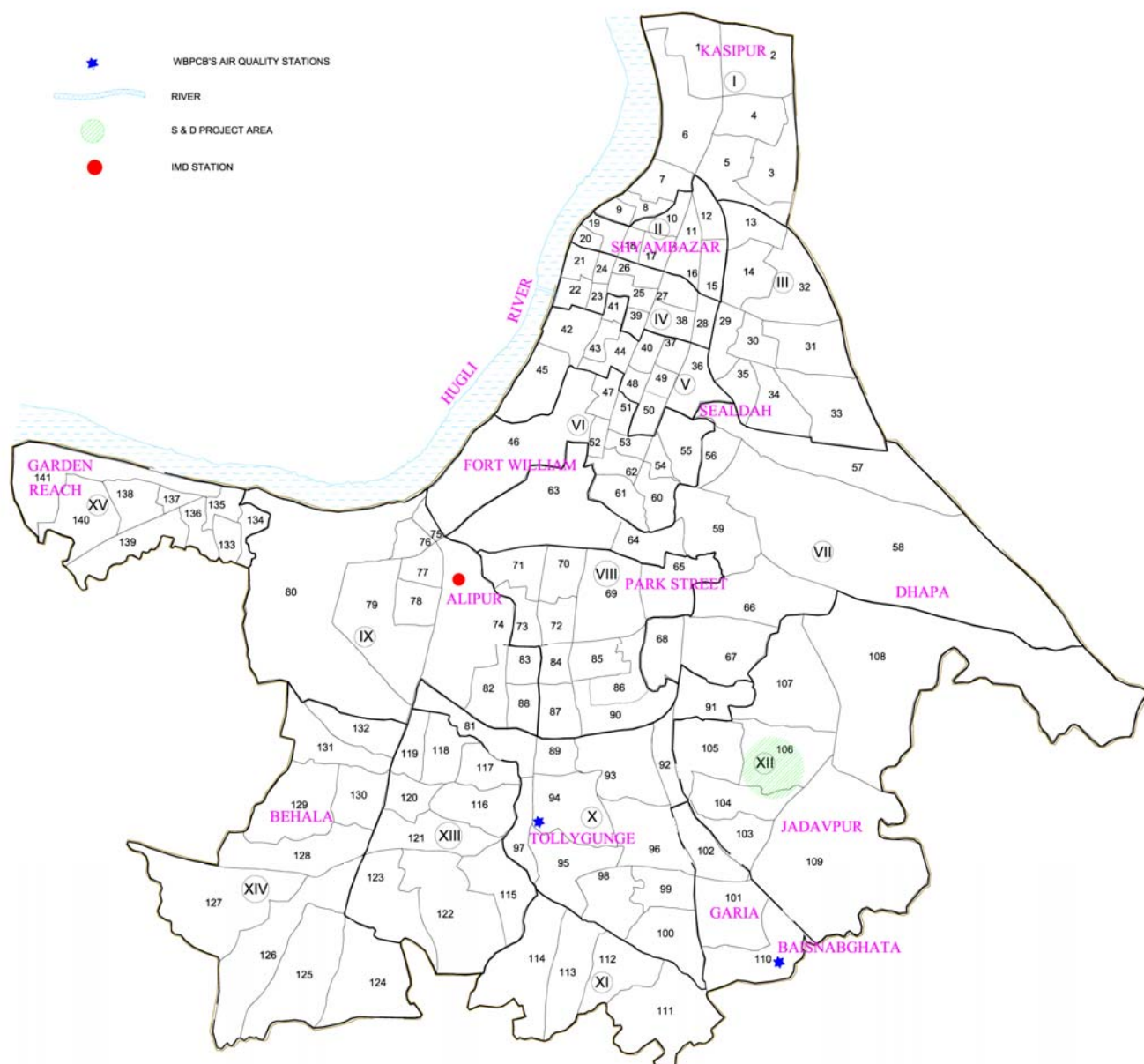


# INITIAL ENVIRONMENTAL EXAMINATION REPORT ON SEWERAGE AND DRAINAGE PROJECT OF BOROUGH XII



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## **1.0 INTRODUCTION**

The Kolkata Municipal Corporation (KMC), with assistance from the Asian Development Bank (ADB) has embarked upon Kolkata Environmental Improvement Project (KEIP). The project is aimed at achieving a sustainable improvement in the environment of Kolkata through implementation of an urban infrastructure and environmental management investment programme.

Sewerage and Drainage (S & D) Project, a key sub project of KEIP, is being implemented to provide comprehensive drainage and sewerage coverage in the 'added areas' of Boroughs I, XI, XII, XIII, XIV and XV covering Wards 1 – 6 and 101 – 141. The existing drainage and sewerage network in these Boroughs is inadequate and needs augmentation and/or improvements considering the development of the area and anticipated growth.

This Initial Environmental Examination (IEE) study pertains to the sewerage and drainage scheme proposed for Borough XI.

Feasibility Study of KEIP conducted by EGIS Consulting Australia PTY Limited, in accordance with the ADB guidelines, has determined the project to be a Category B Project. All Category B projects are judged to have some adverse environmental impacts, but of lesser degree and significance than those of Category A projects. A Category B project requires preparation of IEE to determine if the project would require a detailed Environmental Impact Assessment (EIA). If EIA is not warranted then the IEE is considered as the final environmental assessment report of the project.

### **1.1 Purpose**

The purpose of IEE is to document screening of the environmental consequences of the subproject in accordance with the ADB guidelines, to identify potential adverse and beneficial environmental impacts, and to document the mitigation and monitoring measures that would be incorporated in the project to eliminate or minimise the adverse impacts.

### **1.2 Scope**

The components of this subproject include installation of new lines where drainage and sewerage network does not exist and replacement of existing lines where damaged or determined to be of inadequate capacity along with desilting of existing drainage and sewer system. As such the study is limited to these project components and does not include associated pumping stations and sewage treatment plant as these are not a part of this sub project.

The study is based on available secondary data, reports and design data.

## **2.0 DESCRIPTION OF THE PROJECT**

### **2.1 Need for Project**

The proposed project will provide sewerage and drainage coverage in Borough XII and part of Borough XI of KMC. The sewerage and drainage facilities available in the area are inadequate. Some of the areas do not have any organized sewerage or drainage network while in the remaining area, although a network of sewer lines exists, the system is not functioning properly due to inadequacies in maintenance and other factors. Due to inadequate drainage, several pockets in the Borough XII (particularly parts of wards 108 and 109) are prone to flooding.

### **2.2 Location**

The sub-project will be implemented over an area of 1322 ha (referred as priority area in the Preliminary Design Report for Sewerage and Drainage Improvement, Borough XII). The priority area is located in the south eastern part of KMC. It covers the areas of Picnic Garden, Ruby, Haltu, Santoshpur, Baishnabghata Patuli etc. The priority area includes total area of wards 101 to 107 and ward 110 and part of ward 108 and 109. The area is bounded in the west and north by portions of ward boundaries of wards 108, 107, 105, 104, 102, 101 and 110, largely E. M. By Pass in the east and Tolly's Nullah in the south (Plate 1).

### **2.3 Coverage**

According to our projected population of 2005, the total population of wards 101 - 110 is 322,427 of which the population of priority area is 259,029. The proposed drainage and sewerage scheme will cover priority area of approximately 1322 hectares and is estimated to serve in 2035 the population of approximately 403,160 people. Details of the coverage of proposed scheme is shown in Table 1. The portion of the rest of Borough XII will be considered in the master plan.

**Table 1 Coverage of Priority Area**

Ward No.	Total Area (ha)	Area Considered under Priority Project (ha)	Total Population for the year		Total Population in Priority Area	
			2005	2035	2005	2035
101	160	160	40724	63527	40724	63527
102	81	81	20587	20587	20587	20587
103	90	90	27184	44073	27184	44073
104	117	117	31360	50844	31360	50844
105	64	64	22347	36231	22347	36231
106	176	176	32301	52370	32301	52370
107	264	264	42314	68604	42314	68604
108	261	18	40921	66345	2867	4645
109	538	197	40067	64960	14723	23869
110	156	156	24622	38410	24622	38410
<b>Total</b>	<b>1907</b>	<b>1323</b>	<b>322427</b>	<b>505951</b>	<b>259029</b>	<b>403160</b>

**2.4 Project Schedule**

The preliminary construction work of the project is expected to commence in January, 2006.

**2.5 Proposed Drainage and Sewerage Network**

The proposed drainage and sewerage network in the priority area will retain about 155 km of existing pipeline and would include laying of approximately 72 km of new pipe and replacement of small percentage of existing pipes. In addition, all existing drainage and sewerage network that would remain will be de-silted and thoroughly cleaned. Details of the proposed scheme are provided in Table 2.

**Table 2 Details of the Proposed S & D Scheme of Borough XII and Parts of Borough XI**

Component	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5	Lot 6	Total
Estimated approximate volume of soil to be excavated from new and replaced pipes etc. (m <sup>3</sup> )	27446	32540	49060	79438	40777	39245	268506
Estimated approximate volume of excess excavated soil to be disposed (m <sup>3</sup> )	14786	17390	25234	17545	14323	12034	101312
Estimated approximate volume of silt to be removed and disposed from cleaning of existing pipes (m <sup>3</sup> )	5000	16000	300	-	-	-	21300
Estimated approximate volume of road crust to be removed (m <sup>3</sup> )	2800	3334	4840	4225	2356	1894	19450
Approximate Length of existing sewers to be retained (m)	38034	114659	2608	-	-	-	155301
Approximate Length of proposed new sewers (m)	10012	11955	17116	17490	8125	7530	72228
Diameter of new pipes (mm)	300 - 1600						
Depth of trench (m)	1.5 – 6.0						
Road Width (m)	2.5 – 6.6						

Where :

- Lot 1 - Combined sewerage networks for wards 101, 102 & 110
- Lot 2 - Combined sewerage networks for wards 103 to 107
- Lot 3 - Combined sewerage networks for wards 108 & 109
- Lot 4 - DWF transportation system upto LS 2
- Lot 5 - DWF transportation system from LS 2 to LS 3
- Lot 6 - DWF transportation system from LS 3 to LS 4
- ( LS - Lifting Station)

Combined sewerage system will be provided for Lot 1 to Lot 3, whereas for Lot 4 to Lot 6 DWF transportation system will be provided.

In the proposed system un-sewered priority area is divided into a number of small sub-zones for design purposes. Combined sewerage and drainage system provided to it with separate outfall arrangements. Storm water run-off from the combined flow will be discharged directly into nearby drainage courses and dry weather flow will be intercepted near the outfall locations through intercepting system. The proposed system includes utilization of existing STPs in ward 110 and 107. Separate system has

been suggested for the catchment areas of these two STPs. Existing DWF collection system will be retained and separate SWF collection system is considered.

DWF to be generated in the study area will require four lifting stations (to be dealt separately in respective package) to properly discharge the DWF to DWF channel.

### **3.0 DESCRIPTION OF THE ENVIRONMENT**

#### **3.1 Physical Resources**

**Geology and Soil:** Geological Survey of India (GSI bulletin, 1964) has classified the area as that of Quaternary age formed out of deposits of alluvial and deltaic sediments of the river Ganga and its tributaries. Lithologically, the alluvial fill consists of clay, silt, fine to coarse sand and sand mixed with fine pebbles. The thickness of the upper clay bed varies between 10 to 40 m while the basal clay bed exists at depths of 250 to 650 m below the land surface. Between these layers, confined aquifer occur which is being tapped as a ground water resource. The linear area along the Tolly's Nullah represents a palaeo-channel of one of the distributaries of Hugli River.

The soil of the project area is primarily Entisols, younger alluvial type and can be characterised as predominantly clayey type.

**Climate:** The climate of the study area is humid and tropical. The weather is typically hot and dry during summer from March to May, hot and humid during monsoon or rainy season from June to September and mild during winter from October to February.

Climatological data of the Alipur observatory (Plate 2) reported by India Meteorological Department (IMD) for the period 1990-1999 indicates the following: the maximum temperatures were recorded in May (mean maximum 35.2 °C) while the minimum temperatures occurred during January (mean maximum 14.14 °C). The relative humidity ranged between 86.2% in August to 53.7% in March. The average annual rainfall was about 1919.0 mm. A long term average is about 1650 mm. The winds were predominantly southwesterly during the summer and monsoon season and northerly during the winter months. The wind speed is highest during summer months with average speed of 6.0 km/hr while during the winter months the average wind speed is 2.63 km/hr.

**Air Quality:** There is no ambient air quality monitoring stations within the project area. The air quality monitored by the WBPCB at Tollygunge and Baishnabghata stations, which are within 4 km from the project area (Plate 2), can provide some indication of the air quality within the project area.

The levels of various pollutants measured at these two locations during the months from April, 2003 to March, 2004 are presented in Table 3.

**Table 3 Ambient Air Quality Statistics of two Stations of WBPCB in KMC area based on daily 24-hourly data from April, 2003 to March, 2004.**

A = Average concentration in microgram per cubic metre from 24-hourly data  
B = Number of days the daily value exceeded the standard out of total days monitored based on 24-hourly data

Station Name	Month with Year	SPM		RPM		SO <sub>2</sub>		NO <sub>x</sub>	
		A	B	A	B	A	B	A	B
<b>1. Tollygunge</b>	<b>Apr., 2003</b>	173	1/8	60	0/8	4	0/8	49	0/8
	<b>May, 2003</b>	172	1/8	53	0/8	2	0/8	41	0/8
	<b>Jun., 2003</b>	156	0/8	53	0/8	3	0/8	48	0/8
	<b>July. 2003</b>	136	0/9	49	0/9	2	0/9	41	0/9
	<b>Aug., 2003</b>	115	0/9	47	0/9	2	0/9	39	0/9
	<b>Sep., 2003</b>	128	0/7	50	0/7	3	0/7	47	0/7
	<b>Oct., 2003</b>	150	1/9	64	1/9	4	0/9	62	0/9
	<b>Nov., 2003</b>	277	8/8	153	7/8	8	0/8	89	6/8
	<b>Dec., 2003</b>	404	9/9	239	9/9	11	0/9	105	8/9
	<b>Jan. 2004</b>	349	8/8	192	8/8	11	0/8	73	2/8
	<b>Feb., 2004</b>	346	9/9	198	9/9	14	0/9	78	5/9
	<b>Mar., 2004</b>	304	9/9	147	8/9	12	0/9	49	1/9
	<b>Apr., 2003 -Mar., 2004</b>	226	46/101	109	42/101	6	0/101	60	22/101
<b>2. Baisnabghata</b>	<b>Apr., 2003</b>	90	0/9	34	0/9	2	0/9	32	0/9
	<b>May, 2003</b>	114	0/9	39	0/9	2	0/9	36	0/9
	<b>Jun., 2003</b>	105	0/8	30	0/8	1	0/8	30	0/8
	<b>July. 2003</b>	91	0/10	28	0/10	2	0/10	26	0/10
	<b>Aug., 2003</b>	87	0/8	33	0/8	2	0/8	27	0/8
	<b>Sep., 2003</b>	85	0/9	35	0/9	2	0/9	30	0/9
	<b>Oct., 2003</b>	101	0/8	40	0/8	3	0/8	35	0/8
	<b>Nov., 2003</b>	172	1/9	89	3/9	5	0/9	59	0/9
	<b>Dec., 2003</b>	268	9/9	159	9/9	7	0/9	73	2/9
	<b>Jan. 2004</b>	243	8/8	152	8/8	13	0/8	67	2/8
	<b>Feb., 2004</b>	261	7/8	151	8/8	12	0/8	70	2/8
	<b>Mar., 2004</b>	218	5/9	101	3/9	8	0/9	50	0/9
	<b>Apr., 2003 -Mar., 2004</b>	153	30/104	74	31/104	5	0/104	45	6/104

Source : [www.wbpcb.gov.in](http://www.wbpcb.gov.in)

Based on the above data it appears that the pollutant levels of SPM, RPM, SO<sub>2</sub> and NO<sub>x</sub> in the project area are likely to remain below the limiting ambient air quality standards of residential area during the typical summer (April-May) and the typical monsoon (July-August) months. During the typical winter months (December-January) levels of SPM and RPM are likely to exceed the standard. NO<sub>x</sub> concentration in these months is variable exceeding the standard in some of the days. Pollutant level is comparatively low in the Baisnabghata station.

**Ground Water:** Ground water occurs under confined and unconfined conditions. In Ballygunj, Dhakuria and Garia area, shallow unconfined aquifer exists as thin lenses. Due to lowering of piezometric surface in central Kolkata, the ground water flow is radial in central and south central Kolkata (Central Ground Water Board, 1999). Consequently, ground water flow is towards NNE in the project area with the piezometric surface lying about 9 m below msl during premonsoon, 1998 (CGWB, 1999).

Within the vicinity of the project area (Jadavpur and Tollygung area), the ground water was reported to be of marginal quality. The ground water analysed from deep tube wells in this area showed high concentration of iron and chloride. Iron content was 0.8 to 1.3 mg/l while chloride content varied between 891.1 to 1258.7 mg/l. The total hardness was also high in the range of 586 to 1009 mg/l as CaCO<sub>3</sub> (Central Pollution Control Board, 1998). On the other hand Central Ground Water Board (1999) reported the chemical character of a tube well (hand pump) water in Jadavpur as follows:

**Table 4 Chemical Character of tube well water in nearby area (Jadavpur)**

pH	8.2	Cl	277 mg/l
TDS	951 mg/l	SO <sub>4</sub>	1.6 mg/l
Ca	25 mg/l	HCO <sub>3</sub>	537 mg/l
Mg	17 mg/l	F	0.74 mg/l
K	5.2 mg/l	NO <sub>3</sub>	<0.1 mg/l
Na	32 mg/l	TH as CaCO <sub>3</sub>	140 mg/l
Fe	0.24 mg/l		

(Source: Central Ground Water Board, 1999).

The ground water is of Na-HCO<sub>3</sub> hydrochemical facies type

**Surface Water:** Significant part of TP basin falls inside the priority area. TP system and Tolly's Nullah are major sources of surface water in the project area. The Tolly's Nullah was constructed in 1778 by excavating part of Adi Ganga, a distributary of the river Hugli. Heavy siltation and continued disposal of industrial and municipal waste have rendered the water quality of this canal unfit for any use. A study conducted by the CPCB reported Total Viable Bacteria Count in the range of 23,840 – 1,42,030 Colony Forming Unit (CFU)/ml and Fecal Coliform in the range of 4,200 – 17,000 CFU/ml.

The bed silt of Tolly's Nullah at Kundghat is somewhat acidic (pH 6.8) with K (1440 ppm), As (4.8 ppm), Pb (80 ppm), Cr (63 ppm), Zn (298 ppm) and Ni (38 ppm) (data from DSC).

**Noise:** Like any other major cities Kolkata is also very noisy. The noise level in the vicinity of the project area (South Kolkata) was reported to be in the range of 73-92

dB(A) in 1994 (EGIS report, p-3.7), which is significantly higher than the permissible daytime levels of 65 and 55 dB(A) for commercial and residential area respectively. Vehicular traffic is the main source of noise pollution.

### **3.2 Ecological Resources**

As the project area is highly urbanised, presence of wild life or endangered species is very unlikely. In addition, within the project area there are no forests, coastal resources or fisheries. Neither any of the work components of the project will be on restricted East Kolkata Wetland nor any of the activities envisage causing any detrimental effect to wetland.

### **3.3 Economic Development**

**Land Use:** Predominant land use within the project area is residential and mixed residential and commercial.

**Industries:** About 98% of the area is residential. There is no industry of significance in this area.

**Water Supply:** Water supply in the area is mostly dependent on ground water from deep tube wells. No of deep tube wells supply a substantial amount out of a total demand of 47 MLd, the rest is mainly met from individual sources such as private tube wells in high rise buildings and shallow tube wells. The Garden Reach facility which is being operated and maintained by Kolkata Metropolitan Water and Sanitation Authority (KMWSA) also supply some water to this area.

**Sewerage and Drainage:** A considerable portion of project area is covered by underground sewerage / drainage networks with outfalls to the nearby drainage courses. Residents of the area primarily use septic tank and treatment facilities existing in ward no. 107 and 110. However, existing sewerage and drainage systems are found to suffer from inadequate capacity / design, heavy siltation and damaged condition. The proposed project is aimed at correcting these deficiencies.

**Transportation:** The main mode of transportation within the project area is by road. There is about 59 km of roads network within the project area. As per the site visit information and available map approximate road widths vary between 2.5 to 6.6 m, of these 10-15% of the roads are about 2.5 m wide. Due to the narrowness of the roads and multi modal nature of traffic frequent traffic congestion occur in densely populated areas.

**Electrical Power:** Within the KMC service area, the Calcutta Electric Supply Corporation (CESC) supplies electric power. Total demand of power in the KMC area exceeds 1200 MW. CESC generates about 800 MW at its 5 coal fired thermal power plants and purchases 300-400 MW from West Bengal State Electricity Board and Damodar Valley Corporation (IEE for KEIP, January 2000).

### 3.4 Environmental and other Significant Features

Environmental and other significant features present in the project area such as water bodies, schools, hospitals, markets etc which could be affected by project construction were noted from secondary data. Table 5 lists these features.

**Table 5 – Environmental and other Significant Features of S & D project of Borough XII and Part of Borough XI**

<b>Environmental and other Features</b>	<b>Lot 1</b>	<b>Lot 2</b>	<b>Lot 3</b>	<b>Lot 4</b>	<b>Lot 5</b>	<b>Lot 6</b>
1. Water Bodies	7	4	19	5	1	1
2. Playgrounds	-	2	2	2	-	2
3. Hospitals	-	-	2	-	-	-
4. Bank	-	-	1	1	-	-
5. Pump house / Petrol Pump / Water tank	2	2	1	2	2	2
6. Educational Institute	2	1	2	5	1	2
7. Temple / Mosque	1	6	1	1	-	5
8. Slum	2	-	-	3	-	4
9. Market	-	-	-	1	-	2
10. Library	-	-	-	2	-	-
11. Stadium	-	-	-	1	-	-

### 4.0 POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

The proposed project would influence the environment in two distinct phases:

- i. During the construction phase which would be temporary and short term;
- ii. During the operation phase which would have long term effects

Checklist of potential environmental impacts of the project is presented in Table 6 and the impacts are discussed in the following sections.

**Table 6 – Environmental Checklist of S & D project of Borough XII and Part of Borough XI**

Actions Affecting Environmental Resources and values (A)	Damages to Environment (B)	Recommended Feasible Protection Measure (C)	IEE(D)				Comments
			No Significant Effect (D1)	Potential Significant Effect	Small (D2)	Mod Major (D3) (D4)	
<b>Problems related to siting for facilities</b>							
Interference with other utilities	Nuisance/disturbances to public	Careful planning/design		<input type="checkbox"/>			To the extent feasible existing utilities will be bypassed
Interference with street traffic/blocking of access to building	Nuisance/disturbances to public	Careful planning/design			<input type="checkbox"/>		Due to narrow roads some traffic congestion is likely
Inadequate resettlement provision	Social inequities	Adequate resettlement planning and budgeting	<input type="checkbox"/>				None expected, minor encroachment will be bypassed
Impairment of historical/cultural monuments/ areas	Loss of impairment of these values	Careful planning/design, plus offsetting measures	<input type="checkbox"/>				None expected
<b>Problems Relating to Design Phase</b>							
Overflow/bypassing hazards	Contamination of environment plus flooding	Proper design/O&M plus operations monitoring		<input type="checkbox"/>			Adequate design measures have been incorporated
Hazardous materials illegally in sewer	Damage to sewer system plus danger to workmen, downstream contamination	Do		<input type="checkbox"/>			Monitoring by KMC and WBPCB will prevent this
Inadequate management of industrial wastes discharge to sewers	Damage to pipes, down stream contamination	Do		<input type="checkbox"/>			Do
Hazards of sulfide corrosion	Damage to sewer system	Do		<input type="checkbox"/>			
<b>Problems During Construction Stage</b>							
Silt runoff from construction operation or exposed surface	Soil erosion plus damage to water quality and aesthetics	Do		<input type="checkbox"/>			
Local flooding from dewatering of excavation sites, flushing of pipes and	Hazard and nuisance to workers and public	Do		<input type="checkbox"/>			

Actions Affecting Environmental Resources and values (A)	Damages to Environment (B)	Recommended Feasible Protection Measure (C)	IEE(D)				Comments
			No Significant Effect (D1)	Potential Significant Effect Small (D2) Mod Major (D3) (D4)			
hydraulic testing							
Dumping of silt and construction spoils	Soil and groundwater contamination	Do		<input type="checkbox"/>			
Construction accidents and hazardous materials contacts or spills	Injuries and health safety of workers and public	Do		<input type="checkbox"/>			
Dust/odour/fumes/noise/vibration from construction	Health hazard/nuisance to workers and public	Careful planning, control and monitoring		<input type="checkbox"/>			
Accidental damage to utilities	Public inconvenience due to disruption of services	Appropriate planning plus prompt repair		<input type="checkbox"/>			
Traffic congestion and blockage of access	Accidents/nuisance to public	Appropriate traffic and access control measures			<input type="checkbox"/>		In consultation with Kolkata Police traffic management plan will be prepared
<b>Problems During Operation Stage</b>							
Water logging and/or overflowing of sewer due to clogged sewer lines/gully pits	Health hazard and public nuisance	Proper design construction, O&M, plus monitoring			<input type="checkbox"/>		KMC will undertake periodic cleaning of sewer lines and gully pits
Workers exposed to toxic gases in sewers and hazardous materials in sewage during maintenance work	Serious/health/safety hazards	Proper design construction and O&M, including handling of emergencies plus operations stage monitoring		<input type="checkbox"/>			
Cave-in of sewer lines	Safety hazard to public and workers	Do		<input type="checkbox"/>			
Inadequate operations stage monitoring	Nuisance/hazard to public	Proper O&M and monitoring		<input type="checkbox"/>			

#### 4.1 Environmental Impacts - Construction Phase

During the construction phase there would be some impact on air, noise and water quality, and management of solid waste. Also there would be some impact on quality of life due to inconvenience caused to public as a result of construction activities.

Air quality impacts are likely from general construction activities including land clearing, trenching, laying of pipes, construction of foundations and superstructures, handling and transportation of construction and demolition materials, and from wind erosion of open sites and stock pile areas.

Noise pollution will occur from operation of construction equipment including earth moving and material handling equipment.

Water quality impacts may occur from runoff and waste and sewage generated from construction activities.

Within the Right Of Way (ROW) there are no trees, which would need to be removed as a result of construction. There are few small temples and some structures on the ROW. Design of the proposed network will ensure that these encroachments are bypassed.

The project would require disposal of approximately 142062 m<sup>3</sup> of excavated materials which include road crust of 19450 m<sup>3</sup>, 21300 m<sup>3</sup> of silt removed from desilting of existing pipes and 101312 m<sup>3</sup> of soil. Disposal of excavated soil and roads crust will not pose a problem; however, disposal of silt could cause soil and ground water contamination.

Since most of the roads in the project area are narrow there will be some traffic congestion during the construction phase. Further, for approximately 10 - 15% of road sections, the road width is about 2.5 m. In these narrow sections of road construction activities may cause significant traffic disruption.

Some inconvenience to public may result from restricted access to building and structures and temporary dislocation of civic amenities like water supply, drainage and sewerage, electricity, telephone and cable TV connection due to relocation or replacement of these facilities.

Traffic dislocation, lack of access to buildings and air and noise pollution caused by construction activities could have some adverse impact on trade and commerce in the service area.

Unforeseen accidents could result in personal injury and/or damage to private or public property.

Due to design constraints it will not be feasible to provide drainage and sewerage coverage in all the wards of Borough XI which may result in some discontent from

public residing in the areas that will not be covered by the project. The awareness programme to be undertaken to address this issue and other public concerns are discussed in Section 6.0 - Public Consultation.

#### **4.2 Mitigation Measures - Construction Phase**

Following measures are recommended for mitigating or minimizing the environmental impacts that are likely to occur during the construction phase of the proposed project. The contractor under supervision and direction of DSC shall implement these mitigation measures.

##### **Prevention of erosion**

1. Construction will be scheduled so that large areas of soil are not laid bare during the monsoon.
2. Ground disturbances will be phased so that it is limited to workable size.
3. Exposed surface will be resurfaced and stabilised as soon as possible.
4. Trenches will have adequate backfill to prevent subsequent street settlement. Upon completion of backfill the road surface shall be restored fully to the level at its original condition.

##### **Prevention of dust nuisance**

1. On exposed construction surfaces during dry/windy periods fugitive dust generation will be suppressed by spraying of water or other suitable means.
2. Workers working in dust prone areas will be provided with masks and goggles.
3. Excavated material transported by trucks will be covered and/or wetted to prevent dust nuisance.

##### **Noise and emission from vehicles and construction activities**

1. All construction vehicles will be properly maintained and will have valid "Pollution Under Control Certificate"
2. Noisy construction activities will be carried out only during normal working hours and local residents will be advised of any unusual or unavoidable noise.
3. Where feasible sound barrier will be provided in inhabited areas.

##### **Relocation of utility services**

1. Utility services such as telephone line, electric poles, and water lines etc. that will be impacted by project construction will be identified.
2. Concerned authorities will be informed and their assistance sought to remove, relocate and restore services of these utilities prior to commencement of construction.

3. It will be ensured that these utilities are not damaged due to construction activities.

**Prevention of dust and noise during material handling operation**

Dust and noise producing activities such as stone crushing, bitumen and cement batching plant etc. will be preferably located downwind and away from habitation settlement wherever practicable.

**Prevention of soil, ground and/or surface water contamination**

1. Silt after dewatering will be immediately disposed in approved disposal site.
2. Excess excavated soil and spoils will be disposed in approved disposal site.

**Prevention of water logging/ flooding**

1. De-watering during trenching and water testing of new lines will be regulated in a manner so that it does not lead to water logging of the nearby area.

**Road safety and traffic management during construction**

KMC in coordination with DSC will prepare a traffic management plan for approval of Kolkata Police. The plan will include:

1. Measures to be taken to prevent traffic congestion.
2. Provision of temporary safe access to buildings, which will be blocked due to construction.
3. Measures to be taken for safe passage of traffic including temporary diversions, and/or separation of motor vehicle traffic from non-motorized and pedestrian traffic where necessary.
4. Measures to be taken to ensure safety of traffic passing through the construction area including signs, marking flags, lights and flagmen as may be required.

**Prevention of Accidents and Damage to Property**

All necessary precautions will be taken to prevent accidents and/or damage to property. Measures taken by the contractor will include but not limited to:

1. Safe execution of construction work
2. Providing adequate health and safety protection to workers.
3. Sufficient insurance coverage covering all risks including property damage, third party liability, workmen compensation and transit insurance.

**Health and safety of work force**

1. All occupational and health and safety requirements for workforce will be adhered to.
2. Periodic health check up of workers will be provided
3. A physician's services will be retained to handle emergencies.
4. During sewer line cleaning operation the line will be adequately vented to ensure that no toxic or hazardous gases are present in the line and the gases present in the sewer line will be analysed for hazardous/toxic gases before commencing cleaning operation, if warranted.
5. Workers engaged in cleaning of sewer lines will be provided with proper protective cover including gumboots, rubber gloves and gas masks.

**Environmental health and safety considerations at construction camp sites and construction worksites**

1. Camps/compounds will be located so that they do not interfere with the existing drainage system.
2. Camps/compounds will be contained by surrounding the site with a bund or earth mound with controlled drainage outlet.
3. Campsites will have adequate provision of shelter, water supply, excreta and solid waste management as far as practicable.
4. Construction work-site will be properly barricaded and have adequate provision of drinking water, toilets and dispensing of first aid.
5. Appropriate control measures will be taken to prevent insect/vector diseases especially malaria by measures such as spraying and/or preventing creation of stagnant pool of water

**Prevention of impacts on places of cultural importance**

1. Routing of sewer/drain lines will avoid places of cultural importance including shrines, temples, maazars, mosques etc. to the extent feasible or they will be relocated.
2. Safe access to these places will be maintained.

**Protection of trees**

Routing of sewer/drain lines will avoid impacting trees to the extent feasible. Prior approval of the Forest Department, GoWB will be obtained where trees have to be felled for laying the pipes.

**4.3 Environmental Impacts - Operation Phase**

During the operation phase the environmental impacts are likely to be mostly positive. These positive impacts have been discussed in Section 4.5. However, there could be some adverse impacts due to inadequate operation and maintenance or control.

Lack of proper operation and maintenance of the system could cause over flow of sewage and water logging during rainy season, which would be a nuisance and health hazard to public.

Due to lack of control there may be discharge of hazardous industrial effluents into sewer, which can damage the sewer system, or interfere with the downstream treatment process or pass through the treatment plant and cause damage to the environment.

There is a potential health hazard to workers engaged in sewer maintenance workers. These workers are likely to be exposed to toxic gases and hazardous materials present in the sewage and are likely to contract communicable diseases from exposure to pathogens present in the sewage.

#### **4.4 Mitigation Measures - Operation Phase**

1. Since largely combined sewerage and drainage system has been proposed due to space restriction etc. it is likely that some silting will occur due to difficulty in achieving self cleansing velocity during DWF. To alleviate the siltation problem it would be necessary for KMC to undertake continual routine maintenance of the system. Periodic preventive maintenance carried out by KMC would prevent flooding or water logging caused by clogged drains.
2. Monitoring activities carried out by the West Bengal Pollution Control Board would ensure that untreated effluent from industry is not discharged into the proposed sewer system.
3. KMC will ensure that the proper health and safety precautions are adhered to during sewer cleaning operation.

#### **4.5 Positive Impacts of the project**

Improvement in sewerage and drainage as a result of this project would minimize water logging and/or flooding in the service area and ensure better sanitation practices. This would lead to:

1. Abatement of nuisance and public health hazard in the service area. Improved sanitary conditions would result in reduction in incidence of parasitic infections, hepatitis and various gastrointestinal diseases including cholera and typhoid which occur either through direct contact with fecal material or contamination of water supply and food.

2. Fewer incidence of illness would lead to reduction in health care expenditure and lost workdays.
3. Fewer incidence of disruption of transportation.
4. Accelerate economic growth as a result of improved quality of life within the service area.

A significant population of the service area who are poor and live in slums would benefit the most from the proposed project as they suffer the most when there is flooding and/or water logging in the service area. Other benefits of the project would include:

1. Improvement of water quality of TP Canal, Intercepting Channel and Lead Channels as a result of planned collection and disposal of DWF from the service area into Kolkata DWF.
2. Contamination of local ponds and canals as a result of sewage overflow and flooding will be prevented or minimised.
3. Employment generation during the construction phase
4. Transportation within the service area will improved due to improved road conditions as a result of resurfacing of roads sections damaged by the project.

## 5.0 MONITORING PLAN

Effective implementation of the mitigation measures to mitigate or minimise the environmental impacts would require the project to undertake a comprehensive monitoring programme. The objective of the monitoring programme is to ensure that the construction and operation activities are carried out in an environmentally sensitive and responsible manner, and in accordance with the recommendations of IEE. Recommended monitoring activities of the proposed project is presented in Table 7

**Table 7 -- Summary of Environmental Monitoring Programme of S & D project of Borough XII and Part of Borough XI**

Monitoring Category	Type of Monitoring	Minimal Frequency	Monitoring Agency
<b>CONSTRUCTION PHASE</b>			
<b>Soils</b>			
Excavation and back filling	Monitor adherence to contract specifications	Daily	Contractor/ DSC
Erosion	Monitor proper management of excavated soil/silt including timely removal of material from project site	Monthly	Contractor/ DSC

<b>Monitoring Category</b>	<b>Type of Monitoring</b>	<b>Minimal Frequency</b>	<b>Monitoring Agency</b>
<b>Surface and Ground Water Quality</b>			
Surface runoff management	Monitor measures to channelise surface runoff	Daily	Contractor/ DSC
Contamination from waste and sewage generated from construction activities	Monitor measures taken to prevent contamination of ground and/or surface water from waste and sewage generated from construction activities	Daily	Contractor/ DSC
<b>Air/Noise Pollution</b>			
Dust emission during site preparation, excavation	Monitor adequacy of dust suppression measures undertaken	Daily	Contractor/ DSC
Storage and transportation of construction materials, excavated soil and silt	Monitor adequacy of measures undertaken to prevent fugitive dust	Daily	Contractor/ DSC
Noise and emissions from construction vehicles	Monitor 'Pollution under Control' certificate are current for construction vehicles	Quarterly	Contractor/ DSC
Noise pollution from construction activities	Monitor preventive measures being implemented to curb noise	Daily	Contractor/ DSC
<b>Solid Waste</b>			
Disposal of excavated soil and silt	Monitor to ensure excavated soil and silt are being disposed in approved sites	Daily	Contractor/ DSC
<b>Flooding/Water logging</b>			
Blockage of drainage due to construction activities	Monitor to ensure construction activities does not cause flooding or water logging at the project site.	Weekly	Contractor/ DSC
<b>Health and safety of construction workforce</b>			
Health and safety requirements	Monitor adherence to all occupational and safety requirements	Weekly	Contractor/ DSC
Health check up of workers	Monitor adequacy of health check up service provided including attendance of the physician retained and the extent to which the workforce is availing this service	Monthly	Contractor/ DSC/PMC
Provision of health and safety protection gear	Monitor availability of adequate number of protective gear equipment needed	Monthly	Contractor/ DSC
Maintenance of health and safety records of work force	Review and monitor health and safety records to ensure all project related accidents are being properly investigated and reported	Monthly	Contractor/ DSC
Sanitary conditions of construction campsite	Monitor provision of shelter, water supply, excreta and solid waste management at campsites	Monthly	Contractor/ DSC
<b>Road Safety and Traffic Management</b>			
Traffic management plan	Obtain approval to traffic management plan from Kolkata Police		DSC/KMC/C ontractor
	Monitor adherence to the traffic management plan	Fortnightly	Contractor/ DSC/KMC
Review road safety record	Review and monitor road safety records to ensure all project	Monthly	Contractor/ DSC/KMC

<b>Monitoring Category</b>	<b>Type of Monitoring</b>	<b>Minimal Frequency</b>	<b>Monitoring Agency</b>
	related road accidents are being properly investigated and reported		
<b>Community Life and Economic Activities</b>			
Access to public and private properties	Monitoring impact of project on dwelling and business in the project area	Daily	Contractor/DSC
Damage to public and private property	Monitor construction activities to ensure public and private property is not damaged	Weekly	Contractor/DSC/KMC
	Review and monitor property damage report to ensure timely resolution of claims etc.	Monthly	Contractor/DSC/KMC
Hardship and inconvenience to public and business	Monitor to ensure that communities and business face minimal hardship and inconvenience due to construction activities	Weekly	Contractor/DSC
<b>Public Awareness</b>			
Awareness campaign highlighting the long term benefit of the project and public cooperation to overcome short term construction phase inconveniences	Review and monitor effectiveness of the awareness campaigns conducted	Fortnightly	PRC/NGO/DSC
<b>OPERATION PHASE</b>			
<b>Operation and Maintenance of the System</b>			
Preventive and unscheduled maintenance as result of accidents or damage to the system  Operation and maintenance of down stream equipment.  Provision of adequate financial and human resources to carry out O&M activities	Monitor adequacy of implementation of preventive and all unscheduled maintenance work including periodic cleaning of the system, timely completion of work, health and safety of maintenance crew and allocation of human and financial resources to carry out the preventive and unscheduled maintenance work  Monitor to ensure proper O&M of down stream equipment of the system including lifting and pumping stations and STP	Monthly   Monthly	KMC
<b>Discharge of Industrial Effluents</b>			
Discharge of industrial effluent into the sewer	Monitor discharge of industrial effluent into the sewer including review of consent to operate forms submitted to the WBPCB and analysis of wastewater sample from industries discharging into the sewer system.	Ongoing Monthly	WBPCB

## 6.0 PUBLIC CONSULTATION

Public consultation started prior to commencement of engineering design. Meetings were held with the Borough Chairman and Councillors to appraise them and solicit feedback on the KEIP projects and the proposed scheme. Several field visits were undertaken to identify problems with existing drainage and sewerage system in the project area through interactions with local ward Councillors, Borough Engineers and some primary stakeholders in areas where problems were noted. In addition, NGO Consultants undertook an awareness campaign to inform public about the various components of KEIP project and to highlight the benefits that the public would derive from these projects. Important public consultation undertaken is provided in Table 8

**Table 8 Public Consultations Undertaken in S & D project of Borough XII and Part of Borough XI**

<b>Date</b>	<b>Meeting/Activity</b>	<b>Participant</b>	<b>Subject</b>
18-09-2003	Consultation Meeting	Borough XII Chairman, Councillors of Ward nos. 103, 104, 106 & 107, PD, DG, PMU, KEIP Dy. Chief Executive Engineer, Assistant Engineer, Sub-Assistant Engineer and DSC representatives	Discussion on S & D schemes of Borough XII and Part of Borough XI.
14-10-2003	Consultation Meeting	Municipal Commissioner, PD, DG, PMU, KEIP DG (conservancy), official of KMC and representatives of PMC and DSC	S & D Package of Borough XII
27-11-2003	Consultation Meeting	Municipal Commissioner, PD, DG, PMU, KEIP and representatives of PMC and DSC	Review meeting on S & D schemes of Borough XI
19-07-04	Consultation Meeting	PD, DG, PMU, KEIP CME (P & D) and representatives of PMC and DSC	S & D Package of Borough XII and other

Stake holders consultation process was carried out during the last quarter of year 2003 and different times in year 2004.

During the construction phase of the project, ongoing dialogue will be maintained with the Borough Officials to keep them informed of the project status. Also, public awareness campaigns may be undertaken to seek public support and cooperation for the project. Public awareness initiatives will focus on public acceptance of short-term inconvenience and hardship that are likely due to the construction activities and

mandatory requirement of obtaining sewer connections and decommissioning and demolishing of septic tanks upon completion of the project.

## 7.0 FINDINGS AND CONCLUSIONS

A matrix of environmental impacts, as shown below in Table 9, was developed from examination of potential environmental impacts and mitigation measures discussed in Section 4.0.

**Table 9 – Matrix of Environmental Impacts S & D project of Borough XII and part of Borough XI**

	Physical Resources			Environmental Attributes				Human and Economic Development						Quality of Life Values						
	Topography	Soils/Geology	Erosion/Sedimentation	Surface Water	Ground Water	AirQuality/Noise	Ecology	Land Use	Communities	Trade/Commerce/In	Infrastructure	Housing	Transportation	Socioeconomic	Resettlement	Public Health	Flooding/Water	Cultural/Historical	Aesthetics	Recreation
<b>Construction Phase</b>	□	↓	↓	↓	↓	↓	□	□	↓	↓	↓	↓	↓	□	□	□	↓	□	↓	↓
<b>Operations or Post Project</b>	□	□	□	↑	↑	□	□	□	↑	↑	↑	↑	↑	↑	↑	↑	↑	□	↑	↑

- Insignificant impact, no change over existing conditions  
 ↓ Minor short time negative impact      ↓ Moderate short-term negative impact  
 ↑ Positive impact      ↑ Significant positive impact

As evidenced from the above matrix, the project is not expected to cause any long term irreversible environmental impact. Most of the environmental impacts that are likely will occur for a short duration during the construction phase of the project. Adequate preventive measures have been incorporated to mitigate or minimise these impacts. The project upon completion would realise several positive impacts, most significant of which being reduction of public health hazard as result of improved drainage and sewerage conditions in the service area. In consideration of the above, a detailed EIA is not warranted and this IEE may be considered as the final environmental assessment of the project.