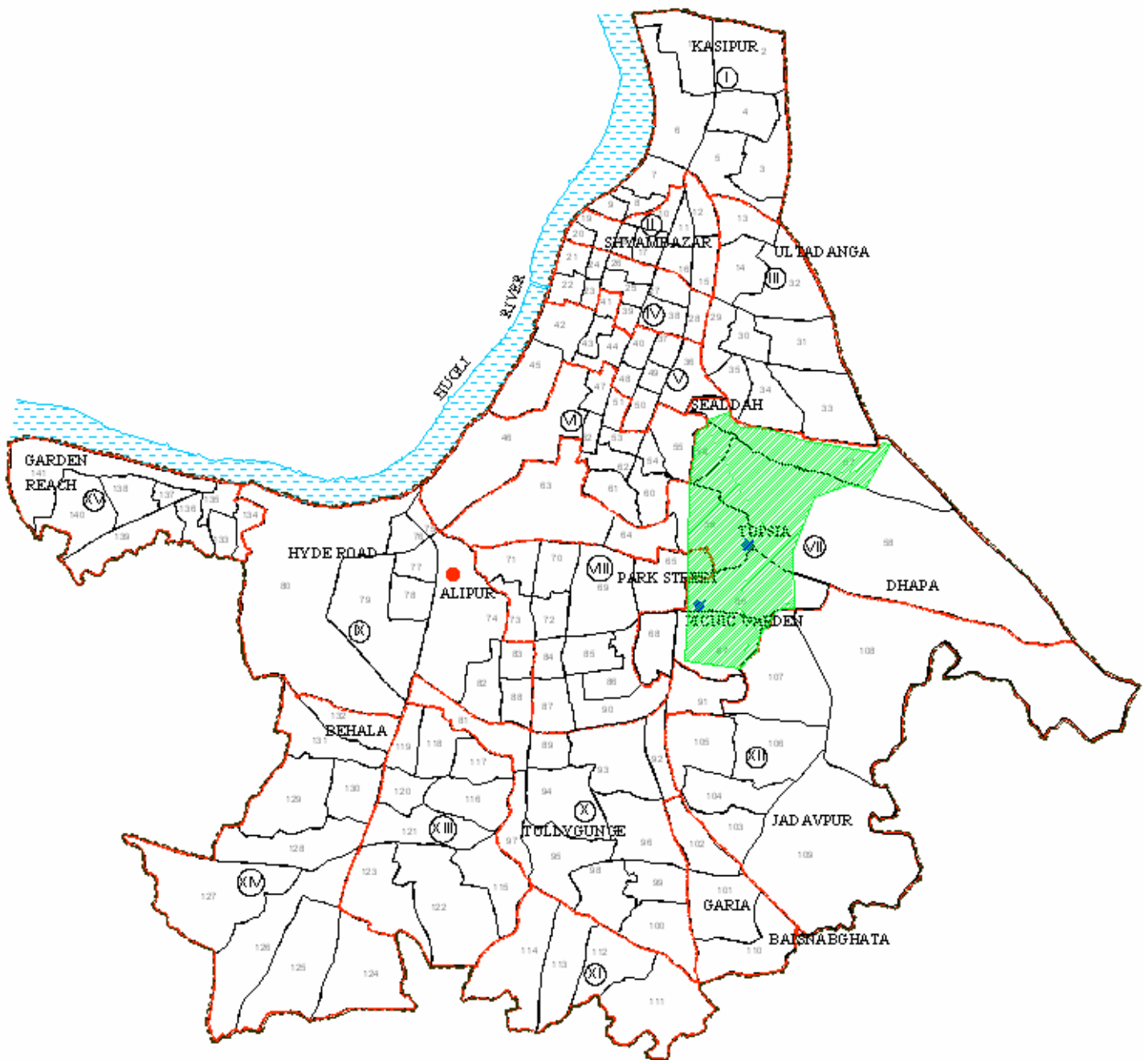


# Initial Environmental Examination Report on Sewerage and Drainage Project of Borough VII



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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 borough I covering wards 1 to 6 and 'added areas' of boroughs XI, XII, XIII, XIV and XV covering wards from 101 – 141. In this sub-project improvement of the drainage system in borough VII was not included initially. After subsequent discussion it was decided that the improvement of sewerage and drainage system in part of borough VII would be undertaken under KEIP. The existing drainage and sewerage network in this borough 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 in part of borough VII covering wards 56 to 59, 66 and 67.

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. 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 subproject to eliminate or minimise the adverse impacts.

### **1.2 Scope**

The components of this subproject include (i) installation of new lines where drainage and sewerage network does not exist (ii) renovation of existing sewers & drains as required along with their desilting. (iii) construction of new pumping stations (iv) augmentation of existing pumping stations and (v) disposal of wastewater into DWF channel.

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 subproject will primarily provide sewerage and drainage coverage in parts of borough VII 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 capacity, maintenance and other factors. Due to inadequate drainage, several pockets in the borough are prone to flooding.

### 2.2 Location

The project area is located in the eastern part of KMC (Plate 1). The sewerage and drainage scheme is proposed to be implemented in the priority area (Plate – II) covering wards 56 to 59, 66 and 67 which is surrounded by Beliaghata canal in the north, Eastern Railway line in the west, Rashbehari connector in the south and E.M.Bye Pass and ward boundary of 66 & 67 in the east.

### 2.3 Coverage

The total projected population of wards 56 to 59, 66 and 67 in 2005 is 383,036 of which the population in priority area covering 986.28 Ha is 338,657. The proposed sewerage and drainage scheme is desired to serve a population of about 386,012 in 2035. Details of the coverage of proposed scheme is shown in Table 1

**Table 1 : Coverage of Priority Area**

Ward No.	Total Area (ha)	Area Considered under Priority Project (ha)	Total Projected Population for the year		Projected Population in Priority Area	
			2005	2035	2005	2035
56	67.78	67.78	45185	51497	45185	51497
57	457.44	169.57	47030	53600	47030	53600
58	727.73	235.55	90698	103369	81995	93451
59	190.26	129.01	69789	79538	61124	69663
66	312.50	193.77	74041	84384	47030	53645
67	190.6	190.60	56293	64157	56293	64157
<b>TOTAL</b>	<b>1946.31</b>	<b>986.28</b>	<b>383036</b>	<b>436545</b>	<b>338657</b>	<b>386012</b>

## **2.4 Project Schedule**

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

## **2.5 Proposed Sewerage and Drainage Network**

The entire study area has been divided into a number of drainage sub-zones (about 95 nos.) depending on the general topography and existing underground drainage pattern. These drainage sub-zones have been developed in such a way that the existing network will be utilized optimally. The proposed system has been developed as a combined system. There is no provision of segregation of wastewater and storm water flow at the existing outfall locations. Presently both waste water and storm water generated from this area discharges into the nearby drainage courses. In the proposed system separate provisions have been made for the disposal of wastewater and storm water generated from this area. Wastewater generated from the northern part of ward 56, entire ward 57 and western part of ward 58 is proposed to be diverted to Palmer Bazar PS (Plate –III) through a proposed DWF network. From Palmer Bazar PS, collected waste water will be discharged to Kolkata DWF channel through 2.4m (8 feet) and 2.7m (9 feet) high level brick sewers along Gobinda Khatick Road. For the diversion of dry weather flow to Palmer's Bazar PS all the existing pumping stations viz. Pagladanga, Chingrighata and Kulia Tangra have been proposed for improvement/augmentation under the scheme. Storm water generated from this area will be discharged either to Beliaghata canal or to Town Head Cut Canal, as proposal, partly by pumping and partly by gravity. Storm water collection system for the above area will be augmented to cater the expected design flow generated from the area. 13 nos stormwater outfall points in Beliaghata canal, 8 nos in Town head cut canal and 5 nos in SWF channel are proposed to discharge the storm water of this area. Three existing pumping stations namely Pagladanga, Chingrighata and Kulia Tangra will also be augmented for the disposal of expected design storm water flow. 15.6 cusec DWF is discharged to DWF channel near PS1.

Presently both waste water and storm water generated from the southern part of ward 56 and western part of ward 58 discharges into a number of nikashis (open drainage course) through existing underground drainage network. In the proposed system all the outfalls to the nikashis are suggested to be discarded and the flows will be diverted to a pumping station. 12.5 cusec DWF will be discharged to the DWF channel near PS2 .

It has been stated earlier that both wastewater and storm generated from the northern part of ward 66 discharges into Kolkata SWF channel. As such there is no such provision of segregation of wastewater and storm water flow discharging to Kolkata SWF channel. Under the proposed system, waste water and storm water will be segregated at the out fall locations by constructing overflow manholes and the waste water will be diverted to the proposed DWF pumping station located on the western side of EM bye-pass through a separate waste water collection system. During monsoon storm water will directly discharge to the Kolkata SWF channel. From the proposed pumping station, wastewater will be pumped to the Kolkata DWF channel. Land for the proposed pumping station is to be identified for acquisition immediately.

Both waste water and storm water generated from the southern part of ward 66 and whole of ward 67 discharges to D-D<sub>1</sub> channel and E-E<sub>1</sub> minor channel through box sewers along Picnic Garden road and Bose Pukur-Dharmatala road. Invert levels of both the box drains at outfall locations are now same as that of the bed of the channels. As a result during monsoon the box drains run in a surcharged condition and often results back flow from the channels thereby creating water logging of considerable area. Under the proposed system two pumping stations (PS3 & PS4) have been suggested at the outfall locations. These two proposed pumping stations will handle waste water and storm water. 10.2 cusec DWF will be discharged to the DWF channel near PS2 from PS3 & PS4 .

From the pumping station, storm water will be discharged directly either to the D-D1 channel or to the E-E1 minor channel and the collected waste water will be diverted to the DWF collection system proposed for Borough XII. 1 no storm water outfall point in both Lead channel E-E1 Minor and Lead channel D-D1 are proposed to discharge the storm water. Under this development project some of the existing underground pipes which are highly inadequate will be replaced / augmented to match with the design flow.

**Proposals for Improvement of Canals**

Improvement of canal system in the borough is essential for smooth drainage from various basins. Unless the canals and major drains within the borough are upgraded, the proposed sewerage and drainage system (combined and/or separate) will not function properly and the prevailing water-logging condition will remain.

- (a) Improvement of D-D1 channel and E-E1 Minor channel has already been considered under proposed canal works.

The proposed drainage and sewerage network will retain approximately 44.2 km of existing pipeline and would include laying of approximately 29.60 km length of proposed combined sewer line, laying of approximately 6.70 km length of proposed dry weather flow (DWF) sewer line pipe and replacement of about 23.85 km 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 VII**

Component	Total
Estimated approximate volume of soil to be excavated from new and replaced pipes and manholes (m <sup>3</sup> )	338,205
Estimated approximate volume of excess excavated soil to be disposed (m <sup>3</sup> )	136,645

Component	Total
Estimated approximate volume of silt to be removed and disposed from cleaning of existing pipes (m <sup>3</sup> )	21,300
Estimated approximate volume of precipitate to be removed from cleaning of existing drainage channels (m <sup>3</sup> )	8,900
Estimated approximate volume of road crust to be removed (m <sup>3</sup> )	30,000
Approximate Length of existing sewer line to be utilized (km)	44.2
Approximate Length of existing sewer line to be replaced (km)	23.85
Approximate Length of proposed combined sewer line (km)	29.60
Approximate Length of proposed Dry weather flow (DWF) sewer line (km)	6.70
Approximate Length of proposed pumping main (km)	0.90
Diameter of new pipes (mm)	225 - 2000
Depth of trench (m)	1.5 to 6.0
Road Width (m)	1.5 - 7

Sewer/drain lines will be constructed beneath the existing roads. Due to lack of sufficient road width a combined sewerage system has been proposed along most of the roads where lines will be laid along centre of the roads.

### 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 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 warm and humid during summer from March to May, sultry during monsoon or rainy season from June to September and comfortable during winter from October to February.

Climatological data of the Alipur observatory 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 are two ambient air quality monitoring stations within the project area. The air quality monitored by the WBPCB at Picnic Garden and Topsia, which is within the project area (Plate 1), can provide indication of the air quality of the project area.

The levels of various pollutants measured at these locations during the months from April, 2004 to March, 2005 are presented in Table 3.

**TABLE 3: AMBIENT AIR QUALITY STATISTICS OF PICNIC GARDEN AND TOPSIA STATION OF WBPCB IN KMC AREA BASED ON DAILY 24-HOURLY DATA FROM APRIL, 2004 TO MARCH, 2005.**

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
PICNIC GARDEN	Apr., 2004	204	6/9	89	2/9	4	0/9	35	0/9
	May, 2004	166	1/8	62	0/8	6	0/8	33	0/8
	Jun., 2004	135	0/9	58	0/9	5	0/9	43	0/9
	July, 2004	109	0/9	52	0/9	4	0/9	35	0/9
	Aug., 2004	99	0/9	44	0/9	3	0/9	25	0/9
	Sep., 2004	91	0/8	44	0/8	3	0/8	27	0/8
	Oct., 2004	123	0/9	56	0/9	5	0/9	40	0/9
	Nov., 2004	206	6/8	103	5/8	11	0/8	70	0/8
	Dec., 2004	356	9/9	221	9/9	19	0/9	94	9/9
	Jan. 2005	348	8/8	218	8/8	15	0/8	85	6/8
	Feb., 2005	329	7/7	181	7/7	16	0/7	81	3/7
	Mar., 2005	240	8/9	140	6/9	6	0/9	58	0/9

Station Name	Month with Year	SPM		RPM		SO <sub>2</sub>		NO <sub>x</sub>	
	Average : Apr., 2004 – Mar., 2005	201		106		8		52	
TOPSIA	Apr., 2004	242	8/9	102	4/9	10	0/9	54	0/9
	May, 2004	210	5/8	80	0/8	11	0/8	66	3/8
	Jun., 2004	157	0/9	70	0/9	7	0/9	54	0/9
	July, 2004	134	0/9	61	0/9	8	0/9	42	0/9
	Aug., 2004	121	0/10	56	0/10	6	0/10	31	0/10
	Sep., 2004	110	0/8	55	0/8	6	0/8	36	0/8
	Oct., 2004	139	0/9	66	0/9	9	0/9	50	0/9
	Nov., 2004	249	8/10	141	8/10	19	0/10	90	8/10
	Dec., 2004	375	9/9	245	9/9	29	9/9	112	8/9
	Jan. 2005	372	8/8	232	8/8	29	0/8	105	8/8
	Feb., 2005	362	6/6	211	6/6	18	0/6	95	6/6
	Mar., 2005	306	7/8	160	7/8	7	0/8	63	1/8
		Average : Apr., 2004 – Mar., 2005	231		123		13		67

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 monsoon (July-August) months. During the typical summer months (April – May) and winter months (December-January) levels of SPM and RPM are likely to exceed the standard. NO<sub>x</sub> concentration in these months are variable exceeding the standard in some of the days.

Ground Water: Kolkata city receives its supply of water from both surface (80 per cent) and sub surface (20 per cent) sources. In some areas of Kolkata the uncontrolled pumping of groundwater by heavy-duty pumps has lowered the level of the ground-water by 10 m in the last thirty-five years. Intrusion of brackish water in the southern part of the city has gained momentum due to over-pumping of water from the aquifers. A further threat arises from the industries generating toxic effluents. These effluents contaminate the ground water considerably. (CMDA Report. 1997).

A study conducted by Geological Survey of India reveals that Kolkata is underlain by quaternary sediments consisting of clay, silt, various grades of sand, gravel and a few beds of

pebble. Lithological logs show the presence of a clay bed at the top of the geological succession from Tribeni in the north to Bansdrani with a varying thickness from 10 m to 40 m.

There is another clay bed between depths of 254 and 614 m below ground level. Between these two clay beds there is a group of granular aquifers and intervening clay lenses. Between 60 – 180 m occur the main aquifers that tube wells tap. The Central Ground Water Board study indicates depletion of water table due to the unplanned over drawing of ground water.

The ground water quality from deep tube wells (Table 4) showed high concentrations of chlorides and the chemical composition is not satisfactory, but free of bacterial contamination. Hardness and the concentrations of Fe, Cl, SO<sub>4</sub> increase from north to south.

**TABLE 4 : QUALITY OF GROUND WATER FROM LARGE-DIAMETER TUBE WELLS**

Location	Depth of aquifer trapped	PH	Iron Fe (mg/L)	Chloride Cl (mg/L)	Sulphate SO <sub>4</sub> (mg/L)	Total hardness CaCO <sub>3</sub> (mg/L)
<b>North Calcutta</b>						
North Calcutta	114 - 138	7.6	0.1	180	-	588
<b>Central Calcutta</b>						
Convent lane	106 – 137	7.4	0.6	446.1	NIL	831
Roy Charan Pal lane	108 – 138	7.8	0.5	439.7	NIL	801
<b>East Calcutta</b>						
Pagla danga	103 – 134	–	0.5	321.6	NIL	581
<b>West Calcutta</b>						
Watgunge Street Sahebpuhur	–	–	1.1	931.0	NIL	763
<b>South Calcutta</b>						
Kankulia	109 – 139	7.4	0.6	802.7	NIL	593
Dhakuria	117 – 147	7.5	Trace	310.0	-	280
Bijoygarh	107 – 137	–	0.8	891.1	NIL	586
Naktala	107 – 137	7.8	1.3	1,258.7	31.6	1,009

Source: *Calcutta's Urban Future, Government of West Bengal, 1991*

Unplanned activities for abstraction of ground water from subsoil of Kolkata have changed the flow direction substantially in the last 40 years. It has been reversed from southward flowing in 1956 to northward flowing in 1996 (CMDA Report. 1997). Considering the above information the ground water should be properly utilised.

Surface Water: Significant part of Beliaghata canal, Town Head Cut Canal, Kolkata DWF Channel, Kolkata SWF Channel, D-D1 channel are major surface water channels in the project area.

The bed silt of D-D1 channel near Rashbehari Connector is somewhat alkaline (pH 7.42) with K (1128 ppm), As (0.69 ppm), Pb (1053.60 ppm), Cr (31.12 ppm), Zn (277.50 ppm) and Ni (11.91 ppm) (data from sample analysed).

The bed silt of Kolkata DWF channel near Ambedkar Bridge is somewhat alkaline (pH 7.02) with K (1520 ppm), As (Nil), Pb (606.90 ppm), Cr (983 ppm), Zn (334.10 ppm) and Ni (35.80 ppm) (data from sample analysed).

The bed silt of Town Head Cut Canal is somewhat acidic (pH 6.52) with K (2540 ppm), As (Nil), Pb (286 ppm), Cr (62.02 ppm), Zn (362.70 ppm) and Ni (70.10 ppm) (data from sample analysed).

Noise: Like any other major cities Kolkata is also very noisy. Vehicular traffic is the main source of noise pollution. Specially along and around the main traffic routes including EM bypass and Park Circus connector & Rashbehari Connector, it ranges from 65 to 70 dB(A) during day time and 55 to 64 dB (A) during night time.

### **3.2 Ecological Resources**

The study area is under the phyto geographical region of moist tropical deciduous vegetation with fresh water aquatic plants. With continuous expansion of human habitation and heavy population pressure, the nature of vegetation is changing fast. The herbaceous plants in some part of the study area are reduced,. But in the few undisturbed land along canal banks, road side and small orchards within the residential area offer better situation for appearance of different types of vegetation. There is no demarcated forest patch.

Fruit tree species commonly met within the residential area include Mango (*Mangifera indica*), Jam (*Syzygium cumini*), Guava (*Psidium guajava*), Jackfruit (*Artocarpus integrifolia*), Tamarind (*Tamarindus indica*), Banana (*Musa sapientum*), Kul (*Ziziphus mauritiana*) Pepe (*Carica papaya*), Bel (*Aegle marmelos*), Nona (*Anona reticulate*), Ata (*Anona squamosa*). Big non fruit trees generally found along road sides and canal banks include Arjun (*Terminalia arjuna*), Jhaun (*Casuarina equisetifolia*), Bot (*Ficus benghalensis*), Ashwatha (*Ficus religiosa*), Radhachura (*Delonix regia*), Nim (*Melia azedarach*), Akashmoni (*Acacia moniliformis*), etc. Palm species like Tal (*Borassus flabellifer*), Narikel (*Cocos nucifera*), etc, thorny plants like Babul

(Acacia Aabica) and bamboo species like baash (Bambusa arundinaceae), Shrubs like Tagar (Tabernaemontana coronaria), Jaba (Hibiscus rosa sinsis), Kanchan (Bauhinia acuminata), Kamini (Murraya exotica), Karabi (Nerium oleander), Gandha Raj (Gardenia jasminoides), etc are common. Many common herbs like Bon-tulsi (Croton bonplandianum), Tulasi (Ocimum sanctum), Hogla (Typha elephantine), Thankuni (Centella asiatica), Parthenium (Parthenium hysterophorus), Kachuripana (Eichhornia crassipes) are ubiquitous. Climbers and grass species are found at suitable locations. A few of the species like Nim, Tulasi, Thankuni, etc also qualify as medicinal plants. Tomato (Lycopersicon lycopersicum), Carrot (daucus carota), Cabbage (Brassica oleracea), Bhendi (Abelmoschus esculentus), Begun (Solanum melongena), etc are vegetables that are commonly grown in kitchen gardens and in open lands. Rice (Oryza sativa) is grown only in very few large open lands on the western side of EM Bypass following in the borough VII.

Common jungle cat, Common Fox, House rat, Mouse etc are the wild life that are presented. Among the reptiles Garden Lizard, snake, krait are common. The avifauna found in the area include House crow, House sparrow, pigeon, etc. Amphibian like Indian bull frog, annelids like earth worm and arthropods like Cockroach, butterflies, ants are common.

Non anchored free floating and submerged hydrophytes can be seen in the abundant open water bodies like pond. Anchored and floating and/or submerged and/or emergent hydrophytes co-exist with them. The open water bodies under favourable circumstances also have several fish species like rohu (Labeo rohita), Catla (Catla catla), Bata (Labeo bata), etc.

### **3.3 Economic Development**

**Land Use:** Predominant land use within the project area is residential and mixed residential and commercial. Apart from these built up areas, open land, water bodies and low lying areas and cultivate are other land use types. Open land in the study area is declining at a fast rate due to population influx and housing development. In the eastern part the land was originally part of waste dump yard of Dhapa.

**Industries:** A number of small scale industries are located within the study area.

**Water Supply:** The water supply in the borough is basically dependent on surface water from Palta Water Works, supplemented by ground water in scarcity pocket. Water demand of borough VII is about 95 MLD. The water is of acceptable quality and properly disinfected maintaining minimum chlorine balance at the receiving end.

**Sewerage and Drainage:** About 60% area of ward no 56 discharges into Palmer Bazar Pumping Station and the remaining 40% area discharges towards ward 58. Combined flow from this area reaches to Palmer Bazar PS through a 900 mm dia sewer along RNC road and through a box drain of size 1350 x 950 mm along Convent Road. From Palmer Bazar PS sewage is pumped out to the Kolkata DWF channel through two high level brick sewers of size

2.4m (8 feet) and 2.7m (9 feet) along Gobinda Khatick road and storm water to Town Head Cut Channel. Combined flow generated from the southern part of this ward discharges to ward 58 through two 900 mm dia sewers, one along Atul Sur road and the other along Christopher road. A part of this ward discharges to nikashi No. 10 flowing west to east and meets nikashi No. 11. The carrying capacity of nikashi No. 10 has been reduced considerably due to sedimentation and indiscriminate dumping of garbage. This creates considerable water logging within its catchment area.

More than 75% of the area has underground drainage system laid by KMW&SA and subsequently extended by KMC. Underground drainage system in the ward no 57, functioning as a combined sewer, was essentially constructed to provide relief for storm water flow. There are some areas within this ward, which faces water stagnation problem for a considerable period of time. This is mainly due to highly inadequate capacity of existing underground drainage system in this area as well as partial blockage of the system due to siltation. Beliaghata Canal and Town Head Cut Canal are the main receiving drainage courses in this area. Presently four pumping stations are working in this area namely Pagladanga, Chingrighata, Kulia Tangra and Palmer Bazar. In addition, recently KMDA has constructed a DWF pumping station on the southern bank of Beliaghata Canal under Ganga Action Plan (Phase-II) with the sole objective to divert untreated sewage falling into Beliaghata canal. For the interception of dry weather flow, KMDA has laid a 600 mm dia sewer along the canal bank road from the railway overbridge to PS. Pagladanga PS mainly receives both storm water and dry weather flow from part of ward 58 and discharges to Town Head Cut Canal. About 50% area of this ward is benefited by Chingrighata PS. However, Chingrighata PS receives both storm water and dry weather flow mainly from part of ward 58 and discharges to Town Head Cut Canal. Both storm water and dry weather flow generated from nearly 40% area of this ward discharges to Town Head Cut canal through Kulia Tangra PS. Palmer Bazar PS serves only about 20% area of this ward. It may be noted that dry weather flow directly discharges to Town Head Cut Canal through Pagladanga, Chingrighata and Kulia Tangra PS. There is no provision of diversion of dry weather flow as a result canal becomes polluted and silted up. There are some pockets in this ward directly discharging to either Beliaghata Canal or Town Head Cut Canal. In the eastern part of this ward there is no underground drainage system. Both sewage and storm water generated from this area is carried all along through surface drains till it is discharged to nearby canals.

About more than 90% of the area under ward no 58 has underground sewerage / drainage system laid by the KMW&SA and subsequently KMC extended the system. Gobinda Khatick road slopes towards north-east direction. Both sewage and storm water generated from this area discharges to Town Head Cut Canal either through Pagladanga PS or through Chingrighata PS. The existing underground drainage system in this area was developed in an unplanned manner and most of the pipelines have inadequate carrying capacity. The capacity of existing pipelines have further reduced due to siltation which create water stagnation in the area. Moreover, the condition of some of the existing pipes have been deteriorated due to inflow

of industrial waste into the pipes mainly from leather industries. There area number of nikashis on the western part of Gobinda Khatick road. The major ones are nikashi No. 9, 10 and 11. Both sewage and storm water flow generated from this area discharges directly to these nikashis. The carrying capacity of these nikashis have been reduced due to siltation and indiscriminate dumping of garbage. As a result vast portion of this area gets water looged for a considerable period of time even during low intensity of rainfall. nikashi No. 9 and 10 discharges to nikashi No. 11 which ultimately discharges to a PS located at Topsia Point A. Most of the underground pipelines are of inadequate capacity and have been laid at a very flatter slope. Due to siltation in the nikashis, outfall invert levels of all the underground pipes are now blocked. As a result most of the underground pipes are now in a surcharged condition there by creating water logging in considerable area.

The area under ward no 59 is fully covered by underground drainage system except some few internal roads. The main receiving water courses in this area are nikashi no. 7, 8 and 11. Apart from that there are few road side drains which collect both sewage and storm water from the surrounding areas and discharge to existing underground sewers. The carrying capacity of these nikashis have been reduced considerably due to siltation and indiscriminate dumping of solid waste. Moreover, the existing underground drainage network in this area has been developed in an unplanned manner and most of the pipelines are of inadequate size. The major pipelines have been laid at a very flatter slope. The capacity of existing pipelines has further reduced due to siltation thereby creating water logging in considerable area. Further more due to heavy siltation in all the nikashis in this area, the outfalls of all the underground pipes are now partially blocked thereby aggravating the inundation problem in this area. Both sewage and storm water generated from about 15% area of this ward located to the south west corner discharges to Town Head Cut Canal through a 600 mm dia along Topsia South road. The condition of this sewer is very poor and needs immediate improvement. Moreover, the manholes are not visible along this road. There is only one pumping station in this area located at Topsia Point 'A' which receives both sewage and storm water flows. From this PS dry weather flow is discharged to Kolkata DWF channel and storm water flow discharged to Kolkata SWF channel.

Northern part of the area under ward no 66 discharges to Kolkata SWF channel and southern part of this area discharges to box sewer of size 2400 x 1800 mm along Picnic Garden road. The area is almost covered by underground drainage system except a very few roads. The major underground sewers in this area are :

- Along G J Khan Road (2400 x 1800)
- Along Kustia Road (600 mm dia)
- Along Topsia Road (600 mm dia)
- Along Golam Jilani Khan Road (2400 x 1800mm box)
- Along Picnic Garden Road (2400 x 1800mm box)
- Along P G Road (600 mm dia)

From the northern part of this area both sewage and storm water discharges to Kolkata SWF channel thereby creating pollution in the channel. There are sluice gate arrangements at all the major outfall locations discharging to Kolkata SWF channel but are in bad shape needing immediate improvement. Due to siltation of channel, outfall invert levels of all the major underground drains are now same as that of the bed of SWF channel. As a result during monsoon the underground drains run in a surcharged condition and often results in back flow from the canals thereby creating water stagnation in considerable area. Southern part of this area which discharges to Picnic Garden box sewer (2400 x 1800mm) is the most affected area in respect of water logging. Both sewage and storm water generated from this area discharge to E-E<sub>1</sub> minor channel through box drain (2400 x 1800mm) along Picnic Garden road. Due to siltation of receiving channel (E-E<sub>1</sub> minor), outfall invert level of the box drain is now below the existing bed level of the channel. As a result during monsoon all the underground drains within the catchment area of Picnic Garden box sewer run in a surcharged condition there by creating water logging in considerable area specially in low lying pockets. A small portion of the area to the western side of this ward flows towards north through a 600mm dia sewer along Tiljala Road. The condition of this sewer is very poor and offer gets blocked mainly due to dumping of garbage and low level of maintenance.

Lead channel D-D<sub>1</sub> and E-E<sub>1</sub> minor channel are the two main receiving water courses in the ward no 67. Both sewage and storm water generated from this area discharges to these channel either through Picnic Garden box sewer (2400 x 1800 mm) or through Bose Pukur – Dharmatola road box sewer (2400 x 1800). Due to siltation in the channels, invert levels of both the box drains at the outfall location are now below the existing bed levels of the channels. As a result all the underground drains are in a surcharged condition. Moreover, the carrying capacity of all the underground drains have reduced drastically due to siltation and dumping of solid waste creating water stagnation in the catchment area for a considerable period of time during monsoon. There are certain areas where existing underground drainage system has been developed in an unplanned manner and has grossly inadequate capacity which further aggravates the water stagnation problem.

#### **Functional Status of Existing System**

There are few sewer pipe network and covered drains facility which are available in all wards of the borough and are functioning properly as combined system.

Surface drains are carrying storm water and septic tank effluent of the entire borough and dispose to main drainage channels. Some areas in the ward 56 are prone to water stagnation for a considerable period even during low intensity of rainfall. This is mainly due to improper and inadequate development of existing drainage system in the area as well as partial blockage of the system due to siltation. The following areas within this ward experience greater water stagnation problems:

- Bibi Bagan area
- Mati Jhil area

- Pottery Road area (near railway crossing)
- Kamardanga Road area
- Hazra Bagan area

There are some areas within the ward 57, which faces water stagnation problem for a considerable period of time. This is mainly due to highly inadequate capacity of existing underground drainage system in this area as well as partial blockage of the system due to siltation. The most problematic areas in respect of water stagnation are :

- Pagladanga Road area
- Area near Kulia Tangra PS
- Rani Rashmoni Garden area

Most of the underground pipelines of the ward no 58 are of inadequate capacity and have been laid at a very flatter slope. Due to siltation in the nikashis, outfall invert levels of all the underground pipes are now blocked. As a result most of the underground pipes are now in a surcharged condition there by creating water logging for a considerable area. The major problematic areas within this ward are :

- KMDA Colony area in the eastern boundary
- Matheswartala road area
- Area between Atal Sur Road and Gobinda Khatick Road.

The main prone to water logging areas in the ward 59 are :

- Dwarapara Basti area
- West side of Gobinda Khatick Road area
- Area surrounding Mohendra Roy Lane
- Gobra Gorosthan area

The condition of the sewer in the ward no 66 is very poor and offer gets blocked mainly due to dumping of garbage and low level of maintenance. The major water logging areas in this ward are:

- Area surrounding Tiljala Road
- Maszid Bari area
- Kustia area
- Picnic Garden 1<sup>st</sup> Lane
- Picnic Garden 2<sup>nd</sup> Lane

There are several pockets within the ward 67, which are prone to water logging during monsoon due to blockage and inadequate capacity of underground drains. The most affected areas are :

- Maszid Bari lane area
- Bedia Danga area
- Swinhoe Lane area
- A few pockets along Rashbehari Connector

The major drainage channels are not in good condition, and choked with solid waste and weeds. There are sluice gates at the outfall location of few drainage channels but operation and maintenance of the same and condition of gates call for routine maintenance.

**Environmental Issue of Sewage Disposal:**

The dry weather flow from the core area of the Kolkata Municipal Corporation is discharged in the DWF channel through various drains. Also at points wastewater is being discharged to storm water canals. The project envisages to separate dry weather flow and taking the same to DWF channel thus improving the health of the canals. Wastewater from the project area is proposed to be discharged to DWF channel, which now receives about 11490 lps of wastewater flow from the core area of KMC. The DWF channel having a capacity of 14170 lps will have no problem in accommodating the additional flow from the project area (about 750 lps in 2021 AD). This will virtually have neither adverse impact nor change the present scenario by any appreciable amount. In its journey from Topsis Point A through the East Kolkata Wetland (EKW) flowing from west to east, DWF water is drawn by the Fisheries in the EKW at several points intermittently for sewage-fed pisciculture. The sewage water thus tapped is fed into the shallow fisheries and passes through several ponds before it is finally returned to the combined SWF/DWF channel near the outfall at Gusighata. The series of ponds simultaneously act as waste stabilization pond to render natural degradation of wastewater. Kolkata East Wastewater fed fisheries having about 3000 ha of fish ponds are the largest example of wastewater based aquaculture in the world which uses approximately 550000 m<sup>3</sup>/day (6365 lps) of untreated wastewater from DWF channel by the local fishermen. This is a very old practice and this practice is found to be safe from the point of view of public health. (Ref: The publication of the Ministry of Environment and Forests and the National River Conservation directorate on 'Design Manual for Waste Stabilization Ponds in India' by Duncan Mara). It is believed that the flow reaching Kulti river after a long travel and passing through a natural treatment process will have the pollution load within the permissible limit for discharge in inland surface water body.

Transportation: The main mode of transportation within the project area is by road. There is about 184 km of roads network within the project area. As per the site visit information and available map approximate road widths vary between 1.5 to 7.0 m. Due to the narrowness of the roads and multi modal nature of traffic frequent traffic congestion occur in densely populated areas

Electrical 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 were noted from field visits information. Small number of these features considered to be affected by project activities during the construction phases will be protected by adequate environmental management measures.

### 4.0 POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

#### A. Sewerage & Drainage Network :

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 5 and the impacts are discussed in the following sections.

**Table 5– ENVIRONMENTAL CHECKLIST OF S & D PROJECT OF BOROUGH VII**

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 (D3)	Major (D4)	
Problems related to siting for facilities							
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	Social inequities	Adequate resettlement	<input type="checkbox"/>				None expected, minor

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 Mod Major (D2) (D3) (D4)			
provision		planning and budgeting					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
Problems Relating to Design Phase							
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"/>			
Problems During Construction Stage							
Silt runoff from construction operation or exposed surface	Soil erosion plus damage to water quality and aesthetics	Do		<input type="checkbox"/>			
Local flooding from	Hazard and	Do					

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 (D3)	Major (D4)	
dewatering of excavation sites, flushing of pipes and hydraulic testing	nuisance to workers and public			<input type="checkbox"/>			
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

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 (D3)	Major (D4)	
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 road flanks there are unlikely to have 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 1,96,845 m<sup>3</sup> of excavated materials including road crust, precipitate removed from cleaning of open channels, excavated soil and silt removed from desilting of existing pipes. Disposal of excavated soil, roads crust, and precipitate from drainage channels will not pose a problem, however, disposal of silt may require adequate protection.

Since most of the roads in the project area are narrow there will be some traffic congestion during the construction phase. In the 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.

It will not be feasible to provide drainage and sewerage coverage in all the wards of Borough VII 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 minimising 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 surface shall be restored in 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 a combined sewerage and drainage system has been proposed instead of a separate storm water drainage system due to space restriction 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 minimise 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 SWF channels as a result of interception of DWF from the service area into these canals.
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.

#### **B. Pumping Station :**

##### **Environmental Issues**

The environmental issues that are relevant to the project are as follows:

- (i) Augmentation/renovation of existing pumping stations in Pagladanga, Chingrighata, Kulia Tangra and Topsia Point - A.
- (ii) Construction of three new pumping stations.
- (iii) Disposal of silt, soil and debris due to the construction of inlet and outlet channels and other civil works of the pump houses

(iv) Safety, security and occupational hazards during construction and operation phases.

### **Impact Assessment**

#### **Construction phase impacts**

Construction activities will inflict short-term minor adverse impacts on soil, surface water, air, noise, ecology of the area and quality of life values of nearby habitants and work force.

#### **Operation phase impacts**

1. The proposed pumps have been designed to transmit DWF to DWF channel as per existing practice and will significantly reduce the incidence of inundation of project area. This is a positive impact.

### **Mitigation Measures**

#### **Construction phase**

1. Construction phase activities related to earth work are to be scheduled in the dry season, so that chances of flooding, inundation, water logging, and surface erosion become minimum.
2. Exposed construction sites to be adequately covered to reduce erosion, surface runoff and air pollution.
3. Construction spoils are to be suitably disposed of.
4. Most of the construction activities are to be carried out during the normal working hour and the local residents to be informed of any unavoidable noise pollution.
5. All necessary precautionary measures are to be taken to prevent accidents and/or damage to property or life.
6. Efforts are to be made to fulfill occupational, health and safety requirements

#### **Operation phase**

1. Pump house has to be adequately operated and maintained with proper desiltation of silt
2. Sewerage and Drainage project of KEIP will separate the DWF from SWF; therefore pollution load to Beliaghata canal, Town Head Cut Canal, SWF channel, DWF channel, D-D1 channel, E-E1 minor channel will be reduced in the long run.

## **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 6

**Table 6 : SUMMARY OF ENVIRONMENTAL MONITORING PROGRAMME  
OF S & D PROJECT OF BOROUGH VII**

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>Surface and Ground Water Quality</b>			
Surface runoff management	Monitor measures to chennelise 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	Quaterly	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>			

Monitoring Category	Type of Monitoring	Minimal Frequency	Monitoring Agency
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/ Contractor
	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 related road accidents are being properly investigated and reported	Monthly	Contractor/ DSC/KMC
<b>Community Life and Economic Activities</b>			
Access to public and private	Monitoring impact of project on	Daily	Contractor/

Monitoring Category	Type of Monitoring	Minimal Frequency	Monitoring Agency
properties	dwelling and business in the project area		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>			

Monitoring Category	Type of Monitoring	Minimal Frequency	Monitoring Agency
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 Member Mayor in Council (MMIC) Drainage, 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 planned 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. Some of the public consultation undertaken is provided in Table 7

**Table 7 : PUBLIC CONSULTATIONS UNDERTAKEN IN S & D PROJECT OF BOROUGH VII**

Date	Meeting/Activity	Participant	Purpose
5.10.05	Consultation Meeting	Borough Chairman, Councilors of all wards, Borough Engineers, KMC Engineers and DSC representatives.	Project overview and identify the problems
10.12.05	Presentation on Concept Plan	Borough Chairman, Councilors of all wards, Borough Engineers, KMC Engineers and DSC representatives.	Project Planning and basic concept
7.01.06	Presentation on	Borough Chairman,	Project overview and

Date	Meeting/Activity	Participant	Purpose
	proposed system	Councilors of all wards, Borough Engineers, KMC Engineers and DSC representatives.	discussion on priority works
September, 05 to April, 06	No of field visit	Borough Engineers, KMC officials, DSC representatives and local residents.	Identify problems and suggestion for improvement.

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 will 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 all septic tanks upon completion of the project.

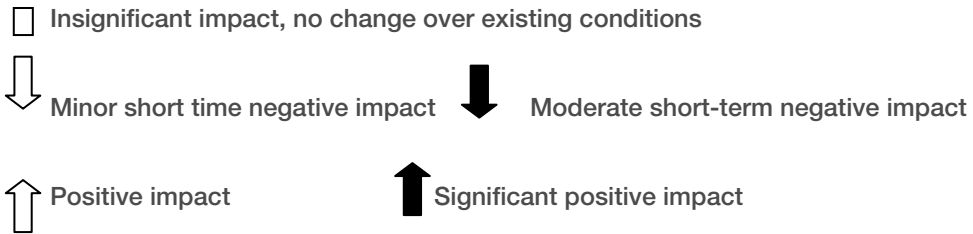
## 7.0 FINDINGS AND CONCLUSIONS

A matrix of environmental impacts, as shown below in Table 8, was developed from examination of potential environmental impacts and mitigation measures discussed in Section 4.0.

**Table 8 : MATRIX OF ENVIRONMENTAL IMPACTS S & D PROJECT OF BOROUGH VII**

	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
Construction Phase	□	↓	↓	↓	↓	↓	□	□	↓	↓	↓	□	↓	□	□	↓	□	↓	↓	

Operations or Post Project				↑	↑				↑	↑	↑	↑	↑	↑		↑	↑		↑	↑	
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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.