



KOLKATA ENVIRONMENTAL IMPROVEMENT PROJECT

PROJECT MANAGEMENT UNIT

**PROGRESS REPORT ON EMP IMPLEMENTATION OF
KOLKATA ENVIRONMENTAL IMPROVEMENT PROJECT
FOR THE PERIOD JULY TO DECEMBER, 2008**

(Loan Nos. 1813-IND & 2293-IND)

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KOLKATA MUNICIPAL CORPORATION

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List of Abbreviations

Asian Development Bank	ADB
Department for International Development	DFID
Design and Supervision Consultants	DSC
Dry Weather Flow	DWF
East Kolkata Wetlands	EKW
EKW Management Authority	EKWMA
Environmental Impact Assessment	EIA
Environmental Management Cell	EMP
Executing Agency	EA
Government of West Bengal	GoWB
Initial Environmental Examination	IEE
Irrigation and Waterways Department	I & W D
Kolkata Environmental Improvement Project	KEIP
Kolkata Municipal Corporation	KMC
Million litres per day	MLD
Occupational Health and Safety Plans	OHSP
Project Affected Persons	PAP
Project Director	PD
Project Management Consultant	PMC
Project Management Unit	PMU
Project Preparatory Technical Assistance	PPTA
Project Specific Study	PSS
Pumping Station	PS
Report and Recommendation of the President, Asian Development Bank	RRP
Sewerage and Drainage	S & D
Sewage Treatment Plant	STP
Solid Waste Management	SWM
Storm Weather Flow	SWF
Team Leader	TL
Tollygunj Panchannagram canal	T P canal

PROGRESS REPORT ON EMP IMPLEMENTATION OF KEIP FOR THE PERIOD JULY TO DECEMBER, 2008

I. INTRODUCTION

1. Kolkata Municipal Corporation (KMC) is the Executing Agency (EA) for implementing the Kolkata Environmental Improvement Project (KEIP or the Project) with financial assistance from Asian Development Bank (ADB) since 2002. The Project consists of the following six parts or components (RRP, 2000):

Part A: Stakeholder Consultation Process

Part B: Sewerage and Drainage Improvement

Part C: Solid Waste Management

Part D: Slum Improvements

Part E: Canal Improvements

Part F: Implementation Assistance and Capacity Building

2. The Project Preparatory Technical Assistance (PPTA) had prepared an Initial Environmental Examination (IEE) report in 2000 designating the Project as Category B. During detailed design and implementation of the Project over last 5 years, the physical scope and design of the Project have been modified, and approved by the ADB. These include construction of new sewerage and drainage (S & D) network in borough VII and discharge of untreated sewage from S & D works under the Project in boroughs VII, XI and XII into the existing Dry Weather Flow (DWF) channel for eventual natural treatment in the fisheries of the East Kolkata Wetlands (EKW), an ecologically sensitive area listed as a Ramsar site. Accordingly, the original IEE of 2000 has been revised and updated to screen and assess potential environmental impacts and appropriate mitigation measures have been proposed. The overall IEE shows that the Project will have a positive impact on the environment of the project area particularly on terrestrial habitats, through improved sewage and drainage facilities, reducing flood damage due to water logging during monsoon, improving the local environment and enhancing institutional capacity for providing improved civic services in the targeted areas of Kolkata and especially in the selected slum areas. The potential adverse impacts on the environment are perceived to be localized, short-term, non-significant, and can generally be mitigated. The mitigation measures have been adequately spelt out in the revised IEE and component-wise IEEs. The summary IEE developed for the Project was publicly disclosed on ADB website in August 2006.

3. Since a part of the Project extends into the environmentally sensitive EKW area, the revised KEIP has now been categorized as B sensitive. As such an environmental management plan (EMP), as per requirements of Environment Policy of ADB, 2002, ADB's

Environmental Guideline, 2003 and ADB's Environmental Operation Manual, 2006, has been developed. Meanwhile a Project Specific Study (PSS) by Dr Tim Wrigley and Dr Asis Mazumdar of School of Water Resources Engineering, Jadavpur University has been carried out as part of TA 4814-IND (component TA for capacity building for the protection of EKW). Findings of the PSS specifically indicate that no additional STP is required to be constructed due to the additional sewage to be generated by KEIP that is proposed to be conveyed and naturally treated in the EKW.

4. The present EMP implementation report relates to the progress of implementation of the provisions of EMP of KEIP during the last six months (July-December) of 2008 in respect of various work components of Part B, Part C, Part D and Part E in which civil constructions are involved. However, construction activities related to involuntary resettlement, their impacts and monitoring of mitigation measures including socio-economic benefits to the project affected persons (PAPs) in accordance with agreed revised Resettlement Plan are not reported in this write-up. The Stake Holder Consultation Process (Part A) is an important component of the Project in all phases of implementation of components of KEIP involving civil construction. Such consultations, during the design stage, have provided important inputs for addressing environmental concerns of the stakeholders and have been duly considered. During the construction phase, more frequent stakeholder consultations at work site levels have been carried out. These consultations were to confirm that the implementation of the EMP to overcome the perceived adverse environmental impacts, identified during the design stage, are being adequately and effectively addressed. The Implementation Assistance and Capacity Building of KMC (Part F) is another important component of the Project that is being implemented through various studies and consultations with DFID, UK funds. Implementation of the EMP will be facilitated by such capacity building of the KMC during the operation and maintenance phase.

II. CONSTRUCTION ACTIVITIES

A. Sewerage and Drainage Improvement

5. Sewerage and Drainage components of KEIP have the following four sub-components.
 - (i) **construction of combined S&D network**
6. Table 1 summarizes construction activities during July to December, 2008.

Table 1. Borough-wise details of construction of S & D network works, July – December, 2008

Component	Borough I		Borough VII		Borough XI (part)	Borough XII & XI (part)	Borough XIII		Borough XIV			Borough XV
	SDD1	SDD2	SDF 1	SDF 2	SDA1	SDC	SDA2	SDA3	SDB1	SDB2	SDB3	SDE
Estimated approximate volume of soil excavated from new and replaced pipes and manholes (m ³)	7877.039	2992.918	7937.672	14981.52	4824.481	42554.957	1872.359	1181.666	4429.447	7521.664	8271.088	16815.849
Estimated approximate volume of excess excavated soil disposed (m ³)	Not in BOQ	Not in BOQ	Not in BOQ	Not in BOQ	12473.99	Not in BOQ	6741.485	11851.03	8500.544	7998.217	4306.892	Not in BOQ
Estimated approximate quantity of silt removed and disposed from cleaning of existing pipes (Rm)	1268.052	0	Not yet measured	Not yet measured	944.1	0	450.05	533.252	0	35	0	0
Estimated approximate quantity of precipitate removed from cleaning of existing drainage channels (Rm)	13926.381	351.151	Not yet measured	Not yet measured	0	445.411	287.96	3683.15	1176	4379.5	0	0
Estimated approximate volume of road crust removed (m ³)	0	0	Not yet measured	Not yet measured	889.619	3976.491	0	1938.308	0	0	0	Not yet measured
Approximate Length of new drainage and sewerage line (m) constructed– up to 450 mm diameter	116.25	50.215	129.842	12.32	637.065	2575.26	148.802	455.1	0	0	0	952.341
Approximate Length of proposed new drainage and sewerage line (m) constructed – above 450 mm diameter	648.725	356.845	1520.758	2822.67	222.95	6114.579	712.25	518.372	621.405	277.002	694.858	1781.864

ii) construction and augmentation of pumping stations

7. The progress of work in the construction of pumping stations (PS) during July to December, 2008 under KEIP is given in Table 2.

Table 2. Progress of work of construction of pumping stations, July – December, 2008

Component	Borough I, XI, XIII, XV					
	SD23	SD24R1	SD24R2	SD26	SD27	SD32
Identification of PS	Borough XII, XIII & XIV	LS1A-2B, Behala Node-C, Kamdahari, LS-5		Borough I	Borough VII	Borough XV
Type DWF/SWF	DWF	DWF	DWF	DWF+SWF	DWF+SWF	DWF+SWF
Status (augmentation/new)	New	Augmentation	Augmentation	New	New	New
Status of construction	Work in progress	Work in progress	Work in progress	Work in progress	Work in progress	Work in progress
Well sinking (m)	14.579	Not in B.O.Q	Not in B.O.Q	13.038	2.05	Not yet measured
Concrete (cu.m.)	956.742	77.775	9.739	196.674	420.557	Not yet measured

(iii) construction of augmented/refurbished sewage treatment plants (STPs) for discharge of treated effluents into the drainage canals.

8. Construction activities during July to December, 2008 related to this sub-component has commenced after pre-construction studies and the progress made is summarized in Table 3.

Table 3. Progress of work in the refurbishment of Sewage Treatment Plants under KEIP from July to December, 2008

Name of Sewage Treatment Plant	Refurbished Treatment Capacity (2021) in MLD	Progress of work					
		Work elements					
		Topographical survey of the total area of the STP	Dewatering of existing ponds/aerators (m ³)	Earth work in excavation of existing ponds (m ³)	Earth work in filling of embankments (m ³)	Laying of outlet DI pipeline (m)	Laying NP3 pipe line (m)
		1	2	3	4		5
South Suburban East	45	15.93	542139.28	47340.903	1577.4	232	0
Bangur	52	Not yet measured but desludging going on					
Garden Reach	57	7.5	5230.555	Not yet measured but desludging going on			

B. Solid Waste Management

9. There was no activity to report with respect to solid waste management component of KEIP during July-December, 2008.

C. Slum Improvement

10. Construction work undertaken in Slum Improvement Packages in KEIP has almost been completed by June 2008.

D. Canal Improvement Works

11. Progress in construction activities in canal improvement works of KEIP from July to December, 2008 is given in Table 4.

III. REPORT ON EMP IMPLEMENTATION

Induction of contractors on implementation & monitoring requirements

12. Consequent upon the award of any contract and during the construction activities, contractors are made aware of the basic provisions of EMP as related to their works. These were accomplished through instructions by the site engineers and Senior Construction Supervisors of Design and Supervision Consultants (DSC), KEIP.

Compliance reports of contractors prior to commencement of works

13. Works related to refurbishment of South Suburban STP commenced after the design parameters were established so as to prevent any flooding of the facility due to inadequate space, capacity and pumping requirements.

14. Works related to canal improvements commenced only when the relocation of canal bank dwellers for the selected stretches is completed. Where felling of trees is involved, tree survey along the stretch to be excavated has been carried out so that re-plantation after completion of work could be taken up vigorously.

Weekly construction reports of contractors and DSC

15. Weekly reviews of all construction activities with emphasis on mitigation measures of potential environmental impacts being undertaken by the Contractors have been taken by the respective Senior Construction Supervisors. Spot flying checks on the construction sites to ensure overall quality control including environmental and social requirements are being made by Team Leader (TL), DSC.

Training of contractors on mitigation of unexpected adverse impacts

16. Mitigation measures for any unexpected adverse impacts being faced are formulated by DSC and implemented by Contractors under the supervision of site engineers of DSC as soon

Table 4. Basin wise details of progress in construction activities from July to December, 2008 of rehabilitation of different canal systems under KEIP

	T P main canal CW -05	T P main canal CW -08	T P main canal CW -09	Manikhali U/S CW -10	Monikhali downstream CW 11	Keorapurkur CW 12A	Churial extension CW 12B	Churial Main CW 13	Churial Main CW 14	Churial Main CW 15
1. Earth work in excavation in cubic m	41500	42000	5000	40246	12800	-	2711	24500	29678	19500
2. Geotextile filter in sq. m	1950	-	-	315	-	-	-	-	-	-
3. Precast concrete block lining in sq. m	1950	-	-	511						
4. M-30 grade concrete in structures in cu. m	4.5	101.83	-	49.3	-	18.75	670.0	-	-	-
5. Reinforcement in M. T.	1.9	18.5	-	1.9		0.52	63.0			
6. Disposal of excavated material	40000	38000	5000	40246	12500	-	2600	22000	29678	162000
7. Topographic survey (km)	-	1.0	6.76	-	-	-	-	1.59	1.74	3.9
8. Clearing and grubbing of canal banks including disposal (km)	0.53	1.35	0.8	2.0	0.49	-	-	1.42	-	3.5
9. Clearing and removal of water hyacinth including disposal in sq.m.	13465	19130	110.0	3730.0	6237	4590.5	-	6600	-	7000
10. Clearing of sludge and slush including floating debris and removal (km)	-	1.42	0.8	2.0	0.67	-	-	-	-	-

as they crop up and reviewed about their efficacies weekly by the Senior Construction Supervisors of DSC.

Monthly monitoring report of contractors

17. Site wise monthly reports are being prepared by Senior Construction Supervisors of DSC in consultation with Environment Specialist of DSC. These reports are available in the office of DSC.

Six monthly progress report of EMP implementation

18. Six monthly review and report of EMP implementation is being developed by Environment Specialist of DSC based on the feed back from and in consultation with Senior Construction Supervisors of DSC incorporating the results of the required sampling, laboratory analysis and measurements. The fourth six monthly report (July-December, 2008) has become due after 31 December, 2008.

Institutional Strengthening and Training

19. The recently established EKWMA of Government of West Bengal has engaged M/S Wetland International for the development of an EKW EMP. In order to safeguard the interests of KEIP while formulating the EKW EMP, Dr Stuart Bunting and Dr P Edwards, International Specialists of Wetland issues, have been engaged by ADB to provide inputs to EKWMA for finalising the EKW EMP.

20. KMC has already established an environment management cell (EMC). The EMC is to play an advisory and overall coordination role for KMC and the KEIP to ensure that agreed mitigation measures and monitoring are being carried out. Environment has been formally introduced as a subject in the portfolio of Sri Sushil Sharma; Member - Mayor-in-Council (Policy making Body in KMC). Sri Anindya Karforma, (a Chief Engineer Rank Officer) is the Nodal Officer of the EMC. Suitable staffing has been made in the EMC. There is a fully functional Central Water Testing Laboratory in KMC now. There is also a dedicated water testing facility at Palta Water Treatment Plant. Further the ponds and water bodies in KMC area are being cleansed and preserved in keeping with the Inland Fisheries Act and the West Bengal Town and Country Planning Act. The EMC is looking into all this.

Statutory Clearances/Approval Status

21. The proposal to build 89 blocks of housing for canal bank dwellers at Nonadanga covering a built-up area of about 70,000 m² will only require prior environmental clearance from WBPCB. Necessary application in prescribed Form 1 and Form 1A has been made to the Board in September, 2007. Comments in the form of minor clarifications were received in

December, 2007 and necessary clarifications have been provided on 12.1.2008. A presentation was made to the members of Expert Appraisal Committee on 31.1.2008. Provisional environmental clearance has been granted by the WBPCB on 26.03.2008.

22. For continued operation of the three Sewage Treatment Plants (South Suburban East, Bangur and Garden Reach) after refurbishment by KEIP, necessary permission has been sought from WBPCB.

23. Letter seeking necessary exemption from obtaining NOC (Consent to Establish & Consent to Operate) in respect of the pumping stations under KEIP has been sent to WBPCB on 29.12.2008.

IV. ENVIRONMENTAL CONDITIONS

A. Sewerage and Drainage Improvement

(i) construction of combined S & D network

24. Construction activities have impacted the local environment in some sites, especially with the on set of monsoon in later part of the six monthly period from July to December, 2008, mainly in the nature of inconveniences to the residents. These inconveniences are transient in nature and will disappear once the construction phase is over. Many of the inconveniences have been mitigated to the extent practicable so that their intensities are minimized and/or shortened in time and there is no adverse permanent impact on the environment. Some of these inconveniences are to be accepted (for which public awareness campaign has been taken up) for a short period of time for bringing in a permanent improved environment once the construction phase is completed.

(ii) construction and augmentation of pumping stations

25. Construction work of new pumping stations during the period has commenced in KMC lands with activities being restricted to preparatory work for installation of new pumps in some cases and well sinking in some other cases. Environmental conditions at the construction works remained unchanged due to low intensity construction activities. On the other hand, better drainage in the catchments of the pumping stations is likely to bring in improvement in environmental conditions.

(iii) disposal of wastewater into DWF channel

26. Disposal of additional wastewater into DWF channel will commence when pipe laying works, house connections and construction and commissioning of pumping stations in the

designated catchments under the KEIP are completed. Environmental condition around the DWF channel therefore was not impacted during the period due to the Project.

(iv) construction of new and augmented/refurbished sewerage treatment plants (STPs) for discharge of treated effluents into the drainage canals.

27. Construction activities related to refurbishment of South Suburban East Sewage Treatment Plant was limited to cleaning of the existing facilities including excavations and raising and strengthening of peripheral embankments of the existing ponds. These activities did not lead to any perceptible change in the environmental conditions in the STP area. Excess soil and silt were used in the strengthening of embankments of the ponds without any change in environmental conditions in and around the embankments. Preparatory activities related to refurbishment of the other two STPs (Bangur and Garden Reach) have commenced. Desludging operations are being carried out. Due to large volume of sludge that has been taken out there are problems in managing this waste. The sludge is being disposed in low lying areas within the premises of the STPs after this is temporarily stored for dewatering.

B. Solid Waste Management

28. No activity is to be reported under this component during the period under review.

C. Slum Improvement

29. The environmental conditions of selected slums have improved wherever the planned constructions of infra-structural facilities are complete. As the improvement works are all in the nature of small scale isolated spot development of basic civic amenities within the slums, construction stage adverse impacts are minimal and as such there are no change in environmental conditions at the sites during construction activities.

D. Canal Improvement Works

30. With the relocation of canal bank dwellers, re-excavations of canals and bridge constructions, the canal bank areas and their surroundings are poised for an improvement in environmental conditions with relatively unpolluted canal water, elimination of foul odour, elimination of cause of solid waste dumping, better conveyance of storm weather flows, improvement of drainage in catchments and elimination of ugly shanties along canal banks. The canal bank dwellers are being rehabilitated with housings having basic civic amenities for a healthy and dignified living. The excavated silts are non-hazardous and are being disposed at pre arranged approved sites where no adverse impacts on environment are expected.

V. MEASUREMENT OR SAMPLING UNDERTAKEN AND MONITORING RESULTS

Canal Silt Analysis

31. Sampling and analysis of canal silts from 28 points of 14 different locations were carried out during November-December, 2008 of Churial diversion canal. The summarized results of canal silt analysis are given in Table 5A and the detailed analysis report is given in Appendix 1 and 2. It is to be noted from the silt analysis report that concentrations of metals in the silt samples, collected from the Churial diversion canal are non-hazardous when compared with limits set in Hazardous Wastes (M&H) Amendment Rules 2003.

Table 5A. Summarised results of analysis of silt of Churial diversion canal July-December, 2008

Parameters	Churial diversion canal	
	Range	Mean
pH(1:5)	5.88 – 7.89	-
Bulk Density (gm/cc)	0.86 – 1.11	1.00
Sand (%)	68.2 – 89.2	75.45
Silt (%)	2 - 21	13.9
Clay (%)	5.8 – 16.8	10.65
Total Kjeldahl Nitrogen (%)	0.12 – 0.38	0.23
Potassium (ppm)	13.68 – 104.6	46.22
Phenolic Compound (ppm)	0.75 – 3.56	1.40
Arsenic(ppm)	2.12 – 7.8	3.84
Mercury(ppm)	0.53 – 1.67	0.87
Lead(ppm)	9.9 – 32.11	16.38
Cadmium(ppm)	<1.00	
Total Chromium(ppm)	16.44 – 66.56	31.29
Chromium +6(ppm)	<0.50	
Zinc(ppm)	30.37 – 109.41	58.92
Nickel(ppm)	14.25 – 26.86	20.72
Copper(ppm)	2.18 – 42.93	18.48

Similar analysis of canal silt in respect of physico-chemical properties and heavy metal concentration has been carried from representative samples of Churial main canal upstream and of Suti canal. The results of the analysis are presented in Appendices 3 & 4 and 5 & 6 respectively. The summarized results of the analysis are given in Table 5B. The results indicate that concentrations of metals in the silt samples, collected from the mentioned canals are non-hazardous when compared with limits set in Hazardous Wastes (M&H) Amendment Rules 2003.

Table 5B. Summarised results of analysis of silt of Churial main canal upstream and Suti canal during July-December, 2008

Parameters	Churial diversion canal		Suti canal	
	Range	Mean	Range	Mean
pH(1:5)	5.54 – 7.7	-	6.7 – 7.82	-
Bulk Density (gm/cc)	0.67 – 1.67	1.04	0.88 – 1.2	1.05
Sand (%)	65.8 – 87.3	75.8	69.2 – 87.2	76.8
Silt (%)	3.0 – 24.0	14.1	7.0 – 25.0	12.6
Clay (%)	5.7 – 19.7	10.1	5.8 – 14.8	10.6
Total Kjeldahl Nitrogen (%)	0.17 – 0.48	0.32	0.18 – 0.42	0.30
Potassium (ppm)	16.14 – 108.1	53.5	15.24 – 77.77	33.67
Phenolic Compound (ppm)	0.51 – 9.27	1.28	0.85 – 1.33	1.03
Arsenic(ppm)	2.35 – 14.18	6.53	0.5 – 5.13	2.87
Mercury(ppm)	0.51 – 3.41	1.2	0.5 – 4.56	1.71
Lead(ppm)	20.73 – 207.15	58.33	11.0 – 35.06	18.6
Cadmium(ppm)	1.09 – 8.41	3.46	<1.0	
Total Chromium(ppm)	4.09 – 87.86	43.3	21.94 – 52.26	36.5
Chromium +6(ppm)	<0.5		<0.5	
Zinc(ppm)	51.86 – 447.08	168.3	54.39 – 127.37	67.64
Nickel(ppm)	13.19 – 55.28	33.81	18.72 – 32.75	26.68
Copper(ppm)	15.15 – 139.53	58.49	17.45 – 38.0	25.19

Sewage line and pumping station silt analysis

32. Sampling and analysis of sewage line and pumping station silt recovered due to (i) dismantling of previous sewage lines or cleaning of old lines from 12 different locations and (ii) digging in pumping stations were carried out once during July-December, 2008. The results of sewage silt analysis are given in Appendix 7. It is to be noted from the silt analysis report that concentrations of phenolic compounds and metals like cadmium, nickel, chromium⁺⁶, mercury and arsenic in the silt samples are below the detection limits of determination. Concentrations of other metals like lead, copper, chromium⁺³ and zinc are relatively low. They are all non-hazardous when compared with limits set in Hazardous Wastes (M&H) Amendment Rules 2003.

STP silt analysis

33. Sampling and analysis of 4 silt samples from refurbishment works of existing Garden Reach and Bangur STPs were carried out once during the period July-December, 2008. The results of STP silt analysis are given in Appendix 7. It is to be noted from the silt analysis report that concentrations of phenolic compounds and metals like cadmium, chromium⁺⁶, mercury and arsenic in the silt samples are below the detection limits of determination.

Concentrations of other metals like lead, copper, chromium⁺³, nickel and zinc are relatively low. They are all non-hazardous when compared with limits set in Hazardous Wastes (M&H) Amendment Rules 2003.

Noise Level Measurement

34. Noise level in dBA has been measured at several work sites for each component of the KEIP where civil construction is going on. The results of the measurements are tabulated in Appendix 8 and 9. All measurements were carried out during day time as all major construction activities were restricted during the day time. It could be seen from the data that at all work sites where manual operations are being carried out during the construction activities the time averaged noise level in dB(A) is from 55 and 65 depending upon the type and volume of traffic on road. Where work is in suspension the ambient noise levels are within acceptable limit in many cases. Considering that ambient noise level is relatively high in typical congested mixed residential-commercial areas of Kolkata with high multi-modal traffic noise, the measured noise level where exceeded the standard is to be accepted. However, where diesel pump sets were used for dewatering trenches/ponds and/or JCP/Hydra was used, the noise level has reached in excess of 80 dB (A) often reaching values above 90 dB (A). Such elevated noise levels can not be avoided at work sites but were often of short and/or intermittent duration and during the day time only and is to be accepted as a temporary situation. However, noise levels as measured progressively away from such work zones show considerable reduction. Necessary protection measures to the work men and those who are working near the site as per rule have been enforced.

VI. FINDINGS ON THE COMPLIANCE STATUS

35. The implementation including monitoring as planned in the EMP has been carried out at all major work sites of the KEIP. The works are related to construction phase only. The daily observations that are required to be made as per list of monitoring agenda were noted each day by the site engineers of the Contractors and DSC in their Construction records. These were summarized on a weekly basis and were reviewed by the respective Senior Construction Supervisors of DSC and extra remedial measures if required were implemented. The extra remedial measures are listed in Chapter VII. A package wise monthly report was prepared by the respective Senior Construction Supervisors that have been used by the Environment Specialist of DSC to develop the six-monthly report of EMP implementation of KEIP.

36. The above structured approach for the period July to December, 2008 has ensured that the provisions of the EMP have been enforced and complied with. The potential adverse

impacts have been mitigated by continuous and timely measures as provided in the EMP. In a few cases unexpected and unavoidable situations (like water logging due to high intensity rains, difficulty faced for movement and access to houses in narrow streets with no alternate pathways, etc) have developed leading to temporary inconveniences that have been mitigated to the extent possible by taking timely appropriate measures.

Sewerage & Drainage network

Construction Phase

37. Summary observations of monitoring carried out during the Construction Phase during July to December, 2008 are given below item-wise:

i. Soil erosion & surface run-off prevention

Daily visual inspections have been carried out by DSC site supervisors at all running work sites to ensure exposed surfaces are resurfaced and stabilized rapidly by the Contractors. There was no case of delayed action by the Contractors. Timely precautionary measures were taken to prevent soil erosion and “landslide” in a few cases where such measures were necessary. Consequent minor damages to boundary walls and walls of individual properties have been noted in some areas due to pipe laying work apparently because these were having very shallow foundations. Remedial action taken is given in Chapter VII.

ii. Prevention of dust nuisance

There was no dust nuisance during the wet periods. Daily visual inspections have been carried out by DSC site supervisors at all running work sites to ensure (a) light water spraying on loose and fine debris whenever necessary during dry periods, (b) use of masks / goggles by workmen whenever necessary & (c) covered transport of excess material whenever necessary. There was no record of heavy fugitive dust emission in the work sites. It is to be noted that site conditions did not allow use of much of heavy equipment. Generation of dust was, therefore, on the low side.

iii. Disposal of silt and excess soil

Monthly visual inspection of sites and delivery records of the Contractors have been carried out by DSC site supervisors to ensure that timely and adequate disposal of silt and excess soil has been undertaken by the Contractors at pre-agreed and pre-approved sites. There was no case of unnecessary silt / soil accumulation at work sites

iv. Prevention of soil, ground and/or surface water contamination from contaminated silt

No contaminated silt arising out of cleaning/dismantling of existing sewage lines has been excavated out during the present construction phase. This is evident from analysis report given in Appendix 7.

v. Vehicular and Construction noise pollution mitigation

Sound level monitoring has been carried out at different running work sites. The data given in Appendix 8 bring out that the noise levels due to construction activities were elevated a few decibals over the ambient noise where works were carried out manually. Where work is in suspension the ambient noise levels are within acceptable limit. Dewatering of trenches by pumps and employment of Hydra/JCP were persistent sources of relatively high noise level at the work sites. However, noise levels as measured progressively away from the work zones show considerable reduction thereby indicating the local people are not distressed by elevated transient noise levels at the work sites compared to the construction workers, Workmen were provided with appropriate gears for adverse sound levels at work sites wherever felt necessary. No night operations were carried out.

vii. Relocation of utility services

Intersection of major utility lines during trenching/excavation for drainage network was avoided in most cases. Diversions of water supply lines and electrical lines have been carried out observing the required formalities and with the consent of affected people.

viii. Prevention of water logging / flooding during trenching

Daily inspection at all running work sites has been carried out by DSC and PMU site supervisors to check water levels in the trenches. Timely dewatering was carried out as required. However, during wet periods some areas experienced temporary water-logging due to high intensity rainfall and due to impaired and insufficient drainage. Necessary draining and pumping of water logged areas were taken up to the extent feasible by deploying additional pumps.

ix. Traffic management

Partial/full closure of any public road including temporary diversion was done in co-ordination with the police authorities. The situation was reviewed daily by DSC site supervisors with the Contractors to minimize inconveniences to the local people. Safe passage for bicycles and pedestrian traffic was always maintained. Cases of major traffic closures/diversions were in the places as mentioned in Table 6.

Table 6. Details of major traffic diversions/closures due to construction of S & D network under KEIP from July to December, 2008

Package	Ward	Road	Duration of diversion/ closure		Description of the closure/diversion and remedial measures provided
			From	To	
SDA 2	119	Roy Bahadur Raod From D.H. Raod crossing to James Long Sarani crossing	10.11.2008	End of December, 2008	Traffic diverted through S.N.Roy Road
SDA 3	121	Raja Rammohan Roy Road From Madanmohantala to J.L. Sarani crossing	1.7.2008	End of December, 2008	Traffic diverted through R.R. Road Bye-lane
SDA 3	121/116	B.L.Saha Road from P.B. Road crossing to Garage Galli	10.11.2008	End of December, 2008	Partial blockade with one way traffic
SDB 1	128	Biren Roy Road (W)	July, 2008	December, 2008	Diversion through wards 126 and 127
SDB 2	131	Mid Bye Road	July, 2008	December, 2008	Diversion through Mid Road, S.C. Road
SDB 2	129	Gopal Mishra Road	01.07.2008	14.11.2008	Diversion through U.P. Road, Goalapara
SDB 2	129	R K Sarani Road	01.07.2008	29.12.2008	Diversion through U.P. Road, Goalapara
SDB 2	131	N.S.Road	01.07.2008	08.09.2008	Diversion through B.S.Road
SDB 2	131	Mid Road	05.08.2008	31.12.2008	Diversion through M.B.Road, S.C. Road
SDB 2	130	K.N.Chatterjee Road	24.10.2008	31.12.2008	Diversion through B.S.Road, N.S.Road
SDB 2	130	Brahma Samaj Road	10.11.2008	20.12.2008	Diversion through Dhalipara, Royed Park
SDB 2	130	Dhali para Road	01.07.2008	30.12/2008	Diversion through U.P. Riad, R.K.Sarani
SDB-3	128	S.S.Pally- 1000mm	1st July'08	5th July'08	Diversion road provided through Mondal Para Road
SDB-3	129	Jayrampur Jala Road-1600mm	1st July'08	12th Sept'08	Diversion road provided through Gopal Mishra Road on our existing work
SDB-3	129	Satyajit Ray Sarani-1400mm	1st July'08	8th Sept'08	Diversion road provided through Hemanta Mukherjee & new road near times of india made by Ramky
SDB-3	129	Sukanta Sarani- 1400mm	4th July'08	30th Sept'08	Diversion road provided through May Road after Road Restoration

Package	Ward	Road	Duration of diversion/ closure		Description of the closure/diversion and remedial measures provided
			From	To	
SDB-3	129	Jayrampur Jala Road-2000mm	16th August'08	24th August'08	Diversion road provided through May Road after Road Restoration
SDB-3	128	Shyamsundar Pally-300 mm	7th July'08	9th July'08	No diversion required
SDB-3	128	Jorapukur 1000mm	6th Sept'08	Running front	Earlier no diversion, Now made one diversion road by KEIP for cycle etc.
SDB-3	128 & 129	Becharam (Bottala Bazar)-1000mm	21st Oct'08	8th Nov'08	Diversion road provided through Housing board colony road
SDB-3	129	Gopal Mishra Road(Aravinda Pally)-1000mm	19th Oct'08	28th Dec'08	Diversion road provided through Gopal Mishra Road(400 & 500mm)
SDB-3	129	Jayrampur jala Road-1800mm	17th Nov'08	Running front	Diversion road provided through Balance existing road of saradomaa Uponibesh
SDB-3	129	Saradomaa Upinebesh-600mm	16th Nov'08	7th Dec'08	Diversion road provided through parallel road of saradomaa Uponibesh
SDB-3	129	B.G.Press-600mm	28th Nov'08	5th Dec'08	Diversion road provided through parallel road
SDB-3	129	Jayrampur Jala Road(Near Satiprasanna School)-2000mm	19th Nov'08	Running front	Diversion road provided through Sukanta Sarani
SDB-3	129	Rabindra Nagar-III(Gap Line)-1200mm	22nd Dec'08	Running front	Diversion road provided through Cross Road Rabindra Nagar-III via Mahendra Banerjee Road
SDB-3	129	Satyajit Ray Sarani-1400mm	24th Dec'08	Running front	Diversion road provided through Lal Bahadur Sarani via Mahendra Banerjee Road
SDC	109	Mukundapur to Daspara Road	17.9.2008	2.10.2008	Traffic movement allowed/regulated for pedestrians and two wheelers
SDC	110	Pronobananda Road	15.7.2008	End of December, 2008	Traffic movement allowed/regulated for pedestrians and two wheelers
SDD 1	South Dum Dum Municipality	Jessore Road	January, 2008	December, 2008	As per directive of the Traffic Dept, a stretch of 200 m road block given at the northern flank of the road. During the blockage both way traffic are allowed to move through the southern flank. Traffic volunteers are also deployed to manage the traffic movement

Package	Ward	Road	Duration of diversion/ closure		Description of the closure/diversion and remedial measures provided
			From	To	
SDD 1	6	Strand bank road	October, 2008	December, 2008	Diversion was not needed for 180 m of work zone
SDD 1	1	Gobinda Mondal Lane	October, 2008	December, 2008	New work. No diversion was needed
SDD 1	3	Khudiram Bose Sarani	May, 2008	July, 2008	Diversion not needed
SDD 2	5	Raja Manindra Dutta Road	25.3.2008	20.9.2008	Allowed one flank for traffic
SDD 2	2	Seven Tank Road	1.7.2007	31.12.2008	Allowed one flank for traffic
SDD 2	4	Rani Debendra bala Road	27.07.2008	31.12.2008	Allowed one flank for traffic
SDD 2	2	Kali charan Ghosh	1.1.2008	20.09.2008	Allowed one flank of the road for traffic movement
SDD 2	4	Raja Manindra Dutta Road for Sarbakhan connection	20.05.2008	31.07.2008	Deployed traffic volunteers for regulating vehicle movement
SDE	137, 138	S A Farooqui Road (formerly Akra Road)	10.12.2008	End of December, 2008	Diversion through Garden Reach road, Dr A.U. Road and railway Line Road
SDF 1	56	Kamardanga Road	July, 2008	December, 2008	Traffic diverted through Radhanath Choudhury Lane
SDF 1	59	Christofer Road	July, 2008	December, 2008	Traffic diverted through Gobinda Khatick Road
SDF 2	57	Canal South Road	July, 2008	December, 2008	Partial blockage has been made allowing traffic to flow from one side
SDF 2	66	G. J. Khan Road	July, 2008	December, 2008	Traffic diverted through the other side of the canal

x. Health and safety of work force

Daily visual inspection was carried out by DSC site supervisors to ensure that Occupational Health & Safety standards were followed by the Contractors.

xi. Environmental health & safety at construction camp sites

A safety, health and environmental plan were submitted by each Contractor on acceptance of the work order detailing the provisions being made under the Plan. The Plan in each case provided for, amongst other things, temporary labour camps with flush latrines. In addition available pay and use toilets came handy for the camp sites in some places. On the whole the camp sites did not pose any threat to environmental health and safety in the area. DSC site supervisors made daily visual inspections.

xii. Conservation of places of cultural importance

There was no case involving places of cultural importance falling along S&D network excavations.

Pumping Stations

Construction Phase

38. Summary observations of monitoring carried out in the Construction Phase during July to December, 2008 are given below item-wise:

i. Soil erosion & surface run-off prevention

Daily visual inspections have been carried out by DSC site supervisors at all running work sites to ensure working surfaces do not remain exposed and unstable after completion of the construction work.

ii. Prevention of dust nuisance

There was no dust emission during the wet periods. Daily visual inspections have been carried out by DSC site supervisors at all running work sites to ensure (a) light water spraying on loose and fine debris whenever necessary during dry periods, (b) use of masks / goggles by workmen whenever necessary & (c) covered transport of excess material whenever necessary. There was no record of fugitive dust emission in the work sites. It is to be noted that site conditions did not allow use of much heavy equipment. Generation of dust was, therefore, on the low side.

iii. Prevention of soil, ground and/or surface water contamination from contaminated silt

No contaminated silt was excavated out during the present construction phase.

Sewage Treatment Plant

Pre-construction Phase

39. Monitoring for pre-construction phase included only situations related to possible flooding of STP sites.

i. Flooding of STP sites

- Flooding of sites are not expected because of provision of improved drainage in the design
- Flooding of sites are not expected because of provision of adequate treatment & pumping capacity and stand by pumps in the design

Construction Phase

40. Summary observations of monitoring carried out during the Construction Phase in the STPs are given below item-wise:

i. Soil erosion & surface run-off prevention

Daily visual inspections have been carried out by DSC site supervisors at all running work sites to ensure exposed surfaces are stabilized rapidly by the Constructors. The embankments are being strengthened to accidental bank erosion and/or failure. There was no case of delayed action by the Contractors.

ii. Prevention of dust nuisance

There was no dust emission during the wet periods. Daily visual inspections have been carried out by DSC site supervisors at all running work sites to ensure (a) light water spraying on loose and fine debris whenever necessary during the dry periods, (b) use of masks / goggles by workmen whenever necessary & (c) covered transport of excess material whenever necessary. There was no record of fugitive dust emission from the work sites. No piling was also done. Generation of dust was, therefore, on the low side.

iii. Prevention of soil, ground and/or surface water contamination from contaminated silt

Silts from excavations/desludging of the existing STPs are non-hazardous (Appendix 7). On the contrary they are rich in nutrients. Current disposal of silts from the existing ponds of SSE STP at pre-approved sites will not contaminate soil, ground and/or surface water. At Garden Reach STP, there were large accumulations of sludge. However, such accumulation, being within the STP premise, is not causing inconveniences to the local people.

iv. Vehicular and Construction noise pollution mitigation

Construction activity was limited to dewatering and manual & machine excavation and desludging during dry periods. There was no major vehicle movement in the area. There was minimum addition to the ambient noise level due to vehicular activities during this period although the work place noise level is high (Appendix 8).

v. Relocation of utility services

There was no record of any intersection of major utility lines during construction work.

vi. Prevention of water logging / flooding during trenching/excavation of ponds

Daily inspection at all running work sites has been carried out by DSC site supervisors to prevent water-logging/flooding due to various activities. However, the surrounding areas outside the STP boundary are low-lying and partially covered with water especially during the wet periods.

vii. Traffic management

There was no partial / full closure of any public road including temporary diversion for construction activities under this sub-component.

viii. Health and safety of work force

Daily visual inspection was carried out by DSC site supervisors to ensure that Occupational Health Safety standards were followed by the Contractors.

Slum Improvements

Operation Phase

41. Summary observation of monitoring carried out during the Operation Phase in boroughs I to XI is given below item-wise:

i. Regular emptying of septic tanks

Quarterly cleaning of septic tanks has been routinely carried out by KMC.

ii. Regular cleaning and maintenance of drains

Boroughs of KMC have a running programme of regular cleaning and maintenance of drains in the slums.

iii. Water quality of stand posts

Stand posts in the slum areas receive water from KMC's filtered water supply and are free from any metal, organic and pathogenic contamination as revealed by regular analysis of water carried out in KMC water testing laboratory.

iv. Cleaning and disinfection of urinals

KMC through its respective Boroughs carried out cleaning and disinfection of urinals continuously. Only visual inspection of urinals was undertaken to ensure cleanliness.

Canal Improvements

Pre-construction Phase

48. Summary observations of monitoring carried out during the Pre-construction Phase are given below item-wise:

i. **Tree replanting**

A large number of trees has been planned to be planted along the canal banks once excavation work is completed. Tender specifications for carrying out such planting along with extensive beautification of the canal banks have been drafted. Necessary permissions from competent authority have been obtained in all cases of unavoidable tree felling.

ii. **Relocation of canal bank dwellers**

The relocated sites/housings have improved environmental conditions with adequate sanitation and other facilities compared to the abominable environmental conditions in the canal bank shanties.

Construction Phase

49. Summary observations of monitoring carried out in the Construction Phase during July to December 2008 are given below item-wise:

i. **Prevention of soil erosion & surface run-off**

Daily visual inspections have been carried out by DSC site supervisors at all running canal excavation sites to ensure that the slopes of excavated banks were stabilized rapidly by the contractor. There were minimum excavation works with on-set of monsoon. Timely precautionary measures were taken to prevent any bank failure in case of development of any adverse situation. DSC site supervisors ensured that there was no case of delayed action by the contractors.

ii. **Prevention of dust nuisance**

It is to be noted that canal silt was wet when excavated. Daily visual inspections were carried out by DSC site supervisors at all canal stretches under excavation to ensure (a) light water spraying on loose dried canal silt if necessary, (b) use of hand gloves / masks / goggles by workmen whenever necessary & (c) covered transport of dewatered and semi-dry canal silt.

iii. **Disposal of excavated silt**

Daily visual inspection of excavation sites and monthly checking of delivery records of the contractor have been carried out by DSC site supervisors to ensure that timely and adequate disposal of excavated silt at pre-agreed and pre-approved sites have been undertaken by the

contractor after dewatering of the excavated silts at the canal banks. There was no case of unnecessary silt accumulation at work sites. Dry silt was transported under cover. The excavated silt is non-hazardous in nature for the analysed parameters with respect to limits set in Hazardous Wastes (M&H) Amendment Rules 2003.

iv. Prevention of soil, ground and/or surface water contamination from contaminated soil

The silt excavated from the canal was temporarily stacked by the side of the same canal. The filtrate is therefore going back to where the water charged silt came from. This is to prevent any possible pollution of other water bodies and spilling of interstitial water during transportation to disposal sites. No statutory clearance is required for this operation more so because the silt itself is non-hazardous.

v. Mitigation of noise pollution

Sound level monitoring has been carried out at running work sites. The data bring out that the noise levels due to canal improvement activities are relatively high where machineries like excavators were in operation. Construction noise generation due to manual excavation work was on comparatively low side. It is to be noted that construction sites are in general away from residential areas (excluding the informal shanties of the canal bank dwellers).

vi. Traffic Management

There was no necessity of temporary/partial diversion/closure of roads for prolonged periods during the construction phase. Traffic situation was regularly reviewed by the Contractors and DSC site supervisors.

vii. Health and Safety of work force

Daily visual inspection was carried out by DSC site supervisors to ensure occupational health and safety standards are strictly followed by the Contractors. There were no violations. Temporary labour camps have primary sanitary facilities

VII. SUMMARY OF ANY NON-COMPLIANCE AND REMEDIAL ACTIONS TAKEN

S & D network construction

50. There were minor threats of deterioration of local environmental quality, mainly in terms of inconveniences to residents in some of the work fronts opened for the construction of S & D network temporarily due to the following reasons:

- Difficulty in ingress and egress into some houses for their respective residents due to electric cable shifting work and due to pipe laying works

- Bad conditions of the roads due to time lag between laying of pipe lines and road restoration work especially during the monsoon months
- Complete or partial closure of roads with restricted traffic movements
- Short-term water-logging in trenches especially after heavy monsoon showers
- Flooding of streets and low-lying houses after heavy monsoon showers because of impaired drainage arrangements
- Short term disruption of electricity and water supply to some households during diversion of underground electric and sewer lines falling along the alignment of S & D lines being laid at some sites.
- Elevated noise levels in some sites due to
 1. working of Hydra machines
 2. use of noisy diesel pumps for dewatering of trenches
 3. use of hammering technology in sheet piling to support walls of trenches
 4. plying of trucks in the night especially for removing excess silt and movement of construction materials
- Minor and major damages to boundary walls and residential buildings due to pipe laying works.

51. The following remedial actions were taken expeditiously mitigating the inconveniences to a large extent.

- Ingress and egress to affected houses were provided as far as practicable although in some cases there were temporary restrictions on full accessibility due to non-availability of alternate space. These restrictions were withdrawn expeditiously through suitable engineering and administrative actions.
- Alternate routes were always provided for temporary closure or part closure of roads with provisions of pathways for pedestrians and two-wheelers.
- Accumulated water was pumped out as and when required to the extent possible
- Flooding after heavy rain was mitigated by continuous pumping to the extent feasible/possible
- Restoration of accidental disruption of electricity and water supply was arranged expeditiously by pursuing the CESC and KMC water supply department to undertake diversion/repair expeditiously.
- Elevated noise levels at work sites are to be accepted, in the cases mentioned, as these are work related noise that can not be avoided. However, proper maintenance of the

equipments was enforced on the contractors so that the noise levels of the used equipments remained at manufacturers' specifications. Workmen also used proper gears so that the occupational health norms were not violated.

- Suitable repairs to the boundary walls and buildings are being carried out. Further repair works are in progress.

Refurbishment of STP

52. (i) The existing ponds of SSE STP are being excavated and the embankments of the ponds are being strengthened by increasing their heights and widths. As a consequence some surrounding built-up areas were water-logged during wet periods due to drainage congestion.

(ii) Due to movements of heavy vehicles, the roads around the SSE STP site are damaged inconveniencing the local people who use these roads.

(iii) Desludging operations in the Garden Reach and Bangur STPs have brought out unexpected large quantities of water charged solid waste. These are being temporarily stored and progressively disposed in the nearby low lying open spaces within the boundaries of the STPs.

53. Remedial measures that have been taken are as follows:

(i) pumping and draining of water from the built-up areas

(ii) roads are being repaired as and when required.

(iii) Contractors are being advised on a day-to-day basis for the required management of the solid waste in an appropriate manner.

Canal Excavation work

54. Environmental problems related to stability of canal banks to be excavated were faced at few sites. They are as follows:

- Threat of soil erosion and landslide due to bank instability along a few vulnerable stretches during excavation posing dangers to stability of the excavated canal banks and in some cases close by hutments/building and road.

55. The following remedial measures were taken expeditiously mitigating the adverse situation to a large extent.

- Extensive Eucalyptus *ballah* piling to prevent soil collapse and soil erosion along vulnerable stretches of the canals under excavation were taken up expeditiously. In

cases where the design requirement is for permanent protection of canal sections, concrete lining has been provided. The details are given in Table 7.

Table 7. Details of bank protection measures carried out to prevent bank/slope failure along stretches canals from July to December, 2008

Serial No	Name of the canal	Chainage (m)		Piling work carried (m)		Remarks
		From	To	From	To	
Eucalyptus ballah piling						
1	Intercepting	1670	1675	1670	1675	Right bank (CW – 08)
2	Intercepting	1585	1670	1585	1670	Right bank (CW – 08)
3	Intercepting	1562	1575	1562	1575	Right bank (CW – 08)
4	Intercepting	1020	1150	1020	1150	Right bank (CW – 08)
5	Intercepting	1150	1290	1150	1290	Right bank (CW – 08)
6	Intercepting	1290	1350	1290	1350	Right bank (CW – 08)
7	Intercepting	450	510	450	510	Left bank (CW – 08)
8	CC1 (west)	1020	1075	1020	1075	Left bank (CW – 08)
9	Intercepting	2200	2300	2200	2300	Left bank at top row (CW 05)
10	Intercepting	2300	2370	2300	2370	Right bank at top row (CW 05)
11	Intercepting	2400	2670	2400	2670	Right bank at bottom row (CW 05)
12	Intercepting	3000	3100	3000	3100	Right bank at top (CW 05)
13	Begore	450	480	450	480	Both bank top (CW – 10)
14	Begore	2575	2680	2575	2680	Left bank, top (CW – 10)
15	Begore	2650	2680	2650	2680	Right bank top (CW – 10)
16	New Monikhali	375	450	375	450	Left bank top (CW – 10)
17	C.P.T.	720	758	720	758	Left bank top (CW – 10)
18	C.P.T.	830	940	830	940	Left bank top (CW – 10)
19	A ₀ A ₁	0.00	(-) 8.5	0.00	(-) 8.5	Top row (R/B) (CW – 09)
20	A ₀ A ₁	0.0	8.7	0.0	8.7	Top row (R/B) (CW – 09)
21	A ₀ A ₁	41.0	45.0	41.0	45.0	Top row (R/B) (CW – 09)
22	A ₀ A ₁	48.0	51.0	48.0	51.0	Top row (R/B) (CW – 09)

Serial No	Name of the canal	Chainage (m)		Piling work carried (m)		Remarks
		From	To	From	To	
23	A ₀ A ₁	62.0	100.0	62.0	100.0	Top row (R/B) (CW – 09)
24	bA ₂	310	342	310	342	Top row (L/B) (CW – 09)
25	Manikhali	3320	3390	3320	3390	Left bank (CW – 11)
26	Manikhali	6357	6377	6357	6377	Both side bank (CW – 11)
27	Churial	780	810	780	810	Right bank (CW – 13)
28	Churial Extension	1850	1860	1850	1860	Left bank (CW – 12B)
29	Churial Extension	623	635	623	635	Left bank (CW - 12B)
P.C.C. Lining						
1	Intercepting	2740	3100	2740	3100	Both sides at top layer (CW – 05)
2	Begore	1775	1815			Bed & side lining (CW – 10)
3	Begore branch	712	720			Bed & side lining (CW – 10)

VIII. RECOMMENDATIONS FOR IMPROVEMENT/ REVISION OF THE MITIGATION MEASURES AND/ OR THE EMP IF ANY

56. At this stage on the implementation of the EMP of the revised KEIP, no improvements/revisions of the mitigation measures of the interim EMP are suggested/ recommended. Progressive strict enforcement of the provisions of the EMP has been planned in the next six months.

APPENDICES

Appendix 1. Physico chemical properties of silt of Churial diversion canal Package IX (9)

Sr. No.	Sampling Site	Sample No.	Sampling point (chainage in m)	pH (1:5)	Bulk Density (gm/cc)	Sand (%)	Silt (%)	Clay (%)	Total Kjeldahl Nitrogen (%)	Potassium (ppm)	Phenolic Compound (ppm)
1	Churial diversion canal	1A: at slush level	500	7.66	1.00	72.2	21.0	6.8	0.35	22.19	<0.50
		1B: 1 m below slush level		7.74	1.05	73.2	15.0	11.8	0.25	23.38	<0.50
2	Churial diversion canal	2A: at slush level	1000	7.89	1.07	72.2	21.0	6.8	0.19	17.77	1.20
		2B: 1 m below slush level		7.64	1.03	77.2	14.0	8.8	0.21	31.65	3.56
3	Churial diversion canal	3A: at slush level	1500	7.87	1.11	89.2	2.0	8.8	0.34	13.68	1.19
		3B: 1 m below slush level		7.66	1.07	80.2	12.0	7.8	0.20	25.00	<0.50
4	Churial diversion canal	4A: Slush level	2000	7.78	1.0	83.2	7.0	9.8	0.15	26.36	<0.50
		4B: 1 m below slush level		7.80	1.03	69.2	20.0	10.8	0.18	29.85	<0.50

Sr. No.	Sampling Site	Sample No.	Sampling point (chainage in m)	pH (1:5)	Bulk Density (gm/cc)	Sand (%)	Silt (%)	Clay (%)	Total Kjeldahl Nitrogen (%)	Potassium (ppm)	Phenolic Compound (ppm)
5	Churial diversion canal	5A: at slush level	2500	7.73	1.03	77.2	10.0	12.8	0.17	24.76	<0.50
		5B: 1 m below slush level		7.70	0.89	76.2	12.0	11.8	0.26	25.87	<0.50
6	Churial diversion canal	6A: at slush level	3000	7.82	0.97	72.2	19.0	8.8	0.20	23.69	1.24
		6B: 1 m below slush level		7.51	1.00	79.2	14.0	6.8	0.19	30.47	<0.50
7	Churial diversion canal	7A: at slush level	3500	7.29	0.88	74.2	11.0	14.8	0.13	28.85	<0.50
		7B: 1 m below slush level		7.56	1.07	68.2	19.0	12.8	0.20	26.37	<0.50
8	Churial diversion canal	8A: at slush level	4000	7.54	0.97	78.2	13.0	8.8	0.31	27.76	0.83
		8B: 1 m below slush level		7.56	0.86	77.2	13.0	9.8	0.23	23.67	<0.50

Sr. No.	Sampling Site	Sample No.	Sampling point (chainage in m)	pH (1:5)	Bulk Density (gm/cc)	Sand (%)	Silt (%)	Clay (%)	Total Kjeldahl Nitrogen (%)	Potassium (ppm)	Phenolic Compound (ppm)
9	Churial diversion canal	9A: at slush level	4500	7.31	1.0	72.2	11.0	16.8	0.37	86.0	0.81
		9B: 1 m below slush level		6.89	0.86	76.2	9.0	14.8	0.38	92.60	<0.50
10	Churial diversion canal	10A: at slush level	5000	7.52	1.11	73.2	21.0	5.8	0.12	73.30	<0.50
		10B: 1 m below slush level		7.23	1.00	71.2	18.0	10.8	0.26	81.50	1.38
11	Churial diversion canal	11A: at slush level	5500	6.29	1.07	80.2	10.0	9.8	0.28	84.40	1.20
		11B: 1 m below slush level		7.71	1.00	72.2	20.0	7.8	0.29	36.80	2.39
12	Churial diversion canal	12A: at slush level	6000	7.37	1.00	76.2	8.0	15.8	0.21	51.80	0.87
		12B: 1 m below slush level		7.11	1.07	74.2	11.0	14.8	0.23	104.6	<0.50

Sr. No.	Sampling Site	Sample No.	Sampling point (chainage in m)	pH (1:5)	Bulk Density (gm/cc)	Sand (%)	Silt (%)	Clay (%)	Total Kjeldahl Nitrogen (%)	Potassium (ppm)	Phenolic Compound (ppm)
13	Churial diversion canal	13A: at slush level	6500	7.33	1.00	74.2	19.0	6.8	0.16	86.20	<0.50
		13B: 1 m below slush level		5.88	1.03	68.2	15.0	16.8	0.16	44.20	0.75
14	Churial diversion canal	14A: at slush level	6900	6.78	1.07	76.2	13.0	10.8	0.23	91.80	<0.50
		14B: 1 m below slush level		7.21	0.97	79.2	11.0	9.8	0.18	59.80	<0.50

Appendix 2. Heavy metals in canal silt of Churial diversion canal Package IX (9)

Sr. No.	Sampling Site	Sample No.	Sampling point (chainage in m)	Arsenic	Mercury	Lead	Cadmium	Total Chromium	Hexavalent chromium	Zinc	Nickel	Copper
				(ppm)								
1	Churial diversion canal	1A: Slush level	500	3.40	0.76	14.16	<1.00	28.75	<0.50	45.88	26.46	4.42
		1B: 1 m below slush level		3.52	0.98	13.36	<1.00	26.97	<0.50	42.06	25.49	3.53

Sr. No.	Sampling Site	Sample No.	Sampling point (chainage in m)	Arsenic	Mercury	Lead	Cadmium	Total Chromium	Hexavalent chromium	Zinc	Nickel	Copper
				(ppm)								
2	Churial diversion canal	2A:Slush level	1000	3.40	0.76	14.16	<1.00	28.75	<0.50	45.88	26.46	4.42
		2B: 1 m below slush level		3.52	0.98	13.36	<1.00	26.97	<0.50	42.06	25.49	3.53
3	Churial diversion canal	3A:Slush level	1500	3.17	<0.50	14.36	<1.00	34.67	<0.50	63.14	22.45	21.14
		3B: 1 m below slush level		3.38	<0.50	15.27	<1.00	32.47	<0.50	59.97	21.33	22.72
4	Churial diversion canal	4A:Slush level	2000	4.51	0.70	11.74	<1.00	25.64	<0.50	30.37	16.05	2.18
		4B: 1 m below slush level		3.01	<0.50	11.73	<1.00	28.92	<0.50	52.00	18.00	22.77
5	Churial diversion canal	5A:Slush level	2500	5.48	0.58	17.26	<1.00	66.56	<0.50	63.55	25.27	17.69
		5B: 1 m below slush level		3.04	<0.50	13.77	<1.00	35.05	<0.50	64.05	21.27	20.84

Sr. No.	Sampling Site	Sample No.	Sampling point (chainage in m)	Arsenic	Mercury	Lead	Cadmium	Total Chromium	Hexavalent chromium	Zinc	Nickel	Copper
				(ppm)								
6	Churial diversion canal	6A:Slush level	3000	2.12	<0.50	9.90	<1.00	19.76	<0.50	43.12	14.25	15.00
		6B: 1 m below slush level		2.95	<0.50	14.52	<1.00	30.95	<0.50	65.74	20.74	20.88
7	Churial diversion canal	7A:Slush level	3500	5.22	0.83	32.11	<1.00	32.72	<0.50	65.62	21.63	12.86
		7B: 1 m below slush level		3.78	<0.50	28.69	<1.00	37.38	<0.50	84.91	22.23	25.14
8	Churial diversion canal	8A:Slush level	4000	3.64	<0.50	28.49	<1.00	33.05	<0.50	79.30	18.85	24.50
		8B: 1 m below slush level		3.41	<0.50	19.76	<1.00	26.14	<0.50	61.76	16.80	19.31
9	Churial diversion canal	9A:Slush level	4500	2.40	<0.50	15.92	<1.00	25.67	<0.50	50.97	21.05	23.01
		9B: 1 m below slush level		6.16	0.53	24.98	<1.00	43.63	<0.50	109.41	26.86	42.93

Sr. No.	Sampling Site	Sample No.	Sampling point (chainage in m)	Arsenic	Mercury	Lead	Cadmium	Total Chromium	Hexavalent chromium	Zinc	Nickel	Copper
				(ppm)								
10	Churial diversion canal	10A:Slush level	5000	4.62	<0.50	13.92	<1.00	33.43	<0.50	64.37	20.95	28.55
		10B: 1 m below slush level		3.37	<0.50	15.75	<1.00	27.63	<0.50	60.33	19.61	20.97
11	Churial diversion canal	11A:Slush level	5500	4.37	0.75	16.52	<1.00	28.34	<0.50	62.98	22.57	14.04
		11B: 1 m below slush level		2.64	<0.50	13.74	<1.00	28.0	<0.50	49.53	16.37	19.14
12	Churial diversion canal	12A:Slush level	6000	3.43	<0.50	12.26	<1.00	29.78	<0.50	52.07	18.97	17.71
		12B: 1 m below slush level		6.32	1.02	18.39	<1.00	30.73	<0.50	51.04	21.08	14.09

Sr. No.	Sampling Site	Sample No.	Sampling point (chainage in m)	Arsenic	Mercury	Lead	Cadmium	Total Chromium	Hexavalent chromium	Zinc	Nickel	Copper
				(ppm)								
13	Churial diversion canal	13A:Slush level	6500	2.71	0.53	12.86	<1.00	31.47	<0.50	58.73	20.84	21.31
		13B: 1 m below slush level		3.83	<0.50	12.40	<1.00	31.43	<0.50	57.13	21.20	16.55
14	Churial diversion canal	14A:Slush level	6900	2.26	1.20	13.35	<1.00	23.11	<0.50	4.24	15.20	16.20
		14B: 1 m below slush level		3.75	1.67	16.35	<1.00	38.79	<0.50	63.30	23.11	23.43

Appendix 3. Physico chemical properties of silt of Churial main canal upstream Package VII (7) of KEIP

Sr. No.	Sampling Site	Sample No.	Sampling point (chainage in m)	pH (1:2.5)	Bulk Density (gm/cc)	Sand (%)	Silt (%)	Clay (%)	Total Kjeldahl Nitrogen (mg/kg)	Potassium (ppm)	Phenolic Compound (ppm)
1	Churial main canal upstream	1A: at slush level	0	7.19	1.04	75.3	19.0	5.7	0.35	84.1	0.55
		1B: 1 m below slush level		7.43	0.94	69.8	24.0	6.2	0.17	39.18	0.77

Sr. No.	Sampling Site	Sample No.	Sampling point (chainage in m)	pH (1:2.5)	Bulk Density (gm/cc)	Sand (%)	Silt (%)	Clay (%)	Total Kjeldahl Nitrogen (mg/kg)	Potassium (ppm)	Phenolic Compound (ppm)
2	Churial main canal upstream	2A: at slush level	500	7.43	1.25	71.3	14.0	14.7	0.19	30.08	0.93
		2B: 1 m below slush level		7.52	1.67	81.3	9.0	9.7	0.27	29.14	0.69
3	Churial main canal upstream	3A: at slush level	1000	5.72	1.25	72.3	8.0	19.7	0.21	50.56	1.19
		3B: 1 m below slush level		6.75	1.25	68.8	16.0	15.2	0.18	80.56	<0.50
4	Churial main canal upstream	4A: Slush level	1500	6.14	0.98	81.8	11.0	7.2	0.42	76.6	0.62
		4B: 1 m below slush level		6.73	1.07	65.8	21.0	13.2	0.39	77.65	9.27
5	Churial main canal upstream	5A: at slush level	2000	7.42	1.04	84.8	9.0	6.2	0.39	29.79	0.65
		5B: 1 m below slush level		7.26	1.25	87.3	7.0	5.7	0.37	16.91	0.79
6	Churial main canal upstream	6A: at slush level	2500	7.47	0.91	78.8	11.0	10.2	0.41	64.43	1.1
		6B: 1 m below slush level		5.8	0.91	77.8	14.0	8.2	0.36	61.19	1.69

Sr. No.	Sampling Site	Sample No.	Sampling point (chainage in m)	pH (1:2.5)	Bulk Density (gm/cc)	Sand (%)	Silt (%)	Clay (%)	Total Kjeldahl Nitrogen (mg/kg)	Potassium (ppm)	Phenolic Compound (ppm)
7	Churial main canal upstream	7A:Slush level	3000	5.95	1.25	74.3	9.0	16.7	0.25	50.06	3.19
		7B: 1 m below slush level		7.21	1.25	71.8	18.0	10.2	0.35	57.91	1.68
8	Churial main canal upstream	8A:Slush level	3500	7.33	0.67	83.9	10.0	6.1	0.37	44.96	0.79
		8B: 1 m below slush level		6.92	0.67	79.9	12.0	8.1	0.36	96.64	0.68
9	Churial main canal upstream	9A:Slush level	4000	7.1	0.97	67.9	22.0	10.1	0.33	39.72	0.55
		9B: 1 m below slush level		7.46	0.86	79.9	3.0	17.1	0.39	37.08	0.94
10	Churial main canal upstream	10A:Slush level	4500	6.64	0.94	82.9	11.0	6.1	0.31	11.51	0.71
		10B: 1 m below slush level		6.78	0.89	69.9	20.0	10.1	0.29	16.14	0.79
11	Churial main canal upstream	11A:Slush level	5000	7.32	0.86	81.9	10.0	8.1	0.41	85.97	1.09
		11B: 1 m below slush level		7.26	1.0	79.9	14.0	6.1	0.27	69.38	<0.5

Sr. No.	Sampling Site	Sample No.	Sampling point (chainage in m)	pH (1:2.5)	Bulk Density (gm/cc)	Sand (%)	Silt (%)	Clay (%)	Total Kjeldahl Nitrogen (mg/kg)	Potassium (ppm)	Phenolic Compound (ppm)
12	Churial main canal upstream	12A:Slush level	5500	7.47	1.03	69.9	14.0	16.1	0.33	108.11	0.51
		12B: 1 m below slush level		7.45	0.91	73.9	19.0	7.1	0.48	70.57	1.18
13	Churial main canal upstream	13A:Slush level	6000	7.7	1.03	74.9	11.0	14.1	0.31	21.0	0.69
		13B: 1 m below slush level		7.11	1.07	69.9	21.0	9.1	0.30	26.95	0.66
14	Churial main canal upstream	14A:Slush level	6500	5.54	1.07	72.9	17.0	10.1	0.23	38.24	<0.50
		14B: 1 m below slush level		6.7	1.14	72.9	21.0	6.1	0.30	42.74	0.52

Appendix 4. Heavy metals in canal silt of Churial main canal upstream under Package- 7 (VII) of KEIP

Sr. No.	Sampling Site	Sample No.	Sampling point	Arsenic	Mercury	Lead	Cadmium	Total Chromium	Hexavalent chromium	Zinc	Nickel	Copper
				(ppm)								
1	Churial main canal upstream	1A: at slush level	0	14.18	<0.50	84.89	2.89	78.4	<0.50	301.92	47.29	110.97
		1B: 1 m below slush level		9.9	<0.50	45.12	1.09	49.3	<0.50	206.07	39.92	81.86

Sr. No.	Sampling Site	Sample No.	Sampling point	Arsenic	Mercury	Lead	Cadmium	Total Chromium	Hexavalent chromium	Zinc	Nickel	Copper
				(ppm)								
2	Churial main canal upstream	2A: at slush level	500	11.59	<0.50	29.01	<1.0	35.9	<0.50	79.97	38.87	23.55
		2B: 1 m below slush level		5.71	<0.50	38.62	<1.0	13.1	<0.50	109.02	24.26	28.98
3	Churial main canal upstream	3A: at slush level	1000	6.65	<0.50	35.92	<1.0	23.54	<0.50	113.15	34.83	15.69
		3B: 1 m below slush level		8.78	<0.50	33.23	<1.0	41.26	<0.50	104.06	45.58	30.33
4	Churial main canal upstream	4A: Slush level	1500	13.87	<0.50	90.92	<1.0	74.3	<0.50	377.41	47.96	131.67
		4B: 1 m below slush level		10.4	<0.50	46.25	2.17	47.75	<0.50	217.25	43.15	72.71
5	Churial main canal upstream	5A: at slush level	2000	7.0	<0.50	32.63	<1.0	13.14	<0.50	113.8	22.71	38.81
		5B: 1 m below slush level		7.6	<0.50	29.94	<1.0	4.09	<0.50	90.23	18.46	16.03
6	Churial main canal upstream	6A: at slush level	2500	9.17	<0.50	39.98	<1.0	44.66	<0.50	177.55	39.25	56.39
		6B: 1 m below slush level		12.4	<0.50	61.49	1.58	52.28	<0.50	220.72	37.73	80.45

Sr. No.	Sampling Site	Sample No.	Sampling point	Arsenic	Mercury	Lead	Cadmium	Total Chromium	Hexavalent chromium	Zinc	Nickel	Copper
				(ppm)								
7	Churial main canal upstream	7A:Slush level	3000	8.61	<0.50	38.52	<1.0	23.54	<0.50	94.76	38.86	21.97
		7B: 1 m below slush level		8.25	<0.50	33.79	<1.0	37.38	<0.50	101.18	44.12	39.0
8	Churial main canal upstream	8A:Slush level	3500	3.68	1.57	207.15	8.41	61.88	<0.50	309.39	37.8	130.17
		8B: 1 m below slush level		4.19	3.41	178.03	5.85	34.78	<0.50	429.96	26.13	104.98
9	Churial main canal upstream	9A:Slush level	4000	2.57	1.6	86.07	<1.0	48.02	<0.50	136.87	29.08	66.29
		9B: 1 m below slush level		4.46	1.9	165.28	2.26	87.86	<0.50	447.08	55.28	139.53
10	Churial main canal upstream	10A:Slush level	4500	2.35	<0.50	23.13	<1.0	34.91	<0.50	80.73	24.53	33.7
		10B: 1 m below slush level		2.62	0.65	35.33	<1.0	50.35	<0.50	97.41	30.27	44.69
11	Churial main canal upstream	11A:Slush level	5000	3.21	0.56	85.01	<1.0	41.79	<0.50	136.74	28.26	70.51
		11B: 1 m below slush level		3.42	<0.50	34.73	<1.0	45.69	<0.50	111.58	26.17	40.21

Sr. No.	Sampling Site	Sample No.	Sampling point	Arsenic	Mercury	Lead	Cadmium	Total Chromium	Hexavalent chromium	Zinc	Nickel	Copper
				(ppm)								
12	Churial main canal upstream	12A:Slush level	5500	2.4	0.51	27.01	<1.0	58.96	<0.50	138.2	13.19	63.57
		12B: 1 m below slush level		2.57	0.51	49.7	<1.0	59.57	<0.50	194.95	30.88	64.22
13	Churial main canal upstream	13A:Slush level	6000	8.75	<0.50	20.73	<1.0	28.03	<0.50	51.86	35.83	15.15
		13B: 1 m below slush level		3.25	0.63	33.7	<1.0	43.87	<0.50	128.49	31.66	49.7
14	Churial main canal upstream	14A:Slush level	6500	2.82	0.65	22.34	<1.0	42.14	<0.50	69.41	25.25	30.46
		14B: 1 m below slush level		2.54	<0.50	24.97	<1.0	35.74	<0.50	72.61	29.57	36.27

Appendix 5. Physico chemical properties of silt of Suti canal under Package 7(VII) of KEIP

Sr. No.	Sampling Site	Sample No.	Sampling point (chainage in m)	pH (1:2.5)	Bulk Density (gm/cc)	Sand (%)	Silt (%)	Clay (%)	Total Kjeldahl Nitrogen (%)	Available Potassium (ppm)	Phenolic Compound (ppm)
1	Suti canal	1A: at slush level	500	7.18	1.06	76.2	9.0	14.8	0.32	19.09	1.33
		1B: 1 m below slush level		7.13	0.88	74.2	11.0	14.8	0.28	21.29	<0.50
2	Suti canal	2A: at slush level	1000	6.73	1.09	78.2	11.0	10.8	0.38	22.39	<0.50
		2B: 1 m below slush level		7.82	0.94	77.2	16.0	6.8	0.18	15.24	<0.50
3	Suti canal	3A: at slush level	1500	7.4	1.11	74.2	13.0	12.8	0.27	21.19	<0.50
		3B: 1 m below slush level		6.75	1.2	77.2	9.0	13.8	0.39	24.28	<0.50
4	Suti canal	4A: Slush level	2000	7.24	1.03	78.2	11.0	10.8	0.21	27.29	<0.50
		4B: 1 m below slush level		7.36	1.11	75.2	10.0	14.8	0.31	20.69	0.85

Sr. No.	Sampling Site	Sample No.	Sampling point (chainage in m)	pH (1:2.5)	Bulk Density (gm/cc)	Sand (%)	Silt (%)	Clay (%)	Total Kjeldahl Nitrogen (%)	Available Potaaaaium (ppm)	Phenolic Compound (ppm)
5	Suti canal	5A: at slush level	2500	6.96	1.0	79.2	10.0	10.8	0.42	49.59	<0.50
		5B: 1 m below slush level		7.42	1.0	74.2	18.0	7.8	0.37	77.77	0.80
6	Suti canal	6A: at slush level	3000	7.6	1.03	87.2	7.0	5.8	0.39	46.37	<0.50
		6B: 1 m below slush level		6.7	1.11	74.2	13.0	12.8	0.26	27.94	<0.50
7	Suti canal	7A :Slush level	3500	7.77	1.15	78.2	12.0	9.8	0.29	20.39	<0.50
		7B: 1 m below slush level		7.6	1.0	76.2	15.0	8.8	0.31	77.55	<0.50
8	Suti canal	8A :Slush level	4200	6.98	0.98	79.2	11.0	9.8	0.23	49.1	<0.50
		8B: 1 m below slush level		7.65	1.15	69.2	25.0	5.8	0.19	18.68	1.16

Appendix 6. Heavy metals in canal silt of Suti canal under Package 7(VII) of KEIP

Sr. No.	Sampling Site	Sample No.	Sampling point	Arsenic	Mercury	Lead	Cadmium	Total Chromium	Hexavalent chromium	Zinc	Nickel	Copper
				(ppm)								
1	Suti canal	1A: at slush level	500	2.24	4.56	13.93	<1.0	32.21	<0.50	127.37	25.53	23.27
		1B: 1 m below slush level		4.18	0.50	18.69	<1.0	52.26	<0.50	54.39	29.94	20.59
2	Suti canal	2A: at slush level	1000	1.52	<0.50	18.19	<1.0	38.14	<0.50	61.98	28.91	31.55
		2B: 1 m below slush level				<1.0	30.39	<0.50	57.35	19.96	18.51	
3	Suti canal	3A: at slush level	1500	5.13	0.65	19.38	<1.0	21.94	<0.50	63.67	27.95	20.14
		3B: 1 m below slush level		1.98	<0.50	11.0	<1.0	28.29	<0.50	55.49	18.72	17.45

Sr. No.	Sampling Site	Sample No.	Sampling point	Arsenic	Mercury	Lead	Cadmium	Total Chromium	Hexavalent chromium	Zinc	Nickel	Copper
				(ppm)								
4	Suti canal	4A: at slush level	2000	3.84	<0.50	18.37	<1.0	37.10	<0.50	59.83	27.6	28.91
		4B: 1 m below slush level		2.58	<0.50	15.17	<1.0	42.72	<0.50	61.44	30.33	24.62
5	Suti canal	5A: at slush level	2500	3.84	<0.50	19.43	<1.0	34.64	<0.50	69.65	27.03	28.18
		5B: 1 m below slush level		2.58	1.36	21.26	<1.0	52.0	<0.50	63.38	32.75	38.0
6	Suti canal	6A: at slush level	3000	3.56	<0.50	22.54	<1.0	35.93	<0.50	74.27	27.64	20.92
		6B: 1 m below slush level		2.2	<0.50	19.14	<1.0	37.16	<0.50	70.76	29.64	30.25

Sr. No.	Sampling Site	Sample No.	Sampling point	Arsenic	Mercury	Lead	Cadmium	Total Chromium	Hexavalent chromium	Zinc	Nickel	Copper
				(ppm)								
7	Suti canal	7A: at slush level	3500	2.49	1.5	16.63	<1.0	28.26	<0.50	56.67	21.33	19.62
		7B: 1 m below slush level		0.69	<0.50	22.2	<1.0	36.52	<0.50	85.15	19.83	30.74
8	Suti canal	8A: at slush level	4200	3.73	<0.50	35.06	<1.0	39.78	<0.50	63.02	29.6	28.06
		8B: 1 m below slush level		4.41	<0.50	15.04	<1.0	36.79	<0.50	57.90	30.24	22.26

Appendix 7. Physico chemical Properties and heavy metal concentrations of Sewage silt from different S & D, STP & Pump House silt

Sample Code	SAMPLE LOCATIONS	Sand (%)	Clay (%)	Silt (%)	pH	Bulk density (gm/cc)	Phenolic compound (mg/kg)	Pb (mg/kg)	Cd (mg/kg)	Cu (mg/kg)	Cr (iii) (mg/kg)	Zn (mg/kg)	Ni (mg/kg)	Cr (vi) (mg/kg)	Hg (mg/kg)	As (mg/kg)
S-A	S & D, RK Chatterjee Lane, Ward 5	54	5	41	7.45	1.64	<1.0	37.69	<0.4	31.87	55.56	63.95	<2.4	<1.0	<0.01	<0.1
S-B	BANGUR STP No. 1	58	22	20	6.86	1.43	<1.0	95.67	<0.4	237.64	166.68	641.16	60.39	<1.0	<0.01	<0.1
S-C	BANGUR STP No 2	15	8	77	6.81	1.49	<1.0	176.84	<0.4	221.70	118.53	243.87	38.25	<1.0	<0.01	<0.1
S-D	Garden Reach STP No. 1	36	6	58	7.10	1.58	<1.0	56.80	<0.4	60.43	70.38	160.00	22.14	<1.0	<0.01	<0.1
S-E	Garden Reach STP No. 2	32	5	63	6.89	1.60	<1.0	60.88	<0.4	73.90	92.60	177.65	22.14	<1.0	<0.01	<0.1
S-F	Pumping Station near R.G.KAR	45	6	49	6.91	1.59	<1.0	<0.3	<0.4	46.20	76.30	30.12	<2.4	<1.0	<0.01	<0.1
S-G	Pumping Station, 30A bus stand	48	5	47	7.19	1.63	<1.0	<0.3	<0.4	33.70	81.90	35.60	<2.4	<1.0	<0.01	<0.1
S-H	S & D, Paikpara 1 row, ward 104	40	5	55	7.12	1.61	<1.0	28.99	<0.4	47.82	114.82	<0.7	<2.4	<1.0	<0.01	<0.1
S-I	S & D, Purba Sreepally, ward 107	10	8	82	7.50	1.48	<1.0	507.33	<0.4	40.57	62.97	113.05	<2.4	<1.0	<0.01	<0.1
S-J	S & D Garfa, B M Road, ward 107	15	7	78	7.20	1.51	<1.0	43.49	<0.4	44.92	81.49	145.35	<2.4	<1.0	<0.01	<0.1
S-K	S&D,Vivek Sarani, ward104	10	8	82	8.30	1.48	<1.0	<0.3	<0.4	<0.4	48.15	10.01	<2.4	<1.0	<0.01	<0.1
S-L	Dutta Bagan P.S. ward 3	68	7	25	7.21	1.62	<1.0	<0.3	<0.4	23.18	81.49	32.62	<2.4	<1.0	<0.01	<0.1
S-M	S&D, Lenin Sarani, ward 135	40	5	55	7.21	1.61	<1.0	<0.3	<0.4	40.39	87.60	30.62	<2.4	<1.0	<0.01	<0.1
S-N	S&D, Lenin Sarani, ward 135	52	8	40	7.31	1.56	<1.0	25.26	<0.4	41.36	55.90	39.52	<2.4	<1.0	<0.01	<0.1
S-O	S&D, Lenin Sarani, ward 139	50	10	40	7.16	1.53	<1.0	27.00	<0.4	52.08	52.60	48.67	<2.4	<1.0	<0.01	<0.1
S-P	S&D, Rashmoni Lane, ward 57	22	8	70	7.71	1.51	<1.0	78.27	<0.4	198.51	70.38	242.90	<2.4	<1.0	<0.01	<0.1
S-Q	S&D, New TangraRd, ward 58	44	5	51	7.52	1.62	<1.0	63.78	<0.4	65.21	1337.14	149.55	<2.4	<1.0	<0.01	<0.1
S-R	S&D, MID Road, ward 131	12	8	80	6.98	1.49	<1.0	37.69	<0.4	17.39	74.08	70.74	<2.4	<1.0	<0.01	<0.1
Limit		-	-	-	-	-	5000	5000	50	5000	5000	20000	5000	50	50	50

Appendix 8. Noise level monitoring at different S & D work sites (pipe laying, pumping stations and STP) of KEIP during July-December, 2008
(average of 4 readings at each site within 5 minutes taken in four cardinal directions at 2 m away from the work zone if not otherwise mentioned)

Serial no	Package no	Lot no	Borough no	Ward no	Monitoring site	Date	Mean sound level in dBA	Remarks
S & D network construction								
1	SDE		XV	139	Karbala rail line road	19.09.08	89.24	The road was closed. Work is suspended. # HP pump was working.
2	SDE		XV	139	Karbala rail line road	19.09.08	93.94	70 HP atata Hitachi machine was moving. Small vehicles were plying
3	SDE		XV	139	Jugi Para	19.09.08	62.57	Road was closed and manual work was going on
4	SDE		XV	133	Ram Nagar	19.09.08	68.13	Light vehicles were plying. Manual work was going on.
5	SDB	2	XIV	131	Airport Road (W)	23.09.08	99.49	Road was closed. 2 nos 25 H.P. pumps were running
6	SDB	2	XIV	131	Airport Road (W)	23.09.08	99.49	Road was closed. 1 no 5 H.P. and one no 6 H.P. pumps were running
7	SDB	2	XIV	131	Airport Road (E)	23.09.08	93.94	J.C.B. (67 H.P.) was in operation. There were only few cars plying
8	SDB	2	XIV	131	Airport Road (W)	23.09.08	85.99	No work was going on only Escort machine was running.
9	SDB	2	XIV	131	Rabindra Nagar (MID) Road	23.09.08	93.98	Miller was in operation. Road preparation was going on.
10	SDB	1	XIV	128	Biren Roy Road (W)	23.09.08	72.02	Light vehicles were plying. D,G. – 320 KVA was running. Other manual work was in operation.

Serial no	Package no	Lot no	Borough no	Ward no	Monitoring site	Date	Mean sound level in dBA	Remarks
11	SDB	1	XIV	128	Biren Roy Road (W)	23.09.08	72.02	Light vehicles were plying. D.G. – 320 KVA was running. Other manual work was in operation.
12	SDB	1	XIV	128	Biren Roy Road (W)	23.09.08	92.02	Light vehicles were plying. Escorts machine was running. Other manual work was in operation.
13	SDB	1	XIV	128	Biren Roy Road (W)	23.09.08	75.2	J.C.B. was in operation. Other manual work was going on. Road was closed.
14	SDB	2	XIV	131	Chata Park	23.09.08	95.28	J.C.B. & Tata Hitachi machines were in operation. Road was closed.
15	SDB	3	XIV	129	Jora Pukur (Shyam Sundar Pally)	23.09.08	88.39	2 nos pumps & 1 no Tata Hitachi machines were in operation. Other manual work was going on.
16	SDB	3	XIV	129	Begore khal	23.09.08	94.85	1 no 8 H.P. pump and 1 no Tata Hitachi machine were in operation. Other manual work was in progress
17	SDA	3	XIII	116	Chanditala branch road	23.09.08	68.24	There was no appreciable construction work going on. Light vehicles were plying.
18	SDA	3	XIII	120	Satyen Roy branch road	23.09.08	68.24	There was no appreciable construction work going on. Light vehicles were plying.
19	SDA	3	XIII	116	Chanditala branch road	23.09.08	68.24	There was no appreciable construction work going on. Light vehicles were plying.
20	SDA	3	XIII	122	Gheer Roy	23.09.08	66.87	There was no appreciable construction work going on. Light vehicles were plying.
21	SDA	3	XIII	121	Jayashree Park	23.09.08	68.24	There was no appreciable construction work going on. Light vehicles were plying.

Serial no	Package no	Lot no	Borough no	Ward no	Monitoring site	Date	Mean sound level in dBA	Remarks
22	SDB	2	XIV	131	STP west	24.09.08	63.04	No work was going. Ambient noise was monitored when construction work was not in operation.
23	SDC		XII	104	Ajanta road	25.09.08	78.81	One no 2.5 H.P. pump was in operation. Manual work was going on and road was closed
24	SDC		XI	101	Raipur road	25.09.08	79.28	Roller was in operation. Manual work was in operation and road was closed
25	SDC		XI	101	New Raipur Road	25.09.08	93.21	Hot mixer machine was in operation. Manual construction work was going on and light vehicles were plying
26	SDD		I	5	Monmotho Dutta road	25.09.08	84.5	Manual work was in progress but road was busy with traffic
27	SDF	2	VII	57	South Canal road	26.09.08	82.8	One 8 H.P. pump was in operation. No construction work was going on and road was closed
28	SDF	2	VII	57	South Canal road	26.09.08	85.12	One 8 H.P. pump was in operation. No construction work was going on and road was closed
29	SDF	2	VII	57	South Canal road	26.09.08	86.0	One 8 H.P. pump was in operation. No construction work was going on and road was closed
31	SDD	1	I	2	Seven Tank	26.09.08	84.5	One 6 H.P. pump was in operation. Manual work was in progress and light vehicles were plying.
32	SDD	1	I	2	Center Sinthi road	26.09.08	60.99	No construction work was in operation and road was closed (ambient noise)

Serial no	Package no	Lot no	Borough no	Ward no	Monitoring site	Date	Mean sound level in dBA	Remarks
33	SDD	1	I	2	Roy para bylane	26.09.08	52.73	No construction work was in operation and road was closed (ambient noise)
34	SDD	2	Dum Dum municipality		Jessore road	26.09.08	87.34	No construction work was in operation and road was closed (ambient noise)
35	SDD	1	I	2	Roy para bylane	26.09.08	57.54	No construction work was in operation and road was closed (ambient noise)
36	SDD	1	I	2	Raja Apurba Krishna Road	26.09.08	66.81	No construction work was in operation and light vehicles were moving (ambient noise)
37	SDD	1	I	2	Raja Bagan Lane	26.09.08	70.55	No construction work was in operation and light vehicles were moving (ambient noise)
38	SDE		XV		Karbala Road	21.11.08	91.46	5 Mixture machines were running. Light vehicles moving on the road. Manual work was going on.
39	SDE		XV		Karbala Road	21.11.08	85.52	10m away from the working zone. Tata Hitachi was running. Manual work was going on. Light vehicles were moving on the road
40	SDE		XV		Karbala Road	21.11.08	82.58	5 meters away from the work zone. 3 H.P. pump was running at about 10m away from the road side; manual work was going on
41	SDE		XV		Bagar khal	21.11.08	65.95	Manual work was going on. The road was closed
42	SDF	2	VII	57	Canal south road	25.11.08	78.69	4 H.P. pump was running. Light vehicles were moving on the road. Manual work was going on.

Serial no	Package no	Lot no	Borough no	Ward no	Monitoring site	Date	Mean sound level in dBA	Remarks
43	SDF	2	VII	57	Kulia Tangra Second Lane	25.11.08	77.93	4 H.P. pump was running. Light vehicles were moving on the road. Manual work was going on.
44	SDF	2	VII	57	Rani Rasmoni Bagan Lane	25.11.08	81.79	12 H.P. pump was running. Manual work was going on.
45	SDF	2	VII	58	New Tangra Road	25.11.08	79.65	12 H.P. pump was running. Manual work was going on. The road was closed.
46	SDF	2	VII	58	P. Garden Lane	25.11.08	79.6	12 H.P. pump was running. Manual work was going on. The road was closed.
47	SDF	1	VII	59	Christofer Road	25.11.08	77.93	5 meters away from working zone. 8 H.P. was running. Manual work was going on. The road was closed.
48	SDF	1	VII	59	32 Christofer Road	25.11.08	81.77	2 meters away from the working zone. * H.P. pump was running. Manual was going on. The road was closed.
49	SDF	1	VII	59	32 Christifer Road	25.11.08	82.42	8 H.P. & 3 H.P. pumps were running. Manual work was going on.
50	SDD	2	I	5	Rajkumar Chatterjee Lane	26.11.08.	88.55	6 H.P. pump was running. Manual work was going on
51	SDD	2	I	4	Paikpara 1 st Row	26.11.08	87.09	6 H.P. pump was running. Manual work was going on. The road was closed.
52	SDD	2	I	4	Paikpara 1 st Row	26.11.08	82.08	5 meters away from working zone. 6 H.P. pump was running. Work under suspension. Road was closed
53	SDD	2	I	4	Paikpara 1 st Row	26.11.08	79.8	8 meters away from working zone. 5 H.P. pump was running. Work under suspension. Road was closed

Serial no	Package no	Lot no	Borough no	Ward no	Monitoring site	Date	Mean sound level in dBA	Remarks
54	SDD	2	I	2	Seven Tank	26.11.08	82.91	5 H.P. pump was running. Manual work was going on. Road was closed.
55	SDD	2	I	2	Central Sinthee Road	26.11.08	85.1	5 H.P. pump was running. Manual was going on. Road was closed.
56	SDD	2	I		Mondal Para	26.11.08	82.08	12 meters away from the working zone. 5 H.P. pump was running. Manual work was going on. Road was closed.
57	SDD	2	I		Mondal Para	26.11.08	84.82	6 H.P. pump was running. Manual work was going on.
58	SDD	2	I	2	Raja Bagan Lane	26.11.08	69.02	No work was going on. Road was closed. Ambient noise level.
59	SDD	3	I	2	Near Sinthee thana	26.11.08	64.12	Manual work was going on. Road was closed. Almost ambient noise level.
60	SDD	2	I	2	Roy Para Bye-lane	26.11.08	68.06	No work was going on. Light vehicles were moving. Ambient noise level.
61	SDB	2	XIV	130	Brahmo Samaj Road	27.11.08	87.39	Manual work was going on. JCB was in operation. Road was closed.
62	SDB	2	XIV	131	M.I.D. Road	27.11.08	87.39	2 meters away from working zone. Manual work was going on. Hydra was in operation. Road was closed.
63	SDB	2	XIV	131	M.I.D. Road	27.11.08	87.39	Manual work was going on. JCB was in operation. Road was closed.
64	SDB	2	XIV	131	M.I.D. Road	27.11.08	75.29	20 meters away from working zone. 5 H.P. pump was running. Manual work was going on. Road was closed.
65	SDB	2	XIV	129	R. K. Sarani	27.11.08	59.44	Manual work was going on. Road was closed. Almost ambient noise.

Serial no	Package no	Lot no	Borough no	Ward no	Monitoring site	Date	Mean sound level in dBA	Remarks
66	SDB	1	XIV	128	Biren Roy Road	27.11.08	71.13	D.G. was running. Manual work was going on. Road was closed.
67	SDB	1	XIV	128	J.P. 2	27.11.08	93.29	Manual work was going on. Hydra was in operation. Road was closed.
68	SDA	2	XIII	120	Roy Bahadur Road	27.11.08	70.16	5 H.P. pump was running. Manual work was going on. Road was closed.
69	SDB	1	XIV	128	R.P.- 4	27.11.08	78.5	Tractor was in operation. Manual work was going on.
70	SDA	2	XIII	117	Roy Bahadur Road	27.11.08	71.4	5 H.P. pump was running. Manual work was going on. Road was closed.
71	SDB	1	XIV	130	In between Pathakpara & Behala thana	27.11.08	87.56	JCB was in operation. Manual work was going on.
72	SDB	II	XIV	130	Brahmo Samaj Road	27.11.08	85.39	6 H.P pump was in operation. Manual work was going on. Road was closed.
73	SDC		XII	107	Purba Shree Pally	28.11.08	92.3	Mixture machine was in operation. Manual work was going on. Road was closed.
74	SDC		XII	107	Purba Shree Pally	28.11.08	88.64	3 meters away from working zone. 5 H.P. pump was running. Manual work was going on. Road was closed.
75	SDC		XII	108	Martin para Purba Shree Pally	28.11.08	82.84	5 H.P. pump was running. Manual work was going on. Road was closed.
76	SDC		XII	106	Purba Shree Pally	28.11.08	86.89	Mixture machine was in operation, Manual work was going on. Road was closed.
77	SDC		XII	106	Garfa Bekare Mondal Road	28.11.08	85.43	5 H.P. pump was running. Manual work was going on. Road was closed.

Serial no	Package no	Lot no	Borough no	Ward no	Monitoring site	Date	Mean sound level in dBA	Remarks
78	SDC		XI	110	Srirampur Road (N), Garia	28.11.08	87.65	5 H.P. pump was running. Manual work was going on. Road was closed.
79	SDC		XII	109	Panchasayer Road	28.11.08	88.64	2 meters away from working zone. 5 H.P. pump was running. Manual work was going on. Road was closed.
80	SDC		XII	109	Panchasayer Road	28.11.08	87.3	Mixture machine was running. Manual work was going on. Road was closed.
81	SDC		XII	104	Vivekananda Sarani	28.11.08	80.45	10 meters away from working zone. Mixture machine was in operation. Manual work was going on. Road was closed.
82	SDC		XII	104	Vivekananda Sarani	28.11.08	91.3	5 H.P. pump was running. Manual work was going on. Road was closed.
83	SDE		XV	141	Lenin Sarani	17.12.08	72.15	No work was going on. Light vehicles were moving. Ambient noise level
84	SDE		XV	136	Santoshpur	17.12.08	72.15	Manual work was going on. Road was closed. Ambient noise level
85	SDA	2	XIII	119	S N Chatterjee Road	19.12.08	52.52	5 meters away from working zone. Manual work was going on. Road was closed. Almost. ambient noise.
86	SDA	2	XIII	119	S N Chatterjee Road	19.12.08	60.9	Manual work was going on. Road was closed. Almost ambient noise.
87	SDA	3	XIII	120	Bama Charan Roy Road	19.12.08	81.77	5 H.P. pump was running. Manual work was going on. Road was closed. .
88	SDA	3	XIII	121	Raja Ram Mohan Roy Road	19.12.08	86.52	10 H.P. pump was running. Manual work was going on. Road was closed. .

Serial no	Package no	Lot no	Borough no	Ward no	Monitoring site	Date	Mean sound level in dBA	Remarks
89	SDF	2	VII	57	P.B. Road	19.12.08	83.19	10 H.P. pump was running. Manual work was going on. Road was closed. .
90	SDC		XI	101	Rabindra Pally Khalpole	20.12.08	68.4	3 meters away from working zone. Pipe laying work was going on. Main road was closed but side road was open & light vehicles were moving on the road. .
91	SDC		XI	101	Rabindra Pally Khalpole	20.12.08	87.45	Pipe laying work was continuing. 5 H.P. pump was running. Manual work was going on. Road was closed.
92	SDC		XI	101	Rabindra Pally Khalpole	20.12.08	61.35	5 meters away from work zone, Pipe laying work was continuing. Manual work was going on. Light vehicles were moving on the road.
93	SDC		XII	109	Lohapul	20.12.08	75.68	5 H.P. pump was running. Manual work was going on. Road was closed.
94	SDC		XI	101	Lohapul	20.12.08	64.21	3 meters away from work zone. Manual work was going on. Light vehicles were moving on the road.
95	SDC		XII	104	Vivekananda Sarani, Garfa	20.12.08	52.05	Manual work was going on. Road was closed.
96	SDC		XII	104	Vivekananda Sarani, Garfa	20.12.08	56.55	10 meters away from work zone. Residential area. Manual work was going on. Light vehicles were moving on the road.
97	SDC		XI	110	Garfa Sabujdal Club	20.12.08	76.76	5 H.P. pump was running. No work was going on. Road was closed.

Serial no	Package no	Lot no	Borough no	Ward no	Monitoring site	Date	Mean sound level in dBA	Remarks
98	SDC		XI	110	Garfa Sabujdal Club	20.12.08	68.25	25 m away from work zone. No work was going on. Sound of loud speaker was coming from the club room. Light vehicles were moving on the road.
99	SDC		XII	107	Garfa Sabujdal Club	20.12.08	88.09	16 H.P. hot mixture machine was in operation. Light vehicles were moving on the road. Manual work was going on.
100	SDC		XII	107	Tagore Park	20.12.08	72.57	10 meters away from work zone. Light vehicles were moving. Manual work was going on.
101	SDC		XI	170	Tagore Park	20.12.08	68.59	25 meters away from work zone. Roller machine was running. Manual work was going on. Road was closed.
102	SDD	2	XI	101	G-block, near Unnayan Parishad Club	20.12.08	55.73	Residential area. Manual work was going on. Road was closed.
103	SDD	2	XI	101	G-block, near Unnayan Parishad Club	20.12.08	50.43	25 meters away from work zone. Residential area. Manual work was going on. Road was closed.
104	SDC		XII	107	Tagore Park	20.12.08	57.03	10 meters away from Roller & 25 meters away from E.M.Byepass. No work was going on. Light vehicles were moving.
105	SDC		XII	107	Tagore Park	20.12.08	57.00	10 meters away from Roller & 25 meters away from E.M.Byepass. Manual work was going on. Road closed.
106	SDD	2	I	2	Seven Tank	29.12.08	88.3	6 H.P. pump was running. Manual work was going on. Light vehicles were moving.

Serial no	Package no	Lot no	Borough no	Ward no	Monitoring site	Date	Mean sound level in dBA	Remarks
107	SDD	2	I	2	Seven Tank	29.12.08	67.773	10 meters away from work zone. Manual work was going on. Light vehicles were moving.
108	SDD	2	I	2	Seven Tank	29.12.08	66.84	20 meters away from work zone. Manual work was going on. Light vehicles were moving.
109	SDD	2	I	2	Central Sinthee	29.12.08	80.44	3 meters away from pump. 6 H.P. pump was running. Manual work was going on. Road was closed.
110	SDD	2	I	2	Central Sinthee	29.12.08	64.09	10 meters away from work zone. Manual work was going on. Road was closed.
111	SDD	2	I	2	Central Sinthee	29.12.08	54.09	30 meters away from work zone. Manual work was going on. Road was closed.
112	SDD	2	I	2	Central Sinthee	29.12.08	84.99	6 H.P. mixer machine was running. Manual work was going on. Road was closed.
113	SDD	2	I	2	Roy Para Road	29.12.08	91.04	One J.C.B. machine was running. Manual work was going on. Road was closed.
114	SDD	2	I	2	Samar Sarani	29.12.08	48.91	10 meters away from work zone. Manual work was going on. Road was closed.
115	SDD	2	I	2	South Sinthee Road	29.12.08	80.11	5 H.P. pump was running. Manual work was going on. Road was closed.
116	SDD	2	I	2	Samar Sarani & South Sinthee Road Crossing	29.12.08	70.17	10 meters away from Samar Sarani work zone & 10 meters away from South Sinthee work zone. Manual work was going on. Road was closed.
117	SDD	2	I	2	Samar Sarani	29.12.08	81.11	6 H.P. pump was running. Manual work was going on. Road was closed.

Serial no	Package no	Lot no	Borough no	Ward no	Monitoring site	Date	Mean sound level in dBA	Remarks
118	SDD	2	I	3	Paikpara	29.12.08	66.67	Road maintenance was going on. Manual work was going on. Road was closed.
119	SDD	2	I	4	Rani Debendra Bala Road	29.12.08	65.85	10 meters away from work zone. Manual work was going on. Light vehicles were running.
120	SDD	2	I	4	Rani Debendra Bala Road	29.12.08	84.26	6 H.P. pump was running. Manual work was going on. Mainroad was closed but side road was open..
121	SDD	2	I	2	Raja Bagan Lane	29.12.08	48.78	No work was going on. Two wheeler and cycle were moving.
122	SDF	2	VII	57	Canal south road	31.12.08	62.49	30 meters away from work zone. Manual work was going on. Light vehicles were running.
123	SDF	2	VII	57	Canal south road	31.12.08	82.54	40 meters away from side road. 5 H.P. pump was running. Manual work was going on. Road was closed..
124	SDF	2	VII	57	Canal south road	31.12.08	67.82	10 meters away from work zone. Manual work was going on. Road was closed..
125	SDF	2	VII	57	Canal south road	31.12.08	65.94	20 meters away from work zone. Manual work was going on. Road was closed.
126	SDF	2	VII	57	R R Bagan Lane	31.12.08	89.99	2 meters away from work zone. 20 H.P. pump was running. Manual work was going on. Road was closed.
127	SDF	2	VII	57	R R Bagan Lane	31.12.08	56.68	10 meters away from work zone. Manual work was going on. Road was closed.
128	SDF	2	VII	57	R R Bagan Lane	31.12.08	71.55	4 H.P. pump was running. Manual work was going on. Road was closed.

Serial no	Package no	Lot no	Borough no	Ward no	Monitoring site	Date	Mean sound level in dBA	Remarks
129	SDF	2	VII	57	R R Bagan Lane	31.12.08	71.02	25 meters away from work zone. Manual work was going on. Road was closed.
130	SDF	2	VII	57	Mathur Babu Lane	31.12.08	71.99	4 H.P. pump was running. Manual work was going on. Side road was open and light vehicles were running.
131	SDF	2	VII	57	Mathur Babu Lane	31.12.08	63.08	5 H.P. pump was running. Manual work was going on. Road was closed. Side road was open and light vehicles were running.
132	SDF	2	VII	57	Mathur Babu Lane	31.12.08	64.03	30 meters away from working zone. Manual work was going on. Road was closed. Side road was open and light vehicles were running.
133	SDF	2	VII	57	Mathur Babu Lane	31.12.08	55.24	20 meters away from work zone. Manual work was going on. Side road was open and light vehicles were running.
134	SDF	2	VII	57	Mathur Babu Lane & R R Bagan Lane Crossing	31.12.08	59.78	30 meters away from work zone. Manual work was going on. Side road was open and light vehicles were running.
Pumping Station								
1	SD 32		Maheshtala Municipality		Pumping station near Bat Tala Pradirhat main road	19.09.08	56.45	No work was going on
2	SD 32		Maheshtala Municipality		pumping station - M.P.S. (near Kalinagar)	19.09.08	56.45	No work was going on

Serial no	Package no	Lot no	Borough no	Ward no	Monitoring site	Date	Mean sound level in dBA	Remarks
3	SD 23		XII	108	Pumping station near Naskar Hat near show room	24.09.08	79.58	Manual work was going on. D.G. (5 H.P.) were running. Road was closed.
4	SD 25		XIII	124	Pumping station of (STP) north	24.09.08	60.97	No work was going. Ambient noise was monitored when construction work was not in operation.
5	SD 25		XIII	124	Pumping station of (STP) south	24.09.08	60.2 7	No work was going. Ambient noise was monitored when construction work was not in operation.
6	SD 27		XII	107	Pumping station near Prantik Pally (P.S. 4)	25.09.08	61.0	No construction work was in operation and the road was closed. (ambient noise)
7	SD 23		XII	108	Pumping station near Anandapur	28.11.08	55.6	Manual work was in operation. Road was closed.
8	SD 26		I	03	Dutta Bagan pumping station	29.11.08	80.66	Manual work is in operation
9	SD 26		I	02	Pumping station near 30 A bus stand	29.11.08	63.99	No work was going on. Light vehicles were running.
10	SD 32		Maheshtala Municipality		Santoshpur Pumping Station	17.12.08	57.34	No work was going on. Ambient noise level.
11	SD 27		VII	66	P.S. 4 pumping station (near Nilachal complex)	20.12.08	84.21	5 H.P. pump was running. No work was going on. Road was closed.

Serial no	Package no	Lot no	Borough no	Ward no	Monitoring site	Date	Mean sound level in dBA	Remarks
12	SD 27		VII	66	P.S. 4 pumping station (near Nilachal complex)	20.12.08	56.1	Manual work was going on. Road was closed.
13	SD 27		VII	66	P.S. 4 pumping station (near Nilachal complex)	20.12.08	61.83	20 meters away from pump. 5 H.P. pump was running. No work was going on. Road was closed.
14	SD 26		I	6	Cossipur pumping station	30.12.08	60.51	No work was going on. Side was open. Light vehicles were running.
15	SD 26		I	6	Cossipore pumping station	30.12.08	59.47	20 meters away from work zone. Manual work was going on. Light vehicles were running.
16	SD 23		I		Pumping station near 30 A bus stand	30.12.08	62.48	No work was going on. Side road was open. Light vehicles were running.
17	SD 23		I		Pumping station near 30 A bus stand	30.12.08	67.43	20 meters away from work zone. Manual work was going on. Light vehicles were running.
18	SD 26		I	3	Birpara pumping station	30.12.08	56.52	Near Dumdum Metro railway station. No work was going on.
19	SD 26		I	3	Birpara pumping station	30.12.08	54.12	10 meters away from work zone. Manual work was going on. Road was closed..
20	SD 23		XII	107	Pumping station near Rajdanga	31.12.08	77.89	Manual work was going on. Light vehicles were moving.

Serial no	Package no	Lot no	Borough no	Ward no	Monitoring site	Date	Mean sound level in dBA	Remarks
STP								
1	SD 25		XII	124	South Suburban East STP	24.09.08	60.97	No work was going on. Ambient noise level.
2	SD 25		XII	124	South Suburban East STP at a different location around the STP	24.09.08	60.97	No work was going on. Ambient noise level.
3	SD 30		Maheshtala municipality		Garden Reach STP near RYP line	21.11.08	57.1	Manual work was going on
4	SD 29		South Dum Dum municipality		Bangur STP near VIP road	26.11.08	50.94	Work under suspension. Ambient noise level.
5	SD 30		Maheshtala municipality		Garden Reach STP	17.12.08	82.26	Tata Hitachi machine was in operation. Other manual work was going on. Light vehicles were moving on the road.
6	SD 29		South Dum Dum municipality		Bangur STP near VIP road	20.12.08	54.06	Only manual work was going on.
7	SD 29		South Dum Dum municipality		Bangur STP near STP pumping station	20.12.08	51.85	Only manual work was going on.

Appendix 9. Noise level monitoring at different work sites of Canal works and canal pumping stations under KEIP during July-December, 2008

(average of 4 readings at each site within 5 minutes taken in four cardinal directions at 2 m away from the work zone if not otherwise mentioned)

Serial no	Package no	Lot no	Borough no	Ward no	Monitoring site	Date	Mean sound level in dBA	Remarks
1	CW 12A				Keorapukur Canal	18.09.08	83.19	No construction activity was going on. A few vehicles were plying on the nearby road. (ambient noise).
2	CW 12B			123	Prasanta Roy Road	18.09.08	69.34	No construction activity was going on. A few vehicles were plying on the nearby road. (ambient noise).
3	CW12B			124	Purba para (Barisha)	18.09.08	68.91	No construction activity was going on. The adjoining road was closed (ambient noise).
4	CW13			124	M.G.Road (near hospital)	18.09.08	90.26	The road was closed but one 200 H.P. Tata Hitachi machine was in operation.
5	CW13			124	M.G.Road (near hospital)	18.09.08	91.25	The road was closed and one 210 H.P. Tata Hitachi machine was in operation.
6	CW13			124	M.G.Road (near hospital)	18.09.08	93.77	The road was closed and one 210 H.P. Tata Hitachi machine was in operation.
7	CW11		Maheshtala municipality		Kankuli Ghosh para	19.09.08	88.93	No construction activity was going on. One Tata-Hitachi machine was moving.
8	CW11		Maheshtala municipality		Kankuli Ghosh para	19.09.08	88.93	No construction activity was going on. One Tata-Hitachi machine was moving.
9	CW10			132	C.P.T. canal	19.09.08	93.81	One 70 H.P.J.C.B machine is in operation..
10	CW 15				Rabindra Kanan Sishu Udyan	22.09.08	52.89	No work is in progress in the nearby work site (ambient noise in the park)
11	CW15				Rabindra Park (Pujali)	22.09.08	95.69	One L & T Kometsu – PC – 130 machine was moving

Serial no	Package no	Lot no	Borough no	Ward no	Monitoring site	Date	Mean sound level in dBA	Remarks
12	CW15				Churial Main Canal	22.09.08	94.98	One L & T Kometsu – PC – 130 machine was moving
13	CW15				Gobar Jhuri Bridge	22.09.08	92.12	One 110 H.P. Tata Hitachi machine was in operation
14	CW14				Khan Beriya (Khalpole)	22.09.08	68.61	One Dozer was in operation. The road was closed.
15	CW 15				Mitha Pole	22.09.08	92.29	Onr J.C.B., 2 nos Tata Hitachi and 2 nos Kometsu were in operation.
16	CW 08		XII	106	C.C. canal (W) P. Majumder bridge	24.09.08	96.28	One Tata-Hitachi machine was in operation.
17	CW 05			108	T.P. main canal	24.09.08	94.0	Manual work was in operation. Miller machine was running.
18	CW 05			108	T.P. main canal.	24.09.08	78.87	Manual work was going on. One Roller was in operation
19	CW 09		XII		House Canal Road (Santosh Park)	24.09.08	63.83	No construction work as going on. (ambient noise level)
20	CW 09		XI		Baghajatin station	24.09.08	56.05	No construction work as going on. (ambient noise level)
21	CW 09		XI	133	Santoshpur lohapul	24.09.08	68.87	No construction work as going on. (ambient noise level)
22	CW 01			108	Chowbhaga (W)	24.09.08	56.46	No construction work as going on. Light vehicles were moving in the nearby road. (ambient noise level)
23	CW 01			108	Chowbhaga (W)	24.09.08	82.09	No construction work as going on. One Tata Hitachi machinewas moving. Light vehicles were also moving in the nearby road.

Serial no	Package no	Lot no	Borough no	Ward no	Monitoring site	Date	Mean sound level in dBA	Remarks
1	CW01				Monikhal canal new pole	21.11.08	87.52	10 m away from work zone; Komastu was running. Light vehicles were running
2	CW01				Monikhal canal new pole	21.11.08	99.53	D.G (3 KVA) was running.
3	CW 10			131	CPT canal (CH-2490)	21.11.08	82.69	2 meters away from work zone. Tata Hitachi was running. Light vehicles were running
4	CW 10			131	CPT canal (CH-2490)	21.11.08	83.58	JCB was in operation. Vehicles were moving.
5	CW 12 B			124	Churial (Ex) canal	22.11.08	86.33	Mixture machine was running. Road was closed.
6	CW 12 B			124	Churial (Ex) canal	22.11.08	84.9	3 meters away from work zone. 2 H.P. Pump was running. Road was closed.
7	CW 14			Asuthi panchayet	Asuthi	22.11.08	48.38	Work under suspension. Ambient noise level.
8	CW 13			Racha Punja Panchayet	Racha Punja	22.11.08	54.02	Work under suspension. Ambient noise level
9	CW12A			114	Kudghat	22.11.08	83.77	5 meters away from work zone. Mixture machine was running. Manual work was going on.
10	CW12A			114	Kudghat	22.11.08	89.19	Vibrator machine was running. Manual work was going on.
11	CW01			108	Chowbhaga Pumping Station	29.11.08	87.99	Mixture machine was running. Manual work was going on. Road was closed.
12	CW01			108	Chowbhaga pumping station	29.11.08	76.05	10 meters away from work zone. Excavator was running. Road was closed

Serial no	Package no	Lot no	Borough no	Ward no	Monitoring site	Date	Mean sound level in dBA	Remarks
13	CW 05		XII	107	Rajdanga canal	29.11.08	75.91	5 meters away from work zone. Tata Hitachi was running.
14	CW05			107	Rajdanga Canal	29.11.08	82.05	Tata Hitachi was running.
15	CW08			107	P.Majumdar Road	29.11.08	88.35	Tata Hitachi was running
1	CW 01				Monikhali Canal New Pole	17.12.08	79.65	Komatsu was running. Light vehicles were moving
2	CW 10				New Monikhali (CH 390)	17.12.08	83.23	JCB was running beside the khal.
3	CW 15				Nishndapur village	17.12.08	80.0	L & T Kamatsu was running
4	CW 15				Nishndapur village	17.12.08	78.17	3 meters away work zone. L & T Kamatsu was running
5	CW 12A				Kudghat	18.12.08	86.75	10 meters away from work zone. Mixture machine was running.
6	CW 12A				Kudghat	18.12.08	81.65	5 H.P. pump was running. Light vehicles were moving on the road.
7	CW 14			123	Chuangar bone	18.12.08	85.43	5 H.P. mixture machine was running. Road was closed.
8	CW 12B			124	Purba para	18.12.08	96.19	5 H.P. mixture machine was running. Road was closed.
9	CW 01			108	Chowbhaga pumping station	30.12.08	42.85	No work was going on. Road was closed. Ambient noise level
10	CW08			107	South Purbachal	30.12.08	74.46	5 meters away from work zone. Witch & Rastoda machine was running. Road was closed.
11	CW 08			107	South Purbachal	30.12.08	80.16	Welding D.G. was running

Serial no	Package no	Lot no	Borough no	Ward no	Monitoring site	Date	Mean sound level in dBA	Remarks
12	CW 08			107	South Purbachal (Ch-54)	30.12.08	61.37	10 meters away from work zone
13	CW 08			107	South Purbachal	30.12.08	55.08	20 meters away from work zone