17) SriGautam Bharali.

Consultation 6

Area: Gopalnagar, (Milansangha Development Society)
Date & Time: !7th December , 2013. From 11.30 am to 12.30am.

S. No.	Issues	Perception	Action taken

1	Awareness and extent of the project and development components	Local people are not aware of the components of the project. It is understood that 25% of the people have some idea.	Awareness program at different project locations related to project components is essential
2	Perceptions and view of the local community on the project–is the project relevant or not?	The people in the project areas agreed on the relevance of the project. They shared that sufficient & quality water needs to be available throughout the day	
3	In what way they may associate with the project	At the construction phase some people can work as laborers	
4	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	No forest land at nearby	
5	Presence of historical/ cultural/ religious sites nearby	There no historical /cultural sites nearby apart from Namghars locally constructed which are not going to be effected.	
6	Unfavourable climatic condition	In the pick summer and in the rainy season it is humid and hot. Not suitable for continuous work.	
7	Occurrence of flood	No such case is reported	Drainage project will be designed considering the issue
8	What is the nature of drainage/ solid waste problem in the community at present? What is the view of the people on improving it?	No such problem	
9	Drainage problem facing	No such case reported even during monsoon.	
10	Present drinking water problem – quantity and quality	There is scarcity of drinking water. People have own dug well or make shift well or buy water from outside.	
11	Present solid waste collection and disposal problem	As per the local people it is disposed in municipal garbage bin	
12	Availability of labour during construction time	Some local people may work as labor during construction phase.	
13	Access road to project Site	There is nonmetallic and non-bituminous road.	
14	Perception of locals On tree felling and afforestation	Generally not required. Forest department has already given permission to cut trees.	Required compensation will be given and required plantation will be done as per Govt. Rule
15	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
16	Setting up worker camp site within the village/ project locality	Project area does appear to have sufficient space for setting labour camp. However Local people will	

		allow to set up labour camp in case of necessity.	
17	Safety of residents during construction phase and plying of vehicle for construction activities	Local people requested for safety measures when excavation and construction work will be going on and also for traffic management.	

NAME AND POSITION OF PERSONS CONSULTED: All persons are the residents of Gopalnagar (Milan sangha Unnan Samity)

1)Sri Rajat Chandra Das.
2)Sri sanat Chandra Roy.
3)Sri Mrigendra Nath Kakati.
4)Sri Chidananda Dutta.
5)Smti Bonti Dvi
6)Smti Renu Burman.
7)Smti Babimoni Kalita
8)Smti Khunu Das
9)Smti Barnsli Kalita.
10) Smti Anupama Das
11) Smti Labanya Das
12)Smti Bina Basya.
13)Smti Moni Kalita
14)Smti Renu Kalita
15)Sri Anil Chandra kalita.
16) Sri Bimal Sarma
17)Sri Bhaben Swargiary
18)SriBhada Nanda
19)Sri Umesh Kalita
20)Sri Jatin Kalita
21)Sri Madhusudhan Choudhury
22)Sri Ranjit Rajbonsi.
23)Sri Kumud Saikia.
24)Sri D.Rajbonsi
25) Sri Ajay Kalita
26)Sri Kamal Das
27)Sri Abinash Sarma
28).Sri Upendra Talukdar
29)Sri Mohesh Chandra Bordoloi
30)Sri Kanak Prasad Das
31)Sri Ranji Pradhan
32)Smti Bina Das Choudhury
33)sri Reboti Duara
34)Sri Bhupen Medhi
35)Sri Nayanmoni Deka
36)Sri Pradip Bera
37)Sri Binod Talukdar
38)Sri Dhanmoni Haloi
39)SriRaja Das
40) Sri Manabendra Chakraborty
41)Sri Dilip Chandra Das

Consultation 7

Area: Jonaki Nagar
Date & Time: 13th September, 2013. From 11.15 AM to 12.30 PM

S. No.	Issues	Perception	Action taken
1	Awareness and extent of the project and development components	Local people are not aware of the components of the project. It is understood that 25% of the people have some idea.	Awareness program at different project locations related to project components is essential
2	Perceptions and view of the local community on the project–is the project relevant or not?	The people in the project areas agreed on the relevance of the project. They shared that sufficient & quality water needs to be available throughout the day	
3	In what way they may associate with the project	At the construction phase some people can work as laborers	

4	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	The project area is in forest land for which permission has been granted. There is no wild life or sensitive/ unique environmental components in the project area. The project area is surrounded by residences.	
5	Presence of historical/ cultural/ religious sites nearby	A temple is present nearby the proposed transmission/ overhead tank site. Local people requested not to impact on this site.	
6	Unfavourable climatic condition	In the pick summer and in the rainy season it is humid and hot. Not suitable for continuous work.	
7	Occurrence of flood	No such case is reported During monsoon water runs down the hill slope and passes through the down hill in to the drain by the road side.	Drainage project will be designed considering the issue
8	What is the nature of drainage/ solid waste problem in the community at present? What is the view of the people on improving it?	No such problem	
9	Drainage problem facing	No such case reported even during monsoon.	
10	Present drinking water problem – quantity and quality	In 70% cases local complained on non availability of water, Presence of iron is not reported by 90% of habitation. In 50% cases people have own arrangement (tube well) within their building premises	
11	Present solid waste collection and disposal problem	As per local people – done properly by GMC	
12	Availability of labour during construction time	Yes, labours are easily available in the nearby villages	
13	Access road to project Site	Yes existing bitumen road in most of the cases	
14	Perception of locals On tree felling and afforestation	Generally not required in most of the cases.	
15	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
16	Setting up worker camp site within the village/ project locality	Project area is having sufficient space for workers camp. Local people will allow to set up labour camp	
17	Safety of residents during construction phase and plying of	Local requested for safety arrangement particularly where	

	vehicle for construction activities	excavation is being planned near main city road.	

NAME AND POSITION OF PERSONS CONSULTED: All persons are the residents of Jonaki nagar

Dimbeswar Saikia, Theneswar Medhi, Gogen Buragohain, Jugeswar Medhi, Basanta Burman, Guruprasad Basumatary, Guneswar Kalita, Prolhad Kumar Deka, Pradip Bhuyan, Purnananda Buarah, Bhagaban Kalita, Jiten Chakraborty, Chinmoy Chaudhury, Dimbeswar Saikia, Palash Chandra Tamuli, Dipa Kalita, Sisei Kumar Deka, Sailen Thakuria, Mukut Chandra Dutta, Mamina Khillar Bora, Tapan Das ,Babita Kalita, Pranita Kalita,Janami Rabha, Benu Das, Jitni Karmakar, Mamani Das, Labanya Das, Nira Kalita, Ramesh Das, Kailash Tamuli, Siddhartha Kalita, H.K.Sarmah, Bibram Hazarika, Dinesh Das, Akhil Kumar Sarma, Hemen Kumar Mahanta, Abinas Das, Ranjit Hazarika, Nripen Sarma, Pranjal Deka, Biren das, Basanta Gogoi, Dipa Rabha, Raju Bora, Dhanjit Das, Mahendra Kalita, Rana Baruah, Prakash Rabha, Banikanta Das, Minati Das, Kamal Baruah, Kalpana Hajong, Sunanda Das, Sajanee Hajong, Kalpana Das, Kamani Basumatary

Consultation 8

Area: Joyti Nagar (North Jyotinagar Command Area)

Date & Time: 13th December, 2013. From 11.15 to 12.30 am.

S. No.	Issues	Perception	Action taken
1	Awareness and extent of the project and development components	Local people are not aware of the components of the project. It is understood that 40% of the people have some idea.	Awareness program at different project locations related to project components is essential
2	Perceptions and view of the local community on the project–is the project relevant or not?	The people in the project areas agreed on the relevance of the project. They shared that sufficient & quality water needs to be available throughout the day	
3	In what way they may associate with the project	At the construction phase some people can work as laborers	
4	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	There is no forest area near by the project site.	
5	Presence of historical/ cultural/ religious sites nearby	There are no historical / cultural / religious sites nearby	
6	Unfavourable climatic condition	In the pick summer and in the rainy season it is humid and hot. Not suitable for continuous work.	
7	Occurrence of flood	No such case is reported. The surface runoff from the nearby hills causes over flooding of drains for a very short duration.	Drainage project will be designed considering the issue
8	What is the nature of	No such problem	

	drainage/ solid waste problem in the community at present? What is the view of the people on improving it?		
9	Drainage problem facing	Generally not reported however during monsoon overflow of drain due to surface runoff for a short duration reported.	
10	Present drinking water problem – quantity and quality	In 70% cases local complained on non availability of water, Presence of iron is not reported by 90% of habitation. In 50% cases people have own arrangement (tube well) within their building premises	
11	Present solid waste collection and disposal problem	As per the local people it is disposed in hand cart and ultimately disposed to municipal dust bin outside.	
12	Availability of labour during construction time	As discussed during the consultation, some local labours may be available during construction.	
13	Access road to project Site	There is nonmetallic and non-bituminous road.	
14	Perception of locals On tree felling and afforestation	Generally not required as there is no forest land nearby. However it is suggested that in spite of cutting trees ,the trees may be replanted after uprooting if required.	
15	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
16	Setting up worker camp site within the village/ project locality	Project area does not have sufficient space for setting labour camp. However local people will allow to set up labour camp if required and if space is found	
17	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.	

NAME AND POSITION OF PERSONS CONSULTED: All persons are the residents of Jyotinagar and nearby area

1)Sri Basanta Burman
2)Sri Basanta Kr.Kalita
3) Sri Jitendra Chandra Talukdar
4)Sri Utsav Ch.Kalita
5)Sri Abdur Jabbar
6)Sri Dalim Das
17)Sri Swapan Kr.Medhi
18)Smti Usha Gohain
19)Smti Jinu Gogoi
20)Smti A.Chakraborty
21)Smti Ambilika Kalita
22)Sri Subrata Roy

7)Sri Amya Kumar Baruah
8)Sri Jitendra Nath Patgiri
9)Smti Nitanjali Baishya
10)Smti Urmila Pathak
11)Smti Bijuli Kalita Medhi
12)Sri Chittaranjan Das
13)Sri Pribin Sarma
14)Sri Ashim Kr.Baruah
15)Sri Nagen Hujiri
16)Smti Gitanjali Kalita
23 Sri Surat Ch. Das
24)Sri Tutu Mani Das
25)Sri Hukum Deka
26) Sri Nirmal Saikia
27) Sri Gunavi Kalita
28) Sri Jiten Sarma
29) Sri Jogesh Ch. Sarma
30) Sri Monoranjan Talukdar
31) Smti Rina Haloi
32) Sri Anowar Hussian

Consultation 9

Area: Kailash Nagar (Near Nabajyoti and Alokjyoti Nagar)
Date & Time: 31st November, 2013. From 3.30pm to 5.0pm

S. No.	Issues	Perception	Action taken
1	Awareness and extent of the project and development components	Local people are not aware of the components of the project. It is understood that 30% of the people have some idea.	Awareness program at different project locations related to project components is essential
2	Perceptions and view of the local community on the project–is the project relevant or not?	The people in the project areas agreed on the relevance of the project. They shared that sufficient & quality water needs to be available throughout the day	
3	In what way they may associate with the project	At the construction phase some people can work as laborers	
4	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	The project area is Govt. land for which permission has been granted. There is no wild life or sensitive/ unique environmental components in the project area.	
5	Presence of historical/ cultural/ religious sites nearby	There is no historical / cultural or religious site nearby.	
6	Unfavourable climatic condition	In the pick summer and in the rainy season it is humid and hot. Not suitable for continuous work.	
7	Occurrence of flood	No such case is reported During monsoon water runs down the hill slope and passes through the down hill in to the drain by the road side.	Drainage project will be designed considering the issue
8	What is the nature of drainage/ solid waste problem in the community at present? What is the view of the people on improving it?	No such problem	
9	Drainage problem facing	No any	

10	Present drinking water problem – quantity and quality	In 70% cases local complained on non availability of water, Presence of iron is not reported by 90% of habitation. In 50% cases people have own arrangement (tube well or dug well) within their premises even carry water from outside	
11	Present solid waste collection and disposal problem	As per local people solid wastes are disposed in municipal dust bin which is cleared by Guwahati Municipal Corporation	
12	Availability of labour during construction time	Yes, labours are available in the nearby areas.	
13	Access road to project Site	Non bituminous road is existing in some of the cases. However access road is to be constructed.	
14	Perception of locals On tree felling and afforestation	Generally not required in most of the cases.	If required compensatory plantation will be done as per Govt. rule
15	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
16	Setting up worker camp site within the village/ project locality	Project area appears not having sufficient space for workers camp. Local people will allow to set up labour camp if necessary	
17	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	

NAME AND POSITION OF PERSONS CONSULTED:

1)Smti Birohi Kathar.
2)Smti Rumi Pachoni
3)Smti Kurachi Devi
4)Smti Renuka Choudhury
5)Smti Anima Choudhury
6)Smti Dalimi Boro
7)Smti Jonali Boro
8)Smti Rina Pegu
9)Smti Dalimi Boro
10)Smti Mamoni Basya
11) Sabita Dangoria
12)Smti Madhumita Das
13)Smti Maya Sonar
14Smti Smitra Tharu
15)Smti Ranu
16)Smti Nilima Sarma
17)Smti Anima Das
18)Sri Hira Das
19)Smti Premoda Das
23)Smti Sabita Roy
24)Smti Pratima Rahman
25)Sri Rami Sinha
26)Sri Mono Roy
27)Smti Minu Goala
28)Smti Sabita Burman
29)Smti Parbati Burman
30)Sri Kanda Burman
31)Sri Bhagya Mandal
32)Sri Sri Kisore Thapa
33)Smti Kapila Thapa
34)Sri Dipak Gurung
35)Sri Simanta Saini
36)Smti Anawara Begum
37)Smti Runujun Begum
38)Sri Gopi Thapa
39)Smti Gita Roy
40)Sri Sadhan sarkar
41)Sri Monoj Rajbonshi
45)Sri Ajit Gogoi
46) Sri Sri Bidyadhar Anand
47)Smti Jahanara Khatun
48)Sri Kajiron
49)Smti Parbati Burman
50)Smti Arpana Kalita
51)Sri Kalaswer Kalita
52)Sri Dilip Thapa
53)Sri Dipak Thapa
54)SriDipak Gurung
55)Sri Boloram Sarma
56)Md.Fatar Ali
57)Smti Saraswati
58)Miss Mamani Begum
59)Smti Lalita Pradhan
60)Sri Mubarak Hussian
61)Smti Kusum Kalita
62)Smti Achiron Begum
63) Smti Anju Baisya

20)SmtiGitingali Das 42)Sri Ranjan Thapa 64) Sm NiRoda Boro
21)Smti Monomoti Burman 44)Sri Monoj Kr.Rai
22)Smti Tunu Deka

Consultation 10

Area : Kenduguri-1
Date & Time: 21st November, 2013. From 04.00pm to o5.30 pm.

S. No.	Issues	Perception	Action taken
1	Awareness and extent of the project and development components	Local people are not aware of the components of the project. It is understood that 30% of the people have some idea.	Awareness program at different project locations related to project components is essential
2	Perceptions and view of the local community on the project–is the project relevant or not?	The people in the project areas agreed on the relevance of the project. They shared that sufficient & quality water needs to be available throughout the day	
3	In what way they may associate with the project	At the construction phase some people can work as laborers	
4	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	The project area is not in forest land There is no wild life or sensitive/ unique environmental components in the project area. The project area is surrounded by residences.	
5	Presence of historical/ cultural/ religious sites nearby	There is no historical/cultural or religious site in the area other than Namghar ,locally constructed.	
6	Unfavourable climatic condition	In the pick summer and in the rainy season it is humid and hot. Not suitable for continuous work.	
7	Occurrence of flood	No such case is reported. Minor water logging for very short duration occurs during heavy monsoon.	Drainage project will be designed considering the issue
8	What is the nature of drainage/ solid waste problem in the community at present? What is the view of the people on improving it?	No such problem	
9	Drainage problem facing	No drainage problem reported.	
10	Present drinking water problem – quantity and quality	In 70% cases local complained on non availability of water, Presence of iron is not reported by 90% of habitation. In 50% cases people have own arrangement (tube well or dug well) within their premises even carry water from outside	

11	Present solid waste collection and disposal problem	As per local people – done properly by GMC	
12	Availability of labour during construction time	Some people may work as labors when the project starts.	
13	Access road to project Site	There is existing bitumen road and non bituminous roads in the area.	
14	Perception of locals On tree felling and afforestation	Generally not required in most of the cases.	If required compensatory plantation will be done as per Govt. rule
15	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
16	Setting up worker camp site within the village/ project locality	Project area appears not having sufficient space for workers camp. Local people will allow to set up labour camp if necessary	
17	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	

NAME AND POSITION OF PERSONS CONSULTED:

1)Smti Minati Devi
2)Smti Sabita Nath
3)Sri Pabitra Kalita
4)Smti Narmada kalita
5)Smti Lakshmi Rajbonsi
6)Smti Archana Das
7)Smti Anima Das
8)Smti Champa Tantra
9) Smti Moni Kalita
10)Smti Narmala Medhi
11)Smti Ulipi Khanikar
12)SmtiMaliti Kalita
13) Smti Gitika Boro
15)Smti Sarala Boro
16)Smti Babita Choudhury
17)Smti Putuli Kalita
18) Smti Cinimola Kalita
19) Smti Nirupoma Das
20) Smti Nilakshi Borgohain
21) Smti Kunjalata Das
22)Smti Sali Talukdar
23) Smti Bela Mazumdar
24) Smti Sudhamoni Choudhury
25) Smti Astami Nath
26) Sri Surjja Kanti Das
27)Smti Asami Devi
28)Sri Pradip Borgohain
29)Sri Pranab Burman

Consultation 11

Area : Suraj Nagar (Kenduguri)
Date & Time : 21st November, 2013. From 07.30 pm to 09.00 pm

S. No.	Issues	Perception	Action taken
1	Awareness and extent of the project and development components	Local people are not aware of the components of the project. It is understood that 30% of the people have some idea.	Awareness program at different project locations related to project components is essential
2	Perceptions and view of the local community on the project–is the project	The people in the project areas agreed on the relevance of the project. They shared that sufficient	

	relevant or not?	& quality water needs to be available throughout the day	
3	In what way they may associate with the project	At the construction phase some people can work as laborers	
4	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	The project area is not in forest land There is no wild life or sensitive/ unique environmental components in the project area. The project area is surrounded by residences.	
5	Presence of historical/ cultural/ religious sites nearby	There is no historical/cultural or religious site in the area other than Namghar ,locally constructed.	
6	Unfavourable climatic condition	In the pick summer and in the rainy season it is humid and hot. Not suitable for continuous work.	
7	Occurrence of flood	No such case is reported. Minor water logging for very sort duration occurs during heavy monsoon.	Drainage project will be designed considering the issue
8	What is the nature of drainage/ solid waste problem in the community at present? What is the view of the people on improving it?	No such problem	
9	Drainage problem facing	No drainage problem reported.	
10	Present drinking water problem – quantity and quality	In 70% cases local complained on non availability of water, Presence of iron is not reported by 90% of habitation. In 50% cases people have own arrangement (tube well or dug well) within their premises even carry water from outside	
11	Present solid waste collection and disposal problem	As per local people – done properly by GMC	
12	Availability of labour during construction time	Some people may work as labors when the project starts.	
13	Access road to project Site	There is existing bitumen road and non bituminous roads in the area.	
14	Perception of locals On tree felling and afforestation	Generally not required in most of the cases.	If required compensatory plantation will be done as per Govt. rule
15	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
16	Setting up worker camp site within the village/ project locality	Project area does sufficient space for workers camp. However local people will allow to set up labor camp in case of necessity.	
17	Safety of residents during construction	Local requested for safety arrangement particularly where	

	phase and plying of vehicle for construction activities	excavation is being planned near main city road	

NAME AND POSITION OF PERSONS CONSULTED:

1)Smti Bindu Medhi.
2)SmtiSewali Medhi.
3)Smti Mira Das
4)Smti Rupali Baruwa
5)Smti Jugamaya Sarma
6)Smti Nirupa Goswami
7)Smti Dipanjali Devi
8)Smti Aparna Talukder
9)Smti Annamai Deka
10)Smti Himani Kalita
11)Smti Minati Basya
12)Smti Minati Mazumder
13)Smti Bhabani Bardoloi
14)Smti Anima Dekadas
15)Smti Anupama Das
16)Smti Supra Borah
17)Smti Sati Burman
18)Smti Bani Chakraborty
19)Smti Girijamala Kulsi
20)Smti Dipali Thakuria
21)Smti Minu das
22)Sri Kamleswar Das
23)Smti Bhagyabati Das
24)Sri Naru Deka

Consultation 12

Area: North Jyotinagar (DeepjyotiSangha)
Date & Time: 2nd, March, 2014. From 11.00 am to12.30pm.

S. No.	Issues	Perception	Action taken
1	Awareness and extent of the project and development components	Local people are not aware of the components of the project. It is understood that 20% of the people have some idea.	Awareness program at different project locations related to project components is essential
2	Perceptions and view of the local community on the project–is the project relevant or not?	The people in the project areas agreed on the relevance of the project. They shared that sufficient & quality water needs to be available throughout the day	
3	In what way they may associate with the project	At construction phase some people can work as labourers and after completion water supply to the nearby areas shall be improved.	
4	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	There is no forest area near by the project site.	
5	Presence of historical/ cultural/ religious sites nearby	There is no presence of historical/cultural sites nearby. Temple like Manasamandir, Sivamandir, constructed by local people are there.	
6	Unfavourable climatic condition	In the pick summer and in the rainy season it is humid and hot. Not suitable for continuous work.	

7	Occurrence of flood	No such case is reported. Minor water logging for very short duration occurs during heavy monsoon.	Drainage project will be designed considering the issue
8	What is the nature of drainage/ solid waste problem in the community at present? What is the view of the people on improving it?	No such case reported even during monsoon other than temporary water logging in the downhill areas	
9	Drainage problem facing	No drainage problem reported.	
10	Present drinking water problem – quantity and quality	There is scarcity of drinking water in the area. Most of the people purchase water for their daily needs. A few people have deep tube well. Presence iron is reported	
11	Present solid waste collection and disposal problem	As per local people – done properly by GMC	
12	Availability of labour during construction time	Some people may work as labors when the project starts.	
13	Access road to project Site	There is existing bitumen road and non bituminous roads in the area.	
14	Perception of locals On tree felling and afforestation	Generally not required in most of the cases.	If required compensatory plantation will be done as per Govt. rule
15	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
16	Setting up worker camp site within the village/ project locality	Project area does sufficient space for workers camp. However local people will allow to set up labor camp in case of necessity.	
17	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	

NAME AND POSITION OF PERSONS CONSULTED:

1)SriNandalal Das
2)SriKailashCh.Sarma
3)SriJogenThakuria
4).Sri BinodSarma
5)SriParagMedhi.
6)SriBhupenSarma
7)SriBrojen Das
8)SriAshis Kr. Bhuyan
9)Sri.G.Rabha
10)Sri.KamalLochan Das
11)Sri DipakChoudhury.
12)Sri RanjitGogoi
13)Smti. Pallabi Devi.
14)Smti.Bina Kote.
15)SmtiPhulaKalita
16)SriMukul Ch. Das.
17)Smti.DipaliBaruah
18)SmtiPadumiMalakar.
19)SmtiReenaTalukdar.

Summary of outcome:

Local people are very much interested on the proposed project. They requested to complete the project at earliest. All sort of cooperation is expected from local habitation. During construction time there is a necessity to apply mitigation measures as per Environment Management Plan.

Public Consultation at Different Locations

APPENDIX 6: SAMPLE GRIEVANCE REGISTRATION FORM

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

The **Assam Urban Infrastructure Investment Program (AUIIP)** welcomes complaints, suggestions, queries and comments regarding project implementation. We encourage persons with grievance to provide their name and contact information to enable us to get in touch with you for clarification and feedback. Should you choose to include your personal details but want that information to remain confidential, please inform us by writing/typing *(CONFIDENTIAL)* above your name. Thank you.

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

FOR OFFICIAL USE ONLY

Registered by: (Name of official registering grievance)	
If – then mode: ■ **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:	

GRIEVANCES RECORD AND ACTION TAKEN

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