Initial Environmental Examination

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IND: Kolkata Environmental Improvement Investment Program (Tranche 3) – Sewerage and Drainage Network (SD34)

Package No. SD34/2017-18: Construction of Pumping Stations at Lalababu Nikashi/Bagjola Canal and Sakuntala Park, Behala at Node C Premises

Prepared by Kolkata Municipal Corporation, Government of West Bengal for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 20 July 2018)

Currency Unit	=	Indian rupee (₹)
₹1.00	=	$0.014
$1.00	=	₹68.94

ABBREVIATIONS

ADB		Asian Development Bank
ASI	-	Archaeological Survey of India
BOD	-	biochemical oxygen demand
COD	-	chemical oxygen demand
CPCB	-	Central Pollution Control Board
CTE	-	consent to establish
CTO	-	consent to operate
DSC	-	design and supervision consultant
DWF		dry weather flow
KMC	-	Kolkata Municipal Corporation
EARF	-	environmental assessment and review framework
EIA	-	environmental impact assessment
EKW	-	East Kolkata Wetlands
EMP	-	environmental management plan
GRC	-	grievance redress committee
GRM	-	grievance redress mechanism
IEE	-	initial environmental examination
KEIP	-	Kolkata Environmental Improvement Project
KEIIP		Kolkata Environmental Improvement Investment Program
MFF	-	multitranche financial facility
NIOSH	-	National Institute of Occupational Health
O&M	-	operation and maintenance
PMC	-	program management consultant
PMU	-	program management unit
REA	-	rapid environmental assessment
ROW	-	right-of-way
S&D	-	sewerage and drainage
SEMR	-	semi-annual environmental monitoring report
SPS	-	Safeguard Policy Statement
STP	-	sewage treatment plant
SWF	-	storm water flow
TMP	-	traffic management plan
WBPCB	-	West Bengal Pollution Control Board
WTP	-	water treatment plant

WEIGHTS AND MEASURES

m^3/h	-	cubic meter per hour
dB(A)	-	decibel in A network
°C	-	degree Celsius
km	-	kilometer
kVA	-	kilovolt-ampere
m	-	meter

$\mu g/m^3$	-	microgram per cubic meter
mg/l	-	milligram per liter
MLD	-	million liters per day
mm	-	millimeter
MPN/100ml	-	Most Probable Number per one hundred milliliters
NTU	-	Nephelometric Turbidity Unit
km^2	-	square kilometer

NOTE

In this report, "$" refers to United States dollars.

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EXECUTIVE SUMMARY

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 an 8-year period from 2014 to 2022. The Program is also proposed to be implemented using a multitranche financing facility (MFF) of Asian Development Bank (ADB). At present KEIIP Tranche 1 and 2 projects are under implementation.

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

This initial environmental examination (IEE) report is for the one of the sewerage and drainage (S&D) subprojects of Tranche 3 "Construction of pumping stations at (1) Lalababu Nikashi/ Bagjola canal (2) Sakuntala Park, Behala at Node C premises."

Tranche 3 loan will be signed in due course but construction works for specific Tranche 3 subprojects are scheduled to commence during fourth quarter (Q4) of 2018 and will be completed in 24 months, i.e. by Q4 of 2020.

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 entitles responsible for carrying out the mitigation and monitoring measures.

Potential negative impacts have been identified in relation to pre-construction, construction and operation phases 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.

The public participation processes have been undertaken during project preliminary design stage which ensures that stakeholders are engaged during the preparation/finalization of the IEE. The

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

The subproject's grievance 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.

The environmental management plan (EMP) will guide the environmentally-sound construction of the subproject and ensure efficient lines of communication between KMC, program management unit (PMU), design and supervision consultant (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.

The contractor for the packages will be required to submit to KMC/PMU, for review and approval, site environmental plan (SEP) including (i) details of proposed sites/locations for construction work camp, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following Tables 22 and 27 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.

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 contractor 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.

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; and (iii) being located mainly along roads and built-up area will not cause direct impact on terrestrial and aquatic 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.

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 city of Kolkata is the seventh largest metropolis in India, and had 4.5 million residents in 2011. It is the largest city in the state of West Bengal, and has been the biggest contributor to West Bengal's gross state domestic product. The continuous improvement in the city's urban environment is necessary to increase labor productivity through better health status of the urban population, especially when it has been experiencing lower population growth. There have been, however, geographical disparities in access and quality of the water supply and sewerage services, because the Kolkata Municipal Corporation (KMC), an urban local body with a mandate to provide these services under the KMC Act of 1980, has an aging water supply system, and has inadequate sewer coverage in the city's peripheral areas.[1] The Asian Development Bank (ADB) loans have assisted KMC in the expansion of the sewerage coverage through the Kolkata Environmental Improvement Project (KEIP) since 2000.[2] The Kolkata Environmental Improvement Investment Program (KEIIP) will help KMC not only to continue sewer network expansion and treatment on a larger scale, but also gradually improve efficiency in water supply operations, which will enable KMC to generate operating surplus for capital investment in water supply and sewerage. [3]

2. On 26 September 2013, ADB approved the provision of loans under a multitranche financing facility (MFF) for KEIIP for an aggregate amount not exceeding $400 million. The impact of KEIIP will be enhanced access to water supply and sanitation in KMC. The outcome will be improved water supply, sewerage and drainage service quality and operational sustainability in selected areas of KMC. Thus, KEIIP has three outputs: (i) inefficient water supply assets rehabilitated; (ii) sewerage extension along with sewage treatment facilities to peripheral areas continued; and (iii) financial and project management capacity further developed.

3. KMC is KEIIP's executing agency. A program management unit (PMU) created under KMC is implementing KEIIP.

4. The first loan under the MFF, Tranche 1 or Loan 3053-IND, amounting to $100 million, was approved by ADB on 22 October 2013, signed on 3 March 2014 and made effective on 30 May 2014. Project 1, supported by Tranche1, included subprojects for improvement of infrastructure, operations and sustainability in sewerage, drainage and water supply in KMC. While Project 2, supported by the Tranche 2, included physical and non-physical investments in water supply and sanitation improvement in KMC. Project 2 is aligned with improved access to water supply and sanitation in KMC as defined by KEIIP. Tranche 2 loan 3413- IND was signed on 21st November 2016 and physical work has already started.

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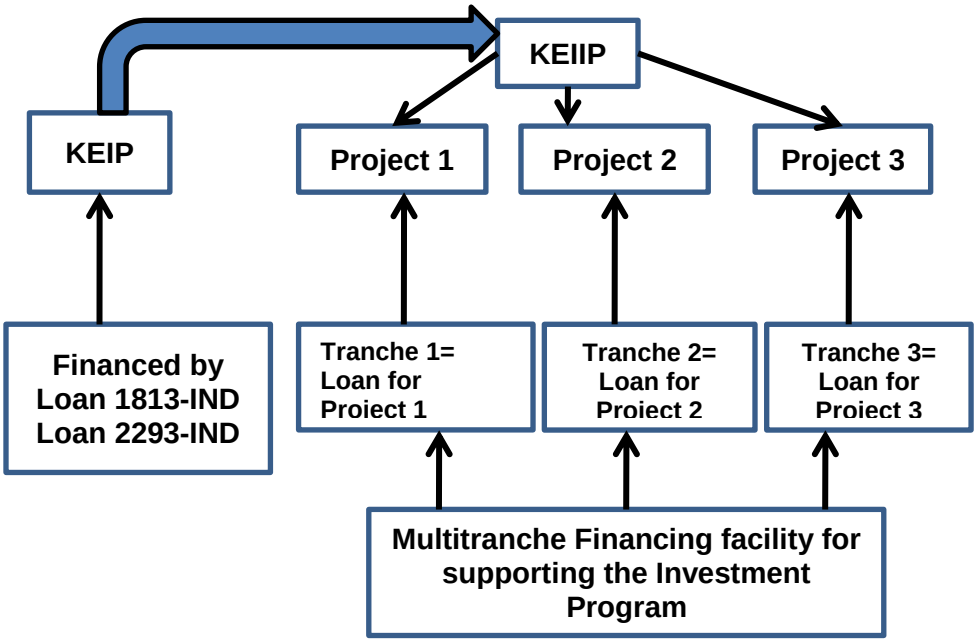
[1] The 1899 Calcutta Municipal Act defined the administrative domain of the municipal authority as covering 25 wards and 48.5 km^2. Many boundary changes followed, the latest one in January 1984, when Boroughs XI, XII, XIII, XIV, and XV were annexed to KMC. These boroughs are popularly known as the "added areas." Recently, the KMC has been further expanded by including Joka area in the southern part of the city creating 3 additional wards under a new Borough XVI.

[2] ADB. 2000. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to India for the Calcutta Environmental Improvement Project.* Manila (Loan 1813-IND, $250 million, approved on 15 November 2000). The project completion date is 30 June 2012.
ADB 2006.*Report and Recommendation of the President to the Board of Directors: Proposed Supplementary Loan to India for the Kolkata Environmental Improvement Project.* Manila (Loan 2293-IND: $80 million, approved on 20 November 2006). The project completion date is 30 June 2012.

[3] ADB provided project preparatory technical assistance. ADB. 2009. *Technical Assistance to India for Preparing for Kolkata Environmental Improvement Project II*. Manila.

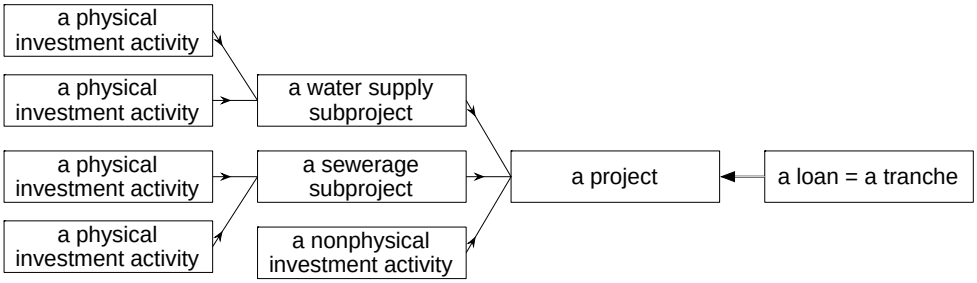
5. At present KEIIP Tranche 1 and 2 are under implementation. The new subproject "Construction of pumping stations at (1) Lalababu Nikashi/ Bagjola canal (2) Sakuntala Park, Behalaat Node C premises" is considered under Tranche 3. Tranche 3 project will be implemented over a 4-year period from 2018 to 2022.

Figure 1: Relationship between the KEIP and the KEIIP



6. KEIIP included: (i) water supply, including pumping and transmission system, and (ii) sewerage and drainage (S&D) including dry weather flow (DWF) and storm water flow (SWF) pumping stations, and (iii) construction of sewage treatment plant.

Figure 2: Structure of a Project, Subprojects, and KEIIP Activities



7. The proposed Project 3 supported under Tranche 3 of KEIIP includes S&D works. Table 1 below shows tentative package list for S&D work under Tranche 3.

Table 1: Sewerage and Drainage Packages under Tranche 3

Package Number	General Description
SD27/2017-18	Improvement of sewerage and drainage (S&D) Network and construction of a Pumping Station in Alipore Body Guard Line premises in ward 74 and laying of sewer line along Diamond Harbor Road by Micro-tunnelling method and Cut and Cover method.
SD28/2017-18	Construction of West Bengal State Electricity Transmission Company Limited sewage treatment plant (STP) (45 MLD)

Package Number	General Description
SD29/2017-18	Construction of STP (40 MLD) at Bank Plot, M G Road, Joka
SD30/2017-18	Construction of Rajpur - Sonarpur STP (23 MLD)
SD31/2017-18	Development of S&D Network in Churial Extension Pumping Station catchment and Dimond Park catchment and construction of Churial Extension pumping station (annexed) in Borough XVI (Part of Ward 124, 143 and 144) and laying of reinforced concrete cement sewer line along Bakrahat Road by Micro tunneling method
SD32/2017-18	Improvement of S&D system in Mukundapur Area (Part of Ward 109) including construction of pumping station
SD34/2017-18	Construction of pumping stations at (1) Lalababu Nikashi/ Bagjola canal (2) Sakuntala Park, Behala at Node C premises

8. Subproject and their components of each loan agreement are to comply with relevant and applicable safeguard requirements of the Government of India, the Government of West Bengal, and the Safeguards Policy Statement (SPS), 2009 of ADB.

9. The provision for the use of frameworks is required for implementation of the investment program under the MFF to guide safeguard assessments in all tranches, as well as in non-sensitive components of each project under the investment program where detailed design takes place.

10. ADB classified the project as environment Category B and accordingly initial environmental examination (IEE) is required for all subprojects. The present document is the IEE for one of the S&D subprojects under Tranche 3 “Construction of pumping stations at (1) Lalababu Nikashi/Bagjola canal (2) Sakuntala Park, Behala at Node C premises”.

11. Construction work will commence during 4th quarter of 2018 and will be completed in 24 months.

12. 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.

II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. ADB Policy

13. ADB requires the consideration of environmental issues in all aspects of ADB’s operations, and the requirements for environmental assessment are described in ADB SPS, 2009. This states that ADB requires environmental assessment of all project loans, program loans, sector loans,

sector development program loans, and loans involving financial intermediaries, and private sector loans.

14. ADB SPS requires PMU to apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines. Applicable to Project 3 are EHS Guidelines on (i) General EHS Guidelines, (ii) Water and Sanitation; (ii) Waste Management, and other as may be applicable. These standards contain performance levels and measures that are normally acceptable and applicable to projects. When Government of India regulations differ from these levels and measures, PMU will achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the borrower/client will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS and EHS Guidelines.

15. **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.** A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required.

(ii) **Category B.** A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination is required.

(iii) **Category C.** A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.

(iv) **Category FI.** A proposed project is classified as category FI if it involves investment of ADB funds to or through a FI (paras. 65-67).

16. **Environmental Management Plan.** An environmental management plan (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.

17. **Public Disclosure.** The IEE will be put in an accessible place (e.g., local government offices, libraries, community centers, etc.), and a summary translated into 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 program management unit (PMU) during project implementation upon receipt.

B. National and State Laws

18. 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 (O&M).

19. The following legislations are applicable to the subproject:

(i) Environmental (Protection) Act of 1986, its rules and amendments;
(ii) 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
(vii) The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (LARR)
(viii) Wetlands (Conservation and Management) Rules, 2010 and 2017;
(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, National Institute of Occupational Health (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 West Bengal Inland Fisheries Act, 1984 and The West Bengal Inland Fisheries (Amendment) Act, 1993
(xv) The Child Labor (Prohibition and Regulation) Amendment Act, 2016.

20. The summary of environmental regulations and mandatory requirements for the subproject is shown in Table 2.

Table 2: Applicable Environmental Regulations for Sewerage and Drainage Subproject

Law	Description	Requirement
Environmental Impact Assessment (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 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	The proposed components of this subprojects are not listed in the EIA Notification's "Schedule of Projects Requiring Prior Environmental Clearance" and thus Environmental Clearance is not required.

Law	Description	Requirement
	Environmental Clearance from the State Environmental Impact Assessment Authority (SEIAA).	
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.	Construction of pumping station and S&D network will not require CTE and CTO from WBPCB
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 Central Pollution Control Board (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 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 occupational 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

Law	Description	Requirement
		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 and 2017	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	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 prepared in respect of each protected monument and protected area	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).
The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (LARR)	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.	Land for one pumping station needs to be acquired through direct purchase. Rests of the lands are available under project implementation authority. A 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 ₹5000/- or both. Also, until plantation of requisite number of trees is undertaken, the violators will be fined for each day of default of ₹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 ₹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.

Law	Description	Requirement
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) 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 subproject is not within the East Kolkata Wetlands thus no permission from the Central Government is required. Proposed facility is approx 5.5 km (Lalababu Nikashi/ Bagjola canal pumping station) and 12 km (Sakuntala Park, Behala at Node C pumping station) away from East Kolkata Wetland. Intervening area is fully urbanized with many high rise building
The Child Labour (Prohibition and Regulation) Amendment Act, 2016	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 help 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.

21. Details of the labor acts and other relevant acts are shown in Appendix 4.

22. Per Government of India Central Pollution Control Board (CPCB)'s Guidelines on Odour Pollution & Its Control,[4] odorous compounds to be monitored in waste water treatment plants are: (i) H2S, and (ii) mercaptans (Methyl mercaptan [methanethiol]). Section 7 provides odor control technologies that are required to be considered in designs and Section 9 provides international legislations, standards, and regulations regarding odor (Australia, Belgium, Canada, Denmark, Germany, Japan, New Zealand, the Netherlands, the UK, and the US) that will be applicable to wastewater treatment plants. Major recommendations of the CPCB Expert Committee on Odour Pollution and its Control include the following (highlighted relevant to KEIIP):

(i) The report of the Expert Committee may be adopted as a guideline for odor pollution and its control.

(ii) In order to develop and implement effective control program on odor pollution, it is necessary to measure odor in a manner that is accurate, precise and acceptable. The instrumental method may be adopted for known compounds and for mixtures of unknown substances, sensory method is preferred. The currently accepted method EN 13725: 2003, Forced-Choice presentation, may be standardized and adopted in India also.

(iii) There is a need for generation of databased information on the magnitude of the odorous gases/chemicals at point source as well as in the ambient environment around these sources.

[4] Central Pollution Control Board, Ministry of Environment and Forests, Government of India. 2008. *Guidelines on Odour Pollution & Its Control*. Delhi.

(iv) Ambient standards for odor pollution should be evolved after adequate becomes available to formulate them.
(v) Source specific (point source as well as diffused source) standard for odor emission should be evolved for odorous industries such as Pulp & Paper, Fertilizer, Pesticides, Tanneries, Sugar & Distillery, Chemical, Dye & Dye Intermediates, Bulk Drugs & Pharmaceuticals, Landfill and Waste Water Treatment Plant etc.
(vi) Human resource may be developed with international exposure and assistance to work in the field of odor pollution control.
(vii) All out efforts should be made to operate and maintain treatment plants, air pollution control devices, dump sites, TSDF etc. to achieve optimal reduction in odor pollution.
(viii) Hot spot of odor pollution may be tackled with knowledge and technology presently available in the country.
(ix) Pilot plants / Best Management Practices to control odor pollution may be installed / demonstrated sector wise to display the technology. Such installation may be sponsored and financial assistance provided, if required.
(x) Green belts with suitable species of plants / trees and other physical methods may be adopted for control of odor pollution especially near odor producing industrial processes and waste disposal sites.

23. In addition to national and state rules and regulations, international conventions such as the International Union for Conservation of Nature and Natural Resources (IUCN), Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Convention on Migratory Species of Wild Animals (CMS), Ramsar Convention on Wetlands of International Importance and Millennium Development Goals are applicable for selection and screening of subprojects under restricted/sensitive areas. India is a party to these conventions. The said package is not linked with any international rules and regulations.

24. During the design, construction, and operation of the project the borrower/client will apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's *Environment, Health and Safety Guidelines.*[5] These standards contain performance levels and measures that are normally acceptable and applicable to projects. When host country regulations differ from these levels and measures, the borrower/client will achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the borrower/client will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in this document.

25. To improve environmental quality more stringent international standard will be followed. The applicable standard for air quality and noise levels Appendixes 1, 2 and 3.

[5] IFC World Bank Group. Environmental, Health and Safety Guidelines.

III. DESCRIPTION OF THE SUBPROJECT

A. Existing Situation

26. **Project Background**. Under Kolkata Environmental Improvement Project (KEIP), development of S&D system in Borough I (Ward no 1 to 6) was taken up and almost all the works related to the S&D system were completed except construction of Lalababu pumping station. The construction of said pumping station was considered to be executed preferably under a pumping station package, being executed in KEIP phase 1. The said works could not be taken up within the stipulated loan closure time and was physically closed on 30th June 2013. Now the project is being taken up to provide benefit to the areas for which S&D network was developed under KEIP.

27. There is an old pumping station at Sakuntala Park, Behala at Node C premises. Under this package augmentation of pumping station will be done after demolishing existing infrastructure.

B. Components of the Subproject

28. **Proposed System – Lalababu Pumping Station**. Part of Borough I (Ward 3, 4, 5) and part of South Dumdum municipality are covered under the specific PS Subproject. Total catchment is 230 Ha approximately.

29. Lalababu pumping station (capacity 5000 lps) is proposed at a location close to the confluence of Lalababu Nikashi and Bagjola Canal to drain the storm water, generated from part of Ward no 3, 4, 5 and SWF flow generated from a portion of South Dum Dum Municipality. DWF, generated from the adjoining area of LalaBabu Nikashi, is proposed to be conveyed to Bagjola PS for onward transmission to Bangur STP. In addition to that a by- pass arrangement is now also proposed to keep provision of gravity flow directly to the Bagjola canal when the water level in the canal is low or during pump house shutdown period. Sluice gates at the end of the by – pass arrangement is also proposed to prevent backflow from the canal.

30. **Pumping Stations.** The basic pumping station configuration and design norms will be considered in the detailed design stage. Mechanical equipment/ items proposed for this pumping station is given below:

(i) Estimated storm water flow (SWF): 5000 lit/sec (18000 m^3/h);
(ii) Estimated DWF: 95 lps;
(iii) Each of capacity 1000 lps, (3600 m^3/h) (5 working + 1 standby), 9 m, 160 kW;
(iv) Capacity of each DWF pump: = 48 lps, 14 m head, 15 kW;
(v) Delivery size of each pump- 800 mm dia.;
(vi) Semi course and fine screen;
(vii) Capacity of pumps provided - SWF pumps:1000 lps (3600 m^3/h);
(viii) arrangement: 12 nos. in 3 channels complete with motorized lifting arrangement: 1 no. with 2 sections;
(ix) Manual lifting type bar screens (medium): 6 nos. for 3 channels;
(x) Sluice gate: 7 nos.; and
(xi) Electrical and substation arrangement.

31. Appendix 5 depicts few photographs of project location.

C. Need of the Subproject

32. Based on preliminary investigation, it was found that areas on either side of the nikashi within South Dum Dum Municipality are low-lying and prone to get waterlogged for a considerable period of time. With development of organized S&D network and construction of Beerpara Pumping Station within Borough I under KEIP, storm runoff flows through Lalababu Nikashi much faster. SWF discharge from Beerpara pumping station also increases the top water level of the said nikashi. Situation becomes worse when water level of Bagjola canal is high. In the process, evacuation of storm runoff generated from the portion of South Dum Dum Municipality also is affected.

33. This problem can be effectively minimized if water level in the Nikashi can be lowered, which is possible only through construction of a storm water pumping station close to the outfall point of the Nikashi. This will, in addition ensure that storm runoff can effectively be discharged even if water level in Bagjola canal is relatively high. Therefore, construction of Lalababu pumping station is urgently required to make the S&D system, developed under KEIIP, most effectively functional.

34. Similarly, the collected DWF will be effectively diverted to Bangur STP.

D. Salient features of the Subproject

35. Proposed components of subproject are:

1. Construction of Lalababu Pumping Station

(i) Construction of inlet chamber, Screen chamber, Well, construction of substation and other allied works;
(ii) Supply and Installation of SWF pumps surface discharge type and DWF pumps including all allied woks;
(iii) Supply and installation of HT panel, Transformer and LT panel and other electro mechanical equipment's;
(iv) Laying of SWF pumping main – 1600 mm dia. mild steel pipe (length = 100 m);
(v) Laying of DWF Pumping main – 300 mm dia. ductile iron pipe (length = 600 m);
(vi) Construction of outfall (Bypass Arrangement) including installation of sluice gate
(vii) Restoration of road;
(viii) Testing and commissioning.

2. Construction of Pumping Station at Sakuntala Park, Behala (Node C) After Demolishing of Existing Infrastructure

(i) Construction of inlet chamber, Screen, Well, construction of substation and other allied works;
(ii) Supply and Installation of SWF pumps surface discharge type including all allied woks;
(iii) Installation of DWF pumps;
(iv) Supply and installation of HT panel, Transformer and LT panel and other electro mechanical equipment's;
(v) Laying of SWF pumping main – 1400 mm Dia. MS pipe (Length = 1200 m);
(vi) Dismantling of different units of existing pumping station
(vii) Restoration of road; and

(viii) Testing and commissioning.

36. Details of structure at existing Sakuntala Park, Behala (Node C) pumping station which to be demolished are as follows:

(i) Pump house - dia 8.5 m, height 12 m;
(ii) Electrical sub-station - 14x4.5 m^2;
(iii) Screen chamber - 3x4 m^2.

37. These will be replaced by a new pump house - dia 9 m & height 12 m and a substation - 22x5 m^2.

38. Figure 3 shows catchment area of Lalababu Pumping Station, Figure 4 and Figure 5 show Google map of location of Lalababu Pumping Station and Sakuntala Park Node C Pumping Station, respectively. Tentative general arrangement drawing of Lalababu Pumping Station is shown in Figure 6, which will be finalized during detailed project report preparation stage.

39. Configuration of both pumping stations can be finalized during detail design.

40. During construction phase excess earth will be generated. Volume of excess earth can be finalized after detailed design.

E. Implementation Schedule

41. Construction work will commence in the year 2018 and is expected to be completed in 24 months for the specific S&D subproject under Tranche 3.

42. During defect liability period for 1 year after commissioning and followed by 4 years of operation, construction contractor will operate the system.

43. Tentative schedule is given below.

Table 3: Implementation Schedule

Activity	**Package No. SD34/2017-18**
Submission by contractor of site environmental plan (SEP) by Contractor	Within 28 days after receiving notice under commencement of work
Review and approval by Kolkata Municipal Corporation (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.	Within 21 days
Construction	24 months (November 2018 to November 2020)
Commissioning period	
Operation and maintenance period	60 months from completion

Figure 3: Catchment Area of Lalababu Pumping Station

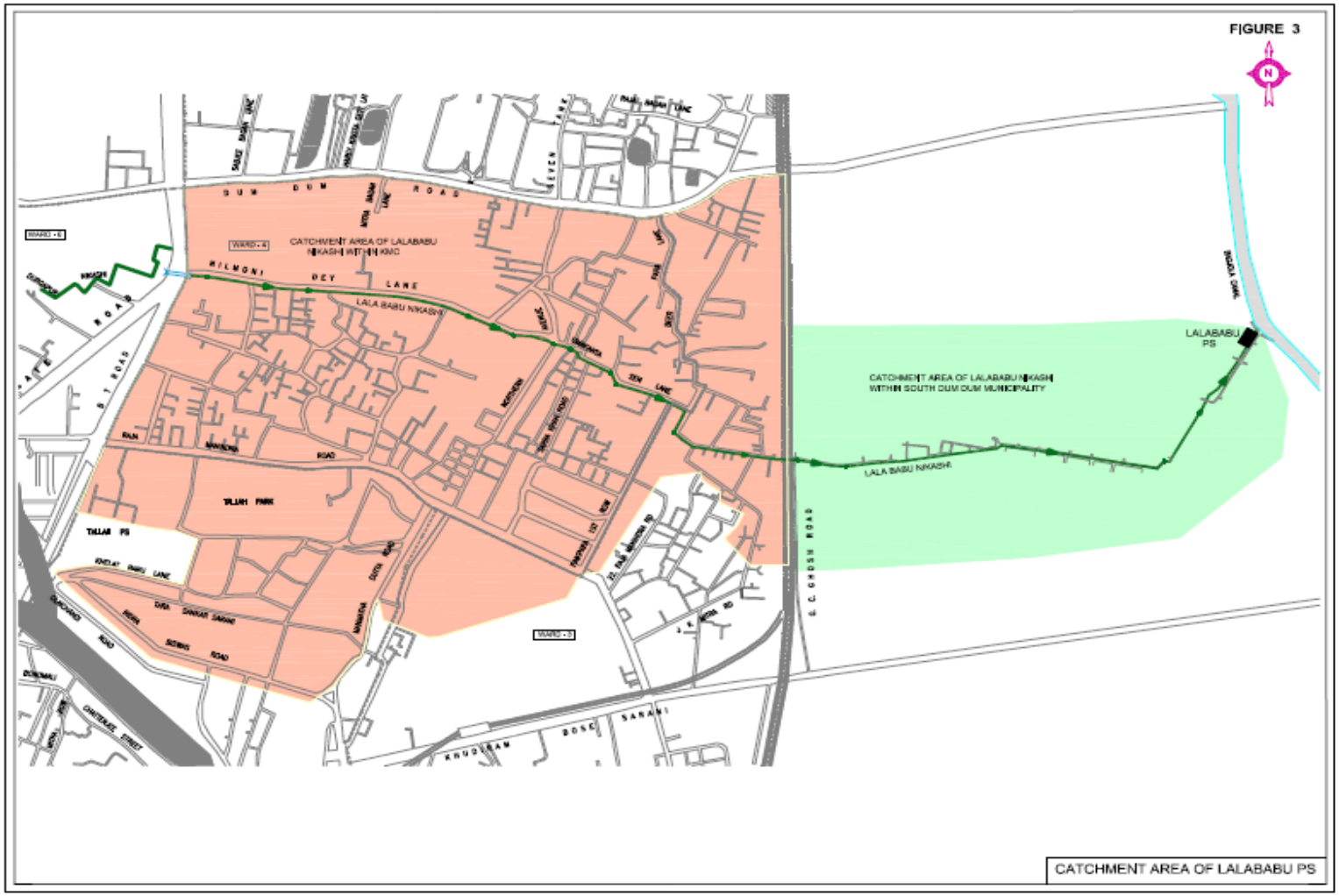


Figure 4: Google Map Shows Location of Lalababu Pumping Station

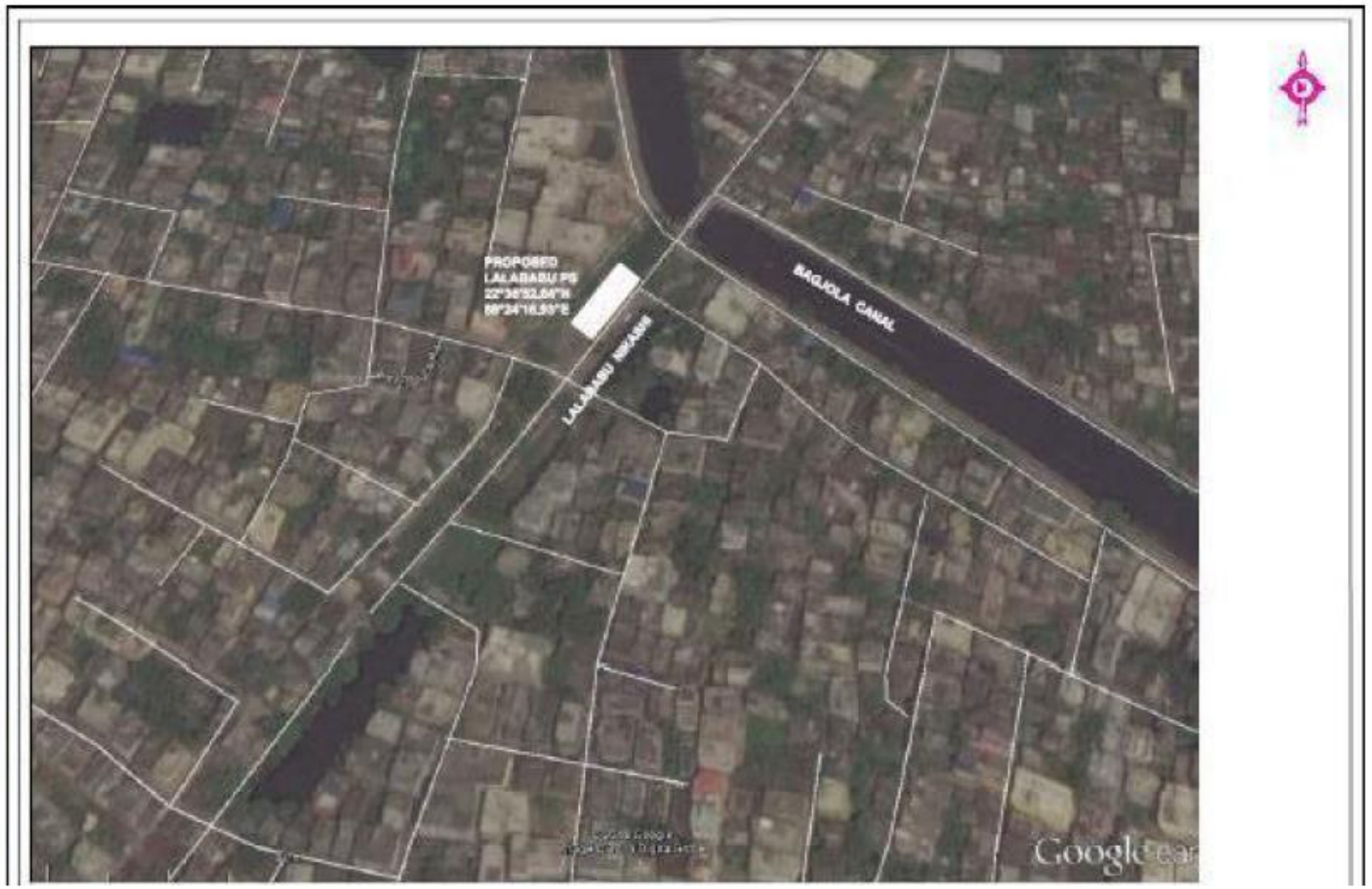


Figure 5: Google Map Shows Location of Sakuntala Park Node C Pumping Station

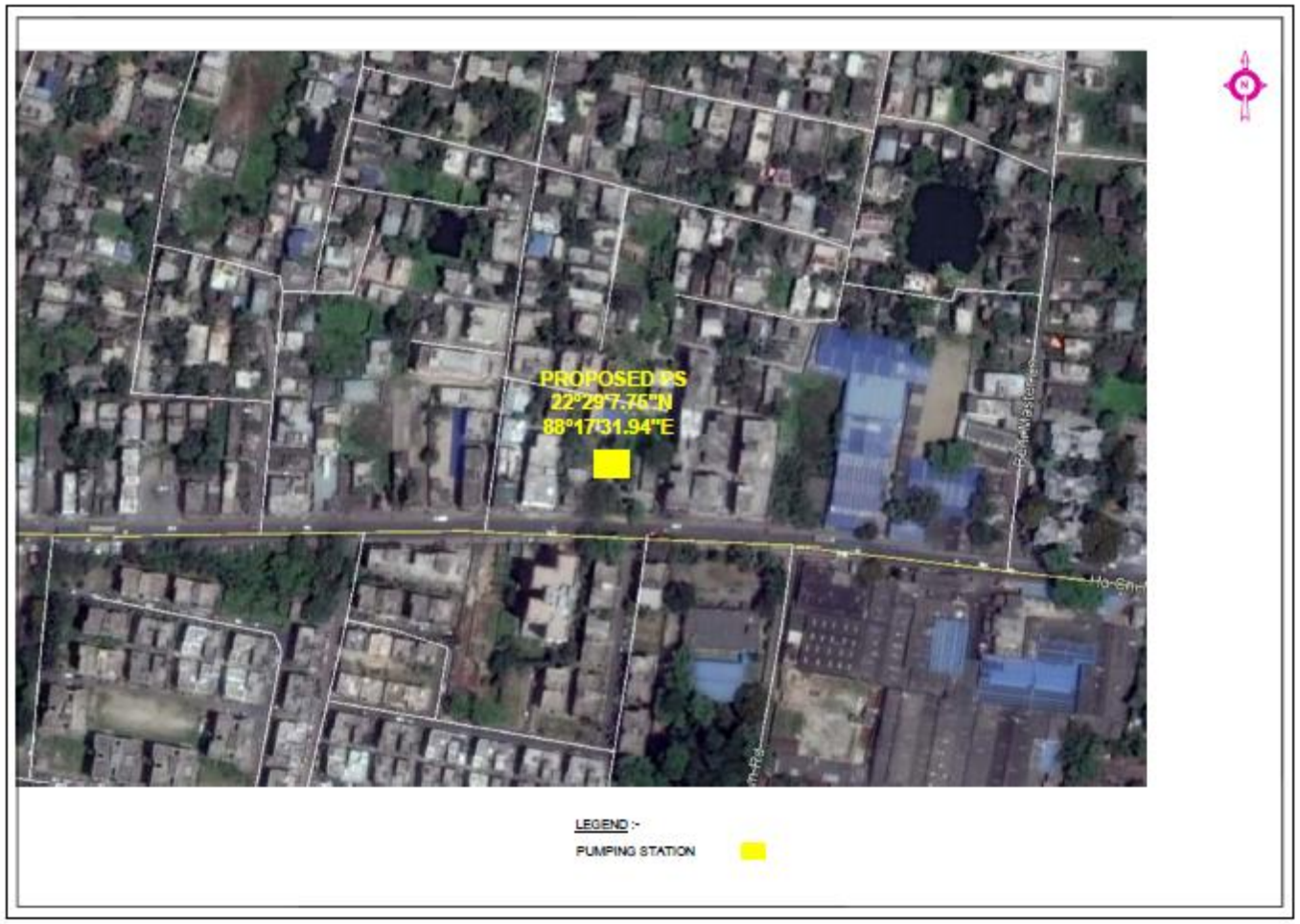
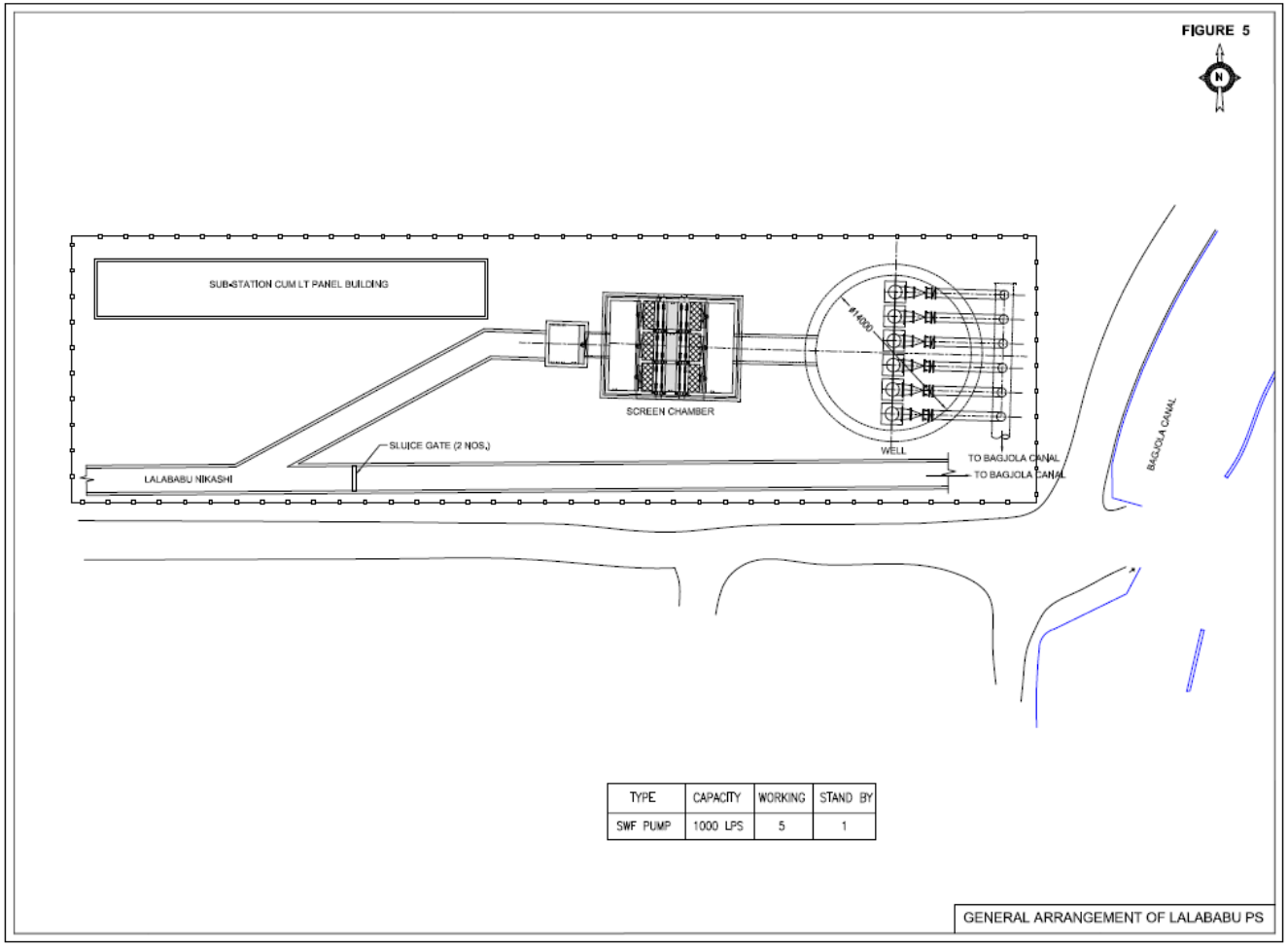


Figure 6: General Arrangement Drawing of Lalababu Pumping Station



IV. DESCRIPTION OF THE ENVIRONMENT (BASELINE DATA)

44. Baseline environmental conditions per detailed engineering design and final alignment/locations will be determined during IEE updating. Results will be reported in the final IEE to be submitted to ADB for review and approval. Detailed surveys will include identification of any properties, wells, physical cultural resources or any other sensitive receptors within 500 m of the alignments/sites. Final IEE will include all sampling sites/locations which will form part of the environmental monitoring program.

A. Physical Resources

45. **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 southwestern part of Borough XV and different parts of Borough XII are low lying.

46. 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.

47. 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.

48. 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; and
(viii) Churial system.

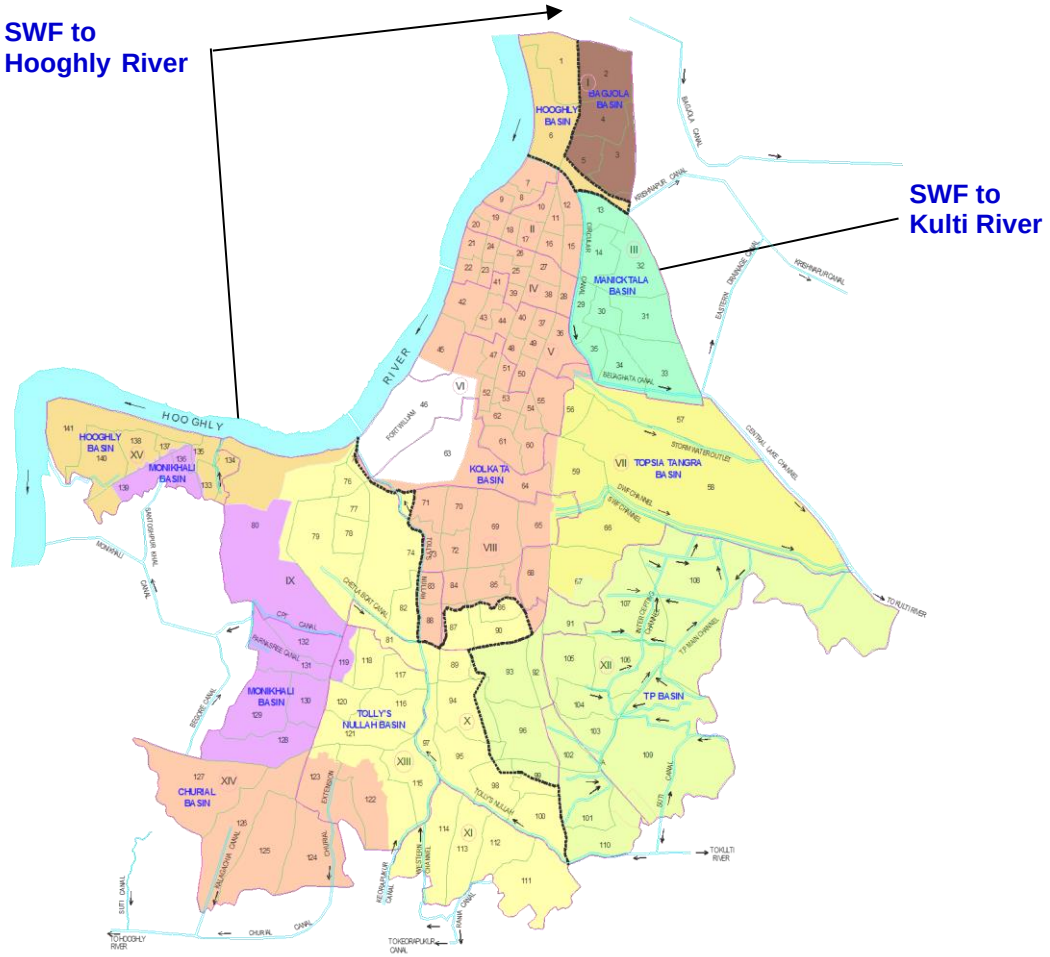
49. Drainage basin and catchment area map of KMC is presented in Figure 7.

50. The principal features of the existing drainage basin layout for the KMC area were delineated in the Master Plan for Water Supply, Sewerage & Drainage in Calcutta Metropolitan District (1966-2000) prepared by CMPO. In the S&D Master Plan prepared for the Kolkata City in 2007 under KEIP, certain changes in basin boundaries have been identified from the earlier

recommendations due to alterations arising out of changes in the existing drainage network of the areas.

51. The KMC area is divided into nine major drainage basins namely Kolkata basin, Manicktala basin, Tolly's Nullah basin, Topsia - Tangra basin, Hooghly basin, Tollygunge - Panchannagram basin, Bagjola basin, Monikhali basin and Churial basin. Out of these, the sub-project area comprising parts of Boroughs XIII and XIV come under Churial Basin. Figure 7 shows the catchment delineation of the different drainage basins within KMC area. The project area falls in Churial *canal* basin.

Figure 7: Catchment Delineation of Different Drainage Basins within Kolkata Municipal Corporation Area



52. Natural hazards in Kolkata include water logging and flooding during monsoon months. Sample survey conducted during preparation of detailed project report of KEIP II revealed that streets of the project area in the vicinity of households remained under water four times on an average during the year 2008. In areas like Behala, Tollygunge and Garden Reach a medium to heavy shower causes water logging in some localities which takes considerable period to evacuate. Some pockets remain partially inundated for even 3 to 4 months in a year. All these result due to inadequate drainage facility in such selected areas. In many cases, newly constructed roads are in embankment and higher than the built-up areas causing stagnation of

water in pockets. However, with the completion of KEIP S&D subprojects situations have improved to a great extent.

53. 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.

54. 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.

55. **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 general stratigraphy of the project area is given in Table 4.

Table 4: Near Surface Stratigraphy of the Project Area

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 +).

56. 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.

57. There is no mineral occurrence in the area.

58. **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 5 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 5: Soil Quality in Five Boroughs of Kolkata Municipal Corporation

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.

59. **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.

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

61. 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.

62. Wind is light to gentle with maximum monthly average speed 7.22 kilometer per hour (km/h). 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/h 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.

63. **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 micrograms 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/m3 respectively. Similarly, 24-hourly nitrogen oxides (NOX) 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.

64. When compared with national air quality standard for residential areas the ambient air quality of Kolkata does not meet the national standard in respect of $PM_{2.5}$, PM_{10} and NO_X in terms of both arithmetic annual average and also percent of time the daily concentration exceeding the prescribed standard. However, the concentration of SO_2 adequately meets the national standard on both counts.

65. Overall average ambient air quality level of Kolkata is shown below. From 2013-2015 concentration of $PM1_0$, $PM_{2.5}$ and NO_2 are always above the standard.

Table 6: Average Ambient Air Quality of Kolkata

Year	PM10 (µg/m^3)			PM2.5 (µg/m^3)			SO_2 (µg/m^3)			NO_2 (µg/m^3)		
	Value	Stan-dard	% days of NC	Value	Stan-dard	% days of NC	Value	Stan-dard	% days of NC	Value	Stan-dard	% days of NC
2013	124	60	46	69	40	41	8	50	0	43	40	6
2014	131	60	50	71	40	47	6	50	0	47	40	10
2015	114	60	41	61	40	38	4	50	0	45	40	4

Source: State of the Environment Report West Bengal, 2016.

66. No air quality monitoring stations under KEIIP Tranche 1 and Tranche 2 projects are located adjacent the PS locations. Before commencement of construction activity base line monitoring will be conducted.

67. 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 7.

Table 7: Water Quality of Hooghly River at Garden Reach

No.	Parameters	Test Result	Test Result
1	Ammonia-N (mg/l)	BDL	BDL
2	BOD (mg/l)	1.90	6.60
3	Boron (mg/l)	BDL	BDL
4	Calcium (mg/l)	30.40	24.00
5	Chloride (mg/l)	19.99	15.00
6	COD (mg/l)	5.76	12.0
7	Conductivity (us/cm)	402.00	340.50

No.	Parameters	Test Result	Test Result
8	Dissolved O_2 (DO) (mg/l)	4.60	7.30
9	Fecal Coliform (MPN/ 100 ml)	22000	50000
10	Magnesium (mg/l)	7.78	4.37
11	Nitrate-N (mg/l)	0.43	0.58
12	pH	8.07	8.02
13	Phenolpthalein Alkalinity(mg/l)	0.00	0.00
14	Phosphate-P(mg/l)	0.03	0.06
15	Potassium(mg/l)	5.00	5.00
16	Sodium (mg/l)	50.00	30.00
17	Sulphate (mg/l)	23.43	19.73
18	Temperature (^oC)	32	24
19	Total Alkalinity (mg/l)	144.00	140.00
20	Total Coliform	50000	130000
21	TDS (mg/l)	206.00	332.00
22	TFS (mg/l)	234.00	312.00
23	Total Hardness as $CaCO_3$ (mg/l)	108.00	78.00
24	TSS (mg/l)	157.00	56.0
25	Turbidity(mg/l)	80.10	44.0
Date of Sampling		**11.05.2017**	**15.02.2017**

BDL = below detection limit, BOD = biochemical oxygen demand, $CaCO_3$ = calcium carbonate, COD = chemical oxygen demand, DO = dissolved oxygen, us/cm = micro siemens per centimeter; mg/l = milligram per liter; MPN/100 mL = most probable number per one hundred milliliters, pH = potential of hydrogen, TDS = total dissolved solid, TFS = total fixed solid, TSS = total suspended solid.
Note: There are no government standards for (tidal) river water.
Source: WBPCB website- WBPCB, www.wbpcb.gov.in, water quality 2017.

68. The drainage canals in the southern part of the city are Kalagachia, Suti, Churial, Manikhali, Begore, Keorapukur, Western channel joining Keorapukur, Rania, Tollygunge – Panchannagram Main canal, Intercepting channel, Suti khal (eastern part), different Lead canals to Tollygunge - Panchannagram Main, Mundapara khal etc. Chemical analysis of water of Churial and Keorapukur canals shows that concentration of TDS is high. Also, Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) are high in both the samples. Concentrations of heavy metals [Pb, Cd, Hg, As, Cr (III) and Cr (VI)] were always below their respective detection limits (Table 8). Water of these canals does not meet the primary water quality criteria for even bathing water.

Table 8: Quality of Churial and Keorapukur Canal Water

No.	Parameters	Sample (CW 1)	Sample (CW 2)
1	pH	7.23	7.12
2	Total suspended solid (mg/l)	30.0	32.5
3	Total dissolved solid (mg/l)	741.0	650.0
4	DO (mg/l)	4.6	5.2
5	COD (mg/l)	109.92	67.96
6	BOD_3 days, 27^0C (mg/l)	35.0	18.0
7	Chloride (mg/l)	131.87	138.0
8	Sulphate (mg/l)	12.0	26.5
9	Nitrate (mg/l)	25.0	19.0
10	Sodium (mg/l)	80.5	70.0
11	Potassium (mg/l)	20.0	18.5
12	Calcium (mg/l)	66.77	51.06
13	Magnesium (mg/l)	28.22	23.52
14	Phosphorus (mg/l)	8.54	4.5
15	Lead (mg/l)	<0.3	<0.3
16	Cadmium (mg/l)	<0.04	<0.04
17	Mercury (mg/l)	<0.9	<0.9
18	Arsenic (mg/l)	<0.01	<0.01

No.	Parameters	Sample (CW 1)	Sample (CW 2)
19	Trivalent Chromium (mg/l)	<0.2	<0.2
20	Hexavalent Chromium (mg/l)	<0.1	<0.1
21	Zinc (mg/l)	0.04	0.8
22	Phenolic Compound (mg/l)	<0.1	<0.1
23	Cyanide (mg/l)	<0.05	<0.05
24	Ammoniacal Nitrogen (mg/l)	6.8	3.0
25	Kjeldahl Nitrogen (mg/l)	23.5	8.5
26	Total Nitrogen (mg/l)	35	15.0
27	Total Ammonia (mg/l)	8.22	3.63
28	Total Coliform (CFU/100 ml)	4.5×10^3	3.2×10^3

BOD = biochemical oxygen demand, COD = chemical oxygen demand, CFU = colony forming unit, CW = canal water, °C = degree Celsius, DO = dissolved oxygen, mg/l = milligram per liter, pH = potential of hydrogen.
Note: Treated effluent will discharge into Churial canal. (i) CW 1: Churial canal (Borough XIV, Ward 124); (ii) CW 2: Keorapukur canal (Borough XIII, Ward 122).
Source: KEIP Phase 1.

69. Chemical analysis of Churial canal water and Tolly's *nullah* was carried out under KEIP Phase 2 (during KEIIP project preparation) which shows high BOD, total volatile solids (TVS), Odor threshold and coliform pollution (Table 9).

Table 9: Chemical Analysis of Canal Water

Parameters	SW1 Tolly's Nullah	SW-2 Churial Khal near Diamond Harbour Road Crossing
Temperature(°C)	32.5	21.50
Colour unit	2.0	2.0
Turbidity (NTU)	16.78	11.50
Odor (TON)	8.0	8.0
pH	6.52	7.47
Total solids (mg/l)	1078.0	582.0
TDS (mg/l)	950.0	365.0
TSS (mg/l)	68.0	67.0
TVS (mg/l)	165.0	128.0
DO (mg/l)	4.8	3.8
B.O.D. (mg/l)	40.0	45.0
C.O.D. (mg/l)	150.0	160.0
Oil & Grease (mg/l)	4.5	5.0
Lead (mg/l)	-	<0.03
Chromium (III) (mg/l)	-	<0.20
Chromium (VI) (mg/l)	-	<0.05
Arsenic (mg/l)	-	<0.01
Cadmium (mg/l)	-	<0.01
Nickel (mg/l)	-	<0.20
Copper (mg/l)	-	<0.05
Zinc (mg/l)	1.1	0.24
Iron (mg/l)	0.93	1.8
Ammoniacal Nitrogen (mg/l)	11.0	16.5
Kjeldahl Nitrogen (mg/l)	20.5	30.0
Total Nitrogen (mg/l)	32.67	58.5
Total Ammonia (mg/l)	13.31	19.96
Free Ammonia (mg/l)	0.00	0.75
Sulphide (mg/l)	3.2	3.60
Mercury (mg/l)	-	<0.0001
Salinity (ppt)	-	0.025
Faecal coliform (MPN/100ml)	3.4×10^6	3.2×10^6

BOD = biochemical oxygen demand, COD = chemical oxygen demand, °C = degree Celsius, DO = dissolved oxygen, mg/l = milligram/liter, MPN/100ml = most probable number per one hundred milliliter, NTU = nephelometric turbidity

units, ppt = parts per thousand, pH = potential of hydrogen, SW = surface water, TON = threshold odor number, TDS = total dissolved solids, TSS = total suspended solid, TVS = total volatile solids.
Source: Primary data generated during present IEE preparation for KEIIP, Date of sampling 01 June 2012.

70. **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 150m 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 avoid ground water through 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.

71. As part of KEIP II detailed project report 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 and 141). Depths of piezometric surface from ground level in these wards varied between 9.3 m to 14.11 m. In wards 110, 112, 113 and 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 to 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 to 7.95m in these dug wells. With most areas reporting water levels within 1 to 2m from the ground surface.

72. 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 10: Groundwater Facies at Project Area of Kolkata Municipal Corporation

Type	Facies	Distribution and Characteristics of Groundwater 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	IX, XI, XII, XIII, XIV, and XV

Type	Facies	Distribution and Characteristics of Groundwater Facies	Borough
		concentration from 14 to 32 mg/l and average total dissolved solid 500mg/l	
	Na- HCO_3	Occurrence in the southern part of the city and particularly Behala, Tollygunge, 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

Ca = calcium, HCO_3 = bicarbonate, Mg = magnesium, mg/l = milligram per liter, Na = sodium.

73. **Noise.** Noise level in Kolkata high and exceeds the national standard. Average noise level in typical residential areas away from the busy streets varies between 47.0 to 66.0 dBA with only about 20% of the measurement sites have noise level conforming to the prescribed noise level of 55 dBA (residential area; day time). Noise level near busy roads expectedly have relatively high but variable noise level depending on the density of vehicle moving on the roads at the time of measurements. The range of measured noise levels was between 58.0 and 88.0 with more than 85% of the measurements show a value above 70 dBA. The measurement sites included some roads in front of school/college/hospital.

B. Ecological Resources

74. **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.

75. **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.

76. **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.

77. **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 sociocultural 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.

78. 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.

79. 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.

80. The representative aquatic flora and fauna of the EKW are listed in Table 11 and Table 13, respectively.

Table 11: Representative Aquatic Flora of the East Kolkata Wetland

Type of Flora	Species
Free floating forms	*Eichhornia sp., Spirodella sp., Pistia sp.,Ceratophyllum/Utricularia sp.,Axolla sp.,*
Fixed anchored forms	*Vallisneria sp., Hydrilla sp., Najas sp., Nymphea sp.,Nymphoides sp*
Emergent amphibious forms	*Marsilea sp., Impomoea sp., Enhydra sp., Colocasia sp.,*
Facultative forms	*Typha sp., Cyperus sp.,*
Algal forms	*Synandra sp., Spirogyra sp., Zygnema sp., Nitelea sp.,*

Source: Utilization scenario of Kolkata Wetlands (1996) 2. Urban Ecology, Ghosh A.K 1988.

Table 12: Representative Fauna of the East Kolkata Wetland

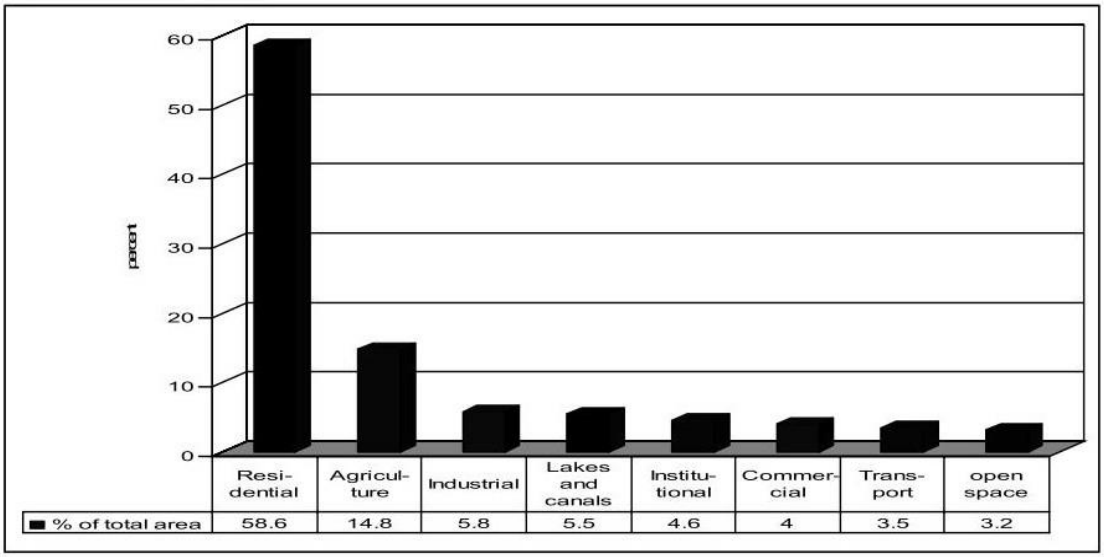
Type of Fauna	Species
Waterfowl	*Phalacrocdax niger, Ardeola gravii; Babulcus ibis; Egretta garzatta*
Waders	*Tringa hypoleucos; Calibris minuta*
Kingfisher	*Ceryle rudies; Alcedo athhis; Pelargopsis capensis; Halcyon Smyrnesis*
Aquatic reptiles	*Lissemys punctata, Enhydris enhydris, xenochrophis piscator*
Amphibians	*Rana cyanophyctis; Rana tigerina, Rana limnocharis, Microphyla ornata; Bufo melanostictus*
Fish	*Catla catla; Labeo rohita; L.calbasu; L.bata; Cirrhinus mrigala, Hypophthalmich thysmolitrix, Microvertebrates Puntius sarana, P.ticto, Amblypharygodon mola; etc.*
Mollusca	*Bellamya bengalensis; Pila globosa; Diagnostoma sp., Lymnea sp., Gyrulus sp., Thiara sp., etc.*
Annelida	*Oligochaeta; Brachuria; Limno drilus sp., Hirudines – Glassophonia sp.,*
Insecta	*Hemiptera: Anisops sp., Limnogonus sp., Plea sp., Hydrometra sp., Micronecta sp.,*

Source: Utilization scenario of Kolkata Wetlands (1996) 2. Urban Ecology, Ghosh A.K 1988.

C. Economic Development

81. **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 15 Boroughs and in 71 of the 144 wards. Urban planning is one of the responsibilities of the KMC. The Kolkata Metropolitan Development Authority (KMDA) also has a role in land planning, with a broader geographic scope than KMC.

Figure 8: Land Use in the Kolkata Municipal Corporation



Source: KEIIP SAR Volume 2 Initial Environmental Examination S&D, June 2012.

82. Land use 3 km around proposed pumping stations is shown below.

Table 13: Land Use Percentage Around Lalababu and Sakuntala Park Node C Pumping Station

No.	Land Use/Land Cover	Land Use Type	Lalababu Pumping Station	Node C Pumping Station
			Percentage (%)	
1	Settlement	Urban	60	65
2	Plantation and habitation	Plantation around habitation	10	15
3	Grassland/barren	Grassland/barren	5	5
4	Water bodies	Pond/tank/river	10	10
5	Canal	Water body	15	5
				100

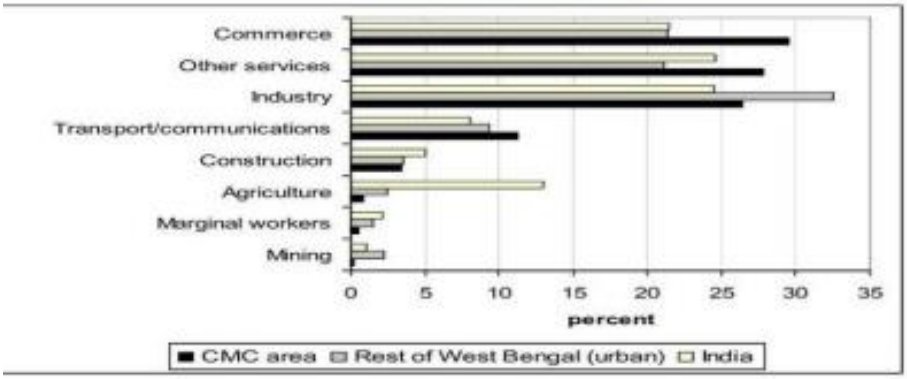
Source: KEIIP data.

83. 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.

84. 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 West Bengal Pollution Control Board (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.

Figure 9: Percentage of Population Working in Kolkata Area



Source: KEIIP SAR Volume 2 Initial Environmental Examination S&D, June 2012.

85. **Water Supply.** The water supply system of Kolkata is very old, operated from 1865. Present (2013) 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 Total Dissolved Solids (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.

86. **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.

87. **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, Calcutta Electric Supply Corporation Limited, presently a licensee of West Bengal State Electricity Board (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.

88. **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%.

89. 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. The 2011 Census results in this respect are not yet available but it is likely that the percentage of the population without toilets would further decrease over the years.

90. 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.

91. The treatment capacity of the existing treatment plants and the 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.

92. 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 favorable to the national target of 20%.

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

94. 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 75% 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.

95. In 2011 75% 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. In the core city area 80% of the population is served by door-to-door collection. In the outer areas this is less (60% - 70%). Collection frequency also differs. The central city and most of the surrounding outer areas are served daily, but some of the lower density fringe areas are only served once or twice per week.

96. KMC estimates that only 3% of waste generated is not collected but (illegally) disposed in channels, vacant land and used for infill, meaning that collection efficiency is close to the national benchmark target of 100%.

97. From secondary collection sites the waste is transported in trucks to the final disposal site. KMC transports 30% of waste, while 70% of solid waste transportation is contracted out to the private sector. Private contractors mostly use open trucks with a tarpaulin covering the waste. They make about 600 trips per day carrying an average of about 5.5 MT per trip. The remaining 30% of the total collected waste is transported by municipal vehicles making about 315 daily trips carrying on average about 3.5-4.9 MT per trip. KMC has 125 tipper trucks and 137 dumper placers, 15 tractor trailers, 17 wheel loaders and 12 mechanical sweepers, 32 street sweeping/washing vehicles and 8 wrecker vans daily in operation. KMC has eight garages where transportation vehicles are stationed. Major vat points that accommodate garbage more than 30 MT are serviced from Dhapa garage with Pay loaders and 11 m3 capacity Tipper Trucks. Other vats are serviced by manual loading vehicles and Dumper placers. The street washing vehicles clean major thoroughfares every day. Three of the refuse collector vehicles are engaged for cleaning wastes from 300 trash bins along sixteen major roads.

98. 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 borough XV nearby. 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.

99. 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.

100. 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

101. **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/km^2 in 2011. Household numbers are 972,264 and average household size is 4.61 in 2011.

102. **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.

103. **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.

104. **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 S&D subproject sites. Kolkata does not fall under the Coastal Regulation Zone (CRZ).

105. **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.

106. 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.

107. **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.

108. **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.

109. **Education, Health and Health Care Facilities.** A listing for Boroughs XI-XV indicated that there are more than 150 government and private educational institutes within the Boroughs. The list includes primary, secondary and higher secondary schools, degree colleges, technical and professional institutes. A number of reputed institutions has recently been established in ward 108. Public health varies according to socio-economic level and location. As of 2008, there are more than forty 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.

110. **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.

111. 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.

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

113. **Recreational and Other Facilities.** More than twenty large play grounds are present in Boroughs XI to XVI area. There are innumerable temples, mats, 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

114. **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.

115. 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 14.

Table 14: Summary of Quantifiers and Qualifiers Used for Assessment Purposes

Duration (time-scale)	Short-term	Impact restricted to construction (0-24 months).
	Medium-term	Impact will continue throughout operation (after construction 30 years).
	Long-term	Impacts will exist beyond the life of the sewerage and drainage works (>50 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%)

116. Categorization of the subproject has been undertaken using ADB's rapid environmental assessment (REA) checklist for sewerage and drainage (Appendix 6).

A. Planning and Design Phase

117. Lalababu pumping station will be located within Railway land. Process has been initiated to purchase the land. For pipe laying rights-of-way (ROWs) of existing road will be followed.

118. The plan and technical design of the S&D 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 (CPHEEO). Engineering decisions considered the results of the population to be served, design period, the nature and location of facilities to be provided, the optimum utilization of the existing network and wastewater disposal. S&D management aims at improving the S&D system.

119. The salient design considerations are presented in Table 15.

Table 15: Salient Design Considerations of Sewerage and Drainage Works and Pumping Station Construction

Parameter	Design Consideration
Design Period	30 Years
Design area	This subproject mainly focuses on the development of sewerage and drainage (S&D) system under Borough 1
Design to meet S&D bench mark target	100%
Treated effluent discharge standards	pH = 6.5 to 9.0, Biochemical Oxygen Demand (BOD_5) = 20 mg/l, Total Suspended Solids (TSS)= < 50 mg/l, Faecal Coliforms = < 1000 MPN/100 ml

Parameter	Design Consideration
Storm water flow (SWF) and dry weather flow (DWF) Pumping Station	With discharge rate of approx. 5000 lps
Design of pumps and accessories Alignment of sewage mains	Pumps and accessories has been designed for the year of 2030 Alignment of the S&D lines is guided by existing road alignment wherever available
Design of the Pipe work	SWF pumping main and DWF pumping main from pumping station to discharge points
Pipe materials	SWF pumping main MS pipe, DWF pumping main DI pipe
Pipe laying	The pipe will be laid for gravity and pumping by conventional open trenching (cut and cover method) method in stretches along the right-of-way (ROW)
Ecological diversity	The subproject is situated within an existing build up area and no areas of ecological diversity occur within the subproject area. The nature and locality of the subproject is such that its implementation is unlikely to have any impact on biodiversity of the area.
Land use and livelihoods	The key efforts undertaken to minimize impacts are: (i) before the preparation of engineering design, a survey of the properties of the pipe laying alignment and pumping station area is to be conducted with regard to their ownership with the objective that minimum proprietary land is utilized for the subproject; (ii) diverting the alignment towards the available government land and ROWs to avoid land acquisition A. due diligence report has been prepared to address any social impact
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. Kolkata Municipal Corporation (KMC) will coordinate with the traffic police for the implementation of the Traffic Management Plan.
Sludge Management from Pumping Station	The sludge from Pumping Station would be sent to sludge sump for storage. This sludge is expected to have a consistency between 0.8% – 1% Dry Solid. This would then be sent to centrifuges for dewatering. The sludge is dosed with polyelectrolyte solution prior to feeding in centrifuge pump to help achieve higher solid concentration. The dewatered sludge will have a 20% – 25% Dry Solid which is semi solid (wet cake) in nature and can be trucked for transportation. The centrifuge pump is placed in such a way that the solids can be stored in a container or a truck beneath it. The wet cakes produce will have to be disposed by the contractor (who is awarded the contract) as per the instruction of engineer within 15km of the plant site. This sludge is stabilized and therefore it could be used as a soil conditioner or landfilled. It can also be sent to a composting plant since it is nutrient rich which would help in improving the compost quality produced. Final design will be done by contractor
Odor Management at Lalababu pumping station	It is noted that Lalababu pumping station is located near public house. Therefore, Management of odor from pumping station needs to be planned. The sump well in the pumping station receiving raw sewage is the only source from where bad odor may be emitted. The appurtenances and the sewage pumps shall be designed to avoid septicity, of the sewage in the sump well, which is one of the main reasons for the odor generation. The pumping station shall be

Parameter	Design Consideration
	covered with reinforced concrete cement slab, with provisions of opening only for entry to the sump well for maintenance. Provision of fresh air ventilation shall be provided inside the well. Efficient and quick removal of screened debris and floating material needs to be planned Wherever possible, the vacant land within the pumping station premises would be covered with plantation to arrest air pollutants and odor.
Environmental Monitoring	The environmental laws place a responsibility on KMC not to pump untreated DWF in the canal and the DWF pumping will commence only when arrangement of monitoring outflows from the STP is constructed and transmission of the results of such monitoring to West Bengal Pollution Control Board is in place. The regulations also specify the parameters to be monitored, the frequency of monitoring and the method of sampling.

120. Under the subproject, cleaner production processes and good energy efficiency practices will be followed as per SPS 2009. Particularly use of power saving LED lamp have been considered during preliminary design.

121. 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.

B. Construction Phase

122. Open trenching (cut and cover method) considered for sewage pipe line. The works will be along or adjacent to roads' un-used ROWs below the level of utilities avoiding properties. The works will involve earth-moving and excavation; mostly those involved in common and simple construction works. Materials will be brought in on trucks and offloaded by hand. Excavation, if necessary will be by backhoe and supplemented by manual digging. Excess spoils will be loaded into trucks for disposal.

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

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

Activities and Facilities	Inputs/Resource Use	Outputs/Waste Production
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 Bulk earthworks, grading and contouring. Movement of construction staff, equipment and materials	Cement Chemical additives used in concrete / asphalt (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	Old asphalt (removed from road carriageway during road restoration)[a] in case of pipe laying Waste concrete and other construction rubble Used fuels, lubricants, solvents and other hazardous waste General waste Contaminated soil

Activities and Facilities	Inputs/Resource Use	Outputs/Waste Production
Importation of selected materials Temporary detours 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, if required (and associated storage and mixing areas, chemicals) Rehabilitation of disturbed areas Interaction between construction workforce and local communities Management of the passing pedestrians and points of congestion Reminders to affected people of construction with time frames	Water for application to sub-base and base layers prior to compaction Petrochemicals Other chemicals/lubricants/paints Construction vehicles, machinery and equipment Temporary energy supply to construction camps 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 particularly at pipe laying area (not just danger tape) to prevent people from felling in trenches during construction	Soil contaminated with petrochemicals (i.e. oils and lubricants) and other chemicals Sewage and grey water (temporary construction camp sanitation) Spoil material (excess soil removed during excavations) 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

[a] The opening of roads may involve the stripping and demolition of old asphalt layers. Ideally, old asphalt shall be reused during restoration of the road in order to avoid large quantities of waste being produced. However, depending on the availability and cost of virgin aggregate in the area through which the road is aligned, reusing the old asphalt may be more costly than using virgin aggregate.

124. Table 17 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. The impact and mitigation will be re-assessed after finalization of design.

Table 17: 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 program management unit (PMU). No open fires permitted on site	Medium (negative)	Site	Short-term	Full Mitigation Possible
Air Quality	Sensitive receptors (e.g. hospitals, schools, religious place) may be affected temporarily by increased traffic and related impacts during the transportation of materials at 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 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 excavations below the water table will occur, causing collapse of excavated area. 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	The design of the site drainage system is adequate to control runoff from the excavated tranche 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	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**
	maintenance taking place on site.	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 West Bengal Pollution Control Board (WBPCB). Dispose of waste from the oil interceptors only 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.				
Drainage and hydrology	The proposed construction 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. 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.	Medium (negative)	Site	Short-term	Full Mitigation Possible
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 design there will be no requirement for tree felling. This	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

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	**Mitigation**	**Significance before Mitigation**	**Geographic Spatial Scale**	**Duration**	**Mitigation**
	will be further assessed during implementation stage					
Land Uses	Due to the location and nature of the subproject, there will be no as such interference with access. Existing public transport facilities and operations will be not affected. There will be only disruptions on pedestrian movements, due to traffic and construction related noise, visual, and air pollution particularly during laying of pipe.	KMC has consulted with various organizations, departments, etc. within the area and will be continued during the construction phase. Consult with local authority, organizations, etc. regarding location of construction camps, access and hauling routes, and other likely disturbances during construction. 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 and vehicles. Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.	Medium (negative)	Local	Short-term	Partial Mitigation Possible
Infrastructure and Services	There is likely to have temporary disruption of infrastructure and services during the pumping main, trunk main pipe laying There are a number of existing infrastructure and services (roads, telecommunication lines, power lines and various pipelines within the vicinity of the subproject.	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. 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.	Low (negative)	Local	Short-term	Full Mitigation Possible
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.	Prepared and follow 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	High (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**
	Road safety concerns due to slow moving construction vehicles. Traffic flow within the vicinity will be affected particularly at pumping main route. 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 for a short period. Pedestrian movements will be affected by the partial road closure.	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. 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. Enforce speed limits. Do not allow deliveries during peak traffic hours Template for traffic management plan is attached as Appendix 7.				
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	Comply with IFC EHS Guidelines on Occupational Health and Safety (https://www.ifc.org/wps/wcm/connect/.../Final+-+General+EHS+Guidelines) 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.	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**
	systems, inadequate waste management practices, pose a health hazard to providing breeding grounds for disease vectors such as mosquitoes, flies and snails. The use of hazardous chemicals in restoration of roads can pose potential environmental, health and safety risks. Improper disposal of hazardous waste create health problem Road safety may be affected during construction, especially when traffic is detoured.	Proper storage of hazardous chemicals, fuels lubricants 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. Disposal of demolition waste after necessary permission Undertake waste management practices (Planned disposal of sludge from pumping stations within surrounding areas of PS) particularly for Pumping Station Disposal of hazardous waste (e.g. burned oil) generated if any as per rules & regulations 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 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 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				

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	**Mitigation**	**Significance before Mitigation**	**Geographic Spatial Scale**	**Duration**	**Mitigation**
		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 8				
Noise and Vibrations	Use of heavy vehicles and equipment may generate high levels of noise. Vibrations resulting from bulk earthworks and compaction may create significant disturbances to nearby people and businesses. Disturbance from afterhours work.	Locate concrete batching, asphalt 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. 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.	High (negative)	Local	Short-term	Partial Mitigation Possible
Water Quality	Impacts on surface drainage and water quality due to contaminated runoff from construction areas in monsoon	• Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets • Stockpiles shall be provided with temporary bunds • Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with Implementing Agency on designated disposal areas • Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies • Place storage areas for fuels and lubricants away from any drainage leading to water bodies • Dispose any wastes generated by construction activities in designated sites	Medium (negative)	Local	Short-term	Partial Mitigation Definite
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	Properly fence off storage areas. Collect all domestic solid waste central point of disposal and feed into the city waste collection system. Handed over of hazardous waste if any to licensed company instead of direct disposal to land	Medium (negative)	Local	Short-term	Partial Mitigation Definite

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	**Mitigation**	**Significance before Mitigation**	**Geographic Spatial Scale**	**Duration**	**Mitigation**
	aesthetics and landscape character	Contractor to exercise strict care in disposing construction / demolition waste including proper disposal of sump residue after testing for the presence of hazardous substances. 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. Template for spoil management plan is attached as Appendix 9.				
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 area.	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
Archaeological and Cultural Characteristics	The proposed development will not require demolition of Archaeological Survey of India (ASI) or state-protected monuments and buildings	Develop a protocol for use by the construction contractors in conducting any excavation work, to ensure that any chance finds are recognized and measures are taken to ensure they are protected and conserved. Ensure that construction staff members are aware of the likelihood of heritage resources being	Low (negative)	Local	Short-term	Full Mitigation Definite

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation
		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 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.				

C. Operation and Maintenance Phase

125. The system has a design life of 30 years, during which it will not require major repairs or refurbishments and should operate with little maintenance beyond routine actions required to keep the pumps and other equipment in working order. The stability and integrity of the system will be monitored periodically to detect 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.

126. The main requirement for maintenance of the S&D conveyance 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 expected to be very rare, and that leaks are mainly limited to joints between pipes. Periodic removal of sludge from pumping station is essential. Sludge will be stored in open spaces within pumping stations and later it will be disposed off to Dhapa dumping ground, permission from WBPCB already exists for such disposal. Spoil disposal plan template is shown in Appendix 9.

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

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

Activities and Facilities	Inputs/Resource Use	Outputs/Waste Production
Operation activities Wastewater flow and pumping Maintenance activities Upkeep and repair of pumps Sludge removal from pumping station and sewer lines	Labor Vehicles and equipment used for inspections and maintenance Fuels and lubricants Electricity	Wastewater Sludge Potential for water source contamination

128. The following Table 19 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 19: Summary of Anticipated Potential Environmental Impacts during Operation and Maintenance
(including defect liability)

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 (due to transportation of materials during repairing work) and related impacts during sewerage and drainage (S&D) pipe line 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 only during maintenance works of pipe line. Existing public transport facilities and operations will be affected in case of road closure and detours. There will be disruptions to health 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. Consult with local authority, 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, health center, 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 contact numbers for concerns/complaints.	Low (negative)	Local	Short-term	Partial Mitigation Possible
Health and Safety	Danger of operations and maintenance-related injuries.	Comply with IFC EHS Guidelines on Occupational Health and Safety	Medium (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**
	Safety of workers and general public must be ensured. Poor waste management practices and unhygienic conditions at the improved 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. Fire and electrocution hazards in the Pumping Station.	(https://www.ifc.org/wps/wcm/connect/.../Final+-+General+EHS+Guidelines) Implement good housekeeping practices at PS Strictly implement health and safety measures and audit on a regular basis. Provide warning signs of hazardous working areas. Proper storage of hazardous chemicals, fuels lubricants 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. Undertake waste management practices-specifically periodic removal of sludge from pumping station. 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 Disposal of hazardous waste (e.g. burned oil) generated if any as per rules and regulations 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; 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,				

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Impacts			
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation
		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. Ensure occupational and community H&S incidents and near misses against performance targets of zero incident Health and Safety Plan is attached as Appendix 8				
Noise and Vibration	Sensitive receptors (hospitals, schools, religious places) may be affected temporarily by increased traffic and related impacts during pipe repairing work 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
Solid Waste	Solid waste/sludge from screens in the pump house	Regular removal through municipal system and approved disposal (preferably within pumping station area initially and then to Dhapa dumping ground after due permission from WBPCB)	High (negative)	Local	Medium-term to Long-term	Partial Mitigation Possible
Wastewater	Excess accumulation of sewage due to various reasons Excess accumulation of storm water	Ensure adequate pumping	High (negative)	Local	Medium-term to Long-term	Partial Mitigation Possible
Gaseous emission- odor from running of pumping station	The sump well in the pumping station receiving raw sewage is the only source from where bad odor may be emitted	It is noted that Lalababu pumping station is located near public house. Therefore, Management of odor from PS needs to be planned. The appurtenances and the sewage pumps shall be designed to avoid septicity, of the sewage in the sump well, which is one of the main reasons for the odor generation. The pumping station shall be covered with RCC slab, with provisions of opening only for entry to the sump well for maintenance. Provision of fresh air ventilation shall be provided inside the well. Efficient and quick removal of screened debris and floating material needs to be planned	High (negative)	Local	Medium-term to Long-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
		Wherever possible, the vacant land within the pumping station premises would be covered with plantation to arrest air pollutants and odor.				

D. Summary of Site Specific Mitigation Measures

129. The important site-specific mitigation/safeguard measures due to the below mentioned site situations are summarized as in Table 20 below.

Table 20: Site Specific Mitigation Measures for the Sewerage and Drainage Subproject

Work Component	Sector	Mitigation Measures
Package- Tr-3/SD 34- Construction of pumping stations at (1) LalababuNikashi/ Bagjola canal (2) Sakuntala Park, Behala at Node C premises.	Construction of PSs and pumping main	1. The location of the proposed pumping station (Lalababu) is within Central govt. land. Purchase of land under process. 2. Alignment of S&D network, trunk main and pumping main is within govt. ROW – no land acquisition is required 3. Roads/ lanes are within the city and accordingly traffic and pedestrian movement management during construction 4. Joining of pipes is to be planned such that the site is not flooded 5. Disposal/ utilization of demolition waste without polluting land including proper disposal of sump residue after testing for the presence of hazardous substances. 6. Sensitive receptors including households are located nearby - construction noise is to be kept at minimum avoiding work at night 7. Suitable bill boards are to be put up at strategic points of the site giving salient information on the work component, time schedule and name & contact numbers of responsible persons of PMU and Contractor 8. Security fencing is to be provided throughout the construction period around excavations/shaft 9. Excess solid waste (including demolition waste from Behala Node C pumping station) is to be disposed at sites pre-approved by PMU. 10. Site camp with toilet and drinking water facilities is to set up at available vacant areas without inconveniencing local residents and without restricting movement of vehicles. Selection of exact location will be done after detailed design and before start of construction work

E. Cumulative Impact Assessment

130. Lalababu Pumping Station will be constructed within Central govt. land. No other major civil construction activities are known to be taking place in the area. Other pipe laying works are in areas where no major civil constructions are in progress. In brief there are no major construction activities within the present subproject areas. The cumulative impact is less significant.

131. Table 21 summarizes the cumulative impacts resulting from the subproject when added to other present and reasonably future actions within reasonably foreseeable (30-year) period. During this time period, it is expected that many other actions will be implemented that will affect the environmental conditions.

Table 21: Cumulative Impact Assessment of Sewerage and Drainage Subproject

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Environmental Impacts			
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation
Cumulative land use and growth-inducing impacts	With sufficient sewerage and drainage (S&D) facilities, development can proceed to the degree that sewerage and drainage is not a constraint	Kolkata Municipal Corporation (KMC) to develop additional facilities beyond the design year to accommodate growth if it is to occur	High (negative)	Site/Local	Long-term	Full Mitigation Possible
Cumulative Air Quality Impacts	The subproject can collectively generate construction-related air emissions.	See mitigation measures in the environmental management plan (EMP)	Low (negative)	Site/Local	Short-term	Partial Mitigation Possible
Cumulative Noise Impacts	Noise is a localized issue that diminishes in intensity with distance from the source. Construction of the proposed facilities along with construction activities of other development in the subproject area can potentially increase construction-related noise impacts on land uses directly adjacent to the construction sites.	Such cumulative noise impacts will be temporary and will not likely occur during sensitive nighttime hours. See mitigation measures in the EMP	Low (negative)	Site/Local	Short-term	Partial Mitigation Possible

VI. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

A. Public Participation During the Preparation of the Initial Environmental Examination

132. 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.

133. Issues/concerns/suggestions raised during consultations pertain to construction schedule, and support of stakeholders to the Project. No issues/concerns raised on potential impacts and participants accepted mitigation measures as specified in the EMPs. Meaningful consultations for sensitive receptors, particularly around the STPs, will be conducted during detailed design phase and will be reported in the final IEE.

134. The primary stakeholders are: (i) local residents, shopkeepers and businesspeople who live and work around PS and alongside the roads where pipeline will be laid; and (ii) custodians and users of socially- and culturally-important areas.

135. 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, National Environmental Engineering Research Institute), 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 of India, and Ministry of Finance.

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

(i) Local communities, Individuals affected to be given priority while conducting public consultation;
(ii) Walk-through informal group consultations along the proposed pumping main pipeline;
(iii) The local communities to be informed through public consultation with briefing on project interventions including its benefits;
(iv) The environmental concerns and suggestions made by the participants to be listed out, discussed and suggestions to be noted for consideration during implementation.

137. Formal consultations have been carried out and copies of concerned Minutes of the meetings are attached as Appendix 10. These consultations were supplemented by series of informal discussions by the program management consultant (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.

B. Future Consultation and Disclosure

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

1. Consultation During Detailed Design

139. 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.

140. 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.

141. 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.

2. Consultation During Construction

(i) 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
(ii) Small-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.

3. Project Disclosure

142. 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. The road closure together with the proposed detours will be communicated via advertising, pamphlets, road signages, etc.

143. 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.

144. 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

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

146. **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.

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

148. 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.

149. 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.

150. 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.

151. 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.

152. **Grievance Redress Committee.** An apex grievance redress committee (GRC) has already been constituted by the Project Director to address grievances pertaining to broader concerns related to the program/subproject. [6] A PMU level GRC has already been constituted by the Project Director to address grievances. Grievances not resolved at borough level are referred

[6] The apex GRC will have the following members: KMC Commissioner as Chairperson, KEIIP Project Director, Director General (P), KEIIP, Environment/Social Safeguard Officer, Administrative Officer as the convener, representatives of affected persons, community-based organizations (CBOs), and eminent citizens. The GRC must have at least two women members.

to PMU level. However, grievances that cannot be resolved at PMU level will be referred to an apex GRC. Still unresolved issues will be referred to an appropriate court of law.

153. The time limit for grievance redressal will be as follows:
   (i) Site level – 7 days;
   (ii) Borough level – 7 days;
   (iii) GRC – PMU level – 15 days; and
   (iv) Apex GRC- 15 days.

154. Appendix 11 shows office order related to set up of GRC.

155. **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.

156. **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.

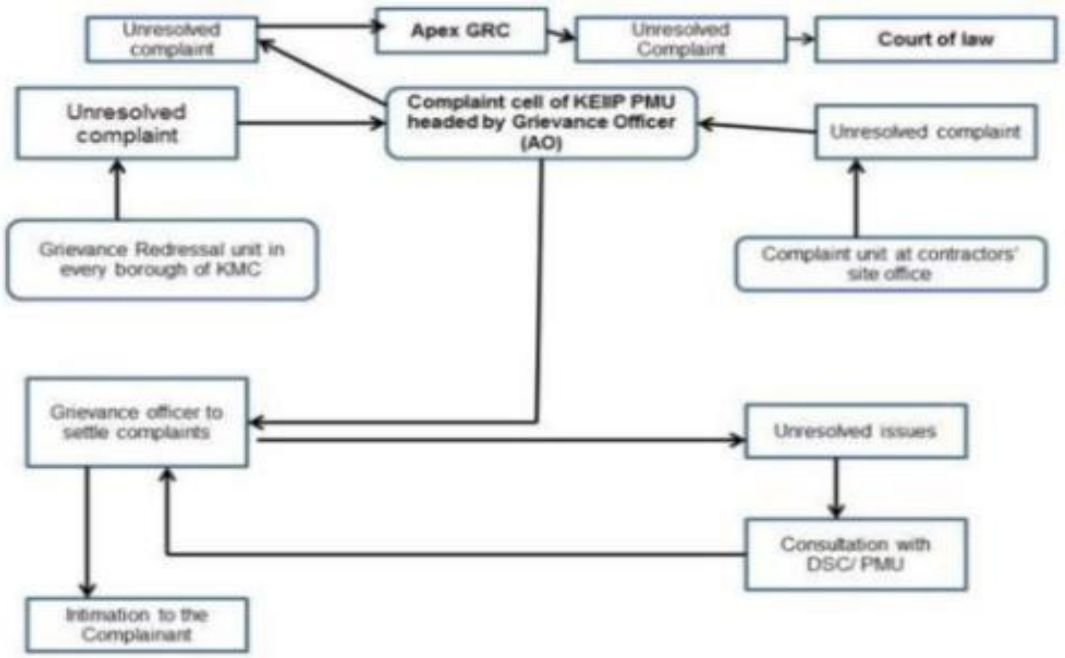
157. **Information Dissemination Methods of the Grievance Redress Mechanism.** Grievances received and responses provided will be documented and reported back to the affected persons. Sample grievance registration form is in Appendix 12. The number of grievances recorded and resolved and the outcomes 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.

158. **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.

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

160. Figure 10 shows GRM flow chart.

Figure 10: Grievance Redress Mechanism System in Kolkata Environmental Improvement Investment Program



DSC = Design and Supervision Consultant, GRC = grievance redress committee, KEIIP = Kolkata Environmental Improvement Investment Program, KMC = Kolkata Municipal Corporation, PMU = program management unit.

VIII. ENVIRONMENTAL MANAGEMENT PLAN

161. 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; (ii) Construction Phase; and (iii) Post Construction/Operational Phase.

162. 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 contractors for the packages 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 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.

163. A copy of the final EMP[7]/approved SEP must be kept on site during the construction period at all times. The EMP will be made binding on contractor operating on the site and will be included within the Contractual Clauses. Non-compliance with, or any deviation from, the

[7] Final EMP will be developed by contractor after finalization of design.

conditions set out in this document constitutes a failure in compliance. It shall be noted that the Supreme Court of India[8] mandates those responsible for environmental damage must pay the repair costs both to the environment and human health and the preventative measures to reduce or prevent further pollution and/or environmental damage. (The polluter pays principle).

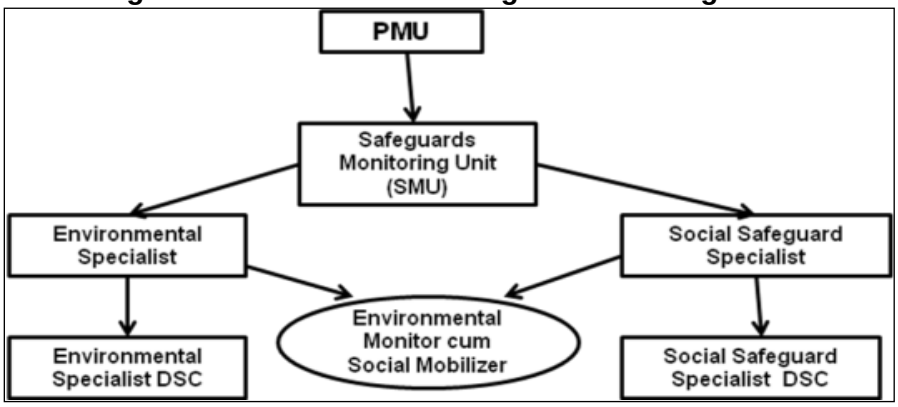
164. The Contractor is deemed not to have complied with the EMP/approved SEP if:
   (i) Within the boundaries of the site, site extensions and haul/ access roads there is evidence of contravention of clauses.
   (ii) If environmental damage ensues due to negligence.
   (iii) The contractor fails to comply 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

165. The institutional arrangement will follow KEIIP's organizational structure and functions (Figure 11). The subproject will be implemented and monitored by the program 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.

166. PMU-SMU will be supported by the Design and Supervision Consultants (DSC). An Environment Specialist will be 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 11: Institutional Arrangement – Safeguards



PMU = program management unit; DSC = Design and Supervision Consultant; SMU = Safeguards Monitoring Unit.

167. Table 22 gives the institutional roles and responsibilities in all phases of the subproject.

[8] 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."

Table 22: Institutional Roles and Responsibilities: Environmental Safeguard

Phase	Program Management Unit/ Safeguards Monitoring Unit	Design and Supervision Consultant	Asian Development Bank
Subproject identification stage		• Design and supervision consultant (DSC) to screen subprojects with inputs based on the environmental assessment and review framework (EARF) subproject selection guidelines	
Subproject appraisal stage	• program management unit (PMU) to review the rapid environmental assessment (REA) checklists and draft initial environmental examination (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	• Asian Development Bank (ADB) to review the REA checklists and reconfirm the categorization. • ADB will review and approve environmental impact assessment (EIA) reports (Category A) and IEE reports (Category B) subprojects. • ADB to disclose on its website the submitted EIA/IEE report.
Preliminary Design Phase and then final design phase	• Safeguards Monitoring Unit (SMU) of PMU with the assistance of DSC to incorporate the environmental management plan (EMP), environmental mitigation and monitoring measures into contract documents.	• DSC to revise the IEE and EMP in accordance with detailed design changes (which to be done by design, supply, installation and operation and maintenance or O&M contractor). • DSC to ensure incorporation of preliminary design based 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 resettlement plan is implemented (if required as per project design) 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	

Phase	Program Management Unit/ Safeguards Monitoring Unit	Design and Supervision Consultant	Asian Development Bank
		areas, lay down areas, and other sites/plans specified in the EMP).	
Construction Phase	• SMU 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	• Initially contractor will do all monitoring up to their contract period after that Kolkata Municipal Corporation (KMC) to conduct monitoring, as specified in the environmental monitoring plan. • West Bengal Pollution Control Board to monitor the compliance of the standards regarding drinking water quality, ground water, ambient air, effluent quality from treatment plant, as applicable.		

168. The Safeguards Monitoring Unit will:
   (i) prepare the REA checklist, to draft the EIA/IEE and to disclose the approved EIA/IEE in the website;
   (ii) ensure that Environmental Clearance, Consent to Establishment and Consent to Operate and other certificates, as required, are obtained in time from appropriate authorities and to ensure compliances with conditions imposed;
   (iii) ensure incorporation of the EMP, environmental mitigation and monitoring measures into the contract documents;
   (iv) monitor disclosure and public consultation arranged by DSC during IEE process and to ensure that comments are reflected in the IEE report
   (v) ensure disclosure of information throughout the duration of the subproject through suitable visual means and publications;
   (vi) provide necessary input for grievance redress;
   (vii) approve contractor's proposed locations for construction work camps, storage areas, hauling roads, lay-down areas, and disposal areas for solid and hazardous wastes on recommendations of DSC;
   (viii) guide the Contractor for drawing up of Site Environmental Management Plan and to approve the same;
   (ix) induct the Contractor for taking up the construction following environmental and social safeguards;
   (x) facilitate scheduled monitoring during implementation of the project.
   (xi) carry out regular onsite monitoring and guide the Contractor to adopt the required site management standard;
   (xii) ensure the required health and safety measures at work sites;
   (xiii) obtain in time and to review the monthly monitoring report of the Contractors
   (xiv) prepare 6-monthly monitoring and EMP implementation report, including the status of project compliance, statutory clearances and relevant loan covenants, and submit the approved 6-monthly report to ADB and seek permission to disclose the same in the investment program website; and
   (xv) prepare monitoring report on post-construction activities by the contractors as specified in the EMP.

169. The Contractor will be required to:
   (i) assist DSC for updating of report after detailed design;
   (ii) 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;
   (iii) comply with all applicable legislation, is conversant with the requirements of the EMP/ approved SEP;
   (iv) brief his staff, employees, and laborer about the requirements of the EMP/ approved SEP;
   (v) ensure any sub-contractors/ suppliers who are deployed 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;
   (vi) submit methodology statements for all activities requiring special attention as specified and/or requested by the DSC Environment Specialist during the duration of the Contract;
   (vii) provide environmental awareness training to staff, employees, and laborers;
   (viii) bear the costs of any damages/compensation resulting from non-adherence to the EMP/ approved SEP or written site instructions;

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

(x) ensure that the PMU Environment Coordinators are timely informed of any foreseeable activities that will require input from the DSC Environment Specialist.

B. Environmental Management and Mitigation Measures

170. Table 23 outlines the site establishment and preliminary activities.

Table 23: Site Establishment and Preliminary Activities

No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
1	Legislation, Permits and Agreements	In all instances, Kolkata Municipal Corporation (KMC), service providers, contractors and consultants must remain in compliance with relevant local and national legislation.	Program management unit (PMU) and design and supervision consultant (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 environmental management plan (EMP)/approved site environmental plan (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.	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 (if any) 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
		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 source 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[a]	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
		The construction camp may not be situated on a floodplain or on slopes greater than 1:3.	PMU Environment Specialist and DSC Environment Specialist	During surveys and preliminary investigations and prior to moving onto the site

No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		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 areas or the surrounding bush be used as a toilet facility.	DSC Environment Specialist	Ongoing
		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[b]	Choice of location for equipment lay-down and storage areas must be taken 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 / animals etc.	DSC Environment Specialist	During site set-up
		It is very important that the proximity of residents, businesses, schools etc., is taken into account when deciding on storage areas for hazardous substances or materials. Residents living adjacent	PMU Environment Specialist and DSC Environment Specialist	During site set-up

No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		to the construction site must be notified of the existence of the hazardous storage are		
		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) shall be readily available on site for all chemicals and hazardous substances to be used on site. Where possible the available, MSDSs shall additionally include information on ecological impacts and measures to minimize negative environmental impacts during accidental releases or escapes	DSC Environment Specialist and Contractor	Ongoing
		Staff dealing with these materials/substances must be aware of their potential impacts and follow the appropriate safety measures. The contractor must ensure that its staff is made aware of the health risks associated with any hazardous substances used and has been provided with the appropriate protective clothing/equipment in case of spillages or accidents and have received the necessary training	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[c]	Contractors shall prepare a source statement indicating the sources of all materials (including topsoil, 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

No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		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[d]	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 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	DSC Environment Specialist and Contractor	During staff induction, followed by ongoing monitoring
6	Social Impacts[e]	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 if any. The road closure (particularly during laying of pipes) together with the proposed detour needs to be communicated locally	PMU Environment Specialist	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	PMU Environment Specialist	Prior to moving onto site and ongoing

No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		duration of construction works and contact numbers for concerns/complaints.		
		Storage facilities and other temporary structures on site shall be located such that they have as little visual impact on local residents as possible.	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.
		Special attention shall be given to the screening of highly reflective materials on site.	PMU Environment Specialist	During site set-up
7	Noise Impacts	Construction and transportation vehicles are be to fitted with standard silencers prior to the beginning of construction	DSC Environment Specialist and PMU Environment Specialist	During site set-up
		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[f]	Vehicles travelling during transportation of materials 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
		Procedures that are in place to conserve topsoil during the construction phase of the subproject are to be applied to the set-up phase. i.e. topsoil is to be conserved while providing access to the site and setting up the camp.	DSC Environment Specialist and PMU Environment Specialist	Ongoing monitoring. during site set-up
10	Storm water[g]	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	DSC Environment Specialist	During surveys and preliminary Investigations.

No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		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).	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[h]	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 up, removed and disposed of safely from the bunded area as soon after detection as possible to minimize pollution risk and reduced bunding capacity.	DSC Environment Specialist and PMU Environment Specialist	During site setup.
		A designated, bunded area is to be set aside for vehicle washing and maintenance. Materials caught in this bunded area must be disposed of to a suitable waste site or as directed by the DSC Environment Specialist	DSC Environment Specialist and PMU Environment Specialist	During site 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[i]	No vegetation may 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-chance find protocol	Develop a protocol for use by the construction contractors in conducting any excavation work, to ensure that any chance finds are recognized and measures are taken to ensure they are protected and conserved. Prior to the commencement of construction, all staff need to know what possible archaeological or historical objects of value may	PMU Environment Specialist	During site set-up and ongoing.

No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		look like, and to notify the DSC Environment Specialist/Contractor shall such an item be uncovered.		
15	Occupational health and safety	Comply with IFC EHS Guidelines on Occupational Health and Safety (https://www.ifc.org/wps/wcm/connect/.../Final+-+General+EHS+Guidelines) Mitigation measures as mentioned during construction phase to be followed	DSC Environment Specialist and PMU Environment Specialist	During site set-up and ongoing.
16	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, such as, pipes 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. Examples are: • stringing of power lines • excavation for the micro-tunnel equipment • earthworks/earthmoving machinery on beside houses/infrastructure/sensitive receptors • risk to residences/sensitive receptors along haulage roads/access routes.	PMU Environment Specialist and DSC Environment	24 hours prior to activity in question

Note: Table to be revised by contractors for package-specific SEP after finalization of design.
[a] Careful planning of the construction camp can ensure that time and costs associated with environmental management and rehabilitation are reduced.
[b] Storage areas can be hazardous, unsightly and can cause environmental pollution if not designed and managed carefully
[c] Materials must be sourced in a legal and sustainable way to prevent offsite environmental degradation.
[d] These points need to be made clear to all staff on site before the subproject begin.
[e] 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.
[f] Establishment of the camp site and related temporary works can reduce air quality.
[g] Serious financial and environmental impacts can be caused by unmanaged storm water.
[h] Incorrect disposal of substances and materials and polluted run-off can have serious negative effects on groundwater quality.
[i] 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.

171. Table 24 outlines management of construction activities and workforce.

Table 24: Management of Construction and Workforce Activities

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
		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,[a] must be followed at all times	DSC Environment Specialist	Ongoing monitoring
4	Dust and Air Pollution[b]	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/h must be adhered to on all dirt roads.	DSC Environment Specialist	Ongoing monitoring

No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		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 utilize screening using wooden supports and shade cloth where dust is unavoidable in residential/commercial/sensitive receptors areas	DSC Environment Specialist	As directed by the DSC Environment Specialist.
		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.
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 commence top soiling and re-vegetation immediately after completion of an activity and at an agreed distance behind any particular work front.	DSC Environment Specialist	As each activity is completed.
		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.	DSC Environment Specialist	Ongoing monitoring.
		Contractor to protect all embankments, unless otherwise directed by the DSC Environment Specialist, by a cut off drain to prevent water from cascading down the face of the embankment and causing erosion.	DSC Environment Specialist	Immediately after the creation of the embankment/ stripping of vegetation.
6	Storm water	Contractor shall not in any way modify nor damage the banks or bed of streams, wetlands, other open water bodies and drainage lines adjacent to or within the designated area, unless required as part of the construction project specification. Where such disturbance is unavoidable, modification of water bodies shall be kept to a minimum in terms of: (i) removal of riparian vegetation; and (ii) opening up of the stream channel	PMU Environment Specialist and DSC Environment Specialist	Ongoing monitoring.
		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.	DSC Environment Specialist	Monitoring throughout the duration of the subproject.
		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.

No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		Contractor to slow down flows where surface run-off is concentrated (e.g. along exposed roadways/tracks by contouring with hay bales or bundled vegetation generated during site clearance operation. If the area must be used for construction vehicles, berms may be used instead. The berms must be at least 30 cm high and well compacted. The berms shall channel concentrated flow into detention ponds or areas protected with hay bales for flow reduction and sediment capture	DSC Environment Specialist	Ongoing monitoring.
7	Water Quality[c]	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, Channel, Canal or groundwater on site.	DSC Environment Specialist	Regular monitoring (refer to the environmental monitoring program)
		Contractor to ensure run-off from vehicle or plant washing does not enter surface water body or the groundwater and ensure wash water passes through an oil-grease trap prior to discharge.	DSC Environment Specialist	Regular monitoring (refer to the environmental monitoring program)
		Contractor to prohibit site staff in using any 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 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.	DSC Environment Specialist	Regular monitoring (refer to the environmental monitoring program)
		Contractor shall refer to emergency contact numbers of West Bengal Pollution Control Board (WBPCB) in order to deal with spillages and contamination of aquatic environments.	PMU Environment Specialist and DSC Environment Specialist	As necessary
8	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 prohibit site staff from hunting of birds and animals 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.

No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		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.
9	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 places 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
		Contractor to prohibit spraying of herbicides/pesticides during windy condition	DSC Environment Specialist	As necessary
10	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. Waybills proving disposal at each site shall be provided for the DSC Environment Specialist's inspection.	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.
		During demolition of sump of existing pump house residual waste will be tested for the presence of relevant hazardous substances and disposal will be made accordingly	DSC Environment Specialist	Once during demolition
11	Occupational Health and Safety	World bank Environmental, Health, and Safety (EHS) Guidelines - EHS Guidelines for water & sanitation will be followed. Specifically,	DSC Environment Specialist	Ongoing monitoring.

No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		(i) Develop and implement site-specific Health and Safety (H and S) Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use Personal Protective Equipment like helmet, gumboot, safety belt, gloves, nose musk and ear plugs; (c) H and S Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents; (ii) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site; (iii) Provide medical insurance coverage for workers; (iv) Secure all installations from unauthorized intrusion and accident risks; (v) Provide supplies of potable drinking water; (vi) Provide clean eating areas where workers are not exposed to hazardous or noxious substances; (vii) Provide H and S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers; (viii) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted; (ix) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas; (x) Ensure moving equipment is outfitted with audible back-up alarms; (xi) Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate; and (xii) Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.		
12	Community Health and Safety	Plan routes to avoid times of peak-pedestrian activities. Liaise with DSC- PIU in identifying risk areas on route cards/maps	DSC Environment Specialist	Ongoing monitoring.

No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure. Provide road signs and flag persons to warn of dangerous conditions, in case of location near the road. Provide protective fencing around open trenches, and cover any open trench with metal planks during non-construction hours		
13	Social Impacts[d]	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 (if any along pipe line) 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	At least 1 week prior to the activity taking place.
		Contractor to inform affected persons around pipe laying area in writing of disruptive activities at least 24 hours beforehand. This can take place by way of leaflets giving DSC Environment Specialist and Contractor's details or other method approved by the DSC Environment Specialist.	DSC Environment Specialist	At least 24 h prior to the activity taking place.
		Contractor to provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.	DSC Environment Specialist	At least 1 week prior to the activity taking place.
		Contractor to ensure lighting at the construction site is to 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	DSC Environment Specialist	Monthly monitoring

No.	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		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.		
		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 Coordinator 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 Coordinator 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
14	Cultural Environment-chance find protocol	Develop a protocol for use by the construction contractors in conducting any excavation work, to ensure that any chance finds are recognized and measures are taken to ensure they are protected and conserved. Contractor to note possible items of historical or archaeological value include old stone foundations, tools, clayware, jewelry, 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
15	Environment Safeguard/ Safety Officer	Contractor shall appoint one Environment Safeguard/ Safety Officer who shall be responsible for assisting contractor in implementation of EMP, community liaison, consultations with interested/affected parties, reporting and grievance redressal on day-to-day basis.	DSC Environment Specialist	As required

Note: Table to be revised by contractors for package-specific SEP after finalization of design.

[a] (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.

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

[c] 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.

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

172. Table 25 presents the site specific EMP for S&D subproject.

Table 25: Site Specific Environmental Management Plan for the Sewerage and Drainage Subproject

Work Component	Subproject Areas	Environment Management Measures
Package-Tr-3/SD34 – Construction of pumping stations at (1) Lalababu Nikashi/ Bagjola canal (2) Sakuntala Park, Behala at Node C premises.	Construction of pumping stations and pumping main	1. The location of the proposed pumping station is within Central government land– purchase/ transfer of land is required 2. Alignment of sewerage and drainage (S&D) main and pumping main is within government right-of-way (ROW) – no land acquisition is required 3. Roads/lanes are within the locality extra care is to be taken for traffic and pedestrian movement management during construction 4. Joining of pipes is to be planned such that the site is not flooded 5. Health center and housing complex is located nearby and within, respectively - construction noise is to be kept at minimum avoiding work at night 6. First aid boxes are to be available at the construction sites 7. PPE are to be provided to workmen 8. Diesel generator set, if used during the construction activities, is to comply with prescribed emission and noise standards 9. Pumps/motors are to comply with the prescribed noise standard and manufacturers' specification of noise level is to be checked when installed. 10. The pumping station is to be provided with fire extinguishers, first aid box, rubber mattings around the control panels and ear muffs for the operators 11. Excess earth is to be utilized in filling up of low lying areas in and around 12. 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. 13. Toilets of work camp sites should have adequate sanitary provisions so as not to pollute land and/or water environment 14 Disposal of demolition waste including sump residues at permitted site 15.There are no site specific environmental issues connected with the construction

173. Table 26 outlines the EMP for post-construction activities.

Table 26: Environmental Management Plan Post-Construction Activities (Defects Liability Period)

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
		The Contractor must arrange the cancellation of all temporary services.	DSC Environment Specialist	Subproject completion

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
		The Contractor is to water and maintain all planted vegetation until the end of the defects liability and operation contract period and is to submit a method statement regarding this to the DSC Environment Specialist.	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
		All embankments are to be trimmed, shaped and replanted to the satisfaction of the DSC Environment Specialist.	DSC Environment Specialist and Contractor	Subproject completion
		Borrow pits are to be closed and rehabilitated in accordance with the pre-approved management plan for each borrow pit. The Contractor shall liaise with the DSC Environment Specialist regarding these requirements.	DSC Environment Specialist	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.	Contractor	As directed by the DSC Environment Specialist.
5	Generation of odor during operation of pumping station	The sump well in the pumping station receiving raw sewage is the only source from where bad odor may be emitted. The appurtenances and the sewage pumps shall be designed to avoid septicity, of the sewage in the sump well, which is one	DSC Environment Specialist and Contractor	Subproject completion

No.	Activities	Management/Mitigation	Responsible for Monitoring	Frequency
		of the main reasons for the odor generation. The pumping station shall be covered with RCC slab, with provisions of opening only for entry to the sump well for maintenance. Provision of fresh air ventilation shall be provided inside the well. Efficient and quick removal of screened debris and floating material Wherever possible, the vacant land within the pumping station premises would be covered with plantation to arrest air pollutants and odor.		
6	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
		Access or haulage roads that were built must be rehabilitated by removing temporary bridges and any other materials placed in/or near to watercourses. Re-vegetation of banks or streambeds must be as necessary to stabilize these and must be approved by the DSC Environment Specialist.	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

Note: Table to be revised by contractors for package-specific SEP.

174. Table 27 outlines EMP for Operation and Maintenance activities.

Table 27: Environmental Management Plan Operation and Maintenance Activities (covering defect liability period and operation phase)

No.	Activities	Management/Mitigation	Responsible for Monitoring	Frequency
1	Pollution monitoring	Monitor the environmental quality in terms of Pumps' discharge, sludge, ambient air and noise levels.	Operation and maintenance (O&M) contractor in association with Environmental Monitoring Laboratory of Kolkata Municipal Corporation (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.	O&M contractor in association KMC	As necessary

No.	Activities	Management/Mitigation	Responsible for Monitoring	Frequency
3	Sludge disposal from pumping station	Analyze for hazardous elements and accomplish safe disposal at pre-approved sites (preferably utilization after drying of sludge) Dhapa dumping ground may be used as disposal site after permission from West Bengal Pollution Control Board (WBPCB)	O&M contractor in association KMC	As necessary
4	Generation of odor during operation of pumping station	The appurtenances and the sewage pumps shall be designed to avoid septicity, of the sewage in the sump well, which is one of the main reasons for the odor generation. The pumping station shall be covered with reinforced concrete cement slab, with provisions of opening only for entry to the sump well for maintenance. Provision of fresh air ventilation shall be provided inside the well. Efficient and quick removal of screened debris and floating material Wherever possible, the vacant land within the pumping station premises would be covered with plantation to arrest air pollutants and odor.	O&M contractor in association KMC	As necessary
5	Trees and landscaping maintenance	Young trees require sufficient water until their roots are able to tap available groundwater. Make every effort to water existing trees during periods of drought. When pruning cut as close as possible to the branch collar. Do not injure or remove the collar.	O&M contractor in association KMC	As necessary.

C. Environmental Monitoring Program

175. Table 28 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 28: Environmental Monitoring Program

Aspect	Parameter	Standards	location	duration / frequency	Implementation	Supervision	Cost (₹) / Source of Fund
1. Site establishment and preliminary activities							
Legislation, Permits and Agreements	Consent to establish (CTE) and consent to operate (CTO) for the hot mix, stone crushers, and	Air (Prevention and Control of Pollution) Act of 1981, Rules of 1982 and amendments.	-	prior to moving onto site and during construction	Contractor	Program management unit (PMU)/design and supervision consultant (DSC)	If required –ref. final design cost / Contractor

Aspect	Parameter	Standards	location	duration / frequency	Implementation	Supervision	Cost (₹) / Source of Fund
	diesel generators)						
	Cutting Permit for Scheduled Trees	West Bengal Trees (Protection and Conservation in Non-Forest Areas) Act, 2006	-	prior to moving onto site	DSC	PMU	If required –ref. final design cost / Contractor
	Copy of Environmental Management Plan (EMP)	Asian Development Bank (ADB) Safeguard Policy Statement (SPS)	subproject site, offices, website, library, etc.	At all times	Contractor	PMU/DSC	-
Access to site	Existing conditions	EMP	all access and haul roads	prior to moving onto site	DSC Environment Specialist	PMU	-
	Road closures and traffic rerouting	Traffic Management Plan and EMP	all affected roads	one week in advance of the activity	DSC Environment Specialist Contractor	PMU	As per engineering – design cost BOQ not considered under EMP cost/ Contractor
	Notifications and road signages	Traffic Management Plan and EMP	all affected roads	one week in advance of the activity	DSC Environment Specialist Contractor	PMU	-
Construction camp	Approval of location and facilities	EMP	as identified	prior to moving onto site	Contractor with the DSC Environment Specialist and PMU Environment Specialist	PMU/DSC	-
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	-

Aspect	Parameter	Standards	location	duration / frequency	Implementation	Supervision	Cost (₹) / Source of Fund
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	Overall Tranche 3100,000/ PMU-contractor
Social impacts	Public Consultations, Information Disclosure, Communication Strategy	Environmental Assessment and Review Framework (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 (Kolkata Municipal Corporation or KMC)	PMU Cost
	Grievance Redress Mechanism (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)	PMU cost
Noise	Baseline Data for noise level in dB(A) L_{eq}	National Noise Standards	Five 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	10,000/ Contractor
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), Hydrogen sulphide (H_2S) and hydrocarbons (HC)	National Ambient Air Quality Standards	Five 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	60,000/ Contractor
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	Project cost not considered under EMP cost/ Contractor

Aspect	Parameter	Standards	location	duration / frequency	Implementation	Supervision	Cost (₹) / Source of Fund
Water quality	Baseline qualitative characteristics	EMP	subproject sites[a]	prior to site set-up	Contractor with DSC Environment Specialist and PMU Environment Specialist	PMU/DSC	10,000/ Contractor
Conservation of Natural Environment	Existing conditions	EMP	subproject sites	prior to site set-up	Contractor with DSC Environment Specialist and PMU Environment Coordinator	PMU/DSC	Project cost (BOQ) not considered under EMP cost/ Contractor
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 Coordinator	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 Coordinator	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	As per engineering – design cost not considered under EMP cost/ Contractor
Construction camp	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	As per engineering – design cost not considered under EMP cost/ Contractor
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, H_2S and HC	National Ambient Air Quality Standards	Five locations near construction sites as specified by	once in four months (three times in a year)	Contractor with close coordination with the DSC Environment Specialist	PMU/DSC	3,60,000/ Contractor

Aspect	Parameter	Standards	location	duration / frequency	Implementation	Supervision	Cost (₹) / Source of Fund
			the engineer (DSC).				
Storm water	Soil erosion management measures	EMP	subproject sites	Ongoing	Contractor	DSC Environment Specialist	As per engineering – design cost not considered under EMP cost/ Contractor
Water quality	Qualitative characteristics	EMP and pre-existing conditions	subproject sites	Ongoing	Contractor	DSC Environment Specialist	70,000/ Contractor
Hazardous waste after demolition of pump house	Waste testing parameters	Hazardous waste disposal	Pumping station which to be demolished	Once	Contractor	DSC Environment Specialist	15,000/- Contractor
Conservation of Natural Resources	Number of scheduled trees	Tree-cutting permit and EMP	subproject sites	Ongoing	Contractor	DSC Environment Specialist	Depending on final SEP- project cost/ Contractor
	Vegetation conditions	EMP	subproject sites	Ongoing	Contractor	DSC Environment Specialist	-
Materials management	Qualitative characteristics	EMP	subproject sites	Ongoing	Contractor	DSC Environment Specialist	Visual Assessment / Contractor
Waste management	Qualitative characteristics	EMP	subproject sites	Ongoing	Contractor	DSC Environment Specialist	Visual Assessment / Contractor
	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)	Total Tranche 3 - 1,00,000/ Contractor
	GRM Register	EMP	subproject sites	Ongoing	Contractor with the DSC Environment Specialist, PMU Environment Specialist, PMU/DSC	Implementing Agency (KMC)	PMU cost
Cultural environment	Chance finds	ASI Act and EMP	subproject sites	Ongoing	Contractor	DSC Environment Specialist	As per requirement/ Contractor

Aspect	Parameter	Standards	location	duration / frequency	Implementation	Supervision	Cost (₹) / Source of Fund
Noise quality	Noise Level in dB(A) L_{eq}	National Noise standards	Five locations near construction sites as specified by the engineer (DSC).	once in four months (three times in a year)	Contractor with close coordination with the DSC Environment Specialist	PMU/DSC	60,000/ Contractor
C. Post-construction activities							
Construction camp	Pre-existing conditions	EMP	construction camp	subproject completion	Contractor	DSC Environment Specialist	As per engineering – design cost not considered under EMP cost/ Contractor
Vegetation	Pre-existing conditions	Tree-cutting Permit and EMP	subproject sites	subproject completion	Contractor	DSC Environment Specialist	As per engineering – design cost not considered under EMP cost/ Contractor
Land rehabilitation	Pre-existing conditions	EMP	subproject sites	subproject completion	Contractor	DSC Environment Specialist	As per engineering – design cost not considered under EMP cost/ Contractor
Materials and infrastructure	Pre-existing conditions	EMP	subproject sites	subproject completion	Contractor	DSC Environment Specialist	As per engineering – design cost not considered under EMP cost/ Contractor
General	Records	EMP	subproject sites	subproject completion	Contractor with DSC Environment Specialist and PMU Environment Specialist	PMU/DSC	-
D. Operation and maintenance (O&M) (defect liability period)							
Air quality	PM_{10}, $PM_{2.5}$, SO_2, NO_2, H_2S	National Ambient Air Quality Standards	Two locations as specified by executing agency	once in 6 months (defect liability period)	O&M contractor in association with Environmental Monitoring Laboratory of KMC	PMU/DSC	48,000/ Contractor
Noise quality	Noise Level in dB(A) L_{eq}	As per National Noise standards	Two locations as specified	once in 6 months (defect liability period)	O&M contractor in association with Environmental	PMU/DSC	8000/ Contractor

Aspect	Parameter	Standards	location	duration / frequency	Implementation	Supervision	Cost (₹) / Source of Fund
			by executing agency		Monitoring Laboratory of KMC		

Note: Table to be revised by contractors for package-specific SEP.

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

176. 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 29.

Table 29: 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 design and supervision consultant (DSC), Safety Officers of Contractors, KEIIP Senior Engineers	DSC and program management unit (PMU) with assistance from INRM, ADB, New Delhi and WBPCB
Initial environmental examination (IEE) and environmental management plan (EMP) of sewerage and drainage (S&D) subproject covering PS works	Once during Pre-construction stage	Safety officers of Contractors and Construction supervisors of DSC	DSC and PMU
Workshop on implementation of EMP of S&D subproject covering pumping station works of KEIIP: lessons learnt and way forward	Once during Construction stage	Senior Construction Supervisors of DSC, PMC Engineers, Safety Officers of Contractors, KEIP Senior Engineers	DSC with assistance from PMU

D. Environmental Management and Monitoring Cost

177. 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.

178. 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. But during O&M contract period specific contractor will do monitoring work.

179. 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 30 and 31 summarizes the indicative cost to implement the EMP during pre-construction and construction phase and operation phase, respectively. The contractors for the said package will provide detailed costs after finalization of design and before start of the construction work.

Table 30: Indicative Costs for Environmental Management Plan Implementation – Preconstruction and Construction Phase

Item	Parameters	Project Phase	Sampling Station	Duration and Frequency	Quantity	Unit cost (₹)	Total cost (₹)	Source of funds
1. Survey and monitoring							**5,85,000.00**	Survey and Investigation /Contingency
Ambient air	PM_{10}, $PM_{2.5}$, SO_2, NO_2, H_2S, and CO	Pre-construction and Construction	2. Pumping station location 3 stations near pipe laying areas	**Preconstruction** – One time at 2 pumping station locations Three locations at pipe laying - one time **Construction phase-** Thrice in a year at 2 locations of pumping station for 24 months Three locations at pipe laying– thrice in a year for 24 months	5 2x6= 12 3x6= 18 **Total 35**	12,000	4,20,000.00	Contractor budget
Noise	L_{eq} in dBA	Pre-construction and Construction	2. Pumping station locations 3 stations near pipe laying areas	**Preconstruction** – One time at 2 pumping station locations Three locations at pipe laying - one time **Construction phase-** Thrice in a year at 2 locations of pumping station for 24 months Three locations at pipe laying– thrice in a year for 24 months	5 2x6 = 12 3x6= 18 **Total 35**	2000	70,000.00	Contractor budget
Waste material – demolition waste	Hazardous waste parameters	Construction	Behala Node C pumping station	Once after demolition	1	15,000	15,000.00	Contractor budget
Surface water	As per surface water standard	Construction	As per requirement- Pumping station	Once in a quarter for 8 quarters in a year for 2 years	8	10,000	80,000.00	Contractor budget
2. Capacity building/ Training/ workshop expenses							**1,00,000.00**	Survey and Investigation /Contingency
3. Environmental Permits if any							**50,000.00**	Government Counterpart funds

Item	Parameters	Project Phase	Sampling Station	Duration and Frequency	Quantity	Unit cost (₹)	Total cost (₹)	Source of funds
4. Plantation in and around pumping station							-	Considered under Engineering project cost
Total (₹)							**7,35,000.00**	
Total ($)							**(approx.)**	
Note/s: **₹65 = $ 1**							**11,308**	

Table 31: Indicative Costs for Environment Management Plan Implementation – Operation Phase

Item	Parameters	Project Phase	Sampling Station	Duration and Frequency	Quantity	Unit cost (₹)	Total cost (₹)	Source of funds
Ambient air	PM_{10}, $PM_{2.5}$, SO_2, NO_2, H_2S and CO	Operation	pumping station area	**Operation phase-** Once in 6 months at 2 locations- for 1 year	4	12,000	48,000.00	Contractor budget
Noise level	L_{eq} in dBA	Operation	pumping station area	**Operation phase-** Once in 6 months at 2 locations- for 1 year	4	2000	8,000.00	Contractor budget
Total (₹)							**56,000.00**	
Total ($)							**(approx.)**	
Note/s: **₹65 = $1**							**861**	

E. Monitoring and Reporting

180. 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.

181. 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.

182. During the construction phase, results from internal monitoring by the contractor will be reflected in their weekly EMP/approved SEP implementation reports to the DSC Construction Supervisors. These weekly report will be retained in DSC office for reference.

183. Monthly reports will also 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 13.

184. 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 14.

185. 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.

186. 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.

187. 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.

188. For projects likely to have significant adverse environmental impact. 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.

189. 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.

190. ADB's monitoring and supervision activities are carried out on an on-going basis until a Project Completion Report (PCR) is issued. ADB issues a PCR within 1-2 years after the project is physically completed and in operation.

IX. RECOMMENDATIONS AND CONCLUSION

191. The process described in this document has assessed the environmental impacts of all elements of the specific sewerage and drainage subproject of KEIIP under Tranche 3 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.

192. 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. During finalization of design contractor will also carry out public consultation and the suggestion will be followed under implementation phase.

193. 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.

194. 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.

195. 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.

196. 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 earth movements; 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.

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

AMBIENT AIR AND AIR EMISSION STANDARDS

A. Notification by Ministry of Environment & Forests, Government of India
Environment (Protection) Seventh Amendment Rules, 2009

Table A1.1: Ambient Air Quality Standards

Pollutant	Time Weighted Average	Industrial, Residential, Rural and Other Areas	Sensitive Area (Notified by Central Government)	Method of Measurement
Sulphur Dioxide (SO_2), µg/m^3	Annual* 24 hours**	50 80	20 80	• Improved West and 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	• Atomic Absorption Spectroscopy (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 and desorption followed by Gas Chromatography analysis
Benzo(o)pyrene (BaP) particulate phase only ng/m^3	Annual*	1	1	• Solvent extraction followed by GC/ High Pressure Liquid Chromatography (HPLC) analysis
Arsenic (As), ng/m^3	Annual*	6	6	• AAS/ Inductively Coupled Plasma Chromatograph (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

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
Source: Central Pollution Control Board, New Delhi, Notification dated 18th November 2009.

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 meter

h = Height of the building in meters 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:

Table A1.2: Range of Generator Sets

For Generator Sets (kVA)	**Total Height of Stack** (m)
50	Height of the building + 1.5
50-100	Height of the building + 2.0
100-150	Height of the building + 2.5
150-200	Height of the building + 3.0
200-250	Height of the building + 3.5
250-300	Height of the building + 3.5

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:

Table A1.3: Emission Limits for Generator Set Applications

Capacity of Diesel Engine	**Date of Implementation**	**Emission limits** (g/kw/h)				**Smoke Limit (light absorption coefficient, m-1) (at full load)**	**Test Cycle**	
1	2	3				4	5	
		NO_x	Hydrocarbons	CO	PM		Torque %	Weighting 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.

Table A1.4: Emission Standards for Generator Set Applications

Parameter		Area Category	Total Engine Rating of the Plant (includes existing as well as new generator sets)	Generator 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 and LDO	Both A and B		75	75	
	Furnace Oils - LSHS and 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.				

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}) meter, PM = Particulate Matter kg/h = Kilo (10^3) gram per hour, CO = Carbon Monoxide, mg/Nm^3 = milli (10^{-3}) gram per cubic meter, SO_2 = Sulphur Dioxide Normal meter cubic, ppmv = part per million (106) by volume.

Note:

1. 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.
2. Individual units with engine ratings less than or equal to 800 KW are not covered by this notification.
3. 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.
4. For expansion Project, stack height of new generator sets shall be as per total Sulphur Dioxide emission (including existing as well as additional load).
5. 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.
6. 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
7. Measurement shall be performed at steady load conditions of more than 85% of the rated load.
8. 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

Table A1.5: General Standards for Discharge of Environmental Pollutants: Effluents

No.	Parameter	Standards			
		Inland surface water	Public sewers	Land of Irrigation	Marine/ coastal areas
		(a)	(b)	(c)	(d)
1	Color and odor	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, max	0.1	1.0		2.0
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

No.	Parameter	Standards			
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. Central Pollution Control Board 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 A1.6: Best Use Based Classification of Surface Waters in India

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 (Organized)	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		C	1. Total Coliform Organism MPN/100 ml:

No.	Designated-Best-Use	Class of Water	Criteria
	Drinking water source after conventional treatment and disinfection		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. Applicable Ambient Air Quality per ADB Safeguard Policy Statement

Following requirements of ADB SPS, PMO and RPMOs shall apply pollution prevention and control technologies and practices consistent with international good practice. When the Government of India regulations differ from these levels and measures, PMO shall achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific subproject circumstances, PMO will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

Table A1.7: Applicable Ambient Air Quality Standards per ADB Safeguard Policy Statement

Parameter	Location[a]	Applicable Standards Per ADB SPS[e] ($\mu g/m^3$)
PM_{10}	Industrial Residential, Rural and Other Areas	20 (Annual) [c] 50 (24-hr) [c]
	Sensitive Area	20 (Annual) [c] 50 (24-hr) [c]
PM_{25}	Industrial Residential, Rural and Other Areas	10 (Annual) [c] 25 (24-hr) [c]
	Sensitive Area	10 (Annual) [c] 25 (24-hr) [c]
SO_2	Industrial Residential, Rural and Other Areas	50 (Annual) [b] 20 (24-hr) [c] 500 (10-min) [c]
	Sensitive Area	20 (Annual) [b] 20 (24-hr) [c] 500 (10-min) [c]
NO_2	Industrial Residential, Rural and Other Areas	40 (Annual) [b] 80 (24-hr) [b] 200 (1-hr) [c]
	Sensitive Area	30 (Annual) [b] 80 (24-hr) [b] 200 (1-hr) [c]
CO	Industrial Residential, Rural and Other Areas	2,000 (8-hr) [b] 4,000 (1-hr) [b] 100,000 (15-min)[d]
	Sensitive Area	2,000 (8-hr) [b] 4,000 (1-hr) [b] 100,000 (15-min)[d]

Parameter	Location[a]	Applicable Standards Per ADB SPS[e] (µg/m^3)
Ozone (O_3)	Industrial Residential, Rural and Other Areas	100 (8-hr) [b] 180 (1-hr) [b]
	Sensitive Area	100 (8-hr) [b] 180 (1-hr) [b]
Lead (Pb)	Industrial, Residential, Rural and Other Areas	0.5 (Annual) [b] 1.0 (24-hr) [b]
	Sensitive Area	0.5 (Annual) [b] 1.0 (24-hr) [b]
Ammonia (NH_3)	Industrial Residential, Rural and Other Areas	100 (Annual) [b] 400 (24-hr) [b]
	Sensitive Area	100 (Annual) [b] 400 (24-hr) [b]
Benzene (C_6H_6)	Industrial Residential, Rural and Other Areas	5 (Annual) [b]
	Sensitive Area	5 (Annual) [b]
Benzo(o)pyrene (BaP) particulate phase only	Industrial Residential, Rural and Other Areas	0.001 (Annual) [b]
	Sensitive Area	0.001 (Annual) [b]
Arsenic (As)	Industrial Residential, Rural and Other Areas	0.006 (Annual) [b]
	Sensitive Area	0.006 (Annual) [b]
Nickel (Ni)	Industrial Residential, Rural and Other Areas	0.02 (Annual) [b]
	Sensitive Area	0.02 (Annual) [b]

[a] Sensitive area refers to such areas notified by the India Central Government.
[b] Notification by Ministry of Environment and Forests, Government of India Environment (Protection) Seventh Amendment Rules, 2009
[c] WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide. *Global update 2005*. WHO. 2006
[d] Air Quality Guidelines for Europe Second Edition. WHO 2000.
[e] Per ADB SPS, the government shall achieve whichever of the ambient air quality standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency of the government will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

NOISE STANDARDS

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

1. Rule 3. Ambient air quality 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 m around hospitals, educational institutions and courts may be declared as silence area/zone for the purpose of these rules.

Table A2.1: Ambient Air Quality Standards in Respect of Noise for Different Areas/Zones

Area Code	Category of Area	Limit in dB(A) L_{eqa}	
		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.

2. 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 equipment.
(3) Sound emitting construction equipment 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

3. 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

4. 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 sets with rated capacity up to 1000 kVA, manufactured on or after the 1st January 2005 shall be 75 dB(A) at 1 meter 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 diesel generator 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 diesel generator 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 diesel generator set, outside his premises, within the ambient noise requirements by proper citing and control measures.

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

04. A proper routine and preventive maintenance procedure for the diesel generator set should be set and followed in consultation with the diesel generator set manufacturer which would help prevent noise levels of the diesel generator 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 Sets.

(i) Noise Standards for diesel generator Sets (15-500 KVA)

The total sound power level, Lw, of a diesel generator set should be less than, 94+10 log10 (KVA), dB(A), at the manufacturing stage, where, KVA is the nominal power rating of a diesel generator 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 diesel generator sets (5 KVA and above)
Noise from the diesel generator 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, 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 0.5m from the acoustic enclosure/room, and then averaged.
The diesel generator set should also be provided with proper exhaust muffler with Insertion Loss of minimum 25 dB(A).
(iii) Guidelines for the manufacturers/users of diesel generator 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 diesel generator set, outside his premises, within the ambient noise
03 The manufacturer should furnish noise power levels of the unsilenced diesel generator sets as per standards prescribed under (A).
04. The total sound power level of a diesel generator set, at the user's end, shall be within2 dB(a) of the total sound power level of the diesel generator set, at the manufacturing stage as prescribed under (A).
05. Installation of a diesel generator set must be strictly in compliance with the recommendations of the diesel generator set manufacturer.
06. A proper routine and preventive maintenance procedure for the diesel generator set should be set and followed in consultation with the diesel generator set manufacturer which would help prevent noise levels of the diesel generator 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 equipment 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

E. Applicable Ambient Noise Level Standards per ADB SPS

Following requirements of ADB SPS, PMO and RPMOs shall apply pollution prevention and control technologies and practices consistent with international good practice. When the Government of India regulations differ from these levels and measures, PMO shall achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific subproject circumstances, PMO will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

Table A2.4: Applicable Ambient Noise Level Standards per ADB SPS

Receptor/ Source	Applicable Standards Per ADB SPS[c] (dBA)	
	Day time	Night time
Industrial area	70[b]	70[b]
Commercial area	65[a]	55[a]
Residential Area	55[a]	45[a]
Silent Zone	50[a]	40[a]

[a] Noise Pollution (Regulation and Control) Rules, 2002 as amended up to 2010.
[b] Guidelines for Community Noise. WHO. 1999
[c] Per ADB SPS, the government shall achieve whichever of the ambient air quality standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency of the government will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

OCCUPATIONAL NOISE EXPOSURE

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

Table A3: 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

HAZARDOUS AND OTHER WASTES (MANAGEMENT AND TRANSBOUNDARY MOVEMENT) RULES, 2016 DATED 4 APRIL 2016

1. 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.

2. 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 authorized in this regard by the State Government, to ensure earmarking or allocation of industrial space or shed for recycling, pre-processing and other utilization of hazardous or other waste in the existing and upcoming industrial park, estate and industrial clusters; (2) Department of Labor in the State or any other government agency authorized in this regard by the State Government shall,- (a) ensure recognition and registration of workers involved in recycling, preprocessing and other utilization 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 utilization; (d) undertake annual monitoring and to ensure safety and health of workers involved in recycling, pre-processing and other utilization. (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.

List of Indian labor laws

(i) Workmen Compensation Act,1923- The Act provides for compensation in case of injury by accident arising out of and during the course of employment.

(ii) Payment of Gratuity Act, 1972 - Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years' service or more or on death at the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.

(iii) Employees 'PF and Miscellaneous Provisions Act,1952-The Act provides for monthly contributions by the employer plus workers @10 % or 8.33 %. The benefits payable under the Act are:

  (a) Pension or family pension on retirement or death as the case may be; (b) deposit linked insurance on the death in harness of the worker; (c) payment of PF accumulation on retirement/death etc.

(iv) Maternity Benefit Act, 2017 –The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.

(v) Contract Labor (Regulation and Abolition) Act,1970-The Act provides for certain welfare measures to be provided by the Contractor to contract labor and in case the Contractor fails to provide, the same are required to be provided by the Principal Employer by Law. The principal employer is required to take Certificate

of Registration and the Contractor is required to take a License from the designated Officer. The Act is applicable to the establishments or Contractor of principal employer if they employ 20 or more contract labor.

(vi) Minimum Wages Act, 1948 - The employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment. Construction of Buildings, Roads, Runways are scheduled employment.

(vii) Payment of Wages Act, 1936 - It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.

(viii) Equal Remuneration Act, 1979 - The Act provides for payment of equal wages for work of equal nature to Male and Female workers and not for making discrimination against Female employees in the matters of transfers, training and promotions etc.

(ix) Payment of Bonus Act, 1965 - The Act is applicable to all establishments employing 20 or more workmen. The Act provides for payments of annual bonus subject to a minimum of 8.33 % of wages and maximum of 20 % of wages to employees drawing ₹3,500/- per month or less. The bonus to be paid to employees getting ₹2,500/- per month or above up to ₹3,500/- per month shall be worked out by taking wages as ₹2,500/- per month only. The Act does not apply to certain establishments. The newly setup establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of the Act.

(x) Industrial Disputes Act, 1947 - The Act lays down the machinery and procedure for resolution of industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.

(xi) Industrial employment (Standing Orders) Act,1946- It is applicable to all establishments employing100 or more workmen (employment size reduced by some of the States and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the employer on matters provided in the Act and get the same certified by the designated Authority.

(xii) Trade UnionsAct,1926- The Act lays down the procedure for registration of trade unions of workmen and employees. The trade unions registered under the Act have been given certain immunities from civil and criminal liabilities.

(xiii) Child Labor (Prohibition and Regulation) Act,1986-The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of child labor is prohibited in Building and Construction Industry.

(xiv) Inter-State Migrant Workmen's (Regulation of Employment and Conditions of Service) Act, 1979 - The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in anotherstate).Theinter-statemigrantworkmen,inanestablishmenttowhichthisActbecomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home up to the establishment and back, etc.

(xv) The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and the Cess Act of 1996 - All the establishments who carry on any building or other construction work and employ 10 or more

workers are covered under this Act. All such establishments are required to pay Cess at rate not exceeding 2% of the cost of construction as may be notified by the Government. The employer of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation for workers near the workplace etc. The employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government. Following are the major requirements under this Act, applicable to this project:

(a) Employer shall:

- Provide and maintain, at suitable point, sufficient quantity of wholesome drinking water, such point shall be at least 6 meters away from any washing areas, urinals or toilets;
- Provide sufficient urinals and latrines at convenient place, easily accessible by workers;
- Provide free of charge, temporary living accommodations near to work sites with separate cooking place, bathing and lavatory facilities and restore the site as preconditions after completing the construction works;
- Provide crèche with proper accommodation, ventilation, lighting, cleanliness and sanitation if more than fifty female workers are engaged;
- Provide first aid facilities in all construction sites.

(b) For safety of workers employer shall provide:

- Safe access to site and work place
- Safety in demolition works
- Safety in use of explosives
- Safety in operation of transporting equipment and appoint competent person to drive or operate such vehicles and equipment
- Safety in lifting appliance, hoist and lifting gears
- Adequate and suitable lighting to every work place and approach
- Prevention of inhalation of dust, smoke, fumes, gases during construction works and provide
- adequate ventilation in work place and confined space
- Safety in material handling and stacking/un stacking
- Safeguarding the machinery with fly-wheel of moving parts
- Safe handling and use of plants operated by compressed air
- Fire safety
- Limit of weight to be lifted by workers individually
- Safety in electric wires, apparatus, tools and equipment
- Provide safety net, safety sheet, safety belts while working at height (more than1.6 m as per OSHA)
- Providing scaffolding, ladders and stairs, lifting appliances, chains and accessories where required
- Safety in pile works, concrete works, hot asphalt, tar, insulation, demolition works, excavation, underground construction and handling materials
- Provide and maintain medical facilities for workers
- Any other matters for the safety and health of workers.

PHOTO ILLUSTRATION OF PROJECT LOCATION

Proposed pumping station location – Lalababu

Proposed pumping station location – Lalababu

Sakuntala Park Node C PS – Augmentation to be done

Sakuntala Park Node C PS – Augmentation to be done

RAPID ENVIRONMENTAL ASSESSMENT CHECKLIST

Instructions:

(i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (SDES) for endorsement by the Director, SDES and for approval by the Chief Compliance Officer.

(ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.

(iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: **India/ Kolkata Environmental Improvement Investment Program (KEIIP) Tranche 3 - Sewerage and Drainage Improvement- Sewage Network and Pumping Station**

Sector Division: **Urban Development**

Screening Questions	Yes	No	Remarks
A. Project siting Is the project area…			
▪ Densely populated?	✓		Project sites are located in urban areas
▪ Heavy with development activities?	✓		No negative impacts are envisaged as infrastructure will be established on government land and pipes will be constructed on ROW. Minimal road disruption is likely. Measures like best activity scheduling, traffic management, etc. will be employed to minimize the impact to acceptable levels.
Adjacent to or within any environmentally sensitive areas?			
▪ Cultural heritage site		✓	
▪ Protected area		✓	
▪ Wetland		✓	
▪ Mangrove		✓	
▪ Estuarine		✓	
▪ Buffer zone of protected area		✓	
▪ Special area for protecting biodiversity		✓	
▪ Bay		✓	
B. Potential Environmental Impacts Will the Project cause…			
▪ impairment of historical/cultural monuments/areas and loss/damage to these sites?		✓	Not anticipated.
▪ interference with other utilities and blocking of access to buildings; nuisance to neighboring areas due to	✓		Anticipated during construction activities. However, impacts are temporary and short in

Screening Questions	Yes	No	Remarks
noise, smell, and influx of insects, rodents, etc.?			duration. The EMP ensures measures are included to mitigate the impacts.
▪ dislocation or involuntary resettlement of people?		✓	No displacement of communities is required in Project 3.
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		✓	Not applicable.
▪ impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage?		✓	Collected sewage will be treated at the STPs proposed in Project 3
▪ overflows and flooding of neighboring properties with raw sewage?		✓	Project 3 will improve current situation of discharging sewage to open drains
▪ environmental pollution due to inadequate sludge disposal or industrial waste discharges illegally disposed in sewers?		✓	STP designs include sludge management. Industrial waste discharges to the sewers will not be allowed and prevented in the proposed sewer network system.
▪ noise and vibration due to blasting and other civil works?	✓		Increased noise is anticipated during construction activities. However, impacts are temporary and short in duration. The EMP ensures measures are included to mitigate the impacts.
▪ risks and vulnerabilities related to occupational health and safety due to physical, chemical, and biological hazards during project construction and operation?	✓		The EMP ensures occupational health and safety measures are included. Chemicals will not be used during construction and operation activities.
▪ discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers?		✓	Not anticipated. The subproject sites are predominantly residential areas. Thus discharge of hazardous materials into sewers are unlikely. Measures have been included in the design to prevent discharge of industrial and hazardous materials into the sewer network system
▪ inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances, and protect facilities?		✓	Buffer zones are included in the design of the STPs and pumping stations.
▪ road blocking and temporary flooding due to land excavation during the rainy season?		✓	Not anticipated. Construction activities will be conducted during non-monsoon season.
▪ noise and dust from construction activities?	✓		Anticipated during construction activities. However, impacts are temporary and short in duration. The EMP ensures measures are included to mitigate the impacts.
▪ traffic disturbances due to construction material transport and wastes?	✓		Anticipated during construction activities. However, impacts are temporary and short in duration. The EMP ensures measures are included to mitigate the impacts. Construction contractors will be required to coordinate with the local traffic police and they will prepare Traffic Management Plan
▪ temporary silt runoff due to construction?	✓		Run-off during construction will be more. However, impacts are temporary and short in

Screening Questions	Yes	No	Remarks
			duration. The EMP ensures measures are included to mitigate the impacts. Construction contractors will be prohibited from stockpiling loose materials along drain channels and will be required to immediately dispose any waste materials.
▪ hazards to public health due to overflow flooding, and groundwater pollution due to failure of sewerage system?		✓	Not anticipated. Design life of the subproject is 30 years. Project 3 includes support to KMC in enhancing its operational capacity to ensure system will not fail.
▪ deterioration of water quality due to inadequate sludge disposal or direct discharge of untreated sewage water?		✓	Not anticipated. STP designs include sludge management and EMPs ensure mitigation measures and monitoring are implemented. The STP includes an Operation and Maintenance (O&M) Manual to ensure effluent complies with government standards.
▪ contamination of surface and ground waters due to sludge disposal on land?		✓	Not anticipated. STP designs include sludge management and EMPs ensure mitigation measures and monitoring are implemented.
▪ health and safety hazards to workers from toxic gases and hazardous materials which maybe contained in confined areas, sewage flow and exposure to pathogens in untreated sewage and unstabilized sludge?		✓	Not anticipated. Confined spaces are not applicable to the sewer network. Capacity of the STPs are designed to ensure sewerage will not overflow and sufficiently treated. Sludge, which is proposed to be reused as soil conditioner and/or fertilizer, will be treated and stabilized.
▪ large population increase during project construction and operation that causes increased burden on social infrastructure (such as sanitation system)?		✓	Priority in employment will be given to local residents. Construction contractors will be required to provide workers camp with water supply and sanitation. Mangalore ULB will provide manpower to operate the improved system.
▪ social conflicts between construction workers from other areas and community workers?		✓	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 construction and operation?		✓	Not applicable. Construction will not involve use of explosives and chemicals. Trenching will be done manually.
▪ 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/ Construction of STP
Sector: Urban Development
Subsector: Wastewater
Division/Department: Kolkata Municipal Corporation

Screening Questions		Score	Remarks[a]
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?	1	The project area is vulnerable to high risks of flooding. Flooding can easily overwhelm sewage / drainage systems, including sewage treatment plant. Projected sea level rise is expected to exacerbate flooding, storm surge, as well as the risks of saltwater intrusion. A technical assistance on Strengthening Climate Resilience of Kolkata City through Improved Planning, Flood and Disaster Risk Management, through the UCCRTF, aims to support the EA in further strengthening its climate resilience through: (i) implementation of early flood warning system and (ii) capacity development in climate resilient planning and disaster management. The TA will provide some physical investment (e.g., software and hardware for the early warning systems, as well as non-physical investments such as hydraulic modeling, installation of systems, and capacity development, etc.
	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.)?	1	The increased frequency of heavy rainfall leads to severe flooding and waterlogging in the city. Impacts include increased flooding, increased siltation and blockage of drainage. Increased cyclone intensity will lead to possible high storm surges resulting to infrastructure damage, e.g. clogging of drainage systems. Inundation of low-lying treatment facilities and outfall may require relocations and cause discharge to back flow, respectively. Proposed investments will not pass through major cross drainages and river. Pipes are designed to handle peak flow demands. Examples of measures adopted while designing the sewerage and drainage network, associated facilities such as pumping stations, and water supply

Screening Questions		Score	Remarks[a]
			system, include hydraulic modelling and sizing of systems using increased precipitation scenarios, prioritizing areas with higher risks of increased inundation, constructing all pipes below ground, avoiding flood plains for siting of any pumping stations or associated structures, among others.
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	No significant effect
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s)?	0	No significant
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?	1	Blockage of drainage/sewage systems likely to become more frequent in the future due to increased flooding. Regular maintenance activities are incorporated in the EMP

[a] 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.

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): Medium Risk

Other Comments: Project team, with support from SARD Front Office Climate Unit, used the Climate Risk Screening Report to confirm the climate risk rating, which was “medium”.

Prepared by: PMU, Kolkata Municipal Corporation

SAMPLE TRAFFIC MANAGEMENT PLAN

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 Traffic Management Plan

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:

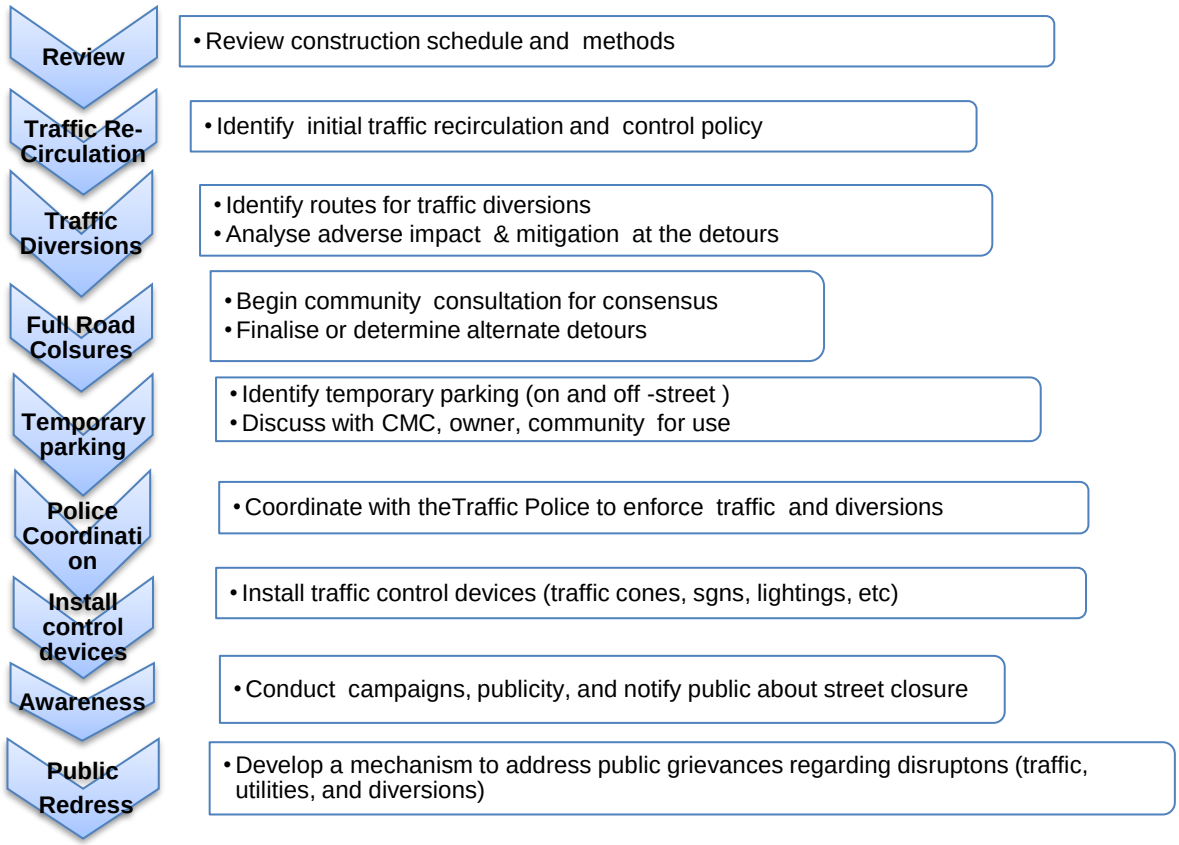
(i) approval from the PMU, local administration to use the local streets as detours;
(ii) consultation with businesses, community members, traffic police, Public Works Department, etc., regarding the mitigation measures necessary at the detours where the road is diverted during the construction;
(iii) 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 A7.1: Policy Steps for the Traffic Management Plan



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 Government/ Government of India. All vehicles to be used shall be in perfect condition meeting pollution standards of West Bengal Govt./ Government of India. The vehicle operator requires a pre-state of shift checklist. Additional safety precautions will include the requirement for:

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

F. Install Traffic Control Devices at the Work Zones and Traffic Diversion Routes

11. 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:

(i) Signs
(ii) Pavement Markings
(iii) Channelizing Devices
(iv) Arrow Panels
(v) Warning Lights

12. 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”).

13 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.

14. 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.

15 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.

16. 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.

HEALTH AND SAFETY PLAN

(To be implemented by the Construction contractor)

A. Responsibility and Authority for EHS Management

1. Project In-charge (PI)

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

2. Site/Front In-charge

1. 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.

2. **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:

(i) Be familiar with Site HS Plan;
(ii) Maintain safe working conditions and good housekeeping in all areas under his supervision.
(iii) Enforce use of PPE as requested by Project Specific Rules and regulations.
(iv) Liaise and cooperate with Site Safety HS Officer and ensure that defects brought to attention are corrected.
(v) Immediately Inform and report to the HS-Officer while any accident, near misses, dangerous occurrence, occupational poisoning or diseases shall be noticed within the project sites.
(vi) Plan safety in accordance with the approved work methodology for daily work activities.
(vii) 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.
(viii) Establish and maintain proper communication with all workers with regard to EHS; and
(ix) Provide proper supervision for the work.

3. **Health and 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:

(i) Monitor and advise relevant personnel on compliance with HS statutory obligations at the site;
(ii) Facilitate inclusion of safety elements into work Method Statement.
(iii) Highlight the requirement of safety through Tool-Box / other meetings.
(iv) Conduct investigation of all accident/dangerous occurrences and recommend appropriate safety measures.
(v) Advice & co-ordinate for implementation of operational control procedures etc.
(vi) Convene safety meeting & minute the proceeding for circulation & follow-up action.
(vii) Provide copies of site / office inspection report to relevant managers
(viii) Plan procurement of PPEs and safety devices and inspect their healthiness.
(ix) Report to PI/Divisional Manager on all matters pertaining to status of safety and promotional program at site level.
(x) Facilitate administration of FIRST – AID.
(xi) Facilitate screening of workman and safety induction.
(xii) Conduct fire drill and facilitate emergency preparedness.
(xiii) Design campaigns, competitions and other special emphasis programs to promote safety in the work place.
(xiv) Notify site personnel non-conformance to safety norms observed during site visits / site inspections.
(xv) Attend and participate in Site HS Management Review Meetings;
(xvi) Access and advise PI on the perceived HS training needs of project personnel;
(xvii) Monitor HS performance of subcontractors and make appropriate recommendations for performance improvement.

4. **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:

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

B. Safety and Health Operational Control Procedures

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

(i) Engineering controls;

(ii) Administrative controls;
(iii) PPE.

C. Site Safety Rules

(i) No one (including staff and workers etc.) will be allowed to enter the work site without prior induction training and without required PPE.
(ii) 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.
(iii) 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.
(iv) 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.
(v) Smoking is strictly prohibited in all parts of the worksites except specific smoking zone as authorized by the site safety dept.
(vi) Working under influence of drugs, alcohol etc. is strictly prohibited on worksite.
(vii) Carrying unwanted flammable items, explosives etc. strictly prohibited at site.
(viii) No vehicle shall be permitted to enter the work site or introduced into the job without prior induction by the plant and safety dept.
(ix) It is mandatory that all vehicle driver and operator of lifting equipment 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.
(x) It is mandatory that all electrical operated machinery's, equipment 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.
(xi) 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.
(xii) All employees including workers must know about the exact location and use of fire Fighting equipment. Never restrict the access towards the firefighting equipment, always keep the access free from any obstructions.
(xiii) Considering emergency situation always keep the access around the work site area free from any obstruction for rescue operation.
(xiv) Everyone including workers should inform about the accident / incident and dangerous Occurrence to Site In charge, Site Engineer & Safety Officer.
(xv) Always stay alert and keep your mind on the work, when you are engaged in the site work.
(xvi) Before starting of everyday work, routine checking of lifting equipment, Tools and Tackles, Winch, all types of pumps etc. to be done by concern Engineer, Supervisor and Worker.
(xvii) Don't carry out unfamiliar work without proper instruction. Any error due to ignorance can cause serious damage.

(xviii) 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.
(xix) Don't leave any tools or materials haphazardly, where they can cause obstruction and create tripping hazards.
(xx) All platforms, walkways, gangways, ramp, work area etc. must be kept clear at all time.
(xxi) During gas cutting uses of FLASH BACK ARRESTOR / nonreturn valve are mandatory on each cylinder s & torch side.
(xxii) 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.
(xxiii) Always use minimum three cores double insulated cables for site electrification job.
(xxiv) During lifting a load by a crane use of guy rope on both ends is mandatory
(xxv) Never use compressed air for cleaning of your clothes or getting relief from excessive heat.
(xxvi) It is mandatory to install Reverse Horn on all vehicles (Like JCB, Tipper and site vehicle) and swing horn and over hoist limit switches for lifting equipment like Cranes.
(xxvii) 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
(xxviii) Horseplay inside the site during or after the job is strictly prohibited.
(xxix) Never roll the compressed gas cylinders (DA and O2) at site, either shift it manually or by gas trolley. Use of gas trolley is mandatory for all cutting sets.
(xxx) Keep all gas cylinders inside proper shed in upright condition and lock it properly.
(xxxi) Keep Diesel / Oil in its tank under the shed. Use oil spill trays below diesel tanks.
(xxxii) Follow the speed limit of 20 km/h inside the work premises religiously.
(xxxiii) Maintaining hygienic environment at camp site
(xxxiv) Consideration of women worker health at working place.

D. First - Aid Facilities and Medical Treatment

(i) Each worksite/area shall be equipped with it's a first aid box catering to the needs of particular work front.
(ii) Medical causality evacuation and treatment procedures involving the nearest clinic / Hospitals shall be instituted.
(iii) Appointment of trained first aider.

E. Emergency Preparedness and Response Plan

1. Approach

6. 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.

2. Emergency Preparedness Facility

7. Following emergency preparedness facilities have been provided at the site:

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

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 diesel generator Rooms / casting Yard etc.,
4	Fire Extinguishers	As required	Store/workshop/office/ Site office container/ All diesel generator Rooms / casting Yard etc.,
5	Safety Helmets	Depends on no. of labor	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

F. Reporting System for Emergency

Important Telephone Numbers of Persons at Corporate /Division Level

Local Fire Station
Private Hospital
Police Station

OUTLINE OF SPOIL MANAGEMENT PLAN

1.0 Purpose and application

Spoil Management Plan (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 Spoil Management Plan

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.

Table A9.1: Key Aspects of Potential Impacts in Relation to Spoil Management Plan

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:

(i) Consideration of likely spoil characteristics
(ii) Identification of possible reuse sites
(iii) 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.

STAKEHOLDERS MINUTES OF THE MEETING

Table A10.1: Summary of Stakeholder Consultation

Date	Location	No. of Participants			Total	Participant Details	Topics Discussed	Issues Raised
		Male	Female	% of Female				
21.09.17	LALBABU NIKASHI BAGJOLA, NIKASHI, CANAL - 1	10	27	72 %	37	MALE: retired persons, businessmen persons, FEMALE: Housewives	Relevant information on the upcoming project Benefits of the Pumping Station to resolve the issue of water logging No chance of structure loss. Possible impact on Environment during construction Grievance redressal procedures. Public participation and awareness.	Commencement date of project work and duration of the project work. Massive Water logging during heavy monsoon in the adjoining area of the proposed pumping station and need for the Proposed intervention Short term impact on air quality- dust generation, noise level, access problem, Application of mitigation measures as per EMP to mitigate short term impact The project work will reduce environmental impact/ health problems that is caused by open discharge of domestic wastewater Timely completion of the proposed project Proper maintenance of the Pumping Stations.

Community Consultation Near Lalababu Nikashi, Bagjola Canal – 1

List of Participants

Participants List

Name of place (Ward No)

Date

Sl.No	Name of Participants	Contact No, if any	Signature
1	Jaba [illegible]	9051843986	[illegible]
2)	Sikha Saha	9432417144	[illegible]
3)			[illegible]
4)	Sunabala [illegible]	697204811	
5)	[illegible] Ghosh	9420174694	[illegible]
6)	Seema Roy	9831707891	সীমা রায়
7)		8961489800	[illegible]
8)	Ila Biswas	9038007262	ইলা বিশ্বাস
9)	[illegible] Ghosh	9903121637	[illegible]
10)	Rima Singh	9088760553	Rima Singh

Participants List

Name of place (Ward No)

Date

Sl.No	Name of Participants	Contact No, if any	Signature
11	PRADIP BASAK	9051093033	P. Basak
12	KAUSTAV BISWAS	9903212328	K Biswas
13	অঞ্জনা বিশ্বাস	7278987900	অঞ্জনা বিশ্বাস
14	[illegible] Ruma Dey	9836169824	—
15	চন্দনা অধিকারী		
16	Pradima Chakraborty		[illegible]
17	Nantu Sutta	9836991865	Nantu Sutta
18	সোনালী হালদার	9836135215	সোনালী হালদার
19	Barnali Naskar	9830885036	Barnali Naskar
20	[illegible]	9674313007	[illegible]

Participants List

Name of place (Ward No)

Date

Sl.No	Name of Participants	Contact No, if any	Signature
21	Manjua Ray		
22			
23			
24			
25		8444845038	
26	Pampa Dey	9831345317	Pampa Dey
27	Rekha dey		Rekha Dey
28	MALAMALAKAR	9748890922	MALA MALAKAR
29	Rita Das.	8583054786	Rita Das.
30	Pinky Das	9836327321	Pinky Das

Participants List

Name of place (Ward No) –

Date

Sl.No	Name of Participants	Contact No, if any	Signature
31	Baby Singh	9883224717	Baby singh
32	Sundari Das.	9333858279	Sundari Das.
33	[illegible]	[illegible]	[illegible]
34	Mallika Jalani	9874173698	Mallika Jalani
35.	[illegible]	9831656145	[illegible]
36	Pranab Roy.	9836822590	
37	Arjun Roy plot no 299		
38			
39			
40			

GRIEVANCE REDRESS MECHANISM OF KOLKATA ENVIRONMENTAL IMPROVEMENT INVESTMENT PROGRAM – 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 enquire 'X' above.

Dt. 12.08.2015

TL/DSC
AO
SO/C

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

12/8/15

SAMPLE GRIEVANCE REGISTRATION FORM

(To be available also in Bengali, Hindi)

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:	

MONTHLY ENVIRONMENTAL MONITORING REPORT - FORMAT

Environmental Monitoring and Evaluation

Monthly Environmental Compliance Monitoring Format for Subproject

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

No.	Environmental Issues	Level of Application of Environmental Management Plan					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 Equipment having Pollution Under Control Certificate						
2g	No fires are allowed on site						
2h	Carrying out air quality monitoring						
3.	**Mitigation of Noise**						
3a.	Regular maintenance of noise producing equipment						
3b.	At sensitive locations enclosures provided around						

No.	Environmental Issues	Level of Application of Environmental Management Plan					Suggestion/ Remarks
		Poor	Below Satisfactory	Partially satisfactory	Satisfactory	Excellent	
	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- 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,						

No.	Environmental Issues	Level of Application of Environmental Management Plan					Suggestion/ Remarks
		Poor	Below Satisfactory	Partially satisfactory	Satisfactory	Excellent	
	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 Labor 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**						
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 neighbors' 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**						

No.	Environmental Issues	Level of Application of Environmental Management Plan					Suggestion/ Remarks
		Poor	Below Satisfactory	Partially satisfactory	Satisfactory	Excellent	
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 and Signature of monitoring person of DSC)

(Name and Signature of Safety Officer of Contractor)

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

(Name and Signature of Environment Specialist of PMU)

ENVIRONMENTAL MONITORING FORMAT - SEMI ANNUAL

SAMPLE Semi-Annual Environmental Monitoring Report Template

I. INTRODUCTION

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

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

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

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

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

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

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

[a] All statutory clearance/s, no-objection certificates, permit/s, etc. should be obtained prior to award of contract/s. Attach as appendix all clearance obtained during the reporting period. If already reported, specify in the "remarks" column.
[b] Specify (environmental clearance? Permit/consent to establish? Forest clearance? Etc.).
[c] Specify if obtained, submitted and awaiting approval, application not yet submitted.
[d] Example: Environmental Clearance requires ambient air quality monitoring, Forest Clearance/Tree-cutting Permit requires 2 trees for every tree, etc.

III. COMPLIANCE STATUS WITH ENVIRONMENTAL LOAN COVENANTS

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

IV. COMPLIANCE STATUS WITH THE ENVIRONMENTAL MANAGEMENT PLAN (refer to EMP TABLES in APPROVED IEE/s)

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

Package-wise Implementation Status

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

- Identify the role/s of Safeguards Team including schedule of on-site verification of reports submitted by consultants and contractors.

- For each package, provide name/s and contact details of contractor/s' nodal person/s for environmental safeguards.
- Include as appendix all supporting documents including **signed** monthly environmental site inspection reports prepared by consultants and/or contractors.
- With reference to approved EMP/site-specific EMP/construction EMP, complete the table below
- Provide the monitoring results as per the parameters outlined in the approved EMP (or site-specific EMP/construction EMP when applicable).
- In addition to the table on EMP implementation, the main text of the report should discuss in details the following items:
    (i) **Grievance Redress Mechanism.** Provide information on establishment of grievance redress mechanism and capacity of grievance redress committee to address project-related issues/complaints. Include as appendix Notification of the GRM (town-wise if applicable).
    (ii) **Complaints Received during the Reporting Period.** Provide information on number, nature, and resolution of complaints received during reporting period. Attach records as per GRM in the approved IEE. Identify safeguards team member/s involved in the GRM process. Attach minutes of meetings (ensure English translation is provided).

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

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

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

[a] Attach Laboratory Results and Sampling Map/Locations.

Overall Compliance with CEMP/ EMP

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

V. APPROACH AND METHODOLOGY FOR ENVIRONMENTAL MONITORING OF THE PROJECT

- Brief description on the approach and methodology used for environmental monitoring of each sub-project

VI. MONITORING OF ENVIRONMENTAL IMPACTS ON PROJECT SURROUNDINGS (ambient air, water quality and noise levels)

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

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

Air Quality Results

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

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

Water Quality Results

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

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

Noise Quality Results

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

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

VII. SUMMARY OF KEY ISSUES AND REMEDIAL ACTIONS

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

VIII. APPENDIXES

- Photos
- Summary of consultations
- Copies of environmental clearances and permits
- Sample of environmental site inspection report
- Other

SAMPLE ENVIRONMENTAL SITE INSPECTION REPORT

Project Name
Contract Number

NAME: _____ DATE: _____
TITLE: _____ DMA: _____
LOCATION: _____ GROUP: _____

WEATHER CONDITION:
_____

INITIAL SITE CONDITION: _____

CONCLUDING SITE CONDITION:

Satisfactory _____ Unsatisfactory _____ Incident _____Resolved _____ Unresolved _____

INCIDENT:
Nature of incident:
_____

Intervention Steps:
_____

Incident Issues

Resolution

Project Activity Stage	Survey	
	Design	
	Implementation	
	Pre-Commissioning	
	Guarantee Period	

Inspection

Emissions	Waste Minimization
Air Quality	Reuse and Recycling
Noise pollution	Dust and Litter Control
Hazardous Substances	Trees and Vegetation

Site Restored to Original Condition Yes [ ] No [ ]

Signature
_____

Sign off

Name _____ **Name** _____
Position _____ **Position**_____