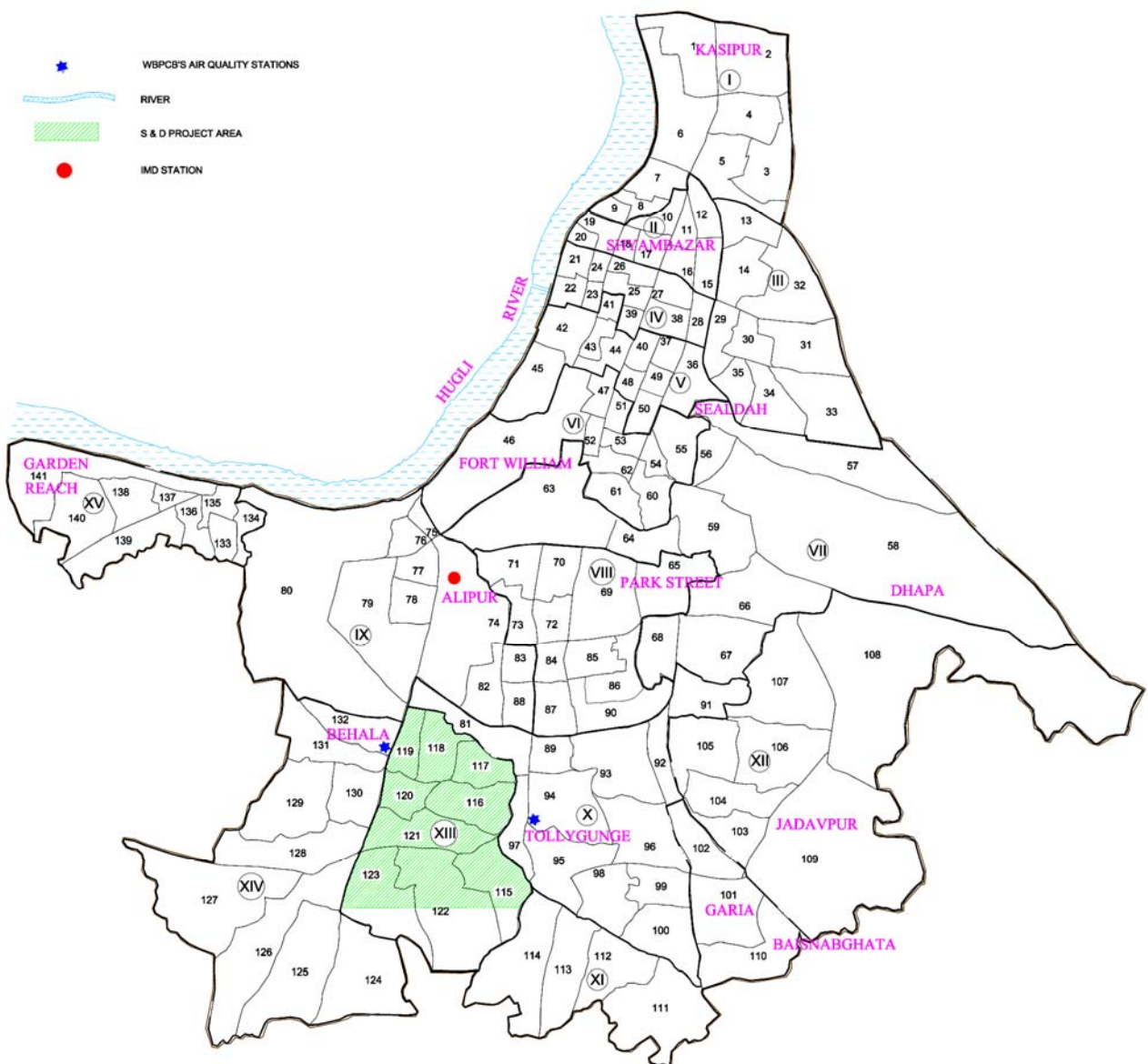


INITIAL ENVIRONMENTAL EXAMINATION REPORT ON SEWERAGE AND DRAINAGE PROJECT OF BOROUGH XIV (PACKAGE – 2)



CONTENTS

- 1.0 INTRODUCTION**
- 2.0 DESCRIPTION OF THE PROJECT**
- 3.0 DESCRIPTION OF THE ENVIRONMENT**
- 4.0 POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES**
- 5.0 MONITORING PLAN**
- 6.0 PUBLIC CONSULTATION**
- 7.0 FINDINGS AND CONCLUSIONS**

LIST OF TABLES

- 1.0 Coverage of S & D project of Borough XIV**
- 2.0 Details of the Proposed S & D Scheme of Borough XIV**
- 3.0 Ambient Air Quality Statistics of two Stations of WBPCB in KMC area based on daily 24-hourly data from April, 2003 to March, 2004.**
- 4.0 Environmental and other Significant Features of S & D project of Borough XIV.**
- 5.0 Environmental Checklist of S & D project of Borough XI**
- 6.0 Summary of Environmental Monitoring Programme of S & D project of Borough XIV.**
- 7.0 Public Consultations Undertaken of S & D project of Borough XIV.**
- 8.0 Matrix of Environmental Impacts of S & D project of Borough XIV.**

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 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 Wards 128-132 of Borough XIV.

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 sub project 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 sub project 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 and reports, design data and field reconnaissance visits.

2.0 DESCRIPTION OF THE PROJECT

2.1 Need for Project

The proposed project has been planned to provide comprehensive sewerage and drainage coverage in Borough XIV of KMC. The sewerage and drainage facilities available in the area is inadequate. Most of the areas do not have any sewerage or drainage network. The existing sewer lines in rest of the area is not functioning properly due to inadequacies in maintenance and other factors. Inadequate drainage also leads to frequent flooding in several pockets of the area.

2.2 Location

The project area is located at the south-western boundary of KMC (Plate I). It primarily covers the Behala area. The project area is bounded on the north by CPT canal, by Diamond Harbour Road in the east, by KMC ward boundary in the west, and Biren Roy Road (west) in the south. A vicinity map of the project is shown in Plate II while Ward-wise relevant existing land form elements and infra-structural activities present in the project area are depicted in Plates III-VII.

In order to design the drainage and sewerage network system a basin wise approach was used. Accordingly, the project area was divided in to four zones in between 128-132, utilizing 6.97 km of existing Ganga Action Plan (GAP) sewer. Zone 1 covers most part of ward 128. Zone 2 covers eastern part of wards 130, 131 and 132. GAP sewer runs from northern fringe of ward 128 to ward 132 along the boundary of ward 129, 130 and 131. Zone 3 includes part of GAP sewer, nearly entire part of ward 132 and some part of ward 131. Zone 4 covers ward 129, large part of ward 131, western part of ward 130, northern fringe of ward 128 and south western fringe of ward 132. This zone includes significant portion of GAP sewer. The proposed drainage system is supposed to ultimately drain at Monikhali canal after treatment at STP. Three existing pumping stations (at Jinjira Bazar, Sakuntala Park, and Islamia Ground), three proposed pumping stations, and couple of drainage lifting stations will be utilised for total utilization of the capacity and smooth functioning of the system.

2.3 Coverage

According to the Census Data of 2001, the total population of Borough XIV is 2,94,349 of which the population of four wards is 1,56,426. The proposed drainage and sewerage scheme will cover a command area of approximately 719 hectares and is estimated to serve a current (2001) population of approximately 1,56,426 people directly or indirectly. However, it is designed to serve ultimately the projected population of 2035 i.e. approximately 2,42,814 people. Details of coverage of the proposed scheme is shown in Table 1.

Table 1 Coverage of S & D project in Borough XIV

	Ward 128	Ward 129	Ward 130	Ward 131	Ward 132	Total
Projected Current (2001) Population to be Served.	31,833	38,977	26,680	30,108	28,828	1,56,426
Projected Future (2035) Population to be served.	49,413	60,503	41,414	46,735	44,749	2,42,814

2.4 Project Schedule

A pilot plant study of sewerage drainage scheme for Borough XI will commence in June, 2004. The preliminary construction work of the project is expected to commence within March, 2005.

2.5 Proposed Drainage and Sewerage Network

The proposed drainage and sewerage network will retain about 3.69 km of existing pipeline and would include laying of approximately 39.13 km of new pipe and replacement of certain sections of existing pipes for a total length of about 2.32 km. 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 XIV

Component	Zone 1	Zone 2	Zone 3	Zone 4	Total
Individual areas of zones (sq.km)	1.51	0.47	1.00	4.21	7.19
Estimated approximate volume of soil to be excavated from new and replaced pipes and manholes	60,000	19,908	23,035	2,47,717	3,50,660

Component	Zone 1	Zone 2	Zone 3	Zone 4	Total
(m ³)					
Estimated approximate volume of excess excavated soil to be disposed (m ³)	25,623	8,222	13,005	76,488	1,23,338
Estimated approximate volume of silt to be removed and disposed from cleaning of existing pipes (m ³)	57	--	601	1,212	1,870
Estimated approximate volume of precipitate to be removed from cleaning of existing drainage channels (m ³)	226	--	2,410	4,864	7,500
Estimated approximate volume of road crust to be removed (m ³)	8,847	2,912	6,320	27,867	45,946
Length of existing drainage and sewerage line to be used (km)	0.16	--	2.22	3.63	6.01
Length of existing drainage and sewerage line to be replaced (km)	0.83	--	--	1.49	2.32
Length of proposed new lines (Km)	7.20	2.40	5.45	24.08	39.13
Diameter of new pipes (mm)	250-2000				
Average Depth of trench (m)	1.1- 6.5				
Road Width (m)	1.8-7.0				

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 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 and unconfined aquifers occur which are 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 soil.

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 I) 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: The air quality monitored by the WBPCB at Behala Chowrasta (situated within the project area) and Hyde Road (situated adjacent to the project area) (Plate I) can provide some indication of the air quality within the project area.

The levels of various pollutant levels measured at these two locations during the months 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 ₂		NO _x	
		A	B	A	B	A	B	A	B
1. Behala Chowrasta	Apr., 2003	198	4/8	73	0/8	3	0/8	45	0/8
	May, 2003	185	3/8	73	0/8	2	0/8	40	0/8
	Jun., 2003	154	0/10	51	0/10	2	0/10	40	0/10
	July, 2003	119	0/8	37	0/8	2	0/8	33	0/8
	Aug., 2003	120	0/9	50	0/9	3	0/9	39	0/9
	Sep., 2003	126	0/9	53	0/9	3	0/9	49	0/9
	2003								

Station Name	Month with Year	SPM		RPM		SO ₂		NO _x	
	Oct., 2003	137	0/9	57	0/9	6	0/9	55	0/9
	Nov., 2003	250	7/9	131	8/9	11	0/9	65	1/9
	Dec., 2003	378	9/9	226	9/9	14	0/9	90	7/9
	Jan., 2004	371	9/9	224	9/9	17	0/9	91	6/9
	Feb., 2004	352	7/7	214	7/7	15	0/7	73	1/7
	Mar., 2004	309	8/8	165	8/8	9	0/8	60	1/8
	Apr., 2003 -Mar., 2004	225	47/103	113	41/103	7	0/103	57	16/103
2. Hyde Road	Apr., 2003	160	0/6	53	0/6	3	0/6	37	0/6
	May, 2003	155	0/8	53	0/8	2	0/8	33	0/8
	Jun., 2003	140	0/8	44	0/8	3	0/8	39	0/8
	July, 2003	128	0/9	39	0/9	2	0/9	36	0/9
	Aug., 2003	104	0/9	42	0/9	3	0/9	31	0/9
	Sep., 2003	109	0/7	42	0/7	2	0/7	35	0/7
	Oct., 2003	122	0/9	52	0/9	3	0/9	38	0/9
	Nov., 2003	201	4/8	108	5/8	7	0/8	69	1/8
	Dec., 2003	317	9/9	175	9/9	8	0/9	70	3/9
	Jan. 2004	297	8/8	168	8/8	11	0/8	59	0/8
	Feb., 2004	275	9/9	159	9/9	14	0/9	66	0/9
	Mar., 2004	252	9/9	118	6/9	9	0/9	41	0/9
	Apr., 2003 -Mar., 2004	188	39/99	88	37/99	6	0/99	46	4/99

Source : www.wbpcb.gov.in

Based on the above it appears that the pollutant level of SPM, RPM, SO₂ and NO_x in the project area are likely to remain below the (residential area) ambient air quality standard on most days during the typical summer (April-May) and monsoon (July-August) months while during the typical winter months (December-January) levels of SPM and RPM are likely to exceed the standard. NO_x levels are somewhat variable in these months whereas SO₂ concentrations are expected to lie much below the standard during winter months. Comparatively Behala area seems to be more polluted than the Hyde Road area.

Ground Water: Ground water occurs both under confined and unconfined conditions. Due to lowering of piezometric surface in central Kolkata, the ground water flow is towards NE in the project (Central Ground Water Board, 1993). In pre-monsoon of 1998, the piezometric surface was at about 8 m below msl.

Potential freshwater aquifer occurs in depth range of 180 – 300 m in the south western part of the KMC area. In the western part of KMC – Garden Reach and Barisha sectors aquifers occur down to 130 m are brackish and those below 160 m are fresh water bearing.

Ground water is of good quality in the southwestern part from Eden Gardens through Harish Park to Kalighat (Central Ground Water Board, 1999). Within the vicinity of the project area (Watgunge Street- Sahebpuhur), the ground water analysed from deep tube wells showed high concentration of iron and chloride. Iron content was 1.1 mg/l while chloride content was 931.0 mg/l. The total hardness was reported 763 mg/l as CaCO₃ (Central Pollution Control Board, 1998). Ground water from a tubewell at Biren Roy Road had the following characteristics (CGWB, 1999): TDS-570, Cl-115, Fe -0.1 and TH (as CaCO₃)-282 (all values in mg/l). The ground water in the project area is of Ca-Mg-HCO₃ facies type.

Surface Water: CPT canal, Begore canal, Parnashree and Jinjira canal are the major source of surface water in the project area. These canals lead to Monikhali canal and ultimately lead to river Hooghly. Acute drainage congestion, unplanned growth-congestion have reduced the cross-section of the canals. Heavy siltation and continued disposal of industrial and municipal waste has rendered the water quality of this canal unfit for any use.

Noise: Like 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), which is significantly higher than the permissible daytime levels of 65 and 55dB(A) for commercial and residential area respectively. Vehicular traffic is the main source of noise pollution.

3.2 Ecological Resources

Since the project area is highly urbanized presence of wild life or endangered species is very unlikely. In addition, within the project area there are no forests, protected areas, coastal resources or fisheries.

Few low lying pockets are present within the project area. These pockets could be categorized as low grassy field based on the site visit during post monsoon period. These areas remain dry during most part of the year.

3.3 Economic Development

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

Industries: Polar Industry and Small scale industries around Diamond Harbour Road and Biren Roy Road are some of the industries located within the project area.

Water Supply: The present water demand of the project area is about 28 MLD. The surface water from Garden Reach Water Treatment Plant is now supplied to this wards through an under ground reservoir cum boosting station situated at Behala Chowrasta having a capacity of 4.2 M.Gallon. This water is pumped from the under ground reservoir to project area through well laid distribution system. Number of hand pumps existing around the lanes or by-lanes of the project area also help in meeting the water demand of the area. However, there are few scarcity pockets, which are supplemented by ground water through deep tube wells discharging about 1,500 –1,800 Gallons/hour.

Sewerage and Drainage: For sewerage and drainage a marginal 6.01 km network of combined GAP sewer exists in the project area. Existing sewer lines present in most part of the area are connected to Septic tank with its effluents connected to surface drains. Proposed combined main sewerage & drainage line is supposed to intercept sewage from the houses adjacent to main sewer line and would help in partially removing the septic tank system. The proposed work is likely to intercept the SWF of the project area directly or indirectly. The combined sewer will be ultimately pumped to the Garden Reach STP through Jhinhira Bazar PS. The treated effluent will lead to Monikhali canal.

Transportation :The main mode of transportation within the project area is by road. There is about 70 km of road network within the project area. As per the site visit information and available map approximately 40% of the roads are narrow within 2.0-5.0 m wide. Due to the narrowness of the roads and multi modal nature of traffic frequent traffic congestion occur in densely populated areas. Roads with high volume of traffic are: Diamond Harbour Road, and Biren Roy Road (West). Buses ply on the Diamond Harbour Road, Banamali Naskar Road, Brahma Samaj Road, Rabindrapally Road and Biren Roy Road (West); while in rest of the roads auto rickshaws, cars, scooters, light duty vehicles and rickshaws make bulk of the traffic.

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 were noted from field visits and secondary data. Table 4 lists these features.

Table 4 Environmental and other Significant Features of S & D Project of Borough XIV

Environmental and other Features	Ward 128	Ward 129	Ward 130	Ward 131	Ward 132	Total
1. Water Bodies,	15 (8)	10(5)	5(5)	8(5)	6(3)	44
2. Water-logged Pockets		1	2	5		8
3. Playgrounds, Open Spaces & Parks	7(4)	8(1)	3	5(1)	9(7)	32
4. Temples, Mosques etc.	9(1)	6(1)	4(1)	3(3)	4(5)	26
5. Major Markets	1	2	(2)	(1)		3
6. Schools & Institutes	4	4(1)	4(4)	7(4)	6	25
7. Library	1			(1)	1(1)	2
8. Hospitals & Health Centres	1		2(1)	2	1(2)	6
9. Factories	1(1)	1	1	2(2)	2(2)	7
10. Post Office	(1)		2	1(1)		3
11. Banks		(1)	2(1)			2
12. Gas Godown						
13. KMC Office			(2)	(1)		
14. Community Hall, Cinema			2(1)		2	4
15. Telephone Exchange	1	1	(1)		1	3
16. Fire Station						
17. Police Station				1		1
18. Petrol Pump				1		1
19. Bus Terminus					1	1
20. Slum	2	1	1		4	8

Notes:

1. Numbers represent environmental and other special features present in the project area, which could be affected by project construction.
2. Numbers in the parenthesis represent environmental and other special features present in the project area, which will not likely to be affected by project construction.

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 5 and the impacts are discussed in the following sections.

Table 5 – Environmental Checklist of S & D Project of Borough XIV

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) Major (D3) (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 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
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	Damage to pipes, down stream contamination	Do		<input type="checkbox"/>			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)	
discharge to sewers							
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 dewatering of excavation sites, flushing of pipes and hydraulic testing	Hazard and nuisance to workers and public	Do		<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
Problems During Operation Stage							
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	Serious/health/safety hazards	Proper design construction and		<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)	
sewers and hazardous materials in sewage during maintenance work		O&M, including handling of emergencies plus operations stage monitoring					
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 55,316 m³ of excavated materials including road crust, 7,500 m³ of precipitate removed from cleaning of open channels and 1,870 m³ of 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 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 about 40 % of road, which are narrow 2-5 m in width, 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 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. Ground disturbances will be phased so that it is limited to workable size.
2. Exposed surface will be resurfaced and stabilised as soon as possible.
3. Trenches will have adequate backfill to prevent subsequent street settlement. Upon completion of backfill the surface shall be restored fully to the level that existed prior to the construction of the sewer.

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 done in a manner so that it does not lead to water logging of the nearby area.

Road safety and traffic management during construction

DSC will coordinate preparation of 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 workforce

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 campsites and construction work-sites

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.
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 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. Likely improvement of water quality of existing canals as a result of interception of DWF from the service area into this 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.

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 XIV

Monitoring Category	Type of Monitoring	Minimal Frequency	Monitoring Agency
CONSTRUCTION PHASE			
Soils			
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
Surface and Ground Water Quality			
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
Air/Noise Pollution			
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
Solid Waste			
Disposal of excavated soil and	Monitor to ensure excavated soil	Daily	Contractor/

Monitoring Category	Type of Monitoring	Minimal Frequency	Monitoring Agency
silt	and silt are being disposed in approved sites		DSC
Flooding/Water logging			
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
Health and safety of construction workforce			
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
Road Safety and Traffic Management			
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 related road accidents are being properly investigated and reported	Monthly	Contractor/ DSC/KMC
Community Life and Economic Activities			
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

Monitoring Category	Type of Monitoring	Minimal Frequency	Monitoring Agency
Public Awareness			
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
OPERATION PHASE			
Operation and Maintenance of the System			
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
Discharge of Industrial Effluents			
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 Councilors 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 Councilors, 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. Details of public consultation undertaken is provided in Table

7

Table 7 Public Consultations Undertaken in S & D Project of Borough XIV

Date	Meeting/Activity	Participant	Purpose
23-10-2002	Distribution of KEIP Leaflets	NGO Consultant	200 copies of KEIP leaflets were given to all Ward Councillors for distribution to public
21-11-2002	Consultation Meeting and Field Visit	Borough Chairman, Councillor of Ward 130, Borough engineers, NGO DSC representatives	Identify problems with the existing drainage and sewerage system. To specify any outstanding issues like relevant slum improvement.
22-11-2002	Consultation Meeting and Field Visit	Borough Chairman, Councillor of Ward 129, Borough engineers, NGO DSC representatives	Identify low lying pockets and other basic need like undertaking canal rehabilitation to achieve greater benefits out of sewerage and drainage project.
25-11-2002	Consultation Meeting and Field Visit	Borough Chairman, Councillor of Ward 131, Borough engineers, NGO DSC representatives	Identify problems with the existing drainage and sewerage system.
26-11-2002	Consultation Meeting and Field Visit	Borough Chairman, Councillor of Ward 132, Borough engineers, NGO DSC representatives	Identify problems with the existing drainage and sewerage system. To specify any outstanding issues like relevant slum improvement or displacement of Khatal.
4-12-2002	Consultation Meeting and Field Visit	Borough Chairman, Councillor of Ward 128, Borough engineers, NGO DSC representatives	Identify areas prone to water logging and to find community needs
9-12-2002	Consultation Meeting	MMIC Drainage, Borough Chairman, Councillors, KMC officials and DSC representatives	To review the proposed sewerage and drainage scheme.

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 by NGO/PRC Consultants 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 respective 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 of S & D Project of Borough XIV

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

- 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.