Initial Environmental Examination

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IND: Kolkata Environmental Improvement Investment Program (KEIIP) Tranche 2 – Water Supply in Joka and Adjoining Area, Kolkata and Water Loss Management at Anandapur and Patuli Areas of East Kolkata

Prepared by Kolkata Municipal Corporation of for the Asian Development Bank.

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Kolkata Municipal Corporation

WEIGHTS AND MEASURES

CFU	-	Colony Forming Unit
cum/hr	-	cubic meter per hour
cum/m^3	-	cubic meter
dB(A)	-	Decibal in A network
Ft	-	feet
Ha	-	hectare
Km	-	kilometer
km^2 or sq km	-	square kilometer
KVA	-	Kilovolt ampere
Lpcd	-	liter per capita per day
M	-	meter
m/yr	-	meter per year
mg/l	-	milligram per liter
MGD	-	million gallon per day
MGH	-	million gallon per hour
MPN	-	Most Probable Number
MT	-	Metric Ton
ML	-	million liter
MLD	-	million liter per day
Mm	-	Millimeter
NTU	-	Nephelometric turbidity Unit

ABBREVIATIONS

ADB	-	Asian Development Bank
BOD	-	Biochemical Oxygen Demand
BPS	-	Booster Pumping Stations
CI	-	Cast Iron
COD	-	Chemical Oxygen Demand
CPHEEO	-	Central Public Health and Environmental Engineering Organisation
DI	-	Ductile Iron
DO	-	Dissolved Oxygen
DSC	-	Design and Supervision Consultants
DWF	-	Dry Weather Flows
KMC	-	Executing Agency
EKW	-	East Kolkata Wetlands
GOI	-	Government of India
GRC	-	Grievance Redressal Committee
GRM	-	Grievance Redress Mechanism
HDPE	-	High-Density Polyethylene
INR	-	Indian National Rupee
KEIP	-	Kolkata Environment Improvement Project
KEIIP		Kolkata Environment Improvement Investment Program
KMA	-	Kolkata Metropolitan Area
KMC	-	Kolkata Municipal Corporation
KMDA	-	Kolkata Metropolitan Development Authority
KMWSA	-	Kolkata Metropolitan Water and Sanitation Authority
MOUD	-	Ministry of Urban Development
MS	-	Mild Steel
O and M	-	Operation and Maintenance
PMU	-	Project Management Unit
PST	-	Pre-Settling Tanks
PWD	-	Public Works Department
SAR	-	Subproject Appraisal Reports
ST	-	Schedule Tribe
STP	-	Sewage Treatment Plant
SWF	-	Storm Water Flow
SWM	-	Solid Waste Management
TDS	-	Total Dissolved Solids
TFS	-	Total Fixed Solids
TKN	-	Total Kjeldahl Nitrogen
TOR	-	Terms of Reference
TSS	-	Total Suspended Solids
USD	-	US Dollar
WBPCB	-	West Bengal Pollution Control Board
WTP	-	Water Treatment Plant
WBSETCL	-	West Bengal State Electricity Transmission Company Limited

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EXECUTIVE SUMMARY

1. The Kolkata Environmental Improvement Investment Program (KEIIP) is a key urban infrastructure initiative of the Kolkata Municipal Corporation (KMC), and aims to improve the urban environment and quality of life in parts of Kolkata Municipal Area mainly through the delivery of improved water supply, sewerage, drainage and sanitation. The Project will be implemented over a 5-year period from 2014 to 2019. The Program is proposed to be implemented using a multi-tranche financing facility (MFF) of ADB. At present KEIIP Tranche 1 project is under implementation.

2. ADB requires consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS), 2009. The SPS *inter alia* mandates that ADB ensures environmental assessment of all project loans, program loans, sector loans, sector development program loans, and loans involving financial intermediaries, and private sector loans.

3. This IEE is an updated version (after finalization of design) of the earlier IEE that has been prepared during SAR stage as a part of Tranche 2 loan for the proposed water supply sub project "Water Supply in Joka & Adjoining Area, Kolkata" and addition of "Water Loss Management at Anandapur and Patuli area of East Kolkata". The work at Joka area includes, (i) Construction of 2 Under Ground Reservoir (UGR) cum Pumping Station (PS) at Prantik Phase III and KMC land on Julpia Road, Construction of 6 Elevated Service Reservoirs (ESRs) at Prantik Ph III, N-E of SSE STP, N-W of SSE STP, KMC land on Julpia Road, WBSETCL (West Bengal State Electricity Transmission Company Limited) and 22 Bigha, (ii) Laying of Transmission Main from existing Daspara PS to UGRs at Pratik Phase III and KMC land on Julpia Road; and transmission main from UGRs to 8 ESRs (6 proposed + 2 existing), (iii) Laying of water supply distribution network including providing household service connection in 4 distribution service areas in Joka and adjoining areas for the command area under proposed ESRs at Prantik Ph III, NE of SSE STP and NW of SSE STP and existing ESR at Prantik, (iv) Laying of water supply distribution network including providing household service connection in 4 distribution service areas in Joka and adjoining areas for the command area under proposed ESRs at Company pukur (KMC land at Julpia road), WBSETCL, 22 Bigha and existing ESR at Diamond Park, , (v) Construction of Elevated Service Reservoir (ESR) at Ramkantapur, Malpara, Charaktala; Laying of Transmission main from UGR at KMC land on Julpia Road to 3 ESRs; Laying of Distribution system and house connection within command area of 3 ESRs, (vi) Dedicated Water Supply Transmission Main from Junction of James Long Sarani to Daspara near existing Pumping Station along James Long Sarani, and additional work for water loss management (vii) Water Loss Management in Anandapur area and Patuli area under Jai Hind WTP Area (Eastern Kolkata).

4. Construction work has commenced in late 2016 and will be completed tentatively by 45 months The IEE aims to (i) provide critical facts, significant finding, and recommended actions; (ii) present the national and local legal and institutional framework within which the environmental assessment has been carried out; (iii) provide information on existing geographic, ecological, social and temporal context including associated facilities within the subproject's area of influence; (iv) assess the subproject's likely positive and negative direct and indirect impacts to physical, biological, socioeconomic, and physical cultural resources in the subproject's area of influence; (v) identify mitigation measures and any residual negative impacts that cannot be mitigated; (vi) describe the process undertaken during project design to engage stakeholders and the planned information disclosure measures and the process for carrying out consultation with affected people and facilitating their participation during project implementation; (vii) describe the subproject's grievance redress mechanism for resolving complaints about environmental performance; (viii) present the set of mitigation measures to be undertaken to avoid, reduce, mitigate, or compensate for adverse environmental impacts; (ix) describe the monitoring measures and reporting

procedures to ensure early detection of conditions that necessitate particular mitigation measures; and (x) identify who is responsible for carrying out the mitigation and monitoring measures.

5. Potential negative impacts were identified in relation to pre- construction, construction and operation stages of the improved infrastructure, but no permanent environmental impacts were identified as being due to either the subproject design or location. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. These were discussed with specialists responsible for the engineering aspects, and as a result some measures have already been included in the designs for the infrastructure. This means that the number of impacts and their significance have already been reduced by amending the design.

6. The public participation processes has been undertaken during project detailed design ensuring that stakeholders are engaged during the implementation of the project. The planned information disclosure measures and process for carrying out consultation with affected people will facilitate their participation during project implementation.

7. The subproject's Grievance Redress Mechanism (GRM) will provide the citizens with a platform for redress of their grievances and describes the informal and formal channels, time frame and mechanisms for resolving complaints about environmental performance.

8. The EMP will guide the environmentally-sound construction of the subproject and ensure efficient lines of communication between KMC, PMU, DSC and the contractors. 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.

9. The contractor for the package will be required to submit to KMC/PMU, for review and approval, site environmental plan (SEP) including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following **Tables 24 to 28** of the EMP to ensure no significant environmental impacts; (iii) monitoring program as per SEP; and (iv) budget for SEP implementation. No works are allowed to commence prior to approval of SEP.

10. A copy of the EMP/approved SEP will be kept on site during the construction period at all times. The EMP has been made binding on all contractors operating on the site and included in the bid and contract documents. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

11. The subproject is unlikely to cause significant adverse impacts because: (i) most of the individual components involve straightforward construction and operation, so impacts will be mainly localized; (ii) in most cases the predicted impacts are localized and likely to be associated with the construction process at isolated locations and are produced because the process is invasive, involving excavation, obstruction at specific construction locations, and earth movements. 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.

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

I. INTRODUCTION

1. The Kolkata Environmental Improvement Investment Program (KEIIP) is an important environmental improvement program of the Kolkata Municipal Corporation (KMC) closely following the implementation of the Kolkata Environmental Improvement Project (KEIP). The Program is expected to further improve the urban environment and living conditions in targeted urban segments of the KMC area. The Program is proposed to be implemented using a multi-tranche financing facility (MFF) of ADB.

2. The Kolkata Environmental Improvement Investment Program (KEIIP) Tranche 2 aims to improve the urban environment and quality of life in parts of Kolkata Municipal Area mainly through the delivery of improved water supply, sewerage, drainage and sanitation. The Tranche 2 project will be implemented over a 3-year period from 2016 to 2019. At present KEIIP Tranche 1 is under implementation and some Tranche 2 projects have just been awarded or while some are yet to be awarded.

3. ADB requires consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS), 2009. The SPS inter alia mandates that ADB ensures environmental assessment of all project loans, program loans, sector loans, sector development program loans, and loans involving financial intermediaries, and private sector loans.

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5. Construction work has commenced in late 2016 and will be completed tentatively by 45 months.

6. This IEE aims to (i) provide critical facts, significant finding, and recommended actions; (ii) present the national and local legal and institutional framework within which the environmental assessment has been carried out; (iii) provide information on existing geographic, ecological, social and temporal context including associated facilities within the subproject's area of influence; (iv) assess the subproject's likely positive and negative direct and indirect impacts to physical, biological, socioeconomic, and physical cultural resources in the subproject's area of influence; (v) identify mitigation measures and any residual

negative impacts that cannot be mitigated; (vi) describe the process undertaken during project design to engage stakeholders and the planned information disclosure measures and the process for carrying out consultation with affected people and facilitating their participation during project implementation; (vii) describe the subproject's grievance redress mechanism for resolving complaints about environmental performance; (viii) present the set of mitigation measures to be undertaken to avoid, reduce, mitigate, or compensate for adverse environmental impacts; (ix) describe the monitoring measures and reporting procedures to ensure early detection of conditions that necessitate particular mitigation measures; and (x) identify who is responsible for carrying out the mitigation and monitoring measures.

II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. ADB Policy

7. ADB requires the consideration of environmental issues in ADB's all aspects of ADB's operations, and the requirements for environmental assessment are described in ADB SPS, 2009. SPS mandates environmental assessment of all ADB's project loans, program loans, sector loans, sector development program loans, and loans involving financial intermediaries, and private sector loans.

8. **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 and are assigned to one of the following four categories:

(i) **Category A.** Projects could have significant adverse environmental impacts. An EIA is required to address significant impacts.

(ii) **Category B.** Projects could have some adverse environmental impacts, but of lesser degree or significance than those in category A. An IEE is required to determine whether significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report.

(iii) **Category C.** Projects are unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are reviewed.

(iv) **Category FI.** Projects involve a credit line through a financial intermediary or an equity investment in a financial intermediary. The financial intermediary must apply an environmental management system, unless all Projects will result in insignificant impacts.

9. **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.

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

(i). For environmental category A projects, a draft EIA report at least 120 days before Board consideration;

(ii). Final or updated EIA and/or IEE upon receipt; and

(iii). Environmental monitoring reports submitted by the Project Management Unit (PMU) during project implementation upon receipt.

B. National and State Laws

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

12. The following legislations are applicable to any project:

(i). Environmental (Protection) Act of 1986, its rules and amendments;

(ii). Environmental Impact Assessment (EIA) Notification of 2006 and 2009;

(iii). Water (Prevention and Control of Pollution) Act of 1974, its Rules, and amendments;

(iv). Air (Prevention and Control of Pollution) Act of 1981, its Rules and amendments;

(v). Central Pollution Control Board (CPCB) Environmental Standards;

(vi). The Ancient Monument and Archaeological Sites and Remains (Amendment and Validation) Act 2010, Ancient Monuments and Archaeological Sites and Remains Rules of 1959;

(vii). The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (LARR),, Land Acquisition Act of 1894 and as amended in 1985;

(viii) Wetlands (Conservation and Management) Rules, 2010;

(ix) Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016

(x) Noise Pollution (Regulation and Control) Rules of 2000 as amended up to 2011.

(xi) National Institute of Occupational Safety and Health Criteria for a recommended standard: occupational noise exposure, NIOSH Publication No. 98-126

(xii) West Bengal Trees (Protection and Conservation in Non-Forest Areas) Act, 2006;

(xiii) East Kolkata Wetlands (Conservation and Management) Act, 2006

(xiv) The Child Labour (Prohibition and Regulation) Amendment Act, 2016, The Child Labour (Prohibition and Regulation) Act, 1986

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

Table 1: Applicable Environmental Regulations for Water supply subproject

Law	Description	Requirement
EIA Notification	The EIA Notification of 2006 and 2009 (replacing the EIA Notification of 1994), set out the requirement for environmental assessment in India. This states that Environmental	The proposed components of this water supply subproject are not listed in the EIA Notification's "Schedule of Projects Requiring

Law	Description	Requirement
	Clearance is required for certain defined activities/projects, and this must be obtained before any construction work or land preparation (except land acquisition) may commence. Projects are categorized as A or B depending on the scale of the project and the nature of its impacts. Category A projects requires Environmental Clearance from the National Ministry of Environment, Forest and Climate Change (MoEFCC). Category B projects require Environmental Clearance from the State Environmental Impact Assessment Authority (SEIAA).	Prior Environmental Clearance" and thus Environmental Clearance is not required.
Water (Prevention and Control of Pollution) Act of 1974, Rules of 1975, and amendments	Control of water pollution is achieved through administering conditions imposed in consent issued under provision of the Water (Prevention and Control of Pollution) Act of 1974. These conditions regulate the quality and quantity of effluent, the location of discharge and the frequency of monitoring of effluents. Any component of the Project having the potential to generate sewage or trade effluent will come under the purview of this Act, its rules and amendments. Such projects have to obtain Consent to Establish (CTE) under Section 25 of the Act from West Bengal Pollution Control Board (WBPCB) 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.	No work components of the water supply subproject under will require CTE and CTO from WBPCB. The construction of the water reservoir and pumping stations does not come under purview of Act
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 CTE under Section 21 of the Air (Prevention and Control of Pollution) Act of 1981 from WBPCB 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.	For the subproject, the following will require CTE and CTO from WBPCB: (i) diesel generators; and (ii) hot mix plants, wet mix plants, stone crushers, etc. if installed for construction. All relevant forms, prescribed fees and procedures to obtain the CTE and CTO can be found in the WBPCB website (www.wbpcb.gov.in). CTE to be obtained by KMC prior to award of contract. CTO to be obtained prior to commissioning. CTO renewal to be undertaken by KMC during operations stage.
Environment (Protection) Act, 1986 and CPCB Environmental Standards.	Emissions and discharges from the facilities to be created or refurbished or augmented shall comply with the notified standards notified.	**Appendix 1** provides applicable standards for ambient air, air emission, effluents, receiving water bodies, and drinking water at the consumer end. Contractors are required to ensure all emissions and discharges

Law	Description	Requirement
		during civil works conform to all applicable standards
Noise Pollution (Regulation and Control) Rules, 2002 amended up to 2010.	Rule 3 of the Act specifies ambient air quality standards in respect of noise for different areas/zones.	**Appendix 2** provides applicable noise standards. Contractors are required to ensure all noise-producing activities during civil works conform to applicable standards
National Institute of Occupational Safety and Health (NIOSH) Publication No. 98-126	NIOSH has laid down criteria for a recommended standard: occupational noise exposure. The standard is a combination of noise exposure levels and duration that no worker exposure shall equal or exceed.	**Appendix 3** provides applicable NIOSH occupationnel noise standards. Contractors are required to provide hearing-protection equipment and ensure exposures of workers to noise-generating activities are within allowed NIOSH standards.
Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016	According to the Rules, "hazardous wastes" are wastes having constituents specified in Schedule II of the Rules if their concentration is equal to or more than the limit indicated in the said schedule **(Appendix 4).**	If during excavation works, the excavated material is analyzed to be hazardous, they are to be stored and disposed of only in such facilities as may be authorized by the WBPCB for the purpose
Forest (Conservation) Act, 1980 and Forest Conservation Rules, 2003 as amended	As per Rule 6, every user agency, who wants to use any forest land for non-forest purposes shall seek approval of the Central Government.	No notified forest land within the subproject area.
Wetlands (Conservation and Management) Rules, 2010	The Rules specify activities which are harmful and prohibited in the wetlands such as industrialization, construction, dumping of untreated waste and effluents, and reclamation. The Central Government may permit any of the prohibited activities on the recommendation of Central Wetlands Regulatory Authority.	The subproject is not within the East Kolkata Wetlands thus no permission from the Central Government is required.
The Ancient Monument and Archaeological Sites and Remains (Amendment and Validation) Act 2010,, Ancient Monuments and Archaeological Sites and Remains Rules of 1959	The Rules designate areas within a radius of 100 m and 200 m from the "protected property/ monument/ area" as "prohibited area" and "regulated area" respectively. Henceforth, no permission for construction of any public projects or any other nature shall be granted in the prohibited areas of the protected monument and protected area. In respect of regulated area, the Competent Authority may grant permission for construction, reconstruction, repair and renovation on the basis of recommendation of the National Monument Authority duly taking note of heritage bye-laws, which shall be	There are no protected properties in the subproject area. However, in case of chance finds, the contractors will be required to follow a protocol as defined in the Environmental Management Plan (EMP).

Law	Description	Requirement
	prepared in respect of each protected monument and protected area	
The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (LARR) 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.	All project locations are within the Govt. land, no acquisition of land is required. Resettlement Plan/ due diligence report has been prepared in accordance with the ADB SPS, 2009.
West Bengal Trees (Protection and Conservation in Non-Forest Areas) Act, 2006	The Act states that those who want to fell trees will have to obtain permission from the Forest Directorate, Government of West Bengal. Violators (means whoever fells or causes to be felled any tree or cuts, uproots or otherwise disposes of any fallen tree or contravenes the permission granted) shall be punished with imprisonment up to one year or with fine of Rs.5000/- or both. Also, until plantation of requisite number of trees is undertaken, the violators will be fined for each day of default of Rs.50/-. In case the development agency or entrepreneur fails to implement the plantation plan, the defaulter might have to face an imprisonment up to two years or fine that may extend to Rs.10,000/- or with both.	Permission from the Divisional Forest Officer (Utilization Division), Forest Directorate, Government of West Bengal will be required if trees, particularly those looked upon as sacred groves, identifies as belonging to an endangered species, or given the status of heritage, will be cut/felled. Promoters/developers will have to submit a 'Tree Plantation Plan' while they seek approval for a residential/ commercial/ industrial project.
East Kolkata Wetlands (Conservation and Management) Act, 2006	In August 2002, 12,500 hectares (ha) of the East Kolkata Wetland area was included in the 'Ramsar List' making it a 'wetland of International Importance'. The Ramsar convention is playing a vital role by providing certain basic guidelines to draw up suitable plans for the maintenance and sustenance of the wetlands. Among these, the three most important guiding principles are: (i) maintenance of the special characteristics of the ecosystem; (ii) wise use of its resources with an eye towards sustainability; and (iii)	The subproject is not within the East Kolkata Wetlands thus no permission from the Central Government is required.

Law	Description	Requirement
	economic development for the wetland community. The East Kolkata Wetlands Management Authority (EKWMA) has the power to enforce land use control in the substantially water body-oriented areas and other areas in the East Kolkata wetlands.	
The Child Labour (Prohibition and Regulation) Amendment Act, 2016 The Child Labour (Prohibition and Regulation) Act, 1986	No child below 14 years of age will be employed or permitted to work in any of the occupations set forth in the Act's Part A of the Schedule or in any workshop wherein any of the processes set forth in Part B of the Schedule. Child can helps his family or family enterprise, which is other than any hazardous occupations or processes set forth in the Schedule, after his school hours or during vacations	No children between the age of 14 to 18 years will be engaged in hazardous working conditions.

III. DESCRIPTION OF THE SUBPROJECT

A. Existing Situation

14. The specific objective of the subproject under Tranche 2 is to develop water supply facilities on priority basis which in turn helps to improve social, environmental and economic condition of the population.

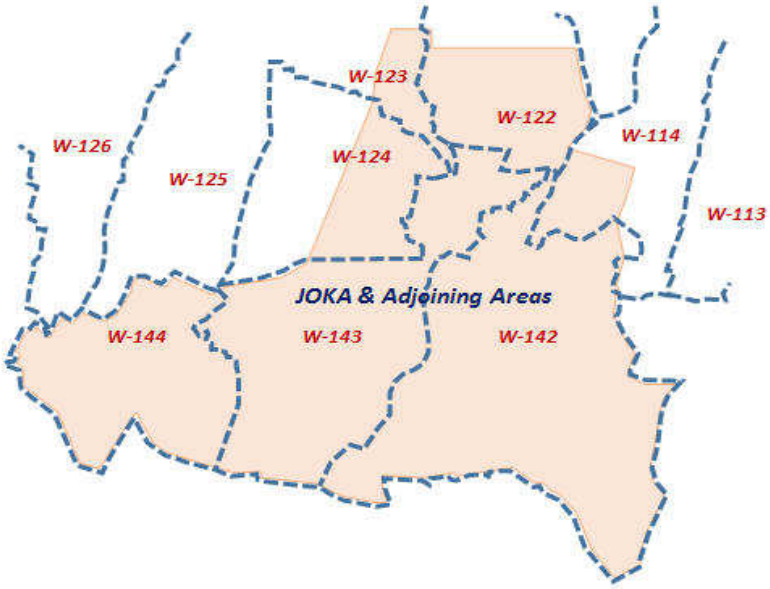
15. This is an IEE Report on Water Supply for Joka and adjoining areas and water loss management in Anandapur area and Patuli area under Jai Hind WTP Area.

Joka Area sub projects

16. The proposed work addresses the need and rationale of the requirement for the proposed infrastructure in the target area. The proposals considered in this report have been framed for the work of Underground Reservoirs, Overhead Reservoirs, Pumping Stations, Transmission Mains and Water Distribution Network in Joka & adjoining areas.

17. KMC area has recently (2015) been enlarged by addition of Joka area in its southern part with the creation of 3 new Wards (nos. 142, 143 and 144). A new Borough XVI has also created within KMC with the new Wards (142 to 144).

18. The Project area includes Wards 142, 143, 144 and adjoining areas of Wards 122, 123, 124 and 114 (Refer Figure below and **Figure 1 -** Project location map- end of this section**)**. Total project area is about 1685 Ha.



Project locatin map – Joka area

19. The area is relatively less populated. There are some primary roads extending in north south direction. In general, width of many of these roads are narrow.

Water Source

20. Potable water in this area is now supplied by PHED supply system. River Hooghly is the source for surface water. Treated water comes from Raipur WTP, situated in South 24 Parganas district, about 25 km from the project area. Total supply to the project area is 1.36 MGD (6.2 mld).

21. There are some private and public shallow tube wells. 124 nos. hand tube wells existed before handover from Gram panchyat to KMC. Most of them (about 50% average) are non-functional at present. KMC sank 116 tube wells 700 ft depth, each discharging 20KL per day. Total discharge from shallow tube well comes to 3.56 mld.[1]

22. In addition, KMC is operating 4 nos. small dia. deep tube well, each having discharging capacity of 8000 Gallon/hr operating 4 hours per day[2]. Total discharge from these deep tube wells comes to 0.58 mld. The supply is intermittent. As per local inquiry the ground water quality is not good.

Surface Water	6.18 mld
Shallow tubewell	3.56 mld
Deep tubewell	0.58 mld
Total	**10.32 mld**

Reservoir

23. There are three overhead reservoirs (or Elevated Service Reservoirs) from where water is being supplied. In the study area, two reservoirs are located within the municipal boundary, one at Diamond park having a capacity of 1500 cum and the other at Prantik with 900 cum capacity.

Existing Network

24. In Joka area, the existing distribution system is from two ESRs. Pipes are predominantly of DI and uPVC, supplemented by CI in few stretches. Total length of existing pipe network is about 30 km for Ward 142 to 144, diameter ranging from 350mm to 90mm.

[1] {124*50/100+116}*20/1000 = 3.56
[2] Source of information for the relevant paragraphs under the sub-chapter – KMC official

25. Number of existing connection for surface water source supply is 3490. But in most parts of the area, public stand posts are the main point of water supply. There is no organized house connection system in the region. In few cases, one connection is being shared by multiple household. Water is being supplied intermittently, maximum supply of 3 hours in a day. Availability of water at consumers' end is grossly inadequate. There is no defined pressure zoning in the existing system. Pressure at the consumer end is low, being 2-3m of water head during supply hours.

26. **Figure 2** (end of the section) shows existing water supply system of Joka.

Jai Hind – Eastern Kolkata area sub project

Project Area

27. The project area has been defined as the area being served from the respective Head Works / Underground Service Reservoirs of Anandapur and Patuli. The other command areas are Mukundapur,GJ Khan and Telipara.

28. The approximate coverage area is 12.62 Sq. kms, covering parts of ward 101, 102, 107, 108 and 110, as per pipeline network maps available in the Water Supply Department of KMC. However, the area is indicative and project boundary may have to be consolidated based on validation / confirmation of the pipeline network and the households actually receiving supply water from the Head works / UGRs of Anandapur and Patuli.

29. The location of water loss management project under 'Anandapur area and Patuli area under Jai Hind WTP Area (Eastern Kolkata)" is shown in the key map below.

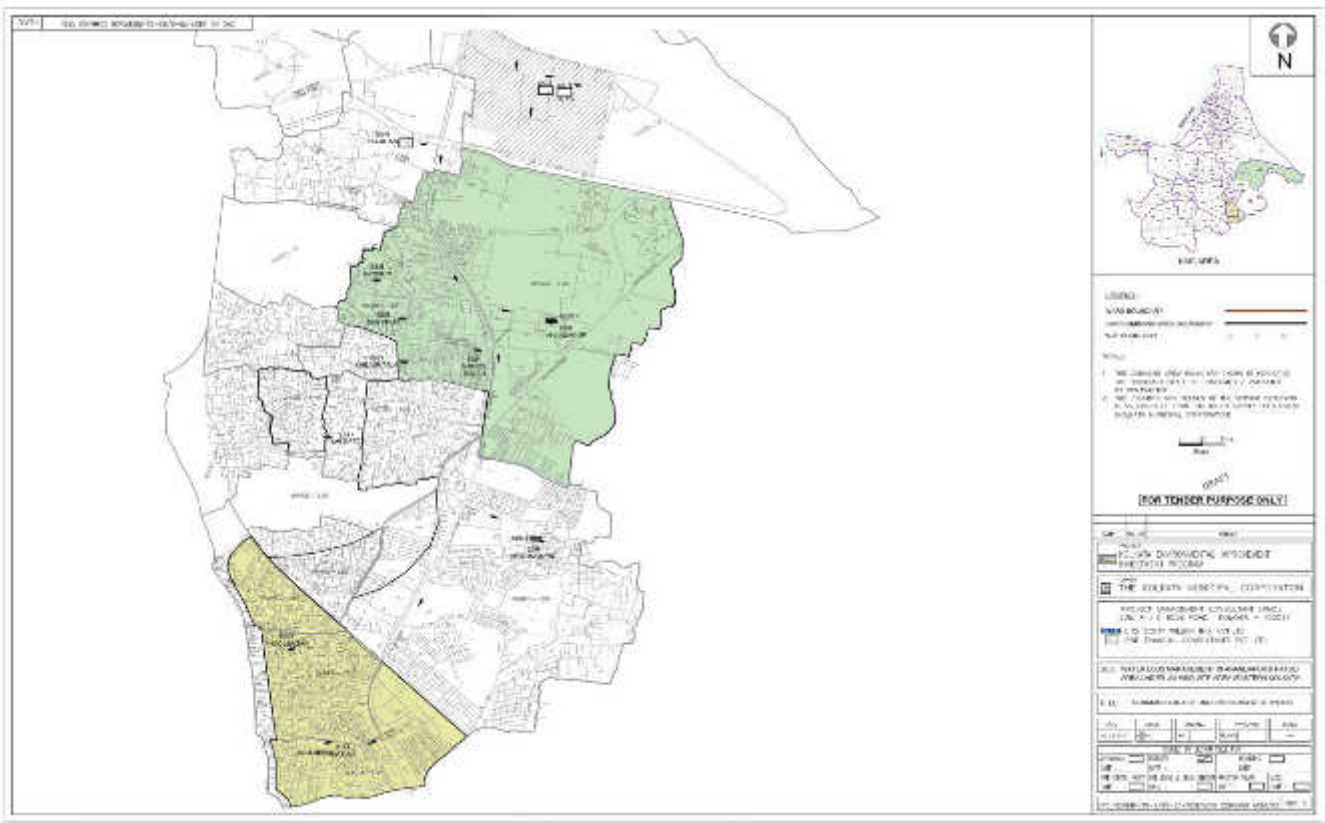


Figure 3: Key project area map for Water Loss Management work- Anandapur and Patuli, East Kolkata

Existing Situation- Treatment Plant Capacity

30. Water in the project area is being supplied from Jai Hind WTP. The Design Capacity of the Jai Hind Water Treatment Plant is 30 MGD. The water pumped from the Jai Hind WTP

as per available records during the past 3 months is around 20.4 MGD. Clear water capacity in the WTP is presently 3MG. KMC has a plan to augment its capacity. Water from the Jai Hind Water Treatment Plant is presently pumped to the Underground Storage Reservoirs at GJ Khan, Mukundapur, Anandapur and Patuli.

Details of Elevated Service Reservoir

31. The details of the major Service reservoirs within Anandapur and Patuli area under the Jai Hind Water Treatment Plant area are tabled below:

Sl. No	**Elevated Service Reservoir**		
	Name / Location	**Capacity (In cum)**	**Staging Height (m)**
	Anandapur Headworks Zone		
1	ESR Anandapur (Within Complex)*	3052	20
2	ESR Narkelbagan	757	20
3	ESR Khejurtola	797	20
4	ESR Santipally	757	20
5	ESR Hathisur	757	20
	Patuli Headworks Zone		
6	ESR Patuli (Within Complex)	3987	20
7	ESR Phoolbagan	1402	20

Supply Areas

32. Supply to the Distribution network is done through the Elevated Service Reservoirs within the command areas of Anandapur and Patuli.

Sl. No	Elevated Service Reservoir at:	Ward areas
1	Anandapur Head Works	108 (Total)
2	Narkelbagan	107 (Partly)
3	Santipur	107 (Partly)
4	Khejurtola	107 (Partly)
5	Hatisur	107 (Partly)
6	Patuli Head Works	110 (Partly), 101 (Partly)
7	Phool Bagan	102 (Partly)

Supply Period

33. The normal supply hours from the Distribution reservoirs are 5 ½ hours a day on an average. The present supply to the local areas is intermittent and water is provided in the morning, noon and evening in 3 shifts.

Supply Time	Supply Period	Supply duration (Hours)
Morning	(06:30 - 09:00)	2.50
Noon	(12:00 - 13:00)	1.00
Evening	(16:00 - 18:00)	2.00

Pipe-length Network

34. The total length of the pipeline network under Anandapur+Patuli area, as estimated from the network map, is approximately 192 Kms. It consists of primarily DI Pipes, with some nominal lengths of HDPE pipes which have been laid recently in select wards. The areas served from the Old tube wells have limited length of CI pipes.

35. The above figure (192 km) is based on the information updated as on 2015, which also shows 31km of unpiped road.. Since then KMC has been laying service pipes in the

unpiped lanes/roads from its own fund. For the purpose of preparation of this bid, it is assumed that 10% unpiped roads will be left out.

B. Need of the sub project

Joka Area Sub projects

36. PHED supplies water to about 60% of the project area. The water supply system of Joka and adjoining area is not very old, but infrastructures are inadequate to meet up urban demand. The present average per capita supply is 49lpcd[3], which is far beyond the desired supply of 150 lpcd (for metropolitan cities). Unaccounted for water is not assessed. 30% system loss is assumed, same as for KMC[4]. The average supply period is 3-4 hours a day. Residual pressure is very low to about 2-3m. Even in some pocket pressure is less than 1m, where stand post supply point is kept at lower level than ground level by making stand post chambers below the ground. In rest 40% project area there is provision for ground water supply, maintained by KMC. But due to poor quality it is not widely used. From quality and public health point of view groundwater needs to be replaced.

37. The water supply service level in Joka and adjoining area of KMC is far from adequate service level. So there is a need for the project on water supply in this area.

38. From the above assessment it is clear that investment is needed to improve the water supply system in Joka and adjoining area under Kolkata Municipal Corporation. The objective of the subproject, within the overall objectives of KEIIP, is to enhance the service levels in a phased approach to arrive at the target service levels.

39. The water supply service level in Joka and adjoining area of KMC is far from adequate service level. So there is a need for the project on water supply in this area. Based on the service level in the current situation for the year 2015, a summary of the demand-supply gap is given below. 'Demand' figures are based on the theoretical demand target as per service level indicator of the national standard and CPHEEO. Services to other municipalities are not considered in this analysis.

Sl. No.	Parameter	Demand	Supply	Gap (as on 2015)	Remarks/ Target
1	Surface water source quality after treatment	As per CPHEEO permissible limits	As per CPHEEO permissible limits	-	From treated water quality point of view there is no gap
2	Groundwater source quality	As per CPHEEO permissible limits	Poor quality (as per local complain).	Replace groundwater by surface water	Replace groundwater by surface water
3	Surface water source quantity (river flow)	With 15 % System loss + 5% treatment loss = 40mld[5]	98000 mld[6]	-	There is no shortage of surface water.
4	Groundwater source quantity	-	-	-	Groundwater source is to be discarded.
5	UFW	15%	-	-	Data not available
7	Water production	With 15 % System loss = 38 mld[7]	10.3mld	27.7mld	There is shortage of production.
9	Per capita	150 lpcd	49lpcd	101lpcd	Water production

[3] 10.32mld * (100%-30% water loss) / 146357 pop. as on 2015 * 10^6 = 49 lpcd
[4] Source : SAR WS KEIP, June 2012
[5] {146357*150*(1+0.15+0.3+0.01)}/0.2
[6] Rough assessment of lean flow in surface water source, i.e. River Hooghly
[7] {146357*150*(1+0.15+0.3+0.01)}/0.15

Sl. No.	Parameter	Demand	Supply	Gap (as on 2015)	Remarks/ Target
	demand				and transmission system to be increased and augemented
10	Supply hours	24 hours	3.5 hours (average)	21.5 hours	Increase in supply hours
11	Coverage of area (by surface water)	100%	60%	40%	Extent of surface water supply to be increased.
12	Distribution lines	300 km	30 km	270 km	Increase of piped water supply coverage.
13	Reservoir capacity	21.2 ML	2.4 ML	18.8 ML	Additional reservoirs required
14	Residual Pressure	12 m minimum. Cause for rejection below 7m	2-3 m water head (In some area it is 1.0m)	9.5 m water head	Rezoning of system network is required with proper districting.
15	Extent of metering	90%	0.0%	90.0%	
16	Efficiency of redressal of complaints	80%	-	-	
17	Efficiency of collection of user charges	90%	-	-	

(Source: SAR, 2015)

Jai Hind area project

40. Other than Joka area, under Tranche 2 additional package is considered related to water loss management at Anandapur area and Patuli area within Jai Hind WTP (Eastern Kolkata) command area.

41. The current water supply service level within that areas falls short of desired level for the following reasons:

- ✓ Inadequate transmission system
- ✓ Inadequate reservoir capacity
- ✓ Low residual pressure
- ✓ Intermittent supply
- ✓ Un-assessed water loss in the system
- ✓ Inequitable pressure at consumer points

42. An analysis has been made by the authority to identify appropriate interventions to overcome current deficiencies and to achieve target service levels for water supply in the immediate, intermediate and ultimate phase. KMC with support from ADB wants to continue the process of improving the Water Supply System through a comprehensive process involving water accountability and a Water Loss Reduction program aimed at increased efficiency in water usage. A work of water loss management in the Cossipore service zone, taken up as a pilot project in Kolkata under Tranche 1, is a step towards the improvement of quality service and the sustainability in water supply and specifically in water distribution management.

43. The process has been continued by taking up the newly developing areas of East Kolkata, being fed from the Jai Hind WTP under a Water Loss Management Program. The

activities for the project financing related to Improvement of Water Supply components are included under in contract packages under Tranche 2.

44. Patuli area and Anandapur area are two command areas under Jai Hind WTP. The proposed package: "Performance Based Contract for Water Loss Management in Anandapur area and Patuli area under Jai Hind WTP Area (Eastern Kolkata), aims at water loss management of Anandapur and Patuli area, defined command areas under Jai Hind WTP.

C. Components of the Subproject for Joka and adjoining areas and Anandapur and Patuli area of Jai Hind WTP command area

45. The proposed system of Joka has been conceptualized to be divided in 3 service zones A, B & C. Zones A & C will be served from one PS and Zone B from other. Total 11 ESRs have been proposed, including 2 existing.

46. The proposed project work under Joka includes (i) Construction of 2 Under Ground Reservoir (UGR) cum Pumping Station (PS) at Prantik Phase III and KMC land on Julpia Road, (ii) Construction of 6 Elevated Service Reservoirs (ESRs) at Prantik Ph III, N-E of SSE STP, N-W of SSE STP, KMC land on Julpia Road, WBSETCL (West Bengal State Electricity Transmission Company Limited) and 22 Bigha, (iii) Laying of water supply distribution network including providing household service connection in 4 distribution service areas in Joka and adjoining areas for the command area under proposed ESRs at Prantik Ph III, NE of SSE STP and NW of SSE STP and existing ESR at Prantik, (iv) Laying of water supply distribution network including providing household service connection in 4 distribution service areas in Joka and adjoining areas for the command area under proposed ESRs at Company pukur (KMC land at Julpia road), WBSETCL, 22 Bigha and existing ESR at Diamond Park,, (v) Construction of Elevated Service Reservoir (ESR) at Ramkantapur, Malpara, Charaktala; Laying of Transmission main from UGR at KMC land on Julpia Road from to 3 ESRs; Laying of Distribution system and house connection within command area of 3 ESRs ,(vi) Dedicated Water Supply Transmission Main from Junction of James Long Sarani to Daspara near existing Pumping Station along James Long Sarani

47. Under separate package of water loss Management in Anandapur area and Patuli area under Jai Hind WTP Area (Eastern Kolkata), covers,

- Topographic Survey including Customer Survey for Updating WS Service Connection Database.
- Review and validation of Existing WS Distribution Network and preparing of District Metered areas (DMA) within the command zones.
- Asset Identification
- Customer survey
- Updating of existing/ executed facilities on GIS platform
- Selection of priority DMAs
- Preparation of System Improvement Plan (SIP)
- Supply and laying of pipes for WS Distribution Network.
- Supply and Installation of Flow-meters including data logging
- Installation and commissioning of of distribution pipelines and associated fittings
- Establishment of DMAs
- Conducting Leak Detection and carrying out pipeline repairs at leakage points
- Providing and Installing Household service connections

- Installation of Domestic Water meters including taking meter readings.
- DMA creation (design and modeling)
- Hydraulically isolation and zero pressure test
- Simulation of network
- Consumer meter connection
- Baseline data generation
- Initial water loss assessment
- DMA establishment (DMA creation, DMA works, DMA proving)
- Design and installation of SCADA (compatible with the WSD SCADA)
- Installation of electro- magnetic flow meters and connection to SCADA
- Pressure and flow monitoring
- Loss reduction study
- Commissioning
- Development of an Information Management System (IMS)
- Operation and Maintenance of the District Metered Areas (DMAs) including flow recording, monitoring and assessment of Water Loss on a regular basis.

48. The entire distribution network in target areas of Anandpur and Patuli would thus be rehabilitated and water losses could be reduced in public network with active public participation and extensive communication program. This initiative would also result in increasing the average pressure in distribution. The savings of water could then be used for better water supply to adjacent KMC's areas. In nutshell it can be stated that the overall objective of this package is to rehabilitate and demonstrate water loss reduction in this project within 3 years and operate and maintain the technical efficiency within the project area for another 3 years.

49. . **Table 2** shows the work components under the project.

Table 2: Sub project components- Joka water supply and Water Loss management in Anandapur area and Patuli area

Sr. No.	Package name (Package no.)	Components	Details area covered by project components	Capacity cubic meter (ML/cum/hr)/ Million liter
JOKA AND ADJOINING AREA				
1	Construction of Underground Reservoirs and Overhead Reservoirs, Pumping Stations and linking Pumping station mains for water supply in Joka and adjoining areas including Operation & Maintenance of the Pumping station (KEIIP/NCB/Tr 2/WS 15/2015-16)	Under Ground Reservoir at Prantik Ph III (ward no 143)	70 m x 50 m x 5 m WD	17500 cum- /17.5 ML
		PS & E&M works at Prantik Ph III	PS - 30 m x 10 m Pumps for Zone A – individual pump 600 cum/hr & 37 m head (3 W + 2 S) & Pumps for Zone C–individual	

Sr. No.	Package name (Package no.)	Components	Details area covered by project components	Capacity cubic meter (ML/cum/hr)/ Million liter
			pump 480 cum/hr & 42 m head (3 W + 2 S)	
		Under Ground Reservoir at KMC land on Julpia Road (ward no 142)	45 m x 20 m x 5 m WD	4500 cum/4.5 ML
		PS & E&M works at KMC land on Julpia Road	PS - 15 m x 10 m Pumps for Zone B– individual 450 cum/hr & 40 m head (3 W + 2 S)	
		ESR at Prantik Ph III (ward no 143)		3100 cum/ /3.1 ML
		ESR at KMC land on Julpia Road (ward no 142)		2000 cum/ 2 ML
		ESR at N-E SSESTP (ward 122)		2000 cum/ 2 ML
		ESR at N-W SSESTP (located at junction of ward 122 & 123)		1800 cum/1.8 ML
		ESR at 22 Bigha (ward 143)		3400 cum/3.4 ML
		ESR at WBSETCL near Joka Tram Depot. (ward 144)		2100 cum/2.1 ML

Sr. No.	Package name (Package no.)	Components	Details area covered by project components	Capacity cubic meter (ML/cum/hr)/ Million liter
2	Laying of Transmission Main from existing Daspara PS to UGRs at Prantik Phase III, KMC land on Julpia Road and Transmission main from PS to zonal reservoirs (KEIIP/NCB/Tr 2/WS 16/2015-16)	✓ Laying of Transmission Main from existing Daspara PS to UGRs cum PS at Prantik Phase III and KMC land on Julpia Road ✓ Supply and laying of Transmission main from Prantik Phase III UGR cum PS to existing ESR at Prantik, and proposed ESR at NW of SSE STP,NE of SSE STP, existing ESR at Diamond Park, proposed ESR at WBSETCL command area and proposed ESR at 22 Bigha command area	**Approx. 18.4 km** DI K9 pipe- 100 mm to 200 mm dia= 0.195 km MS pipe – 115 mm OD to 1219 mm OD= 18.150 km	
3	Laying of water supply distribution network including providing household service connection in 4 distribution service areas in Joka and adjoining areas for the command area under proposed ESRs at Prantik Ph III, NE of SSE STP and NW of SSE STP and existing ESR at Prantik (KEIIP/Tr 2/WS 17A/2016-17)	✓ Laying of water supply distribution network including providing household service connection for proposed Elevated service reservoirs related to Prantik Ph III, NE of SSE STP and NW of SSE STP	Approx. Length= 155 km MS pipe- 324 mm to 610 mm OD= 47.505 km (approx) DI K7 pipe- 100 mm to 250 mm dia= 107.495 km (approx)	
		✓ Supply and laying of water supply distribution network including providing household service		

Sr. No.	Package name (Package no.)	Components	Details area covered by project components	Capacity cubic meter (ML/cum/hr)/ Million liter
		connection for existing elevated service reservoirs related to Prantik		
4	Laying of water supply distribution network including providing household service connection in 4 distribution service areas in Joka and adjoining areas for the command area under proposed ESRs at Company pukur (KMC land at Julpia road), WBSETCL, 22 Bigha and existing ESR at Diamond Park (KEIIP/Tr 2/WS 17B/2016-17)	✓ Laying of water supply distribution network including providing household service connection for proposed Elevated service reservoirs related to Company pukur (KMC land at Julpia road), WBSETCL, and 22 Bigha	Approx. Length= 131 km MS pipe- 324 mm to 610 mm OD= 50.200 km (approx) DI K7 pipe- 100 mm to 250 mm dia= 81.160 km km (approx)	
		✓ Supply and laying of water supply distribution network including providing household service connection for existing elevated service reservoirs related to Diamond Park		
5	Laying of Transmission main from pumping stations to proposed 3 nos. ESRs at Ramakantpur, Malpara, Charaktala and construction of 3 ESRs including laying of distribution network with house service connection within the command area of the 3 ESRs for water supply in Joka and adjoining areas KEIIP/NCB/Tr 2/WS 18/ 2016-17	✓ Construction of Elevated Service Reservoirs (ESRs): • Ramkantapur, • Malpara, • Charaktala ✓ Laying of Transmission main from pumping stations to ESRs at Ramkantpur, Malpara and Charaktala ✓ Laying of	Ramkantapur -27M dia, 3.5 M SWD Malpara - 22M dia, 3.5 M SWD Charaktala- 22M dia, 3.5 M SWD	Ramkantapur,- 2100 cum / 2.1 ML Malpara,- 1500 cum/ 1.5 ML Charaktala- 1200cum/ 1.2 ML
			Approx. Length= 72 km Carbon steel pipe- 250 mm to 324 mm ID = 0.457 km MS pipe – 324 mm to 610 OD= 31.440 km DI K7 pipe- 100 to	

Sr. No.	Package name (Package no.)	Components	Details area covered by project components	Capacity cubic meter (ML/cum/hr)/ Million liter
		Distribution system and house connection within command area of 3 ESRs. at Ramkantpur, Malpara and Charaktala	150 mm dia= 40.330 km	
6	Dedicated Water Supply Transmission Main from Junction of James Long Sarani to Daspara near existing pumping station along James Long Sarani, KEIIP/NCB/Tr 2/WS 24/ 2016-17	Laying of pipeline	Approx. length 6.0 km, 800 – 1400 mm OD by micro-tunneling	
JAI HIND (WS 25)				
7	Water Loss Management in Anandapur area and Patuli area under Jai Hind WTP Area (Eastern Kolkata)	• Topographic Survey including Customer Survey for Updating WS Service Connection Database. • Review of Existing WS Distribution Network and preparing of District Metered areas within the command zones. • Preparation of System Improvement Plan (SIP) • Supply and Laying of WS Distribution Network. • Supply and Installation of Flow-meters including data logging • Establishment of DMAs • Conducting Leak Detection and carrying out pipeline repairs at leakage points	Total area coverage.- 13.69 sq km. ✓ Distribution area- Anandapur Head Works- ward 108 (full), Narkelbagan ward 107 (partly), Santipur ward 107 (partly), Khejurtola ward 107 (partly),, Hatisur ward 107 (partly), Patuli Head Works 110 (partly) and 101 wards (partly), Phool Bagan ward 102 (partly) **Approx length=** DI dia 100 to 300 mm - **41 km,** MS dia 300 to 600 mm OD- **3.4 km,** HDPE dia 110 to 200 mm- **0.4 km.** House connections pipe- GI + MDPE- **86 km** and all types of valves – 298 nos.	

Sr. No.	Package name (Package no.)	Components	Details area covered by project components	Capacity cubic meter (ML/cum/hr)/ Million liter
		• Providing and Installing Household service connections (approx 35,000 nos.) • Installation of Domestic Water meters including taking meter readings. • Operation and Maintenance of the District Metered Areas (DMAs) including flow recording, monitoring and assessment of Water Loss on a regular basis. •		

ESR: Elevated storage reservoir, E & M: Electrical & Mechanical, PS: Pumping station, SSE STP: South Suburban East sewage treatment plant, WD: water depth,

50. Details of Land area available for combined UGR, ESR and pumping house at the identified locations are as :

Land/ Component location	Area available[8]	Owner	Present Status
Prantik Ph III	8 bigha (10600 sqm approx.) Land of 8515 sqm already demarcated and survey done .for Under Ground Reservoir (UGR)+ Elevated Storage Reservoir, ESR A2 + Pumping station (PS)	Land belongs to Govt. department. Housing Board land	• Land within prantik ph II housing • Unfenced. • Covered with small trees and shrubs.
KMC land on Julpia Road	8 bigha (10600 sqm approx.) Land of 3962 sqm already demarcated and survey done for Under Ground Reservoir (UGR)+ Elevated Storage	Land belongs to Kolkata Municipal Corporation	• Fenced by masonry boundary wall. • Presently under the possession of KMC. • Deep tubewell with pump house (for local supply) at north east corner of the plot. • Part will be available for water supply purpose. • Pond located nearby

[8] Source of information – KMC official

Land/ Component location	Area available[8]	Owner	Present Status
	Reservoir, ESR B1 + Pumping station (PS)		

51. Pumping system has been designed for year 2035. For Zone A+C (i.e. Prantik PS), 2 sets of pumping system has been proposed – one for ESRs of zone A and the other for zone C.

52. All ESRs under Water supply package Tr2-WS-15 will be constructed in the government land. Land for construction of ESRs (package WS-18) at Ramakantapur, Malpara and Charaktala are private land. Present land status is shown below.

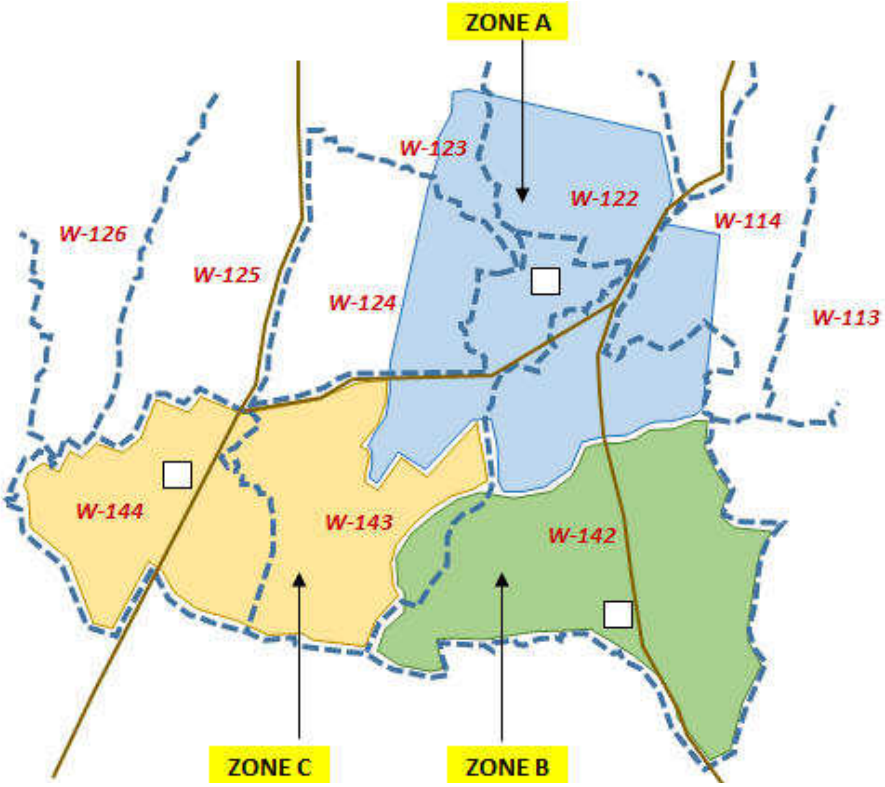
Land	Area Requirement	Land ownership	Status of Gift Deed (in favour of KMC)
At N-E SSESTP	1444 sqm for construction of ESR, A3	KMC land within STP	
At N-W SSESTP	1505 sqm for construction of ESR, A4	KMC land within STP	
At WBSETCL near Joka Tram Depot.	1521 sqm for construction of ESR, C2	WBSETCL land Transfer under process	
At 22 Bigha	2021 sqm for construction of ESR C3,	Govt. land	
At Charaktala	Available – 1660 sq m Required – 668 sqm for construction of ESR B3	Private land	Land records and land map available **Status -** Executed and registered; witnessed by independent party
At Malpara	Available –2671 sq m Required – 1335 sqm for construction of ESR B2	Private land	Land records and land map available **Status -** Executed and registered; witnessed by independent party
At Udayachal/ Ramkantapur	Available –2833 sq m Required – 668 sqm for construction of ESR A5	Private land	Land records and land map available **Status** - Executed and registered; witnessed by independent party

(Source: Land Dept., KMC)

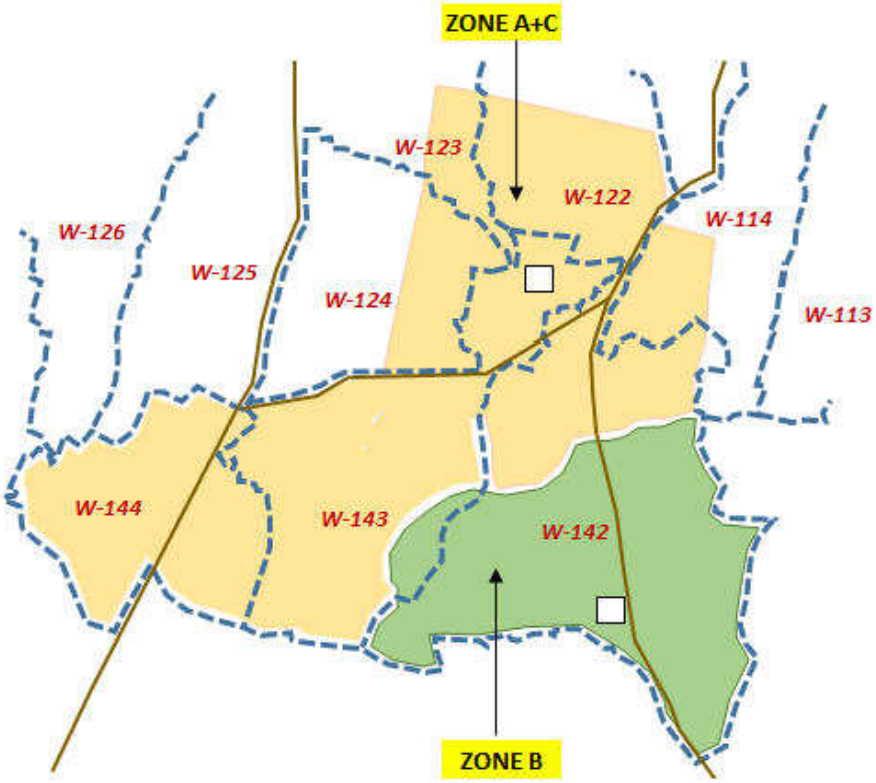
53. ***Command area zoning***. The project area has been conceptually divided in 3 major water zones, with two dedicated underground reservoir (UGR) and pumping station (PS) and 11 elevated service reservoir (ESR).

54. A dedicated transmission system needs to be developed to feed underground reservoirs. Pumping station will be constructed with the UGRs, to convey water from UGR to ESRs within the respective zone. Zonal supply to customer will be done from ESR.

55. Initial proposal at preliminary stage,

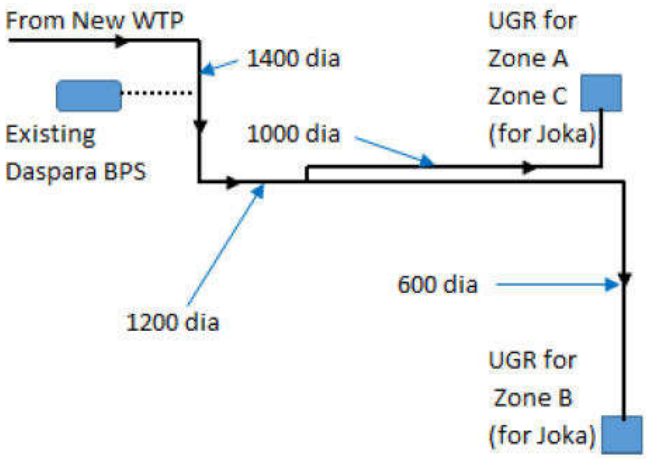


56. Recommended zoning is as below,

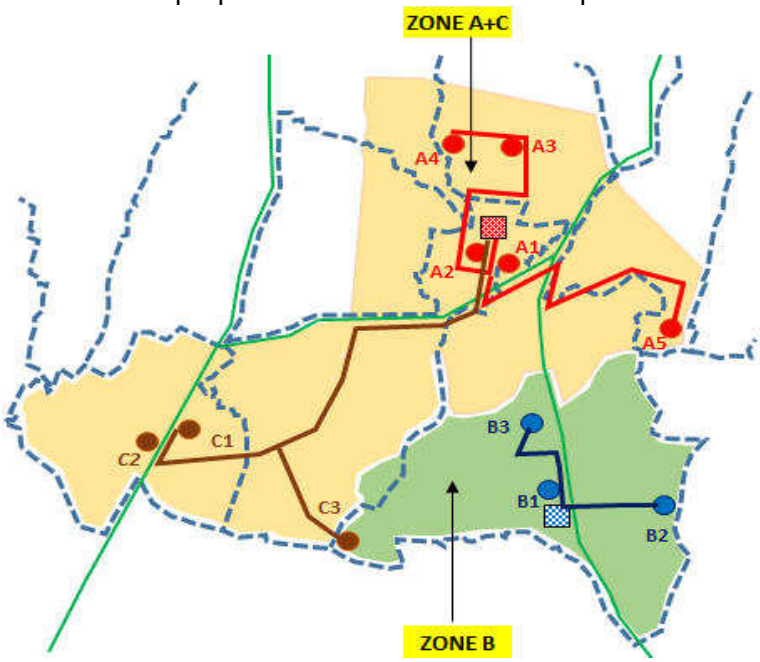


57. Supply of treated water for Joka area. KMC has been planned through construction of a 50 MGD (227 mld) WTP near existing GRWW, i.e. 2.1 MG/hr considering 24 hrs supply.

58. A dedicated water supply transmission system is proposed. A schematic figure on treated water transmission concept is shown below.



59. ***Transmission Main***. Transmission main has been designed for the year 2050. Transmission system has been considered to be operative for 18 hrs a day. In Zone A+C, 2 dedicated transmission main has been proposed from Prantik PS: one for near ESRs within 3km under zone 'A' and the other for ESRs above 3km under zone 'C'. For Zone B, separate transmission main has been proposed from KMC land at Julpia Road.



Zones (Command area) with UGR, ESR and transmission main (to ESR)

60. ***Elevated Service Reservoirs***.**Service zones**

61. The project area is divided in three zones and each zone is again divided in service zones, each served by individual Elevated Service Reservoir (ESR). The service zones are formed considering the availability of land for the ESR, road connectivity for laying the distribution network and other topographical restrictions such as Canals etc. The details of the proposed zone wise service areas are as listed below

Zone A:

62. Zone A is divided in 5 service areas, each served by independent elevated service reservoir (ESR). One ESR of 900 cum storage capacity is existing in this zone at Prantik Ph-III, which is in good condition and can be utilised in this project. 4 new ESRs are proposed.

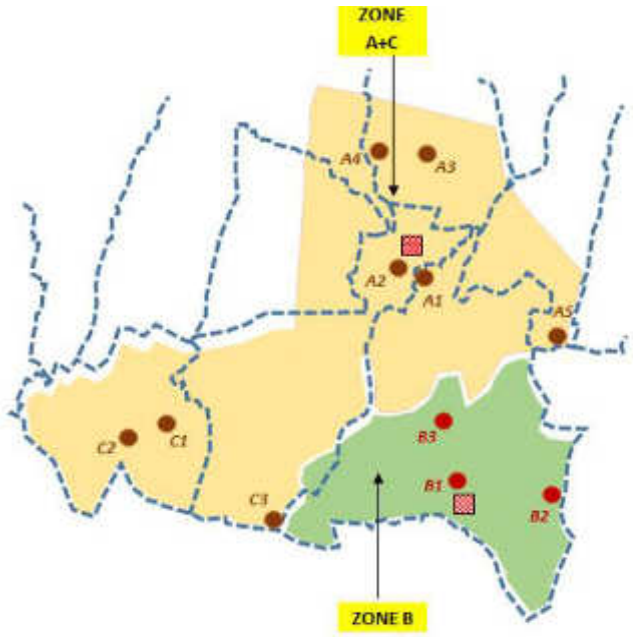
Zone B

63. This zone is divided in 3 service areas to be supplied with 3 new Elevated Reservoirs.

Zone C

64. Zone C also covers three service areas. One ESR of 1500 cum storage capacity is existing at Diamond Park in this zone and hence two additional ESRs are proposed for other two service areas. Existing ESR is in good condition and hence proposed to be utilised in this project.

65. Thus, the project area will be having in all 11 service zones which will be served with 2 existing and 9 proposed ESRs.



66. ESRs will be fed from PS. 8 ESRs in Zone (A+C) and 3 ESRs in Zone B have been proposed. Location of ESRs are selected as per the availability of land. Two existing reservoirs of capacity 900 cum and 1500 cum (marked as A1 and C1 in the figure) would be utilized to integrate in the proposed system. Capacity of each ERS has been adopted as 0.25 times daily demand, i.e. 6 hours storage capacity. Salient details of the ESRs are given below.

I. No.	ESR Designation	Location Name	Remarks
1	A1	Prantik	Existing
2	A2	Prantik phase III	
3	A3	N-E of SSE STP	
4	A4	N-W of SSE STP	
5	A5	Ramkantapur	
6	B1	KMC land at Julpia Road	
7	B2	Malpara	
8	B3	Charaktala	
9	C1	Diamond Park	Existing
10	C2	WBSETCL	
11	C3	22 Bigha	

67. ***Distribution Pipes.*** Each zone is further divided in service area zones for distribution of water. Water supply to each service area is proposed through an independent Elevated Service Reservoir (ESR) located in that service area.

Zone A : 5 Service area zones A-1, A-2, A-3, A-4 and A-5
Zone B : 3 Service area zones B-1, B-2 and B-3, and
Zone C : 3 Service area zones C-1, C-2 and C-3

68. Thus the project area covers 11 service zones served by individual Elevated Service Reservoir (ESR). The service area zoning is also dependent on the land availability for the ESR, road connectivity, topographical conditions such as local drainage etc.

69. Diameter of pipe in distribution system is varied from 100 to 600 mm. Mainly DI K9, CI and MS pipes will be utilized. Length of the pipe package wise is given in the **Table 2** above.

House Connection. It is assumed that after completion of project in 2020, house connection will be provided by KMC.

Population as on 2020	191385		
Household Premises	Approx. DPR)	38200	(source

70. **Figures 4, 5 and 6** show proposed water supply zone, transmission line and water reservoir service zone, respectively.

71. During construction phase, excess earth will be generated that will be utilized for filling up of low lying area of different sites of the Subproject. Estimation of volume of excess earth will be done at detail design stage and site specific disposal will be drawn up. Any earth remaining after such disposal will be carried away by the contractors for disposal in pre-approved sites.

D. Salient features of the Subproject

72. The design norms adopted for preparation of various components of project are generally in line with CPHEEO Manual (2013), KMC practices, KEIP practices & standard practices. Whenever felt necessary guide lines laid down in other internationally accepted manuals are followed.

Components	Design Period (Years)	Remarks
Underground Reservoir	30	
Pumping Station - Civil	30	
Pumping Station – Mechanical and Electrical	15	
Elevated Service Reservoir	15	In KMC area it is very difficult to get required land area that would be required as additional for future demand, which is for next 15 years. So, ESR has been considered for 30 years design period.
Transmission main from PS to ESR	30	
Distribution System	30	

73. **Figure 7** shows layout map for UGRs cum PS and ESRs. Google map for project components are shown in **Figure 8.** Water Supply Transmission Main from Junction of James Long Sarani to Daspara PS is shown in **Figure 9.** Google Map Jai Hind WTP, Anandapur and Patuli command area is shown in **Figure 10.**

E. Implementation Schedule

74. Construction work is commenced in late 2016 and will be completed tentatively by 45 months.

75. Tentative schedule is given below.

Table 3: Package Implementation Schedule

Activity	Project – Joka Water supply and water loss management project East Kolkata
Submission by contractor of Site Environmental Plan (SEP) by Contractor	Within 28 days after receiving notice under commencement of work
Review and approval by KMC of contractor's SEP, proposed locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes if any.	Within 21 days
Construction period – considering all packages	45 months Tentatively (December 2016 to September 2020)
Commissioning period	

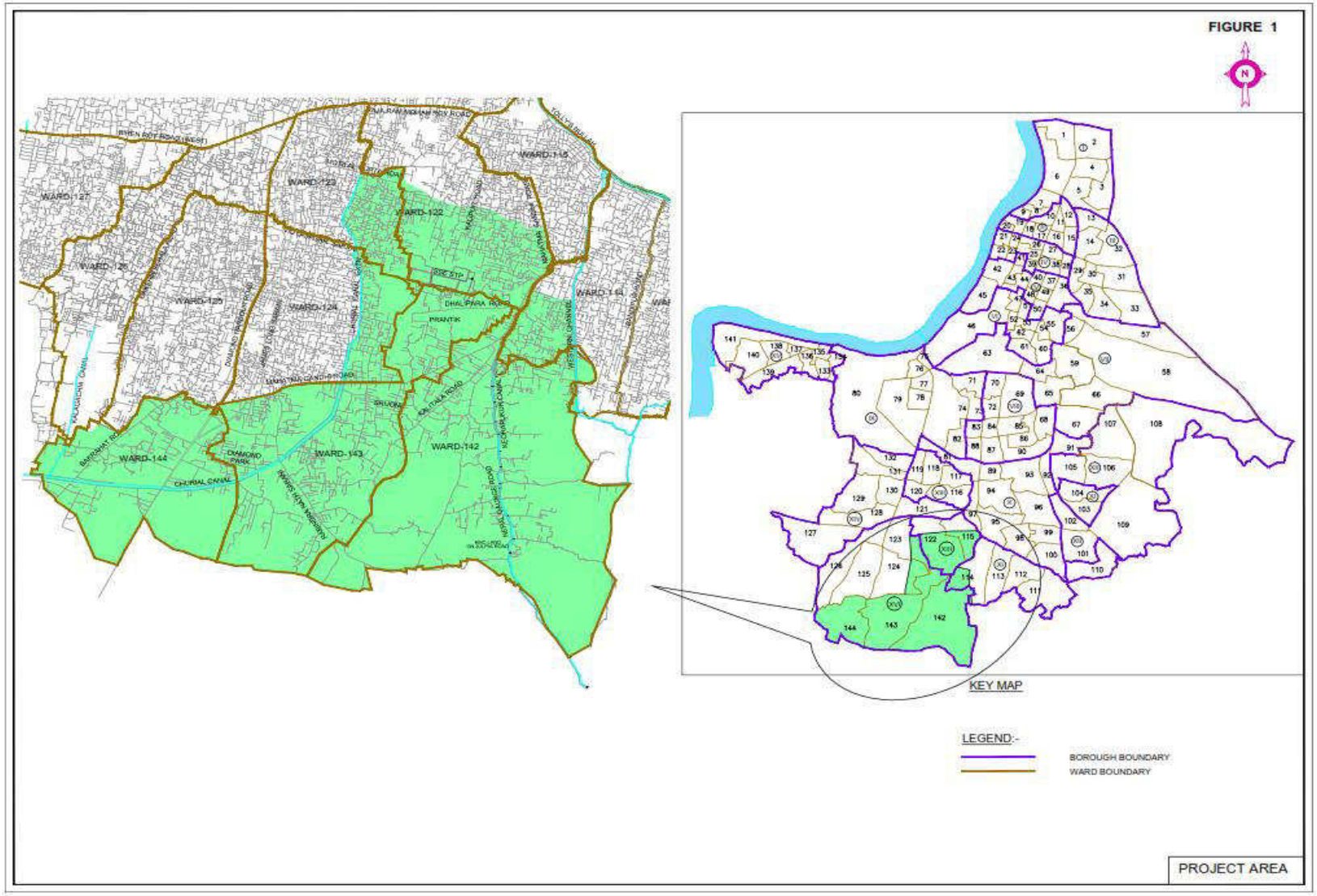


Figure 1: Project Location map

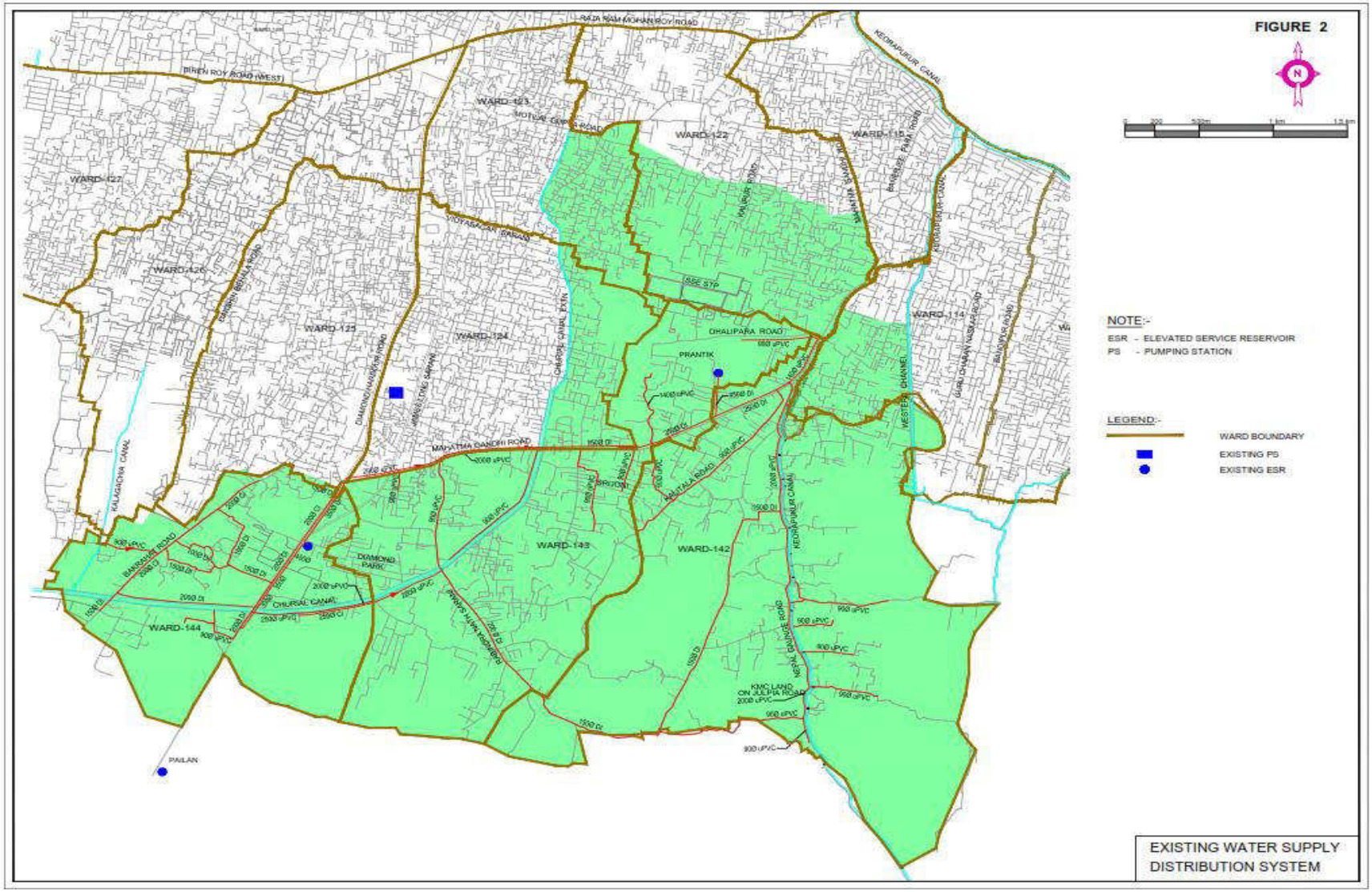


Figure 2: Existing water supply distribution system at Joka area

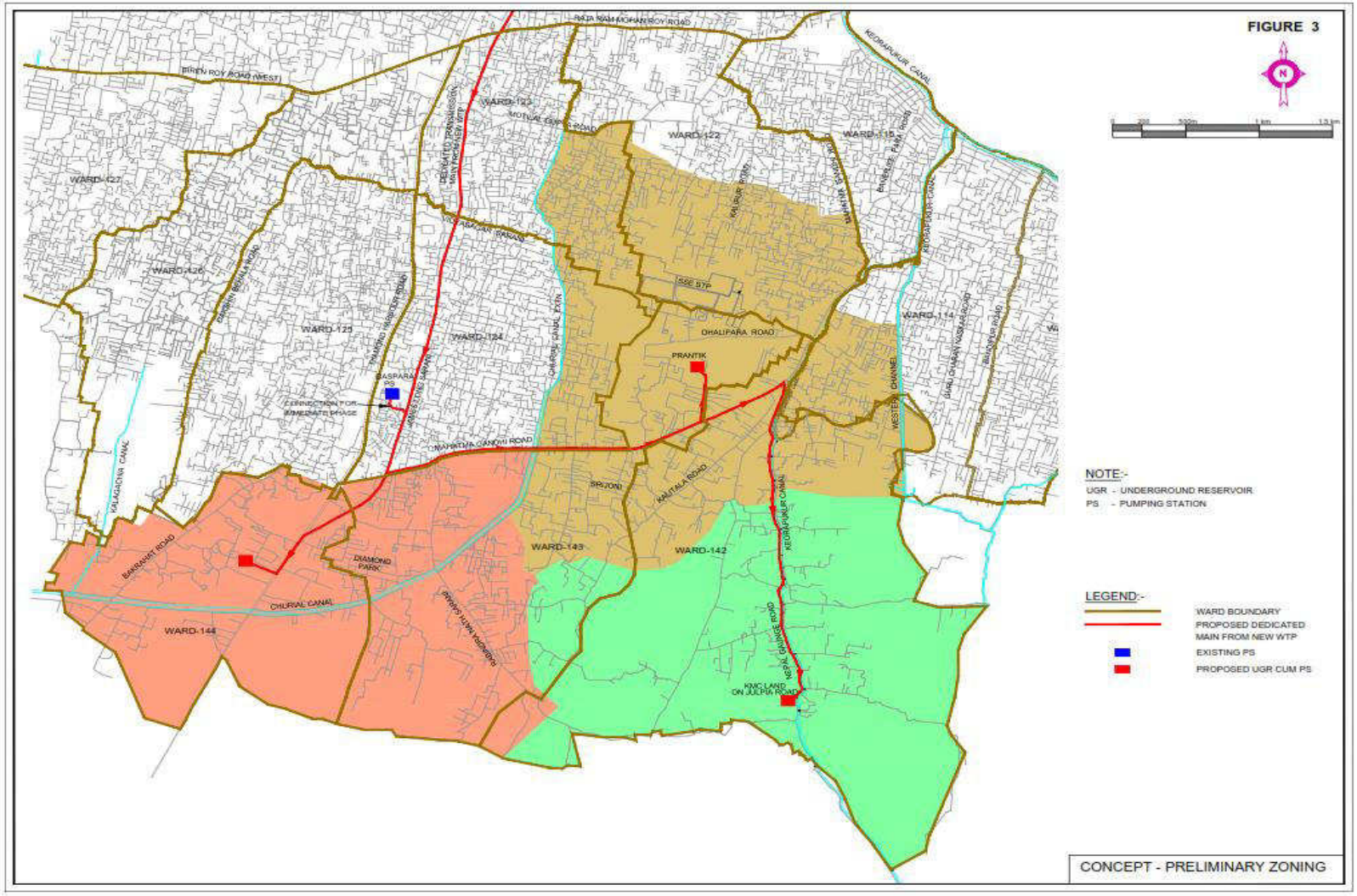


Figure 4: Proposed Preliminary Zoning

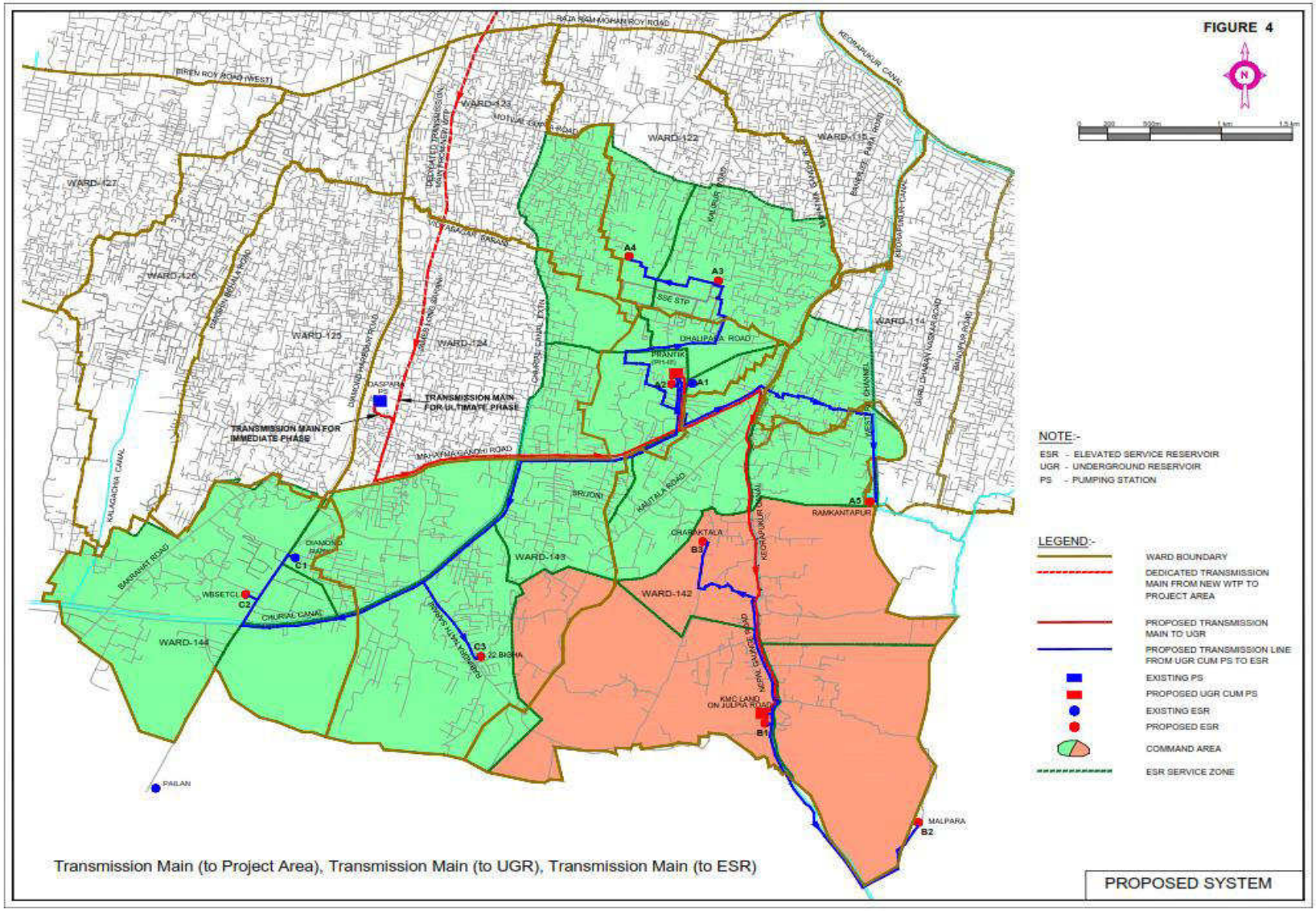


Figure 5: Proposed Transmission system

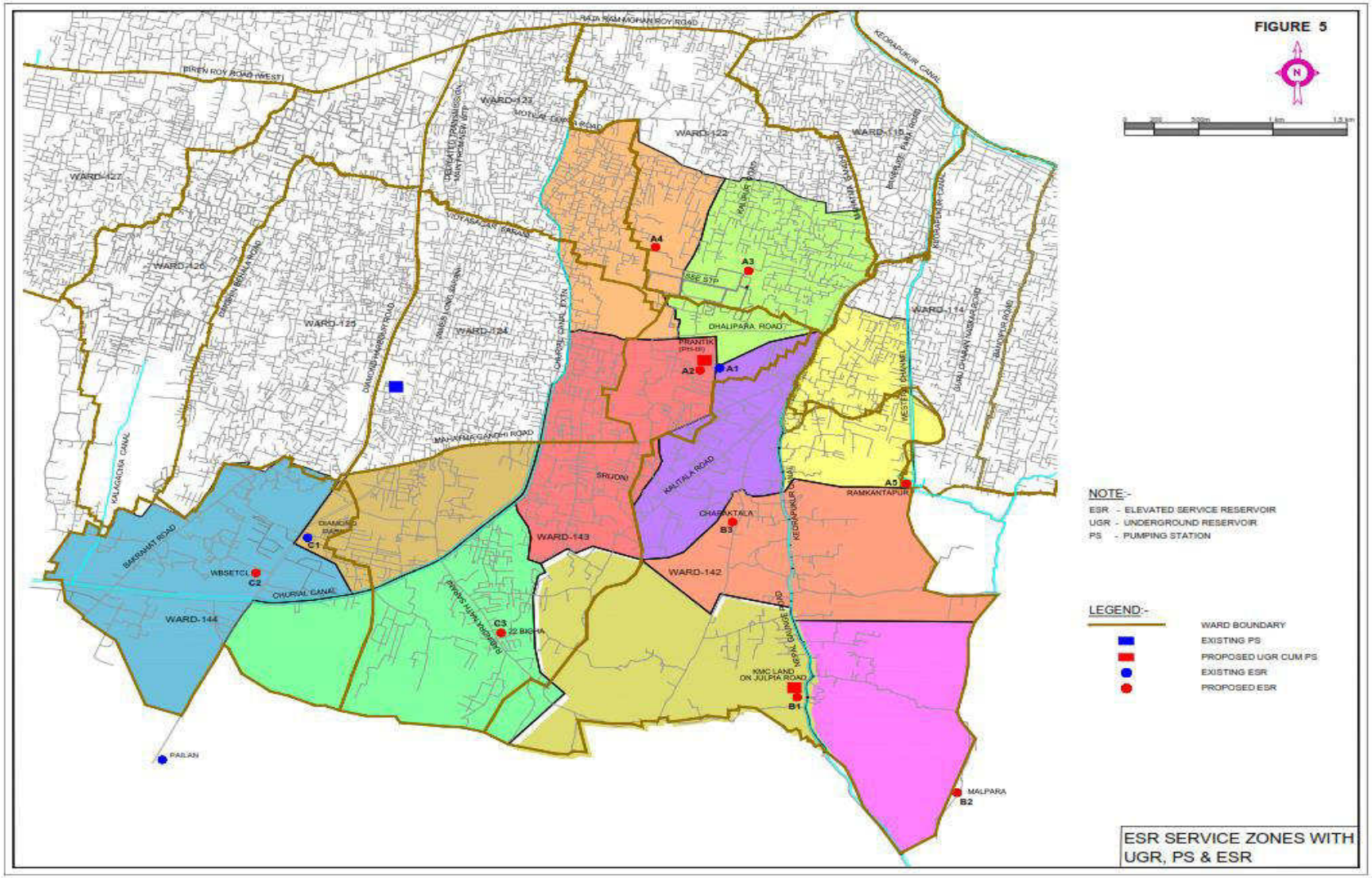
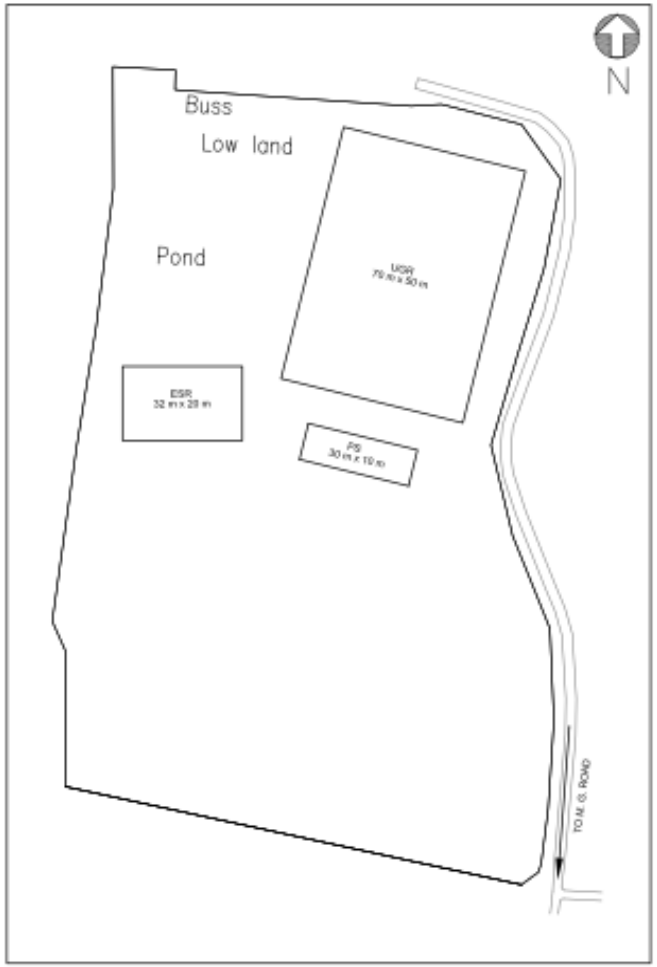


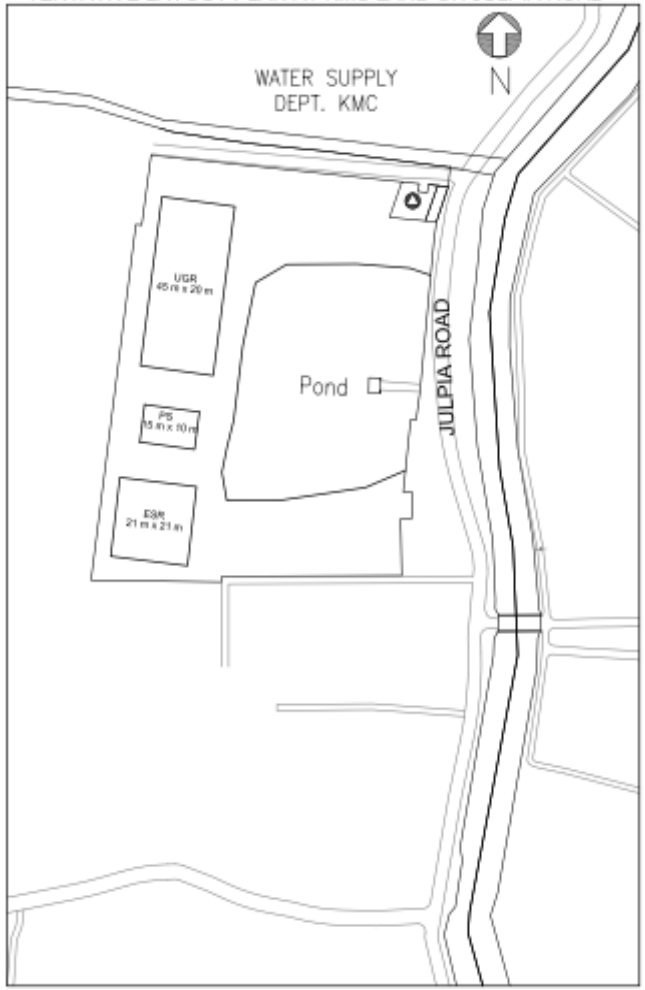
Figure 6: Proposed ESR service zones with UGR, PS and ESR

TENTATIVE LAYOUT PLAN AT PRNTIK PHASE III

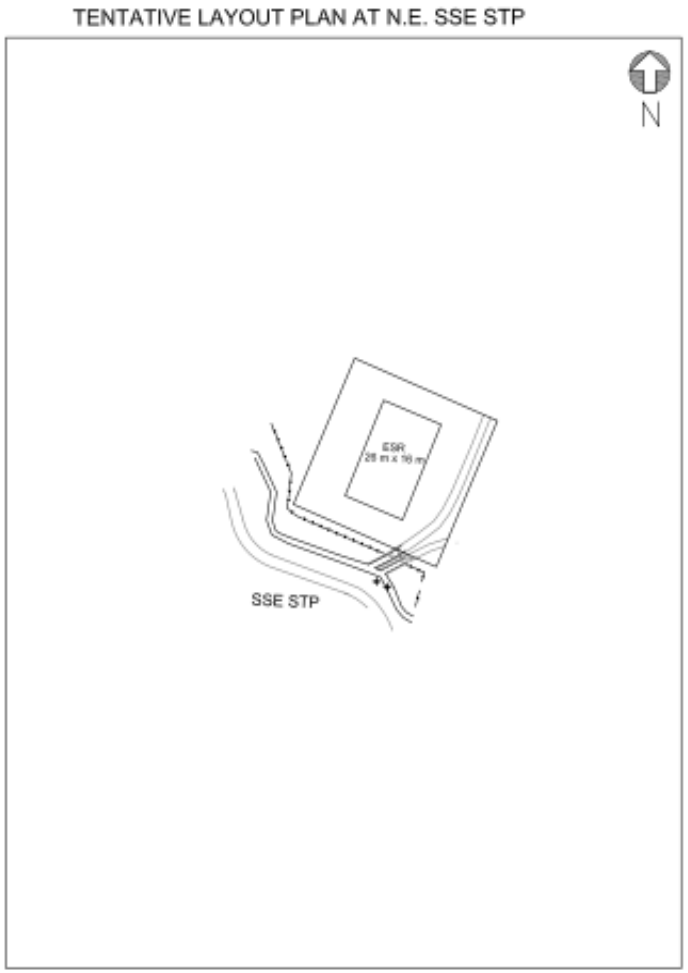


Layout plan UG Reservoir, PS and ESR

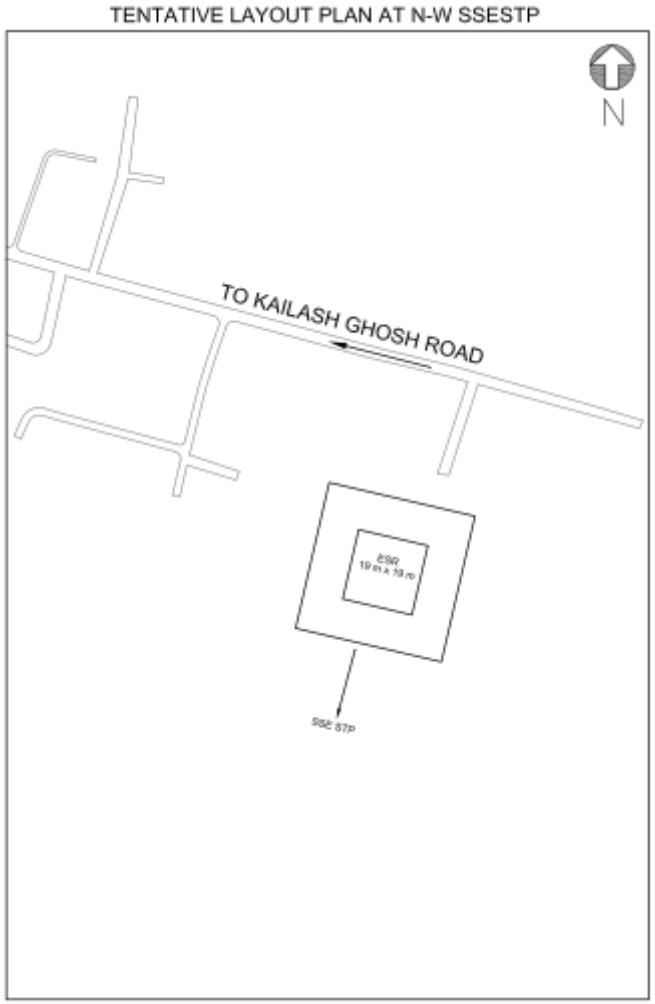
TENTATIVE LAYOUT PLAN AT KMC LAND ON JULPIA ROAD



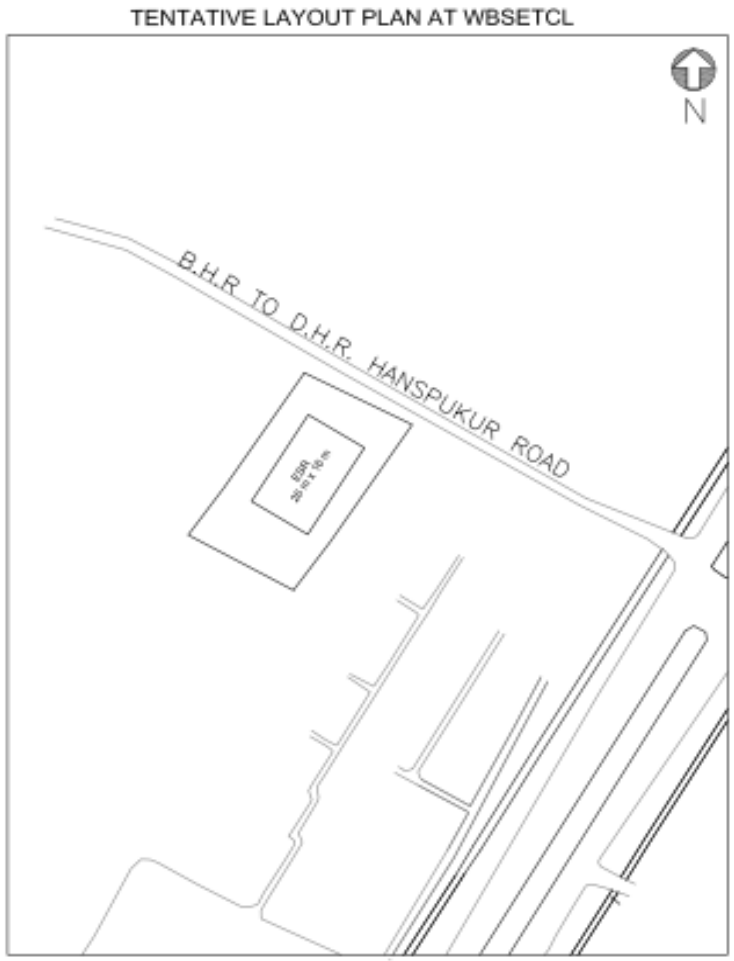
Layout plan UG Reservoir, PS and ESR



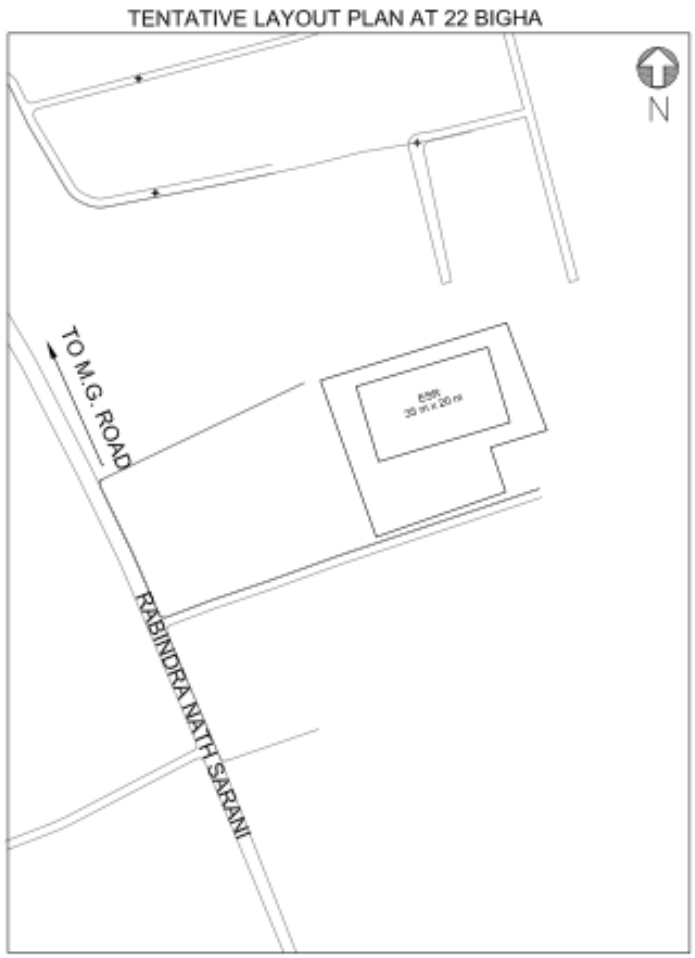
Layout plan – ESR



Layout plan - ESR



Layout plan - ESR



Layout plan - ESR

Figure 7: Layout plan of project components at different locations (will be updated after finalization of specific area design)

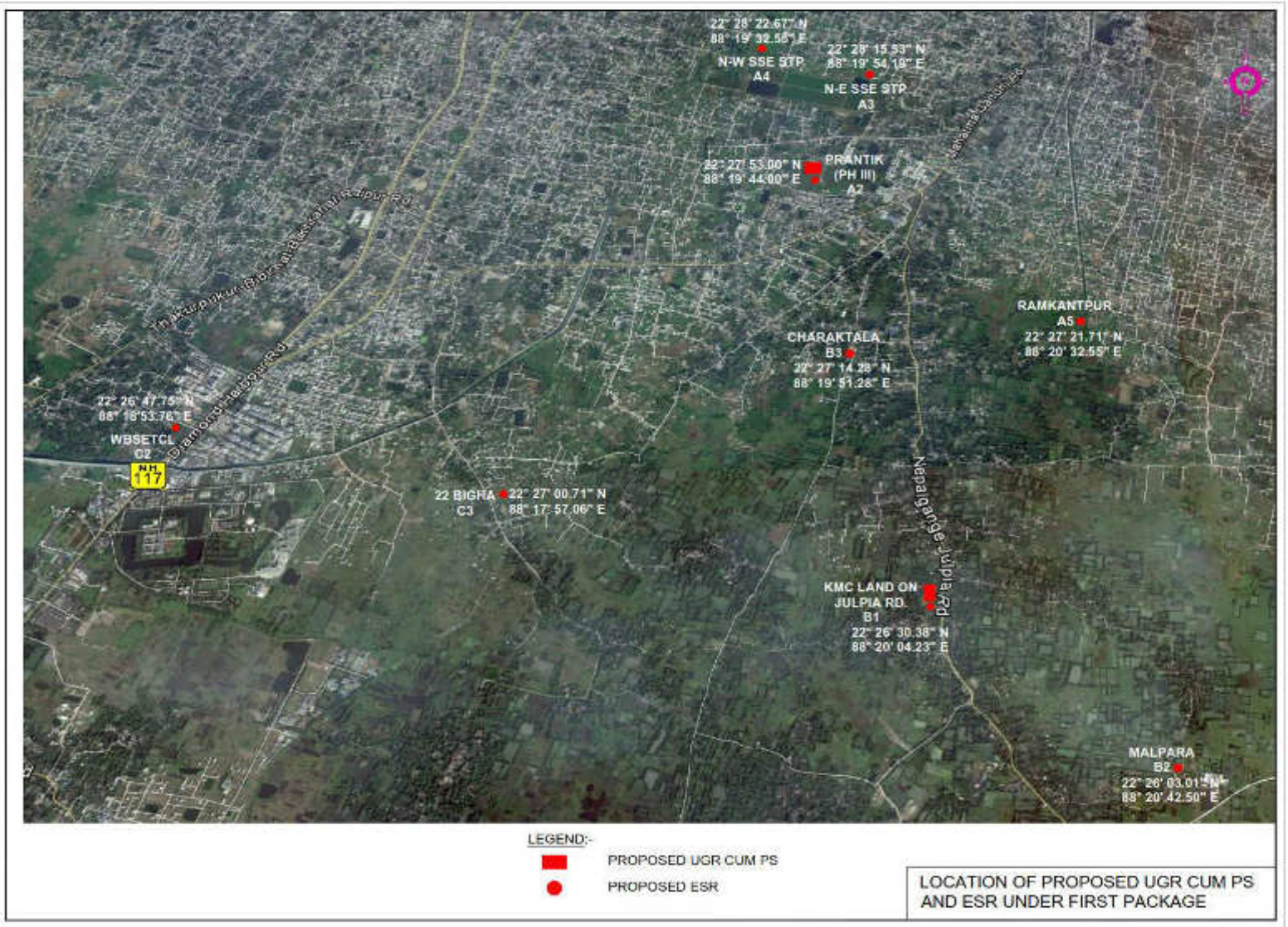


Figure 8: Google map of project locations- Joka

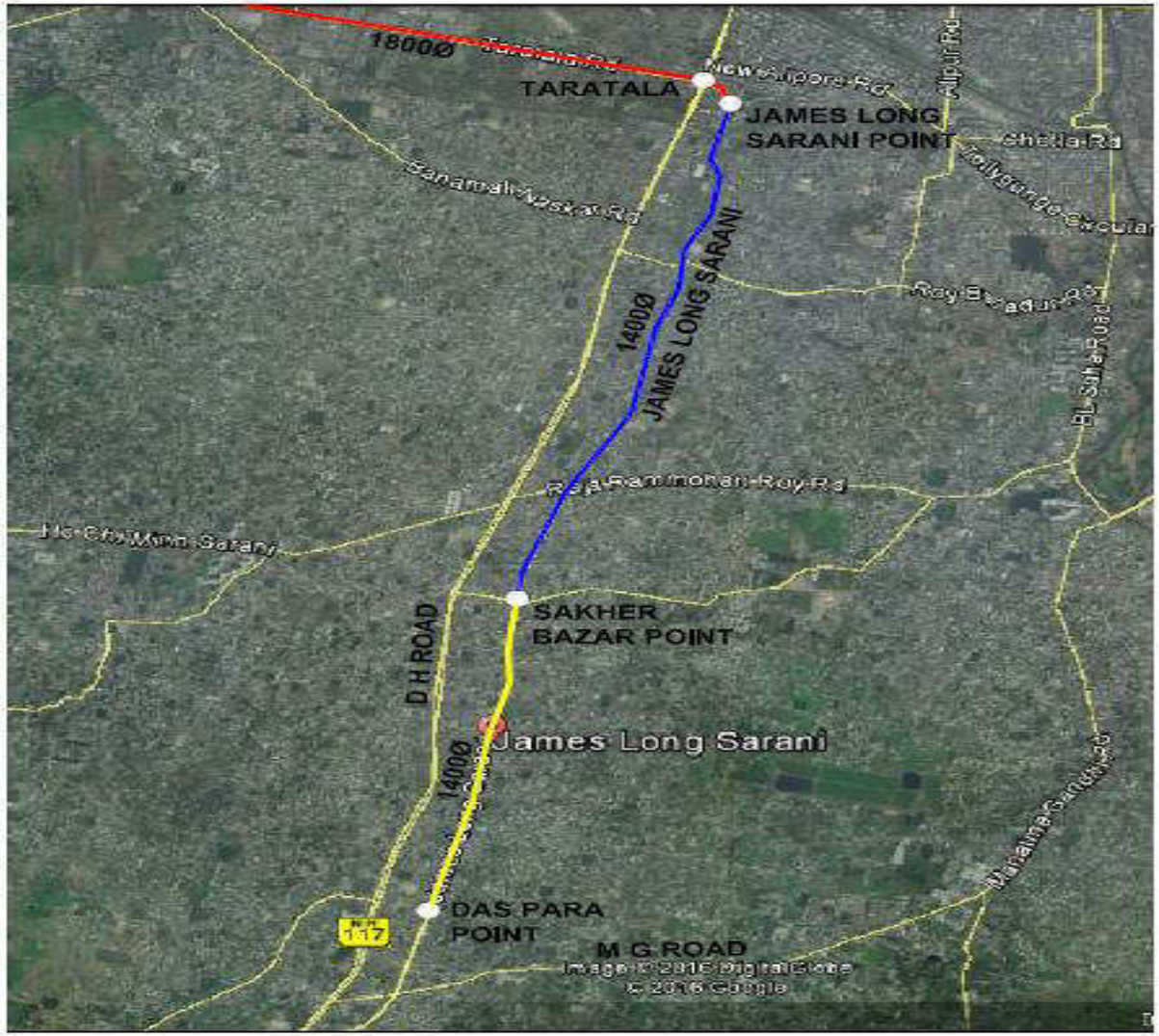


Figure 9: Water Supply Transmission Main from Junction of James Long Sarani to Daspara

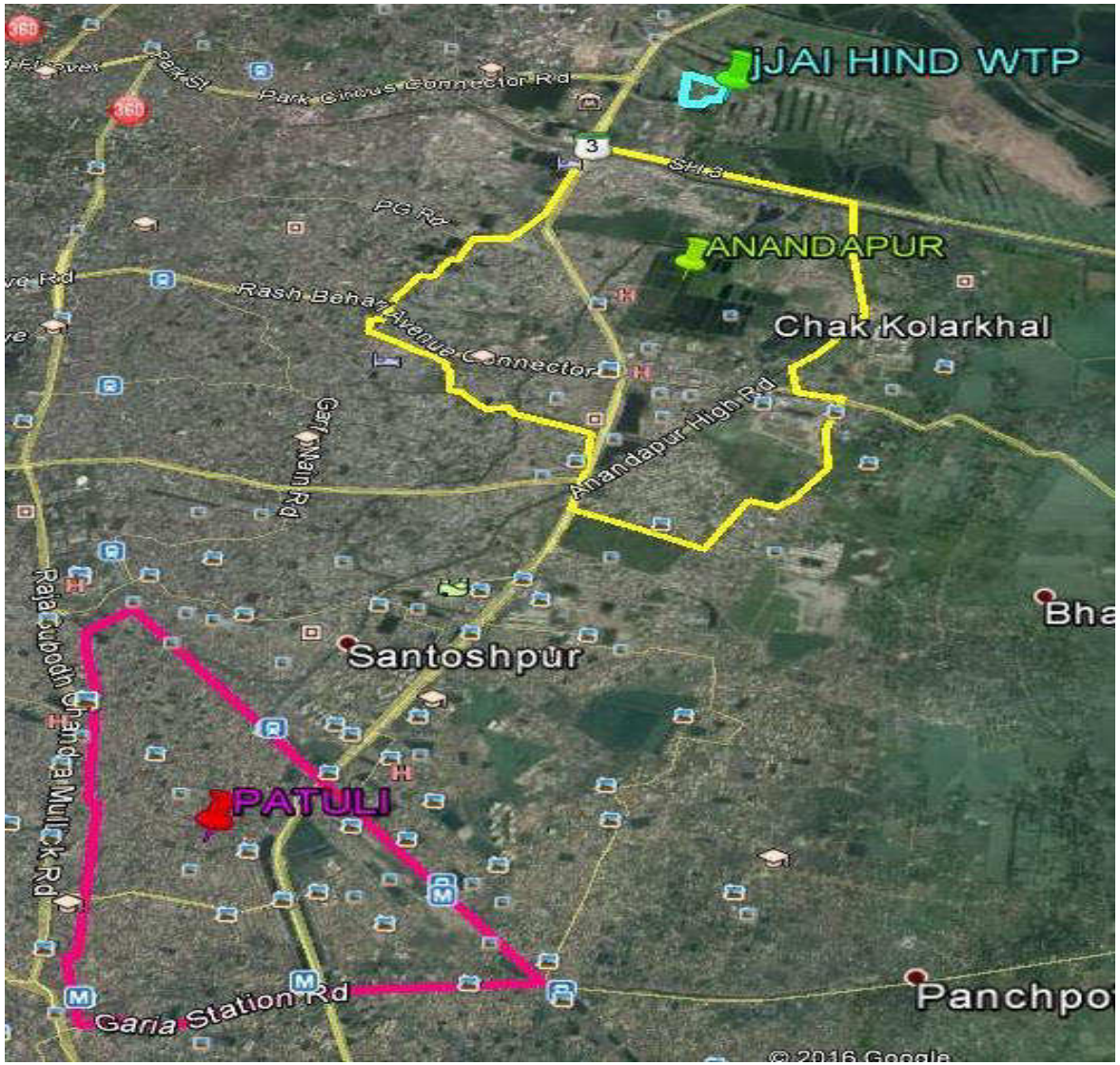


Figure 10: Google Map Jai Hind WTP, Anandapur and Patuli command area

IV. DESCRIPTION OF THE ENVIRONMENT (BASELINE DATA)

A. Physical Resources

76. **Topography, drainage, and natural hazards**. Regionally KMC area is mostly flat and sloping in general from north to south and from west to east. The southern portion of the Boroughs XI, XIII. XIV and XVI are low lying and marshy. Similarly, the southwestern part of Borough XV and different parts of Borough XII are low lying. The broad topographical features of the subproject area are given in **Table 4**.

Table 4: Topographical information of Borough XVI in KMC

Basin	Ground level	General slope
XVI	Elevations range from 2.5 to 4.5 m. from MSL	General topography is flat and low laying

77. The primary surface water resource for Kolkata is the Hooghly River. In addition, the city has a large number of water bodies and canals that are heavily used for everything from water supply, bathing, washing, aquaculture, and recreation to waste disposal. Hooghly river forms the western boundary of the KMC area. Bidyadhari and Kulti rivers meander along the eastern boundaries of KMC and discharge directly in to the Bay of Bengal. These rivers, along with an elaborate network of canal systems connected to these rivers are the recipients of entire drainage from KMC and its adjacent areas. Drainage of KMC area is generally divided in to the following drainage basins according to the topography and land use: Kolkata Basin; Bagjola Basin; Tollys Nullah Basin; Manicktala Basin; Tollygunge – Panchanagram (T-P) Basin; Keorapukur Basin; Monikhali Basin; and Churial Basin.

78. The KMC area, with its generally flat terrain condition, receives more than 1,582 mm of rainfall yearly mainly spread over a 4 months period and comprised of mainly medium density – high frequency long duration storms. Due to the absence of an efficient drainage system to cater such an adverse condition, large areas of KMC suffer from prolonged inundation during monsoon causing severe health and economic hazards to the inhabitants.

79. The waste and storm water of the KMC area is carried by a system of natural and man-made canal system as follows:

(i). Bagjola Canal system – flowing in easterly direction

(ii). Kestopur Canal system – flowing in southerly direction

(iii). Beliaghata (Circular) Canal system

(iv). Storm Water Flow (SWF) – Dry Weather Flow (DWF) canal system flowing in easterly direction towards East Kolkata Wetlands carrying the pumped storm and sewage water of Kolkata

(v). Tolly's *nala* system

(vi). T-P system

(vii). Monikhali system

(viii). Churial system

80. Natural hazards in southern part of Kolkata (project influence area in general) include water logging and flooding during monsoon months. In areas like Behala, Tollygunge, Joka and Garden Reach even a small shower causes water logging in many localities which takes considerable period to evacuate. Some pockets remain inundated for even 3 to 4 months in a year. All these result due to poor and inadequate drainage facility in the areas. However, with the completion of KEIP I S & D subprojects situations have improved to a great extent.

Duration of flooding varies from hours to days, depending on the facility available, nature of topography and outfall conditions in and around different localities. However, July is the worst month, followed by June and August. Some part of sub project areas of Joka is low laying.

81. In revised seismic zones map of India (IS 1893; Part 1, 2002) eastern part of Kolkata falls in Zone IV while the area to the west falls in Zone III. No seismic micro-zonation map has yet been prepared for the KMC area.

82. **Geology and Mineral Resources.** The subproject area is underlain by Quaternary sediments consisting of clay, silt, and various grades of sand, gravel, and pebbles. Lithological logs show the presence of a clay bed at the top, with a thickness of 10 to 40m. There is a further clay bed 250 to 650 m below ground level. There is a group of granular aquifers between these layers, and these are being tapped as a ground water resource. Regional subsoil data covering a large area in subproject area reveal six levels of strata up to a depth of about 50 m below ground level. Near surface stratigraphy of Kolkata Region is given in **Table 5.**

Table 5: Near Surface Stratigraphy of Kolkata Region

Horizon I	Stratum I	Brownish grey/ light brown, silty clay/ clayey silt/ sandy silt with occasional lenses of silty fine sand; encountered from the top ground surface to a depth of about 3 to 4 m; occasionally only fill material of widely varying characteristics (about 4 m).
	Stratum II	Grey/ dark gray silty clay with semi-decomposed timber pieces, having lenses of silt and peaty clay; encountered between depths 3-4m and approximately 15m below ground level (about 10m).
Horizon II	Stratum III	Bluish grey and mottled brown/ grey, silty clay with kankar nodules and minute pockets of silt and sand (about 5.5m).
	Stratum IV	Brown/ yellowish brown, sandy silt/ silty fine sand/ clayey silt with lenses and pockets of brown/ grey silty clay (about 6m).
	Stratum V	Mottled brown/ grey, grey silty clay and brown silty clay frequently showing laminar character (about 18m).
	Stratum VI	Brown/ light brown, silty fine to medium sand (9m +).

83. The Horizon I comprising Strata I and II represents generally soft sediments. The second horizon comprising Strata III to VI have two clay layers (Stratum III and V) separated by a predominantly cohesionless layer (Stratum IV). Stratum VI is definitely water bearing and shallow tube wells in Kolkata region draw water from this stratum. The sediments of the second horizon are oxidized and are consolidated. The sequence is intercepted at several locations by deposits of the recent river system, parts of which are now dry.

84. There no mineral occurrence in the area.

85. **Soil.** The Kolkata area may be divided into two groups based on the soil types : Entisols and Alfisols. The Entisols are present at the western part of the area and the other part is represented by Alfisols. These soils are typically deltaic alluvial soils. The agro-climatic zone characterization of the area is Gangetic alluvium group of soils rich in calcium. Free calcium carbonate occurs in surface soils and the soil profile shows low to medium levels of organic matter and medium levels of available phosphate and potash. Kolkata and the neighboring areas are represented predominantly by clayey soils. **Table 6** lists the physical and chemical characteristics of soil sampled and analyzed from the five selected Boroughs of KMC in the southern part of the city.

Table 6: Soil Quality in Five Boroughs of Kolkata Municipal Council

Sl. No.	Parameters	Sample (S1)	Sample (S2)	Sample (S3)	Sample (S4)	Sample (S5)
1	Sand (%)	14.0	15	20	22.0	24.0
2	Silt (%)	32.0	30	40	44.0	30.0
3	Clay (%)	54.0	65.0	60.0	34.0	46.0
4	pH	8.5	9.3	6.9	9.7	9.47
5	Available nitrogen (mg/kg)	1250	1428.0	1071.0	2356.2	904.4
6	Available phosphorus (mg./kg)	180	230	190	280	210
7	Available potassium (mg./kg)	58	80	62.5	90	52.0
8	Iron (mg/kg)	326.0	266.9	250.0	5433.57	3125.87
9	Zinc (mg/kg)	29.1	25.0	28.5	31.1	31.48
10	Copper (mg/kg)	5.81	7.69	8.5	21.94	<0.4
11	Hexavalent chromium (mg/kg)	<1.0	<1.0	<1.0	<1.0	<1.0
12	Trivalent chromium (mg/kg)	11.67	8.33	5	28.33	25.0
13	Nickel (mg/kg)	10.0	13.2	8	14.8	14.0
14	Arsenic (mg/kg)	<0.1	<0.1	<0.1	<0.1	<0.1
15	Lead (mg./kg)	12.35	12.8	8.5	25.19	13.33
16	Cadmium (mg./kg)	<0.4	<0.4	<0.4	<0.4	<0.4

Notes: S1 - HL Sarkar Road, Borough XI, Ward 113; S2 - Near Chowbagha, Borough XII, Ward 108; S3 - Motilal Gupta Road, Borough XIII, Ward 122; S4 - Near Kalitala Market, Borough XIV, Ward 125; and S5 - Near Badartala, Borough XV, Ward 141

86. **Climate.** The climate is hot and humid from March to October. It is somewhat cool from November to February. Rains are received principally from June to September with frequent pre-monsoon showers and nor'westers during April and May. The winter season begins in November and continues to February, followed by the summer season which continues until mid-June. The monsoon starts in mid-June and goes up to mid-September, sometimes extending up to October.

87. April and May are the hottest months with monthly mean maximum temperature above 35 degree Celcius (deg C). Mean maximum temperature is above 30 deg C from March to October. Relatively low monthly mean minimum temperatures occur during December (15.2 deg C), January (14.1 deg C) and February (18.1 deg C). Mean monthly minimum temperature is relatively high and is between 26 deg C and 27 deg C during the months of May, June, July and August.

88. The average annual rainfall is about 1919 mm with the four monsoon months (June to September). Rainfall peaks in July. Average number of rainy days is about 146 days per annum. During monsoon months it is not uncommon to receive 75 mm to 100 mm of rainfall in a 24 hour period. Such heavy rainfall may occur from 4 to 10 times in a year.

89. Wind is light to gentle with maximum monthly average speed 7.22 kilometer per hour (km/hr). The post-monsoon and winter months (October-February) experience very light wind. The average monthly wind speed during pre-monsoon and monsoon are 6.10 and 5.03 km/hr respectively. The mean annual wind speed is 4.28 km/hr. The prevalent wind direction was from southwest during most of the time in the year, except during winter when the northerly wind became significant. However, during cyclonic storms and depressions

especially those occurring in September to October, high wind speed reaching around 100 km/hour is not uncommon.

90. **Air Quality.** The concentrations of air pollutants in Kolkata are highly variable over the seasons. They are at their highest during winter months (November to February) and at their lowest during monsoon months (June to September). 24-hourly suspended particulate matter (SPM) concentration in the winter months generally ranges between 300 and 400 microgram per cubic meter (µg/m^3), sometimes reaching values in excess of 500 µg/m^3. 24-hourly respirable particulate matter (RPM) concentration in those months is mostly in the range of 150 to 200 µg/m^3 but often exceeds 200 µg/m^3. During monsoon months, the 24-hourly SPM and RPM concentrations come down to around 100 µg/m^3 and around 50 µg/m^3 respectively. Similarly, 24-hourly nitrogen oxides (NO_X) concentrations are around 50 µg/m^3 during the monsoon months but rises to around 90 µg/m^3, sometime exceeding 100 µg/m^3, during the winter months. Except for a slight build-up during the winter months, 24-hourly sulphur dioxide (SO_2) concentrations are mostly around 5 to 7 µg/m^3 during most months of the year. The month of October generally shows a rapid transition from low concentrations of all pollutants to the succeeding high concentration months. But the transition from high concentration in winter months to that of low in monsoon months is rather gradual through the months of March, April and May. Seasonal variations in temperature, wind, rainfall, and other factors account for this.

91. Ambient air quality at Behala Chowrasta (near project site) and overall Kolkata average close to the subproject sites showed the same pattern from April, 2011 to March, 2012 as given in **Table 7.** Concentration of PM_{10} is above the standard.

Table 7: Month-Wise Average Ambient Air Quality at Behala Chowrasta

April, 2011 to March, 2012 (Arithmetic Mean Concentration in µg/m^3 from 24-Hourly Data)

Months	Behala Chowrasta			Kolkata Average		
	NO_2	**PM_{10}**	**SO_2**	**NO_2**	**PM_{10}**	**SO_2**
March'12	NA	NA	NA	24.5	152.0	2.5
February'12	NA	NA	NA	48.0	237.0	5.7
January'12	NA	NA	NA	34.6	188.0	5.0
December'11	88.0	250	10.0	75.2	207.0	8.2
November'11	67.7	165	8.9	58.0	161.0	7.3
October'11	65.3	125	9.4	57.1	107.0	8.1
September' 11	47.1	52	7.2	37.3	42.0	5.7
August'11	37.8	40	6.4	31.9	31.0	5.3
July' 11	40.0	40	5.8	31.0	33.0	4.9
June' 11	42.7	45	5.5	36.2	39.0	4.7
May' 11	44.8	50	6.0	40.4	45.0	5.3
April' 11	48.7	70	6.0	43.7	67.0	**5.4**
Yearly Mean	**53.6**	**93.0**	**7.2**	**43.2**	**109.0**	**5.7**

NA: Not Available

{Standard = 1. PM_{10} for industrial, Residential and Rural and other areas: 60 µg/m^3 (Annual); 100 µg/m^3 (24 Hour); 2. NO_2 for industrial, Residential and Rural and other areas: 40 µg/m^3 (Annual); 80 µg/m^3 (24 Hour); 3. SO_2 for industrial, Residential and Rural and other areas: 50 µg/m^3 (Annual); 80 µg/m^3 (24 Hour)}

Source: WBPCB Annual Report 2011-2012- Latest report disclosed by WBPCB, www.wbpcb.gov.in

Notes: NO_2 = Nitrogen oxides; PM_{10} = Particulate Matter with diameter of 10 micron or less; SO_2 = Sulphur dioxide

92. Results of limited time air quality monitoring carried out by KEIIP near Joka tram depot are reproduced in **Table 8**. The values are comparable with the general air quality level of Kolkata and surrounding areas.

Table 8: Ambient Air Quality at Diamond Park Club, near Joka Tram depot nearby the project location

Date	Shift wise sample no.	Pollutants level in µg/m^3				
		PM_{10}	SPM	SO_2	NO_2	CO
21.10.2011 to 22.10.2011	1/1	139.2	268.5	6.8	38.5	<125
	1/2	126.0	237.2	5.2	26.5	<125
	1/3	137.2	241.8	5.8	30.0	<125
24.10.2011 to 25.10.2011	2/1	143.8	278.2	7.2	40.0	<125
	2/2	130.8	236.5	5.6	26.5	<125
	2/3	136.8	247.2	6.5	35.0	<125
31.10.2011 to 01.11.2011	3/1	136.8	260.1	6.7	36.5	<125
	3/2	120.8	228.5	5.8	28.7	<125
	3/3	128.3	237.2	6.1	32.8	<125
03.11.2011 to 04.11.2011	4/1	130.8	256.2	6.5	35.0	<125
	4/2	112.9	218.5	5.6	25.0	<125
	4/3	120.5	224.8	5.8	31.6	<125
07.11.2011 to 08.11.2011	5/1	143.8	280.5	7.2	42.5	<125
	5/2	132.5	256.7	6.2	32.5	<125
	5/3	123.7	238.2	6.0	31.2	<125
10.11.2011 to 11.11.2011	6/1	123.5	237.2	5.9	32.8	<125
	6/2	116.3	210.5	5.6	25.0	<125
	6/3	126.5	228.1	5.6	31.5	<125
14.11.2011 to 15.11.2011	7/1	168.2	273.5	7.8	45.0	<125
	7/2	130.8	236.2	7.0	35.0	<125
	7/3	162.5	258.7	7.0	38.2	<125
18.11.2011 to 19.11.2011	8/1	162.5	261.8	6.8	38.2	<125
	8/2	123.8	232.5	5.8	26.5	<125
	8/3	138.5	248.2	6.2	32.8	<125

Source: Primary data generated under KEIIP preparation

Notes: NO_2 = Nitrogen oxides; PM_{10} = Particulate Matter with diameter of 10 micron or less; SO_2 = Sulphur dioxide, SPM = Suspended Particulate Matter, CO = Carbon Monoxide

93. Air quality monitoring has been carried out recently for packages under implementation (KEIIP Tranche 1) near project locations. Results are shown in **Table 9** below. Like other locations concentration of PM_{10} is above the standard.

Table 9: Ambient Air Quality monitoring data under KEIIP- near sub project location

Location	Date	Parameters- level in µg/m^3			
		PM_{10}	$PM_{2.5}$	SO_2	NOx
Joka (near Metro station)	09.06.2015	139.96	59.85	27.34	59.84

(Source: KEIIP Tranche 1 monitoring, 2015)

94. **Surface Water Quality**. The primary surface water resource for Kolkata is the Hooghly River that skirts the western margin of Kolkata. In addition, the project area has a large number of water bodies and canals that are heavily used for everything : from bathing, washing, aquaculture and waste disposal. A large quantity of water is drawn from the Hooghly River for various uses and returns as wastewater to the river without little treatment. Industrial and domestic pollution along with runoff from adjoining areas has led to deterioration in river water quality. Summary chemical analysis Hooghly river water at Garden reach are given below in **Table 10.**

Table 10. Water quality of Hooghly river at Garden Reach

Sl No.	Parameter	Unit	Test result (dated 11.01.11)	Test result (dated 07.04.11)	Test result (dated 08.07.10)
1	Conductivity	µs/cm	336	371	214
2	Dissolved O2(DO)	mg/l	12.2	4.4	5.7
3	pH	Unit	8.27	8.03	7.4
4	Temperature	^{0}C	16	29	27
5	BOD	mg/l	5.55	3.8	5.9
6	Nitrate-N	mg/l	0.04	1	0.31
7	Fecal Coliform	MPN/100ml	250000	8000	22000
8	Total Coliform	MPN/100ml	350000	11000	33000
9	Ammonia-N	mg/l	BDL	0.164	0.225
10	Phosphate - P	mg/l		0.25	0.04
11	Chloride	mg/l		29.14	14.56
12	Lead	microgram/l		7.48	

Source: WBPCB, www.wbpcb.gov.in

Notes: us/cm = micro siemen per centimetr; mg/l = milligram per litre; MPN/100 mL = Most Probable Number per one hundred millilitre; BDL = Below Detection Limit; ug/l = Microgram per litre; There are no government standards for (tidal) river water

95. Treated water quality which presently supply in and around project area is given below.

Table 11: Treated Water Quality

DAKSHIN RAIPUR WATER TREATMENT PLANT LABORATORY
South 24 Parganas Water Supply Division – I, Public Health Engineering Dte.
Government of West Bengal

TEST REPORT OF CLEAR WATER

Sl No.	Characteristic	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source	Report Of CWR
1	Colour, hazen units,Max	5	15	5.15
2	pH Value	6.5 - 8.5	6.5 - 8.5	7.68
3	Taste	Agreeable	Agreeable	Agreeable
4	Total Dissolved Solid, mg/l,Max	500	2000	164.00
5	Turbidity,NTU,Max	1	5	0.50
6	Free Residual Chlorine,Mg/l,Min,	0.2	1	1.50
7	Total Alkalinity,Mg/l,Max	200	600	106.32
8	Salinity	-	-	0.00
9	Conductivity,Mg/l,Max	222	385	280.00

Source: KMC

96. **Groundwater.** The aquifers that are tapped for ground water in Kolkata are under confined condition because of the presence of a thick clay layer near the surface. Such aquifers occur at various depths separated by other clay layers. Generally the first aquifer is encountered at a depth of about 15 m followed by other aquifers with a principal one at

about 90 m depth. The shallow aquifer is not used for bulk water tapping purposes, and is generally only tapped for spot supply of through hand pumps. A further deep aquifer occurs at depths approximately between 150 and 200m, and majority of deep tube wells for organized supply of drinking water tap this aquifer. The earliest geohydrological data for the configuration of the piezometric surface beneath Kolkata are available for the post-monsoon period of 1956. It shows that in the northern part of the city, the piezometric surface was about 0.5-1.0 m above sea level and progressively declined below mean sea level towards the south. There was a drastic change in the pattern in the pre-monsoon of 1958 when a small depression in the piezometric surface was created with the center near Park Street lying at 5 m below mean sea level. The piezometric surface contour plan therefore defined a centripetal ground water flow pattern changing from an open north to south to a closed one. This ovoid ground water trough with long axis trending northwest-southeast persisted since then progressively going down with the central part having piezometric surface lying at (-) 13 m below the mean sea level in the pre-monsoon of 1998. The fall in elevation of the piezometric surface over a period of 40 years is of the order of at least 5 m at the extreme eastern part of Kolkata. The fall of piezometric surface in Command Hospital (Alipore), Kudghat and Tiljala area are 2.08, 3.06 and 3.24 m respectively. The area of depression is roughly bounded by the triangle formed by Narkeldanga, Park Circus and Alipore National Library.

97. As part of KEIIP DPR preparation for added area geohydrological investigations were carried out in January, 2009 in seventeen Wards distributed in Borough XI to XV. In these areas, ground water occurs mainly under confined to semi-confined conditions in 13 Wards (108, 109, 111, 115, 122, 123, 124, 125, 126, 127, 139, 140 & 141). Depths of piezometric surface from ground level in these Wards varied between 9.3m and 14.11m. In Wards 110, 112, 113 & 114, due to presence of near surface aquifers under water table conditions the depths to water level in the tube wells in these wards are between 1.3m and 2.9m. An aquitard occurs near surface over the entire studied area and ground water from this aquitard is tapped by dug wells. The depths to water table varied between 0.50m and 7.95m in these dug wells. With most areas reporting water levels within 1 to 2 m from the ground surface.

98. The relevant ground water level data are given in the following **Table 12.**

Table 12: Ground water level data as measured during December, 2011 (near project locations)

Sl. No.	Location	Type of Structure	Sector	SWL (m bgl)
1	57/6/2, Santosh Roy Road, Kolkata-8	Dug Well	Behala	0.85
2	210, James Long Sarani, Opposite to Fire Brigade Depo, Kolkata-63	Dug Well	Behala	0.6
3	P-21, J. L. Sarani, Majher Para, Thakurpukur, Kolkata-63	Dug Well	Behala	1.0
4	Diamond Park, behind Vaishnawi Garden, 444, J. L. Sarani, Kolkata-104	Dug Well	Behala	0.5
5	12/1A, Roy Bahadur Roy, Kolkata-34	Tube Well	Behala	13.85
6	N/214, Biren Roy Road (E), Kolkata-8	Tube Well	Behala	14.85
7	Primary School, Barisha Purba Para, Kolkata-63	Tube Well	Behala	13.32
8	Thakurpukur, Maheshtola, J. L. Sarani, Kolkata-108	Tube Well	Behala	12.07

Notes: SWL = Static Water Level, m bgl = Meter Below Ground Level

99. Ground water in KMC area under two principal types, viz. a) Bicarbonate type and b) Chloride type. Ground Water in the area west of a line connecting BBD Bag, Park Street and Jadavpur is of Biocarbonate type whereas in the area east of this line ground water is of Chloride type. The two anionic types were further subdivided each into two types on the

basis of predominance of cation concentration. These are (i) Calcium – magnesium bicarbonate, (ii) Sodium bicarbonate; (iii) Calcium –Magnesium chloride; and (iv) Sodium chloride.

Table 13: Ground water facies at project area of KMC

Type	Facies	Distribution and characteristics of ground water facies	Borough
Bicarbonate	**Ca-Mg- HCO_3**	Occurrence in the entire western and south-central part of the city, south of Taltala- Kasba-Santoshpur tract in the NNW- SSE direction concentration of chloride low, in some places around New Alipore, Khidirpur, Elgin Road and Harish Park etc., chloride concentration as low as 11mg/l to 67 mg/l. Sodium concentration from 14 to 32 mg/l and average total dissolved solid 500mg/l	IX, XI, XII, XIII, XIV, and XV
	Na- HCO_3	Occurrence in the southern part of the city and particularly Behala, Tollygunge, Joka, Jadavpur and Putiari Soft with total hardness less than 150 mg/l; softening of ground water probably due to base exchange of calcium- magnesium ion with sodium ion from sodium montmorrilonite clay	X, XII, XVI

100. Ground water quality was monitored around the project sites during November, 2011 - 12 and the results are reproduced in **Table 14** below. Water quality is rather high in TDS but within acceptable limit. Fe concentration is also high. No heavy metal pollution especially that of arsenic has been detected.

Table 14: Ground water quality around water supply subproject sites

Parameters	GW – 1 Diamond Park, Joka (Tube Well)	GW – 2 Krishnayan Cooperative Housing, Behala (Tube Well)	GW – 3 Thakurpukur, James Long Sarani (Tube Well)	National drinking water standard Permissible limit
Temperature(^{0}C)	19.50	18.0	18.5	-
Colour unit	1.0	1.0	1.0	5
Turbidity(NTU)	2.65	4.8	6.8	1
Odour	No odour observed	No odour observed	No odour observed	Agreeable
pH	7.78	7.71	7.8	6.5-8.5
TSS (mg./l)	<10	<10	<10	-
TDS(mg./l)	556.0	879.0	580.0	500
Total hardness(mg./l)	228.0	232.0	240.0	200
Chloride(mg./l)	79.12	219.79	76.93	250

Parameters	GW – 1 Diamond Park, Joka (Tube Well)	GW – 2 Krishnayan Cooperative Housing, Behala (Tube Well)	GW – 3 Thakurpukur, James Long Sarani (Tube Well)	National drinking water standard Permissible limit
Sulphate(mg./l)	5.0	9.75	3.5	200
Nitrate(mg./l)	12.5	35.80	25.0	45
Sodium(mg./l)	138.5	212.0	180.0	-
Potassium(mg./l)	30.0	42.10	25.0	-
Calcium(mg./l)	56.11	72.14	60.92	75
Magnesium(mg./l)	21.12	12.48	21.12	30
Iron(mg./l)	0.64	1.61	2.34	0.3
Zinc(mg./l)	0.65	0.65	0.28	5.0
Phosphorus(mg./l)	0.14	0.04	0.06	-
Fluoride(mg./l)	<0.02	<0.02	<0.02	1.0
Lead(mg./l)	<0.03	<0.03	<0.03	0.01
Cadmium(mg./l)	<0.01	<0.01	<0.01	0.003
Arsenic(mg./l)	<0.01	<0.01	<0.01	0.01
Chromium (III) (mg./l)	<0.20	<0.20	<0.20	-
Chromium(VI) (mg./l)	<0.01	<0.01	<0.01	0.05
Phenolic compound(mg./l)	<0.001	<0.001	<0.001	0.001
Cyanide(mg./l)	<0.05	<0.05	<0.05	0.05
Mercury(mg./l)	<0.0001	<0.0001	<0.0001	0.001
Total coliform (MPN/100 ml)	<2	<2	<2	Not detectable

Source: Primary data generated under KEIIP

Notes: NTU = Nephelometric Turbidity Units; TON = Threshold Odor Number; mg/l = milligram/litre; MPN/100 ml = Most Probable Number per one hundred millilitre;
TSS = Total Suspended Solid TDS = Total Dissolved Solid

101. **Noise.** Noise level in Kolkata high and exceeds the national standard.

102. Ambient noise level monitoring was carried out in the subproject area and the results are reproduced in **Table 15**. The day and night Leq level is generally above 70 dBA (maximum value above 80 in most of the cases) due to heavy traffic movement.

Table 15: Noise along Diamond Harbour Road & James Long Sarani

Station No.	Location	Date & time	Minimum dB(A)	Maximum dB(A)	L_{eq} dB(A)
N1	Diamond Park	24.10.2011 (day time)	55.3	61.5	58.79
		24.10.2011 (Night time)	51.2	60.8	56.18
N2	ESIC Hospital	24.10.2011	79.8	85.3	82.56

Station No.	Location	Date & time	Minimum dB(A)	Maximum dB(A)	L_{eq} dB(A)
		(day time)			
		24.10.2011 (Night time)	64.2	69.8	67.20
N3	Kolkata Model School. James Long Sarani	24.10.2011 (day time)	74.2	83.5	77.87
		24.10.2011 (Night time)	62.8	71.5	67.89
N4	Thakurpukur Police Station	24.10.2011 (day time)	80.9	89.5	83.69
		24.10.2011 (Night time)	64.8	72.5	70.67
N5	Birsha High School (Sakher Bazar)	24.10.2011 (day time)	79.2	88.9	82.45
		24.10.2011 (Night time)	63.8	72.5	70.67
N6	Joka Tram Depot	24.10.2011 (day time)	78.3	85.2	82.47
		24.10.2011 (Night time)	67.2	74.8	72.50

Source: Primary data generated ,Notes: dBA = decibal in A network; Leq = Equivalent noise level

B. Ecological Resources

103. **East Kolkata Wetlands**. The East Kolkata Wetlands (EKW), located on the eastern fringes of Kolkata city, is a part of the extensive inter-distributory wetland regimes formed by the Gangetic delta. The total area is 12,500 ha. Only a small part of KMC area falls within the limits of EKW. The EKW area includes one of the largest assemblages of sewage fed fish ponds. The importance of this wetland lies in the fact that these sustain the world's largest and oldest integrated resource recovery practice based on a combination of agriculture and aquaculture, and provide livelihood support to a large, economically underprivileged population of around 27,000 families which depend upon various wetland products, primarily fish and vegetables for sustenance. Based on its immense ecological and socio cultural importance, the Government of India, declared East Kolkata Wetlands as Wetland of International Importance under Ramsar Convention in 2002. EKW is a classical example of harnessing natural resources of the wetland system for fisheries and agriculture through ingenuity of local communities with their traditional knowledge. The wetland has been included by the Ramsar Convention as one of the 17 case studies on wise use of wetlands at the global level. The wetland provides strong arguments for integration of traditional knowledge of local communities into conservation and management practices. More than 1000 MLD of untreated sewage from Kolkata are discharged in to the fisheries of EKW for natural treatment in the fish ponds.

104. The ecology of the EKW area has undergone a dramatic change since the beginning of the 19th century due to cessation of tidal (brackish water) influx from Bidyadhari and Matla rivers in to the then saline marshy area with brackish water fisheries. The change is not only due to natural causes like siltation but also due to developmental activities and hydrological interventions. The brackish water fisheries of earlier years were converted in to sewage fed fisheries bringing in a changed ecosystem and establishing a new biodiversity in the EKW areas.

105. There is no forest patch within EKW. There are no endangered species but there are a number of rare mammals, reptiles, fish and bird species. According to the Ramsar information database, there are rare mammals such as Marsh mongoose, small Indian mongoose, Palm civet and small Indian civet which are significant in and around the EKW.

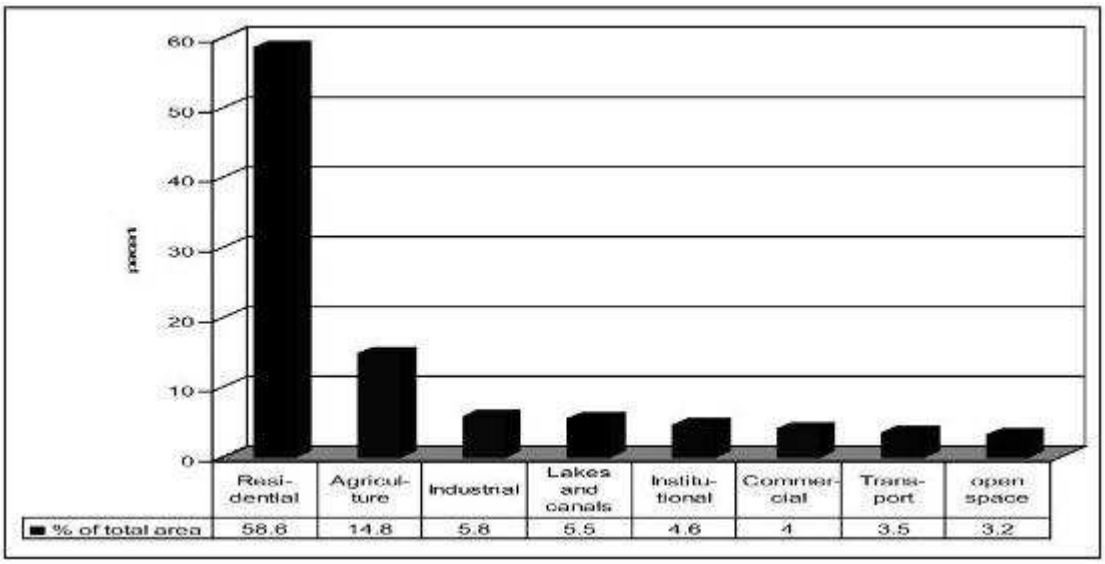
106. **Vegetation.** The Kolkata region, except a small part that is falling in East Kolkata Wetlands to the east is in a region of moist tropical deciduous vegetation with fresh water aquatic plants. Because of the continuous expansion of human habitation and heavy population pressure, the nature of the vegetation is rapidly changing and there are fewer herbaceous plants in some parts of the area. The few undisturbed areas along canal banks, road sides and small orchards within the residential area offer more varied vegetation. There is no demarcated forest.

107. **Wildlife.** Common jungle cats, foxes (*Vulpes bengalensis*), house rats (*Rattus rattus*), and mice (*Mus muscatus*), kingfisher (Alcedo sp.) are present. Of the reptiles, garden lizards (*Calotes versicolor*), snakes (Natrix sp., Viper sp.), and kraits (*Bungarus caeruleus*) are common. The bird life includes house crows (*Acridotheres tristis*), house sparrows (*Paser domesticus*), and pigeons (*Coluamba livia*). Amphibians such as Indian bullfrogs (*Rana tigrina*), annelids such as earthworms (*Eisenia foetida*), and arthropods such as cockroaches (*Periplanata americana*), butterflies and ants (*Tapinoma sessile*) are common. There are no endangered faunal species in the subproject area.

108. **Aquatic Flora and Fauna**. Anchored and free floating and submerged hydrophytes like Kachuri pana (*Eichhornia crassipes*), Azolla (*Azolla pinnata*), Sagittaria (Sagittaria sp.), Hogla (*Typha angustifolia*) etc can be seen in the many open water bodies other than Hooghly river. Such water bodies often contain fishes such as Rohu (*Labeo rohita*), Catla (*Catla catla*), and Bata (*Labeo bata*). Phytoplankton like Spirogyra sp., Zygnema sp., Navicula sp., Nostoc sp., Hydrodistyom sp., etc and zooplankton like Cyclops sp., Paramecium sp., Euglena sp., Diaptomus sp., larvae of culex sp. etc are ubiquitous.

C. Economic Development

109. **Land use.** The metropolitan area of Kolkata has grown from a few small villages to its present status as India's most populous city. The predominant land use in the KMC is residential, as shown in Figure below. However, for most residential areas a more exact description will be mixed use. There are industrial sites throughout the city, in all 16 Boroughs and in 71 of the 144 Wards. Urban planning is one of the responsibilities of the KMC. The KMDA also has a role in land planning, with a broader geographic scope than KMC.



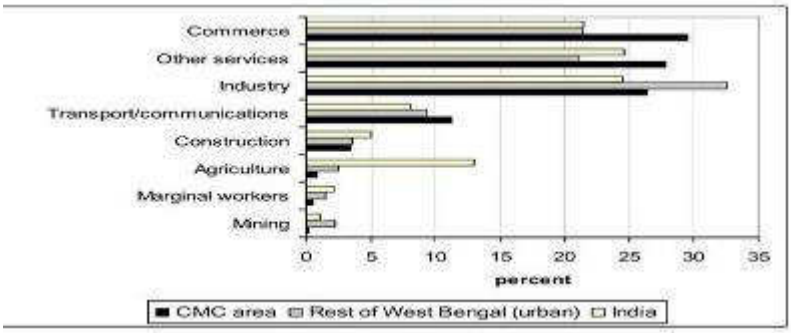
110. The land use pattern in the subproject area is predominantly semi urban with scattered residential colonies. However, very little commercial activities are also observed in some parts. Joka Cancer Hospital and IIM Kolkata are the major health and educational facilities present within the project area respectively. One important sewage treatment plant (SSE

STP) is located in the northern part of the project area. There is no approved landuse map of this area.

111. The new extension of the metro railway line, under construction, terminates in Joka. The Diamond Harbour Road, being the trunk road to Sager island (religious spot) and Kulpi (developing area for future harbor access) passes through the heart of the project area. Joka is the doorway from south of West Bengal to Kolkata. Institutional, commercial and industrial activities will definitely enhance and expand. Construction of residential towers are already at place. It is expected that there will be boom in this area.

112. **Commerce and industry**. Kolkata is a service center rather than an industrial center. As shown on Figure below, the proportion of the population working in industry is similar to the India urban average, but below that of the rest of urban West Bengal.

113. Industrial growth has been accelerating in West Bengal with the introduction of the New Economic Policy (1992), the average annual growth of industrial production has moved up to 5.05%. While the organized industries are located in Cossipore area (Borough I), small scale industries as lead recycling, tanneries etc. are located in the Tiljala/Topsia area (Borough VII). It may be noted that all the tanneries are being relocated to a specially designated site at Karaidanga about 25 km away with all environmental safeguards. Only green i.e. non-polluting industries are permitted to be set up in KMC area. Permission from WBPCB is mandatory for discharging of waste in to municipal sewer or land or inland surface water body. For discharge to municipal sewer, industries must treat the effluent to the acceptable discharge limit as prescribed. Port related industries such as oil handling facilities etc. are found in the Garden Reach area viz Borough XV.



114. **Water supply.** The water supply system of Kolkata is very old, operated from 1865. Present average per capita supply is 134 lpcd, which is very near to desired supply of 150 lpcd (for metropolitan cities). But the supply is very uneven, ranging from 310 lpcd to 40 lpcd. Unaccounted for water (UFW) is 40%. Average supply period is 8 hours a day. Residual pressure is very low. The average terminal pressure at consumer end is around 2.5 m of water head. In some areas it ranges around 0.5 m-1.0 m of water head. About 10% of supply in Kolkata is from ground water. The source is affected by arsenic in some locations and TDS and Fe values are often above permissible values. From quality and health point of view the ground water source needs to be replaced. Coverage by piped water supply is 92% which is nearing 100%. But the rest 8% is near the periphery of the study area and far from surface water source. The two main water works are Palta and Garden Reach. Recently Jai Hind WTP in the eastern part of Kolkata has been added with in an installed capacity of 30 MGD.

115. **Transportation.** The Kolkata's transportation system is multi-modal and highly heterogeneous. Public transportation comprises everything from human-powered rickshaws to a subway system. Main thoroughfares in Kolkata are crowded with taxis, buses, two-wheelers, three-wheelers, hawkers, and a myriad of pedestrians all vying for limited space on the streets.

116. **Electrical Power.** Power supply in Kolkata dates back to 1898, when Calcutta Electric Supply Corporation was formed for generation, transmission and distribution of electrical energy in and around the city of Kolkata. From about 100 kw demand in 1898, the system has grown to about 1200 MW in 1998. Apart from its own generation, CESC Limited, presently a licensee of WBSEB, purchases power from the latter and also from Damodar Valley Corporation (DVC). The generating stations that operate in Kolkata area are: Mulajore, capacity 150 MW, New Cossipore 160 MW, Titagarh 240 MW, Southern 135 MW, and Budge-budge 250 MW. In addition, 300-400 MW of power is supplied by West Bengal State Power Development Corporation and Damodar Valley Corporation. All these power plants are coal-based.

117. **Sanitation and Sewerage**. In the core city area all properties, except the slums, are directly connected to the underground sewer network, meaning a total number of 358,750 households directly connected which is equivalent to 75% of all households in the core city area. The slum areas are in general served by communal toilets connected to septic tanks. In the outer areas served by KEIP a total number of 70,000 house connections would be constructed once the project is finalized in June 2012. This means a coverage of 22% of the total population in the KEIP areas. In the outer areas not yet served house connections to underground sewers don't exist by lack of any underground sewer system, meaning 0% coverage. This brings the average total for the entire KMC area at 44% as compared to the national target level of 100% but nevertheless it is way above the national average of 28%.

118. According to the 2001 Census 96% of the KMC population has access to individual or community toilets within walking distance in the service area. This compares favorably with the national average of 82% and is near the national benchmark of 100%. Most of the KMC slum areas are provided with communal toilet facilities within walking distance. Only 4% of the KMC population has no sanitation facilities and uses gutters, open drains, channels or vacant land for sanitation. This is mostly in the urban fringe areas where population densities are still relatively low.

119. The collection efficiency of sewage is 71%, which is higher than the percentage of people with direct sewer connections because it also includes sewage collected through the interceptor sewer system. The collection efficiency is around 90% in the core city area as well as in the KEIP areas. The remaining outer areas have no formal sewer system yet and collection is zero.

120. The treatment capacity of the existing treatment plants and the East Kolkata Wetlands (EKW) is sufficient to serve the entire central city (100%) and the KEIP areas (100%). The total average for KMC is 88% because the outer areas not yet served by KEIP generate 12% of the waste water for the entire KMC. The effluent quality at the outlets of the East Kolkata Wetlands and the existing treatment plants fully comply with national norms.

121. The extent of re-use is very high because 90% of all sewage from KMC ends up in the fisheries of the EKW where it serves as quality food for the fisheries. Effluent from other treatment facilities is partially re-used for agricultural purposes before it finally discharges into the Hooghly River. On average 93% of waste water generated in KMC is re-used, comparing very favourable to the national target of 20%.

122. **Solid Waste Management**. The solid waste management system consists of three main components: Collection, Transportation and Disposal.

123. The majority (90%) of collection is done by KMC and 10% is contracted out to private contractors. House-to-house (doorstep) collection has been introduced in 80% of the KMC area. Other areas are served by street sweepers who operate manually. Many roads are too narrow to allow access for motorized collection vehicles. Primary collection is mostly by open hand carts and delivery at secondary collection sites (vats). There are 694 such collection points – 392 open vats and 302 bulk containers or direct loading. Open vats are generally poorly managed with spillage of disposed waste from the bulk containers or from open vat

boundaries creating in most cases an unhygienic environment. In 2011 source segregation has been introduced as a pilot project in 7 Wards.

124. 80% of the KMC area is served by a door-to-door collection system and 25% by street sweeping. This compares favorably to the national average of 51% but is still far below the 100% benchmark target. The central city and most of the surrounding outer areas are served daily collection, but some of the lower density fringe areas are only served once or twice per week.

125. Presently, mixed waste (biodegradable and recyclable) is collected from residential, commercial and market areas and brought to collection points, which may be small bins or large bulk containers (dumpers) that are painted yellow (42%) or open storage enclosures (58%). Waste is directly loaded from these containers into trucks or trailers manually or using pay loaders. This step is known as secondary collection. Pay loaders cannot collect all the waste from the storage enclosures, since some manual cleaning is required. They tend to break the edge of the storage enclosures and that spills waste when loading. Pay loaders also often find it difficult to operate in the narrow cramped streets of Kolkata metropolitan area. Currently, pay loaders are used to collect waste from only 5% of the total collection points, while the remaining collection is done either manually or by private agencies (mostly manual operations).

126. KMC has two waste disposal sites. The Garden Reach dumping ground is a small facility with little remaining capacity. It receives currently about 10 MT/day of waste mainly from nearby Borough XV. The main dumping ground is at Dhapa in the east of KMC at approximately 8 km from the city centre. This dump site is nearing its maximum capacity and has been authorized by West Bengal Pollution Control Board to operate for one more year only. It received an average of 4286 MT/day solid waste in 2011 out of which 300 MT/day was diverted to the privately operated Dhapa composting plant.

127. The extent of scientific disposal of solid waste is currently zero and should become 100% in accordance with the national benchmark target. Both the Dhapa and the Garden Reach dump site are not operated as sanitary landfill in accordance with national standards. There is no formal leachate treatment, no proper soil cover and informal, unorganized rag pickers operate at the sites. KMC has an interim permit from WBPCB to operate the Dhapa landfill facility for one year.

128. West Bengal has one Common Hazardous Waste Treatment, Storage and Disposal Facility (CHWTSDF) at Haldia (about 100 km south of Kolkata) that commenced operations in 2005. The facility was jointly developed by the Haldia Development Authority and the Hyderabad based private company, M/s Ramky Enviro Engineers Ltd. who formed a joint venture company named M/s West Bengal Waste Management limited (WBWML) for the development and operation of the facility. The CHWTSDF at Haldia operated by M/s WBWML has completed almost four years of successful operation. The facility caters to units in the entire state of West Bengal.

D. Social and Cultural Resources

129. **Communities and Population**. The population of the KMC area is 4.45 million with a growth rate -1.93% (2001 to 2011). Approximately one third (32%) of the KMC population lives in bustees and substandard housing. The Project team prepared population projections to 2022 based on the using previous census data of 2001, 1991 and 1981. These projections show a declining population trend for the KMC area, increasing from 4.38 million in 1991 to 4.56 million in 2022. This hike will indicate a general growth of population in the south and south-eastern part of Kolkata which has a tremendous growth potential. The average household no. for the total KMC area is 972,264 and the average household size of Kolkata Municipal Corporation is 4.61 in 2011. Population density of KMC is very high 24,783 persons/sq.km. in 2011. Household numbers are 972,264 and average household size is 4.61 in 2011.

130. **Institutions**. A number of institutions are present in the KMC area and may have a role in the Project's development. These can be classified in to several categories, as follows: government administration and services, police and security, urban development, and environmental protection.

131. **Government administration and services.** . The agency with the most important role in the Project is KMC. Municipal administration in Kolkata dates from 1727. The functions of the first Corporation were then limited to provision of local roads and drainage and conservancy service. The present system of municipal government has come through an evolutionary process over a long period, resulting in KMC being assigned the responsibility for the following services: regulation of land use; regulation of construction of buildings; planning for economic and social development; roads and bridges; water supply; public health, sanitation, conservancy and solid waste management; urban forestry, protection of the environment and promotion of ecological aspects; safeguarding interests of weaker sections of society, including the handicapped; slum improvement; urban poverty alleviation; provision of urban amenities such as parks gardens, playgrounds; promotion of cultural, educational and aesthetic aspects; burials and burial grounds, cremation and cremation grounds; cattle grounds, prevention of cruelty to animals; vital statistics including registration of births and deaths; public amenities including street lighting, parking lots, bus stops and public conveyance; and regulation of slaughterhouses and tanneries.

132. **Environmental protection.** The WBPCB has the overall responsibility to set policy and standards for the protection of the environment, following the lead of the Central Pollution Control Board. This includes air, noise, hazardous waste, and water quality standards, and the requirement for the preparation of EIAs. The WBPCB also carries out water and air quality monitoring, and might be involved in the environmental quality monitoring program that will be a part of this project. No designated protected area lies within 10 km radius of the water supply subproject sites. Kolkata does not fall under the Coastal Regulation Zone (CRZ).

133. **Education**. The population of is fairly literate, around 90% of males and females being literate. School enrollment is moderately for all segments of the population. 85% of males and 80% of females report at least a primary school education. 27% of the population has completed secondary school and 9% have graduated from college.

134. **Religion.** About 80% of the residents of KMC are Hindus. Most belong to general castes (84%), with the balance belonging to scheduled caste or scheduled tribes. There are significant concentrations of Muslims in the bustees.

135. **Languages.** The mother tongue reported by 74% of the population is Bengali, with Hindi and Urdu represented by 14% and 12% of the population respectively. Interestingly, those living in standard residential housing report 91% Bengali, while those in sub-standard housing reporting only 58% Bengali and 25% Hindi.

136. **Occupation.** About 6% of households report unemployment: 5% for those living in standard residential areas and 7% for those in bustees and refugee colonies. Of those employed, there is a broad variety of employment types, with no single category predominating over others.

137. **Education, Health and Health Care Facilities**. A listing for Boroughs XI-XVI indicated that there are more than 180 government and private educational institutes within the Boroughs. The list includes primary, secondary and higher secondary schools, degree colleges, technical and professional institutes. Public health varies according to socio-economic level and location. There are more than fifty health centers, government hospitals/dispensaries, private hospitals and nursing homes within the study area. Mention may be made of Ruby General Hospital (Ward 108), Manovikash Kendra (Ward 108), R N Tagore International Institute for Cardiac Sciences (Ward 109), Peerless Hospital and B K Roy Research Centre (Ward 109) and Thakurpukur Cancer Hospital (Ward 124). Health

care facilities appear to be on the low side in Wards 112, 113 and 122. Malaria is seasonally prevalent. Cardio-vascular diseases are increasingly prevalent among people over 40, while waterborne diseases such as gastrointestinal diseases are common among children less than 15 years of age.

138. **Aesthetic Resources.** The main aesthetic resources of Kolkata as a whole consist of historic buildings and many small lakes and other water bodies. Both of these resources are recognized as being in need of restoration, and a number of efforts are under way to accomplish this. Foreign tourism is not yet a well-developed industry in Kolkata, and there are opportunities for making tourism a profitable industry while still conserving the urban beauty of the area.

139. **Cultural Resources.** The buildings of north Kolkata reflect the traditional culture of the zamindar and rajas, whereas the structures in central Kolkata reflect the British colonial style. The buildings and churches in this area are around 50 to 100 years old. Most of the archaeological monuments are maintained either by the Department of Archaeology or by private concerns like Rama Krishna Mission or Trusts. Some of the valuable monuments are: Metcalfe Hall, Gwalior Monument, Victoria Memorial, Shahid Minar, Indian Museum, Cossipore, Club, Town Hall, Tagore's Baitak Khana, Fort William, Vivekananda's house, and Roy's Naroial – Cossipore. There are also a few monuments at Tollygunge and Kalighat areas

140. As the subproject is concentrated primarily in the added areas of KMC, the project will not hamper any precincts of cultural or historical significance.

141. **Recreational and other facilities.** More than twenty five large play grounds are present in Boroughs XI to XVI area. There are innumerable temples, maths, mosques and a few churches scattered over the area. Housing complexes with their own recreational areas have come up especially in Wards, 108, 109 and 110.

V. ANTICIPATED IMPACTS AND MITIGATION MEASURES

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

143. The methodology used to rate the impacts was qualitative. Each category was divided into a number of different levels. These levels were then assigned various criteria as indicated in **Table 16.**

Table 16: Summary of Quantifiers and Qualifiers Used for Assessment Purposes

Duration (time-scale)	Short-term	Impact restricted to construction (0-27 months).
	Medium-term	Impact will continue throughout operation (after construction-30 years).
	Long-term	Impacts will exist beyond the life of the project components (>30 years)
	Permanent	Impacts will have permanent potential
Geographic spatial scale	Site	The impact will be limited to within the site boundaries.
	Local	The impact will affect surrounding areas.
	Regional	The impact will affect areas far beyond the site boundary but limited to the State of West Bengal.
Significance rating before mitigation (positive / negative)	Low	The impact will have a minimal effect on the environment.
	Medium	The impact will result in a measurable deterioration in the environment.

	High	The impact will cause a significant deterioration in the environment.
Mitigation	n/a	No mitigation necessary.
	Full	Full mitigation/reversal of the impact is possible.
	Partial	Only partial mitigation/reversal of the impact is possible
	None	No mitigation or reversal of the impact is possible
Degree of Certainty	Definite	(>90%)
	Possible	(50%)
	Unsure	(<40%)

144. Categorization of the subproject has been undertaken using ADB's REA Checklist for Water supply (**Appendix 6).**

A. Planning and Design Phase

145. Except 3 proposed ESR locations a Joka all other subproject components will be located in properties held by KMC. Purchase of land will be required only for Charaktala, Malpara and Ramakantapur ESR locations. Purchase process has already been initiated.

146. The plan and technical design of the subproject are based on the specifications of the Manual on Water Supply and Treatment developed by the Ministry of Urban Development's Central Public Health and Environmental Engineering Organization. Engineering decisions considered the results of the demand-supply gap analysis, area and population to be served, design period, the per capita rate of water supply, other water needs in the area, the nature and location of facilities to be provided, the optimum utilization of the existing WTPs, points of water supply intake and wastewater disposal. The salient design features are presented in **Table 17.**

Table 17: Design Consideration

Parameter	Design Consideration
Design Period	The subproject is designed to meet the requirements over a 30-year period after completion.
Design Population	The forecasted population of 325882 is estimated with due regard to all the factors governing the future growth and development of KMC until year 2050
Per capita supply	150 lpcd for 100% of population
Pressure requirements	The subproject is designed on continuous 24 hours basis to distribute water to consumers at adequate pressure at all points. The minimum residual pressure is 12 m in general (7m in some specific location).
Water storage	Capacity of reservoirs considering 24 hours consumer supply and 10 to 18 hours pumping at different years. Volume of reservoir (in ML) = 0.25 times Demand (mld), i.e 1/4th of Daily demand or 6 hrs storage. Maximum 18 hours supply from UGR to ESR, and 8 to 12 hours pumping to UGR
Alignment of transmission mains and distribution network	Alignment of the transmission mains and distribution pipeline is guided by public ROWs and existing road alignment.
Design of the transmission mains	The design velocity considered will eliminate any possibility of siltation and abrasion inside the pipe and will ensure the stipulated discharge capacity.
Pipe materials	The pipe materials considered in the design will ensure durability, life and overall cost which include pipe cost, installation and maintenance costs necessary to ensure the required function and performance of the pipeline throughout its designed life time.
Pipe laying	The transmission mains will be laid using open trenching. Everyday's work will be done in short length
Sanitation systems	Improvements on sewerage of the area will be considered separately
Ecological diversity	The subproject is situated within an existing built up area and no areas of ecological diversity occur within the subproject. Due to the nature and locality of the subproject there is unlikely to any impacts on biodiversity within the

Parameter	Design Consideration
	area. Any landscaping to be undertaken will be done with locally indigenous species and low maintenance requirements.
Land use and livelihoods	The key efforts undertaken to minimize impacts: before the preparation of engineering design, a detailed survey of the properties nearby the project components was conducted with regard to their ownership with the objective that minimum proprietary land is utilized for the subproject
Traffic flow and access	A traffic Management Plan will be developed to provide vehicle and pedestrian access and maintain community linkages. Local communities along the alignment will be continuously consulted regarding location of construction camps, access and hauling routes and other likely disturbances during construction. The road closure together with the proposed detours will be communicated via advertising, pamphlets, radio broadcasts, road signages, etc. The implementation of the road detours will also be dependent on advance road signages indicating the road detour and alternative routes. KMC will coordinate with the traffic police for the implementation of the Traffic Management Plan. At ESR and UGR sites, due to isolated locations no impact on traffic flow is expected Template for Traffic Management plan is shown as **Appendix 7**
Infrastructure and services	There are a number of existing infrastructure (roads, telecommunication lines, power lines and various pipelines along the alignment of the transmission mains. To mitigate the adverse impacts due to relocation of the utilities, PMU will (i) identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase; and (ii) require construction contractors to prepare a contingency plan
Noise and vibrations	During construction phase, some noise and vibration will be generated from the various construction activities like construction works, operation of construction equipment and vehicles engaged in transportation of construction materials. However, these will be confined to the work sites only and will be temporary in nature occurring mostly during daytime.
Aesthetics, landscape character, and sense of place	The subproject is considered to be compatible with the surrounding landscape and is not expected to negatively impact the existing visual quality or landscape character of the area. Construction waste, spoil materials will be disposed as per Spoil Management Plan (Template shown in **Appendix 8)**
Environmental Monitoring	Monitoring will be done in respect to supply water from reservoirs as per Environment Management Plant

147. The design considerations were discussed with the specialists responsible for the engineering aspects, and as a result measures have already been included in the subproject design for the infrastructure. This means that the number of impacts and their significance has already been reduced by amending the design.

148. For the package “Dedicated Water Supply Transmission Main from Junction of James Long Sarani to Daspara near existing Pumping Station along James Long Sarani” micro tunneling will be utilized for pipe laying. Existing road is busy traffic route and accordingly micro tunneling technology is planned to minimize impact. Design consideration including benefit of pipe laying through micro tunneling is given below.

Design Considerations for the Pipe laying Methodology

	Parameters	Micro-Tunneling	Open Trenching
1	Construction methodology	Modern; boring with pipe jacking technique	Primitive; manual
2	Accidental damage to utilities	Below utility lines	Invasive through or avoiding the utility lines; often utility lines are required to be shifted
3	Waste (solid and liquid)	Solid waste handling	Handling volume is more;

	Parameters	Micro-Tunneling	Open Trenching
	handling and disposal during construction	volume is less; disposal of waste is somewhat complicated	some part of the excavated material need to be put back again to fill up the trench after pipe is placed; construction method is hazardous
4	Pollution potential (air, noise, vibration, surface water, etc) during construction	Less severe as operation is below the ground without disturbing the surface	Open trenching gives rise air, water and noise pollution
5	Relative hazards during construction	Same degree	Same degree
6	Relative loss of business due to construction	Loss of business is minimal	Loss of business is likely to be more if the roads are narrow and traffic is heavy
7	Inconvenience to people using ROW	Less likely	More likely
8	Cost	More compared to trenching	Much less
9	Construction time	Less	More
10	Maintenance	Same effort is required	Same effort is required
	Recommendation	Micro-tunneling	

B. Construction Phase

149. ***Construction method water storage reservoir***. Excavation will be done as per the execution drawing for excavation by adopting standard procedures by using Excavators. The Excavation will be carried out in methodical manner by providing proper approach roads with adequate slopes for machinery movement. Wherever the excavation is not possible by machines – manual excavation by workmen will be carried out.

150. Consolidation will be carried out by knowing the exact geo-technical characteristics of the site. Compaction and consolidation of earth will be carried out upto the desired level of consolidation by adopting standard procedures. The necessary compaction test will be conducted.

151. Before carrying out any concreting works necessary approval of client/consultant in the pour card will be obtained. Bill of materials and Bar bending schedules as per the approved drawings will be prepared and kept ready.

152. The shuttering plates of proper sizes with proper finish or new plywood (waterproof) of adequate thickness will be used along with scaffolding pipes and clamps.

153. All concreting works will be carried out as per the Mix design hence required materials such as course sand, stone aggregates and cement will be sent to the design laboratories. After receipt of design mix from approved labs, all concrete works will be taken up accordingly. Only one type of cement will be used in one mix. The quality of cement will generally confirm the required IS specification.

154. At the time of placing concrete at every stage required test cubes will be taken and it will be kept under proper curing. These cubes will be tested in the Site laboratory in the presence of client/consultant on 7/14/28 days sampling and testing shall be as per respective specification under the supervision of client/consultant.

155. After completing concrete work required curing arrangements are kept ready. Curing will be carried out as per the IS. The de-shuttering of formwork of concrete surface will be as per IS 456 without any deviations.

156. After the completion of the super structure the required finishes viz. plastering,

water proof plastering & other amenity works as per the specifications. Finally the entire building will be white washed besides application of necessary approved color shade.

157. At construction phase for quality control project site will have a laboratory which will be equipped with various testing machines including cube testing machines, sieve analysis unit, measuring jars, weighing balance etc.

158. ***Transmission mains and Distribution network***. Distribution mains and transmission mains will be buried in trenches adjacent to roads un-used RoWs. In some areas occupied by drains or edges of shops and houses, trenches may be dug into the edge of the road to avoid damage to utilities and properties.

159. Trenches will be dug using a backhoe/manual, supplemented by manual digging where necessary. Excavated soil will be placed alongside, and the pipes (brought to site on trucks and stored on unused land nearby) will be placed in the trench by hand or using ropes for the Ductile Iron (DI) pipes. Pipes will be joined by hand, after which filling will be done with the excavated soil manually upto the ground level and compacted by a vibrating compressor. Where trenches are dug into an existing roadway, the bitumen or concrete surface will be broken by hand-held pneumatic drills, after which the trench will be excavated by backhoe, and the appropriate surface will be reapplied on completion.

160. Pipes are normally placed by approx 1 m below the existing ground level/road level and a clearance of 200 mm is left between the pipe and each side of the trench to allow backfilling. Trenches will be smaller for the distribution main (minimum of 1m deep and 1 m wide).

161. New pipes and connections to the distribution main will be provided to house connections, and these will run to individual dwellings in small hand-dug trenches, or on the surface. New consumer meters will be located outside houses, attached to a wall or set onto the ground.

162. ***Transmission main by micro-tunneling***. Micro tunneling technology will be applied for laying of 6.0 km pipeline within busy road. Intermittent shafts of access will be dug using a backhoe digger, supplemented by manual digging where necessary. Excavated soil will be placed alongside the shafts and the pipes will be brought to shaft sites on trucks and stored on unused land nearby. Excess spoils will be loaded into trucks for disposal. Slurry will be collected, stored in a container and disposed of to permitted low laying area.

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

Table 18 Summary of activities and facilities, resource use, and produced outputs during Construction Phase

Activities and Facilities	Inputs/Resource Use	Outputs/Waste Production
Construction camp and its associated facilities (including lay-down areas) Storage camps and lay-down areas Materials and equipment stockpiles Handling and storage of hazardous materials including chemicals additives, gravel, cement, concrete and lubricants Source of water Vegetation clearance (as per requirement) Earthworks, grading and contouring. Movement of construction staff, equipment and materials Importation of selected materials	Cement Chemical additives used in concrete (i.e. retarders) Paving blocks/bricks Aggregate (sand and stone) Gravel Water Drinking, cooking and sanitation at construction camps Water for dust suppression Water applied to base and sub-base layers during compaction Water for application to sub-base and base layers prior to	Waste concrete and other construction rubble Used fuels, lubricants, solvents and other hazardous waste General waste Contaminated soil Soil contaminated with petrochemicals (i.e. oils and lubricants) and other chemicals Sewage and grey water (temporary construction camp sanitation)

Activities and Facilities	Inputs/Resource Use	Outputs/Waste Production
Noise and vibrations Dust suppression Waste production and temporary storage/disposal i.e. used fuels, waste concrete and bitumen, spoil materials and general waste Use of asphalt/bitumen (and associated storage and mixing areas, chemicals) Concrete batching plan (and associated storage and mixing areas, chemicals) Rehabilitation of disturbed areas Interaction between construction workforce and local communities Reminders to affected people (if any) of construction with time frames	compaction Petrochemicals Other Chemicals/lubricants/paints Construction vehicles, machinery and equipment Temporary energy supply to construction camps Topsoil used during re-vegetation and rehabilitation Plant material for re-vegetation (seeds, sods, plant specimens) Labor Recruitment of construction work force Skills training Control of movement of public needs barriers (not just danger tape) to prevent people from felling in trenches/ excavated area for underground reservoirs during construction	Spoil material (excess soil removed during excavations) Noise and vibrations (construction vehicles and machinery) Lighting at construction camps, equipment yards and lay-down areas Plant material removed from servitude/right-of-way during vegetation clearance Smoke and fumes Burning of waste Burning of vegetation cover Fires used for cooking and space heating (construction camps) Vehicle exhaust emissions

164. The following table (**Table 19**) outlines potential impacts during the construction phase gathered from a process that included a review of available documentation, verified during the site visit, i.e. how, where and when the proposed development can interact and affect the environment significantly, and details what mitigation measures may be taken to counteract these impacts.

Table 19: Summary of anticipated potential environmental impacts during Construction Phase

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation
Climate	The nature and intensity of rainfall events in an area, has implications for storm water management. Smoke from burning activities could have wider spread on windy days especially when dust could be blown off site.	Consider seasonal climatic variations during scheduling of construction activities in the area. Do excavations and other clearing activities only during agreed working times and permitted weather conditions. Implement storm water control as per method approved by PMU. No open fires permitted on site	Low (negative)	Site	Short-term	Full Mitigation Possible
Air Quality	Sensitive receptors (e.g. hospitals, schools, religious places) may be affected temporarily by increased traffic and related impacts during the construction phase Fugitive dust can also impact on roadside air quality during construction. Exhaust fumes from construction machinery, and potential smoke from cooking fires. Burning of waste and cleared vegetation Odors from use of toilet 'facilities' other than provided facilities.	Guidelines that deal with the control of air pollution and dusts on site have been outlined in the Environmental Management Plan (EMP) Ensure compliance with the Air Act. Ensure compliance with emission standards Undertake monitoring of air pollution levels in potential problem areas. Manage (including storage, transport, handling and disposal) hazardous substances used. Avoid dust generating construction activities during strong winds. Cover soil loads in transit. Cover stockpiles of soil or apply suitable dust palliative such as water or commercial dust suppressants. Regularly service vehicles off-site in order to limit gaseous emissions. No open fires permitted on site Place atleast portable toilets on-site and maintain on a daily basis.	Medium (negative)	Local	Short-term	Partial Mitigation Possible
Geology and soil	Strong water flows into open excavated area	The design of the site drainage system is adequate to control runoff from the	Low (negative)	Site	Short-term	Full Mitigation

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation
	Layers of mixed fill cover natural ground surface in many places. Contamination from spillage of petroleum products, spent engine oil and oil leaks from construction vehicle maintenance taking place on site.	excavated and open areas in line with topographical features of the site. Rehabilitate all sites during construction including construction camps, stockpile area, temporary access and hauling routes, as soon as possible after the disturbance has ceased. Contractor to exercise strict care in the disposal of construction waste Contain contaminated water and dispose off site at an approved disposal site in consultation with WBPCB. Mix cement, concrete and chemicals on a concrete plinth and contain spillages or overflows into the soil. Do not allow vehicle maintenance on site. If oil spills occur, dispose contaminated soil at a disposal site in consultation with WBPCB. Stockpile subsoil and overburden in all construction and lay down areas. Utilizatiion of overburden/ excavated earth for project site development or disposal at designated areas				Possible
Drainage and hydrology	The proposed development is situated within an existing built up area. Due to the nature and locality of the subproject there is unlikely any significant impacts on water resources within the immediate area.	The site surface has been engineered and shaped in such a way that rapid and efficient evacuation of runoff is achieved. No contamination of water body nearby Provide containment areas for potential pollutants at construction camps, refueling, depots and concrete batching plants. Implement waste management practices. Control and manage transport, storage, handling and disposal of hazardous substances.	Medium (negative)	Site	Short-term	Full Mitigation Possible

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation
Biodiversity Fauna and Flora	The proposed development is situated within an existing built up area. No areas of ecological diversity occur within the subproject location. Due to the nature and locality of the subproject, the proposed development is unlikely to cause any significant impact on biodiversity within the area As per preliminary design there will be no requirement for tree felling. This will be further assessed during detail design stage	Permission will be obtained (if required) from the KMC for the cutting/felling of trees prior to start of civil works. Ensure any landscaping to be undertaken will be done with locally indigenous species and low maintenance requirements.	Low (negative)	Site	Short-term	Full Mitigation Possible
Land Uses	Due to the location and nature of the subproject, there will be limited interference with access. There will be no as such road closure. There will be no as such disruptions to health services, education services, local businesses, transport services, pedestrian movements, due to traffic and construction	KMC has consulted with various organizations, departments, etc within the area and will be continued during the construction phase. Consult with local departments, organizations, etc regarding location of construction camps, access and hauling routes, and other likely disturbances during construction. Make use of local labor, materials, goods and services as far as possible Provide sign boards for pedestrians/ locality nearby to inform nature and duration of construction works and contact numbers for concerns/complaints.	Low (negative)	Local	Short-term	Partial Mitigation Possible
Infrastructure and Services	There is likely to have temporary disruption of infrastructure and services during the pipe laying of the transmission mains. There are a number of existing	Undertake utility shifting prior to commencing pipe laying Keep construction-related disturbances to a minimum. Consult with affected service providers	Low (negative)	Local	Short-term	Full Mitigation Possible

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation
	infrastructure and services (roads, telecommunication lines, power lines and various pipelines within the vicinity of the subproject).	regarding impacts on access to infrastructure and services and alternatives. Consult with affected communities or businesses prior to foreseeable disruptions, for example notifying residents of a temporary severance of water supply. Provide backup or alternative services during construction-related disruptions, for example by providing generators for power supply. Provide access points to infrastructure and services. Monitor complaints by the public.				
Traffic	Increased volume of construction vehicles on the roads may lead to increased wear and tear of roads in the vicinity of the subproject site. Road safety concerns due to slow moving construction vehicles. Traffic flow within the vicinity will be affected. The temporary road closure will result in a decrease in overall network performance in terms of queuing delay, travel times/speeds. The road closure will impact on a public transport operations and routing. On street parking and loading bays will be affected by the proposed road closure. Pedestrian movements will be affected by the road closure.	Reroute traffic and close roads according the Traffic Management Plan (TMP). The objective of the TMP is to ensure safety of all the road-users along the work zone and to address: (i) protection of work crews from hazards associated with moving traffic; (ii) mitigation of the adverse impact to the road capacity and delays to the road-users; (iii) maintenance of access to adjoining properties; and (iv) issues that may delay the subproject works. Negotiate with privately-owned public transport operators regarding the affected public transport facilities and routing. Negotiate with business owners and social service operations regarding the loss of parking and loading bays. Clear roads signs will be erected for the full length of the construction period. Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints. Ensure the City Traffic Police will be	Medium (negative)	Regional	Short-term	Partial Mitigation Possible

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation
		available on site. Communicate road closure together with the proposed detour via advertising, pamphlets, radio broadcasts, road signage, etc. The implementation of the road detour is also dependent on advance road signage indicating the road detour and alternative routes. Define clearly construction routes. Strictly control access of all construction and material delivery vehicles. Enforce speed limits. Do not allow deliveries during peak traffic hours				
Health and Safety	Construction related activities may lead to injuries. Open fires in construction camp can result in accidents Safety of workers and general public may be compromised due to difficult site conditions. Poor waste management practices and unhygienic conditions at temporary ablution facilities can breed diseases. Standing water due to inadequate storm water drainage systems, inadequate waste management practices, pose a health hazard to providing breeding grounds for disease vectors such as mosquitoes, flies and snails.	Implement good housekeeping practices at the construction camp. Strictly implement health and safety measures and audit on a regular basis. Secure enclosed construction site. Use reputable contractors. Provide warning signs of hazardous working areas. Clearly demarcate excavations and provide barriers (not just danger tape) to protect pedestrians from open trenches. Thoroughly train workers assigned to dangerous equipment. Workers have the right to refuse work in unsafe conditions. Control speed and movement of construction vehicles Exclude public from the site Ensure all workers are provided with and use Personal Protective Equipment. Ensure the visibility of workers through their	High (negative)	Site and Local	Short-term	Partial Mitigation Possible

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation
		use of high visibility vests when working at night Ensure that qualified first-aid can be provided at all times. Ensure equipped first-aid stations are easily accessible throughout the site; Provide medical insurance coverage for workers. Provide clean eating areas where workers are not exposed to hazardous or noxious substances; 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; 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. Health and Safety Plan is attached as **Appendix 9**				
Noise and Vibrations	Sensitive receptors (hospitals, schools, religious places) may be affected temporarily by increased traffic and related impacts Disturbance from afterhours work.	Locate concrete batching, lay down areas and construction camps away from sensitive receptors. Restrict construction activities to reasonable working hours Keep adjacent landowners informed of unusually noisy activities planned. Regulate roadworthiness of vehicles.	High (negative)	Local	Short-term	Partial Mitigation Possible

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation
		Ensure that machinery in a good state of maintenance. Monitor noise levels in potential problem areas.				
Aesthetics, Landscape Character, and Sense of Place	The presence of heavy duty vehicles and equipment, temporary structures at construction camps, stockpiles, may result in impacts on aesthetics and landscape character	Properly fence off storage areas. Collect all domestic solid waste central point of disposal and feed into the city waste collection system. Contractor to exercise strict care in disposing construction waste. Identify suitable waste disposal site to hold additional waste to be generated by the construction activities. Remove unwanted material and litter on a frequent basis.	Medium (negative)	Local	Short-term	Partial Mitigation Definite
Workers Conduct	Construction workers on site disrupting adjacent land uses by creating noise, generating litter, and possible loitering.	Ensure strict control of laborers Minimize working hours to normal working times Control littering Ensure no overnight accommodation is provided.	Low (negative)	Local	Short-term	Full Mitigation Definite
Employment Generation	The subproject will provide employment opportunities for local people during construction. Expectations regarding new employment will be high especially among the unemployed individuals in the area. Labor gathering at the site for work can be a safety and security issue, and must be avoided. The training of unskilled or previously unemployed persons will add to the skills base of the	Employ local (unskilled) labor if possible Training of labor to benefit individuals beyond completion of the subproject. Ensure recruitment of labors will take place offsite. Ensure at least 50% of all labor is from surrounding communities in the contractual documentation.	Medium (positive)	Local	Short-term	Partial Mitigation Possible

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation
	area.					
Archaeological and Cultural Characteristics	The proposed development will not require demolition of ASI- or state-protected monuments and buildings	Ensure that construction staff members are aware of the likelihood of heritage resources being unearthed and of the scientific importance of such discoveries. Contact ASI or the State Department of Archaeology if any graves be discovered and all activities will be ceased until further notice. Contact ASI or the State Department of Archaeology if any heritage resources or objects, defined in the Act, be discovered and all activities will be ceased until further notice. Cease all activities immediately and do not move any heritage object found without prior consultation with ASI or the State Department of Archaeology	Low (negative)	Local	Short-term	Full Mitigation Definite

C. Operation and Maintenance phase

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

166. The main requirement for maintenance of the transmission main and distribution system will be for the detection and repair of leaks. The generally flat topography and the usage of good quality pipes shall mean that pipeline breaks are very rare, and that leaks are mainly limited to joints between pipes.

167. **Table 20** presents an indication of what activities and facilities are likely to be undertaken during operation and maintenance of the subproject, including the associated inputs and outputs.

Table 20: Summary of Activities and Facilities, Resource Use, and Produced Outputs during Operation and Maintenance Phase

Activities and Facilities	Inputs/Resource Use	Outputs/Waste Production
Operation activities Wastewater generation if any Maintenance activities Upkeep and repair of pumps, painting of ESR	Labor Vehicles and equipment used for inspections and maintenance Fuels and lubricants for pumps	Wastewater Spent chemicals and containers Vehicle exhaust emissions

168. The following **Table 21** outlines potential impacts during the operation and maintenance phase gathered from a process that included a review of available documentation, verified during the site visit, i.e. how, where and when the proposed development can interact and affect the environment significantly, and details what mitigation measures may be taken to counteract these impacts.

Table 21: Summary of Anticipated Potential Environmental Impacts During Operation and Maintenance (including defect liability) Phase

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	**Mitigation**	**Significance before Mitigation**	**Geographic Spatial Scale**	**Duration**	**Mitigation**
Air Quality	Sensitive receptors (e.g. hospitals, schools, religious places) may be affected temporarily by increased traffic and related impacts during water storage reservoir maintenance.	Ensure compliance with the Air Act. Ensure compliance with emission standards Regularly service vehicles off-site in order to limit gaseous emissions.	Low (negative)	Local	Short-term	Partial Mitigation Possible
Biodiversity Fauna and Flora	The proposed development is situated within an existing built up locality. No areas of ecological diversity occur within the subproject location. Due to the nature and locality of the subproject, the proposed development is unlikely to have any significant impact on biodiversity within the area during maintenance works	Ensure no accidental damage to local flora and fauna.	Low (negative)	Site	Short-term	Full Mitigation Possible
Land Uses	Due to the location and nature of the subproject, there will be interference with access during maintenance works Existing public transport facilities and operations will be affected by the road closure and detours. There will be disruptions to health services, education services, local businesses, transport services, pedestrian movements, due to traffic and maintenance-related noise, visual, and air pollution.	Put a sign of “Keep Clear” near critical roads (e.g. in front of fire and police stations, school and hospitals). Consult with local departments, organizations, etc regarding location of construction camps, access and hauling routes, and other likely disturbances. Provide clear and realistic information regarding detours and alternative accesses for local communities and businesses in order to prevent unrealistic expectations. Provide walkways and metal sheets where required to maintain access across for people and vehicles. Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools.	Low (negative)	Local	Short-term	Partial Mitigation Possible

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation
		Consult businesses and institutions regarding operating hours and factoring this in work schedules. Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.				
Health and Safety	Danger of operations and maintenance-related injuries. Safety of workers and general public must be ensured. Standing water due to inadequate storm water drainage systems, inadequate waste management practices, pose a health hazard to providing breeding grounds for disease vectors such as mosquitoes, flies and snails. Fire and electrocution hazards in the pumping stations.	Implement good housekeeping practices at pumping stations. Strictly implement health and safety measures and audit on a regular basis. Provide warning signs of hazardous working areas. Clearly demarcate excavations and provide barriers (not just danger tape) to protect pedestrians from open trenches. Thoroughly train workers assigned to dangerous equipment. Workers have the right to refuse work in unsafe conditions. Ensure all workers are provided with Personal Protective Equipment. Ensure the visibility of workers through their use of high visibility vests when working at night Ensure that qualified first-aid can be provided at all times. Ensure equipped first-aid stations are easily accessible throughout the site; Provide medical insurance coverage for workers. Provide clean eating areas where workers are not exposed to hazardous or noxious substances; Ensure moving equipment is outfitted with audible back-up alarms; Mark and provide sign boards for hazardous areas such as energized electrical devices and	Low (negative)	Site and Local	Short-term	Partial Mitigation Possible

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	**Mitigation**	**Significance before Mitigation**	**Geographic Spatial Scale**	**Duration**	**Mitigation**
		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. Health and Safety Plan is attached as **Appendix 9**				
Noise and Vibrations	Sensitive receptors (hospitals, schools, religious places) may be affected temporarily by increased traffic and related impacts Disturbance from afterhours work.	Restrict maintenance activities to reasonable working hours where near sensitive receptors. Keep adjacent landowners informed of unusually noisy activities planned. Fit and maintain silencers to all machinery on site. Monitor noise levels in potential problem areas.	Low (negative)	Local	Short-term	Partial Mitigation Possible
Workers Conduct	Maintenance workers on site disrupting adjacent land uses by creating noise, generating litter, and possible loitering.	Ensure strict control of laborers Minimize working hours to normal working times Control littering	Low (negative)	Local	Short-term	Full Mitigation Definite

D. Summary of Site Specific Mitigation Measures

169. Site specific mitigation/safeguard measures for below mentioned project sites are summarized as in table (**Table 22**) below. It will be revised again aft

Table 22: Site Specific Mitigation Measures for the water supply project

Work Component	Mitigation measures
Construction of Underground reservoir, pumping station and Elevated water storage reservoir – at Prantik phase III	1. Location within housing complex – safety arrangement (use of caution tape/ barricade) is to be provided around working areas especially around excavations 2. Only scrubs are to be removed. Absolutely no felling of trees 3. Excess earth from excavations are to be utilized for filling up low laying areas within the housing complex 4. Material storage will be planned within designated area without impeding movement of people 5. Site camp with toilet and drinking water facilities is to set up at available vacant areas of the housing complex without inconveniencing local residents and without restricting movement of vehicles 6. Noise generation from construction activity will be regulated and activity should be planned during day time only
Construction of Underground reservoir, pumping station and Elevated water storage reservoir at KMC land of Julpia road	1. Sufficient road width available for transportation of materials at site 2. Pond near the site will be protected and its present use will not be disturbed. No construction materials will be disposed in pond water. Water of the pond will not be polluted with construction waste water 3. Camp site with toilet and drinking water facility will be set up at vacant location 4. Excavated earth will be utilized locally 5. Safety arrangement (use of caution tape/ barricade etc) is to be provided around working areas especially around excavations
Construction of Elevated water storage reservoir – at 22 Bigha, WBSETCL near Joka Tram Depot, at SSE STP North west and North East, Ramkantapur, Malpara, Charaktala	1. There are few residence nearby the ESR and caution tape and barricade will be utilized for public safety 2. Material storage will be planned within designated area without impacting movement of people 3. Camp site with toilet and drinking water facility will be set up at vacant location without inconveniencing local residents and obstructing movement of vehicles 4. Noise generation from construction activity will be regulated and activity should be planned during day time only 5. Excavated earth will be utilized locally 6. Scrub need to be removed from KMC land of SSE STP complex
• **Laying of Transmission Main**	1. Caution tape and barricade are to be provided for public safety especially near residential area nearby adjacent to the pipe

Work Component	Mitigation measures
from existing Daspara PS to UGRs at Pratik Ph III and KMC land of Julpia road; and Transmission Main from UGRs to 8 ESRs (6 proposed and 2 existing) • **Transmission Main from UGR at KMC land of Julpia road to 3 ESRs**	laying location and near school 2. Material storage will be planned within designated area without obstructing movement of people 3. Traffic diversion and road closure as per requirement 4. Camp site with toilet and drinking water facility will be set up at vacant location without impacting local residents and movement of vehicles 5. Noise generation from construction activity will be regulated and activity should be planned during day time only 6. Excavated earth will be utilized locally or disposed as per spoil management plan
• **Laying of distribution system and house connection within the command area of 8 ESRs (6 proposed + 2 existing).** • **Distribution system and house connection within command area of 3 ESRs**	1. Caution tape and barricade will be provided for public safety especially near residential area, pipe laying location, near schools and religious places 2. Well planned traffic diversion and road closure as per requirement especially for narrow roads 3. Material storage will be planned within designated area without obstructing movement of people 4. Camp site with toilet and drinking water facility will be set up at vacant location without inconveniencing local residents and movement of vehicles 5. Noise generation from construction activity will be regulated and activity should be planned during day time only 6. .Excavated earth will be utilized locally or disposed as per spoil management plan
• **Construction of Elevated Service Reservoir (ESR) at Ramkantapur, Malpara, Charaktala; Laying of Transmission main from UGR at KMC land on Julpia Road to 3 ESRs; Laying of Distribution system and house connection within command area of 3 ESRs**	1. Caution tape and barricade will be utilized for public safety especially at ESR and pipe laying site 2. Material storage will be planned within designated area without affecting movement of people 3. Camp site with toilet and drinking water facility will be selected at vacant location without inconveniencing local residents and movement of vehicles 4. Noise generation from construction activity will be regulated and activity should be planned during day time only 5. Excavated earth will be utilized locally 6. Traffic diversion and road closure as per requirement in the narrow roads present in the site
• **Dedicated Water Supply Transmission Main from Junction of James Long Sarani to Daspara near existing Pumping Station along James Long Sarani**	1. Entry shafts for the micro-tunnels are to be located at places on the road where there are least encroachment on the ROW and least chances of inconveniences to pedestrians and people living in the neighborhood. 2. A traffic management plan as approved by the DSC and PMU is to be in place before construction work commences

Work Component	Mitigation measures
	3. Suitable bill boards are to be put up at strategic points on the James Long Sarani giving salient information on the work component, time schedule and name & contact numbers of responsible persons of PMU and Contractor 4. Security fencing is to be provided throughout the construction period around the shafts 5. Excess solid waste is to be disposed at sites pre-approved by PMU 6. Slurry is to be stored in container and needs to be disposed of at sites with due permission
• **Water Loss Management in Anandapur area and Patuli area under Jai Hind WTP Area (Eastern Kolkata)",**	1. Material storage will be planned within designated area without impacting movement of people 2. Camp site with toilet and drinking water facility will be selected at vacant location without inconveniencing local residents and movement of vehicles 3. Excess solid waste/ earth is to be disposed at sites pre-approved by PMU 4. A traffic management plan as approved by the DSC and PMU is to be in place before construction work commences 5. Public safety and occupational safety at construction site

VI. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

A. Public participation during the preparation of the IEE

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

171. The primary stakeholders are: (i) local residents, shopkeepers and business people who live and work alongside the roads where pipeline will be laid and facilities will be provided; and (ii) custodians and users of socially- and culturally-important buildings in affected areas.

172. The secondary stakeholders are: (i) KMC as the executing agency; (ii) KEIIP officials as implementation agency; (iii) WBPCB, government department (like Environment department, Government of West Bengal, Forest Directorate, Government of West Bengal, Ministry of Environment, Forests and Climate Change, Government of India) and relevant government agencies (like CPCB, NEERI), including state and local authorities responsible for land acquisition, ,(iv) non-government organizations, university professors, and community-based organizations (CBOs) working in the affected communities; (v) other community representatives (prominent citizens, religious leaders, elders, women's groups); (vi) beneficiary community in general; and (vii) ADB, the government, and Ministry of Finance.

173. The following methodologies will be used for carrying out public consultation:

- Local communities, Individuals affected, traders and local shopkeepers who may be directly affected to be given priority while conducting public consultation.
- Walk-through informal group consultations along the proposed water supply pipe laying stretch.
- The local communities to be informed through public consultation with briefing on project interventions including its benefits.
- The environmental concerns and suggestions made by the participants to be listed out, discussed and suggestions to be noted for consideration during implementation.

174. There are series of informal discussions by the DSC & PMC engineering Consultants with Chief Engineers of KMC and Director General (Projects), PMU mainly on understanding current situation and optimum design to be adopted in order to attain the objectives of taking up the work items. On environmental issues of KEIIP a meeting at the WBPCB office was held on 1st December 2015 in which Chairman, Member Secretary, Chief Engineer and other engineers of WBPCB were present. The officials of WBPCB were appraised about the proposed work program of Tranche 1 and 2 of KEIIP. **Appendix 10** shows Minutes of the Meeting.

175. Also discussion has been carried out with Chief Engineer West Bengal Pollution Control Board on different safeguard issues on 10.04.2015, 29.06.2015 and 17.08.2015. WBPCB opined that,

- Consent to operate for sub projects under Tranche 1 and 2 should be taken in single composite manner along with other facilities with KMC requiring consent to operate authorization
- Public liability insurance as per MoEFCC notification should be taken for all KMC facilities including tranche 1 and 2 sub projects requiring consent to operate authorization
- Consent to establish (NOC) authorization for relevant subprojects should be taken under orange category in serial tiltled infrastructure facility development
- WBPCB wanted presentation from KEIIP for the benefit of its engineers and officers covering all sub projects under Tranche 1 and 2 so that the engineers of WBPCB are appraised about details of the work plan of the sub projects in Tranche 1 and 2 of KEIIP.

176. Official community consultation has been carried out at 41 Pally, KMC Ward Office, Ward No. 122 on 16th December 2015, Office of Borough XVI, Ward No. 144 on 19th December 2015 and Prantik Abasan, Phase-III, (Community Hall) Ward No. 143 on 21st December. They informed that present availability of water at the project area is absolutely inadequate. Issues related to consultation and design consideration is shown in Table below and detail of the consultation and participation enclosed as **Appendix 11.**

Issues raised by the participants	Consideration in design
➢ The commencement of the project work and duration. ➢ Water logging during heavy monsoon is a big challenge for the local people. ➢ Absence of drainage network and Scarcity of drinking water in the project area ➢ Quality of the water that is being supplied at	▪ Work will be started very soon, within 6 months ▪ Sewerage and drainage package needs to be considered separately to tackle water logging ▪ Sufficient water will be provided as per demand and completely treated water will be supplied after treatment ▪ New distribution pipelines will be laid under

Issues raised by the participants	Consideration in design
present by PHE (Public Health Engineering Dept) is not up to the mark for drinking (quantity of iron is above than normal range and salinity is also present). ➢ Application of protection measures including safety during construction ➢ Quantity of water supply is inadequate to cater the present demand. ➢ Replacement of poor PVC pipe by new one. ➢ Policy of house connection in case of joint property recorded in Kolkata Municipal Corporation (erstwhile Joka gram panchayet). ➢ Policy regarding connection fees in case of house connection. ➢ Network coverage in remote part of the ward.	different packages in the KEIIP program ▪ Design is developed with the consideration of 100% coverage and 24 hrs supply ▪ Application of Environment Management Plan during project implementation

177. Public consultation has been conducted during designing of package WS 25 .Details is attached in **Appendix 11.** After finalization of survey and location of works further consultation will be conducted with local public.

178. Consultation Strategy- Public Information and communication plan as below.

Stages of consultation	**Public consultation and communication plan**	**Participant – target group**	**Conducted by**	**Cost involved**
During survey and finalization of working areas	Project awareness Explaining possible impact	Local people at project influence area Authority of Sensitive receptors –like hospital, educational institutes, religious places	DSC, PMU with the help of community consultation group of KMC	Project cost - PMU
During implementation of the project – construction phase	Project impact and mitigation strategy Communication through leaflets and information disclosure at ward or borough level	Impacted locals and business	DSC, PMU with the help of community consultation group of KMC	Project cost - PMU
Post construction	Project benefit Disclosure through media – like newspaper, TV, Information, education and communication (IEC) materials	Benefited person at project influenced area	DSC, PMU with the help of community consultation group of KMC	Project cost - PMU

B. Future Consultation and Disclosure

179. The public consultation and disclosure program will remain a continuous process throughout the subproject implementation and shall include the following:

i. Consultation during detailed design

180. Focus-group discussions with affected persons and other stakeholders to hear their views and concerns, so that these can be addressed in subproject design wherever necessary. Regular updates on the environmental component of the subproject will kept available at the PMU office of KMC.

181. KMC will conduct information dissemination sessions at major intersections and solicit the help of the local community leaders/prominent citizens to encourage the participation of the people to discuss various environmental issues.

182. The PMU, with assistance of DSC will conduct information dissemination sessions in the subproject area. During EMP implementation PMU and DSC will organize public meetings and will apprise the communities about the progress on the implementation of EMP in the subproject works.

ii. Consultation during construction:

183. Public meetings with affected communities (if any) to discuss and plan work programs and allow issues to be raised and addressed once construction has started; and

184. Smaller-scale meetings to discuss and plan construction work with local communities to reduce disturbance and other impacts, and provide a mechanism through which stakeholders can participate in subproject monitoring and evaluation;

iii. Project disclosure

185. A communications strategy is of vital importance in terms of accommodating traffic during road closure. Local communities will be continuously consulted regarding location of construction camps, access and hauling routes and other likely disturbances during construction.

186. One public information campaigns via newspaper/radio/TV is proposed to explain the subproject details to a wider population. Public disclosure meetings at key project stages will be organized to inform the public of progress and future plans.

187. For the benefit of the community a summary of the IEE will be translated in the local language and made available at the offices of KMC, PMU and DSC. Hard copies of the English version of the IEE will be accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. Electronic version of the IEE will be placed in the official website of the KEIIP and the official website of ADB after approval of the IEE by Government and ADB. The PMU will issue Notification on the start date of implementation of the S & D subproject in KEIIP web site ahead of the implementation works.

VII. GRIEVANCE REDRESS MECHANISM

188. Common Grievance Redress Mechanism: A common grievance redress mechanism (GRM) has been established for social, environmental or any other subproject related grievances.

189. Grievance Redress Process. PMU will maintain a Complaint Cell at KEIIP office located in 206 A J C Bose Road Kolkata 700017 headed by a designated Grievance Officer (currently the Administrative Officer) under Project Director. The Complaint Cell will also serve as Public Information Centers, where, apart from grievance registration, information on the Project, subprojects, social and environmental safeguards, etc can be provided.

190. At every Borough of KMC under which works are in progress, a Public Relations & Grievance Redressal Unit is to be established for information disclosure on request from public and for receipt of complaints.

191. At Contractors' site offices, complaint and suggestion books will be available for lodging any complaint. The concerned Executive Engineers of KEIIP will monitor these

books and if possible take necessary actions for redressal of minor complaints with intimation to the complainant.

192. The Grievance Registration/Suggestion Form will be available at the Complaints Cell and in Borough Offices and will also be downloadable from the KEIIP/KMC websites. Grievances/ suggestions of affected persons can be dropped in suggestion boxes or conveyed through phone or mail. Affected Persons will also be able to register grievances - social, environmental or other, personally at the Complaint Cell and at Borough offices of KMC. The Grievance Officer and designated official at the Boroughs will be able to correctly interpret/record verbal grievances of non-literate persons and those received over telephone.

193. All complaints (unresolved at local site/Borough level) relating to KEIIP will be sent to the Project Director, KEIIP including those received in the KMC/KEIIP website for redressal The Grievance Officer will resolve simple unresolved issues and in case of complicated issues, consult/seek the assistance of the Environment/Social Specialist of the DSC/PMU. Grievances not redressed through this process within one month of registration will be brought to the notice of the Project Director, KEIIP. Action taken in respect of all complains will be communicated to the complainant by letter, over phone or e-mail or whatsapp as the case may be.

194. Periodic community meetings with affected communities to understand their concerns and help them through the process of grievance redress (including translation from local dialect/language, recording and registering grievances of non-literate affected persons and explaining the process of grievance redress) will be conducted if required. The above Grievance Redress Process will be discussed with the stakeholders at the proposed disclosure workshop.

195. Grievance Redressal Committee (GRC): An apex GRC has already been constituted by the Project Director to address grievances pertaining to broader concerns related to the program/subproject. **Appendix 12** shows office order related to set up of GRC.

196. **Consultation Arrangements**. This will include group meetings and discussions with affected persons, to be announced in advance and conducted at the time of day agreed on with affected persons and conducted to address general/common grievances; and if required with the Environment/Social Specialist of PMU/DSC for one-to-one consultations. Non-literate affected persons/ vulnerable affected persons will be assisted to understand the grievance redress process, to register complaints and with follow-up actions at different stages in the process.

197. **Record-keeping**. Records will be kept by PMU/Borough Office/Contractors' site office of all grievances received including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions and the date these were in effect, and final outcome.

198. **Information Dissemination Methods of the GRM**. Grievances received and responses provided will be documented and reported back to the affected persons. (**Appendix 13** -Sample Grievance Registration Form). The number of grievances recorded and resolved and the outcomes will be displayed/disclosed in the offices of the different Boroughs of KMC and web. The phone number where grievances are to be recorded will be prominently displayed at the construction sites.

199. Periodic Review and Documentation of Lessons Learned. PMU will periodically review the functioning of the GRM and effectiveness of the mechanism, especially on the Project's ability to prevent and address grievances.

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

201. **Figure 11** shows GRM flow chart.

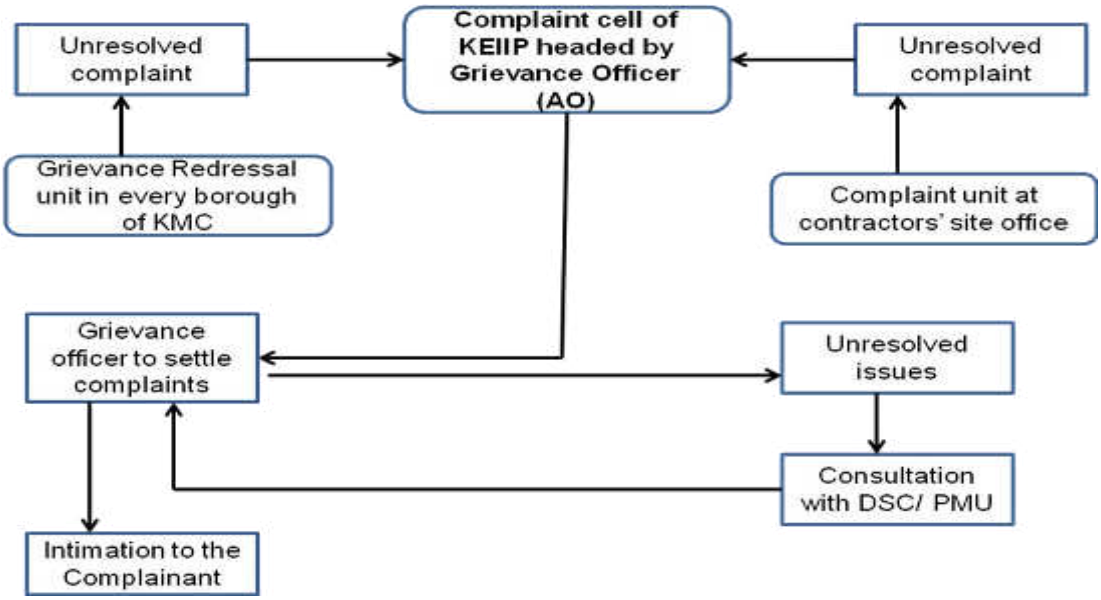


Figure 11: GRM system in KEIIP

VIII. ENVIRONMENTAL MANAGEMENT PLAN

202. The EMP will guide the environmentally-sound construction of the subproject and ensure efficient lines of communication between the PMU, DSC, and the contractors. The EMP identifies activities according to the following three phases of development: (i) Site Establishment and Preliminary Activities (Pre construction Phase); (ii) Construction Phase; and (iii) Post Construction/Operational Phase.

203. The purpose of the EMP is to ensure that the activities are undertaken in a responsible non-detrimental manner with the objectives of: (i) provide a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on site; (ii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iii) detail specific actions deemed necessary to assist in mitigating the environmental impact of the subproject; and (iv) ensure that safety recommendations are complied with. The contractor will be required to submit to PMU for review and approval site environmental plan (SEP) including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following **Tables 24 to 28** of the EMP to ensure no significant environmental impacts; (iii) monitoring program as per SEP; and (iv) budget for SEP implementation. No physical works are allowed to commence prior to approval of SEP.

204. A copy of the EMP/ approved SEP must 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. It shall be noted that the Supreme Court of India[9] mandates those responsible for environmental damage must pay the repair costs both to the environment and human health and the preventative

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

measures to reduce or prevent further pollution and/or environmental damage. (The polluter pays principle).

205. The Contractor is deemed not to have complied with the EMP/approved SEP if:

(i). Within the boundaries of the site, site extensions and haul/ access roads there is evidence of contravention of clauses.

(ii). If environmental damage ensues due to negligence.

(iii). The contractor fails to comply with corrective or other instructions issued by the PMU/DSC within a specified time.

(iv). The Contractor fails to respond adequately to complaints from the public.

A. Institutional Arrangement

206. The institutional arrangement will follow KEIIP's organizational structure and functions (**Figure 12**). The subproject will be implemented and monitored by the Project Management Unit (PMU). The KEIIP's PMU Environment Specialist is overall in-charge on Environmental safeguard of the program. The responsibilities of the Environmental Specialist will ensure that (i) environmental safeguard issues are addressed; (ii) EMP/approved SEP is implemented; (iii) physical and non-physical activities under the subproject are monitored; and (iv) monitoring reports are prepared on time and submitted to ADB.

207. PMU will be supported by the Design and Supervision Consultants (DSC). An Environment Specialist engaged to ensure: (i) EMP/ approved SEP is implemented; (ii) surveys and measurements are undertaken; (iii) inspections and observations throughout the construction period are recorded to ensure that safeguards and mitigation measures are provided as intended; and (iv) statutory clearances and permits from government agencies/other entities are obtained prior to start of civil works.

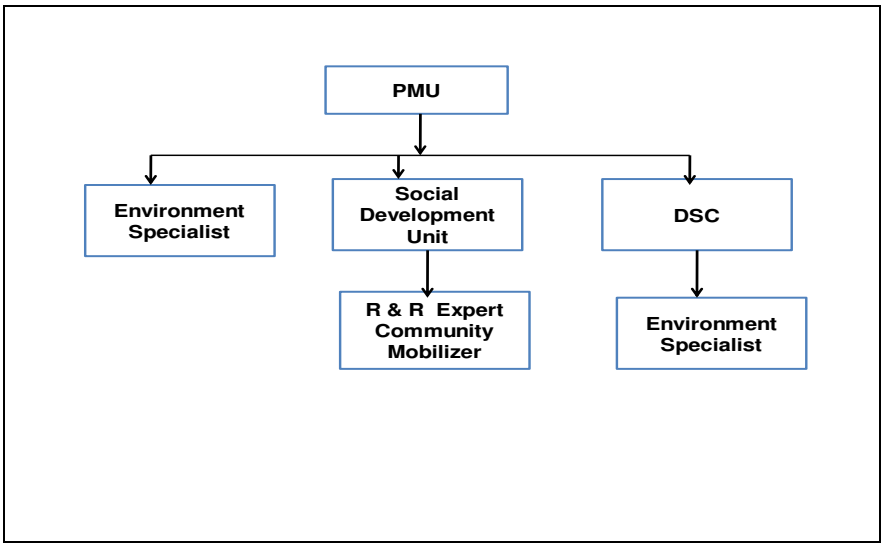


Figure 12: Institutional Arrangement – Safeguards

Notes: PMU = Project Management Unit; DSC = Design and Supervision Consultants; R & R = Relocation and Rehabilitation

208. **Table 23** gives the institutional roles and responsibilities in all phases of the subproject.

Table 23: Institutional Roles and Responsibilities: Environmental Safeguard

Phase	PMU	DSC	ADB
Subproject identification stage		• DSC to screen subprojects with inputs based on the EARF subproject selection guidelines	
Subproject appraisal stage	• PMU to review the REA checklists and draft IEE. • PMU to disclose on its website the approved IEE. • PMU to ensure disclosure of information throughout the duration of the subproject.	• DSC to conduct REA for each subproject using checklists and to prepare IEE	• ADB to review the REA checklists and reconfirm the categorization. • ADB will review and approve EIA reports (Category A) and IEE reports (Category B) subprojects. • ADB to disclose on its website the submitted EIA/IEE report.
Detailed Design Phase	• PMU with the assistance of DSC to incorporate the EMP, environmental mitigation and monitoring measures into contract documents.	• DSC to revise the IEE and EMP in accordance with detailed design changes if warranted. • DSC to ensure incorporation of EMP in bid documents and contracts. • DSC to prepare inventory of utilities to be affected by the subproject. • DSC to conduct baseline environmental conditions and inventory of affected trees	• ADB will review and approve updated EIA reports (Category A) and IEE reports (Category B) subprojects. • ADB to disclose on its website updated EIA/IEE report.
Pre-construction Phase	• DSC to conduct public consultation and disclosure during IEE process and comments will be reflected in the IEE report. • PMU to monitor the disclosure and public consultation. • PMU and DSC to approve contractor's proposed locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes	• DSC to ensure statutory clearances and permits from government agencies/other entities are obtained prior to start of civil works. • DSC to consult affected people and ensure RP is implemented prior to start of civil works. • DSC to ensure disclosure of information prior to start of civil works and throughout the duration of the construction period. • DSC to approve contractor's site-specific environmental plan (such as traffic management plan, waste management plan, locations for camp sites, storage areas, lay down areas, and other sites/plans specified in the EMP).	

Phase	PMU	DSC	ADB
Construction Phase	• PMU will review 6-monthly monitoring and EMP implementation report including the status of Project compliance with statutory clearances and with relevant loan covenants and submit the 6-monthly report to ADB and seek permission to disclose the same in the Project web site.	• DSC to monitor the implementation of mitigation measures by Contractor. • DSC to prepare monthly progress reports including a section on implementation of the mitigation measures (application of EMP and monitoring plan) • DSC (as per EMP) will conduct environmental quality monitoring during construction stage (ambient air and noise, and water quality). • DSC to prepare the 6 monthly (semi-annual) monitoring report on environment by focusing on the progress in implementation of the EMP and issues encountered and measures adopted, follow-up actions required, if any.	ADB to review the 6 monthly report, provide necessary advice if needed to the PMU and approve the same. • ADB to disclose on its website environmental monitoring reports.
Pre-operation Phase (Commissioning and Defect Liability Period)	PMU to review monitoring report of DSC on post-construction activities by the contractors as specified in the EMP	• DSC to monitor post-construction activities by the contractors as specified in the EMP.	
Operation Phase	• KMC to conduct monitoring, as specified in the environmental monitoring plan. • WBPCB to monitor the compliance of the standards regarding drinking water quality, ground water, ambient air, effluent quality from treatment plant, as applicable.		

Notes: WBPCB = West Bengal State Pollution Control Board, KMC = Kolkata Municipal Corporation, CTE = Consent to Establish, CTO = Consent to Operate, DSC = Design and Supervision Consultant, EIA = Environmental Impact Assessment, EMP = Environmental Management Plan, IEE = Initial Environmental Examination, PMU = Project Management Unit; REA = Rapid Environmental Assessment,

209. The Contractor will be required to:

(i). Submit Site environmental plan (SEP) covering proposed sites / locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes

(ii). Comply with all applicable legislation, is conversant with the requirements of the EMP/ approved SEP;

(iii). Brief his staff, employees, and laborer about the requirements of the EMP/ approved SEP;

(iv). Ensure any sub-contractors/ suppliers who are utilized within the context of the contract comply with the environmental requirements of the EMP/

approved SEP. The Contractor will be held responsible for non-compliance on their behalf;

(v). Supply method statements for all activities requiring special attention as specified and/or requested by the DSC Environment Specialist during the duration of the Contract;

(vi). Provide environmental awareness training to staff, employees, and laborers;

(vii). Bear the costs of any damages/compensation resulting from non-adherence to the EMP/ approved SEP or written site instructions;

(viii). Conduct all activities in a manner that minimizes disturbance to directly affected residents and the public in general, and foreseeable impacts on the environment.

(ix). Ensure that the PMU Environment Specialist is timely informed of any foreseeable activities that will require input from the DSC Environment Specialist.

B. Environmental Management and Mitigation Measures

210. **Table 24** outlines the site establishment and preliminary activities.

Table 24: Site Establishment and Preliminary Activities (to be revised by contractors during preparation of SEP)

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
1.	Legislation, Permits and Agreements	In all instances, KMC, service providers, contractors and consultants must remain in compliance with relevant local and national legislation.	PMU and DSC	Prior to moving onto site and during construction
		DSC to obtain statutory clearances and permits from government agencies/other entities	PMU	Prior to start of civil works
		Contractor to submit proof of compliance to Air Act (in relation to hot mixing, stone crushers, diesel generators)	DSC Environment Specialist	Prior to moving onto site and during construction
		A copy of the EMP/approved SEP must be kept on site during the construction period	PMU Environment Specialist and DSC Environment Specialist	At all times
2.	Access to Site	Access to site will be via existing roads. The Contractor will need to ascertain the existing condition of the roads and repair damage shall not occur due to construction. For accessing reservoir sites within SSE STP haul road to be constructed	DSC Environment Specialist	Prior to moving onto site and during construction
		The Local Traffic Department shall be involved in the planning stages of the road closure and detour and available on site in the monitoring of traffic in the early stages of the operations during road closure	DSC Environment Specialist	Prior to moving onto site
		The Local Traffic Department must be informed at least a week in advance if the traffic in the area will be affected.	DSC Environment Specialist	Prior to moving onto site
		The location of all affected services and servitudes must be identified and confirmed.	DSC Environment Specialist	Prior to moving onto site

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		All roads for construction access must be planned and approved ahead of construction activities. They shall not be created on an ad-hoc basis.	PMU Environment Specialist and DSC Environment Specialist	Prior to moving onto site and during construction.
		No trees/shrubs/groundcover may be removed or vegetation stripped without the prior permission.	PMU Environment Specialist and DSC Environment Specialist	Before and during construction.
		Contractors shall construct formal drainage on all temporary haulage roads in the form of side drains and miter drains to prevent erosion and point source discharge of run-off.	DSC Environment Specialist	Prior to moving onto site.
3.	Setting up of Construction Camp[10]	Choice of site for the contractor's camp requires the DSC Environment Specialist's permission and must take into account location of local residents, businesses and existing land uses, including flood zones and slip / unstable zones. A site plan must be submitted to the DSC Environment Specialist for approval.	DSC Environment Specialist and PMU Environment Specialist	During surveys and preliminary investigations and prior to moving onto the site
		If the Contractor chooses to locate the camp site on private land, he must get prior permission from both the DSC Environment Specialist and the landowner.	PMU Environment Specialist and DSC Environment Specialist	During site establishment and ongoing – weekly inspections
		In most cases, on-site accommodation will not be required. The construction camp can thus be comprised of: • site office • toilet facilities • designated first aid area • eating areas • staff lockers and showers (where water and waterborne sewers are available) • storage areas • batching plant (if required) • re-fuelling areas (if required) • maintenance areas (if required) • crushers (if required)	DSC Environment Specialist	During set-up
		Cut and fill must be avoided where possible during the set up of the construction camp.	DSC Environment Specialist	During site set-up
		The contractor shall make adequate provision for temporary toilets for the use of their employees during the construction phase. Such facilities, which shall comply with local authority regulations, shall be maintained in a clean and hygienic condition. Their use shall be strictly enforced.	DSC Environment Specialist	During site establishment and ongoing – weekly inspections
		Under no circumstances may open	DSC Environment	Ongoing

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

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		areas or the surrounding bush be used as a toilet facility.	Specialist	
		Bins and/or skips shall be provided at convenient intervals for disposal of waste within the construction camp.	DSC Environment Specialist	During site set-up and ongoing
		Bins shall have liner bags for efficient control and safe disposal of waste	DSC Environment Specialist	Ongoing
		Recycling and the provision of separate waste receptacles for different types of waste shall be encouraged.	DSC Environment Specialist	During site set-up and ongoing
4.	Establishing Equipment Lay-down and Storage Area[11]	Choice of location for equipment lay-down and storage areas must take into account prevailing winds, distances to adjacent land uses, general on – site topography and water erosion potential of the soil. Impervious surfaces must be provided where necessary	PMU Environment Specialist and DSC Environment Specialist	During site set-up
		Storage areas shall be secure so as to minimize the risk of crime. They shall also be safe from access by children	DSC Environment Specialist	During site set-up
		It is very important that the proximity of resident is taken into account when deciding on storage areas for hazardous substances or materials. Residents living adjacent to the construction site must be notified of the existence of the hazardous storage are	PMU Environment Specialist and DSC Environment Specialist	During site set-up
		Equipment lay-down and storage areas must be designated, demarcated and fenced if necessary.	DSC Environment Specialist	During site set-up
		Fire prevention facilities must be present at all storage facilities	DSC Environment Specialist	During site set-up
		Proper storage facilities for the storage of oils, paints, grease, fuels, chemicals and any hazardous materials to be used must be provided to prevent the migration of spillage into the ground and groundwater regime around the temporary storage area(s). These pollution prevention measures for storage shall include a bund wall high enough to contain at least 110% of any stored volume. The contractor shall submit a method statement for approval	DSC Environment Specialist	During site set-up and ongoing
		These storage facilities (including any tanks) must be on an impermeable surface that is protected from the ingress of storm water from surrounding areas in order to ensure that accidental spillage does not pollute local soil or water resources	DSC Environment Specialist	During site set-up and ongoing
		Fuel tanks must meet relevant specifications and be elevated so that leaks may be easily detected.	DSC Environment Specialist	During site setup and monitored
		Material Safety Data Sheets (MSDSs)	DSC Environment	Ongoing

[11] Storage areas can be hazardous, unsightly and can cause environmental pollution if not designed and managed carefully

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		shall be readily available on site for all chemicals and hazardous substances to be used on site.	Specialist and Contractor	
		Staff dealing with these materials/substances must be aware of their potential impacts and follow the appropriate safety measures.	DSC Environment Specialist and Contractor	Ongoing
		Contractors shall submit a method statement and plans for the storage of hazardous materials and emergency procedures.	DSC Environment Specialist	Prior to establishment of storage area
5.	Materials Management – Sourcing[12]	Contractors shall prepare a source statement indicating the sources of all materials (including sands, natural gravels, crushed stone, asphalt, clay liners etc), and submit these to the DSC Environment Specialist for approval prior to commencement of any work.	PMU Environment Specialist and DSC Environment Specialist	On award of contract
		Where possible, a signed document from the supplier of natural materials shall be obtained confirming that they have been obtained in a sustainable manner and in compliance with relevant legislation	PMU Environment Specialist and DSC Environment Specialist	On receipt of natural materials
		Where materials are borrowed (mined), proof must be provided of authorization to utilize these materials from the landowner/material rights owner and the Department of Minerals	DSC Environment Specialist	On receipt of borrowed (mined) materials
6.	Education of site staff on general and Environmental Conduct[13]	Ensure that all site personnel have a basic level of environmental awareness training	PMU Environment Specialist, DSC Environment Specialist and Contractor	During staff induction and ongoing
		Staff operating equipment (such as excavators, loaders, etc.) shall be adequately trained and sensitized to any potential hazards associated with their task	DSC Environment Specialist and Contractor	During staff induction, followed by ongoing monitoring
		No operator shall be permitted to operate critical items of mechanical equipment without having been trained by the Contractor and certified competent by DSC	DSC Environment Specialist and Contractor	During staff induction, followed by ongoing monitoring
		All employees must undergo safety training and wear the necessary protective clothing	DSC Environment Specialist and Contractor	During staff induction, followed by ongoing monitoring
		A general regard for the social and ecological well-being of the site and adjacent areas is expected of the site staff. Workers need to be made aware of the following general rules: • No alcohol / drugs to be present on	DSC Environment Specialist and Contractor	During staff induction, followed by ongoing monitoring

[12] Materials must be sourced in a legal and sustainable way to prevent offsite environmental degradation.
[13] These points need to be made clear to all staff on site before the subproject begin.

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		site; • Prevent excessive noise • Construction staff are to make use of the facilities provided for them, as opposed to ad-hoc alternatives (e.g. fires for cooking, the use of surrounding bus as a toilet facility are forbidden) • No fires to be permitted on site • Trespassing on private / commercial properties adjoining the site is forbidden • Other than pre-approved security staff, no workers shall be permitted to live on the construction site • No worker may be forced to do work that is potentially dangerous or for what he / she is not trained to do		
6.	Social Impacts[14]	Open liaison channels shall be established between the site owner, the developer, operator, the contractors and interested and affected people such that any queries, complaints or suggestions can be dealt with quickly and by the appropriate person(s).	PMU Environment Coordinator and DSC Environment Specialist	Prior to moving onto site and ongoing
		A communications strategy is of vital importance in terms of accommodating traffic during road closure. The road closure together with the proposed detour needs to be communicated via advertising, pamphlets, radio broadcasts, road signage, etc	PMU Environment Coordinator	Prior to moving onto site and ongoing
		Advance road signage indicating the road detour and alternative routes. Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.	PMU Environment Specialist	Prior to moving onto site and ongoing
		Storage facilities, elevated tanks and other temporary structures on site shall be located such that they have as little visual impact on local residents as possible.	DSC Environment Specialist and PMU Environment Specialist	During surveys and preliminary investigations and site set-up.
		In areas where the visual environment is particularly important or privacy concerns for surrounding buildings exist, the site may require screening. This could be in the form of shade cloth, temporary walls, or other suitable materials prior to the beginning of construction.	DSC Environment Specialist and PMU Environment Specialist	During surveys and preliminary investigations and site set-up.
7.	Noise Impacts	Construction vehicles/ equipments are be to fitted with standard silencers prior	DSC Environment Specialist and	During site set-up

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

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		to the beginning of construction	PMU Environment Specialist	
		Equipment that is fitted with noise reduction facilities (e.g. side flaps, silencers, etc) will be used as per operating instructions and maintained properly during site operations	DSC Environment Specialist and PMU Environment Specialist	During site set-up
8.	Dust/Air Pollution[15]	Vehicles travelling along the access roads must adhere to speed limits to avoid creating excessive dust.	PMU Environment Specialist	Ongoing.
		Camp construction / haulage road construction – areas that have been stripped of vegetation must be dampened periodically to avoid excessive dust.	PMU Environment Specialist	Ongoing – more frequently during dry and windy conditions
		The Contractor must make alternative arrangements (other than fires) for cooking and / or heating requirements. LPG gas cookers may be used provided that all safety regulations are followed.	DSC Environment Specialist	Ongoing.
9.	Soil Erosion	The time that stripped areas are left open to exposure shall be minimized wherever possible. Care shall be taken to ensure that lead times are not excessive.	DSC Environment Specialist and PMU Environment Specialist	Throughout the duration of the subproject.
		Wind screening and storm water control shall be undertaken to prevent soil loss from the site.	DSC Environment Specialist and PMU Environment Specialist	During site set-up
10.	Storm water[16]	To prevent storm water damage, the increase in storm water run-off resulting from construction activities must be estimated and the drainage system assessed accordingly. A drainage plan must be submitted to the DSC Environment Specialist for approval and must include the location and design criteria of any temporary stream crossings (siting and return period etc).	DSC Environment Specialist	During surveys and preliminary Investigations.
		During site establishment, storm water culverts and drains are to be located and covered with metal grids to prevent blockages if deemed necessary by the DSC Environment Specialist. (e.g. due to demolition work).	DSC Environment Specialist	During site setup.
		Temporary cut off drains and berms may be required to capture storm water and promote infiltration.	PMU Environment Specialist	During site setup.
11.	Water Quality[17].	Storage areas that contain hazardous substances must be bunded with an approved impermeable liner	DSC Environment Specialist	During site setup.
		Spills in bunded areas must be cleaned	DSC Environment	During site

[15] Establishment of the camp site, and related temporary works can reduce air quality.

[16] Serious financial and environmental impacts can be caused by unmanaged stormwater.

[17] Incorrect disposal of substances and materials and polluted run-off can have serious negative effects on groundwater quality

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		up, removed and disposed of safely from the bunded area as soon after detection as possible to minimise pollution risk and reduced bunding capacity.	Specialist and PMU Environment Specialist	setup.
		Provision shall be made during set up for all polluted runoff to be treated to the DSC Environment Specialist's approval before being discharged into the storm water system. (This will be required for the duration of the project.)	DSC Environment Specialist and PMU Environment Specialist	During site setup and to be monitored weekly
12.	Conservation of the Natural Environment[18]	No vegetation will be cleared without prior permission from the DSC Environment Specialist.	DSC Environment Specialist and PMU Environment Specialist	During site setup and ongoing.
		Trees that are not to be cleared shall be marked beforehand with danger tape. The PMU Environment Specialist must be given a chance to mark vegetation that is to be conserved before the Contractor begins clearing the site	DSC Environment Specialist and PMU Environment Specialist	During site set-up
		Care must be taken to avoid the introduction of alien plant species to the site and surrounding areas. (Particular attention must be paid to imported material)	PMU Environment Specialist	Ongoing in camp Site, haulage Areas
13.	Set-up of Waste Management Procedure	The excavation and use of rubbish pits on site is forbidden	PMU Environment Specialist	Ongoing
		Burning of waste is forbidden.	PMU Environment Specialist	Ongoing
14.	Cultural Environment	Prior to the commencement of construction, all staff need to know what possible archaeological or historical objects of value may look like, and to notify the DSC Environment Specialist/Contractor shall such an item be uncovered.	PMU Environment Specialist	During site set-up and ongoing.
15.	Security and Safety	Lighting on site is to be set out to provide maximum security and to enable easier policing of the site, without creating a visual nuisance to local residents or businesses.	DSC Environment Specialist	During site set-up
		Material stockpiles or stacks must be stable and well secured to avoid collapse and possible injury to site workers / local residents.	PMU Environment Specialist	Ongoing
		Flammable materials shall be stored as far as possible from adjacent residents / businesses.	PMU Environment Specialist	Ongoing
		All interested and affected persons shall be notified in advance of any known potential risks associated with the construction site and the activities on it.	PMU Environment Specialist and DSC Environment	24 hours prior to activity in question

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

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		Examples are: • stringing of power lines • excavation • earthworks/earthmoving machinery on beside houses/infrastructure/sensitive receptors • risk to residences/sensitive receptors along haulage roads / access routes		

211. **Table 25** outlines management of construction activities and workforce.

Table 25: Management of Construction and Workforce Activities (to be revised by contractors during preparation of SEP)

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
1.	Access to Site	Contractor shall ensure that all side and miter drains and scour check walls on access and haul roads are functioning properly and are well maintained.	DSC Environment Specialist	Weekly and after heavy rains.
		Contractor shall ensure that access roads are maintained in good condition by attending to potholes, corrugations and storm water damage as soon as these develop.	DSC Environment Specialist	Weekly inspection.
		If necessary, contractor to employ a staff to clean surface roads adjacent to construction sites where materials have been spilt.	DSC Environment Specialist	When necessary
		Contractor to avoid unnecessary compaction of soils by heavy vehicles.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to restrict construction vehicles to demarcated access, haulage routes and turning areas.	DSC Environment Specialist	Ongoing monitoring.
2.	Maintenance of Construction Camp	Contractor to monitor and manage drainage of the camp site to avoid standing water and soil erosion.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to ensure run-off from the camp site must not discharge into neighbors' properties.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to maintain toilets in a clean state and shall be moved to ensure that they adequately service the work areas	DSC Environment Specialist	Weekly inspection
		Contractor to ensure that open areas or the surrounding bush are not being used as a toilet facility.	DSC Environment Specialist	Weekly inspection
		Contractor to ensure all litter is collected from the work and camp areas daily.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to empty bins and/or skips regularly, dispose wastes at the pre-approved sites, keep all disposal waybills for review.	DSC Environment Specialist	Weekly inspection
		Contractor to ensure eating areas are regularly serviced and cleaned to the highest possible standards of hygiene and cleanliness.	DSC Environment Specialist	Ongoing monitoring.

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		Contractor to ensure that his camp and working areas are kept clean and tidy at all times.	DSC Environment Specialist	Weekly monitoring
3.	Staff Conduct	Contractor to monitor performance of construction workers, ensure points relayed during their induction have been properly understood and are being followed. If necessary, the DSC Environment Specialist and/or a translator shall be called to the site to further explain aspects of environmental or social behavior that are unclear.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to ensure rules that are explained in the worker conduct section,[19] must be followed at all times	DSC Environment Specialist	Ongoing monitoring.
4.	Dust and Air Pollution[20]	Contractor to ensure vehicles travelling to and from the construction site adhere to speed limits so as to avoid producing excessive dust.	DSC Environment Specialist	Ongoing monitoring.
		A speed limit of 30km/hr must be adhered to on all dirt roads.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to dampen access and other cleared surfaces whenever possible and especially in dry and windy conditions to avoid excessive dust.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to keep vehicles and machinery in good working order and meet manufacturers specifications for safety, fuel consumption etc.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to check and repair equipment as soon as possible if excessive emissions are observed.	DSC Environment Specialist	As directed by the DSC Environment Specialist.
		No fires are allowed on site except for the burning of firebreaks.	DSC Environment Specialist	Ongoing monitoring.
		Undertake monitoring of air pollution levels in potential problem areas	DSC Environment Specialist	Ongoing monitoring.
		Cover stockpiles of soil or apply suitable dust palliative such as water or commercial dust suppressants.	DSC Environment Specialist	Ongoing monitoring.
5.	Soil Erosion	Once an area has been cleared of vegetation, the top layer (nominally 150mm) of soil shall be removed and contractor to stockpile in the designated area.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to ensure storm water control and wind screening to prevent soil loss from the site.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to dispose unusable soils and spoils to pre-approved disposal sites. Volume will be estimated during detail	DSC Environment Specialist	Ongoing monitoring.

[19] (i) no alcohol / drugs to be present on site; (ii) prevent excessive noise; (iii) construction staff are to make use of the facilities provided for them, as opposed to ad-hoc alternatives (e.g. fires for cooking, the use of surrounding bus as a toilet facility are forbidden); (iv) no fires to be permitted on site; (v) trespassing on private / commercial properties adjoining the site is forbidden; (vi) other than pre-approved security staff, no workers shall be permitted to live on the construction site; (vii) no worker may be forced to do work that is potentially dangerous or for what he / she is not trained to do

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

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		design		
6	Noise & vibration	Locate concrete batching, lay down areas and construction camps away from residential houses.	DSC Environment Specialist	Ongoing monitoring.
		Restrict construction activities to reasonable working hours	DSC Environment Specialist	Ongoing monitoring.
		Keep adjacent landowners informed of unusually noisy activities planned	DSC Environment Specialist	Ongoing monitoring.
		Regulate roadworthiness of vehicles.	DSC Environment Specialist	Ongoing monitoring.
		Ensure that machinery in a good state of maintenance.	DSC Environment Specialist	Ongoing monitoring.
		Monitor noise levels in potential problem areas.	DSC Environment Specialist	Ongoing monitoring.
7	Storm water drainage and hydrology	Contractor to dispose earth, stones, and rubbles and prevent obstruction of natural water pathway, i.e.: these materials must not be placed in storm water channels, drainage lines or ponds	PMU Environment Specialist and DSC Environment Specialist	Monitoring throughout the duration of the subproject.
		The site surface has been engineered and shaped in such a way that rapid and efficient evacuation of runoff is achieved	DSC Environment Specialist	Ongoing monitoring.
		Provide containment areas for potential pollutants at construction camps, refueling, depots and concrete batching plants.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to check periodically sites' drainage system to ensure that the water flow is unobstructed.	DSC Environment Specialist	Monthly inspection.
		Contractor to control un-channeled flows. Where large areas of soil are left exposed, rows of straw/ hay or bundles of cut vegetation shall be dug into the soil in contours to slow surface wash and capture eroded soil.	DSC Environment Specialist	As surfaces become exposed.
		Control and manage transport, storage, handling and disposal of hazardous substances.	DSC Environment Specialist	Ongoing monitoring.
8	Water Quality[21]	Contractor to ensure mixing/decanting of all chemicals and hazardous substances take place either on a tray or on an impermeable surface and dispose waste from these to pre-approved disposal sites.	DSC Environment Specialist	Regular monitoring (refer to the environmental monitoring program)
		Contractor to ensure every effort is made that any chemicals or hazardous substances do not contaminate the soil	DSC Environment Specialist	Regular monitoring (refer to the environmental monitoring program)
		Contractor to prohibit site staff in using any stream, other open water body or natural water source adjacent to or within the designated site for the purposes of bathing, washing of clothing or for any construction or related activities. Municipal water (or another source approved by the DSC	DSC Environment Specialist	Regular monitoring (refer to the environmental monitoring program)

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

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		Environment Specialist) shall instead be used for all activities such as washing of equipment or disposal of any type of waste, dust suppression, concrete mixing, compacting etc.		
		Contractor shall refer to emergency contact numbers of WBPCB in order to deal with spillages and contamination of aquatic environments.	PMU Environment Specialist and DSC Environment Specialist	As necessary
9	Conservation of Natural Environment	Contractor is to check vegetation clearing and tree-felling have prior permission as the work front progresses.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to ensure only trees that have been marked beforehand are to be removed.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to prohibit site staff from gathering firewood, fruits, plants, crops or any other natural material on-site or in areas adjacent to the sites.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to immediately re-vegetate stripped areas and remove aliens species by weeding. This significantly reduces the amount of time and money that must be spent on alien plant management during rehabilitation.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to ensure, where possible, cleared indigenous vegetation is kept in a nursery for use at a later stage (such as site rehabilitation process).	DSC Environment Specialist	As the work front progresses.
10.	Materials Management	Contractor to ensure stockpiles do not obstruct natural water pathways.	DSC Environment Specialist.	As necessary.
		Contractor to ensure stockpiles do not exceed 2m in height unless otherwise permitted by the DSC Environment Specialist.	DSC Environment Specialist	As necessary.
		Contractor to cover stockpiles exposed to windy conditions or heavy rain with vegetation, cloth, or tarps.	DSC Environment Specialist	As necessary.
		Contractor to ensure stockpiles are kept clear of weeds and alien vegetation growth by regular weeding	DSC Environment Specialist	Monthly monitoring
		Contractor to ensure all concrete mixing take place on a designated, impermeable surface.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to ensure vehicles transporting concrete to the site are not washed on-site.	Contractor	Ongoing monitoring.
		Contractor to prohibit mixing of lime and other powders during excessively windy conditions.	DSC Environment Specialist	As necessary
		Contractor to store all substances required for vehicle maintenance and repair in sealed containers until they can be disposed of/removed from the sites.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to ensure hazardous substances/materials are transported in sealed containers or bags	DSC Environment Specialist	Ongoing monitoring
11	Land uses	KMC has consulted with various	DSC Environment	Ongoing

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		organizations, departments, etc within the area and will be continued during the construction phase.	Specialist	monitoring.
		Consult with local departments, organizations, etc regarding location of construction camps, access and hauling routes, and other likely disturbances during construction.	DSC Environment Specialist	Ongoing monitoring.
		Make use of local labor, materials, goods and services as far as possible	DSC Environment Specialist	Ongoing monitoring.
		Provide sign boards for locality nearby to inform nature and duration of construction works and contact numbers for concerns/complaints.	DSC Environment Specialist	Ongoing monitoring.
12	Waste Management	Contractor to place refuse in designated skips/bins, rubbles in demarcated areas, remove from the site, and transport to the pre-approved disposal sites.	DSC Environment Specialist	Checked at each site meeting.
		Contractor to prohibit littering on-site and clear the site of litter at the end of each working day.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to encourage recycling by providing separate receptacles for different types of waste and make sure that staffs are aware of their uses.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to clean toilets regularly; and avoid contamination of soils, water, pollution and nuisance to adjoining areas.	DSC Environment Specialist	Weekly monitoring.
13	Health & safety	• Implement good housekeeping practices at the construction camp. • Strictly implement health and safety measures and audit on a regular basis. • Secure enclosed construction site. • Use reputable contractors. • Provide warning signs of hazardous working areas. • Clearly demarcate excavations and provide barriers (not just danger tape) to protect pedestrians from open trenches. • Thoroughly train workers assigned to dangerous equipment. • Workers have the right to refuse work in unsafe conditions. • Control speed and movement of construction vehicles • Exclude public from the site • Ensure all workers are provided with and use Personal Protective Equipment. • Ensure the visibility of workers through their use of high visibility vests when working at night • Ensure that qualified first-aid can be provided at all times. Ensure equipped first-aid stations are easily accessible throughout the site;	DSC Environment Specialist	Weekly monitoring.

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		• Provide medical insurance coverage for workers. • Provide clean eating areas where workers are not exposed to hazardous or noxious substances; • 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; • 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. • Health and Safety Plan is attached as **Appendix 9**		
14.	Social Impacts[22]	Contractor to restrict activities and movement of staff to designated construction areas.	DSC Environment Specialist	Ongoing.
		Contractor to assist in locating DSC Environment Specialist and/or PMU Environment Specialist in the event a construction staff is approached by members of the public or other stakeholders.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to ensure conduct of construction staff, when dealing with the public or other stakeholders, shall be in a manner that is polite and courteous at all times. Failure to adhere to this requirement may result in the removal of staff from the site.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to ensure disruption of access for local residents is minimized and approved by the DSC Environment Specialist.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to provide walkways and metal sheets where required to maintain access across for people and vehicles.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to consult businesses and institutions regarding operating hours and factoring this in work schedules.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to provide sign boards for pedestrians to inform nature and duration of	DSC Environment Specialist	At least 1 week prior to the activity

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

Sr. No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		construction works and contact numbers for concerns/complaints.		taking place.
		Contractors to ensure lighting on the construction site is be pointed downwards and away from oncoming traffic and nearby houses.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to ensure machinery and vehicles are in good working order to minimize noise nuisance.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to restrict noisy activities to the daytime.	DSC Environment Specialist	Ongoing monitoring.
		A complaints register (refer to the Grievance Redress Mechanism) shall be housed at the site office. This shall be in carbon copy format, with numbered pages. Any missing pages must be accounted for by the Contractor. This register is to be tabled during monthly site meetings.	DSC Environment Specialist	Monthly monitoring.
		Interested and affected people' need to be made aware of the existence of the complaints book and the methods of communication available to them.	PMU Environment Specialist and DSC Environment Specialist	Ongoing monitoring.
		Contractor to initially handle and document queries and complaints; submit these for inclusion in complaints register; bring issues to DSC Environment Specialist's attention immediately; and take remedial action as per DSC Environment Specialist's instruction	PMU Environment Specialist and DSC Environment Specialist	As necessary.
		Contractor to assign staff for formal consultation with the interested and affected people in order to explain and answer questions on the construction process.	DSC Environment Specialist	Ongoing monitoring.
15.	Archaeological and Cultural Characteristics	Contractor to note possible items of historical or archaeological value include old stone foundations, tools, clayware, jewellery, remains, fossils etc. If something of this nature be uncovered, contractor to stop work immediately and notify the DSC Environment Specialist which in turn inform the PMU and coordinate with ASI or State Department of Archaeology.	DSC Environment Specialist	As required.

Table 26: Site Specific EMP for Water supply package

Work Component	Environment Management Measures
Construction of Underground reservoir,(UGR) pumping station (PS) and Elevated water storage reservoir (ESR) – at Prantik phase III	1. Excess earth is to be utilized in filling up of low lying areas promoting sound solid waste management practices. Ponds if present at or near site should not be filled up with construction solid waste 2. Local terrestrial ecology is to be preserved by not clear felling of trees if present. Scrubs are to be removed wherever absolutely required 3. Local water environment should not be degraded by discharging waste water indiscriminately. Nearby
Construction of UGR, PS and ESR at KMC land of Julpia road	
Construction of ESR – at 22 Bigha, WBSETCL near Joka Tram Depot, at SSE STP North west and North East,	

Work Component	Environment Management Measures
Ramkantapur, Malpara, Charaktala	canals and drains meant for carrying storm water will be used for discharge of waste water. No waste water should be discharged in ponds. 4. Extant ambient noise level is to be maintained at the current level by regulating noise generation from construction activity with activity planned during day time only 5. Pre-construction stage ambient air quality (especially dust concentration) is to be maintained at the current level by suitable dust control measures like periodic spraying of water at the dust generating sources. 6. Toilets of work camp sites should have adequate sanitary provisions so as not to pollute land and/or water environment
• Laying of Transmission Main from existing Daspara PS to UGRs at Pratik Ph III and KMC land of Julpia road; and Transmission Main from UGRs to 8 ESRs (6 proposed and 2 existing) • Transmission Main from UGR at KMC land of Julpia road to 3 ESRs	
• Laying of distribution system and house connection within the command area of 8 ESRs (6 proposed + 2 existing). • Distribution system and house connection within command area of 3 ESRs	
Construction of ESRs at Ramkantapur, Malpara, Charaktala; Laying of Transmission main from UGR at KMC land on Julpia Road to 3 ESRs; Laying of Distribution system and house connection within command area of 3 ESRs	
Dedicated Water Supply Transmission Main from Junction of James Long Sarani to Daspara near existing Pumping Station along James Long Sarani	
Water Loss Management in Anandapur area and Patuli area under Jai Hind WTP Area (Eastern Kolkata)	

212. **Table 27** outlines the post-construction activities.

Table 27: Post-Construction Activities (Defects Liability Period)- (to be revised by contractors before operation)

Sr. no.	Activities	Management/Mitigation	Responsible for Monitoring	Frequency
1.	Construction Camp	All structures comprising the construction camp are to be removed from site.	DSC Environment Specialist	Subproject completion
		The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint etc. and these shall be cleaned up.	DSC Environment Specialist	Subproject completion
		All hardened surfaces within the construction camp area shall be ripped, all imported materials removed, and the area shall be top-soiled and re-grassed using the guidelines set out in the re-vegetation specification that forms part of this document.	DSC Environment Specialist	Subproject completion

Sr. no.	Activities	Management/Mitigation	Responsible for Monitoring	Frequency
2.	Vegetation	All areas that have been disturbed by construction activities (including the construction camp area) must be cleared of alien vegetation.	DSC Environment Specialist	Subproject completion
		Open areas are to be re-planted as per the re-vegetation specification.	DSC Environment Specialist	Subproject completion
		All vegetation that has been cleared during construction is to be removed from site or used as much as per the re-vegetation specification, (except for seeding alien vegetation).	DSC Environment Specialist	Subproject completion
3.	Land Rehabilitation	All surfaces hardened due to construction activities are to be ripped and imported materials thereon removed.	Contractor	Subproject completion
		All rubble is to be removed from the site to an approved disposal site. Burying of rubble on site is prohibited.	Contractor	Subproject completion
		The site is to be cleared of all litter.	Contractor	Subproject completion
		Surfaces are to be checked for waste products from activities such as concreting or asphalting and cleared in a manner approved by the DSC Environment Specialist.	Contractor	Subproject completion
		The Contractor is to check that all watercourses are free from building rubble, spoil materials and waste materials.	Contractor	Subproject completion
4.	Materials and Infrastructure	Fences, barriers and demarcations associated with the construction phase are to be removed from the site unless stipulated otherwise by the DSC Environment Specialist.	DSC Environment Specialist	Subproject completion
		All residual stockpiles must be removed to spoil or spread on site as directed by the DSC Environment Specialist.	DSC Environment Specialist	Subproject completion
		All leftover building materials must be returned to the depot or removed from the site.	Contractor	Subproject completion
		The Contractor must repair any damage that the construction works has caused to neighboring properties.	Contractors	As directed by the DSC Environment Specialist.
5	General	A meeting is to be held on site between the DSC Environment Specialist, PMU Environment Specialist and the Contractor to approve all remediation activities and to ensure that the site has been restored to a condition approved by the DSC Environment Specialist.	DSC Environment Specialist and PMU Environment Specialist	On completion of the construction and maintenance phases
		Temporary roads must be closed and access across these blocked.	DSC Environment Specialist and PMU Environment Specialist	On completion of construction

Sr. no.	Activities	Management/Mitigation	Responsible for Monitoring	Frequency
		Access or haulage roads that were built must be rehabilitated	DSC Environment Specialist and Contractor	On completion of construction
		All areas where temporary services were installed are to be rehabilitated to the satisfaction of the DSC Environment Specialist	DSC Environment Specialist and Contractor	On completion of construction

Table 28: Operation and Maintenance Activities (covering defect liability period)

Sr. No.	Activities	Management/Mitigation	Responsible for Monitoring	Frequency
1.	Pollution monitoring	Monitor the environmental quality in terms of Pumps' discharge, ambient air and noise levels.	Contractor in association with Environmental Monitoring Laboratory of KMC	As necessary on regular basis
2.	Leaks detection and repairs	Conduct pipe repairs the soonest time possible to avoid disruption of service and disturbance to users/sensitive receptors.	KMC	As necessary.
3	Health & Safety	• Implement good housekeeping practices at pumping stations. • Strictly implement health and safety measures and audit on a regular basis. • Provide warning signs of hazardous working areas. • Clearly demarcate excavations and provide barriers (not just danger tape) to protect pedestrians from open trenches. • Thoroughly train workers assigned to dangerous equipment. • Workers have the right to refuse work in unsafe conditions. • Ensure all workers are provided with Personal Protective Equipment. • Ensure the visibility of workers through their use of high visibility vests when working at night • Ensure that qualified first-aid can be provided at all times. Ensure equipped first-aid stations are easily accessible throughout the site; • Provide medical insurance coverage for workers. • Provide clean eating areas where workers are not exposed to hazardous or noxious substances; • Ensure moving equipment is	Contractor KMC	As necessary on regular basis

Sr. No.	Activities	Management/Mitigation	Responsible for Monitoring	Frequency
		outfitted with audible back-up alarms; • Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate.		
4.	Works conduct	Ensure strict control of laborers Minimize working hours to normal working times Control littering	Contractor	On regular basis

C. Environmental Monitoring Program

213. **Table 29** outlines the environmental monitoring program to ensure implementation of the management and mitigation measures specified in the EMP. The table shall be read within the context of the body of the entire EMP.

Table 29: Environmental Monitoring Program

Aspect	Parameter	Standards	location	duration / frequency	Implementation	Supervision
1. Site establishment and preliminary activities						
Legislation, Permits and Agreements	CTE and CTO for the hot mix, stone crushers, and diesel generators)	Air (Prevention and Control of Pollution) Act of 1981, Rules of 1982 and amendments.	-	prior to moving onto site and during construction	Contractor	PMU / DSC
	Cutting Permit for Scheduled Trees – if any	West Bengal Trees (Protection and Conservation in Non-Forest Areas) Act, 2006	-	prior to moving onto site	DSC	PMU
	Copy of EMP	ADB SPS	subproject site, offices, website, library, etc.	At all times	Contractor	PMU/DSC
Access to site	Existing conditions New development	EMP	all access and haul roads	prior to moving onto site	DSC Environment Specialist	PMU
Construction camp	Approval of location and facilities	EMP	as identified	prior to moving onto site	Contractor with the DSC Environment Specialist and	PMU/DSC

Aspect	Parameter	Standards	location	duration / frequency	Implementation	Supervision
					PMU Environment Specialist	
Equipment Lay-down and Storage Area	Approval of location and facilities	EMP	as identified	prior to moving onto site and during site set-up	Contractor with the DSC Environment Specialist and PMU Environment Specialist	PMU/DSC
Materials management – sourcing	Approval of sources and suppliers	EMP	as identified	prior to procurement of materials	Contractor with the DSC Environment Specialist and PMU Environment Specialist	PMU/DSC
Education of site staff	Awareness Level Training - Environment - Health and Safety	EMP and records	-	during staff induction, followed by scheduled as determined	Contractor with the DSC Environment Specialist and PMU Environment Specialist	PMU/DSC
Social impacts	Public Consultations, Information Disclosure, Communication Strategy	EARF, ADB SPS and EMP	subproject site	prior to moving onto site and ongoing	Contractor with the DSC Environment Specialist, PMU Environment Specialist /DSC	Implementing Agency (KMC)
	GRM Register	EMP	subproject site	prior to moving onto site and ongoing	Contractor with the DSC Environment Specialist, PMU Environment Specialist, PMU/DSC	Implementing Agency (KMC)
Noise	Baseline Data for noise level in dB(A) L_{eq}	National Noise Standards	Two locations near construction sites as specified by the engineer	prior to site set-up	Contractor with the DSC Environment Specialist and PMU Environment Specialist	PMU/DSC
Air quality	Baseline ambient data for particulate matters 10 and 2.5 (PM_{10}, $PM_{2.5}$), sulfur dioxides (SO_2), nitrogen dioxide (NO_2), and hydrocarbons (HC)	National Ambient Air Quality Standards	Two locations near construction sites as specified by the engineer	prior to site set-up	Contractor with the DSC Environment Specialist and PMU Environment Specialist	PMU/DSC
Soil erosion	Soil erosion	EMP	as identified	during site	Contractor with	PMU/DSC

Aspect	Parameter	Standards	location	duration / frequency	Implementation	Supervision
	management measures		by the engineer	set-up and throughout the duration of the subproject	the DSC Environment Specialist and PMU Environment Specialist	
Storm water	Storm water management measures	EMP	as identified by the engineer	during site set-up and throughout the duration of the subproject	Contractor with the DSC Environment Specialist and PMU Environment Specialist	PMU/DSC
Water quality	Baseline qualitative characteristics-pond water	EMP	subproject sites[23]	prior to site set-up	Contractor with DSC Environment Specialist and PMU Environment Specialist	PMU/DSC
Conservation of Natural Environment	Existing conditions	EMP	subproject sites	prior to site set-up	Contractor with DSC Environment Specialist and PMU Environment Specialist	PMU/DSC
Waste management procedure	Disposal sites	EMP	as determined	prior to site set-up and ongoing throughout the subproject	Contractor with DSC Environment Specialist and PMU Environment Specialist	PMU/DSC
Cultural environment	Chance finds	ASI Act and EMP	as determined	prior to site set-up and ongoing throughout the subproject	Contractor with DSC Environment Specialist and PMU Environment Specialist	PMU/DSC
2. Construction phase						
Access to Site	Qualitative characteristics	Pre-subproject condition and EMP	all access and haul roads	refer to EMP table on management of construction and workforce activities	Contractor	DSC Environment Specialist
Construction camp	Qualitative characteristics	Pre-subproject condition and EMP	all access and haul roads	refer to EMP table on management of	Contractor	DSC Environment Specialist

[23] Subproject sites include approved construction site, equipment lay-down and storage area, water courses along the subproject site, open drainages

Aspect	Parameter	Standards	location	duration / frequency	Implementation	Supervision
				construction and workforce activities		
Staff conduct	Site Records (Accidents, Complaints)	EMP	subproject sites	Ongoing	Contractor	DSC Environment Specialist
Air quality	PM_{10}, $PM_{2.5}$, SO_2, NO_2 and HC	National Ambient Air Quality Standards	Two locations near construction sites as specified by the engineer (DSC).	once in four months (three times in an year)	Contractor with close coordination with the DSC Environment Specialist	PMU/DSC
Soil erosion	Soil erosion management measures	EMP	subproject sites	Ongoing	Contractor	DSC Environment Specialist
Storm water	Soil erosion management measures	EMP	subproject sites	Ongoing	Contractor	DSC Environment Specialist
Water quality	Qualitative characteristics	EMP and pre-existing conditions	subproject sites	Ongoing	Contractor	DSC Environment Specialist
Conservation of Natural Resources	Number of scheduled trees	Tree-cutting permit and EMP	subproject sites	Ongoing	Contractor	DSC Environment Specialist
	Vegetation conditions	EMP	subproject sites	Ongoing	Contractor	DSC Environment Specialist
Materials management	Qualitative characteristics	EMP	subproject sites	Ongoing	Contractor	DSC Environment Specialist
Waste management	Qualitative characteristics	EMP	subproject sites	Ongoing	Contractor	DSC Environment Specialist
	Disposal manifests	EMP	subproject sites	Ongoing	Contractor	DSC Environment Specialist
Social impacts	Public Consultations, Information Disclosure, Communication Strategy	EARF, ADB SPS and EMP	subproject sites	Ongoing	Contractor with the DSC Environment Specialist, PMU Environment Specialist, PMU/DSC	Implementing Agency (KMC)
	GRM Register	EMP	subproject sites	Ongoing	Contractor with the DSC Environment Specialist, PMU Environment Specialist, PMU/DSC	Implementing Agency (KMC)
Cultural environment	Chance finds	ASI Act and EMP	subproject sites	Ongoing	Contractor	DSC Environment Specialist

Aspect	Parameter	Standards	location	duration / frequency	Implementation	Supervision
Noise quality	Noise Level in dB(A) L_{eq}	National Noise standards	Two locations near construction sites as specified by the engineer (DSC).	once in four months (three times in an year)	Contractor with close coordination with the DSC Environment Specialist	PMU/DSC
C. Post-construction activities						
Construction camp	Pre-existing conditions	EMP	construction camp	subproject completion	Contractor	DSC Environment Specialist
Vegetation	Pre-existing conditions	Tree-cutting Permit and EMP	subproject sites	subproject completion	Contractor	DSC Environment Specialist
Land rehabilitation	Pre-existing conditions	EMP	subproject sites	subproject completion	Contractor	DSC Environment Specialist
Materials and infrastructure	Pre-existing conditions	EMP	subproject sites	subproject completion	Contractor	DSC Environment Specialist
General	Records	EMP	subproject sites	subproject completion	Contractor with DSC Environment Specialist and PMU Environment Specialist	PMU/DSC
D. Operation and maintenance (defect liability period)						
Air quality	PM_{10}, $PM_{2.5}$, SO_2, NO_2	National Ambient Air Quality Standards	Two locations as specified by the Environment Spl.	once in 6 months (defect liability period)	Contractor in association with Environmental Monitoring Laboratory	PMU/DSC
Noise quality	Noise Level in dB(A) L_{eq}	As per National Noise standards	Two locations as specified by the Environment Spl	once in 6 months (defect liability period)	Contractor in association with Environmental Monitoring Laboratory	PMU/DSC

214. A training program has been developed to build the capability of KMC and PMU in implementing the EMP. The suggested outline of the training program is presented in **Table 30.**

Table 30: Training Program on environmental safeguards and its implementation

Module	Frequency of sessions	Target participants	Conducting agency
Environmental Safeguards Requirements comprising (i) ADB's Safeguards Policy Statement of 2009, (ii) environmental documentation requirements and (iii) Environmental requirements of India particularly those applicable to KEIIP subprojects, international obligations (common for all subprojects)	Once in Pre-construction stage	Senior Construction Supervisors of DSC, Safety Officers of Contractors, KEIIP Senior Engineers	DSC and PMU with assistance from INRM, ADB, New Delhi and WBPCB

Module	Frequency of sessions	Target participants	Conducting agency
IEE and EMP of water supply subproject	Once during Pre-construction stage	Safety officers of Contractors and Construction supervisors of DSC	DSC and PMU
Workshop on implementation of EMP of water supply subproject of KEIIP: lessons learnt and way forward	Once during Construction stage	Senior Construction Supervisors of DSC, PMC Engineers, Safety Officers of Contractors, KEIIP Senior Engineers	DSC with assistance from PMU

D. Environmental Management and Monitoring Cost

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

216. The operation phase mitigation measures are again of good operating practices, which will be the responsibility of implementing agency (KMC). The air quality and noise level monitoring during the operation and maintenance phase will be organized by the operating offices of KMC as part of their routine office expenses.

217. The activities identified in environmental monitoring programme mainly includes site inspections and informal discussions with workers and local people and this will be the responsibility of PMU and DSC, costs of which are part of project management**. Table 31** summarizes the indicative cost to implement the EMP.

Table 31: Indicative Costs for EMP Implementation- pre construction and construction phase (to be revised during preparation of SEP)

Item	Parameters	Project Phase	Sampling Station	Duration and Frequency	Quantity	Unit cost (INR)	Total cost INR)	Source of funds
1. Survey and monitoring							**19,50,000**	Survey and Investigation /Contingency
Ambient air	PM10, PM2.5, SO_2, NO_2 and CO	Pre Construction & construction	All 9 ESR, 2 UG reservoir and pumping station sites – 2 locations at each sites Pipe laying locations Additional monitoring for water loss management project- pipe laying area	2 years Once in a quarter for 3 quarter in a year	Approx. 150 nos.	10,000	15,00,000	Contractor budget
Noise	Leq in dBA	Pre Construction & construction	All 9 ESR, 2 UG reservoir and pumping station sites – 2 locations at each sites Pipe laying locations Additional monitoring for water loss management project- pipe laying area	2 years Once in a quarter for 3 quarter in a year	Approx 150 measurements	1000	1,50,000	Contractor budget
Surface water	As per Drinking water standard	Pre Construction, construction and operation	Nearby ponds and other surface water/ supply water source	Once in a quarter for 4 quarters in a year for 2 years	25 nos.	12,000	3,00,000	Contractor budget
2. Capacity building/ Training/ workshop expenses							**300,000**	Survey and Investigation /Contingency
3. Environmental Permits if any							**100,000**	Government Counterpart funds
Total (INR)							23,50,000	

Item	Parameters	Project Phase	Sampling Station	Duration and Frequency	Quantity	Unit cost (INR)	Total cost INR)	Source of funds
Total (US$)							36,154	
Note/s: INR 65 = US$ 1								

E. Monitoring and Reporting

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

219. DSC will organize an induction course for the training of contractors preparing them on:

(i). EMP/approved SEP implementation including environmental monitoring requirements related to identified mitigation measures; and

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

220. Monthly reports will be prepared by Contractors summarizing compliance with monitoring requirements, details on any noncompliance, remedial actions taken and additional environmental mitigation measures if necessary and will be duly authorized by the respective Construction Supervisors/ Managers. The format of the monthly environmental monitoring report is given in **Appendix 14 .**

221. Environmental monitoring activities involving measurements will require engagement of external agencies and will be organized by the Contractors. Based on monthly reports and measurements, DSC will draft a Semi-annual Environmental Monitoring Report (SEMR). The formats of suggested SEMR along with Sample Environmental Site Inspection Report and Sample Checklist for Construction Safety are given in **Appendix 15**.

222. The PMU will review, approve and submit to ADB the SEMR by 1st July and 1st January each year. Once concurrence from the ADB is received the report will be uploaded in the KEIIP website.

223. Based on review of environmental monitoring results, future modifications in the EMP/approved SEP could be undertaken with the concurrence of the ADB. These will be generally undertaken, if required, upon review of the SEMR by the PMU to ADB following agreed procedures and mechanisms.

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

225. For projects likely to have significant adverse environmental impacts, the KMC will retain qualified and experienced external experts to verify its monitoring information. The KMC external auditor will document significant monitoring results, identify the necessary corrective actions, and reflect them in a corrective action plan. The KMC, in each quarter, will study the compliance with the action plan developed in the previous quarter. Compliance with loan covenants will be screened by the KMC.

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

IX. RECOMMENDATIONS AND CONCLUSION

227. The process described in this document has assessed the environmental impacts of all elements of the water supply subproject of KEIIP under Tranche 2 in the Kolkata City. Potential negative impacts were identified in relation to pre-construction, construction and operation of the improved infrastructure. No environmental impacts were identified as being due to either the subproject design or location. Mitigation measures have been developed to

reduce all negative impacts to acceptable levels. These were discussed with specialists responsible for the engineering aspects, and as a result some measures have already been included in the designs for the infrastructure. This means that the number of impacts and their significance has already been reduced by amending the design.

228. The public participation processes undertaken during project design ensure 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.

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

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

231. A copy of the EMP/approved SEP 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.

232. The subproject is unlikely to cause significant adverse impacts because: (i) most of the individual components involve straightforward construction and operation, so impacts will be mainly localized; (ii) in most cases the predicted impacts are likely to be associated with the construction process and are produced because the process is invasive, involving excavation, obstruction at specific construction locations; and (iii) being located mainly in built-up areas will not cause direct impact on terrestrial biodiversity values. 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.

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

Appendix 1. Standards Ambient Air, air emission, effluents, receiving water bodies, drinking water at consumer end

A) Notification by Ministry of Environment & Forests, Government of India

Environment (Protection) Seventh Amendment Rules, 2009

Ambient Air Quality Standards

Pollutant	Time Weighted Average	Industrial, Residential, Rural and Other Areas	Sensitive Area (Notified by Central Govt)	Method of Measurement
Sulphur Dioxide (SO_2), µg/m^3	Annual* 24 hours**	50 80	20 80	• Improved West & Gaeke method • Ultraviolet Fluorescence
Nitrogen Oxide (NO_2), µg/m^3	Annual* 24 hours**	40 80	30 80	• Jacobs & Hochheiser modified ($NaOH – NaAsO_2$) method • Gas Chemiluminiscence
Particulate Matter (PM_{10}) (Size <10 µm) µg/m^3	Annual* 24 hours**	60 100	60 100	• Gravimetric • TOEM • Beta Attenuation
Particulate Matter ($PM_{2.5}$) (Size <2.5 µm) µg/m^3	Annual8 24 hours**	40 60	40 60	• Gravimetric • TOEM • Beta Attenuation
Ozone (O_3) µg/m^3	8 hours** 1 hour**	100 180	100 180	• UV photometric • Chemiluminiscence • Chemical method
Lead (Pb) µg/m^3	Annual* 24 hours**	0.5 1.0	0.5 1.0	• AAS method after sampling using EPM 2000 or equivalent filter paper
Carbon Monoxide (CO), mg/m^3	8 hours** 1 hour**	2.0 4.0	2.0 4.0	• Non Dispersive Infrared Spectroscopy
Ammonia (NH_3),	Annual* 24 hours**	100 400	100 400	• Chemiluminiscence • Indophenol blue method
Benzene (C_6H_6) µg/m^3	Annual*	5	5	• Gas Chromatography continuous analyzer • Adsorption & desorption followed by GC analysis
Benzo(o)pyrene (BaP) particulate phase only ng/m^3	Annual*	1	1	• Solvent extraction followed by GC/HPLC analysis
Arsenic (As), ng/m^3	Annual*	6	6	• AAS/ICP method after sampling using EPM 2000 or equivalent filter paper
Nickel (Ni) ng/m^3	Annual*	20	20	• AAS/ICP method after sampling using EPM 2000 or equivalent filter paper

Source: Central Pollution Control Board, New Delhi, Notification dated 18th November 2009
Notes:
* Indicates Annual Arithmetic Mean of Minimum 104 measurement in a year measured twice a week, 24 hourly at uniform intervals
** 24 hourly/8 hourly/1 hourly values should be met 98% of the time in a year. However, 2% of the time, it may exceed by not on two consecutive days

B) Emission standards for diesel generator sets

1) CPCB emission regulations, Part IV, COINDS/26/1986-87

Stack Height

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

$$H = h + 0.2x\ (KVA)^{0.5}$$

where

H = Total height of stack in metre

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

KVA = Total generator capacity of the set in KVA

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

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

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

2) GSR 371(E) 17 May 2002, amendment to Environment (Protection) Rules 2002 and

(The Emission Limits for new diesel engines (up to 800 KW) for Generator Sets (GENSETS) were notified by the Environment (Protection) Amendment Rules 2002 vide GSR 371(E), dated 17th May 2002 at Sl. No. 95 and as amended vide GSR 520(E), dated 1st July 2003, GSR 448 (E) dated 12th July, 2004, GSR 520(E) dated 12th August 2004 and GSR 280(E) dated 11th April, 2008 under Environment (Protection) Act, 1986)

Para 95. Emission limits for new diesel engines (up to 800 W) for gen set application

The emission limits for new diesel engines up to 800 kw, for gen set applications shall be as follows:

Capacity of diesel engine	Date of implementation	Emission limits (g/kw-hr) for				Smoke limit (light absorption coefficient, m-1) (at full load)	Test cycle	
1	2	3				4	5	
		NO_x	HC	CO	PM		Torque	Weight-

							%	ing factors
Up to 19 KW	1.7.2005	9.2	1.3	3.5	0.3	0.7	100 75	0.05 0.25
> 19 KW up to 176 KW	1.1.2004 1.7.2004	9.2 9.2	1.3 1.3	5.0 3.5	0.5 0.3	0.7 0.7	50 25	0.30 0.30
> 176 KW up to 800 KW	1.11.2004	9.2	1.3	3.5	0.3	0.7	10	0.10

3) Environment Protect third amendment rules 2002 vide 489(E) 9 July, 2002

Para 96. Emission standards for diesel engines (engine rating more than 0.8 Mw (800 Kw) for power plant, generator set applications and other requirements

Parameter		Area Category	Total engine rating of the plant (includes existing as well as new generator sets)	Gerator sets commissioning date		
				Before 1/7/2003	Between 1/7/2003 and 1/7/2005	On or after 1/7/2005
NO_x (as NO_2) (AT 15% O_2), dry basis, in ppmv		A	Up to 75MW	1100	970	710
		B	Up to 150MW			
		A	More than 75MW	1100	710	360
		B	More than 150MW			
NMHC (as C) (at 15% O_2), mg/Nm^3		Both A and B		150	100	
PM (at 15% O_2), mg/Nm^3	Diesel Fuels - HSD & LDO	Both A and B		75	75	
	Furnace Oils - LSHS & FO	Both A and B		150	100	
CO (at 15% O_2), mg/Nm		Both A and B		150	150	
Sulphur content in fuel		A		<2%		
		B		<4%		
Fuel specification		For A only	Up to 5MW	Only Diesel Fuels (HSD, LDO) shall be used.		
Stack height (for generator sets commissioned after 1/7/2003)		Stack height shall be maximum of the following, in meter: (i) 14 Q $^{0.3}$, Q = Total SO_2 emission from the plant in kg/hr (ii) Minimum 6 m above the building where generator set is installed. (iii) 30 m.				

Note:

1. Acronyms used: MW : Mega (106) Watt, FO : Furnace Oil, NO_x : Oxides of Nitrogen: HSD : High Speed Diesel, NO2 : Nitrogen Dioxide, LDO : Light Diesel Oil; O_2 : Oxygen, LSHS : Low Sulphur Heavy Stock, NMHC : Non-Methane Hydrocarbon kPa : Kilo Pascal, C : Carbon, mm : Milli (10^{-3}) metre, PM : Particulate Matter kg/hr : Kilo (10^3) gram per hour, CO : Carbon Monoxide, mg/Nm^3 : Milli (10^{-3}) gram per ; SO_2 : Sulphur Dioxide Normal metre cubic, ppmv : part per million (106) by volume

2. Area categories A and B are defined as follows:

Category A: Areas within the municipal limits of towns/cities having population more than 1million and also up to 5 km beyond the municipal limits of such towns/cities.

Category B: Areas not covered by category A.

4. Individual units with engine ratings less than or equal to 800 KW are not covered by this notification.

5. Only following liquid fuels viz. High Speed Diesel, Light Diesel Oil, Low Sulphur Heavy Stock and Furnace Oil or liquid fuels with equivalent specifications shall be used in these power plants and generator sets.

6. For expansion Project, stack height of new generator sets shall be as per total Sulphur Dioxide emission (including existing as well as additional load).

7. For multi engine plants, fuels shall be grouped in cluster to get better plume rise and dispersion. Provision for any future expansion should be made in planning stage itself.

8. Particulate Matter, Non-Methane Hydrocarbon and percent moisture (dry basis). Carbon Monoxide results -are to be normalized to 25^0C, 1.01 Kilo Pascal (760 mm of mercury) pressure and zero

9. Measurement shall be performed at steady load conditions of more than 85% of the rated load.

10. Continuous monitoring of Oxides of Nitrogen shall be done by the plants whose total engine capacity is more than 50 Mega Waft. However, minimum once in six month monitoring for other parameters shall be adopted by the plants.

ii) Effluent

A) Schedule VI of Environment (Protection) Rules, 1986

General standards for discharge of environmental pollutants: Effluents

Sl no	Parameter	Standards			
		Inland surface water	Public sewers	Land of Irrigation	Marine/ coastal areas
		(a)	(b)	(c)	(d)
1.	Colour and odour	remove as far as practicable			
2.	Suspended solids, mg/l. max.	100	600	200	(a) For process waste water100 (b) For cooling water effluent 10% above total suspended matter of influent.
3.	Particle size of suspended solids	shall pass 850 micron IS Sieve			(a)Floatable solids, max. 3mm. (b)Settable solids (max 850 micron)
4.	pH value	5.5. to 9.0	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
5.	Temperature	shall not exceed 50°C above the receiving water temperature			shall not exceed 50°C above the receiving water temperature
6.	Oil and grease, mg./l, max.	10	20	10	20
7.	Total residual chlorine, mg/l. max.	1.0			1.0
8.	Ammonical nitrogen (as N.) mg/l max	50	50		50
9.	Total Kjeldahl Nitrogen (as NH_3) mg/l. max	100			100
10.	Free ammonia (as NH_3), mg/l.max	5.0			5.0
11.	Biochemical oxygen demand (3 days at 27^0C), mg/l. max.	30	350	100	100
12.	Chemical oxygen demand, mg/l, max.	250			250
13.	Arsenic (as As) mg/l, max.	0.2	0.2	0.2	0.2
14.	Mercury (as Hg), mg/l, max.	0.1	0.1	0.1	0.1
15.	Lead (as Pb) mg/l,	0.1	1.0		2.0

Sl no	Parameter	Standards			
	max				
16.	Cadmium (as Cd) mg/l. max	2.0	1.0		2.0
17.	Hexavalent chromium (as Cr. +6). Mg/l, max	0.1	2.0		1.0
18.	Total Chromium (as Cr) mg/l, max	2.0	2.0		2.0
19.	Copper (as Cu) mg/l, max	3.0	3.0		3.0
20.	Zinc (as Zn) mg/l, max	5.0	15		15
21.	Selenium (as Se) mg/l, max	0.05	0.05		0.05
22.	Nickel (as Ni) mg/l, max	3.0	3.0		5.0
23.	Cyanide (as CN) mg/l, max	0.2	2.0	0.2	0.2
24.	Fluoride (as F) mg/l, max	2.0	15		15
25.	Dissolved phosphates (as P) mg/l, max	5.0			
26.	Sulfide (as S) mg/l, max	2.0			5.0
27.	Phenolic compounds (as C_6H_5OH) mg/l, max	1.0	5.0		5.0
28.	Radioactive materials: (a)Alfa emitters microcurie/ml, max. (b)Beta emitters micro curie/ml, max.	10^{-7} 10^{-6}	10^{-7} 10^{-6}	10^{-8} 10^{-7}	10^{-7} 10^{-6}
29.	Bio-assay test	90% Survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent
30.	Manganese (as Mn)	2 mg/l	2 mg/l		2 mg/l
31.	Iron (as Fe)	3 mg/l	3 mg/l		3 mg/l
32.	Vanadium (as V)	0.2 mg/l	0.2 mg/l		0.2 mg/l
33.	Nitrate Nitrogen	10 mg/l			20 mg/l

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

B) CPCB Primary Water Quality Criteria

The Central Pollution Control Board (CPCB), an apex body in the field of water quality management, has developed a concept of "designated best use". According to which, out of several uses a particular water body is put to, the use which demands highest quality of water is called its

"designated best use", and accordingly the water body is designated. The CPCB has identified 5 such "designated best uses". All those water bodies, which are used for drinking without any treatment, but with disinfection (chlorination), are termed as "A" Class Water, those which are used for outdoor bathing are termed as "B" Class Water, those which are used for drinking after conventional treatment are termed as "C" Class Water, those which are used for propagation of wildlife and fisheries are termed as "D" Class Water and those which are used for irrigation, cooling and controlled waste disposal are termed as "E" Class Water. For each of these five "designated best uses", the CPCB has identified water quality requirements in terms of few chemical characteristics, known as primary water quality criteria. The "designated best uses" along with respective water quality criteria is given in Table below.

Table. Best use based classification of surface waters in India

Sr. No.	Designated-Best-Use	Class of Water	Criteria
1	Drinking Water Source without conventional treatment but after disinfection	A	1. Total Coliform Organism MPN/100 ml: 50 or less
			2. pH: between 6.5 and 8.
			3. Dissolved Oxygen: 6mg/1 or more
			4. Biochemical Oxygen Demand 5 days 20°C: 2mg/1 or less
2	Outdoor bathing (Organised)	B	1. Total Coliform Organism MPN/100 ml: 500 or less
			2. pH: between 6.5 and 8.5
			3. Dissolved Oxygen: 5mg/1 or more
			4. Biochemical Oxygen Demand 5 days 20°C: 3mg/1 or less
3	Drinking water source after conventional treatment and disinfection	C	1. Total Coliform Organism MPN/100 ml: 5000 or less
			2. pH: between 6 to 9
			3. Dissolved Oxygen: 4mg/1 or more
			4. Biochemical Oxygen Demand 5 days 20°C: 3mg/1 or less
4	Propagation of Wild life and Fisheries	D	1. pH: between 6.5 to 8.5
			2. Dissolved Oxygen: 4mg/1 or more
5	Irrigation, Industrial Cooling, Controlled waste disposal	E	1. pH: between 6.0 to 8.5
			2. Electrical Conductivity at 25OC micro mhos/cm: Max 2250
			3. Sodium Absorption Ratio Max.: 26
			4. Boron Max.: 2mg/1

C) Drinking water standard at consumer end is under revision and the draft version is given in the following Table

Indian Standards for Drinking Water - Specification (BIS 10500: 1991) revised draft 2009

Sl. No	Substance or characteristic	Requirement (Acceptable Limit)	Undesirable effect outside the acceptable limit	Permissible limit in the absence of alternate source	Method of Test (Ref to IS)	Remarks
1. Organoleptic and physical parameters						
i)	Colour, Hazen units, Max	5	Above 5 consumer acceptance drcreases	15	3025 (Part 5)	
ii).	Odour	Agreeable	-	Agreeable	3025 (Part 5)	a)Test cold when heated b)Test at several dilutions
iii)	Taste	Agreeable	-	Agreeable	3025 (Part 7 & 8)	Test to be conducted only after safety has been established
iv)	Turbidity, NTU, Max	1	Above 5 consumer acceptance decreases	5	3025 (Part 10)	-
v)	Dissolved solids, mg/l, Max	500	Beyond this palatability decreases and may cause gastrointestinal irritation	2000	3025 (Part 16)	-
vi)	pH Value	6.5 to 8.5	Beyond this range the water will affect the mucous membrane and/or water supply system	No Relaxation	3025 (Part 11)	-
vii)	Total hardness (as $CaCO_3$), mg/l., Max	200	Encrustation in water supply structure and adverse effects on domestic use	600	3025 (Part 21)	
Note 1: It is recommended that the acceptable limit is to be implemented. Values in excess of those mentioned under the water not acceptable, but still may be tolerated in the absence of an alternative source but up to the limits indicated under permissible limit in the absence of alternate source in col (5), above which the sources will have to be rejected.						
General parameters concerning substances undesirable in excessive amounts						
i)	Iron (as Fe) mg/l, Max	0.3	Beyond this limit taste/appearance are affected, has adverse effect on domestic uses and water	No relaxation	3025 (Part 53)	Total concentration of Manganese (as Mn) and

Sl. No	Substance or characteristic	Requirement (Acceptable Limit)	Undesirable effect outside the acceptable limit	Permissible limit in the absence of alternate source	Method of Test (Ref to IS)	Remarks
			supply structures, and promotes iron bacteria			Iron (as Fe) shall not exceed 0.3 mg/l
ii)	Aluminium (as Al), mg/l, Max	0.1	Beyond this limit taste/ appearance are affected, has adverse effect on domestic uses and water supply structures	0.3	IS 3025 (Part 59)	-
iii)	Copper (as Cu), mg/l, Max	0.05	Astringent taste, discoloration and corrosion of pipes, fittings and utensils will be caused beyond this	1.5	IS 3025 (Part 42)	-
iv)	Manganese (as Mn), mg/l ,Max	0.1	Beyond this limit taste/ appearance are affected, has adverse effect on domestic uses and water supply structures	0.3	IS 3025 (Part 59)	Total concentration of Manganese (as Mn) and Iron (as Fe) shall not exceed 0.3 mg/l
v)	Zinc (as Zn), mg/l, Max	5	Beyond this limit it can cause astringent taste and an opalescence in water	15	IS 3025 (Part 49)	-
vi)	Magnesium (as Mg), mg/l, Max.	30	Encrustation in water supply structure and adverse effects on domestic use	No relaxation	IS 3025 (Part 46)	-
vii)	Barium (as Ba), mg/l, Max	0.7	May lead to cardiovascular problem	No relaxation	Annex F of IS 13428*/ S 15302	-
viii)	Calcium (as Ca) mg/l, Max	75	Encrustation in water supply structure and adverse effects on domestic use	200	3025 (Part 40)	-

Sl. No	Substance or characteristic	Requirement (Acceptable Limit)	Undesirable effect outside the acceptable limit	Permissible limit in the absence of alternate source	Method of Test (Ref to IS)	Remarks
ix)	Silver (as Ag), mg/l, Max	0.1	-	No relaxation	Annex J of IS 13428	-
x)	Selenium (as Se), mg/l, Max	0.01	Beyond this the water becomes toxic	No relaxation	3025 (Part 56) or IS 15303*	-
xi)	Molybdenum (as Mo), mg/l, Max	0.07	Beyond this it may cause osteoporosis/bone disorders	No relaxation	3025 (Part 2; 2002)/ ISO 11885: 1996	-
xii)	Boron (as B), mg/l, Max	0.5	-	1.0	3025 (Part 57)	-
xiii)	Nitrate (as NO_3) mg/l, Max	45	Beyond this methaemoglobinamia takes place/may be indicative of pollution	No relaxation	3025 (Part 34)	
xiv)	Sulfate (as SO_4) mg/l, Max	200	Beyond this causes gastro intestinal irritation when magnesium or sodium is present	400	3025 (Part 24)	May be extended to 400 provided that Mg does not exceed 30
xv)	Sulphide (as H_2S), mg/l, Max	Below detectable limit	Beyond this it may cause objectionable taste and odour	No relaxation	3025 (Part 29)	-
xvi)	Fluoride (as F) mg/l, Max	1.0	Fluoride may be kept as low as possible. High fluoride may cause fluorosis	1.5	3025 (Part 60)	-
xvii)	Chlorides (as Cl) mg/l, Max.	250	Beyond this taste corrosion and palatability are affected	1000	3025 (Part 32)	-
xviii)	Ammonia (as total ammonia – N), mg/l, Max	0.5	Toxicological effect about 200 mg per kg of body weight	No relaxation	3025 (Part 34)	-
xix)	Chloramines (as Cl_2), mg/l, Max	0.2	Eyes, nose irritation, anaemia, stomach discomfort	No relaxation	3025 (Part 26) or APHA 4500-ClG	-
xx)	Residual, Free chlorine, mg/l,	0.2	-	-	3025 (Part 26)	To be applicable

Sl. No	Substance or characteristic	Requirement (Acceptable Limit)	Undesirable effect outside the acceptable limit	Permissible limit in the absence of alternate source	Method of Test (Ref to IS)	Remarks
	Min					only when water is chlorinated. Tested at consumer end. When protection against viral infection is required, it should be minimum 0.5 mg/l.
xxi)	Total alkalinity in Calcium carbonate, mg/l, Max	200	Beyond this limit taste becomes unpleasant	600	3025 (Part 23)	-
xxii)	Phenolic Compounds (as C_6H_5OH) mg/l, Max.	0.001	Beyond this may cause objectionable taste and odour	0.002	3025 (Part 43)	-
xxiii)	Mineral Oil mg/l, Max	Below detectable limit	Beyond this limit undesirable taste and odour after chlorination takes place	No relaxation	3025 (Part 39) Infra red partition method	-
xxiv)	Anionic detergents (as MBAS) mg/l, Max	0.2	Beyond this limit it can cause a light froth in water	1.0	Annex K to IS 13428-	-
Note 2: in case of dispute, the method by '*' shall be referee method. Note 3: It is recommended that the acceptable limit is to be implemented. Values in excess of those mentioned under Acceptable render the water not acceptable, but still may be tolerated in the absence of an alternative source but up to the limits indicated under permissible limit in the absence of alternate source in col (5), above which the sources will have to be rejected.						
Parameters concerning toxic substances						
i)	Total Chromium (as Cr_{6+}), mg/l, Max	0.05	May be carcinogenic above this limit	No relaxation	3025 (part 52)	-
ii)	Total Arsenic (as As) mg/l, Max	0.01	Beyond this the water becomes toxic	0.05	3025 (part 37)	

Sl. No	Substance or characteristic	Requirement (Acceptable Limit)	Undesirable effect outside the acceptable limit	Permissible limit in the absence of alternate source	Method of Test (Ref to IS)	Remarks
iii)	Mercury (as Hg) mg/l, Max	0.001	Beyond this the water becomes toxic	No relaxation	3025 (part 48)/Mercury Analyser	-
iv)	Cadmiun (as Cd) mg/lit, Max	0.003	Beyond this the water becomes toxic	No relaxation	3025 (part 41)	
v)	Lead (as Pb) mg/l, Max	0.01	Beyond this the water becomes toxic	No relaxation	3025 (part 47)	
vi)	Nickel (as Ni), mg/l, Max	0.02	Beyond this the water becomes toxic	No relaxation	3025 (part 54)	
vii)	Cyanide (CN), mg/l, Max	0.05	Beyond this the water becomes toxic	No relaxation	3025 (part 27)	
viii)	Polynuclear Aromatic Hydrocarbons (as PAH), mg/l, Max	0.0001	May be carcinogenic	No relaxation	APHA 6440	-
ix)	Polychlorinated biphenyls, mg/l. Max	0.0005	May be carcinogenic	No relaxation	ASTM 5175/APHA 6630	-

Bacteriological quality of drinking water	
Organisms	Guidelines
E. coli or thermotolerent coliform bacteria	Must not be detectable in any 100 ml sample
Total coliform bacteria	Must not be detectable in any 100 ml sample

Appendix 2. Noise standards

A). Noise Pollution (Regulation and Control) Rules, 2002 as amended up to 2010

Rule 3. Ambient air guality standards in respect of noise for different areas/zones

(1) The ambient air quality standards in respect of noise for different areas/zones shall be such as specified below

(2) The State Government shall categorize the areas into industrial, commercial, residential or silence areas/zones for the purpose of implementation of noise standards for different areas.

(5) An area comprising not less than 100 metres around hospitals, educational institutions and courts may be declared as silence area/zone for the purpose of these rules.

Area Code	Category of Area	Limit in dB(A) Leqa	
		Day Time	Night Time
A.	Industrial area	75	70
B.	Commercial area	65	55
C.	Residential area	55	45
D.	Silence zone	50	40

Notes:
1. Day time is reckoned in between 6 a.m. and 10 p.m.
2. Night time is reckoned in between 10 PM and 6 AM.
3. Silence zone is an area comprising not less than 100 m around hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority
4. Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.
** dB(A) Leq denotes the time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.*
A "decibel" is a unit in which noise is measured.
"A", in dB(A) Leq, denotes the frequency weighting in the measurement of noise and corresponds to frequency response characteristics of the human ear.
Leq is an energy mean of the noise level over a specified period.

Rule 5. Restrictions on the use of Loud Speakers/Public Address system and sound producing instruments

(2) Any sound producing instrument shall not be used at night time except in closed premises for communication within, like auditoria, conference rooms, community halls, banquet halls or during a public emergency;

(4) The noise level at the boundary of the public place, where any noise source is being used shall not exceed 10 dB (A) above the ambient noise standards for the area or 75 dB (A) whichever is lower;

Rule 5A. Restrictions on the use of sound emitting construction equipments.

(3) Sound emitting construction equipments shall not be used or operated during night time in residential areas and silence zones.

B) Noise limit for generator sets run with petrol or kerosene

The noise limit for generator sets run with petrol or kerosene notified by Environment (Protection) (Amendment) Rules, 2000, vide G.S.R. 742 (E), dated 25th September, 2000, at serial no. 91, and as amended by Environment (Protection) (Amendment) Rules, 2001, vide G.S.R. 628 (E), dated 30th August, 2001 and Environment (Protection) (Amendment) Rules, 2011, vide G.S.R. 215 (E), dated 15th March, 2011, under the Environment (Protection) Act, 1986 is as follows:

	Noise Limit from	
	September 1, 2002	September 1, 2003
Sound Power Level LWA	90 dBA	86 dBA

C) Noise limit for generator sets run with diesel

Noise limit for Generator Sets run with Diesel notified by Environment (Protection) second Amendment Rules vide GSR 371(E), dated 17th May 2002 at serial no.94 and its amendments vide GSR No 520(E) dated 1st July 2003; GSR 448(E), dated 12th July 2004; GSR 315(E) dated 16th May 2005; GSR 464(E) dated 7th August 2006; GSR 566(E) dated 29th August 2007 and GSR 752(E) dated 24th October 2008; G.S.R. 215 (E), dated 15th March, 2011 under the Environment (Protection) Act, 1986) is as follows:

Para 50. Noise limit for diesel generator sets (up to 1000 KVA) manufactured on or after the 1st January, 2005

The maximum permissible sound pressure level for new diesel generator (DG) sets with rated capacity up to 1000 KVA, manufactured on or after the 1st January, 2005 shall be 75 dB(A) at 1 metre from the enclosure surface. The diesel generator sets should be provided with integral acoustic enclosure at the manufacturing stage itself.

The implementation of noise limit for these diesel generator sets shall be regulated as given in paragraph 3 below.

2. Noise limit for DG sets not covered by paragraph 1.

Noise limits for diesel generator sets not covered by paragraph 1, shall be as follows:-

2.1 Noise from DG set shall be controlled by providing an acoustic enclosure or by treating the room acoustically, at the users end.

2.2 The acoustic enclosure or acoustic treatment of the room shall be designed for minimum 25 dB (A) insertion loss or for meeting the ambient noise standards, whichever is on the higher side (if the actual ambient noise is on the higher side, it may not be possible to check the performance of the acoustic enclosure/acoustic treatment. Under such circumstances the performance may be checked for noise reduction up to actual ambient noise level, preferably, in the night time). The measurement for Insertion Loss may be done at different points at 0.5 m from the acoustic enclosure/ room, then averaged.

2.3 The DG set shall be provided with proper exhaust muffler with insertion loss of minimum 25 dB (A).

2.5 Guidelines for the manufacturers/ users of Diesel Generator sets shall be as under:-

01. The manufacturer shall offer to the user a standard acoustic enclosure of 25 dB (A) insertion loss and also a suitable exhaust muffler with insertion loss of 25 dB(A).

02. The user shall make efforts to bring down the noise levels due to the DG set, outside his premises, within the ambient noise requirements by proper citing and control measures.

03. Installation of DG set must be strictly in compliance with the recommendations of the DG set manufacturer.

04. A proper routine and preventive maintenance procedure for the DG set should be set and followed in consultation with the DG set manufacturer which would help prevent noise levels of the DG set from deteriorating with use.

GSR.7 dated 22 December 1998 amendment to Environment Protection Rules 1986

83. Standards/guidelines for control of Noise Pollution from Stationary Diesel Generator (DG) Sets.

(i) Noise Standards for DG Sets (15-500 KVA)

The total sound power level, Lw, of a DG set should be less than, 94+10 log10 (KVA), dB(A), at the manufacturing stage, where, KVA is the nominal power rating of a DG set. This level should fall by 5 dB(A) every five years, till 2007, i.e. in 2002 and then in 2007.

(ii) Mandatory acoustic enclosure/acoustic treatment of room for stationary DG sets (5 KVA and above)

Noise from the DG set should be controlled by providing an acoustic enclosure or by treating the room acoustically.

The acoustic enclosure/acoustic treatment of the room should be designed for minimum 25 dB(A) Insertion Loss or for meeting the ambient noise standards, which ever is on the higher side (if the actual ambient noise is on the higher side, it may not be possible to check the performance of the acoustic enclosure/acoustic treatment. Under such circumstances the performance may be checked for noise reduction up to actual ambient noise level, preferably, in the night time). The measurement for Insertion Loss may be done at different points at 0.5m from the acoustic enclosure/room, and then averaged.

The DG set should also be provide with proper exhaust muffler with Insertion Loss of minimum 25 dB(A).

(iii) Guidelines for the manufacturers/users of DG sets (5KVA and above)

01 The manufacturer should offer to the user a standard acoustic enclosure of 25 dB(A) insertion Loss and also a suitable exhaust muffler, with insertion loss of 25dB(A).

02. The user should make efforts to bring down the noise levels due to the DG set, outside his premises, within the ambient noise

03 The manufacturer should furnish noise power levels of the unsilenced DG sets as per standards prescribed under (A).

04. The total sound power level of a DG set, at the user's end, shall be within2 dB(a) of the total sound power level of the DG set, at the manufacturing stage as prescribed under (A).

05. Installation of a DG set must be strictly in compliance with the recommendations of the DG set manufacturer.

06. A proper routine and preventive maintenance procedure for the DG set should be set and followed in consultation with the DG set manufacturer which would help prevent noise levels of the DG set from deteriorating with use.

D) GSR 742(E) dated 30.08.1990 amended GSR 422 (E) dated 19 May, 1993

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

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

Appendix 3. Occupational noise exposure

National Institute of Occupational Safety and Health

Criteria for a recommended standard: occupational noise exposure

NIOSH Publication no. 98-126

Combination of noise exposure levels and duration that no worker exposure shall equal or exceed

Exposure Level (dBA)	Duration		
	Hours	Minutes	Seconds
80	25	24	-
81	20	10	-
82	16	-	-
83	12	42	-
84	10	5	-
85	8	-	-
86	6	21	
87	5	2	-
88	4	-	-
89	3	10	-
90	2	31	-
91	2	-	-
92	1	35	-
93	1	16	
94	1	-	-
95	-	47	37
96	-	37	48
97	-	30	-
98	-	23	49
99	-	18	59
100	-	15	-
103	-	7	30
105	-	4	43
110	-	1	29

Appendix 4. Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 dated 4th April 2016

These rules shall apply to the management of hazardous and other wastes as specified in the Schedules to these rules but shall not apply to - (a) waste-water and exhaust gases as covered under the provisions of the Water (Prevention and Control of Pollution) Act, 1974 (6 of 1974) and the Air (Prevention and Control of Pollution) Act, 1981 (14 of 1981) and the rules made thereunder and as amended from time to time; (b) wastes arising out of the operation from ships beyond five km of the relevant baseline as covered under the provisions of the Merchant Shipping Act, 195 radio-active wastes as covered under the provisions of the Atomic Energy Act, 1962 (33 of 1962) and the rules made thereunder and as amended from time to time; (d) bio-medical wastes covered under the Bio-Medical Wastes (Management and Handling) Rules, 1998 made under the Act and as amended from time to time; and (e) wastes covered under the Municipal Solid Wastes (Management and Handling) Rules, 2000 made under the Act and as amended from time to time. 8 (44 of 1958) and the rules made thereunder and as amended from time to time;

Responsibilities of State Government for environmentally sound management of hazardous and other wastes. – (1) Department of Industry in the State or any other government agency authorised in this regard by the State Government, to ensure earmarking or allocation of industrial space or shed for recycling, pre-processing and other utilisation of hazardous or other waste in the existing and upcoming industrial park, estate and industrial clusters; (2) Department of Labour in the State or any other government agency authorised in this regard by the State Government shall,- (a) ensure recognition and registration of workers involved in recycling, preprocessing and other utilisation activities; (b) assist formation of groups of such workers to facilitate setting up such facilities; (c) undertake industrial skill development activities for the workers involved in recycling, pre-processing and other utilisation; (d) undertake annual monitoring and to ensure safety and health of workers involved in recycling, pre-processing and other utilisation. (3) Every State Government may prepare integrated plan for effective implementation of these provisions and to submit annual report to the Ministry of Environment, Forest and Climate Change, in the Central Government.

Grant of authorisation for managing hazardous and other wastes.- (1) Every occupier of the facility who is engaged in handling, generation, collection, storage, packaging, transportation, use, treatment, processing, recycling, recovery, pre-processing, co-processing, utilisation, offering for sale, transfer or disposal of the hazardous and other wastes shall be required to make an application in Form 1 to the State Pollution Control Board and obtain an authorisation from the State Pollution Control Board within a period of sixty days from the date of publication of these rules. Such application for authorisation shall be accompanied with a copy each of the following documents, namely:- (a) consent to establish granted by the State Pollution Control Board under the Water (Prevention and Control of Pollution) Act, 1974 (25 of 1974) and the Air (Prevention and Control of Pollution) Act, 1981 (21 of 1981); (b) Consent to operate granted by the State Pollution Control Board under the Water (Prevention and Control of Pollution) Act, 1974 (25 of 1974) and/or Air (Prevention and Control of Pollution) Act, 1981, (21 of 1981); (c) in case of renewal of authorisation, a self-certified compliance report in respect of effluent, emission standards and the conditions specified in the authorisation for hazardous and other wastes: Provided that an application for renewal of authorisation may be made three months before the expiry of such authorisation: Provided further that- (i) any person authorised under the provisions of the Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008, prior to the date of commencement of these rules, shall not be required to make an application for authorisation till the period of expiry of such authorisation; (ii) any person engaged in recycling or reprocessing of the hazardous waste specified in Schedule IV and having registration under the provisions of the Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008, shall not be required to make an application for authorisation till the period of expiry of such registration. (2) On receipt of an application complete in all respects for the authorisation, the State Pollution Control Board may, after such inquiry as it considers necessary, and on being satisfied that the applicant possesses appropriate facilities for collection, storage, packaging, transportation, treatment, processing, use, destruction, recycling, recovery, pre-processing, co-processing, utilisation, offering for sale, transfer or disposal of the hazardous and other waste, as the case may be, and after ensuring technical capabilities and equipment complying with the standard operating procedure or other guidelines specified by the Central Pollution Control Board from time to time and through site inspection, grant within a period of one hundred and twenty days, an authorisation in Form 2 to the applicant, which shall be valid for a period of five years subject to

such conditions as may be laid down therein. For commonly recyclable hazardous waste as given in Schedule IV, the guidelines already prepared by the Central Pollution Control Board shall be followed: Provided that in the case of an application for renewal of authorisation, the State Pollution Control Board may, before granting such authorisation, satisfy itself that there has been no violation of the conditions specified in the authorisation earlier granted by it and same shall be recorded in the inspection report. (3) The authorisation granted by the State Pollution Control Board under sub-rule (2) shall be accompanied by a copy of the field inspection report signed by that Board indicating the adequacy of facilities for collection, storage, packaging, transportation, treatment, processing, use, destruction, recycling, recovery, pre-processing, co-processing, utilisation, offering for sale, transfer or disposal of the hazardous and other wastes and compliance to the guidelines or standard operating procedures specified by the Central Pollution Control Board from time to time. (4) The State Pollution Control Board may, for the reasons to be recorded in writing and after giving reasonable opportunity of being heard to the applicant, refuse to grant any authorisation under these rules. (5) Every occupier authorised under these rules, shall maintain a record of hazardous and other wastes managed by him in Form 3 and prepare and submit to the State Pollution Control Board, an annual return containing the details specified in Form 4 on or before the 30th day of June following the financial year to which that return relates.

(6) The State Pollution Control Board shall maintain a register containing particulars of the conditions imposed under these rules for management of hazardous and other wastes and it shall be open for inspection during office hours to any interested or affected person.

(7) The authorised actual user of hazardous and other wastes shall maintain records of hazardous and other wastes purchased in a passbook issued by the State Pollution Control Board along with the authorisation. (8) Handing over of the hazardous and other wastes to the authorised actual user shall be only after making the entry into the passbook of the actual user.

Power to suspend or cancel an authorisation.- (1) The State Pollution Control Board, may, if in its opinion the holder of the authorisation has failed to comply with any of the conditions of the authorisation or with any provisions of the Act or these rules and after giving him a reasonable opportunity of being heard and after recording reasons thereof in writing cancel or suspend the authorisation issued under rule 6 for such period as it considers necessary in the public interest. (2) Upon suspension or cancellation of the authorisation, the State Pollution Control Board may give directions to the person whose authorisation has been suspended or cancelled for the safe storage and management of the hazardous and other wastes, and such occupier shall comply with such directions.

Storage of hazardous and other wastes.- (1) The occupiers of facilities may store the hazardous and other wastes for a period not exceeding ninety days and shall maintain a record of sale, transfer, storage, recycling, recovery, pre-processing, co-processing and utilisation of such wastes and make these records available for inspection: Provided that the State Pollution Control Board may extend the said period of ninety days in following cases, namely:- (i) small generators (up to ten tonnes per annum) up to one hundred and eighty days of their annual capacity; (ii) actual users and disposal facility operators up to one hundred and eighty days of their annual capacity, (iii) occupiers who do not have access to any treatment, storage, disposal facility in the concerned State; or (iv) the waste which needs to be specifically stored for development of a process for its recycling, recovery, pre-processing, co-processing or utilisation; (v) in any other case, on justifiable grounds up to one hundred and eighty days.

Utilisation of hazardous and other wastes.- (1) The utilisation of hazardous and other wastes as a resource or after pre-processing either for co-processing or for any other use, including within the premises of the generator (if it is not part of process), shall be carried out only after obtaining authorisation from the State Pollution Control Board in respect of waste on the basis of standard operating procedures or guidelines provided by the Central Pollution Control Board. (2) Where standard operating procedures or guidelines are not available for specific utilisation, the approval has to be sought from Central Pollution Control Board which shall be granting approval on the basis of trial runs and thereafter, standard operating procedures or guidelines shall be prepared by Central Pollution Control Board: Provided, if trial run has been conducted for particular waste with respect to particular utilisation and compliance to the environmental standards has been demonstrated, authorisation may be granted by the State Pollution Control Board with respect to the same waste and utilisation, without need of separate trial run by Central Pollution Control Board and such cases of successful trial run, Central Pollution Control Board shall intimate all the State Pollution Control Board regarding the same. (3) No trial runs shall be required for co-processing of waste in cement plants for

which guidelines by the Central Pollution Control Board are already available; however, the actual users shall ensure compliance to the standards notified under the Environment (Protection) Act,1986 (29 of 1986), for cement plant with respect to co-processing of waste: Provided that till the time the standards are notified, the procedure as applicable to other kind of utilisation of hazardous and other waste, as enumerated above shall be followed.

Standard Operating Procedure or guidelines for actual users.- The Ministry of Environment, Forest and Climate Change or the Central Pollution Control Board may issue guidelines or standard operating procedures for environmentally sound management of hazardous and other wastes from time to time.

Schedule 2

SCHEDULE II

[See rule 3 (1) (17) (ii)]

List of waste constituents with concentration limits

Class A: Based on leachable concentration limits [Toxicity Characteristic Leaching Procedure (TCLP) or Soluble Threshold Limit Concentration (STLC)]

Class	Constituents	Concentration in mg/l
(1)	(2)	(3)
A1	Arsenic	5.0
A2	Barium	100.0
A3	Cadmium	1.0
A4	Chromium and/or Chromium (III) compounds	5.0
A5	Lead	5.0
A6	Manganese	10.0
A7	Mercury	0.2
A8	Selenium	1.0
A9	Silver	5.0
A10	Ammonia	50*
A11	Cyanide	20*
A12	Nitrate (as nitrate-nitrogen)	1000.0
A13	Sulphide (as H_2S)	5.0
A14	1,1-Dichloroethylene	0.7
A15	1,2-Dichloroethane	0.5
A16	1,4-Dichlorobenzene	7.5
A17	2,4,5-Trichlorophenol	400.0
A18	2,4,6-Trichlorophenol	2.0
A19	2,4-Dinitrotoluene	0.13
A20	Benzene	0.5
A21	Benzo (a) Pyrene	0.001
A22	Bromodicholromethane	6.0
A23	Bromoform	10.0
A24	Carbon tetrachloride	0.5
A25	Chlorobenzene	100.0
A26	Chloroform	6.0
A27	Cresol (ortho+ meta+ para)	200.0
A28	Dibromochloromethane	10.0
A29	Hexachlorobenzene	0.13
A30	Hexachlorobutadiene	0.5
A31	Hexachloroethane	3.0
A32	Methyl ethyl ketone	200.0
A33	Naphthalene	5.0
A34	Nitrobenzene	2.0
A35	Pentachlorophenol	100.0
A36	Pyridine	5.0
A37	Tetrachloroethylene	0.7
A38	Trichloroethylene	0.5

(1)	(2)	(3)
A39	Vinyl chloride	0.2
A40	2,4,5-TP (Silvex)	1.0
A41	2,4-Dichlorophenoxyacetic acid	10.0
A42	Alachlor	2.0
A43	Alpha HCH	0.001
A44	Atrazine	0.2
A45	Beta HCH	0.004
A46	Butachlor	12.5
A47	Chlordane	0.03
A48	Chlorpyriphos	9.0
A49	Delta HCH	0.004
A50	Endosulfan (alpha+ beta+ sulphate)	0.04
A51	Endrin	0.02
A52	Ethion	0.3
A53	Heptachlor (& its Epoxide)	0.008
A54	Isoproturon	0.9
A55	Lindane	0.4
A56	Malathion	19
A57	Methoxychlor	10
A58	Methyl parathion	0.7
A59	Monocrotophos	0.1
A60	Phorate	0.2
A61	Toxaphene	0.5
A62	Antimony	15
A63	Beryllium	0.75
A64	Chromium (VI)	5.0
A65	Cobalt	80.0
A66	Copper	25.0
A67	Molybdenum	350
A68	Nickel	20.0
A69	Thallium	7.0
A70	Vanadium	24.0
A71	Zinc	250
A72	Fluoride	180.0
A73	Aldrin	0.14
A74	Dichlorodiphenyltrichloroethane (DDT), Dichlorodiphenyldichloroethylene (DDE), Dichlorodiphenyldichloroethane (DDD)	0.1
A75	Dieldrin	0.8
A76	Kepone	2.1
A77	Mirex	2.1
A78	Polychlorinated biphenyls	5.0
A79	Dioxin (2,3,7,8-TCDD)	0.001

Class B: Based on Total Threshold Limit Concentration (TTLC)

Class	Constituent	Concentration in mg/kg
(1)	(2)	(3)
B1	Asbestos	10000
B2	Total Petroleum Hydrocarbons (TPH) (C5 - C36)	5,000

Note:

(1) The testing method for list of constituents at A1 to A61 in Class-A, shall be basec on Toxicity Characteristic Leaching Procedure (TCLP) and for extraction c leachable constituents, USEPA Test Method 1311 shall be used.
(2) The testing method for list of constituents at A62 to A79 in Class- A, shall be based on Soluble Threshold Limit Concentration (STLC) and Waste Extractior Test (WET) Procedure given in Appendix II of section 66261 of Title 22 o California Code regulation (CCR) shall be used.
(3) In case of ammonia (A10), cyanide (A11) and chromium VI (A64), extractions sha be conducted using distilled water in place of the leaching media specified in the TCLP/STLC procedures.
(4) A summary of above specified leaching/extraction procedures is included ir manual for characterization and analysis of hazardous waste published by Centra Pollution Control Board and in case the method is not covered in the said manual suitable reference method may be adopted for the measurement.
(5) In case of asbestos, the specified concentration limits apply only if the substance: are in a friable, powdered or finely divided state.
(6) The hazardous constituents to be analyzed in the waste shall be relevant to the nature of the industry and the materials used in the process.
(7) Wastes which contain any of the constituents listed below shall be considered a: hazardous, provided they exhibit the characteristics listed in Class-C of thi: Schedule :

1.	Acid Amides
2.	Acid anhydrides
3.	Amines
4.	Anthracene
5.	Aromatic compounds other than those listed in Class A
6.	Bromates, (hypo-bromites)
7.	Chlorates (hypo-chlorites)
8.	Carbonyls
9.	Ferro-silicate and alloys
10.	Halogen- containing compounds which produce acidic vapours on contact with humid air or water e.g. silicon tetrachloride, aluminum chloride, titanium tetrachloride
11.	Halogen- silanes
12.	Halogenated Aliphatic Compounds
13.	Hydrazine (s)

14.	Hydrides
15.	Inorganic Acids
16.	Inorganic Peroxides
17.	Inorganic Tin Compounds
18.	Iodates
19.	(Iso- and thio-) Cyanates
20.	Manganese-silicate
21.	Mercaptans
22.	Metal Carbonyls
23.	Metal hydrogen sulphates
24.	Nitrides
25.	Nitriles
26.	Organic azo and azooxy Compounds
27.	Organic Peroxides
28.	Organic Oxygen Compounds
29.	Organic Sulphur Compounds
30.	Organo- Tin Compounds
31.	Organo nitro- and nitroso compounds
32.	Oxides and hydroxides except those of hydrogen, carbon, silicon, iron, aluminum, titanium, manganese, magnesium, calcium
33.	Phenanthrene
34.	Phenolic Compounds
35.	Phosphate compounds except phosphates of aluminum, calcium and iron
36.	Salts of pre-acids
37.	Total Sulphur
38.	Tungsten Compounds
39.	Tellurium and tellurium compounds
40.	White and Red Phosphorus
41.	2-Acetylaminofluorene
42.	4-Aminodiphenyl
43.	Benzidine and its salts
44.	Bis (Chloromethyl) ether
45.	Methyl chloromethyl ether
46.	1,2-Dibromo-3-chloropropane
47.	3,3'-Dichlorobenzidine and its salts
48.	4-Dimethylaminoazobenzene
49.	4-Nitrobiphenyl
50.	Beta-Propiolactone

CLASS C : Based on hazardous Characteristics

Apart from the concentration limit given above, the substances or wastes shall be classified as hazardous waste if it exhibits any of the following characteristics due to the presence of any hazardous constituents:

Class C1: Flammable- A waste exhibits the characteristic of flammability or ignitability if a representative sample of the waste has any of the following properties, namely:-

(i) flammable liquids, or mixture of liquids, or liquids containing solids in solution or suspension (for example, paints, varnishes, lacquers, etc; but not including substances or wastes otherwise classified on account of their dangerous characteristics), which give off a flammable vapour at temperature less than 60°C. This flash point shall be measured as per ASTM D 93-79 closed-cup test method or as determined by an equivalent test method published by Central Pollution Control Board;

(ii) it is not a liquid and is capable, under standard temperature and pressure, of causing fire through friction, absorption of moisture or spontaneous chemical changes and, when ignited, burns vigorously and persistently creating a hazard;

(iii) it is an ignitable compressed gas;

(iv) It is an oxidizer and for the purposes of characterisation is a substance such as a chlorate, permanganate, inorganic peroxide, or a nitrate, that yields oxygen readily to stimulate the combustion of organic matter.

Class C2: Corrosive- A waste exhibits the characteristic of corrosivity if a representative sample of the waste has either of the following properties, namely:-

(i) it is aqueous and has a pH less than or equal to 2 or greater than or equal to 12.5;

(ii) it is a liquid and corrodes steel (SAE 1020) at a rate greater than 6.35 mm per year at a test temperature of 55 °C;

(iii) it is not aqueous and, when mixed with an equivalent weight of water, produces a solution having a pH less than or equal to 2 or greater than or equal to 12.5;

(iv) it is not a liquid and, when mixed with an equivalent weight of water, produces a liquid that corrodes steel (SAE1020) at a rate greater than 6.35 mm per year at a test temperature of 55 °C.

Note:

For the purpose of determining the corrosivity, the Bureau of Indian Standard 9040 C method for pH determination, NACE TM 01 69 : Laboratory Corrosion Testing of Metals and EPA 1110A method for corrosivity towards steel (SAE1020) to establish the corrosivity characteristics shall be adopted.

Class C3: Reactive or explosive- A waste exhibits the characteristic of reactivity if a representative sample of the waste it has any of the following properties, namely:-

(i) it is normally unstable and readily undergoes violent change without detonating;

(ii) it reacts violently with water or forms potentially explosive mixtures with water;

(iii) when mixed with water, it generates toxic gases, vapours or fumes in a quantity sufficient to present a danger to human health or the environment;

(iv) it is a cyanide or sulphide bearing waste which, when exposed to pH conditions between 2 and 12.5, can generate toxic gases, vapours or fumes in a quantity sufficient to present a danger to human health or the environmental;

(v) it is capable of detonation or explosive reaction if it is subjected to a strong initiating source or if heated under confinement;

(vi) it is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure;

(vii) it is a forbidden explosive.

Class C4: Toxic- A waste exhibits the characteristic of toxicity, if, :-

(i) the concentration of the waste constituents listed in Class A and B (of this schedule) are equal to or more than the permissible limits prescribed therein;
(ii) it has an acute oral LD50 less than 2,500 milligrams per kilogram;
(iii) it has an acute dermal LD50 less than 4,300 milligrams per kilogram;
(iv) it has an acute inhalation LC50 less than 10,000 parts per million as a gas or vapour;
(v) it has acute aquatic toxicity with 50% mortality within 96 hours for zebra fish (*Brachidanio rerio*) at a concentration of 500 milligrams per litre in dilution water and test conditions as specified in BIS test method 6582 – 2001.
(vi) it has been shown through experience or by any standard reference test- method to pose a hazard to human health or environment because of its carcinogenicity, mutagenecity, endocrine disruptivity, acute toxicity, chronic toxicity, bio-accumulative properties or persistence in the environment.

Class C5: Substances or Wastes liable to spontaneous combustion - Substances or Wastes which are liable to spontaneous heating under normal conditions encountered in transport, or to heating up on contact with air, and being then liable to catch fire.

Class C6: Substances or Wastes which, in contact with water emit flammable gases- Substances or Wastes which, by interaction with water, are liable to become spontaneously flammable or to give off flammable gases in dangerous quantities.

Class C5: Oxidizing - Substances or Wastes which, while in themselves not necessarily combustible, may, generally by yielding oxygen cause, or contribute to, the combustion of other materials.

Class C8: Organic Peroxides - Organic substances or Wastes which contain the bivalent O−O structure, which may undergo exothermic self-accelerating decomposition.

Class C9: Poisons (acute) - Substances or Wastes liable either to cause death or serious injury or to harm human health if swallowed or inhaled or by skin contact.

Class C10: Infectious substances - Substances or Wastes containing viable micro-organisms or their toxins which are known or suspected to cause disease in animals or humans.

Class C11: Liberation of toxic gases in contact with air or water - Substances or Wastes which, by interaction with air or water, are liable to give off toxic gases in dangerous quantities.

Class C12: Eco-toxic- Substances or Wastes which if released, present or may present immediate or delayed adverse impacts to the environment by means of bioaccumulation or toxic effects upon biotic systems or both.

Class C13: Capable, by any means, after disposal, of yielding another material, e.g., leachate, which possesses any of the characteristics listed above.

Appendix 5: Photo illustration

Prantik phase III – UG reservoir, pump house and ESR location

KMC land Julpia road – UG reservoir, pump house and ESR location

22 Bigha – ESR location

WBSETCL near Joka Tram Depot. – ESR location

SSE STP North East- area for ESR

SSE STP North West - area for ESR

Charaktala ESR location

Malpara ESR location

Ramakantapur ESR location

Pipe laying location

Appendix 6. Rapid Environmental Assessment (REA) Checklist

Water supply sub project

Screening Questions	Yes	No	Remarks
A. Project siting Is the project area…			
▪ Densely populated?	✓		Kolkata is densely populated. As per 2011 census, the urban population of Kolkata is 4.45 million and population density is 24,783 persons per square kilometer.
▪ Heavy with development activities?		✓	About 60% of KMC area is residential. Industries occupy only about 5% of the area. Infrastructural development is however picking up.
Adjacent to or within any environmentally sensitive areas?			No part of the water supply subproject components is within locations in or near sensitive and valuable ecosystems, including protected areas and forests.
▪ 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?		✓	The existing water supply source will be utilized for storage
▪ Impairment of historical/cultural monuments/areas and loss/damage to these sites?		✓	
▪ Hazard of land subsidence caused by excessive ground water pumping?		✓	Not applicable.
▪ Social conflicts arising from displacement of communities?		✓	No displacement of communities is required in this subproject.
▪ Conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?		✓	Not anticipated. The main source of raw water is the Hoogli River, a principal tributary of Ganga River. 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)?		✓	Water quality of treated water is ensured to comply with the National Standards for Drinking Water.
▪ Delivery of unsafe water to distribution system?		✓	The subproject will provide treated water through new pipes to prevent leakages and contamination.
▪ Inadequate protection of intake works		✓	Not applicable as per nature of work

Screening Questions	Yes	No	Remarks
or wells, leading to pollution of water supply?			
▪ Over pumping of ground water, leading to salinization and ground subsidence?		✓	Not applicable.
▪ Excessive algal growth in storage reservoir?		✓	Not anticipated. Storage reservoirs will be fully enclosed structures. Treated water will only be stored in a short period of time.
▪ Increase in production of sewage beyond capabilities of community facilities?		✓	New sewerage system will be developed at the project area
▪ 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?		✓	Designs of the subproject components include provision of buffer zones. All pump sets conforming to noise standards
▪ Impairments associated with transmission lines and access roads?	✓		Short term impact expected during pipe laying. Mitigation measures will be applied
▪ Health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.		✓	Not applicable as per nature of work
▪ Health and safety hazards to workers from handling and management of chlorine used for disinfection, other contaminants, and biological and physical hazards during project construction and operation?		✓	Personal protective equipment will be provided to workers. Regular training will also be conducted to ensure that workers are aware of the health hazards.
▪ Dislocation or involuntary resettlement of people?		✓	No displacement of communities is required in this subproject.
▪ 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 the 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 the impacts.
▪ Continuing soil erosion/silt runoff from construction operations?	✓		The construction areas are all flat lands; soil erosion and silt run-off are least expected except during monsoon months. The EMP includes measures to mitigate the impacts. Construction contractors will be required to include channelization where required.
▪ Delivery of unsafe water due to poor O & M, treatment processes (especially mud accumulations in		✓	Not applicable as per nature of work

Screening Questions	Yes	No	Remarks
filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems?			
▪ Delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals?		✓	Not Anticipated. Water quality will be regularly monitored by the State Public Health and Engineering Department
▪ Accidental leakage of chlorine gas?		✓	Not applicable as per nature of work
▪ Excessive abstraction of water affecting downstream water users?		✓	Not applicable as per nature of work
▪ Competing uses of water?		✓	Not anticipated. Adequate water is available for storage
▪ Increased sewage flow due to increased water supply	✓		Sewerage system development are being undertaken by KMC.
▪ Increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant		✓	Not applicable as per nature of work
▪ Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		✓	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?		✓	Priority in employment will be given to local 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.
▪ 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?		✓	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.

A Checklist for Preliminary Climate Risk Screening

Country/Project Title: India/

Sector : Urban Development

Subsector: Water Supply

Division/Department: Kolkata Municipal Corporation

Screening Questions		Score	Remarks[24]
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather related events such as floods, droughts, storms, landslides?	0	
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc)?	0	
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	0	
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s) ?	0	
Performance of project outputs	Would weather/climate conditions, and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	0	

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1
Very Likely	2

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

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

Other Comments:_____

Prepared by: PMU, Kolkata Municipal Corporation

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

Appendix 7. Sample Traffic Management Plan (TMP)

A. Principles

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

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

B. Operating Policies for TMP

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

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

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

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

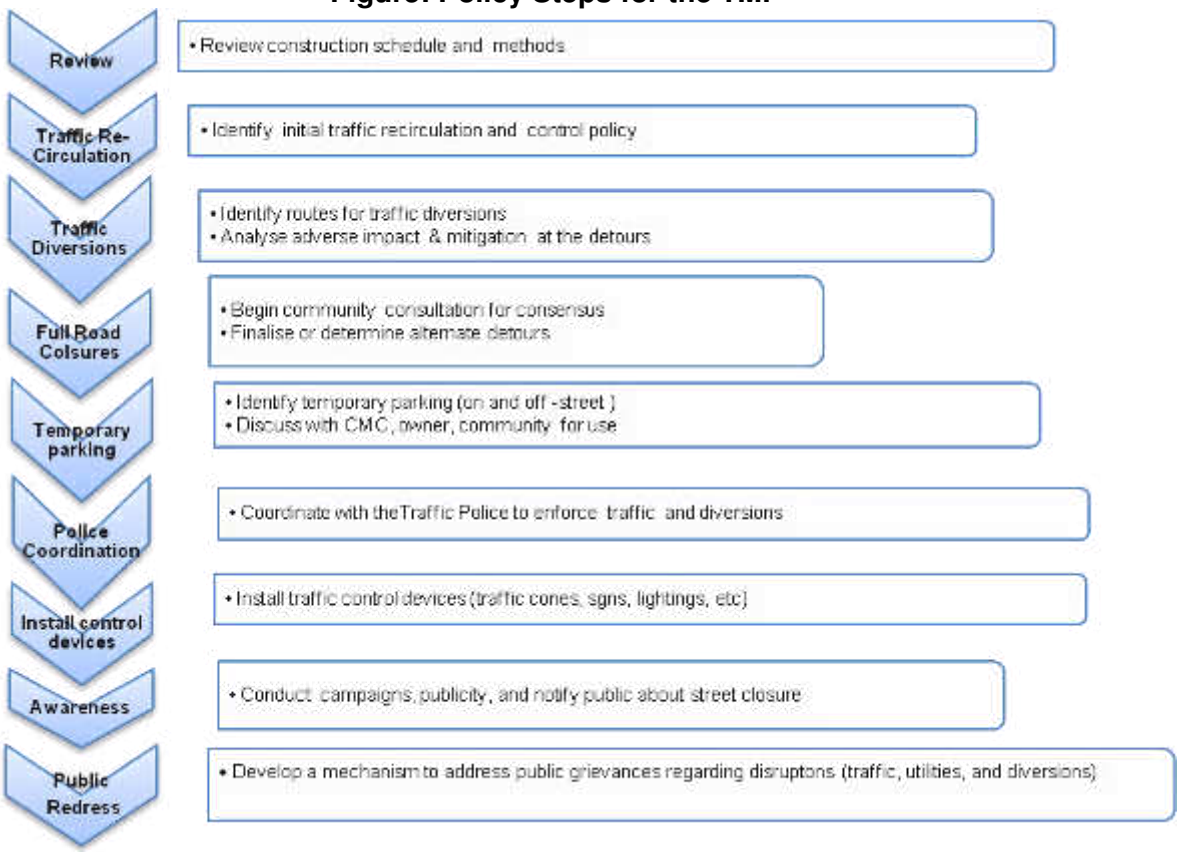
(i) approval from the PMU, local administration to use the local streets as detours;
(ii) consultation with businesses, community members, traffic police, PWD, etc, regarding the mitigation measures necessary at the detours where the road is diverted during the construction;
(iii) determining of the maximum number of days allowed for road closure, and incorporation of such provisions into the contract documents;
(iv) determining if additional traffic control or temporary improvements are needed along the detour route;
(v) considering how access will be provided to the worksite;

(vi) contacting emergency service, school officials, and transit authorities to determine if there are impacts to their operations; and

(vii) developing a notification program to the public so that the closure is not a surprise. As part of this program, the public should be advised of alternate routes that commuters can take or will have to take as result of the traffic diversion.

4. If full road-closure of certain streets within the area is not feasible due to inadequate capacity of the Detour Street or public opposition, the full closure can be restricted to weekends with the construction commencing on Saturday night and ending on Monday morning prior to the morning peak period.

Figure: Policy Steps for the TMP



D. Public awareness and notifications

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

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

roadblocks and traffic diversion through public notices, ward level meetings and city level meeting with the elected representatives.

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

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

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

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

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

E. Vehicle Maintenance and Safety

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

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

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

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

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

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

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

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

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

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

Appendix 8. Outline of Spoil and Sludge Management Plan (SSMP)

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

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

3.0 Structure of SMP:
Section 1: Introduction of SMP
Section 2: Legal and other requirements
Section 3: Roles and responsibilities
Section 4: Identification and assessment of spoil aspects and impacts
Section 5: Spoil volumes, characteristics and minimization
Section 6: Spoil reuses opportunities, identification and assessment
Section 7: On site spoil management approach
Section 8: Spoil transportation methodology
Section 9: Monitoring, Reporting, Review, and Improvements
4.0 Aspects and Potential Impacts
The key aspects of potential impacts in relation to SMP are listed in table below

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

5.0 Spoil volumes, characteristics and minimization
5.1 Spoil volume calculations: Estimate the volumes of spoils produced from each of the construction sites.
5.2 Characterization of spoil: Based on the type of spoil; characterization is done (sand stone, mud mix materials, reusable materials
5.3 Adopt Spoil Reduce, Reuse Opportunities
An overview of the assessment methodology to be used is mentioned below.

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

- Screening of possible reuse opportunities

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

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

Appendix 9: Health and Safety Plan

(To be implemented by the Construction contractor)

RESPONSIBILITY AND AUTHORITY FOR EHS MANAGEMENT

Project In charge (PI)

- ✓ The project PI will have overall responsibility of Health & Safety (H & S) Management at the site and improving safety and health in all areas. He/ She shall:
- ✓ Comply with Client's requirements, HS-Policy of the company and relevant statutory requirements that are applicable to the relevant work.
- ✓ Ascertain that all plants and machinery utilized at the project site meets the safety standard and are safe for use.
- ✓ Get familiar with and demonstrate his commitment to continual improvement in HS performance;
- ✓ Ensure that all personnel are aware of commitment to environmental protection and worker safety;
- ✓ Monitor HS performance of the personnel and activities under his control;
- ✓ Ensure that safe system of work are implemented and maintained by the project Engineers / Supervisors / Foreman and employees at the work site.
- ✓ Ensure that Site HS Plan is accessible to all relevant parties;
- ✓ Ensure that sufficient induction training for all employees and workers is given before commencement of work at site and subsequently for new inductees;
- ✓ Undertake program of regular HS Inspection at site.
- ✓ Arrange and chair monthly Site HS Management Review Meeting.

Site/Front In-charge

The Site/Front In-charge will be responsible to the PI for implementation of HS operational control procedures. In the absence of PI, he/she would take control of the Site. His/Her duties are similar to that of the PI.

Site Engineers/Supervisors

- They will be responsible to the PI / Site / Front In-charge for implementing the requirements of this plan. In particular they are required to: -
- Be familiar with Site HS Plan;
- Maintain safe working conditions and good housekeeping in all areas under his supervision.
- Enforce use of PPE as requested by Project Specific Rules and regulations.
- Liaise and cooperate with Site Safety HS Officer and ensure that defects brought to attention are corrected.
- Immediately Inform & report to the HS-Officer while any accident, near misses, dangerous occurrence, occupational poisoning or diseases shall be noticed within the project sites.
- Plan safety in accordance with the approved work methodology for daily work activities.
- Prepare Standard Operating Procedure (S.O.P) and General Risk Assessment (GRA) for each activity and it should be explained to employee before begins work.
- Establish and maintain proper communication with all workers with regard to EHS; and
- Provide proper supervision for the work.

Health & Safety (HS) Officer

He will be accountable to the PI for fulfilling the duties assigned to him and ensure implementation of HS Plan.

His / Her duties will include:

- Monitor and advise relevant personnel on compliance with HS statutory obligations at the site;
- Facilitate inclusion of safety elements into work Method Statement.
- Highlight the requirement of safety through Tool-Box / other meetings.
- Conduct investigation of all accident/dangerous occurrences and recommend appropriate safety measures.

- Advice & co-ordinate for implementation of operational control procedures etc.
- Convene safety meeting & minute the proceeding for circulation & follow-up action.
- Provide copies of site / office inspection report to relevant managers
- Plan procurement of PPEs and safety devices and inspect their healthiness.
- Report to PI/Divisional Manager on all matters pertaining to status of safety and promotional program at site level.
- Facilitate administration of FIRST – AID.
- Facilitate screening of workman and safety induction.
- Conduct fire drill and facilitate emergency preparedness.
- Design campaigns, competitions and other special emphasis programs to promote safety in the work place.
- Notify site personnel non-conformance to safety norms observed during site visits / site inspections.
- Attend and participate in Site HS Management Review Meetings;
- Access and advise PI on the perceived HS training needs of project personnel;
- Monitor HS performance of subcontractors and make appropriate recommendations for performance improvement.

Employees

All employees will be accountable for conforming to the requirement of the HS Plan and statutory requirements. In particular every employee will be required to: -

- Take care of environmental protection and safety of himself & others;
- Co-operate to fulfill statutory HS obligations;
- Co-operate in pursuit of continuous HS performance Improvement; and
- Conform to requirement of Project HS plan.
- Report defects in lifting appliances, lifting gears, transport equipments and any other equipments or tools & tackles to your immediate superior.
- Not to remove or interfere with any fencing, gangway, ladder, covering, life saving appliances, lighting and other things whatsoever required by site safety rules & regulations.
- Take care of personal protective equipment
- Don't let your work put another worker in danger.
- Use only means of access provided for specific work at site.
- Avoid horseplay, practical jokes or other activities to create a hazard.
- Don't use drugs or alcohol on the job.
- Keep the latrines, urinals, wash points, canteen and other facilities provided in a clean and hygienic condition
- Report any unsafe work practice and any injury or accident to your supervisor.

SAFETY AND HEALTH OPERATIONAL CONTROL PROCEDURES

To minimize hazards and risks, control measures shall be introduced in the following order of priority: -

- ☞ Engineering controls
- ☞ Administrative controls
- ☞ PPE

SITE SAFETY RULES

- No one (including staff and workers etc.) will be allowed to enter the work site without prior induction training & without required PPE.
- Before start of work every day, five minutes pre work briefing shall be conducted by each respective front engineers / supervisor with subcontractor's job supervisor present. The job to be undertaken that day shall be explained.
- Once every week toolbox talks on specific topics will be conducted by the front engineer/supervisor in the presence of safety officer, all talks will be documented on the company's specified format. Toolbox talks will also be given whenever a new activity is taken up or a new gang turns up for work.

- No Staff or workers will be allowed to enter the work site or to start his everyday activity without necessary job related PPE's. If there is any non compliance, Safety Officer or Site Management will issue a warning and if it is repeated impose fine on the concerned person and concerned Sub contractors.
- Smoking is strictly prohibited in all parts of the worksites except specific smoking zone as authorized by the site safety dept.
- Working under influence of drugs, alcohol etc. is strictly prohibited on worksite.
- Carrying unwanted flammable items, explosives etc. strictly prohibited at site.
- No vehicle shall be permitted to enter the work site or introduced into the job without prior induction by the plant and safety dept.
- It is mandatory that all vehicle driver and operator of lifting equipments etc. (heavy Vehicles like JCB, Tipper, and Crane etc.) should possess valid authorization certificates from the site plant dept. before starting of their respective job.
- It is mandatory that all electrical operated machinery's, equipments etc. (like Vacseal Pump, water pump, welding rectifiers/ transformers, diesel welding generators, panels, Switch gear, starter switch, D G Shed etc.) should be duly certified by Contractor's Electrical dept. prior to introduce into operation.
- Prior to introduction of any lifting tools, tackles, machinery's etc. in operation it is mandatory to conduct Third Party Competent Persons checking as per requirement and the Safe Working Load (SWL) should be marked on the equipment.
- All employees including workers must know about the exact location and use of fire Fighting equipments. Never restrict the access towards the firefighting equipment, always keep the access free from any obstructions.
- Considering emergency situation always keep the access around the work site area free from any obstruction for rescue operation.
- Everyone including workers should inform about the accident / incident and dangerous Occurrence to Site In charge, Site Engineer & Safety Officer.
- Always stay alert and keep your mind on the work, when you are engaged in the site work.
- Before starting of everyday work, routine checking of lifting equipments, Tools & Tackles, Winch, all types of pumps etc. to be done by concern Engineer, Supervisor and Worker.
- Don't carry out unfamiliar work without proper instruction. Any error due to ignorance can cause serious damage.
- When working at site especially around the moving machinery's, operating winch machine etc., wearing of loose clothing like dhoti, lungi, open sleeve shirt etc. are strictly prohibited.
- Don't leave any tools or materials haphazardly, where they can cause obstruction and create tripping hazards.
- All platforms, walkways, gangways, ramp, work area etc. must be kept clear at all time.
- During gas cutting uses of FLASH BACK ARRESTOR / non return valve are mandatory on each cylinder s & torch side.
- It is mandatory to use of Earth Leakage Circuit Breaker (ELCB) / Miniature Circuit Breaker (MCB) / Residual Current Circuit Breaker (RCCB) etc. on all site temporary electrical facilities.
- Always use minimum three cores double insulated cables for site electrification job.
- During lifting a load by a crane use of guy rope on both ends is mandatory
- Never use compressed air for cleaning of your clothes or getting relief from excessive heat.

- It is mandatory to install Reverse Horn on all vehicles (Like JCB, Tipper and site vehicle) and swing horn & over hoist limit switches for lifting equipments like Cranes.
- All materials must be stored in a safe manner and height of stacking should be maintained (below the man height) to protect collapsing of the stack and when material shifting work is carried out manually
- Horseplay inside the site during or after the job is strictly prohibited.
- Never roll the compressed gas cylinders (DA & O_2) at site, either shift it manually or by gas trolley. Use of gas trolley is mandatory for all cutting sets.
- Keep all gas cylinders inside proper shed in upright condition and lock it properly.
- Keep Diesel / Oil in its tank under the shed. Use oil spill trays below diesel tanks.
- Follow the speed limit of 20 Km/hr inside the work premises religiously.
- Maintaining hygienic environment at camp site
- Consideration of women worker health at working place

FIRST - AID FACILITIES AND MEDICAL TREATMENT

a) Each worksite/area shall be equipped with it's a first aid box catering to the needs of particular work front.

b) Medical causality evacuation and treatment procedures involving the nearest clinic / Hospitals shall be instituted.

c) Appointment of trained first aider.

EMERGENCY PREPAREDNESS AND RESPONSE PLAN

Approach

The aim of this emergency preparedness and response plan is to guide personnel in an accident or emergency situation to prevent or minimize injury, damage and material loss and also to prevent or mitigate environmental impact from the accident or emergency.

Emergency Preparedness facility

Following emergency preparedness facilities have been provided at the site:

- All the buildings and structures are well supplied with fire fighting devices.
- Proper security arrangements are functioning round the clock.
- There is quick and efficient transport as well as communication system.
- Smoking is prohibited throughout the flammable premises.
- Water is kept available for firefighting purpose.
- Sufficient number of trained manpower is available to extinguish any fire and attend emergency.
- Sufficient number of Personal Protective Equipment like helmet and gloves are available
- Audible emergency alarm/whistles are provided.
- First Aid Kit is available.
- All key personnel have been provided communication mean such as telephone / walkie-talkie / mobiles. Any message can be communicated immediately.
- All work fronts / floating crafts will have emergency lights and Torches.
- All exit doors are kept unobstructed
- It is ensured that access to fire extinguishers is not obstructed.
- Proper containers are used for flammable liquids.
- Safe distance of POL is maintained from any point of ignition.
- Welding and cutting equipment is checked before and after use.
- Main electrical equipment is switched off when not in use.
- All workers and staff are familiarized with the fire fighting system.
- Escape routes are well defined.
- The POL dumps and gas cylinders are barricaded.
- Fire extinguishers are refilled on time.

Sr. No.	Item	Nos.	Location
1	First aid kits	01 each	In all work fronts
3.	Sand / Fire buckets	As required	Store/workshop/office/ Site office container/ All DG Rooms / casting Yard etc.,
4	Fire Extinguishers	As required	Store/workshop/office/ Site office container/ All DG Rooms / casting Yard etc.,
5	Safety Helmets	Depends on no. of labour	Site Store
6	Safety Shoes Pairs	10 Nos. (Each sizes)	Site Store
7	**Stretchers**	4-6 Nos.	First Aid room / Ambulance / Store
8	**Oil spill absorbent materials (Hesian Cloth / Foam)**	Sufficient Quantity	Site Store

Reporting System for Emergency
Important Telephone Numbers of Persons at Corporate /Division Level

Local Fire Station
Private Hospital
Police Station

Appendix 10: Minutes of the Meeting

Meeting held on Dec 01, 2015 at Paribesh Bhawan, Salt Lake between officials of WBPCB, KMC and KEIIP

The following persons attended the meeting

On behalf of KEIIP & KMC			
Sl. No.	Name	Contact no	E-mail
1.	Md. G.A. Ansari	9800862246	pdkeiip@gmail.com
2.	Soumya Ganguly	9831080056	soumya.ganguly@rediffmail.com
3.	Subhajit Das Gupta	9830060382	Subhajit.Dasgupta@gmail.com
4.	Ranajit Banerjee	9831074177	rbanerjee1946@gmail.com
5.	Dr. Chinmoy Chakrabarti	9830284360	chin_moy@yahoo.com
6.	Diptarup Kahali	9051022223	Diptarup.kahali@gkw.consult.com
7.	Dr. Ardhendu Mitra	9830415953	ardhendumitra@gmail.com

On behalf of WBPCB			
Sl. No.	Name	Contact no.	E-mail
1.	Dr. Kalyan Rudra	9433507176	chairman@wbpcb.gov.in
2.	Dr. Subrat Mukherjee, IFS	9874948678	ms@wbpcb.gov.in
1.	Dr. Ujjal Mukhopadhyay	9830063508	ujjal@wbpcb.gov.in
1.	S.K. Adhikari	9830596338	shyamala@wbpcb.gov.in
2.	Sarmistha Kundu	9831165615	Sormistha @wbpcb.gov.in
3.	Ranadip Mondal	9331934875	rmondal@wbpcb.gov.in
4.	Ruby Sinha	9330869729	ruby@wbpcb.gov.in
1.	D. Sarkar	9434031887	debasarkar@wbpcb.gov.in
2.	Barna Mujumdar	9038090305	barna@wbpcb.gov.in

At the outset the officials of KEIIP and KMC explained that the purpose of their visit to WBPCB and this meeting was to apprise the Board officials about the various activities being undertaken under the Kolkata Environmental Improvement Project (KEIP) and also under the Kolkata Environmental Improvement Investment Program (KEIIP).

They mentioned that the purpose of KEIP was primarily to focus on the development and environment of the KMC Wards 1-6 and 101 to 141 which had several infrastructural deficiencies leading to frequent flooding and lack of basic urban services. The duration of the KEIP was from the year 2002 to the year 2013.

Subsequently, the second phase i.e. KEIIP started in the year 2014 and is expected to run upto 2022. The KEIIP aims at rrehabilitation of inefficient and out-dated water supply assets to minimize cost of operation, restoration and enhancement of production capacities, and reduction of water loss in distribution and construction of sewer network to newly developed areas.

They explained and indicated the different locations where the new STPs were planned for installation. During the discussion, the KMC and KEIIP officials were intimated about the new CPCB standards of Sewage Treatment Systems for implementation. A copy of the same was handed over to them for reference.

The KMC and KEIIP officials submitted that in the course of their activities under the KEIP and KEIIP, they would conform to all statutory formalities (CFE and CFO) as and when applicable. Statutory environmental obligation of KEIIP with respect to currently planned work programs including those requiring authorisation from WBPCB was presented by KEIIP which is reproduced below:

1. No Environmental Clearance (EC) under EIA Notification 2006 is required for any work packages under KEIIP

2. Under Tranche 1: Rehabilitation of WTP (20 MGD) at Palta – CTE received on 10.09.2015. CTO to be obtained before commission

3. Under Tranche 1: Rehabilitation of SSE STP - *work for ponds embankment, work on floating aerator, removal of silt & sludge from aerobic, ponds, aerated lagoons and maturation pond* – CTE and CTO exist. No change in design and capacity; therefore no fresh CTE required

4. No CTE and CTO required for other projects under Tranche 1 & 2

5. Tentative KEIIP Works Requiring WBPCB's clearance

Sr. No.	Name	Capacity	Technical summary	Status	Outfall to
1	Jiadgore STP	40 MLD	Sequential Batch Reactor (SBR)	To be applied for CTE & CTO	Keorapukur canal
2	SSE STP*	60 MLD	Facultative Aerated Lagoon (FAL)	To be applied for CTE & CTO	Churial Extension canal
3	Kalagachia & Suti STP	70 MLD	Sequential Batch Reactor (SBR)	To be applied for CTE & CTO	Churial canal
4	Bantala STP	Yet to be worked out	Sequential Batch Reactor (SBR)	To be applied for CTE & CTO	SWF Channel
5	Joka STP	Yet to be worked out	Sequential Batch Reactor (SBR)	To be applied for CTE & CTO	Keorapukur canal
6	Baghajatin STP	Yet to be worked out	Sequential Batch Reactor (SBR)	To be applied for CTE & CTO	TP system

SBR: Probable option of sewage treatment considering the minimum land requirement
* Rehabilitation & renovation (with increase in capacity)

The meeting ended after discussing the following two issues which are not directly connected with the current work program of KEIIP.

1. Wastewater treatment for the dyeing-bleaching units in and around Maheshtala, Chatta area - KEIIP officials informed that they were aware of the fact that MSME Dept. is looking into the matter and that the MSME has already identified a land which may accommodate about 200 units along with the Common Effluent Treatment Plant. It was further informed that MSME Dept. has also appointed a consultant for this purpose.
2. Unauthorised activities of leather shaving units in and around the CLC, Bantala - It was decided that the concerned stakeholders viz. KEIIP, Directorate of Industries, WBPCB, KMC and the local administration would meet on a mutually convenient date to resolve the issue.

Appendix 11: Summary of Community Consultation with Participant List

A Brief Report on Community Consultation at Ward No 143
Prantik Abasan PH-III (Community Hall)
Mahatma Gandhi Road

A Community Consultation programme was conducted on 21st December 2015 at above mentioned location for information dissemination and exchange of views for the upcoming Water Supply project under Package WS-15 to WS-17 of Tranche – II, KEIIP.

The Consultation programme was organized by the councilor Shri. Indrajit Bhattachariya, Ward No-143. The meeting was conducted in presence of Staffs of Social Safeguard Cell, KEIIP, Social Safeguard Specialist of Social Safeguard Cell, 4 female and 46 male participants (Total 50) were present during the programme. The programme continued for 1 hour. Information was exchanged regarding the project work.

Among the female participants, all were housewives. The male participants were mainly businessmen and service holders and retired persons.

Information shared on following topics:

- Introduction of KEIIP as an initiatives of Kolkata Municipal Corporation with the financial support of Asian Development Bank for arresting the degradation of environment of Kolkata and adjoining areas.
- Need and scope of work of KEIIP.
- KMC being the mother body of KEIIP is planning to undertake a Water Supply project in Joka and adjoining areas which are now at the planning stage. By virtue of this project the problem of scarcity of drinking water will be catered.
- Water supply project to be taken up as a part of the entire project at Ward No 143 under package Ws-15 to WS-17 of Tranche – II.
- 1 ESR (Overhead Tank), 1 PS (Pumping Station), 1 UGR (Underground Reservoir) has been proposed in the plan in this ward.
- Entire Plan and design has been prepared to supply house to house for 24 hrs in a day and cover the 100% area of the ward after completion of entire network.
- Availability of land in the Prantik Abasan.
- There will be no adverse impact on structures, livelihood, transportation and other utilities like electricity, water supply etc.
- Importance of Public participation and public awareness in case of short term inconvenience may take place during implementation phase of the project i.e. lying of distribution line, traffic diversion etc.
- Long term Benefits of the project.
- Phase wise implementation of the project.
- S & D work is also in the proposed plan.
- Impact of the project on environment, reducing the chance of water contamination etc.
- Tentative date for commencement and commissioning of the project.
- Necessary arrangements will be done by the project authority before commencing the work, like public information, shifting of utilities etc.
- Cooperation is needed on behalf of the local residents during project implementation phase.

Issues raised by the participants:

- The commencement of the project work and duration.
- Water logging during heavy monsoon is a big challenge for the local people.
- Quality of the water that is being supplied at present by PHE (Public Health Engineering Dept) is not up to the mark for drinking (quantity of iron is above than normal range and salinity is also present).
- Quantity of water supply is inadequate to cater the present demand.
- The residents of Prantik Abasan are very much concerned about their quality of water that is being supplied for them by PHE. They have a query whether there is any provision in the project to supply the treated water in their complex.
- Replacement of present PVC pipe which are in poor condition.
- Application of protection measures including safety during construction
- Policy of house connection in case of joint property recorded in Kolkata Municipal Corporation (erstwhile Joka gram panchayet).
- Policy regarding connection fees in case of house connection.
- Network coverage in remote part of the ward.

Design consideration in respect to raised issues and project requirement

- Work will be started very soon, within 6 months
- Sewerage and drainage package needs to be considered separately to tackle water logging
- Sufficient water will be provided as per demand and completely treated water will be supplied after treatment
- New distribution pipelines will be laid under different packages in the KEIIP program
- Design is developed with the consideration of 100% coverage and 24 hrs supply
- Application of Environment Management Plan during project implementation

Community consultation

Community Consultation
Pkg - WS - 15

Participants List

Name of place (Ward No) 143, Community Hall, Pranti Housing, Ph-III M.G. Road

Date 21/12/2015

Sl.No	Name of Participants	Contact No, if any	Signature
1	SYAMAPADA JANA	9433614271	
2	DR BHABANI KUMAR GHOSH	9883085132	
3	MADHU SUDAN GARAI	9681359755	MSGarai
4	R Raha Parf.	9831640750	
5	Samsu Safi	9088264188	Samsu Safi
6	Bijan Mondal	9883174810	Bijan Mondal
7	Malay Bagh	9433420576	Bagh
8	Dolchal Mondal	9831667158	Dolchal
9	Bichar Mondal	9007589309	Mondal
10	Khokan Dhara	9163035038	K Dhara

1 of 5

Participants List

Name of place (Ward No) 14 3

Date 21/12/2015

Sl.No	Name of Participants	Contact No, if any	Signature
11	Subhas Karmakar	7890884166	Sub Karmakar
12	Dilip Kr Biswas	9433662166	[illegible]
13	Swapan Bandyopadhyay	9432674008	[illegible]
14	Swapan Kumar Chatterjee	9433625840	SK Chatterjee
15	Tushar Bhattacharjee	9748463503	[illegible]
16	Subhash Bagh	9477350007	Bagh
17	Haran Ch Majumder	9163635771	[illegible]
18	Nilotpal Biswas	9851439842	[illegible]
19	Manatosh Dey	9331145440	MDey
20	Kakali Chakraborty	8013828153	Kakali Chakraborty

1 of 5

Participants List

Name of place (Ward No) 143

Date 21/12/2015

Sl.No	Name of Participants	Contact No, if any	Signature
21	Subhadhadar		
22	SANKAR ADHIKARY	8282859494	
23	Rakin mondal.	9837225715	
24	[illegible]	8983116145	
25	[illegible]	8981508810	
26	[illegible]	9903719594	
27	Kamal Mondal	9748556399	
28	[illegible]	9531683744	
29	[illegible]	8478082457	
30	[illegible]	81002682 66	

3 পৃষ্ঠা 5

Participants List

Name of place (Ward No)

Date

Sl.No	Name of Participants	Contact No, if any	Signature
31	Babul Mistry	9748699969	
32	[illegible]	8017472526	
33	Nimai Bar	9748447862	
34	Ajgar Ali Sahi	7890576011	
35	Debasish Bar	9836636099	
36	Asit Mondal	9038569628	
37	Babul Dari	8281173249	
38	Sanjoy Roy	9903661567	
39	[illegible]	8013581349	
40	[illegible]	8820110979	

4 of 5

Participants List

Name of place (Ward No) 143

Date: 21/12/2015

Sl.No	Name of Participants	Contact No, if any	Signature
41	Jagantla Paul	9051832686	[illegible]
42	[illegible]	9903396138	[illegible]
43	[illegible]	7278426824	[illegible]
44	Pranabchakraborty	8017455738	[illegible]
45	LAKSHMI DAS	9831091274	[illegible]
46	Mrs G. Burman	24385946	[illegible] 21/12/15
47	Nirmal Mondal		[illegible]
48	বিভুরাঁজা	9749705588	বিভুরাঁজা
49	Ramen mondal	9007128741	Ramen mondal
50	Biswajit Mondal	7685950914	

5 of 5

A Brief Report on Community Consultation at Ward No 144
Office of Borough XVI, Diamond Park

A Community Consultation programme was conducted on 19th December 2015 at above mentioned location for information dissemination and exchange of views for the upcoming Water Supply project under Package WS-15 to WS-17 of Tranche – II, KEIIP.

The Consultation programme was organized by the Councilor Smt. Shefali Pramanik, Ward No-144. The meeting was conducted in presence of Staffs of Social Safeguard Cell, KEIIP, 8 female and 54 male participants (Total 62) were present during the programme. The programme continued for 1 hour. Information was exchanged regarding the project work.

Among the female participants, all were housewives. The male participants were mainly businessmen.

Information shared on following topics:

- Introduction of KEIIP as an initiatives of Kolkata Municipal Corporation with the financial support of Asian Development Bank for arresting the degradation of environment of Kolkata and adjoining areas.
- Need and scope of work of KEIIP.
- KMC being the mother body of KEIIP is planning to undertake a Water Supply project in Joka and adjoining areas which are now at the planning stage. By virtue of this project the problem of scarcity of drinking water will be catered.
- Water supply project to be taken up as a part of the entire project at Ward No 144 under package WS-15 to WS-17 of Tranche – II.
- 1 ESR (Overhead Tank), 1 PS (Pumping Station), 1 UGR (Underground Reservoir) has been proposed in the plan in this ward.
- Entire Plan and design has been prepared to supply house to house for 24 hrs in a day and cover the 100% area of the ward after completion of entire network.
- Availability of land in WBESETCL .
- There will be no adverse impact on structures, livelihood, transportation and other utilities like electricity, water supply etc.
- Importance of Public participation and public awareness in case of short term inconvenience may take place during implementation phase of the project i.e. lying of distribution line, traffic diversion etc.
- Long term Benefits of the project.
- Phase wise implementation of the project.
- S&D work is also in the proposed plan.
- Impact of the project on environment, reducing the chance of water contamination etc.
- Tentative date for commencement and commissioning of the project.
- Necessary arrangements will be done by the project authority before commencing the work, like public information, shifting of utilities etc.
- Cooperation is needed on behalf of the local residents during project implementation phase.

Issues raised by the participants:

- The commencement of the project work and duration.
- Water logging during heavy monsoon is a big challenge for the local people.

- Absence of drainage network and Scarcity of drinking water in the area of Dhalipara, Palui Palpara, Chak Thakurani etc.
- Quality of the water that is being supplied at present by PHE (Public Health Engineering Dept) is not up to the mark for drinking (quantity of iron is above than normal range and salinity is also present).
- Application of protection measures including safety during construction
- Quantity of water supply is inadequate to cater the present demand.
- Replacement of poor PVC pipe by new one.
- Policy of house connection in case of joint property recorded in Kolkata Municipal Corporation (erstwhile Joka gram panchayet).
- Policy regarding connection fees in case of house connection.
- Network coverage in remote part of the ward.

Design consideration in respect to raised issues and project requirement

- ✓ Work will be started very soon, within 6 months
- ✓ Sewerage and drainage package needs to be considered separately to tackle water logging
- ✓ Sufficient water will be provided as per demand and completely treated water will be supplied after treatment
- ✓ New distribution pipelines will be laid under different packages in the KEIIP program
- ✓ Design is developed with the consideration of 100% coverage and 24 hrs supply
- ✓ Application of Environment Management Plan during project implementation

Community consultation

Community Consultation
Pkg - W.16

Participants List

Name of place (Ward No) 144, BZ-XVI Office

Date 19.12.2015

Sl.No	Name of Participants	Contact No, if any	Signature
1	[illegible]	7186839022	
2.	Apurba Kayal	9903104089	Akayal
3.	SKAROUSAN ALI	8013058402	SKAR
4.	[illegible]	9230297-	
5.	Rekha Barui	9836723016	R Barui
6.	Juthika Mondal	9836371011	J. mondal
7.	Sudeshna Chakraborty	9836800950	[illegible]
8.	Monoshi Kayal	9088817427	[illegible]
9.	Pallabi Pramanik	9804313152	Ppramanik
10.	Dilip Das	8420252086	D. Das

1 of 7

Spramanik (Patra)
Shefali Pramanik (Patra) 19/12/15
Councillor, Ward No. - 144
The Kolkata Municipal Corporation

Participants List

Name of place (Ward No) 144, Office of BZ-XVI

Date 19.12.2015

Sl.No	Name of Participants	Contact No, If any	Signature
11.	Goutam Mondal	9903514108	
12.	Sk Rajib	9638125646	
13.	Hari Mistry	9038213914	Hari
14.	Pramodesh Bhakta	8961634[illegible]6	Pramodesh
15.	Mahamma Pabin	8296596149	
16.	Sabita Bankar	9088842376	
17.	Sabram Thakur	8921236355	SThakur
18.	Parbin Laskar	8013492081	Laskar
19.	Bijay Das	900706513	Bijay Das
20.	[illegible]	8443927803	—

2 of 7

Shefali Pramanik (Patra) 19/12/15
Councillor, Ward No. - 144
The Kolkata Municipal Corporation

Participants List

Name of place (Ward No) 144, office of BL-XVI

Date 19.12.15

Sl.No	Name of Participants	Contact No, if any	Signature
21.	[illegible]		
22.	[illegible]	8583902937	
23.	Prabir Mondal		P.M
24.	Sanar Pawan	9748883759	[illegible]
25.	Swapankayal	9831744612	
26.	Bhakta Mondal	9831630259	[illegible]
27.	Tarun Dewan	8017494790	[illegible]
28.	[illegible]	NG	[illegible]
29.	Gautam mondal	9836859047	
30.	Rakesh Bakoria	8017926324	

3 of 7

Pramanik (Patra)
Shefali Pramanik (Patra)
Councillor, Ward No. - 144
The Kolkata Municipal Corporation

19/12/15

Participants List

Name of place (Ward No) 144, Office of BR - XVI

Date 19.12.15

Sl.No	Name of Participants	Contact No, if any	Signature
31.	Pijush Mondal.	NO	Pijush Mondal.
32.	Subir mondal	9163172870	Subir mondal
33.	Mehebub Alam Faraki	9883489175	Mehebub Alam Faraki
34.	Sujay Biswas	9836143874	Sujay Biswas
35.	Somnath Nasi	9038261346	Somnath Nasi
36.	Prosenjit Bauri	8981306232	Prosenjit Bauri
37.	Md Salim	9088490320	Md. Salim
38.	Tuman Ali	8017323348	Tuman Ali
39.	Ramesh mondal	8981888549	Ramesh mondal
40.	[illegible]	X	[illegible]

4 Nos 7

Pramanik (Patra) 19/12/15

Shefali Pramanik (Patra)
Councillor, Ward No. - 144
The Kolkata Municipal Corporation

Participants List

Name of place (Ward No) 144, Office of BR-XVI

Date 19.12.15

Sl.No	Name of Participants	Contact No, if any	Signature
41	SK RAJU	9038287558	SK RAJU
42	[illegible]		[illegible]
43	Sonali Goswami	9339100737	S. Goswami
44	Sourav Bannerjee	9147248156	
45	[illegible]	X	
46	Rajesh Banerjee	9038176016	[illegible]
47	Minta Mondal	9681398184	[illegible]
48	Debashis Mondal	8697901080	D. Mondal
49	PRABIR PATRA	9331615566	[illegible]
50	BIJAY MONDAL	8584970179	Bijoy mondal

5 to 7

Shefali Pramanik (Patra) 19/12/15

Shefali Pramanik (Patra)
Councillor, Ward No. - 144
The Kolkata Municipal Corporation

Participants List

Name of place (Ward No) 144, Office of the BL-XVI

Date 19.12.15

Sl.No	Name of Participants	Contact No, if any	Signature
51/	[illegible]	x	
52/	Dhananath Batang	9674920165	D. Batang
53/	Pramod Batang	x	P. Batang
54/	Abdul Samim	x	x
55/	Indranil [illegible]	8420904890	[illegible]
56/	Sandeep Pramanik	9903462[illegible]	[illegible]
57.	Arabinda Biswas	9874921845	[illegible]
58/	Tejesh Pramanik	9831244438	[illegible]
59/	Kurban Chakraborty	9433427332	[illegible]
60.	Geeragga Batang	9681244355	[illegible]

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Shefali Pramanik (Patra) 19/12/15
Shefali Pramanik (Patra)
Councilor, Ward No. - 144
The Kolkata Municipal Corporation

Participants List

Name of place (Ward No) 144, Office of BS - XVI

Date 19.12.15

Sl.No	Name of Participants	Contact No, if any	Signature
61	Bidhan Adhikary	9831349553	
62.	Ranjan Goswami	8013296333	

Pramanik (Patra)
Shefali Pramanik (Patra)
Councillor, Ward No. - 144
The Kolkata Municipal Corporation
19/12/15

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A Brief Report on Community Consultation at Ward No.122
KMC Ward Office (41 Pally, Haridevpore)

A Community Consultation programme was conducted on 16th December 2015 at above mentioned location for information dissemination and exchange of views for the upcoming Water Supply project under Package WS-15 of Tranche – II, KEIIP.
The Consultation programme was organized by the Councilor Smt. Soma Chkarabory, Ward No-122. The meeting was conducted in presence of Staffs of Social Safeguard Cell, KEIIP, Social Safeguard Specialist of Social safeguard Cell and Engineer (DSC/KEIIP), 36 Female and 13 male participants (Total 49) were present during the programme. The programme continued for 1 hour. Information was exchanged regarding the project work.
Among the Female participants, all were Housewives. The Male participants were mainly businessmen and Service Holders and retired persons.

Information shared on following topics:

- Introduction of KEIIP as an initiatives of Kolkata Municipal Corporation with the financial support of Asian Development Bank for arresting the degradation of environment of Kolkata and adjoining areas.
- Need and scope of work of KEIIP.
- KMC being the mother body of KEIIP is planning to undertake a Water Supply project in Joka and adjoining areas which are now at the planning stage. By virtue of this project the problem of scarcity of drinking water will be catered.
- Water supply project to be taken up as a part of the entire project at Ward No 122 under package WS-15 of Tranche – II.
- There will be no adverse impact on structures, livelihood, transportation and other utilities like electricity, water supply etc.
- Importance of Public participation and public awareness.
- Long term Benefits of the project.
- Phase wise implementation of the project.
- S&D work is also in the proposed plan.
- Impact of the project on environment, reducing the chance of water contamination etc.
- Tentative date for commencement of the project.
- Necessary arrangements will be done by the project authority before commencing the work, like public information, shifting of utilities etc.
- Cooperation is needed on behalf of the local residents during project implementation phase.

Issues raised by the participants:

- The commencement of the project work and duration.
- Water logging during heavy monsoon is a big challenge for the local people.
- Water supply and drainage problem at K. K. Road, Sodepur Brickfield Road, Dackar Bagan.
- Water supply line can be damaged during S&D work.
- Public Awareness will be required for not throwing any garbage into the “catch pits” as it blocks the main drain.
- Scarcity of drinking water is also need to be addressed.

- Application of mitigation measures including safety during construction

Design consideration in respect to raised issues and project requirement

- ✓ Work will be started very soon, within 6 months
- ✓ Sewerage and drainage package needs to be considered separately to tackle water logging
- ✓ Sufficient water will be provided as per demand and completely treated water will be supplied after treatment
- ✓ New distribution pipelines will be laid under different packages in the KEIIP program
- ✓ Design is developed with the consideration of 100% coverage and 24 hrs supply
- ✓ Water supply pipeline and S & D pipeline will be laid in different tranches



Community Consultation

Community Consultation
PKg - WS - 15

Participants List

Name of place (Ward No) 122 K.N.C. ward office M.G. Road. Kol - 41

Date 16/12/2015

Sl.No	Name of Participants	Contact No, if any	Signature
1	Debi Gir	7278119948	Debi Gir
2	Kalpana Das	9883163476	K. Das
3	[illegible]		[illegible]
4	Sabina bibi	9163540216	S. bibi
5	Ayesha Gayen		Ayesha gayen
6	Lakshmi Bibi	8961345162	Bibi
7	[illegible]	8981468445	[illegible]
8	Gouri Roy	8981172055	Gouri Roy
9	Aklima Gayen		
10	[illegible]		[illegible]

Soma Chakraborty
16/12/15

1 of 5

SOMA CHAKRABORTY
Councillor Ward No - 122
Kolkata Municipal Corporation

Participants List

Name of place (Ward No) 122

Date 16/12/2015

Sl.No	Name of Participants	Contact No, if any	Signature
11	Rakhi Das	9748478417	RDas
12	Lata Prasad	9830085444	L. Prasad.
13	Sukjan Bibi		সুকজান বিবি
14	Rinki Saha.	9433364290	Rinki Saha.
15	Subhamoy	94333588	Subhamoy
16	[illegible]		[illegible]
17	Mousumi Pal		Mousumi Pal.
18	Mousumi Ghosh	9432521698	[illegible]
19	Parthasarathi	8697721482	P. Sarathi
20	SK Sahida	9903685527	S. Sahida

Soma Chakraborty
16.12.15

SOMA CHAKRABORTY
Councillor Ward No - 122
Kolkata Municipal Corporation

2 of 5

Participants List

Name of place (Ward No)

Date

Sl.No	Name of Participants	Contact No, if any	Signature
21	Kalpana Shaha	9831766126	Kalpana Saha
22	Kalpana Dutta	9836029118	Kalpana Dutta
23	Rama Das	8697910452	Rama Das
24	Mona Saha	8820005514	Saha
25	Bulbuli Das	9874696207	Bulbuli Das
26	Rajiyara Banu	8981184744	RBanu
27	Mian	9903114598	SOSOS
28	Dipika Das	9830863257	D. Das.
29	MUKUL SARKAR	8479938933	M. SARKAR
30	~~9903146755~~ Kalpana Ganguly	9903146755	K. Ganguly.

Soma Chakraborty
16.12.15

SOMA CHAKRABORTY
Councillor Ward No - 123
Kolkata Municipal Corporation

3 of 5

Participants List

Name of place (Ward No) 122

Date 16/12/15

Sl.No	Name of Participants	Contact No, if any	Signature
31	Rinku Arch	03224028788	R. Arch
32	GOURI DAS		গৌরী দাস
33	SIMA SIL		সীমা শীল
34	PARUL BHATTACHARYA		পারুল ভট্টাচার্য
35	Sangita Kundu	9903782560	Sangita Kundu
36	DEBASHIS GANGULY	9831812022	[illegible]
37	Gowrong Day	9748250171	[illegible]
38	[illegible]	9433221115	[illegible]
39	Swapna Mondal	8282857594	S. Mondal.
40	Jhuma Naskar	9051920836	J. Naskar

Soma Chakraborty
16.12.15

4 of 5

SOMA CHAKRABORTY
Councillor Ward No - 122
Kolkata Municipal Corporation

Participants List

Name of place (Ward No) 122

Date 16/12/2015

Sl.No	Name of Participants	Contact No, if any	Signature
41	Ranjit Kumar Ray	9163916902	RKRay
42	গোপাল অধিকারী	8961450971	গোপাল অধিকারী
43	Bappa Ghosh	9804748273	[illegible]
44	[illegible]	9748046982	[illegible]
45	ASHOKE SARKAR	9830137611	Ashoke Sarkar
46	Sujoy Pyne	8420156076	[illegible]
47	অলকা রায়		A. Roy
48	কৃষ্ণা মাইতি	9331471150	কৃষ্ণা মাইতি
49	Dipankar Shil	9007964110	[illegible]
50			

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Soma Chakraborty
16. 12. 15

SOMA CHAKRABORTY
Councillor Ward No - 122
Kolkata Municipal Corporation

Summary of Consultations with Stakeholders- Package: WS 25

DATE	LOCATION	NO OF PARTICIPANTS				STATUS OF PARTICIPANTS	TOPIC DISCUSSED	ISSUES RAISED
		MALE	FEMALE	% of Female	TOTAL			
21.03.17	Patuli (people joined from other project areas)	12	8	40%	20	Female : Housewives and SHG members Male : Servicemen and retired person	1. Introduction of KEIIP as an initiatives of Kolkata Municipal Corporation with the financial support of Asian Development Bank 2. Need and scope of work of KEIIP. 3. Laying of new pipes & replacement of old supply lines. 4. No impact on Structure, livelihood& transportation. 5. Short term impact on air quality- dust generation, noise level, access problem, inconvenience for public and movement of vehicle 6. Public participation required for successful implementation of the project work.	1. Public awareness through mass campaigning on 24x 7 water supply. 2. Identification & short listing of consumers having high requirement of water especially the commercial units. 3. Digging within the consumer premises shall be completed in a day's time. 4. Residents Welfare Association (RWA) / notified societies shall be informed about time schedule for digging & restoration work within the colony. 5. Application of mitigation measures as per EMP to mitigate short term impact 6. Formation and sustainability of user group for water stand posts is a challenging task for the community representatives until they are trained properly.

Photographs of Community Consultation at Patuli

Signature of Participants of Community Consultation

Participants List

Name of place (Ward No) Patuli

Date 21.03.17

Sl.No	Name of Participants	Contact No, if any	Signature
1	Prosenjit Mondal	9836464346	P. Mondal
2	Biplab KV. [illegible]	9804910883	[illegible]
3	Biswajit Bhowmick	9903597129	[illegible]
4	Sreebash	9830447104	[illegible]
5	Sirna Dutta Roy	9674480587	BR
6	Barnali Sengupta	8013663455	[illegible]
7	RAKHI DUTTA (Bhattacharya)	9748199272	[illegible]
8	Ramu Samyal	9831425991	RSamyal
9	Anshendu Biswas	9635197623	Biswas
10	Mamata Rajbanshi	9038057587	M. Rajbanshi

Participants List

Name of place (Ward No) Partuli

Date 27.03.17

Sl.No	Name of Participants	Contact No, if any	Signature
11	Kakali Pramanik	9804242227	[illegible]
12	Maoya Murmu.	8017658442	M.M.
13	Shyamali Halder	9903237444	S. Halder
14	Susmita Das.	7687097853	[illegible]
15	Anjana Sahoo	7278554887	A. Sahoo.
16	Ashim Das	9038703699.	A. Das.
17	Nibedita Paul	7278884642	N. Paul
18	Rinku Nayak	9007770993	[illegible]
19	ANUP GUPTA	9007715670	[illegible]
20	Sambhu Das	9163467510	Sdas

Appendix 12: Grievance Redressal Mechanism of KEIIP – Approval notice

GRIEVANCE REDRESSAL MECHANISM OF KEIIP WORKS

- Display of address of Contractors' site office at all work locations.
- At Contractors' site office Complaint & Suggestion Books are to be made available for lodging any complaint. The concerned Executive Engineer of KEIIP to periodically monitor these Books and take necessary actions for redressal with intimation to the complainant.
- At every Borough under which works are under progress, a Public Relation & Grievance Redressal Unit, comprising of a few KEIIP staff to be established for availing detailed information of the works, registering of complaint and act as Liaison for its redressal under intimation to the complainant.
- In KEIIP office at 206, A.J.C. Bose Road, Kolkata – 700 017, the Administrative Officer, KEIIP will be In-charge of the grievance redressal matters under the Project Director.
- Complaints may also be lodged through KEIIP website and KMC website.
- Through KMC WhatsApp no. 8335988888, all complaints relating to KEIIP will be sent to the Project Director, KEIIP for redressal.
- A Grievance Redressal Committee (GRC) has been constituted consisting of :

1)	Administrative Officer, KEIIP	- Member
2)	Dy. C.E.(I), KEIIP	- Member
3)	Social Safeguard Specialist, KEIIP	-Member
4)	Environmental Specialist, KEIIP	-Member
5)	Special Officer (Coord.), KEIIP	- Member Secretary (Convener)
6)	Team Leader, DSC, KEIIP	- Member

under the Project Director, KEIIP for regular monitoring of the entire process.

TL/DSC may consider 'X' above.

Dt. 12.08.2015

TL/DSC
AO
CO/C

As proposed. AO & SO/C will please also take necessary action as proposed above.

12/8/15

12/8/15

Appendix 13. Sample Grievance Registration Form

(To be available also in Bengali, Hindi and Urdu)

The _____Project 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)	
Mode of communication: 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:	

Appendix 14: Monthly Environmental Monitoring Report - Format

ENVIRONMENTAL MONITORING AND EVALUATION

MONTHLY ENVIRONMENTAL COMPLIANCE MONITORING FORMAT FOR SUB-PROJECT

SECTOR:
MONTH/YEAR:
PROJECT (PACKAGE):
WORKING LOCATION:
DATE OF OBSERVATION:
NAME OF THE MONITORING PERSON FROM DSC (Designation):

Sr. No.	Environmental Issues	Level of application of EMP					Suggestion / Remarks
		Poor	Below Satisfactory	Partially satisfactory	Satisfactory	Excellent	
1.	**Mitigation/protection of Land Environment**						
1a	Proper storage of construction materials and petroleum products – avoidance of land pollution						
1b	Conservation of top soil						
1c	Proper disposal of unusable soils and spoils to pre-approved disposal sites						
1d	Storm water control and wind screening to prevent soil loss from the site.						
2.	**Mitigation/protection of Air Environment**						
2a	Water sprinkling at construction site for arresting dust (if any during dry period)						
2b	Cover or damp down sand stockpiled at site						
2c	Utilize screen by using wooden supports and shade cloth where dust is unavoidable in residential/ commercial /sensitive receptors areas						
2d	Keep vehicles and machinery in good working order and meet manufacturers specifications for safety, fuel consumption etc						
2e	Covering of materials carrying vehicles-reducing dust hazard						
2f	Vehicles and Equipments having Pollution Under Control Certificate						
2g	No fires are allowed on site						
2h	Carrying out air quality						

Sr. No.	Environmental Issues	Level of application of EMP					Suggestion / Remarks
		Poor	Below Satisfactory	Partially satisfactory	Satisfactory	Excellent	
	monitoring						
3.	**Mitigation of Noise**						
3a.	Regular maintenance of noise producing equipment						
3b.	At sensitive locations enclosures provided around generator set and other noise producing machinery						
3c.	Use of ear plug by the workers at noise generating location						
3d	Locate concrete batching, asphalt, crushing plants, lay down areas and construction camps away from sensitive receptors						
3e	Plan construction activities to reasonable working hours where near sensitive receptors.						
3f	Fit and maintain silencers to all machinery on site						
3g	Monitor noise levels in potential problem areas						
4.	**Mitigation/protection of Water Environment**						
4a.	Protection of water bodies nearby the project site by application of suitable mitigation measures- not to discharge waste water in nearby water body						
4b	Chemicals or hazardous substances do not contaminate the water body, or groundwater on site.						
5.	**Mitigation/protection of Biological Environment**						
5a	Vegetation clearing and tree-felling have prior permission as the work front progresses.						
5b.	Plant and maintain five trees for every one removed- in case of tree felling (if any)						
5c	Clearing of indigenous vegetation is kept in a nursery for use at a later stage (such as site rehabilitation process)						
6.	**Mitigation of Socio-economic Environment**						
6a.	Level of mitigation measures for local people-						

Sr. No.	Environmental Issues	Level of application of EMP					Suggestion / Remarks
		Poor	Below Satisfactory	Partially satisfactory	Satisfactory	Excellent	
	placement of caution tape and barricade at excavated area						
6b.	Avoidance of pick traffic hour for carrying of materials like pipe						
6c.	Arrangement of employment at least 50% of workforce from communities near sites						
7.	**Mitigation of overall environment, safety and health**						
7a.	Use of Personal Protective Equipment like helmet, gumboot, gloves, nose mask, safety belt and earplugs at working place						
7b.	Provision of warning signs of hazardous working areas						
7c.	Visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas						
7d.	Maintaining safety during movement of equipment						
7e	Arrangement of First Aid box and fire extinguisher at Labour camp and site office and First Aid box at all working sites						
7f	Use of modern vehicles and machinery and maintain as specified						
7g.	Demarcation of excavations and provide barriers (not just danger tape) to protect pedestrians from open trenches.						
7h.	Enclosure at construction site						
7i	Placement of public information board with mention of safety requirement at working places						
7j	Boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage						
8	**Material Management**						

Sr. No.	Environmental Issues	Level of application of EMP					Suggestion / Remarks
		Poor	Below Satisfactory	Partially satisfactory	Satisfactory	Excellent	
8a	Storage of stockpiles. Stockpiles do not obstruct natural water pathways						
8b	Exposure of stockpile to windy conditions or heavy rain with vegetation, cloth, or tarps.						
8c	Proper transportation of hazardous materials						
9	**Camp site Management**						
9a	Camp and working areas are kept clean and tidy						
9b	Proper drainage of the camp site						
9c	Discharge into neighbours' properties.						
9d	Maintenance of toilets in a clean state						
9e	Maintenance of eating area						
9f	Arrangement of solid waste collection bin, dispose wastes at the pre-approved sites						
9g	Collection of litter from the work and camp areas						
8.	**Mitigation of Sensitive environment**						
8a.	Level of protection at religious, cultural and historic sites if any nearby						
8b.	Maintaining working schedule by avoiding sensitive time						

Note: Put √ mark in EMP application column

Remarks column need to be filled up considering present state along with suggestion and site photos

For each sub-project monitoring should be done at all the working sites
Suggestion should be provided against EMP application level
In case of non applicable – please write NA/NR in Remarks column

(Name & Signature of monitoring person of DSC)

(Name & Signature of Safety Officer of Contractor)

(Name and Signature of TL/Dy TL DSC/ Environment Specialist of DSC)

(Name & Signature of Environment Specialist of PMU)

Appendix 15. Environmental Monitoring Format - Semi Annual

I. INTRODUCTION

A. Background

- Overall project description, objectives and outputs

B. Report purpose

- Environmental category of the sub-projects

II. IMPLEMENTATION PROGRESS

A. Status of Subprojects

- Description and Status of sub project- under implementation or to be awarded

Summary of Subprojects

Sr. No.	Package No.	Components	Status

Status of Awarded Sub-project Under the Program

Package No.	Component	Start Date	Number of Days/Months to Complete Work	Target date of complet ion	% Physical Progress on report date	Works Completed on report date

B Compliance of Safeguard Loan Covenants

- Table provides a summary of compliance to the loan covenants related to environmental safeguards.

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

C Implementation Arrangement

- Implementation arrangement of environment monitoring
- Responsibility of contractor, project management authority and design and monitoring consultant
- Detail safeguard team of the project

III. ENVIRONMENTAL PROCEDURE REVIEW

A. Environmental Legal Requirement

- Provides a list of national and state laws, rules, policies and regulations applicable to program

Environmental Legal Requirements Applicable to Specific Project

Component	Applicable Legislation	Compliance	Action Required

B. Compliance with Environmental Legal Requirements

- Describe present status of Environment, forest and other clearances are mentioned below.

Status of Compliance with National and State Legal Requirements upto report period

Package	Main package work	National and State Legal Requirement	Status	Conditions of the Clearance/NOCs

IV. COMPLIANCE STATUS WITH THE ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

- There should be reporting on the following items which can be incorporated in the checklist of routine Environmental Site Inspection Report followed with a summary in the semi-annual report send to ADB. Visual assessment and review of relevant site documentation during routine site inspection needs to note and record the following:

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

Package wise compliance status as per site specific EMP. Blank sample monitoring table as follows,

Blank Summary Monitoring Table –Water supply sub project

A. Pre-construction Stage

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
Legislation, Permits and Agreements	In all instances, KMC, service providers, contractors and consultants must remain in compliance with relevant local and national legislation. DSC to obtain statutory clearances and permits from government agencies/other entities Contractor to submit proof of compliance to Air Act (in relation to hot mixing, stone crushers, diesel generators) A copy of the EMP/approved SEP must be kept on site during the construction period						
Utilities/Tree cutting	(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						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	services. (iii) Collection of tree cutting permission (if any) with assistance PMU/DSC						
Traffic Management	(i) Prepare a short traffic management schedule during preconstruction phase.						
Access to the site	Access to site will be via existing roads. The Contractor will need to ascertain the existing condition of the roads and repair damage shall not occur due to construction. For accessing reservoir sites within SSE STP haul road to be constructed The location of all affected services and servitudes must be identified and confirmed. All roads for construction access must be planned and approved ahead of construction activities. They shall not be created on an ad-hoc basis. No trees/shrubs/ groundcover may be removed or vegetation stripped without the prior permission. Contractors shall construct formal drainage on all temporary haulage roads in						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	the form of side drains and miter drains to prevent erosion and point source discharge of run-off.						
Setting up of Construction Camp[25]	Choice of site for the contractor's camp requires the DSC Environment Specialist's permission and must take into account location of local residents, businesses and existing land uses, including flood zones and slip / unstable zones. A site plan must be submitted to the DSC Environment Specialist for approval. If the Contractor chooses to locate the camp site on private land, he must get prior permission from both the DSC Environment Specialist and the landowner. In most cases, on-site accommodation will not be required. The construction camp can thus be comprised of: • site office • toilet facilities • designated first aid area • eating areas • staff lockers and showers						

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

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	(where water and waterborne sewers are available) • storage areas • batching plant (if required) • re-fuelling areas (if required) • maintenance areas (if required) • crushers (if required) Cut and fill must be avoided where possible during the set up of the construction camp. The contractor shall make adequate provision for temporary toilets for the use of their employees during the construction phase. Such facilities, which shall comply with local authority regulations, shall be maintained in a clean and hygienic condition. Their use shall be strictly enforced. Under no circumstances may open areas or the surrounding bush be used as a toilet facility. Bins and/or skips shall be provided at convenient intervals for disposal of waste within the construction camp.						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	Bins shall have liner bags for efficient control and safe disposal of waste Recycling and the provision of separate waste receptacles for different types of waste shall be encouraged.						
Establishing Equipment Lay-down and Storage Area[26]	Choice of location for equipment lay-down and storage areas must take into account prevailing winds, distances to adjacent land uses, general on – site topography and water erosion potential of the soil. Impervious surfaces must be provided where necessary Storage areas shall be secure so as to minimize the risk of crime. They shall also be safe from access by children It is very important that the proximity of resident is taken into account when deciding on storage areas for hazardous substances or materials. Residents living adjacent to the construction site must be notified of the existence of the hazardous storage are						

[26] Storage areas can be hazardous, unsightly and can cause environmental pollution if not designed and managed carefully

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	Equipment lay-down and storage areas must be designated, demarcated and fenced if necessary. Fire prevention facilities must be present at all storage facilities Proper storage facilities for the storage of oils, paints, grease, fuels, chemicals and any hazardous materials to be used must be provided to prevent the migration of spillage into the ground and groundwater regime around the temporary storage area(s). These storage facilities (including any tanks) must be on an impermeable surface that is protected from the ingress of storm water from surrounding areas in order to ensure that accidental spillage does not pollute local soil or water resources Fuel tanks must meet relevant specifications and be elevated so that leaks may be easily detected. Material Safety Data Sheets (MSDSs) shall be readily available on site for all						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	chemicals and hazardous substances to be used on site. Staff dealing with these materials/substances must be aware of their potential impacts and follow the appropriate safety measures. Contractors shall submit a method statement and plans for the storage of hazardous materials and emergency procedures.						
Materials Management – Sourcing[27]	Contractors shall prepare a source statement indicating the sources of all materials (including sands, natural gravels, crushed stone, asphalt, clay liners etc), and submit these to the DSC Environment Specialist for approval prior to commencement of any work. Where possible, a signed document from the supplier of natural materials shall be obtained confirming that they have been obtained in a sustainable manner and in compliance with relevant legislation Where materials are						

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

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	borrowed (mined), proof must be provided of authorization to utilize these materials from the landowner/material rights owner and the Department of Minerals						
Social impacts	Open liaison channels shall be established between the site owner, the developer, operator, the contractors and interested and affected people such that any queries, complaints or suggestions can be dealt with quickly and by the appropriate person(s). Advance road signage indicating the road detour and alternative routes. Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints. Storage facilities, elevated tanks and other temporary structures on site shall be located such that they have as little visual impact on local residents as possible. In areas where the visual environment is particularly important or privacy concerns for surrounding buildings exist, the site may require screening. This could be in						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	the form of shade cloth, temporary walls, or other suitable materials prior to the beginning of construction.						
Noise impacts	Construction vehicles/ equipments are be to fitted with standard silencers prior to the beginning of construction Equipment that is fitted with noise reduction facilities (e.g. side flaps, silencers, etc) will be used as per operating instructions and maintained properly during site operations						
Dust/ air pollution	Vehicles travelling along the access roads must adhere to speed limits to avoid creating excessive dust. Camp construction / haulage road construction – areas that have been stripped of vegetation must be dampened periodically to avoid excessive dust. The Contractor must make alternative arrangements (other than fires) for cooking and / or heating requirements. LPG gas cookers may be used provided that all safety regulations are followed.						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
Storm water	To prevent storm water damage, the increase in storm water run-off resulting from construction activities must be estimated and the drainage system assessed accordingly. A drainage plan must be submitted to the DSC Environment Specialist for approval and must include the location and design criteria of any temporary stream crossings (siting and return period etc). During site establishment, storm water culverts and drains are to be located and covered with metal grids to prevent blockages if deemed necessary by the DSC Environment Specialist. (e.g. due to demolition work). Temporary cut off drains and berms may be required to capture storm water and promote infiltration.						
Water quality	Storage areas that contain hazardous substances must be bunded with an approved impermeable liner Spills in bunded areas must be cleaned up, removed and disposed of safely from the bunded area as soon after						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	detection as possible to minimise pollution risk and reduced bunding capacity. Provision shall be made during set up for all polluted runoff to be treated to the DSC Environment Specialist's approval before being discharged into the storm water system. (This will be required for the duration of the project.)						
Conservation of Natural Environment	No vegetation may be cleared without prior permission from the DSC Environment Specialist. Trees that are not to be cleared shall be marked beforehand with danger tape. The PMU Environment Specialist must be given a chance to mark vegetation that is to be conserved before the Contractor begins clearing the site Care must be taken to avoid the introduction of alien plant species to the site and surrounding areas. (Particular attention must be paid to imported material)						
Set-up of Waste Management	The excavation and use of rubbish pits on site is						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
Procedure	forbidden Burning of waste is forbidden.						
Cultural Environment	Prior to the commencement of construction, all staff need to know what possible archaeological or historical objects of value may look like, and to notify the DSC Environment Specialist/Contractor shall such an item be uncovered.						

DSC = Design Supervision Consultant, PMU = Project Management Unit

B. Construction Stage

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
Climate	Consider seasonal climatic variations during scheduling of construction activities in the area. Do excavations and other clearing activities only during agreed working times and permitted weather conditions. Implement storm water control as per method approved by PMU. No open fires permitted on site						
Air Quality	Guidelines that deal with						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	the control of air pollution and dusts on site have been outlined in the Environmental Management Plan (EMP) Ensure compliance with the Air Act. Ensure compliance with emission standards Undertake monitoring of air pollution levels in potential problem areas. Manage (including storage, transport, handling and disposal) hazardous substances used. Avoid dust generating construction activities during strong winds. Cover soil loads in transit. Cover stockpiles of soil or apply suitable dust palliative such as water or commercial dust suppressants. Regularly service vehicles off-site in order to limit gaseous emissions. No open fires permitted on site						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	Place portable toilets on-site and maintain on a daily basis.						
Geology and soil	The design of the site drainage system is adequate to control runoff from the micro-tunnels and open areas in line with topographical features of the site. Rehabilitate all sites during construction including construction camps, stockpile area, temporary access and hauling routes, as soon as possible after the disturbance has ceased. Contractor to exercise strict care in the disposal of construction waste, with proof of disposal at an approved site provided after offloading each waste load and this logged/registered. Contain contaminated water and dispose off site at an approved disposal site in consultation with WBPCB. Dispose of waste from the oil interceptors only						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	through suitable waste-handling contractor and request for safe disposal certificates. Mix cement, concrete and chemicals on a concrete plinth and contain spillages or overflows into the soil. Do not allow vehicle maintenance on site. If oil spills occur, dispose contaminated soil at a disposal site in consultation with WBPCB. Stockpile subsoil and overburden in all construction and lay down areas. Protect topsoil and subsoil from contamination. Return for backfilling in the correct soil horizon order.						
Infrastructure and service	Undertake utility shifting prior to commencing pipe laying Keep construction-related disturbances to a minimum. Consult with affected service providers regarding impacts on access to infrastructure and services and alternatives.						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	Consult with affected communities or businesses prior to foreseeable disruptions, for example notifying residents of a temporary severance of water supply. Provide backup or alternative services during construction-related disruptions, for example by providing generators for power supply. Provide access points to infrastructure and services. Monitor complaints by the public.						
Traffic	Reroute traffic and close roads according the Traffic Management Plan (TMP). The objective of the TMP is to ensure safety of all the road-users along the work zone and to address: (i) protection of work crews from hazards associated with moving traffic; (ii) mitigation of the adverse impact to the road capacity and delays to the road-users; (iii) maintenance of access to adjoining properties; and (iv) issues that may delay the subproject works. Negotiate with privately-						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	owned public transport operators regarding the affected public transport facilities and routing. Negotiate with business owners and social service operations regarding the loss of parking and loading bays. Clear roads signs will be erected for the full length of the construction period. Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints. Ensure the City Traffic Police will be available on site. Communicate road closure together with the proposed detour via advertising, pamphlets, radio broadcasts, road signage, etc. The implementation of the road detour is also dependent on advance road signage indicating the road detour and alternative routes. Define clearly construction routes. Strictly control access of all construction and material delivery vehicles.						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	Enforce speed limits. Do not allow deliveries during peak traffic hours						
Drainage and hydrology	The site surface has been engineered and shaped in such a way that rapid and efficient evacuation of runoff is achieved. Provide containment areas for potential pollutants at construction camps, refueling, depots, asphalt plants and concrete batching plants. Implement waste management practices. Control and manage transport, storage, handling and disposal of hazardous substances.						
Biodiversity Fauna and Flora	Permission will be obtained (if required) from the PMU for the cutting/felling of trees prior to start of civil works. Ensure any landscaping to be undertaken will be done with locally indigenous species and low maintenance requirements.						
Land uses	PMU has consulted with various organizations, departments, etc within the area and will be						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	continued during the construction phase. Put a sign of “Keep Clear” near critical roads (e.g. in front of fire and police stations and hospitals). Consult with local departments, organizations, etc regarding location of construction camps, access and hauling routes, and other likely disturbances during construction. Provide clear and realistic information regarding detours and alternative accesses for local communities and businesses in order to prevent unrealistic expectations. Provide clear and realistic information regarding employment opportunities and other benefits for local communities in order to prevent unrealistic expectations. Make use of local labor, materials, goods and services as far as possible Provide walkways and metal sheets where required to maintain access across for people						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	and vehicles. Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools.						
Health and Safety	Implement good housekeeping practices at the construction camp. Strictly implement health and safety measures and audit on a regular basis. Secure enclosed construction site. Use reputable contractors. Provide warning signs of hazardous working areas. Clearly demarcate excavations and provide barriers (not just danger tape) to protect pedestrians from open trenches. Thoroughly train workers assigned to dangerous equipment. Workers have the right to refuse work in unsafe conditions. Control speed and						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	movement of construction vehicles Exclude public from the site Ensure all workers are provided with and use Personal Protective Equipment. Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas Ensure that qualified first-aid can be provided at all times. Ensure equipped first-aid stations are easily accessible throughout the site; Provide medical insurance coverage for workers. Provide clean eating areas where workers are not exposed to hazardous or noxious substances; 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						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	enter hazard areas unescorted; Ensure moving equipment is outfitted with audible back-up alarms; Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate.						
Noise and Vibrations	Locate concrete batching, asphalt, crushing plants, lay down areas and construction camps away from sensitive receptors. Restrict construction activities to reasonable working hours where near sensitive receptors. Keep adjacent landowners informed of unusually noisy activities planned.						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	Regulate roadworthiness of vehicles. Ensure that machinery in a good state of maintenance. Fit and maintain silencers to all machinery on site. Monitor noise levels in potential problem areas.						
Aesthetics, Landscape Character, and Sense of Place	Properly fence off storage areas. Collect all domestic solid waste central point of disposal and feed into the city waste collection system. Contractor to exercise strict care in disposing construction waste. Identify suitable waste disposal site with enough capacity to hold additional waste to be generated by the construction activities. Retain mature trees on and around the site where possible. Remove unwanted material and litter on a frequent basis.						
Workers Conduct	Ensure strict control of laborers Minimize working hours to normal working times Control littering						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	Ensure no overnight accommodation is provided.						
Employment Generation	Employ local (unskilled) labor if possible Training of labor to benefit individuals beyond completion of the subproject. Ensure recruitment of labors will take place offsite. Ensure at least 50% of all labor is from surrounding communities in the contractual documentation.						
Archaeological and Cultural Characteristics	Ensure that construction staff members are aware of the likelihood of heritage resources being unearthed and of the scientific importance of such discoveries. Contact ASI or the State Department of Archaeology if any graves be discovered and all activities will be ceased until further notice. Contact ASI or the State Department of Archaeology if any heritage resources or objects, defined in the Act, be discovered and all activities will be ceased						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	until further notice. Cease all activities immediately and do not move any heritage object found without prior consultation with ASI or the State Department of Archaeology No structures older than 100 years will be allowed to be demolished, altered or destructed without a permit from ASI or the State Department of Archaeology.						

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

C. Defects Liability Stage

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
Air Quality	Ensure compliance with the Air Act. Ensure compliance with emission standards Regularly service vehicles off-site in order to limit gaseous emissions.						
Biodiversity Fauna and Flora	Ensure no accidental damage to local flora and fauna.						
Land Uses	Put a sign of “Keep Clear”						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	near critical roads (e.g. in front of fire and police stations and hospitals). Consult with local departments, organizations, etc regarding location of construction camps, access and hauling routes, and other likely disturbances. Provide clear and realistic information regarding detours and alternative accesses for local communities and businesses in order to prevent unrealistic expectations. Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools. Consult businesses and institutions regarding operating hours and factoring this in work schedules. Provide sign boards for pedestrians to inform nature and duration of construction works and						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	contact numbers for concerns/complaints.						
Health and Safety	Implement good housekeeping practices at pumping stations. Strictly implement health and safety measures and audit on a regular basis. Provide warning signs of hazardous working areas. Clearly demarcate excavations and provide barriers (not just danger tape) to protect pedestrians from open trenches. Thoroughly train workers assigned to dangerous equipment. Workers have the right to refuse work in unsafe conditions. Ensure all workers are provided with Personal Protective Equipment. Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas Ensure that qualified first-						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	aid can be provided at all times. Ensure equipped first-aid stations are easily accessible throughout the site; Provide medical insurance coverage for workers. Provide clean eating areas where workers are not exposed to hazardous or noxious substances; Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted; Ensure moving equipment is outfitted with audible back-up alarms; Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards						

Field	Mitigation Measures	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name and Designation of Person Who Conducted the Monitoring	Compliance status
	and be well known to, and easily understood by workers, visitors, and the general public as appropriate.						
Noise and Vibrations	Restrict maintenance activities to reasonable working hours where near sensitive receptors. Keep adjacent landowners informed of unusually noisy activities planned. Fit and maintain silencers to all machinery on site. Monitor noise levels in potential problem areas.						
Workers Conduct	Ensure strict control of laborers Minimize working hours to normal working times Control littering						

V. ENVIRONMENTAL MONITORING AND EVALUATION

- Provide the monitoring results as per the parameters outlined in the EMP. Append supporting documents where applicable, including Environmental Site Inspection Reports.

Ambient Air Quality Monitoring Data at working sites

Package	Monitoring location	Monitoring stage	Date of monitoring	Parameters				
				SO_2 µg/m^3	NO_2 µg/m^3	$PM_{2.5}$ µg/m^3	PM_{10} µg/m^3	HC µg/m^3

Noise Level Monitoring Data at Working Sites

Package	Sampling Locations	Implementation Stage	Date of Monitoring	Day Time Leq dB(A)	Night Time Leq dB(A)

Water quality monitoring data as per standard parameters

- Comparison of during construction data with base line data
- Mitigation measures against impact
- Performance monitoring

Table for Performance Fact Sheet for Required Environmental Consents/Clearances of the project

	Package	Name of Contractor	EMP Part of contract Document(Yes / No)	Environmental Consents / Clearances Required					
				Tree Cutting	Crusher	Batching Plant	Hot Mix Plant	Diesel Generator Set	Pollution Under Control (PUC) Certificates for Contractor's Vehicles

Table for Performance Fact Sheet for EMP Implementation of the project

	Package Number	Name of Contractor	EMP Part of contract Document (Yes / No)	Contract or Social/ Environment Person	Overall Status of EMP Implementation	Field to be Monitored as per EMP												
						Source of Materials	Camp Sites	Landscape and Aesthetics	Air Quality	Noise Level	Traffic	Ecological Resources – Terrestrial	Accessibility	Water Quality	Occupational Health & safety	Community Health & safety	Socio cultural resources	Employment generation
					In compliance (2) / Partial Compliance (1) / Not in compliance (0) / Not applicable (n/a)													

VI. CONSULTATIONS AND DISCLOSURES CONDUCTED

- Detail of consultation done during project implementation and proposed schedule of consultation
- Detail of training conducted

VII. GRIEVANCE REDRESSAL

- Detail of grievances recorded and cases resolve

VIII. FINDINGS AND RECOMMENDATIONS

- Based on site observation and document check corrective action plan to be drawn

Table Corrective Action Plan

	Non-compliance	Action Required	Responsible	Target Date	Indicator of Compliance

Appendix of the Report-

Location map of the project area

Implementation schedule

Photo Illustration of project locations covering EMP compliance

Site specific EMP

Spoil Management Plan

Air, noise, water quality data – monitoring test report certificate

Site specific Health & Safety plan
Records of trainings conducted during training period
Workers insurance certificate
Availability of labour work package wise
Tree felling permission or other relevant NOC
Traffic Management plan
Environment, health and safety budget
Public consultation during project implementation
Sample Grievance Registration Form

SAMPLE ENVIRONMENTAL SITE INSPECTION REPORT

Project Name:
Contract Number:
Name: _____ Date: _____
Title: _____ DMA: _____
Location: _____ Group: _____
Weather Condition: _____
Initial Site Condition: _____

Concluding Site Condition:
Satisfactory _____ Unsatisfactory _____ Incident _____ Resolved _____ Unresolved _____

Incident:
Nature of Incident:
_____

Intervention Steps:
_____

Incident Issues

Project Activity Stage	Survey	
	Design	
	Implementation	
	Pre-Commissioning	
	Guarantee Period	

Inspection

Emissions	Waste Minimization
Air Quality	Reuse and Recycling
Noise pollution	Dust and Litter Control
Hazardous Substances	Trees and Vegetation

Site Restored to Original Condition Yes ☐ ☐

Signature _____
Name Name

SAMPLE CHECKLIST FOR CONSTRUCTION SAFETY

Sl. No.	Safety Issues	Yes	No	Non-Compliance	Corrective Action	Penalty	Remarks
1	Appointment of qualified construction safety officers						
2	Approval for construction safety management plan by the SC						
3	Approval for traffic management/control plan in accordance with IRC: SP: 55-2001						
4	Maintenance of the existing road stretches handed over to the contractor.						
5	Provision of temporary traffic barriers/barricades/caution tapes in construction zones						
6	Provision of traffic signboards						
7	Provision for flags and warning lights						
9	Providing plastic crash barrier						
10	Provision of adequate staging, form work, and access (ladders with handrail) for works at a height of more than 3 m						
11	Provision of adequate shoring / bracing/barricading/lighting for all deep excavations of more than 3 m depth.						
12	Demarcations (fencing, guarding, and watching) at construction sites						
13	Provision for sufficient lighting, especially for						

Sl. No.	Safety Issues	Yes	No	Non-Compliance	Corrective Action	Penalty	Remarks
	night time work						
14	Arrangements for controlled access and entry to construction zones						
15	Safety arrangements for road users/pedestrians						
16	Arrangements for detouring traffic to alternate facilities						
17	Regular inspection of work zone traffic control devices by authorized contractor personnel						
18	Construction workers' safety - Provision of personnel protective equipment						
19	A. Helmets						
	B. Safety shoes						
	C. Dust masks						
	D. Hand gloves						
	E. Safety belts						
	F. Reflective jackets						
	G. Earplugs for labour						
20	Workers employed on bituminous works, stone crushers, concrete batching plants, etc. provided with protective goggles, gloves, gumboots, etc.						
21	Workers engaged in welding work shall be provided with welder protective shields						
22	All vehicles are provided with reverse horns.						
23	All scaffolds, ladders, and other safety devices shall be maintained in safe and sound						

Sl. No.	Safety Issues	Yes	No	Non-Compliance	Corrective Action	Penalty	Remarks
	condition.						
24	Regular health check up for labor/ contractor's personnel						
25	Ensuring sanitary conditions and all waste disposal procedures and methods in the camps.						
26	The contractor shall provide adequate circuit for traffic flow around construction areas, control speed of construction vehicles through road safety and training of drivers, provide adequate signage, barriers, and flag persons for traffic control						
27.	Provision of insurance coverage for the contractor's personnel						

Contractor

Consultant