Due Diligence Report on Environment Safeguards

February 2016

BAN: Railway Sector Investment Program – Tranches 1, 2 and 3

Prepared by Bangladesh Railway for People's Republic of Bangladesh and the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of February 2016)

Currency unit	–	Bangladesh Taka (BDT)
BDT1.00	=	$.012874
$1.00	=	BDT 77.67500

ABBREVIATIONS AND ACRONYMS

ADB	-	Asian Development Bank
ADF	-	Asian Development Fund
BG	-	Broad Gauge railway track where distance between rails is 1.676 metres
BOD	-	Biological Oxygen Demand (Biochemical Oxygen Demand)
BOQ	-	Bill of Quantities
BR	-	Bangladesh Railway
BRSIP	-	Bangladesh Railway Sector Improvement Program
BUET	-	Bangladesh University of Engineering and Technology
BWQS	-	Bangladesh Water Quality Standard
CBI	-	Computer Based Interlocking
CO	-	Carbon Monoxide
COD	-	Chemical Oxygen Demand
CREC	-	China Railway Group Ltd (Contractor)
CSC	-	Construction Supervision Consultant
DFID	-	Department for International Development (UK)
DO	-	Dissolved Oxygen
DOE	-	Department of Environment
DORP	-	Development Organisation of the Rural Poor (NGO)
DPP	-	Development Project Proforma/Proposal
ECNEC	-	Executive Committee of National Economic Council
EMP	-	Environmental Management Plan
EMR	-	Environmental Monitoring Report
EMWS	-	Environmental Management Implementation Works Schedule
FC	-	Faecal Coliform
GCC	-	General Conditions of Contract
GM/PD	-	General Manager/Project Director, Bangladesh Railway
GOB	-	Government of Bangladesh
IA	-	Implementing Agency
IEC	-	Impacted Environmental Components
IPC	-	Interim Payment Certificate
JICA	-	Japan International Cooperation Agency
KMC	-	Knowledge Management Consultants Ltd (NGO)
MFF	-	Multitranche Financing Facility
MG	-	Metre Gauge railway track where distance between rails is 1 metre
NGO/INGO	-	Non Governmental Organisation
OCR	-	Ordinary Capital Resources
OFC	-	Optical Fibre Cable
PCC	-	Particular Conditions of Contract
PD	-	Project Director
RDPP	-	Revised Development Project Proforma/Proposal
PFR	-	Project Financing Request

PM	-	Project Manager
PM10	-	Particulate Matter (≤ 10 micrometers or less)
PSC	-	Pre-stressed Concrete
ROW	-	Right of Way
RDC	-	Rural Development Council (HIV/AIDS NGO)
RP	-	Resettlement Plan
SIEE	-	Summary Initial Environmental Examination
SMEC	-	SMEC International Pty Ltd, Australia
TBDLP	-	Tongi-Bhairab Bazar Double Line Project
TDS	-	Total Dissolved Solids
TP	-	Total Phosphates
TSS	-	Total Suspended Solids
WHO	-	World Health Organisation

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I. INTRODUCTION

A. Report Purpose and Rationale

1. Environmental due diligence of ongoing tranches is a requirement of the Asian Development Bank (ADB) for a multi-tranche financing facility (MFF) during processing of subsequent tranches, as provided in Para 29, Section H, Multitranche Financing Facility, OM Section D14/OP issued on 17 February 2015. This EDD is a requirement for the processing of the Periodic Financial Request 4 (PFR4). Environmental due diligence (EDD) is a process of identifying environmental problems to avoid or manage risks that could result in increased costs for making the project comply with environmental regulations and address third-party damages. EDD helps ADB to determine whether the investments are ready for financing by allowing the early identification of potential sources of environmental risks and liabilities and avoid damage to corporate's reputation.

2. This EDD report assesses the compliance of tranches 1, 2 and 3 against GoB environmental policies, laws, and regulations particularly Environmental Conservation Act 1995 and the ADB's Environment Policy 2002 and Safeguard Policy Statement (SPS), 2009 as translated into provisions of the Environmental Assessment and Review Framework (EARF), Environmental Management Plan (EMP), and Environmental Monitoring Plan (EMoP). The subprojects falling under the earlier tranches are listed in table 1. The scope of PFR 4 will finance the funding gap due to cost overrun under subproject 1 and 2 to complete; i) 64-km Tongi-Bhairab Bazar Double Track, ii) rehabilitation of yards and extension loops at different stations in Darsana-Ishurdi, Sirajganj Bazar section, and iii) improvement of signaling in Darsana, Ishurdi section.

Table 1: Subprojects under earlier tranches

Sub-project	Tranches		
	1	2	3
1. Tongi-Bhairab Bazar Double Track Project including cost overruns	■	■	
2. Rehabilitation of Yards and Extension of Loops at stations in Darsana-Ishurdi-Sirajganj Bazar		■	
3. Signalling on 11 Stations Between Ishurdi-Darsana		■	
4. Procurement of Rolling Stock			■

B. The Bangladesh Railway Sector Investment Program

3. A framework financing agreement (FFA) for the Railway Sector Investment Program (RSIP) was signed on 7 September 2006 between the Government of Bangladesh and the Asian Development Bank (ADB) with a loan amount of $430 million. RSIP is structured in four tranches:

a. Tranche 1[1] was approved on 13 February 2007 with a total of $130 million to finance: i) Construction of the Tongi-Bhairab Bazar double track (subproject 1) and ii) railway reform.

[1] Loan 2316 and 2317

b. Tranche 2[2] with a loan for $150 million was approved on 22 December 2011 for financing i) funding gap due to cost overrun under subproject 1, ii) rehabilitation of yards and extension of Loops at Different Stations in the Darsana-IshurdiSirajganj Bazar Section (subproject 2), (ii) upgrading of Signaling at 11 stations between Ishurdi and Darsana (subproject 3), and (iii) construction supervision consulting services for subprojects 2 and 3.

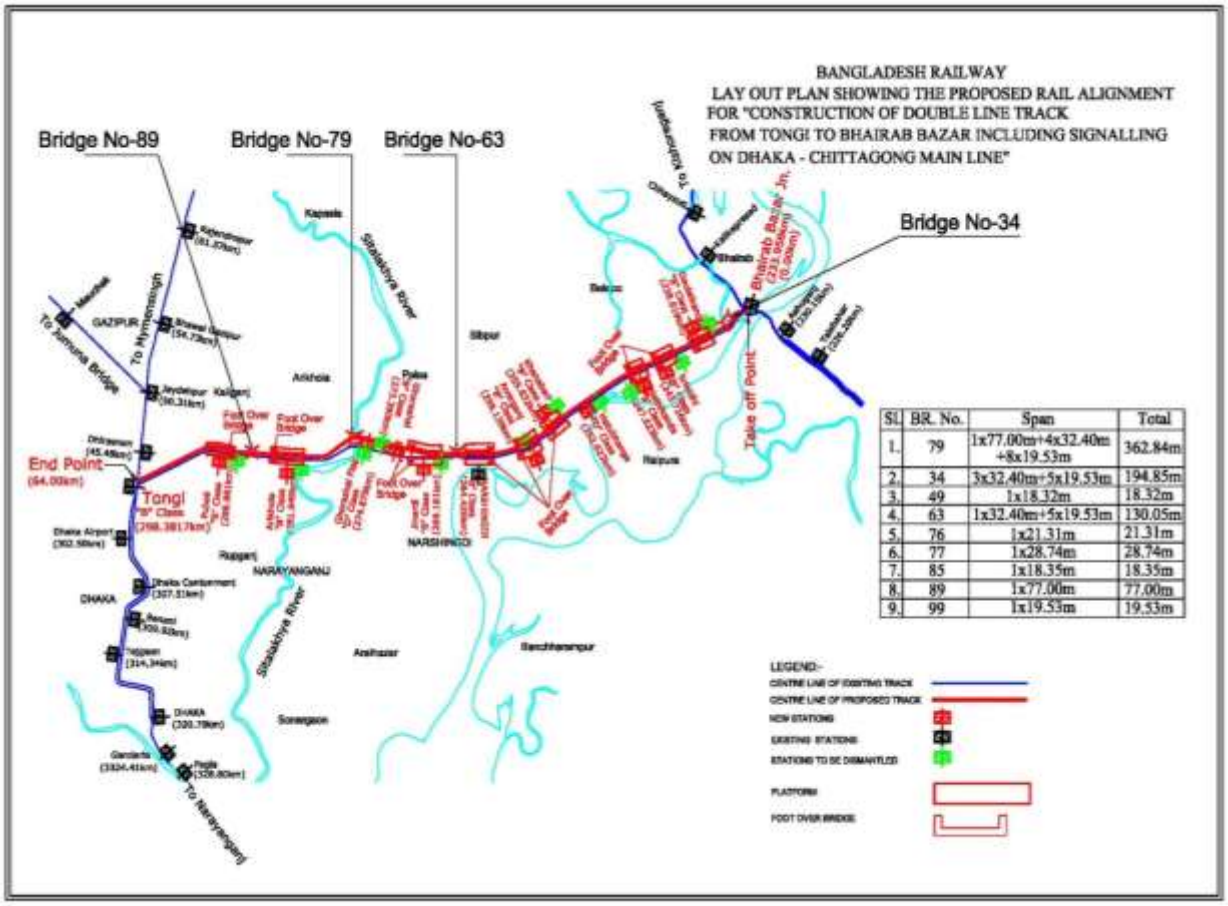
c. Tranche 3[3] with a loan for $100 million was approved on 9 December 2013 for financing the procurement of rolling stock.

C. Project Location and Scope

1. Subproject 1: Tongi-Bhairab Bazaar double track

4. The line from Tongi to Bhairab Bazar passes 14 railway stations and the Project area is administratively located in 3 districts: Gazipur, Narsingdi and Kishoreganj as shown in figure 1.

Figure 1: Project Location Plan



[2] Loan 2845
[3] Loan 3097

5. The scope of the Tongi-Bhairab Bazar Double Line Project (TBDLP) and the major project activities are summarized as follows:

(i) Construction of 64 km of main line and 22 km of loops and sidings involving widening of embankment and construction of new embankment for bridge approaches alongside the existing operating main line. The embankment is to be constructed to accommodate future broad gauge (BG) tracks.

(ii) About 2 million cubic metres of new embankment from the ROW and river dredging).

(iii) Construction of new Metre Gauge (MG) track with 90A rails for the down-line including new loops and sidings at stations involving 64 km of main line and 22 km of loops and sidings.

(iv) Construction of 40 new bridges and 31 new culverts.

(v) Construction of 10 station buildings, platforms, platform sheds, several foot overbridges and remodelling of station yards.

(vi) Modernisation of signalling systems of 12 stations involving the Supply and installation of computer based interlocking (CBI) signalling system with associated telecommunications facilities at these stations.

(vii) Relocation of overhead electricity wire crossings and underground utility crossings affecting construction works. Construction of 37 Level Crossings including Gate Goomties and Equipment Rooms for Signalling.

(viii) Construction and upgrading of access roads to the stations

2. Subproject 2: Rehabilitation of yards and extension of loops Lines at Darsana-Ishurdi-Siraganj Bazar BG Section

6. The scope of this subproject include the rehabilitation of yards, increasing lengths of the loops and siding lines of a priority list of 8 stations (Table 2) that lie in Darsana-Ishurdi-Sirajganj Bazar for strengthening the holding capacity of the stations, and for increasing the throughput capacity of the section (Table 3). The following works are proposed:

1. Darsana-Ishurdi Junction Section:
   - Loops to be extended/reconstructed: 9 loops at 5 stations;
   - Rehabilitation of the loops involved in extension; and
   - Rehabilitation of yard lines: Darsana 4, Ishurdi Junction 6.

2. Ishurdi-Sirajganj Section:
   - Rehabilitation of yard lines: 3 lines (Sirajganj Bazar yard)

Table 2: Description of the loop at the selected eight railway stations (eight subprojects)

Name of Station	Description of Loop (km)			
	Extension of Loop (km)	Rehabilitation of Loop(km)	Re-construction of Loop(km)	Total (km)
1.Darsana	-	4.15	-	4.15
2.Chuadanga	0.105	1.475	-	1.58
3.Alamdanga	-	-	1.44	1.44
4.Halsa	0.167	1.44	-	1.61
5.Mirpur	-	-	1.44	1.44
6.Bheramara	0.15	1.44	-	1.59
7.Ishurdi Junction	-	4.20	-	4.20
8.Sigrajganj Bazar	-	2.25	-	2.25
Total:	**0.422**	**14.95**	**2.88**	**18.36**

7. This sub-project on extension, rehabilitation and re-construction of loop lines mainly include:

(i) Extension, rehabilitation of loop lines with BS 90A new rails, new steel sleepers with elastic rail clip (ERC) and other fittings;
(ii) Installation of BG turnouts and trap points;
(iii) Ballasting of track; and
(iv) Extension and rehabilitation of embankment where necessary

8. These activities will be implemented in the locations listed in table 3:

Table 3: List of Stations to be improved

Sl. No.	Subprojects (Stations)	Subproject Activities
1.	Darsana Railway Station	Rehabilitation (R)= 4167 m
2.	Chuadanga Railway Station	R= 1541 m, Extension (Ex)=105 m and Dismantling (D)= 115 m
3.	Alamdanga Railway Station	R= 112 m, Re-construction (RC)= 1652 m, D= 376 m
4.	Halsa Railway Station	R=1527 m, Ex= 137 m, D= 146 m
5.	Mirpur Railway Station	R= 170 m, RC= 1633 m, D= 314 m
6.	Bheramara Railway Station	R= 1583 m, Ex= 151 m, D= 310 m
7.	Ishurdi Railway Station	R= 4827 m
8.	Sirajganj Bazar Station Yard	R= 2217 m, Ex= 566 m

3. Subproject 3: Signalling on 11 Stations Between Ishurdi-Darsana

9. The sub-project will install computer based interlocking (CBI) color light signaling at 11 stations as part of the railway modernization with the following components:

(i) Signaling with block communication system
(ii) Supply, installation and commissioning of Tokenless block working and communication system
(iii) Level crossing gate
(iv) Storage and safeguard of equipment, materials, and supplies

10. The selected 11 railway stations are located in the West Zone of BR. The names of the stations and administrative locations are provided in Table 4.

Table 4: Stations for improvement of signaling

Sl. No.	Railway Stations	Administrative Location	GPS Coordinate
1.	Darsana Railway Station	Darsana, Uz-Damurhuda, Dist-Chuadanga	23°31'35.69"N 88°47'49.40"E
2.	Darsana Junction	Darsana, Uz-Damurhuda, Dist-Chuadanga	23°32'38.17"N 88°48'7.70"E
3.	Jayrampur Railway Station	Jayrampur, Uz-Damurhuda, Dist-Chuadanga	23°34'14.43"N 88°48'35.02"E
4.	Chuadanga Railway Station	Chuadanga, Uz-Chuadanga Sadar, Dist-Chuadanga	23°38'22.82"N 88°51'23.18"E
5.	Munshiganj Railway Station	Munshiganj, Uz-Alamdanga, Dist-Chuadanga	23°42'56.72"N 88°53'36.73"E
6.	Alamdanga Railway Station	Alamdanga, Uz-Alamdanga, Dist-Chuadanga	23°45'40.29"N 88°56'11.21"E
7.	Halsa Railway Station	Halsa, Uz-Mirpur, Dist- Kushtia	23°48'54.16"N 88°59'29.00"E
8.	Mirpur Railway Station	Mirpur, Uz-Mirpur, Dist-Kushtia	23°56'29.62"N 88°59'49.59"E
9.	Bheramara Railway Station	Bheramara, Uz-Bheramara, Kushtia	24° 1'23.33"N 88°59'31.09"E
10.	Paksey Railway Station	Paksey, Uz-Ishurdi, Dist-Pabna	24° 4'14.73"N 89° 2'27.29"E
11.	Ishurdi Railway Station	Ishurdi, Uz-Ishurdi, Dist-Pabna	24° 7'49.69"N 89° 3'45.56"E

D. Implementation Progress as of December 2015

Table 5: Physical progress and Disbursement

Sub-project	Physical Progress	Disbursement
1. Tongi-Bhairab Bazar Double Track Project including cost overruns	95%	95%
2. Rehabilitation of Yards and Extension of Loops at stations in Darsana-Ishurdi-Sirajganj Bazar	99%	99%
3. Signalling on 11 Stations Between Ishurdi-Darsana	99%	99%
4. Procurement of Rolling Stock	1%	1%

11. As shown in Table 5 substantial progress has been achieved under subproject 1, 2 and 3. Disbursement for subproject 4 is expected to start during the first quarter of 2016 and compete by third quarter of 2016.

E. Environmental Categorization, Assessments, and Reporting

12. Tranche 1 of the MFF was categorized as B in accordance to the ADB's Environment Policy 2002 and Guidelines on Environmental Assessment which was the applicable safeguard policy in 2007. Tranche 2 was classified as Category B and tranche 3 as category C under to the ADB SPS which became effective in 2010. A summary IEE[4] was prepared and disclosed in

[4] http://www.adb.org/sites/default/files/project-document/66849/32234-023-ban-siee.pdf

September 2006 for Subproject 1, Tranche 1 on Tongi-Bhairab Bazar Double Track Project. Under Tranche 2 an IEE report[5] for Subproject 2 on the Rehabilitation of Yards and Extension of Loops at Different Stations in Darsana — Ishurdi — Sirajganj Bazar Section was prepared and disclosed in October 2011 in compliance to SPS 2009. Subproject 3, Tranche 2 Signalling on 11 Stations Between Ishurdi-Darsana, and Subproject 4, Tranche 3, Procurement of Rolling Stock were categorized as C.

13. A total of 6 annual and semi-annual monitoring reports have been prepared for the subproject 1 and disclosed on the ADB website in compliance to EARF and loan covenants These monitoring reports cover the periods of: December 2011 - October 20126, November 2012 - August 20137, September 2013 - June 20148, July – December 2014[9], January – June 2015[10] and July – December 2015[11]. One annual environmental monitoring report covering the period of January – December 2015 has been prepared for subproject 2 and disclosed on the ADB website.

14. Mainly due to the time gap between the IEE review and approval and the start of construction, the environmental management plans (EMPs) of Tranches 1 and 2 were updated by the CSC to better guide the Contractor implement the needed mitigation and monitoring measures. These EMPs for the 2 category B sub-projects substantially expanded the previous EMP. The revised EMPs were incorporated into the detailed design and the tender documents and have then become a part of the civil works contract. The cost for the implementation of the EMP has been included in the Contract and the approved Revised Development Project Proforma/Proposal (RDPP). The updated EMP for Tranche 1 was approved by ADB in 2008 and was included in the tender documentation in 2008. The updated EMP for Tranche 2 subproject 2 was revised in May 2014.

F. Institutional Setup and Responsibilities

15. The Executing Agency for the Project is the Bangladesh Railway represented by General Manager/Project Director TBDLP. The Contractor for subproject 1 is the China Railway Group Ltd (CREC) represented by the Contractor's Representative in Dhaka, while the contractor for subproject 2 is GDCL – Dienco Joint Venture and subproject 3 is Ircon International Limited. The Implementation Consultant is SMEC and Associates represented by the Team Leader/Project Manager who has also been delegated as "The Engineer" under the Contract. The responsibilities of each organisation during the various Phases of the Project are shown in Table 6 below.

Table 6: Environmental Responsibility Matrix

Phase	Agency	Contact	Responsibility	Deliverables
Design/ Preconstruction	Executing Agency: (BR)	General Manager/ Project Director	Preparation of EMP. Incorporation of EMP clauses	
	Design	Team Leader/		EMP, Bidding

[5] http://www.adb.org/sites/default/files/project-document/60563/32234-043-ban-iee-01.pdf
[6] http://www.adb.org/sites/default/files/project-document/77435/32234-023-ban-emr-01.pdf
[7] http://www.adb.org/sites/default/files/project-document/79940/32234-023-emr-02.pdf
[8] http://www.adb.org/sites/default/files/project-document/100119/32234-043-023-emr-03.pdf
[9] http://www.adb.org/sites/default/files/project-document/156389/32234-043-sddr.pdf
[10] http://www.adb.org/sites/default/files/project-document/175926/32234-043-emr-04.pdf
[11] http://www.adb.org/sites/default/files/project-document/178480/32234-043-esmr-01.pdf

Phase	Agency	Contact	Responsibility	Deliverables
	Consultant: SMEC & Associates	Project Manager	into bidding documents. Reporting to ADB.	Documents
Construction	Executing Agency: (BR)	General Manager/ Project Director	Monitoring of EMP Implementation, Audit and Reporting to ADB.	Monthly, Quarterly Reports. Semi-Annual Reports to ADB.
	Implementation Consultant: SMEC & Associates	Team Leader/ Project Manager		
	Contractor: China Railway Group Ltd (CREC) for Tranche 1, and subproject 2 is GDCL – Dienco Joint Venture and subproject 3 is Ircon International Limited, Tranche 2	CREC Representative	Implementation of Mitigation Measures and internal monitoring & reporting	Monthly Reports
	INGO: DORP	DORP Team Leader	Execution of RP	Monthly Reports
	NGO: RDC	RDC Team Leader	Delivery of HIV/AIDS Awareness Program	Monthly Reports
	Independent 3rd Party RP monitor:	KMC Managing Director	Monitoring of execution & Compliance of UFRP	Inception Report, Bi-Annual Report, Final Report.
Operation / Post Construction	Executing Agency: (BR)	General Manager/ Project Director	Monitoring of EMP Implementation,	

G. Compliance with ADB Guidelines, Environmental Assessment Review Framework (EARF)

16. The BRSIP complied with the ADB Environmental Assessment (EA) Policy 2002[12] and ADB SPS 2009 environmental safeguards requirements:

- Tranche 1 was classified as environment category B as it involved substantial physical works for double tracking of the rail line between Tongi and Bhairab

[12] At the time of the approval of Tranche 1 the applicable environment safeguard policy was the ADB Environmental Assessment Policy 2002. The ADB Safeguard Policy Statement 2009 governs safeguards requirements for Tranche 2

Bazaar, but did not involve encroachment on any protected area or other forms of environmentally sensitive areas. An SIEE as required by the EA Policy 2002 was prepared and disclosed on the ADB website.

- Tranche 2 was screened using appropriate REA checklist and based on potential impacts the Rehabilitation of Loop Lines at Darsana-Ishurdi-Siraganj Bazar BG Section (sub-project 2) was considered as Category B while the Computer Based Interlocking Colour Light Signalling System on Turnkey Basis at 11 Stations in Ishurdi-Darsana Section of Bangladesh Railway (sub-project 3) was Category C. An IEE report was prepared for the Rehabilitation of Loop Lines at Darsana-Ishurdi-Siraganj Bazar BG Section (sub-project 2) reviewed, and disclosed in the ADB and BR websites

- Sub-project 4, Tranche 3 Procurement of Rolling Stock was classified as environment category C.

- The bid document for the Rehabilitation of Loop Lines sub-project included the EMP

17. The EARF also mentions the need for the Reform Project under the MFF to include institutional strengthening and capacity building within BR to address safeguard issues. Accordingly under the delineation of Line of Business (LOB) under BR, a safeguards cell has been created with 2 safeguard officers for Resettlement and social issues and 2 officers for environment safeguard issues.

18. Schedule 5 of FFA stipulated environmental considerations[13]. The project's compliance with contractual environmental safeguards requirements are shown in the succeeding Table 7. Substantial compliance was achieved by the BRSIP on the environmental provisions of the FFA.

Table 7: Compliance with Environmental Considerations of FFAs of 2006

Clause & Para No.	Loan Condition	Compliance by the project
1	BR shall ensure that the Investment Project, each Investment Subproject and all Investment Project facilities are developed, conducted, implemented and maintain in accordance with all applicable laws and regulations, including the Borrower's *Environmental Conservation Act 1995*, and *ADB's Environment Policy (2002)*. If there is any discrepancy between the Government's laws and regulations, and *ADB's Environment Policy,* then the ADB's Policy requirements shall apply. BR shall ensure that all Investment Subprojects comply with and incorporate all mitigation measures required by *ADB's Environment Policy*, and the Initial Environmental Examination (IEE), including preparing an Environmental Management Plan (EMP) for the Investment Project and each Investment Subproject. All civil	**Complied**. Initial Environmental examination (IEE) including Environmental Management Plan (EMP) have been prepared for the Investment Project (Project-1) and each Investment Subproject in accordance with all applicable laws and regulations, including the Borrower's *Environmental Conservation Act 1995*, and *ADB's SPS 2009*. The recommendations of IEE & EMP have been incorporated in the

[13] These clauses are the environmentally specific Loan Covenants in the Legal Agreement

Clause & Para No.	Loan Condition	Compliance by the project
	works and consultant contracts shall contain provisions that reflect these requirements. For the follow up Investment Subprojects, the BR shall ensure that an IEE or Environmental Impact Assessment (EIA), as applicable, is prepared in accordance with the Borrower's requirements and *ADB's Environment Policy.* BR shall ensure that all IEEs or EIAs, as applicable, are approved by the Borrower following its approval procedures.	construction contract of Subproject 1 and 2. Environmental clearance required only for subproject 1, was issued and renewed periodically.
2	For each Investment Subproject for which an IEE has not been prepared, BR shall prepare an IEE or EIA, as applicable, which includes an EMP specific to that Investment Subproject. Prior to civil works contracts being awarded for the Investment Subproject, BR shall ensure that IEE or EIA, as applicable: (a) are based on the Investment Project IEE prepared during Investment Project preparation and follow the Environmental Assessment and Review Procedures set forth in the IEE; (b) meet *ADB's Environment Policy* requirements; (c) include details of local consultation carried out before and during IEE or EIA, as applicable, preparation; and (d) are approved by the appropriate authority of the Borrower for environmental compliance before being submitted to ADB for approval. For Investment Subprojects confirmed by ADB as environmentally sensitive (i.e., Category A or B sensitive under *ADB's Environment Policy*), the Investment Subproject proposal and the IEE or EIA, as applicable, shall be forwarded to ADB for review (as well as an environmental impact assessment if it is determined that there will be a significant environmental impact) and the Summary Environmental Impact Assessment (SEIA) or shall be made available to the general public at least 120 days before each Investment Subproject is approved.	**Complied**. Initial Environmental examination (IEE) including Environmental Management Plan (EMP) have been prepared for the Investment Projects (subproject 1 and 2) and each Investment Subproject in accordance with all applicable laws and regulations, including the Borrower's *Environmental Conservation Act 1995*, and *ADB's Environment Policy (2002)* for Tranche 1 and SPS 2009 for Tranche 2. Both the IEE and EMP prepared for the Investment Subprojects has been approved by BR, DOE and ADB.
3	The Borrower and BR shall ensure that the contract documents for all civil works under the Investment Project includes specific measures as indicated in the IEE and Summary Initial Environmental Examination (SIEE) or EIA and SIEA, as applicable, and in accordance with *ADB's Environment Policy* to mitigate negative environmental impacts caused by the construction and to give due consideration to prevention of damage to the natural environment in the design, construction, operation and maintenance of	**Complied**. The recommendations of IEE & EMP including EMP budget have been incorporated in the construction contract of subproject 1 and 2. Change in alignment was not necessary.

Clause & Para No.	Loan Condition	Compliance by the project
	Investment Project facilities. If there are any changes in the specific locations or alignments or infrastructure or Invest Project facilities after the IEE or EIA, as applicable, is completed, for either already approved Investment Subprojects or for proposed Investment Subprojects, an additional environmental assessment shall be completed and a process similar to that used for an IEE or SIEE, as applicable, and acceptable to ADB, shall be undertaken.	
4	BR shall: (a) prepare an Investment Project Environment Management Plan to monitor the contractor's implementation of the EMPs;	**Complied**.
	(b) ensure that specific provisions are included for the preparation, implementation, and monitoring of EMPs in civil works and consulting services contracts;	**Complied**.
	(c) ensure that the environmental mitigation measures in the IEE or EIA, as applicable, are adequately implemented by the contractors; and	**Complied**. Contractor is progressing with the works and is following the requirements in the EMP for mitigation and monitoring. CSC is monitoring these activities with regular site inspections, audits and advice to the Contractor and providing timely reports to BR.
	(d) provide adequate budgetary allocation for this activity.	**Complied**.
5	The Borrower and BR shall ensure that the contract documents for all civil works under the Investment Project includes specific measures as indicated in the SIEE and IEE or EIA and SIEA, as applicable, and in accordance with *ADB's Environment Policy* to mitigate negative environmental impacts caused by the construction and to give due consideration to prevention of damage to the natural environment in the design, construction, operation and maintenance of Investment Project facilities. Such mitigation measures may include, but not limited to, rerouting traffic, maintaining moisture content during soil handling, controlling noise and vibration during construction, pumping stagnant water and providing adequate drainage, restricting placement of construction materials and	**Complied**. The recommendations of IEE & EMP have been incorporated in the construction contract of subproject 1 and 2. Mitigation measures have been implemented by the contractor.

Clause & Para No.	Loan Condition	Compliance by the project
	equipment, stabilizing embankment side slopes, and rehabilitating/reclaiming the temporary access road when construction work is completed. If there are any changes in the specific locations or alignments or infrastructure or Invest Project facilities after the IEE or EIA, as applicable, is completed, for either already approved Investment Subprojects or for proposed Investment Subprojects, an additional environmental assessment shall be completed and a process similar to that used for an IEE or SIEE, as applicable, and acceptable to ADB, shall be undertaken.	
6	The Borrower shall cause (i) the contractors engaged under the civil works contracts to comply strictly with all environmental impact mitigation requirements set out in the contract documents, and (ii) the consultants engaged for construction supervision to monitor closely the compliance by the contractors with the environmental impact mitigation requirements. BR shall submit to ADB semi-annual reports on implementation of EMP as stated in the IEE or EIA, as applicable.	**Partly Complied.** The implementation of EMP is being carried out against construction contract. The recommendations of IEE & EMP have been incorporated in the construction contract of Project-1. Close monitoring is being done by BR and supervision consultants to ensure implementation of EMP during construction work. Corrective actions with threat of sanctions are being implemented by BR on identified non-compliances in spite of initial recalcitrant behavior of the Contractors.

Table 8: Environmental Provisions of the Loan Agreement (Ordinary Operations) for Tranche 2. ADB Loan No. 2845-BAN

Environmental Provision	Status
Environment. Execution of Project and Financial Matters. Schedule 5. The Borrower shall ensure or cause BR to ensure that preparation, design, construction, implementation, operation and decommissioning of Subprojects 1 and 2 and all Project facilities comply with (a) all applicable laws and regulations of the Borrower relating to environment, health and safety; (b) the Environmental Safeguards; and (c) all measures and requirements set forth in the IEEs, the EMP, and any corrective or	**Being Complied**. As stated above (table 6, clause 1) environmental clearance has been secured for subproject 1. Subproject 2 does not require environmental clearance. Revised EMP has been prepared, preparatory works are on-going.

Environmental Provision	Status
preventative actions set forth in a Safeguards Monitoring Report.	
Item 9. Safeguards – Related Provisions in Bidding Documents and Works Contracts Schedule 5. The Borrower shall ensure or cause BR to ensure that all bidding documents and contracts for Works contain provisions that require contractors to: (a) comply with the measures relevant to the contractor set forth in the IEE, the EMP and the RP (to the extent they concern impacts on affected people during construction), and any corrective or preventive actions set forth in a Safeguards Monitoring Report; (b) make available a budget for all such environmental and social measures; (c) provide the Borrower with a written notice of any unanticipated environmental, resettlement or indigenous peoples risks or impacts that arise during construction, implementation or operation of the Project that were not considered in the IEE, the EMP and the RP; (d) adequately record the condition of roads, agricultural land and other infrastructure prior to starting to transport materials and construction; and (e) reinstate pathways, other local infrastructure, and agricultural land to at least their pre-project condition upon the completion of construction.	**Partly Complied**. EMPs for both subprojects 1 and 2 have been included in the bidding documents. Subsequently the EMPs was updated by the CSC who guides the contractors of the 2-subprojects. During the early stage od sub-projects implementation, delays in the mobilization of environmental focal persons-contractor side has resulted to numerous non-compliances of the EMP including monitoring plan. Adequate budget were provided in the sub-projects civil works contracts to implement construction-stage environmental management measures stipulated in EMPs and to CSC to supervise its implementation and provide advice to BR. No unanticipated impacts were observed during the implementation of Tranches. Following the successful inspection by GIBR on 26 December 2015 and the subsequent certification of the track for the Public Carriage of Passenger on 30 December 2015 the Works under Tranche 2 were assessed to be substantially completed by the contract completion date of 31 December 2015. The Taking-Over Certificate was issued on 31 December 2015 confirming the Defects Notification Period from 01 January 2016 to 31 December 2016 with the line informally opened for passenger train operations on 07 January 2016. Minor outstanding works not affecting the operation of the new line and including the defects reported will be completed/rectified within the Defects Notification Period
Item 10. Safeguards Monitoring and Reporting Schedule 5. The Borrower shall do the following or cause BR to do the following: (a) submit semi-annual Safeguards Monitoring Reports to ADB and disclose relevant information from such reports to affected persons promptly upon submission; (b) if any unanticipated environmental and/or social risks and impacts arise during construction, implementation or operation of the Project that were not considered in the IEE, the EMP, the RP and the IPPF, promptly inform ADB of the	**Partly Complied.** Semi-annual report were prepared and disclosed. No unanticipated impacts were encountered. External experts (ADB staff consultants) who have been engaged as external monitor for a number of projects under ADB, also conducted external monitoring of subproject 1. Subproject 1 was the only component which had significant environmental issues.

Environmental Provision	Status
occurrence of such risks or impacts, with detailed description of the event and proposed corrective action plan; (c) engage qualified and experienced external expert[s] or qualified NGO[s] under a selection process and terms of reference acceptable to ADB, to verify information produced through the Project monitoring process, and facilitate the carrying out of any verification activities by such external experts; (d) no later than 6 months after the Effective Date engage an independent advisory panel to monitor and report upon Project implementation, and facilitate the carrying out of any monitoring activities by such panel; and (e) report any actual or potential breach of compliance with the measures and requirements set forth in the EMP and the RP promptly after becoming aware of the breach.	

II. STATUS OF EMP IMPLEMENTATION AND MONITORING REQUIREMENTS

A. The Environmental Management Plan

19. The revised EMP for Subproject 1, Tranche 1 contains 34 preconstruction, construction, and operation mitigation measures. Of this 27 pertain to pre-construction and construction stage. Table 10 presents the compliance performance of subproject 1 from 31.10.12 to 30.11.15 which demonstrates continuous improvement in overall compliance rate. Of the 27 pre-construction and construction mitigation measures, TBDL sub-project registered full compliance on 78% of the EMP requirements as of the last reporting. Full compliances were achieved on the design and preconstruction, natural environment, ecological environment, and environmental pollution aspects of the EMP. Partial compliance were not improved in the area of health and safety and waste management with the lack of waste bins in the station facilities, and dirty work and camp sites. However, a continuing non-compliance all throughout the project implementation is the delay in the submission of timely environmental monitoring report. Figure 2 clearly depicts the continuous improvement towards environmental compliance of Tranche 1.

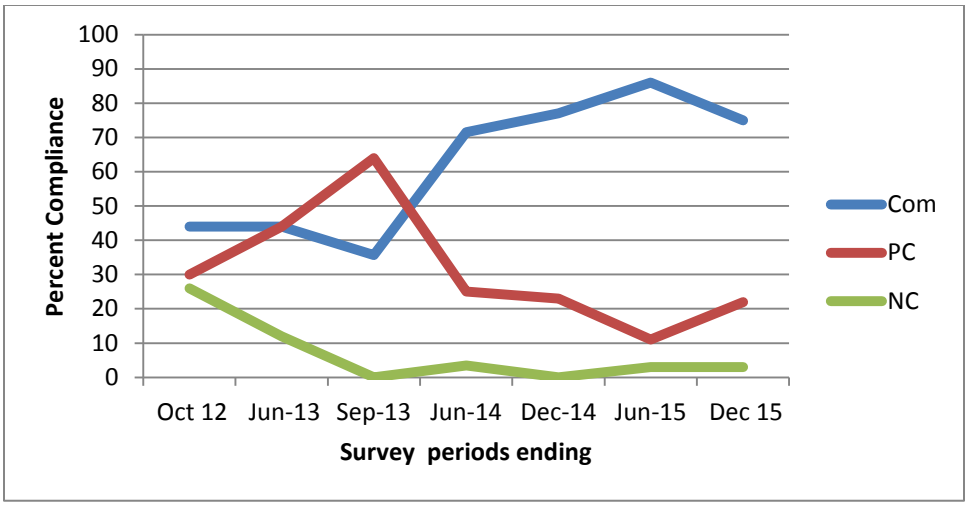


Figure 2: Line graph of environmental compliance performance, Tranche 1

20. The EMP for the Extension, Rehabilitation and Reconstruction of Loop Lines at Darsana-Ishurdi-Siraganj Bazar BG Section (subproject 2) has 29 construction-phase environmental management measures to be implemented by the contractor. As of January 2016, the subproject has performed poorly with 5 measures achieving full compliances, 14 partial compliances, and 10 non-compliances. Non-compliance recorded pertains to camp and construction debris management. Appendix 1 presents the Status of EMP implementation of Tranche 2.

B. Environmental Monitoring Plan

1. Tranche 1

21. **Surface Water Quality Monitoring.** The environmental monitoring plan for subproject 1 comes in two parts, monitoring of impact and mitigation measures, and environmental quality. BR exceeded the require number of locations required.

22. The monitoring of impacts and mitigation measures included the management of ballast waste cleaning, local fish movement and migration, tree planting and re-vegetation, management of carried earth collection process, construction related plan, improvement of safety crossings and upgrading stations. While the monitoring of environmental quality included air, noise, and water quality on at least 3 stations.

23. The surface water quality focused on following 5 locations covering pH, total suspended solids (TSS), biochemical oxygen demand (BOD5), dissolved oxygen (DO), total phosphates (TP), Oil and Grease, and fecal coliform (FC) parameters. The succeeding Table 9 summarizes the results of the surface water quality monitoring of TDBL from April 2012-December 2015 that was carried out in the five locations.

i) Br#34: Old Brahamaputra River at Km 2+458
ii) Br#63: Arialkhan River at km 27+193
iii) Br#79: Sitalakha River at Km 41+167
iv) Br#89: Balu River at Km 54+522
v) Active Dredging Site: Khal River

24. In the absence of applicable Bangladesh standards for aquatic life the reference standard of Canadian Water Quality Guidelines for the Protection of Aquatic Organisms (2003) has been applied. In particular the limit of faecal coliform for aquatic harvesting where applicable has been referenced.

25. A total of 150 surface water samples were collected and 900 laboratory analysis were conducted. The poor water quality of the receiving waters was evident with 393 of the 900 analysis results indicated above the applicable ambient standard representing 44%. All upstream faecal coliform and oil and grease ambient concentrations exceed standards. The impacts of the project on water quality which is defined as samples taken from downstream is more contaminated than the upstream waters was registered at 19%, of which total phosphates registered the highest project related contamination with 35% of the total downstream ambient levels higher than upstream. The elevated total phosphate downstream ambient levels recorded between January and June 2014 mostly at the dredging area is anticipated as the sediments are resuspended.

26. Results and analysis of surface water quality monitoring revealed the following:

- Between June and Dec. 2014 when no work was being undertaken on bridges 34, 63, and 89 BOD_5, TP, and oil and grease concentrations of all downstream (D/S) exceeded standards indicating land-based sources outside the project scope but near the bridges contributes to the water quality deterioration.
- None use of bentonite during pile placement and instead use of autochthonous mud ensures water quality is protected.
- The lack of quality control and assurances of local laboratories in water sampling and analysis cast doubt on the accuracy and precision of the water quality monitoring. After Dec 2014 sampling period, the CSC has implemented protocols to minimize errors due to sampling.
- Between 2013-2014, TP levels D/S of the river dredging site were eleven times higher than upstream, confirming that dredging disturbs bottom sediments, putting nutrients back into suspension. The CSC adviced the contactor to revised the dredging operation to reduce water quality deterioration. Interestingly, the TSS levels were not significantly elevated downstream of the dredger operations. Further sampling at sand dredging sites were undertaken to evaluate the revision in dredge operation which peaked at 123 mg/li for TSS in Sept. 2013. This level has returned below standard at 20 mg/li and 20 mg/li by Oct. 2013 and Nov. 2013. DO levels remain around 6 mg/l, except nearing the end of the dry season when they drop to very low levels. Parameters like pH, and biological oxygen demand the majority of the results are within the acceptable limits, with upstream and downstream readings varying little, suggesting no significant impact by the project.
- Similarly between July 2014 – December 2014, with little or no construction TSS, BOD_5, DO, TP and Oil and Grease readings all had a significant number of higher D/S readings due to highly contaminated (concluded based on visual observations and odour) tributaries discharging into the main channel both upstream and downstream of the sampling stations. It is very likely these discharges or contaminants from upstream industrial discharges resulted in higher downstream readings. BOD5, TP, Oil and Grease and Faecal Coliform up- and down-stream samples exceeded permissible GoB standards for fishery waters (waters were fish can safely be eaten without “clearing”. The data clearly

show that the construction work had a marginal and temporary impact on the surface water quality and clear differences related to the work could only be detected at the dredge site, which was not active after November 2013.

- From January 2015 – June 2015 BOD5, TP, Oil and Grease up- and down-stream samples exceeded applicable standards. Minor construction are being undertaken but all had no impact on surface water quality.

27. **Ground Water Quality Monitoring.** Groundwater quality was monitored at 6 locations namely: i) Br#34: Contractor's Camp Km 2+458 (Construction Of Bridge Over Old Brahamaputra River), ii) Narsingdi Engineer's Camp: Km 30+150, iii) Br#79 Engineer's Camp, Km 41+167(Construction of Bridge over Sitalakha River), iv) Br#89 Contractor's Pubail Camp, Km 54+522 (Construction of Bridge over Balu River), v) Br#61 Works Site - Piling Km 24+700 (Construction of Bridge), and vi) Br#84 Works Site - Piling Km 47+300 (Construction of Bridge). Water quality parameters monitored are pH, TSP, arsenic (As), iron (Fe), manganese (Mn), Sulphur (S), chlorine (Cl), and fecal coliform (FC).

28. Sampling is required every 6 months at new wells bored for camp water supplies and at existing tube wells within 150 metres of pile boring (5 samples/6 months). Following an assessment of the results to date during the Environmental Audit update done in January 2015 it was decided that after the sampling that is carried out in March 2015 further sampling will not be necessary.

29. A total of 22 monthly groundwater monitoring conducted on all stations at different periods between April 2012 and April 2015. A total of 321 samples were taken and 42% (135/321) registered higher than GoB standards. Important findings include presence of Arsenic in Br#34 camp and Br#61 worksite and high levels of faecal coliform also in BR#34, Narsingdi Engineer's camp, and BR#79 Engineer's camp. Immediately orders were issued by the CSC to discontinue sourcing water for domestic use and instead use of bottled water.

30. Results and analysis of groundwater water quality monitoring revealed the following:

- From start of project to June 2013 majority of parameters tested showed results exceeding the GOB drinking water standards underscoring the need to provide alternative sources of drinking water at camps. This has been addressed by the use of bottled water as drinking water at project site offices and some camps with local staff using drinking water from nearby houses. The Contractor has also taken note of the high arsenic levels in the water at the Br#34 camp and has prohibited all staff from using it as drinking water and is providing alternative potable water sources. The high TSP level would also suggest that the tubewell water has been contaminated from a surface water source. The contractor inspected all tubewell sites to insure that they are sealed and that no contaminated water enters the system and signboards were installed at each tubewell instructing users not to wash, brush teeth or otherwise use the water from contaminated tubewell.
- From January 2015 to date no new tubewells were dug. All active water sources complied with drinking water standards.

31. **Air Quality Monitoring.** Sampling is required quarterly (every 3 months) at 4 main bridge construction sites, one crushing plant site, 2 active works sites and 3 stations (10 samples/quarter). One sample within 50m of active works site (A) and one sample at closest boundary to the community (B).

32. 10 stations were established for air quality monitoring namely: i) Br#34 Km 2+458, Old Brahamaputra River, ii) Br#63 Km 27+193, Arialkhan River, iii) Br#79 Km 41+167: Sitalakha River, iv) Br#89 Km 54+522: Balu River, v) Methikanda Stn, vi) Pubail Station, vii) Tongi Station, viii) Work Site #1, ix) Br#85 – Km, x) Work Site #2, xi) Br#82, and xii) Work Site #3 Crusher at Bhairab Bazar.

33. Air quality parameters monitored were TPM, SO2, NO2, and CO. A total of 1,592 samples were taken from June 2013 to March 2015 of which 477 or 30% were beyond applicable standards.

34. Of all stations monitored, Sitalakha registered the most number of exceedance (67/192), followed by Tongi (51/160) and Crusher at Bhairab (51/128). TPM and NO2 are the most exceeded parameters.

35. Results and analysis of air quality monitoring revealed the following:

- For Br#34, TPM, SO2, and NO2 exceedances of standard started to increase dramatically on April 2014 with all minimum and maximum and NO2, and all maximum readings SO2 exceeding 150, 100, and 365 ug/m3 ambient standards. Starting Sept. 2014-Oct. 2015, only maximum readings of TPM and NO2 exceeds standards while SO2 minimum and maximum are lower than standard.
- For Br#63 similar trend was observed with maximum concentrations observed in April 2014 after which only 14% of the SO2 samples exceeded standards
- For Br#79, elevated ambient concentrations of TPM, SO2, NO2 drastically increased from Nov.2013-March 2015 and by Oct. 2015, only maximum readings of TMP and NO2 breached standards.
- For Br#89, exceedances were prevalent between April-Sept 2014 and by October 2015 all samples were below standards
- For Worksites 1, 2, and 3 similar trend were recorded with increase in TPM, SO2, and NO2 on April 2014 and has returned to baseline with no SO2 observation exceeding standards afterwards.
- However, Tongi and Methikanda stations being major hubs, the air quality have remained deteriorated since Nov. 2013 indicating the increase in induced traffic from the double tracking.

36. **Noise Monitoring.** Sampling required quarterly (every 3 months) at 2 major bridge construction sites (#79, #89), one crushing and one batching plant site, one ballast dumping/laying site, one dredging site and one Class B station (7 sample sets/quarter). Samples are to be taken at the nearest occupied structure to the works (A) and the next closest receptor (B), with & without a train passing, once during peak working time and once at night.

37. For the 14 month period from the first recordings in April 2012 until Jul 2012 sampling was carried out at the sites indicated in the table below, although there was no. Daytime and evening readings were compiled and compared to mixed zone standards and revealed that noise levels during the daytime are exceeded and most incidents occur in Tongi Station.

38. Results of noise monitoring revealed the following distinct trend of increase starting around Sept 2013-April 2014 and subsequent decrease below standards.

39. **Fisheries Resources.** Fish species found on the major rivers crossed by the project was recorded and from January 2014, CREC conducted creel censuses to determine catch quantity and diversity. The fish survey were implemented in Old Brahamaputra, Arial Khan, Sitalakha, and Balu rivers.

40. Giant river catfish, *Sperata Aor*, Labeo carp *Labeo bata*, Wallago Sheatfish *Wallago attu*, Indian carp *Catla catla*, Boggut labeo *Labeo ghonius*, Orange-fin labeo *Labeo calbasu*, Mrigal carp *Cirrhinus cirrhosis*, Yellow catfish *Pangasius pangasius*, Rita fish *Rita rita*, Rohu *Labea rohita*, and Silong catfish *Silonia silondia*. No blockade of fish movement was observed during the bridge construction. Interviews with fishermen indicated that catch size was not affected by the bridge construction.

Table 9: Summary of Surface Water Quality Monitoring Result Status Tranche 1

Location/ detail	Monitoring Period	No of Months	No of samples gathered and analyzed					
			TSS	BOD5	DO	TP	Oil & Grease	FC
Br#34	Jan. – Oct.2015	10	8	8	8	8	8	8
Br#63		10	8	8	8	8	8	8
Br#79		10	8	8	8	8	8	8
Br#89		10	8	8	8	8	8	8
Br#34	Apr.2012-Dec.2014	14	28	28	28	28	28	28
Br#63		13	26	26	26	26	26	26
Br#79		14	28	28	28	28	28	28
Br#89		14	28	28	28	28	28	28
Dredge Site	Jul 2013-Nov 2013	4	8	8	8	8	8	8
Total No of Samples			150	150	150	150	150	150
No. of samples upstream > than standards								
No. of samples where downstream> upstream			21	25	30	39	23	27

2. Tranche 2

41. For sub-project 2 Tranche 2, monitoring plans for the environment, health and safety for the loop for Darsana, Chuadanga, Alamdanga, Halsha, Mirpur, Bheramara, Ishurdi, ans Siarajganj railway stations were prepared. These monitoring plans covers air and dust pollution, noise pollution, drinking water quality, community safety, surface water pollution, tree planting, occupational health and safety, stocking of materials, and erosion and siltation as deemed applicable to each station.

42. For the sub-project 3 Tranche 2, monitoring parameters are limied to occupational health and safety, tree planning, clearing and demolition of old structures, and drinking water quality.

43. For tranche 2, all monitoring parameters with the exception of air and water quality have been accomplished to date.

Table 10: EMP Compliance Status Tranche 1

EMP Compliance Status: FC=full compliance, PC=partial compliance, NC=non compliant

S/N	Item No.	Description	Status: 31.10.12			Status: 30.06.13			Status: 31.08.13			Status 31.06.14			Status 31.12.2014			Status 30.06.2015			Status 31.01.2016		
		Compliance Category	FC	PC	NC	FC	PC	NC	NC	PC	NC	FC	PC	NC	FC	PC	NC	FC	PC	NC	FC	PC	NC
1.0 Design & Preconstruction																							
1	1.1	Design within ROW	1			1	1					1			1			1			1		
2	1.2	Transport of Materials	1			1	1					1			1			1			1		
3	1.3	Env Clauses in Contract	1			1	1					1			1			1			1		
4	1.4	EMP Documentation	1			1	1					1			1			1			1		
5	1.5	Design with Env Conditions	1			1	1					1			1			1			1		
6	1.6	Adequate Station Design	1			1	1					1			1			NA			1		
2.0 Construction Period																							
2.1 Natural Environment																							
7	2.1.1	Hydrology & Flood Pattern	1			1	1			1		1			1			1			1		
8	2.1.2	Drainage Congestion	1			1		1		1			1		1			1			1		
9	2.1.3	Erosion & Silt Deposition	1			1	1					1			1			1			1		
10	2.1.4	Landscape		1				1		1			1		1				1			1	
11	2.1.5	The EMWS		1			1			1		1			1			1			1		
2.2 Ecological Environment																							
12	2.2.1	Tree Felling			1			1		1			1		1			NA			NA		
13	2.2.2	Fisheries, Fish habitat, etc		1			1			1		1			1			1			1		
14	2.2.3	Wildlife			1			1		1			1		1			1			1		
2.3 Environmental Pollution																							
15	2.3.1	Surface Water			1		1			1		1			1			1			1		
16	2.3.2	Ground Water			1		1			1		1			1			1			1		

S/N	Item No.	Description	Status: 31.10.12			Status: 30.06.13			Status: 31.08.13			Status 31.06.14			Status 31.12.2014			Status 30.06.2015			Status 31.01.2016		
		Compliance Category	**FC**	**PC**	**NC**	**FC**	**PC**	**NC**	**NC**	**PC**	**NC**	**FC**	**PC**	**NC**	**FC**	**PC**	**NC**	**FC**	**PC**	**NC**	**FC**	**PC**	**NC**
17	2.3.3	Air Pollution			1		1			1		1				1		1			1		
18	2.3.4	Noise and Vibration			1		1			1		1				1			1		1		
19	2.3.5	Soil Contamination			1		1					1			1			1			1		
2.4 Health and Safety																							
20	2.4.1	Loss of Navigation Route	1			1	1					1			1			1			1		
21	2.4.2	Work Force Camp Conditions		1			1			1			1		1			NA			NA		
22	2.4.3	Waste Management		1			1			1			1		1			1				1	
23	2.4.4	Health & Safety		1			1			1		1				1		NA			NA		
24	2.4.5	Vector-borne diseases		1			1			1				1		1		1				1	
25	2.4.6	Rail Traffic Disruption	1			1			1			1			1			1			NA		
26	2.4.7	Env Completion . Report	1			1			1			1				1				1			1
27	2.4.8	Waste Materials		1			1			1			1		1			1				1	
		Score	**12**	**8**	**7**	**12**	**12**	**3**	**10**	**18**	**0**	**20**	**7**	**1**	**21**	**6**	**0**	**20**	**2**	**1**	**18**	**4**	**1**
		Percent Compliance	**44**	**30**	**26**	**44**	**44**	**12**	**35.7**	**64**	**0**	**71.5**	**25**	**3.5**	**77**	**23**	**0**	**87**	**9**	**4**	**78**	**17**	**5**
		Not Applicable (NA)																**4**			**4**		

Table 11: EMP Compliance Tranche -2

S.N	Mitigation Measure	FC	PC	NC
1	1.1 Recycle			1
	1.2 Hazwaste		1	
	1.3 Waste Disposal			1
2	2.1 Cut and fill		1	
	2.2 Erosion Plan		1	
3	3.1 Noise and Vibration Plan			1
	3.2 Time restriction	1		
4	4.1 Proper diesel maintenance	1		
	4.2 Reduce dust		1	
	4.3 Watering		1	
5	5.1 First aid		1	
	5.2 PPE		1	
	5.3Trainin	1		
	5.4Clean drinking water	1		
	5.5 Public safety		1	
	5.6 Safe access		1	
	5.7 Drainage		1	
	5.8 Septic tank	1		
	5.9 SW collection			1
6	6.1 Hazwaste storage			1
	6.2 Spills			1
	6.3 Disposal sites		1	
	6.4 Hazwaste management plan			1
	6.5 Water pollution		1	
	6.6 Waste containers			1
	6.7 Toilets		1	
7	7.1 Vegetation		1	
	7.2 Green Belt			1
	7.3 Tree Planting			1
	Total	**5**	**14**	**10**

III. FINDINGS AND RECOMMENDATIONS

44. **Compliance to environmental safeguards requirements.** Full compliance was achieved on the loan covenant, domestic environmental laws, and EARF by the BRSIP. The EMP implementation for subproject 1 achieved an 85% compliance rate and the non-compliances were limited to camp management and occupational health and safety. The environmental monitoring plan was implemented successfully in spite of initial delays. For subproject 2 the EMP implementation achieved a 17% full compliance rate, 48% partial compliance and 34% non-compliance. The non-compliance was mainly due to the lack of ambient quality monitoring and not actual negative impacts on site. Given the small scale of works no adverse environmental impacts were observed on the Project site

45. **Innovation on the environmental management planning**. In pursuit of better environmental compliance, Bangladesh Railway updated the approved EMP and introduces the environmental management review schedule (EMWS). These innovations ensured the EMP is responsive to the current ground conditions and the contractor understands the schedule of the mitigation measures.

46. **Leveraging Compliance**. Bangladesh Railways (BR) has demonstrated its sincerity to bring the project back to compliance through a series of notices and later with a threat of sanction. During the environmental audit by CSC on 30 October to 1 Nov 2012, several non-conformances were noted including occupational health and safety. Weekly reporting by CREC was required and on 15 Dec 2012 an inspection was made with dismal findings. Bangladesh Railway through the CSC invoked FIDIC GCC provision 7.6 on the need to rectify works with a threat of sanction authorized in FIDIC Sub-Clause 2.5 on corrective measures by 3rd party at the expense of the Contractor. This also points out the need to strengthen the monitoring and enforcement capability of MoEF and highlights the need for information sharing by the BR.

47. **Comprehensive environmental quality monitoring data supports no long term adverse impacts**. . A total of 150 surface water, 321 groundwater, 1,592 air, and 295 noise samples were taken in the course of the project implementation for Tranche 1. Tranche 2 has yet to establish the monitoring stations. Surface water quality assessment indicated that of the 44%, groundwater 42%, air quality 30%, and noise 20% compliance rates. No long term adverse impacts has resulted in the implementation of Tranche 1 as supported by the following:

- Between the 2013-2014, TP levels D/S of the river dredging site were eleven times higher than upstream, confirming that dredging disturbs bottom sediments, putting nutrients back into suspension. The CSC adviced the contactor to revised the dredging operation to reduce water quality deterioration. Interestingly, the TSS levels were not significantly elevated downstream of the dredger operations. Further sampling at sand dredging sites were undertake to evaluate the revision in dredge operation which peaked at 123 mg/li for TSS in Sept. 2013. This level has returned below standard at 20 mg/li and 20 mg/li by Oct. 2013 and Nov. 2013.

- Groundwater quality was monitored at 6 locations revealed presence of Arsenic in Br#34 camp and Br#61 worksite and high levels of faecal coliform also in BR#34, Narsingdi Engineer's camp, and BR#79 Engineer's camp. Immediately orders were issued by the CSC to discontinue sourcing water and the contractor use bottled water as drinking water at project site offices and some camps with local staff using drinking water from nearby houses. The Contractor has also taken note of the high arsenic levels in the water at the Br#34 camp and has prohibited all staff from using it as drinking water and is providing alternative potable water sources. The high TSP level would also suggest that the tubewell water has been contaminated from a surface water source. The contractor inspected all tubewell sites to insure that they are sealed and that no contaminated water enters the system and signboards were installed at each tubewell instructing users not to wash, brush teeth or otherwise use the water from contaminated tubewell.

48. Air quality parameters monitored were TPM, SO2, NO2, and CO. A total of 1,592 samples were taken from June 2013 to March 2015 of which 477 or 30% were beyond applicable standards.

49. Of all stations monitored, Sitalakha registered the most number of exceedance (67/192), followed by Tongi (51/160) and Crusher at Bhairab (51/128). TPM and NO2 are the most exceeded parameters.

50. **Noise Monitoring.** Sampling required quarterly (every 3 months) at 2 major bridge construction sites (#79, #89), one crushing and one batching plant site, one ballast dumping/laying site, one dredging site and one Class B station (7 sample sets/quarter). Samples are to be taken at the nearest occupied structure to the works (A) and the next closest receptor (B), with & without a train passing, once during peak working time and once at night.

51. For the 14 month period from the first recordings in April 2012 until Jul 2012 sampling was carried out at the sites indicated in the table below, although there was no. Daytime and evening readings were compiled and compared to mixed zone standards and revealed that noise levels during the daytime are exceeded and most incidents occur in Tongi Station.

52. **Fisheries Resources.** Fish species found on the major rivers crossed by the project was recorded and from January 2014, CREC conducted creel censuses to determine catch quantity and diversity. The fish survey were implemented in Old Brahamaputra, Arial Khan, Sitalakha, and Balu rivers.

53. Giant river catfish, *Sperata Aor*, Labeo carp *Labeo bata*, Wallago Sheatfish *Wallago attu*, Indian carp *Catla catla*, Boggut labeo *Labeo ghonius*, Orange-fin labeo *Labeo calbasu*, Mrigal carp *Cirrhinus cirrhosis*, Yellow catfish *Pangasius pangasius*, Rita fish *Rita rita*, Rohu *Labea rohita*, and Silong catfish *Silonia silondia*. No blockade of fish movement was observed during the bridge construction. Interviews with fishermen indicated that catch size was not affected by the bridge construction.

54. **Delays in the mobilization of the contractor's environmental focal person resulted poor compliance performance.** Despite numerous notices issued by the CSC to CREC to mobilize their environmental specialist, it was on May 2013, or 16 months after mobilization that it was heeded. This resulted to large gaps in the monitoring coverage which hindered the assessment of the project impacts as no suitable baseline are available for comparison. This delay in mobilization in part explains why the CREC continued to use borewells that are arsenic and coliform contaminated risking health and welfare of the workers staying at the: i) contractor's camp, km 2+458 construction of bridge over old Brahamaputra River; ii) engineer's camp: km 30+150; iii) engineer's camp; km 41+167: construction of bridge over sitalakha river; and iv) works site - piling; km 24+700: construction of bridge. Further, until September 2013 the environmental quality monitoring data submitted by the CREC were unreliable and could not be verified. To address data reliability, a sampling program was designed by CSC and implemented by the contractor and by November 2013 better datasets with supporting documentation on sample collections and methodology were generated. Finally, the poor overall performance in implementing the EMP was evident in the early stage of the project implement which is attributed by the CSC to the CREC delay in fielding their environmental specialist.

55. **Need to improve sampling and analysis protocols.** A total of 70% surface water samples indicated lower pollution level downstream than upstream indicating "cleaner" water as it passes the project site which is counterintuitive. This error can only be explained by faulty sampling and analysis procedure. However, this claim cannot be fully supported and no documents were made on the chain-of-custody for the sampling activity, suitability of sampling storage and transport, while the laboratory did not conduct standard quality control like blanks and spikes to ensure test accuracy and precision. The poor protocols undermined the reliability of the entire environmental monitoring program of the project.

APPENDIX 1: STATUS OF EMP IMPLEMENTATIONOF TRANCHE 2

A. SURFACE WATER - EMP 2.5.1

Sampling is required monthly at 4 main rivers and one dredging site (10 samples/month) with a set of samples to be taken at each location upstream and downstream of the work site.

Following an assessment of the results to date during the Environmental Audit update done in January 2015 it was decided that further sampling will only be necessary in May and October 2015.

Br#34	OLD BRAHAMAPUTRA RIVER: Km 2+458 (Avg Annual Flow – 1,265 m^3/sec) – Permanent Flow													
Parameter	**pH**		**TSS**		**BOD_5**		**DO**		**TP**		**Oil & Grease**		**FC**	
GOB Ambient WQ Stndrd.	**6 – 8**		**70 mg/l**		**0.02**		**≥ 3 mg/l**		**< 0.20 mg/l**		**0.0**		**≤45 /NA CFU/100ml**	
Loc'n of Sample	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S
Apr 2012	6.78		--		< MDL		**0.5**		--		--		--	
May 2013	7.11	7.07	25.5	36	< 2.0	< 2.0	6.80	6.55	**0.21**	**0.36**	**293**	**368**	**3000**	**7000**
Jun 2013	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Jul 2013	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aug 2013	6.89	6.72	18.8	16.9	< 2.0	< 2.0	6.10	6.00	0.074	0.093	**36.28**	**35.42**	**130**	**380**
Sep 2013	7.29	6.65	39.7	41.5	< 2.0	< 2.0	6.00	6.00	0.164	0.091	**42.86**	**34.57**	**2000**	**190**
Oct 2013	6.70	6.90	5.00	4.00	**6.0**	**8.0**	5.50	5.30	< 0.12	< 0.12	**0.21**	**0.21**	**780**	**800**
Nov 2013	7.70	7.80	5.00	5.00	**10.0**	**7.0**	5.30	5.00	**1.00**	**0.84**	**0.19**	**0.84**	**880**	**820**
Dec 2013	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Jan 2014	7.30	7.20	7.00	4.00	**12.0**	**10.0**	5.82	6.97	**0.60**	**0.83**	**0.21**	**0.19**	**1210**	**1140**
Feb 2014	7.20	7.30	14.0	12.0	**43**	**32**	5.67	5.64	**0.47**	**0.36**	**0.33**	**0.25**	**4180**	**4100**
Mar 2014	7.20	7.30	12.0	12.0	**11**	**8.0**	6.25	6.20	**0.92**	**0.23**	**0.27**	**0.23**	**7800**	**7200**
Apr 2014	7.20	7.40	8.0	9.0	**8.0**	**6.0**	4.76	5.50	**0.24**	**0.22**	**0.18**	**0.15**	**8700**	**8400**
May 2014	6.90	7.10	10.0	15.0	**23.0**	**20.0**	5.24	4.64	**1.17**	**1.10**	**0.22**	**0.20**	**6700**	**6950**
Jun 2014	7.00	7.00	12.0	14.0	**20.0**	**24.0**	5.65	5.49	**0.68**	**0.60**	**0.17**	**0.18**	**6400**	**6600**
Jul 2014	7.00	7.00	11.0	13.0	**12.0**	**15.0**	4.3	3.8	**0.63**	**0.67**	**0.20**	**0.17**	**4800**	**4250**
Aug 2014	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sep 2014	7.1	7.2	12.0	11.0	**14.0**	**14.0**	6.2	6.62	**0.95**	**1.32**	**0.18**	**0.19**	**1480**	**1620**
Oct 2014	7.1	7.07	13	7.5	**7.0**	**1.0**	5.26	5.08	**0.36**	**0.40**	**0.12**	**0.14**	**887**	**825**
Nov 2014	7.49	7.49	10	7.5	**1.07**	**0.7**	5.2	5.33	**0.86**	**0.87**	**0.13**	**0.13**	**220**	**200**
Dec 2014	7.35	7.50	9	8	**3.90**	**0.7**	5.61	5.59	**0.79**	**0.81**	**0.15**	**0.13**	**450**	**230**
Jan 2015	7.38	7.41	11	8	**0.12**	**0.4**	5.39	4.55	**0.75**	**0.85**	**0.13**	**0.13**	**100**	**200**
Feb 2015	7.42	7.22	12	9	**0.18**	**1.15**	5.47	5.55	**1.01**	**1.02**	**0.13**	**0.14**	**300**	**400**
May 2015	7.4	7.1	10	12	**13.4**	**14.6**	4.61	4.15	**1.65**	**1.58**	**0.16**	**0.19**	**1130**	**1410**
Oct 2015	7.3	7.3	10	9	**4.00**	**3.00**	6.59	6.69	**1.21**	**0.84**	**0.17**	**0.15**	**1280**	**1160**
Result Status	OK		OK		Above Limit		OK		Above Limit		Above Limit		Above Limit	
Project Effect	None		Minimal		None		None		None		None		None	

Br#63	ARIALKHAN RIVER: Km 27+193 (Avg Annual Flow – 2,564 m^3/sec) – Permanent Flow													
Parameter	**pH**		**TSS**		**BOD_5**		**DO**		**TP**		**Oil & Grease**		**FC**	
GOB Ambient WQ Stndrd.	**6 – 8**		**70 mg/l**		**0.02**		**≥ 3 mg/l**		**< 0.20 mg/l**		**0.0**		**≤45 /NA CFU/100ml**	
Loc'n of Sample	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S
Apr 2012	6.86		--		< MDL		**0.61**		--		--		--	
May 2013	7.1	7.23	46	**73**	< 2.0	< 2.0	6.43	6.25	**0.21**	0.18	**502**	**283**	**2500**	**2500**
Jun 2013	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Jul 2013	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aug 2013	6.88	7.07	20.5	< 10.0	< 2.0	< 2.0	5.80	5.90	0.151	0.172	**347.7**	**160.3**	**160**	**190**

Br#63	ARIALKHAN RIVER: Km 27+193 (Avg Annual Flow – 2,564 m^3/sec) – Permanent Flow													
Parameter	**pH**		**TSS**		**BOD_5**		**DO**		**TP**		**Oil & Grease**		**FC**	
GOB Ambient WQ Stndrd.	**6 – 8**		**70 mg/l**		**0.02**		**≥ 3 mg/l**		**< 0.20 mg/l**		**0.0**		**≤45 /NA CFU/100ml**	
Sep 2013	6.82	6.81	55.3	60	**3.0**	**3.0**	5.80	5.90	**0.309**	0.085	**54.29**	**12.57**	**85**	**86**
Oct 2013	6.90	7.10	28	12	**12**	**10**	5.80	6.00	**0.21**	< 0.12	**0.026**	**0.02**	**2120**	**2200**
Nov 2013	7.70	7.70	9.0	8.0	**18**	**16**	4.80	5.10	**0.88**	**0.84**	**0.22**	**0.20**	**1080**	**1340**
Dec 2013	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Jan 2014	7.40	7.50	37	32	**20**	**18**	6.97	6.70	**1.10**	**1.50**	**0.27**	**0.02**	**1300**	**1500**
Feb 2014	7.60	7.30	38	35	**15**	**12**	5.63	5.43	**0.50**	**0.46**	**0.35**	**0.27**	**2500**	**1400**
Mar 2014	7.70	7.70	34	22	**5.0**	**10**	5.65	5.95	**1.39**	**1.38**	**0.32**	**0.25**	**1620**	**1540**
Apr 2014	7.70	7.80	18	20	**7.0**	**10**	4.37	4.67	**1.40**	**1.30**	**0.26**	**0.29**	**2400**	**900**
May 2014	7.20	7.30	13	15	**4.0**	**8.0**	6.54	5.66	**1.65**	**1.99**	**0.29**	**0.25**	**2400**	**2500**
Jun 2014	7.00	7.10	12	10	**6.0**	**8.0**	4.75	4.65	**0.85**	**0.71**	**0.24**	**0.22**	**2950**	**3240**
Jul 2014	7.40	7.50	15	10	**7.0**	**5.0**	4.8	5.0	< 0.12	< 0.12	**0.21**	**0.19**	**1800**	**2200**
Aug 2014	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sep 2014	6.8	6.9	13	10	**9.0**	**7.0**	4.25	5.74	**3.61**	**3.94**	**0.17**	**0.20**	**1410**	**1320**
Oct 2014	7.27	7.24	12	13	**2.0**	**8.0**	4.83	5.17	**6.40**	**6.48**	**0.15**	**0.17**	**476**	**356**
Nov 2014	7.78	7.79	12	8.5	**0.81**	**0.81**	5.89	5.8	**0.89**	**0.91**	**0.17**	**0.18**	**130**	**124**
Dec 2014	7.77	7.82	11	9	**1.05**	**1.09**	5.9	5.97	**0.98**	**0.92**	**0.16**	**0.16**	**200**	**190**
Jan 2015	7.68	7.72	11	8	**0.16**	**0.17**	5.53	5.68	**0.88**	**0.87**	**0.13**	**0.13**	**190**	**510**
Feb 2015	7.64	7.82	10	9.5	**1.81**	**1.69**	5.19	5.09	**1.25**	**1.52**	**0.16**	**0.20**	**350**	**650**
May 2015	7.4	7.4	15	19	**12.8**	**10**	5.52	5.92	**1.78**	**1.55**	**0.18**	**0.20**	**1180**	**1260**
Oct 2015	7.1	7.4	13	9	**3.00**	**3.00**	6.71	6.89	**0.78**	**1.18**	**0.13**	**0.14**	**1420**	**1210**
Result Status	OK		OK		Above Limit		OK		OK		Above Limit		Above Limit	
Project Effect	None		None		None		None		None		None		Minimal	

Br#79	SITALAKHA RIVER: Km 41+167 (Avg Annual Flow - 74 m^3/sec) – Permanent Flow													
Parameter	**pH**		**TSS**		**BOD_5**		**DO**		**TP**		**Oil & Grease**		**FC**	
GOB Ambient WQ Stndrd.	**6 – 8**		**70 mg/l**		**0.02**		**≥ 3 mg/l**		**< 0.20 mg/l**		**0.0**		**≤45 /NA CFU/100ml**	
Loc'n of Sample	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S
Apr 2012	7.02		--		< MDL		**0.53**		--		--		--	
May 2013	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Jun 2013	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Jul 2013	6.96	7.04	**95.9**	**98.2**	**4.0**	**3.0**	5.80	5.70	**0.736**	0.181	**588.6**	**22.85**	**336,000**	**25000**
Aug 2013	7.13	7.19	53.8	46.2	**5.5**	**5.0**	5.60	5.60	0.122	0.144	**153.4**	**82**	**2000**	**2000**
Sep 2013	6.74	6.90	**77.3**	68.2	**4.0**	**4.0**	5.80	5.90	**0.356**	0.138	**10.28**	**2.857**	**65000**	**29000**
Oct 2013	7.50	7.60	15	20	**7.0**	**9.0**	6.10	5.90	< 0.12	< 0.12	**0.031**	**0.026**	**2080**	**2160**
Nov 2013	7.80	7.70	8.0	7.0	**15**	**11**	5.60	5.70	**2.50**	**2.20**	**0.26**	**0.23**	**1160**	**1120**
Dec 2013	--	--	--	--	**--**	**--**	--	--	**--**	**--**	**--**	**--**	**--**	**--**
Jan 2014	7.6	8.0	42.0	40.0	**14**	**12**	5.94	6.01	**1.5**	**1.8**	**0.35**	**0.26**	**5400**	**3000**
Feb 2014	7.8	**8.1**	27	25	**11**	**13**	4.52	4.96	**0.42**	**0.34**	**0.41**	**0.32**	**9200**	**8000**
Mar 2014	7.6	7.7	30	33	**10**	**9**	5.70	6.00	**0.42**	**0.25**	**0.35**	**0.35**	**6780**	**6400**
Apr 2014	7.7	7.8	26	22	**12**	**14**	???	4.23	**0.57**	**1.16**	**0.29**	**0.24**	**9300**	**8900**
May 2014	7.8	7.8	20	16	**6.0**	**10**	5.80	5.52	**1.35**	**1.75**	**0.20**	**0.24**	**7400**	**7200**
Jun 2014	7.6	7.6	19	18	**10.0**	**12.0**	5.11	5.39	**1.18**	**1.24**	**0.25**	**0.22**	**7120**	**7040**
Jul 2014	7.5	7.5	24	20	**6.0**	**8.0**	4.8	4.7	**1.88**	**1.66**	**0.23**	**0.20**	**6840**	**6400**
Aug 2014	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sep 2014	7.1	7.5	18	21	**5.0**	**7.0**	6.05	6.05	**18.01**	**18.14**	**0.21**	**0.23**	**3220**	**3860**
Oct 2014	7.62	7.6	15.5	12	**7**	**13**	5.51	5.42	**9.32**	**8.0**	**0.18**	**0.23**	**735**	**612**
Nov 2014	**8.29**	**8.21**	6.5	9.5	**1.50**	**3.45**	5.64	5.37	**0.88**	**0.83**	**0.19**	**0.17**	**225**	**595**
Dec 2014	**8.44**	**8.45**	7	7.5	**4.64**	**4.79**	5.93	5.81	**0.85**	**0.82**	**0.17**	**0.18**	**800**	**780**
Jan 2015	**8.00**	**8.05**	10	10	**3.0**	**1.59**	3.85	**2.42**	**1.12**	**1.01**	**0.19**	**0.17**	**1600**	**1000**
Feb 2015	**8.28**	**8.25**	12	11	**2.81**	**3.02**	4.02	**2.50**	**1.95**	**2.01**	**0.20**	**0.18**	**1400**	**1200**
May 2015	7.5	7.6	14	17	**4.0**	**5.0**	6.22	6.09	**1.94**	**1.96**	**0.20**	**0.24**	**3080**	**3170**

Br#79	SITALAKHA RIVER: Km 41+167 (Avg Annual Flow - 74 m^3/sec) – Permanent Flow													
Parameter	**pH**		**TSS**		**BOD_5**		**DO**		**TP**		**Oil & Grease**		**FC**	
GOB Ambient WQ Stndrd.	**6 – 8**		**70 mg/l**		**0.02**		**≥ 3 mg/l**		**< 0.20 mg/l**		**0.0**		**≤45 /NA CFU/100ml**	
Loc'n of Sample	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S
Oct 2015	7.8	7.8	12	9	**5.0**	**4.0**	6.08	6.19	**0.79**	**0.89**	**0.18**	**0.13**	**890**	**760**
Result Status	OK		OK		Above Limit		OK		Above Limit		Above Limit		Above Limit	
Project Effect	None		None		None		None		None		None		None	

Br#89	BALU RIVER: Km 54+522 (Avg Annual Flow 60 m^3/sec) – Permanent Flow													
Parameter	**pH**		**TSS**		**BOD_5**		**DO**		**TP**		**Oil & Grease**		**FC**	
GOB Ambient WQ Stndrd.	**6 – 8**		**70 mg/l**		**0.02**		**≥ 3 mg/l**		**< 0.20 mg/l**		**0.0**		**≤45 /NA CFU/100ml**	
Loc'n of Sample	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S
Apr 2012	7.22		--		< MDL		**0.78**		--		--		--	
May 2013	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Jun 2013	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Jul 2013	7.04	7.01	**73.1**	69.1	≤2.0	≤2.0	5.90	5.90	**0.345**	**0.421**	**40.85**	**5.714**	**22000**	**18000**
Aug 2013	6.99	6.75	22.8	33.0	≤2.0	≤2.0	5.80	5.70	0.186	0.099	**260**	**122.5**	**8000**	**10000**
Sep 2013	6.82	6.86	41.2	38.2	< 2.0	< 2.0	5.60	5.70	0.049	0.058	**4.857**	**1.429**	**15**	**285**
Oct 2013	7.20	7.00	4.0	8.0	**6.0**	**9.0**	5.50	5.70	< 0.12	< 0.12	**0.025**	**0.024**	**1180**	**1300**
Nov 2013	7.50	7.50	6.0	7.0	**8.0**	**10**	5.40	5.60	**0.78**	**0.95**	**0.21**	**0.19**	**1540**	**1480**
Dec 2013	--	--	--	--	**--**	**--**	--	--	**--**	**--**	**--**	**--**	**--**	**--**
Jan 2014	7.50	7.50	26.0	27.0	**20**	**16**	7.03	6.70	**2.10**	**1.90**	**0.25**	**0.21**	**2000**	**3500**
Feb 2014	7.90	7.80	39	34	**12**	**11**	4.80	4.74	**1.12**	**1.4**	**0.29**	**0.24**	**3500**	**3400**
Mar 2014	7.85	7.85	49	53	**26**	**20**	1.90	3.83	**10.87**	**10.62**	**0.40**	**0.31**	**2480**	**2340**
Apr 2014	7.70	7.80	47	44	**35**	**31**	???	4.42	**13.9**	**19.0**	**0.37**	**0.35**	**5300**	**5000**
May 2014	7.60	7.70	88	38	**16**	**23**	2.34	4.20	**14.3**	**6.97**	**0.43**	**0.25**	**7800**	**8100**
Jun 2014	7.20	7.20	30	27	**16**	**14**	3.14	3.37	**1.37**	**1.49**	**0.31**	**0.28**	**8280**	**8410**
Jul 2014	7.40	7.40	35	33	**6**	**7**	4.60	4.60	**0.83**	**0.63**	**0.27**	**0.23**	**6100**	**5800**
Aug 2014	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sep 2014	7.5	7.4	23	23	**10**	**8**	6.65	6.30	**1.08**	**1.12**	**0.25**	**0.27**	**1220**	**1280**
Oct 2014	7.15	7.06	4	11	**7**	**6**	5.54	5.63	**5.47**	**5.43**	**21**	**0.25**	**575**	**540**
Nov 2014	7.79	7.75	13.5	12.5	**0.2**	**3.49**	4.15	4.25	**1.65**	**2.04**	**0.19**	**0.20**	**2200**	**2010**
Dec 2014	7.9	7.84	13	13	**4.41**	**4**	5.34	5.64	**1.12**	**1.82**	**0.21**	**0.22**	**2400**	**2000**
Jan 2015	**8.03**	**8.01**	12	13	**2.98**	**3.09**	3.86	3.88	**2.11**	**2.50**	**0.22**	**0.25**	**2300**	**2400**
Feb 2015	**8.33**	**8.21**	13	12.5	**5.95**	**5.87**	6.24	6.22	**2.44**	**2.35**	**0.23**	**0.24**	**1800**	**1500**
May 2015	7.6	7.6	21	24	**7.1**	**9.0**	5.69	5.55	**2.24**	**2.17**	**0.24**	**0.27**	**970**	**1040**
Oct 2015	7.1	7.0	12	10	**4.0**	**3.0**	6.37	6.42	**0.73**	**0.67**	**0.19**	**0.17**	**1040**	**980**
Result Status	OK		OK		Above Limit		OK		Above		Above Limit		Above Limit	
Project Effect	None		None		None		None		Minimal		None		Minimal	

	ACTIVE DREDGING SITE: Khal River – Permanent Flow													
Parameter	**pH**		**TSS**		**BOD_5**		**DO**		**TP**		**Oil & Grease**		**FC**	
GOB Ambient WQ Stndrd.	**6 – 8**		**70 mg/l**		**0.02**		**≥ 3 mg/l**		**< 0.20 mg/l**		**0.0**		**≤45 /NA CFU/100ml**	
Loc'n of Sample	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S
Jul 2013	--	--	**--**	--	--	--	--	--	**--**	**--**	**--**	**--**	**--**	**--**
Aug 2013	6.86	6.81	47.7	33.5	**4.5**	**4.5**	5.90	5.90	0.074	**0.825**	**59.14**	**14.29**	**54000**	**32000**
Sep 2013	6.79	6.86	**223.8**	**123.6**	**6.0**	**5.0**	5.60	5.70	**0.742**	0.185	**28.57**	**12.86**	**76000**	**119000**
Oct 2013	7.00	7.10	18.0	20.0	**6.0**	**5.0**	5.60	5.50	**0.750**	**0.230**	**0.075**	**0.055**	**2600**	**2660**
Nov 2013	7.20	7.20	23.0	28.0	**12.0**	**10.0**	5.30	5.00	**3.70**	**3.90**	**0.310**	**0.260**	**2160**	**2480**
Dec 2013	--	--	--	--	**--**	**--**	--	--	**--**	**--**	**--**	**--**	**--**	**--**
Result Status														
Project Effect	None		None		None		None		None		None		None	

B. GROUND WATER - EMP 2.5.2

Bhairab/Br#34	CONTRACTOR'S CAMP: Km 2+458: Camp Site for construction of Bridge over Old Brahamaputra River.							
Parameter	**pH**	**TSP**	**As**	**Fe**	**Mn**	**S**	**Cl**	**FC**
GOB Drinking Wtr Stndrd. ECR'97	**6.5 – 8.5**	**10 mg/l**	**0.05 mg/l**	**0.3 – 1.06 mg/l**	**0.1 mg/l**	**< 5 mg/l**	**≤600 mg/l**	**0 CFU/100 ml**
Jul 2013	--	--	--	--	--	--	--	--
Aug 2013	6.86/6.55	**123/109**	**25/100**	0.50/0.485	**1.90/1.90**	1.0/4.2	2.24/16.89	Nil/Nil
Sep 2013	6.7/6.7	**388/387**	**0.065/0.068**	0.54/0.60	**2.4/2.8**	**28/26**	87/94	**6.0/12**
Jan 2014	6.6/6.8	10/10	< .001/< .001	< .09/< .09	< .05/< .05	1.0/1.0	4.0/16.89	**2 / 6**
Aug 2014	6.85/6.8	**17/15**	**0.078/0.08**	**5.1/5.4**	**2.9/3.01**	**17/15**	63/62	0/0
Mar 2015	--	--	--	--	--	--	--	--
Result Status	OK	Above	Above	Above	Above	Above	OK	OK
Project Effect	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Narsingdi	ENGINEER'S CAMP: Km 30+150:							
Parameter	**pH**	**TSP**	**As**	**Fe**	**Mn**	**S**	**Cl**	**FC**
GOB Drinking Wtr Stndrd. ECR'97	**6.5 – 8.5**	**10 mg/l**	**0.05 mg/l**	**0.3 – 1.06 mg/l**	**0.1 mg/l**	**< 5 mg/l**	**≤600 mg/l**	**0 CFU/100 ml**
Sep 2013	6.8/6.8	**344/361**	≤0.001	**0.12/0.11**	**0.58/0.58**	1.0/1.0	57/57	**2.0/4.0**
Jan 2014	--	--	--	--	--	--	--	--
Aug 2014	--	--	--	--	--	--	--	--
Apr 2015	7.4/7.4	**420/418**	≤0.001	**0.13/0.64**	**0.12/0.29**	2/3.0	83/82	**56/62**
Result Status	OK	Above	OK	Below/OK	Above	OK	OK	Above
Project Effect	n/a	n/a	n/a	n/a	n/a	n/a	n/a	**Major**

Br#79	ENGINEER'S CAMP: Km 41+167: Construction of Bridge over Sitalakha River:							
Parameter	**pH**	**TSP**	**As**	**Fe**	**Mn**	**S**	**Cl**	**FC**
GOB Drinking Wtr Stndrd. ECR'97	**6.5 – 8.5**	**10 mg/l**	**0.05 mg/l**	**0.3 – 1.06 mg/l**	**0.1 mg/l**	**< 5 mg/l**	**≤600 mg/l**	**0 CFU/100ml**
Apr 2012	6.62	--	0.001	**2.32**	0.087	--	**8**	**2**
Jul 2013	--	--	--	--	--	--	--	--
Aug 2013	**6.36/6.26**	**608/645**	≤10	**0.128/0.098**	**0.50/0.30**	0.50/0.20	11.78/29.3	Nil/Nil
Jan 2014	**5.10/5.20**	**25/25**	<0.001	**<0.09**	<0.05	2.0/2.0	9.0/10.0	Nil/Nil
Aug 2014 – GW	6	3	0.001	0.10	0.37	1	15	0
Aug 2014 – FW	5.6	2	0.002	0.09	0.15	1	16	0
Apr 2015	6.7/6.7	**205/204**	0.001	**0.28/0.32**	**0.32/0.45**	1	90/92	0
Result Status	OK	Above	OK	Low/OK	Above	OK	OK	OK
Project Effect	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Br#79	CONTRACTOR'S CAMP (East): Km 41+167: Construction of Bridge over Sitalakha River:							
Parameter	**pH**	**TSP**	**As**	**Fe**	**Mn**	**S**	**Cl**	**FC**
GOB Drinking Wtr Stndrd. ECR'97	**6.5 – 8.5**	**10 mg/l**	**0.05 mg/l**	**0.3 – 1.06 mg/l**	**0.1 mg/l**	**< 5 mg/l**	**≤600 mg/l**	**0 CFU/100ml**
Sep 2013	**6.3/6.4**	**286/286**	≤0.001	**≤0.09**	**0.48/0.48**	**5.0/5.0**	85/114	Nil/Nil
Jan 2014	7.8/8.1	**135/138**	≤0.001	**<0.09/0.76**	<0.05/0.09	2.0/3.0	7.0/8.0	Nil/Nil
Aug 2014 – O/H	7.3	2.0	0.001	0.34	0.19	1	10	0
Aug 2014 – GW	7.4	2.0	0.001	0.36	0.20	1	10	0
Apr 2015	--	--	--	--	--	--	--	--
Result Status	OK	OK	OK	OK	Above	OK	OK	OK
Project Effect	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Br#79	CONTRACTOR'S CAMP (West): Km 41+167: Construction of Bridge over Sitalakha River:							
Parameter	**pH**	**TSP**	**As**	**Fe**	**Mn**	**S**	**Cl**	**FC**
GOB Drinking Wtr Stndrd. ECR'97	**6.5 – 8.5**	**10 mg/l**	**0.05 mg/l**	**0.3 – 1.06 mg/l**	**0.1 mg/l**	**< 5 mg/l**	**≤600 mg/l**	**0 CFU/100 ml**
Sep 2013	**6.3/6.4**	**218/203**	0.001	**4.2/3.8**	**0.27/0.28**	1.0/1.0	50/54	Nil/Nil
Jan 2014	--	--	--	--	--	--	--	--
Aug 2014	--	--	--	--	--	--	--	--
Apr 2015	--	--	--	--	--	--	--	--
Result Status								
Project Effect	n/a	n/a	n/a	n/a	n/a	n/a	n/a	None

Pubail	CONTRACTOR'S CAMP: Km 55+920: Camp Site for Project Site Office and Storage Yard. (Br#89)							
Parameter	**pH**	**TSP**	**As**	**Fe**	**Mn**	**S**	**Cl**	**FC**
GOB Drinking Wtr Stndrd. ECR'97	**6.5 – 8.5**	**10 mg/l**	**0.05 mg/l**	**0.3 – 1.06 mg/l**	**0.1 mg/l**	**< 5 mg/l**	**≤600 mg/l**	**0 CFU/100 ml**
Jul 2013	--	--	--	--	--	--	--	--
Aug 2013	6.77/6.77	**313/241**	≤10	**0.144/0.065**	**0.40/0.30**	1.1/0.3	0.18/3.75	Nil/Nil
Jan 2014	--	--	--	--	--	--	--	--
Aug 2014	--	--	--	--	--	--	--	--
Apr 2015	--	--	--	--	--	--	--	--
Result Status								
Project Effect	n/a	n/a	n/a	n/a	n/a	n/a	n/a	None

Br#61	WORK SITE – PILING: Km 24+700 – Construction of Bridge							
Parameter	**pH**	**TSP**	**As**	**Fe**	**Mn**	**S**	**Cl**	**FC**
GOB Drinking Wtr Stndrd. ECR'97	**6.5 – 8.5**	**10 mg/l**	**0.05 mg/l**	**0.3 – 1.06 mg/l**	**0.1 mg/l**	**< 5 mg/l**	**≤600 mg/l**	**0 CFU/100 ml**
Jul 2013	--	--	--	--	--	--	--	--
Aug 2013	**6.43/6.45**	**204/206**	≤10/50	**1.199/1.246**	**1.9/2.0**	**6.0/6.7**	2.66/17.68	Nil/Nil
Jan 2014	7.3/7.3	**216/215**	**.067/.071**	**3.13/3.16**	**1.35/1.36**	**11/10**	14/13	Nil/Nil
Aug 2014	7.2/7.2	6.0/5.0	**.093/.095**	**4.5/4.0**	**1.87/2.05**	2.0/1.0	21/18	0/0
Apr 2015	7.7/7.6	**248/244**	.044/.046	**3.32/3.28**	**1.5/1.5**	1/1	20/17	0
Result Status	OK	Above	OK	Above limit	Above limit	OK	OK	OK
Project Effect	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Br#84	WORK SITE – PILING: Km 47+300 – Construction of Bridge							
Parameter	**pH**	**TSP**	**As**	**Fe**	**Mn**	**S**	**Cl**	**FC**
GOB Drinking Wtr Stndrd. ECR'97	**6.5 – 8.5**	**10 mg/l**	**0.05 mg/l**	**0.3 – 1.06 mg/l**	**0.1 mg/l**	**< 5 mg/l**	**≤600 mg/l**	**0 CFU/100 ml**
Jul 2013	--	--	--	--	--	--	--	--
Aug 2013	6.86/7.06	**294/312**	≤10	**1.064/1.33**	**0.4/0.7**	**33.4/33.5**	3.32/7.06	Nil/Nil
Jan 2014	7.5/7.3	**236/239**	0.002	**3.18/3.30**	**0.22/0.22**	1.0/1.0	29/31	Nil/Nil
Aug 2014	--	--	--	--	--	--	--	--
Apr 2015	8.0/8.1	**194/194**	.002/.001	0.30/0.38	.005/0.05	2.0/1.0	35/25	0
Result Status	OK	Above	OK	OK	OK	OK	OK	OK
Project Effect	n/a	n/a	n/a	n/a	n/a	n/a	n/a	None

Br#89	WORK SITE – PILING: Km 54+550 – Construction of Bridge							
Parameter	**pH**	**TSP**	**As**	**Fe**	**Mn**	**S**	**Cl**	**FC**
GOB Drinking Wtr Stndrd. ECR'97	**6.5 – 8.5**	**10 mg/l**	**0.05 mg/l**	**0.3 – 1.06 mg/l**	**0.1 mg/l**	**< 5 mg/l**	**≤600 mg/l**	**0 CFU/100 ml**
Sep 2013	7.0/6.8	**165/165**	≤0.001	**0.13/0.10**	**0.33/0.34**	<1.0	3.0/4.0	Nil/Nil
Jan 2014	--	--	--	--	--	--	--	--
Aug 2014	6.4/6.5	3.0/3.0	.005/.001	**0.19/0.21**	**0.34/0.36**	1/1	10/10	0/0
Apr 2015	8.2/7.9	**201/160**	.001/.001	**0.38/0.83**	**0.17/0.16**	4/1	13/15	0/0
Result Status	OK	OK	OK	Below/OK	Above	OK	OK	OK
Project Effect	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

C. AIR QUALITY - EMP 2.5.3

Br#34			Km 2+458: OLD BRAHAMAPUTRA RIVER – 195 m bridge (5 x 19.53m, 3 x 32.4m)														
Parameter			TPM			SO_2			NO_2			CO			Black Soot		
GOB Air Quality Stndrd ERC-1997.			150 µg/m^3			365 µg/m^3			100 µg/m^3			40,000 µg/m^3			µg/m^3		
Value of Sample			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Jun 2013	A	1055	0	16	6.6	0	0	0	0	76	11.7	0	0	0			
		1618	0	183	55.5	0	2201	124.5	0	137	49.0	0	1596	252.5			
	B	0950	0	31	16.1	0	232	21.6	0	0	0	0	0	0			
		1510	0	24	10.7	0	52	2.1	0	10	0.17	0	121	26.7			
Sep 2013	A	0735	0	2	0.21	0	0	0	0	260	58.11	0	609	188.7			
		1559	0	1	0.02	0	169	79.86	0	133	77.32	121	244	154.8			
	B	0839	0	9	2.79	0	0	0	16	104	76.9	0	377	151.1			
		1646	1	11	1.44	0	481	65.66	0	79	25.69	0	1417	176.1			
Nov 2013	A	0948	26	518	137.7	0	446	177.8	5	282	96.35	88	1457	863.3			
		1208	22	571	148.1	0	366	164.5	0	234	83.77	67	1192	772.1			
	B	1057	31	448	132.1	0	459	181.8	9	237	76.19	63	1215	733.7			
		1315	35	462	109.1	0	287	111.9	1	162	39.14	83	1024	465.4			
Apr 2014	A	0941	73	386	206.0	29	507	197.6	15	281	124.3	73	1067	783.2			
		1200	85	497	216.8	35	528	203.6	31	293	161.9	91	1168	955.6			
	B	1049	56	397	189.3	32	547	215.9	24	376	149.1	96	1374	1023			
		1306	64	412	192.6	39	564	221.5	29	319	158.2	101	1405	1068			
Sep 2014	A	0705	30	164	97.6	0	137	54.3	10	251	67.1	63	576	268.0			
		1539	39	204	127.5	0	186	76.7	19	264	71.5	59	588	279.3			
	B	0810	22	149	85.8	0	143	61.1	12	189	52.1	55	524	236.4			
		1646	27	175	102.1	0	161	65	17	193	63.5	50	556	248.3			
Mar 2015	A	0947	28	156	87.22	0	133	45.17	37	201	72.57	51	679	302.3			
		1307	48	179	106.7	0	179	63.08	32	296	99.01	63	845	351.7			
	B	1054	21	130	68.08	0	117	32.05	29	115	61.89	46	562	273.4			
		1203	36	154	95.62	0	149	49.11	25	197	78.15	59	616	323.6			
Oct 2015	A	0946	35	168	74.14	0	113	40.25	19	143	39.84	37	604	315.0			
		1202	44	189	95.01	0	121	49.67	28	165	47.38	53	791	433.6			
	B	1055	30	156	70.46	0	96	18.37	9	120	28.41	30	579	291.3			
		1309	38	172	87.22	0	118	34.77	17	134	30.88	41	673	345.2			
Result Status			Max above/Avg OK			OK			Max above/Avg OK			OK					
Project Effect			Minimal			Minimal			Minimal			Minimal					

Br#63			Km 27+193: ARIALKHAN RIVER – 130 m bridge (5 x 19.53m, 1 x 32.4m)														
Parameter			TPM			SO_2			NO_2			CO			Black Soot		
GOB Air Quality Stndrd ERC-1997.			150 µg/m^3			365 µg/m^3			100 µg/m^3			40,000 µg/m^3			µg/m^3		
Value of Sample			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Sep 2013	A	0712	0	6	1.15	0	327	102.7	0	126	18.29	0	452	169.3			
		1640	17	58	27.33	0	385	32.98	0	0	0	0	4787	646.1			
	B	0819	0	9	2.16	0	320	47.07	0	134	40.54	0	0	0			
		1532	0	24	5.95	0	1386	393.2	0	116	52.73	362	7679	3304			
Nov 2013	A	0725	19	47	33.54	0	184	97.97	7	116	50.21	28	621	255.4			
		1231	26	108	35.52	0	163	86.11	0	187	37.60	49	782	267.9			
	B	0832	16	35	25.70	0	352	139.2	0	163	44.11	31	947	199.3			
		1343	19	58	45.87	0	289	104.1	0	93	32.77	81	681	399.9			
Apr 2014	A	0949	67	247	163.1	13	341	150.5	19	219.4	89.61	57	735	567.2			
		1203	79	294	186.4	24	329	163.6	34	256	101.8	87	813	651.3			
	B	1058	74	269	172.5	19	307	157.9	31	234	97.27	63	794	490.4			
		1309	84	286	179.9	26	337	177.3	37	240	103.5	75	832	673.7			
Sep 2014	A	0710	70	256	135.7	0	356	155.3	28	203	64.2	67	567	268.3			
		1425	64	280	149.4	0	377	164.2	30	219	75.6	91	634	275.9			

Br#63			Km 27+193: ARIALKHAN RIVER – 130 m bridge (5 x 19.53m, 1 x 32.4m)														
Parameter			TPM			SO_2			NO_2			CO			Black Soot		
GOB Air Quality Stndrd ERC-1997.			150 µg/m^3			365 µg/m^3			100 µg/m^3			40,000 µg/m^3			µg/m^3		
Value of Sample			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
	B	0815	59	278	130.1	0	311	126.3	26	231	71.6	69	541	247.1			
		1320	49	276	139.8	0	319	132.5	35	225	69.9	72	610	258.5			
Mar 2015	A	0754	53	154	93.55	0	274	121.0	19	194	87.09	52	569	278.3			
		1303	70	252	132.3	0	378	217.6	37	243	104.3	61	713	296.1			
	B	0648	47	136	88.42	0	248	99.74	22	168	59.4	46	482	246.8			
		1407	65	240	117.8	0	359	143.4	31	197	88.95	55	667	279.4			
Oct 2015	A	0631	42	131	88.19	0	92	28.5	17	106	49.88	31	557	233.9			
		1552	65	188	119.0	0	100	51.79	26	141	58.76	45	766	381.4			
	B	0737	38	118	76.51	0	78	22.73	11	97	43.76	21	532	224.4			
		1659	48	146	87.26	0	90	39.84	20	116	48.22	34	603	260.4			
Result Status			Max above/Avg OK			OK			Max above/Avg OK			OK					
Project Effect			Minimal			n/a			Minimal			Minimal					

Br#79			Km 41+167: SITALAKHA RIVER – 360 m bridge (1 x 21.78, 1 x 14.62, 6 x 19.53, 4 x 32.4, 1 x 77 m)														
Parameter			TPM			SO_2			NO_2			CO			Black Soot		
GOB Air Quality Stndrd ERC-1997.			150 µg/m^3			365 µg/m^3			100 µg/m^3			40,000 µg/m^3			µg/m^3		
Value of Sample			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Oct 2012					104			63			42			--			--
Jun 2013	A	0944	19	46	36.3	0	123	7.8	0	0	0	0	126	18.0			
		1440	0	24	11.0	0	39	6.0	0	0	0	0	218	72.2			
	B	1053	1	40	23.4	0	50	7.3	0	115	13.1	0	0	0			
		1202	1	52	27.2	0	0	0	0	89	13.5	0	0	0			
Sep 2013	A	0721	0	23	5.67	0	792	121.4	0	96	6.40	0	1110	209.3			
		1602	5	34	17.49	0	0	0	18	125	99.56	378	603	508.5			
	B	0827	0	31	12.38	0	4485	84.63	114	248	186.2	0	18539	393.1			
		1715	0	148	36.21	0	175	22.79	0	226	91.41	85	605	254.6			
Nov 2013	A	0704	27	93	69.18	0	330	161.3	9	209	71.20	21	1064	284.4			
		1642	72	1297	214.9	0	1574	333.7	0	291	92.46	117	3872	478.5			
	B	0810	46	185	82.28	0	451	306	0	403	52.11	2	1119	295.9			
		1750	58	667	157.7	0	659	247.9	0	278	85.27	778	2469	1039			
Apr 2014	A	0710	50	249	164.1	16	307	117.2	31	351	118.7	68	1073	713.9			
		1551	83	328	217.8	32	397	217.2	43	510	134.8	106	1682	1264			
	B	0816	59	219	137.2	27	312	133.0	28	287	79.39	60	981	641.1			
		1703	78	311	194.7	45	468	209.5	37	491	103.6	97	1353	1074			
Sep 2014	A	0913	44	152	96.2	0	431	159.3	20	248	83.5	38	689	273.5			
		1204	60	189	132.4	0	423	174.1	20	264	132.9	79	748	439.3			
	B	1020	53	186	117.6	0	511	119.6	16	25.6	103.5	30	657	294.3			
		1310	67	231	144.2	0	443	156.7	19	250	110.8	62	698	289.3			
Mar 2015	A	0715	62	176	109.3	0	394	144.9	22	258	89.66	39	629	289.1			
		1630	56	286	146.3	0	399	160.3	40	298	113.7	69	712	356.6			
	B	0820	66	214	138.1	0	417	157.1	20	275	98.42	46	661	317.6			
		1738	98	292	162.9	0	341	179.3	34	357	127.0	78	806	387.1			
Oct 2015	A	0701	82	187	121.2	0	175	51.4	28	177	79.06	49	736	518.0			
		1611	86	191	133.6	0	187	67.74	33	191	88.64	64	892	586.3			
	B	0807	72	156	101.2	0	166.1	44.36	22	154	61.77	42	697	430.8			
		1719	82	174	127.0	0	167	58.09	25	160	69.87	51	716	527.9			
Result Status			Max high/Avg OK			Max high/Avg OK			Max above/Avg OK			OK					
Project Effect			Minimal			Minimal			Minimal			Minimal					

Br#89			Km 54+522: BALU RIVER – 77 m bridge (1 x 77.0m)															
Parameter			**TPM**			**SO_2**			**NO_2**			**CO**			**Black Soot**		
GOB Air Quality Stndrd ERC-1997.			**150 µg/m^3**			**365 µg/m^3**			**100 µg/m^3**			**40,000 µg/m^3**			**µg/m^3**		
Value of Sample			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Sep 2013	A	0713	0	49	27.90	0	237	96.84	0	0	0	147	480	265.7			
		1530	22	38	29.20	0	62	5.54	0	0	0	7	282	168.1			
	B	0816	0	29	14.02	0	332	86.25	0	**195**	31.88	0	472	281.3			
		1641	0	26	16.87	0	0	0	0	0	0	273	511	347.4			
Nov 2013	A	0945	39	110	93.53	29	**452**	277.8	0	**246**	44.7	10	579	180.9			
		1207	51	68	61.92	0	219	93.67	0	**136**	72.7	19	634	216.9			
	B	1053	23	65	53.97	123	304	227.1	0	**277**	48.0	9	483	127.6			
		1317	39	63	55.02	0	193	86.23	2	**145**	29.9	19	458	153.5			
Apr 2014	A	0948	91	**291**	**227.2**	49	**433**	279.1	59	**465**	**212.6**	137	1567	1134			
		1204	65	**183**	132.1	31	247	118.1	47	**431**	**102.7**	92	932	647.1			
	B	1057	31	**172**	116.0	37	348	139.5	10	**531**	**127.2**	83	1017	651.8			
		1311	26	134	99.81	9	165	87.54	6	**386**	94.81	62	731	564.0			
Sep 2014	A	0815	41	**204**	**167.4**	0	236	68.2	26	**157**	85.7	69	873	319.6			
		1725	61	**243**	**194.2**	0	255	127.7	39	**189**	**132.2**	78	896	356.1			
	B	0710	28	**169**	136.2	0	175	53.4	12	**131**	45.6	50	761	230.5			
		1618	32	**205**	**153.8**	0	179	59.9	27	**163**	79.7	64	779	294.7			
Mar 2015	A	0950	49	**170**	97.15	0	159	43.08	27	**136**	78.5	56	652	331.4			
		1310	57	**205**	114.6	0	164	58.93	34	**170**	85.99	68	719	346.9			
	B	1058	37	135	70.84	0	98	30.9	19	**118**	39.09	48	468	298.8			
		1203	45	**181**	92.66	0	142	43.52	25	**152**	67.05	56	670	328.7			
Oct 2015	A	0948	56	99	71.96	0	59	24.15	9	73	37.66	37	361	114.4			
		1207	64	117	90.81	0	67	26.7	14	79	44.39	41	408	119.6			
	B	1056	49	74	61.38	0	46	22.36	4	67	31.59	34	318	106.0			
		1315	59	109	85.24	0	60	24.03	10	72	40.14	39	367	112.9			
Result Status			OK			OK			OK			OK					
Project Effect			Minimal			Minimal			Minimal			Minimal					

Methikanda Stn			Km														
Parameter			**TPM**			**SO_2**			**NO_2**			**CO**			**Black Soot**		
GOB Air Quality Stndrd ERC-1997.			**150 µg/m^3**			**365 µg/m^3**			**100 µg/m^3**			**40,000 µg/m^3**			**µg/m^3**		
Value of Sample			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Sep 2013	A	0945	0	38	7.49	0	48	1.33	0	**171**	65.44	0	2753	141.8			
		1314	0	54	14.85	0	0	0	**102**	**206**	**162.6**	0	0	0			
	B	1059	0	20	5.14	0	0	0	89	**259**	**187.3**	0	1425	22.27			
		1207	5	120	20.08	0	0	0	**145**	**282**	**201.6**	0	6451	584.2			
Nov 2013	A	0702	25	126	47.52	0	**374**	156.5	0	**207**	69.16	38	957	313.8			
		1606	59	**504**	**235.4**	0	347	177.6	7	**164**	55.95	28	1019	387.3			
	B	0809	21	109	57.87	0	262	120.9	1	**267**	44.37	19	616	282.2			
		1714	29	**343**	114.9	0	362	139.6	1	57	38.09	19	941	274.3			
Apr 2014	A	0809	48	**204**	146.9	37	**465**	168.6	19	**374**	98.73	62	1094	683.4			
		1602	81	**453**	**252.8**	45	**608**	187.6	38	**591**	**152.9**	83	1306	942.7			
	B	0704	30	**167**	94.43	7	307	132.9	11	**290**	76.31	41	769	391.8			
		1708	52	**217**	144.5	16	358	149.1	24	**297**	90.57	56	978	418.3			
Sep 2014	A	0956	40	**214**	125.3	0	261	120.1	26	**231**	73.1	58	714	220.9			
		1735	48	**237**	136.8	0	238	137.0	24	**246**	94.5	62	687	229.6			
	B	1058	31	**152**	111.1	0	241	124.0	16	**201**	**110.7**	55	674	199.3			
		1630	36	**214**	119.6	0	199	128.6	20	**234**	89.6	50	682	211.6			
Mar 2015	A	0950	50	**195**	136.9	0	**374**	144.7	41	**267**	**118.5**	67	915	435.8			
		1630	58	**358**	**193.7**	0	**426**	163.8	43	**308**	**132.1**	78	1032	489.3			
	B	1054	45	**189**	94.36	0	298	113.8	30	**211**	78.4	59	792	384.5			
		1736	55	**284**	**157.3**	0	**379**	139.5	46	**266**	92.68	56	881	416.8			
Oct 2015	A	0950	82	**291**	**158.8**	0	**389**	157.6	45	**279**	**172.5**	64	1073	690.6			
		1202	88	**357**	**177.9**	0	**419**	201.5	51	**321**	**193.1**	84	1363	703.8			

Methikanda Stn			Km														
Parameter			TPM			SO_2			NO_2			CO			Black Soot		
GOB Air Quality Stndrd ERC-1997.			150 µg/m^3			365 µg/m^3			100 µg/m^3			40,000 µg/m^3			µg/m^3		
Value of Sample			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
	B	0958	56	**209**	131.5	0	327	112.0	31	**237**	**108.4**	51	829	396.1			
		1315	63	**234**	139.6	0	347	152.7	49	**272**	**139.6**	61	947	467.8			
Result Status			Max above/Avg high			Max above/Avg OK			Max above/Avg high			OK					
Project Effect			Minimal			Minimal			Minimal			Minimal					

Pubail Station			Km														
Parameter			TPM			SO_2			NO_2			CO			Black Soot		
GOB Air Quality Stndrd ERC-1997.			150 µg/m^3			365 µg/m^3			100 µg/m^3			40,000 µg/m^3			µg/m^3		
Value of Sample			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Sep 2013	A	0950	14	57	26.12	0	182	55.74	0	0	0	242	594	403.6			
		1205	0	19	10.78	0	126	39.36	0	0	0	317	864	460.1			
	B	1055	15	120	49.84	0	274	85.18	0	0	0	325	1540	740.8			
		1310	4	84	30.92	0	16	0.41	0	0	0	370	1367	625.5			
Nov 2013	A	0705	16	44	36.97	0	**531**	267.7	0	**197**	44.9	42	971	515.0			
		1932	39	**324**	**183.5**	0	**673**	157.9	0	**288**	79.4	1699	2639	2212			
	B	0816	25	64	43.04	0	**674**	219.2	0	**319**	60.5	34	852	546.8			
		2035	32	**296**	**154.9**	0	336	162.7	0	**165**	67.2	1350	2701	1983			
Apr 2014	A	0947	31	105	65.43	51	**387**	249.2	27	**289**	94.73	67	867	497.3			
		1205	67	**325**	**189.6**	41	**587**	307.6	47	**355**	**228.5**	861	1748	1385			
	B	1056	44	**167**	96.09	7	319	226.0	31	**382**	**197.2**	79	932	691.9			
		1312	90	**314**	**198.2**	47	**429**	281.5	64	**395**	**288.1**	1019	2014	1536			
Sep 2014	A	0710	33	**161**	65.4	0	268	169.3	21	**133**	**115.4**	67	973	574.2			
		1643	49	**180**	97.2	0	304	275.8	18	**212**	**157.8**	101	1238	649.8			
	B	0816	14	138	59.5	0	197	143.7	10	**128**	92.0	55	892	538.8			
		1749	20	144	65.6	0	201	147.3	15	**150**	97.3	92	1034	594.7			
Mar 2015	A	0700	98	**274**	142.5	0	167	95.55	30	**354**	**132.0**	57	814	491.7			
		1720	80	**235**	**151.3**	0	412	214.8	48	**421**	**210.9**	80	984	752.2			
	B	0806	82	**221**	125.9	0	301	124.2	27	**240**	**152.8**	70	1033	553.3			
		1615	87	**230**	137.1	0	356	251.9	19	**314**	**200.8**	61	1134	738.3			
Oct 2015	A	0915	67	**193**	117.9	0	151	73.3	19	**241**	**116.7**	43	819	637.3			
		1022	69	**207**	139.6	0	169	88.7	31	**279**	**152.0**	73	1066	844.3			
	B	1201	81	**214**	125.9	0	178	76.66	23	**254**	**122.9**	51	1013	724.7			
		1310	87	**235**	143.6	0	193	95.3	36	**291**	**150.0**	76	1179	867.4			
Result Status			Max above/Avg OK			OK			Max above/Avg above			OK					
Project Effect			Minimal			Minimal			Minimal			Minimal					

Tongi Station			Km														
Parameter			TPM			SO_2			NO_2			CO			Black Soot		
GOB Air Quality Stndrd ERC-1997.			150 µg/m^3			365 µg/m^3			100 µg/m^3			40,000 µg/m^3			µg/m^3		
Value of Sample			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Sep 2013	A	0710	17	52	30.55	0	141	24.62	0	0	0	0	959	580.7			
		1515	21	222	41.25	0	195	57.57	31	**126**	62.82	573	1926	1139			
	B	0815	0	47	17.67	0	67	3.26	18	**142**	94.62	0	999	630.5			
		1630	22	53	36.66	0	**380**	171.4	0	**152**	32.68	168	1134	623.6			
Nov 2013	A	0950	15	62	49.61	0	**369**	137.9	0	**212**	40.98	21	561	328.6			
		1320	107	**186**	139.1	0	332	166.8	0	**319**	87.50	674	1344	918.1			
	B	1058	23	88	34.18	0	341	174.5	0	**262**	65.79	24	784	220.8			
		1205	19	97	56.32	0	226	106.1	0	**187**	58.87	11.5	536	158.2			
Apr 2014	A	0701	34	**153**	96.3	17	345	103.7	19	**262**	**153.8**	112	1019	541.3			
		1541	87	**255**	**186.3**	74	**374**	185.8	34	**241**	**181.4**	359	1545	1035			

Tongi Station			Km															
Parameter			TPM			SO_2			NO_2			CO			Black Soot		
GOB Air Quality Stndrd ERC-1997.			150 µg/m^3			365 µg/m^3			100 µg/m^3			40,000 µg/m^3			µg/m^3		
Value of Sample			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
	B	0809	28	134	86.61	5	**375**	89.11	9	**311**	97.22	46	813	351.8			
		1652	68	**207**	126.6	11	**405**	99.43	23	**371**	**102.4**	73	1037	650.1			
Sep 2014	A	0917	25	**215**	88.1	0	323	144.7	42	**252**	**123.2**	83	1370	458.4			
		1407	56	**284**	137.5	0	307	176.3	64	**317**	**142.9**	91	1421	886.7			
	B	1030	40	**276**	93.4	0	**1091**	281.2	39	**230**	**148.2**	74	1386	776.2			
		1515	65	**294**	139.6	0	**571**	247.8	47	**295**	**152.4**	113	1481	990.3			
Mar 2015	A	0659	89	136	109.1	0	256	106.1	33	**489**	**169.4**	71	1281	693.5			
		1550	32	**278**	134.6	10	**620**	288.9	49	**532**	**205.1**	86	1320	994.2			
	B	0809	36	**202**	123.9	0	**387**	181.7	47	**513**	**187.7**	52	1125	784.6			
		1700	60	**481**	146.6	1	**533**	286.6	55	**610**	**234.1**	118	1682	1066			
Oct 2015	A	0650	43	**179**	98.31	0	137	65.91	28	**201**	90.3	62	1085	599.2			
		1555	51	**216**	129.2	0	183	74.27	35	**263**	**126.9**	74	1156	631.1			
	B	0806	32	147	87.98	0	135	40.37	19	**168**	79.35	43	833	375.6			
		1708	46	**192**	120.9	0	176	73.32	32	**210**	**109.5**	70	1021	499.8			
Result Status			Max above/Avg OK			OK			Max above/Avg high			OK					
Project Effect			Minimal			Minimal			Minimal			Minimal					

Work Site #1			Br#85 - Km														
Parameter			TPM			SO_2			NO_2			CO			Black Soot		
GOB Air Quality Stndrd ERC-1997.			150 µg/m^3			365 µg/m^3			100 µg/m^3			40,000 µg/m^3			µg/m^3		
Value of Sample			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Sep 2013	A	0955	0	41	11.81	0	**387**	90.35	0	**191**	48.21	0	471	142.9			
		1210	12	52	21.42	0	0	0	0	59	9.83	434	1041	623.8			
	B	1058	0	46	7.84	0	253	127.6	0	19	3.85	0	0	0			
		1310	1	25	13.73	68	**403**	238.1	0	**115**	19.27	0	835	145.8			
Nov 2013	A	1053	65	108	78.34	0	**589**	157.2	1	**450**	38.11	31	989	238.9			
		1202	48	89	64.89	0	**642**	161.6	0	**187**	57.25	1	1050	302.1			
	B	0947	29	70	49.94	0	**919**	**532.2**	6	**554**	66.37	17	580	321.4			
		1310	52	84	68.24	0	**754**	229.4	13	**224**	91.21	32	973	394.6			
Apr 2014	A	0945	59	**257**	127.3	28	**437**	164.2	35	**524**	83.62	62	972	681.6			
		1205	91	**318**	**169.7**	70	**531**	249.5	29	**613**	**113.8**	81	1067	726.8			
	B	1052	72	**294**	149.6	43	**507**	230.6	29	**546**	97.76	68	991	701.3			
		1312	96	**335**	**176.4**	64	**491**	242.9	46	**652**	**121.7**	92	1234	997.3			
Sep 2014	A	0951	26	**233**	89.4	0	284	96.6	19	**256**	66.8	37	694	212.5			
		1205	32	**259**	124.8	0	280	92.6	21	**267**	88.3	76	910	283.1			
	B	1057	50	**247**	118.1	0	348	162.7	31	**307**	85.8	73	776	265.6			
		1310	57	**286**	138.5	0	328	170.7	30	**326**	94.6	82	1037	291.3			
Mar 2015	A	0954	84	137	111.2	5	**590**	161.9	25	**197**	64.15	46	722	256.9			
		1307	71	**164**	128.0	9	**603**	180.4	34	**199**	76.81	55	862	310.9			
	B	1058	95	**172**	133.2	13	**618**	204.6	45	**215**	89.11	67	841	324.1			
		1203	92	**213**	145.1	16	**639**	224.1	53	**238**	**102.7**	75	995	401.8			
Oct 2015	A	0942	57	**150**	125.2	0	169	72.11	21	**113**	59.35	37	675	231.4			
		1203	72	**193**	134.4	0	176	84.58	29	**140**	72.31	61	958	327.2			
	B	1055	61	**186**	132.5	0	181	76.0	32	**143**	70.17	54	936	311.6			
		1312	81	**209**	147.4	0	191	92.63	41	**159**	76.31	77	1049	556.5			
Result Status			Max above/Avg OK			OK			Max above/Avg OK			OK					
Project Effect			Minimal			Minimal			Minimal			Minimal					

Work Site #2			Br#82 - Km														
Parameter			TPM			SO_2			NO_2			CO			Black Soot		
GOB Air Quality Stndrd ERC-1997.			150 µg/m^3			365 µg/m^3			100 µg/m^3			40,000 µg/m^3			µg/m^3		
Value of Sample			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Nov 2013	A	0810	34	216	80.44	0	273	139.3	0	140	38.82	24	654	248.7			
		1647	155	287	187.0	0	386	177.9	0	275	67.09	69	771	311.8			
	B	0701	24	105	54.66	0	381	180.6	0	169	77.65	31	580	216.3			
		1540	85	146	123.2	0	253	175.2	9	454	59.33	51	847	287.7			
Apr 2014	A	0707	67	295	187.5	21	168	115.0	37	143	87.71	73	644	471.8			
		1557	89	316	218.5	51	379	198.6	62	331	197.3	110	1148	845.4			
	B	0812	49	230	132.6	11	159	101.9	28	109	59.71	61	527	424.1			
		1705	73	283	174.6	48	268	174.3	42	337	139.4	93	971	674.8			
Sep 2014	A	0951	48	226	86.7	0	251	73.5	19	149	93.5	57	534	243.6			
		1307	55	240	128.3	0	238	86.5	25	186	116.7	59	564	254.1			
	B	1056	36	204	79.2	0	207	67.2	17	123	79.5	41	528	210.8			
		1202	49	214	113.9	0	219	72.6	19	144	89.7	52	54.2	216.9			
Sep 2014	A	0953	42	181	95.23	0	262	98.91	10	273	101.5	59	533	282.6			
		1308	68	218	116.8	0	298	102.5	18	291	121.1	67	587	317.8			
	B	1059	49	168	81.32	0	218	84.16	15	257	88.25	55	538	269.0			
		1202	75	231	129.5	0	269	96.81	23	258	119.6	65	688	310.7			
Oct 2015	A	0710	37	91	67.43	0	46	18.58	6	56	33.88	25	337	101.6			
		1535	54	130	99.07	0	64	25.87	13	69	39.22	34	398	132.6			
	B	0816	52	128	95.71	0	58	23.5	11	72	40.39	33	462	149.4			
		1643	63	207	131.0	0	80	31.4	24	96	53.77	45	688	216.1			
Result Status			Max high/Avg OK			OK			OK			OK					
Project Effect			Minimal			Minimal			Minimal			Minimal					

Work Site #3			Crusher at Bhairab Bazar														
Parameter			TPM			SO_2			NO_2			CO			Black Soot		
GOB Air Quality Stndrd ERC-1997.			150 µg/m^3			365 µg/m^3			100 µg/m^3			40,000 µg/m^3			µg/m^3		
Value of Sample			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Sep 2013	A	0925	19	633	245.4	0	513	274.1	0	130	83.66	26	1335	369.2			
		1308	46	896	259.5	41	786	567.4	9	231	87.01	47	1297	574.2			
	B	1040	38	593	141.2	0	537	168.2	13	162	47.31	94	916	326.3			
		1200	29	667	148.3	0	612	231.1	17	186	66.94	64	1093	418.7			
Apr 2014	A	0811	68	267	137.5	23	273	143.2	26	379	167.1	58	823	647.3			
		1539	112	731	589.2	69	688	304.7	46	497	266.3	97	1497	1135			
	B	0704	53	284	115.7	23	273	143.2	19	342	139.8	42	786	609.2			
		1646	76	682	319.1	53	619	283.2	36	349	231.6	72	1164	961.9			
Sep 2014	A	0945	53	197	129.6	0	164	82.1	15	143	61.7	86	538	267.2			
		1308	67	210	137.6	0	213	127.5	19	160	76.4	92	546	273.1			
	B	1056	40	188	108.6	0	211	71.6	11	109	48.7	73	494	249.9			
		1202	65	190	132.6	0	207	95.8	15	124	55.8	87	532	255.9			
Mar 2015	A	0700	52	225	188.1	0	147	70.21	34	157	51.66	67	749	362.0			
		1515	82	593	196.3	0	173	108.7	44	311	89.33	98	1078	540.1			
	B	0806	55	207	163.1	0	129	62.79	20	148	42.96	43	657	314.7			
		1621	63	527	173.1	0	169	86.2	31	237	82.09	84	915	494.6			
Oct 2015	A	0704	89	349	193.6	0	180	74.68	31	173	65.47	72	950	544.1			
		1510	95	358	198.9	0	203	88.0	46	201	71.42	81	1106	707.0			
	B	0811	91	395	201.7	0	193	81.8	51	192	83.17	76	1050	778.3			
		1617	121	584	285.8	0	229	96.47	58	216	91.29	88	1273	839.1			
Result Status			Max high/Avg high			OK			Max high/Avg OK			OK					
Project Effect			Minimal			Minimal			Minimal			Minimal					

D. NOISE - EMP 2.5.4

	Bhairab Bazar Station		Methikanda Station		Narsingdi Station		Pubail Station		School		Tongi Junction Station	
Chainage (Km)	0+000		13+665		30+467		55+920		58+600		64+424	
GOB Standard	**70**	**60**	**70**	**60**	**70**	**60**	**70**	**60**	**70**	**60**	**70**	**60**
Time of Sample	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Apr 2012	66	53	62	51	69	52	68	53	66	52	**70**	**61**
May 2012	67	55	60	54	**71**	51	69	51	67	55	**71**	60
Jun 2012	66	53	59	51	69	52	65	50	63	53	**72**	58
Jul 2012	63	52	60	53	67	54	63	52	62	51	**73**	54
Aug 2012	--	--	--	--	--	--	--	--	--	--	--	--
Sep 2012	--	--	--	--	--	--	--	--	--	--	--	--
Oct 2012	--	--	--	--	--	--	--	--	--	--	--	--
Nov 2012	--	--	--	--	--	--	--	--	--	--	--	--
Dec 2012	--	--	--	--	--	--	--	--	--	--	--	--
Jan 2013	--	--	--	--	--	--	--	--	--	--	--	--
Feb 2013	--	--	--	--	--	--	--	--	--	--	--	--
Mar 2013	--	--	--	--	--	--	--	--	--	--	--	--
Apr 2013	--	--	--	--	--	--	--	--	--	--	--	--
May 2013	--	--	--	--	--	--	--	--	--	--	--	--
Average	66	53	60	52	69	52	66	52	65	53	**72**	58
Result Status	OK		OK		OK		OK		OK		OK	
Project Effect	None		None		None		None		None		None	

From June 2013 sampling commenced in line with the Sampling Program in the EMP at construction sites with the effects of train movements recorded at the required sites.

Br#34		**Km 2+458: OLD BRAHAMAPUTRA RIVER – 195 m bridge (5 x 19.53m, 3 x 32.4m)**															
Time		**Day**								**Night**							
GOB Noise Stndrd (2006).		**70 dBA (Commercial)**								**60 dBA (Commercial)**							
		No Train Passing				Train Passing				No Train Passing				Train Passing			
Value of Sample		Time	Min	Max	Avg	Time	Min	Max	Avg	Time	Min	Max	Avg	Time	Min	Max	Avg
Jun 2013	A		51	**72.2**													
	B		52														
Sep 2013	A	0805	45.2	**74.7**	59.3	0750	55	**70.7**	62.3	1824	46.6	**72.8**	57.1	1811	50.4	**73.3**	**67.2**
	B	0811	48.5	**74.2**	59.3	0903	52.6	**80.5**	68.9	1835	49.3	**73.8**	**60.5**	1829	49.4	**74.5**	**64.9**
Nov 2013	A	0948	59.4	**83.1**	**75.7**					2035	59.4	**62.6**	**61.2**				
	B	1057	59.6	**79.0**	67.7					2000	58.9	**74.7**	**66.1**				
Apr 2014	A	0941	61.8	**80.6**	68.1					2014	56.7	59.1	57.7				
	B	1049	56.5	**78.7**	63.8					2049	52.3	**75.4**	**60.2**				
Sep 2014	A	0705	45.8	64.7	57.1					1845	47.3	**64.2**	54.2				
	B	0810	47.2	63.7	52.0					1918	46.4	60.1	51.4				
Mar 2015	A	0947	44.5	59.6	51.6					1843	44	**65.5**	53.3				
	B	1054	45.3	65.2	54.0					1920	43.2	56	49.5				
Oct 2015	A	0946	47	**71**	56.4					1925	42	**64**	49.0				
	B	1055	46	61	51.8					2002	43	58	45.8				
Result Status		OK								Max above/Avg OK							
Project Effect		Minimal				Minimal				Minimal				Minimal			

Br#79		Km 41+167: SITALAKHA RIVER – 360 m bridge (1 x 21.78, 1 x 14.62, 6 x 19.53, 4 x 32.4, 1 x 77 m)															
Time		Day								Night							
GOB Noise Stndrd (2006).		70 dBA (Commercial)								60 dBA (Commercial)							
		No Train Passing				Train Passing				No Train Passing				Train Passing			
Value of Sample		Time	Min	Max	Avg	Time	Min	Max	Avg	Time	Min	Max	Avg	Time	Min	Max	Avg
Sep 2013	A	0808	49.2	64	53.8	0917	50.7	**78.5**	62.7	1834	56.7	**60.5**	58.2	1857	57.9	**90.8**	**74.8**
	B	0814	44.7	82	61.6	0826	53.3	**94**	**77.5**	1815	50.5	**73**	58.7	1819	54.3	**73.1**	**67.2**
Nov 2013	A	0704	51.5	64.2	59.5					2000	50.1	**68.0**	57.9				
	B	0810	48.0	**74.3**	63.1					2037	50.7	**71.5**	**60.4**				
Apr 2014	A	0710	48.1	**92.9**	**71.2**					1901	47.8	**84.7**	**67.0**				
	B	0816	43.4	**90.1**	58.8					1935	46.7	57.0	51.9				
Sep 2014	A	0913	45.8	**84.2**	68.6					1840	44.4	**74.2**	**62.2**				
	B	1020	52.3	66.8	61.9					1915	48.0	**63.2**	52.8				
Mar 2015	A	0715	46.9	**104**	**86.1**					1835	44.3	**91.9**	**76.7**				
	B	0820	47	**86.9**	68.6					1916	44.7	**82.2**	**64.8**				
Oct 2015	A	0701	48.7	**78.6**	67.3					1845	44.9	**68.3**	59.6				
	B	0807	47.2	**71.8**	64.5					1925	43.8	**65.4**	56.6				
Result Status		**A** Above Limit/ **B** Above								Max Above Limit/ Av OK							
Project Effect		Minimal				Minimal				Minimal				Minimal			

Crushing Plant		Bhairab Bazar-Stopped operation in August 2015-BR leased to coal storage yard															
Time		Day								Night							
GOB Noise Stndrd (2006).		70 dBA (Commercial)								60 dBA (Commercial)							
		No Train Passing				Train Passing				No Train Passing				Train Passing			
Value of Sample		Time	Min	Max	Avg	Time	Min	Max	Avg	Time	Min	Max	Avg	Time	Min	Max	Avg
Sep 2013	A	1031	43.2	**71**	57.3	1027	46.5	**74.6**	63.1	1845	45	**64**	52.8	1842	58.3	**75.2**	**65.9**
	B	1037	42.6	**75.3**	61.8	1114	41.2	**75**	**58.9**	1908	45.3	**69.1**	58.7	1935	46.1	**73.7**	**62.6**
Nov 2013	A	0925	66.7	**77.8**	**73.1**					2000	69.7	**75.7**	**73.1**				
	B	1040	45.8	58.6	50.7					2033	45.3	**61.1**	52.2				
Apr 2014	A	0811	51.9	**83.7**	67.9					1845	53.2	**79.7**	**74.2**				
	B	0704	47.7	60.5	49.9					1918	63.5	**87.0**	**83.2**				
Sep 2014	A	0945	43.8	63.0	53.0					2050	43.0	56.9	47.1				
	B	1055	43.5	60.1	48.7					2123	42.9	53.3	46.2				
Mar 2015	A	0700	44	65.5	53.3					2012	42	56.4	46.9				
	B	0806	43.9	60.6	51.5					2049	41.8	54.8	44.6				
Oct 2015	A	0704	47.1	65.2	58.8					1815	42	51	46.7				
	B	0811	46.9	67.3	59.4					1848	44	53	48.4				
Result Status		OK								OK							
Project Effect		Minimal				Minimal				Minimal				Minimal			

Ballast – Track		Not completed by contractor															
Time		Day								Night							
GOB Noise Stndrd (2006).		70 dBA (Commercial)								60 dBA (Commercial)							
		No Train Passing				Train Passing				No Train Passing				Train Passing			
Value of Sample		Time	Min	Max	Avg	Time	Min	Max	Avg	Time	Min	Max	Avg	Time	Min	Max	Avg
	A																
	B																
Result Status		OK				OK/Above Limit				Above Limit				Above Limit			
Project Effect		Minimal				Minimal				Minimal				Minimal			

Dredging Site																	
Time		Day								Night							
GOB Noise Stndrd (2006).		70 dBA (Commercial)								60 dBA (Commercial)							
		No Train Passing				Train Passing				No Train Passing				Train Passing			
Value of Sample		Time	Min	Max	Avg	Time	Min	Max	Avg	Time	Min	Max	Avg	Time	Min	Max	Avg
Sep 2013	A	0812	54.8	**80.9**	69.7	Site Remote from railway line – not applicable				1935	41.8	**64.3**	51.1	Site Remote from railway line – not applicable			
	B	0817	55.9	**77.9**	66.9					1939	41.8	**65.9**	52.4				
Nov 2013	A	0951	50.2	**78.3**	**70.3**					2000	52.1	**62.6**	57.5				
	B	1057	47.0	**75.1**	61.4					2035	49.1	**59.6**	57.3				
Result Status		Above Limit								Max above/Avg OK Limit							
Project Effect		Minimal				Minimal				Minimal				Minimal			

Methikanda Stn		Km: 13+665															
Time		Day								Night							
GOB Noise Stndrd (2006).		70 dBA (Commercial)								60 dBA (Commercial)							
		No Train Passing				Train Passing				No Train Passing				Train Passing			
Value of Sample		Time	Min	Max	Avg	Time	Min	Max	Avg	Time	Min	Max	Avg	Time	Min	Max	Avg
Sep 2013	A	1012	42.1	**72.2**	57.5	1127	46.7	**92**	**74.3**	2026	41.9	**71.2**	57.7	2023	44.1	**88.1**	**71.7**
	B	1018	44.9	66.8	51.3	1035	46.2	**77.7**	68.8	2032	43.5	**63.6**	50.3	2114	46.2	**75.3**	**67.6**
Nov 2013	A	0702	46.7	**75.3**	58.9					2140	45.5	**71.4**	**62.4**				
	B	0809	45.9	**71.4**	54.9					2215	45.8	**63.4**	53.1				
Apr 2014	A	0809	51.3	**95.5**	70.0					1847	40.8	**88.4**	**65.0**				
	B	0704	43.3	68.0	56.7					1923	43.1	56.7	47.0				
Sep 2014	A	0955	46.4	**73.8**	58.1					1845	51.7	**63.5**	56.7				
	B	1058	46.7	67.8	57.9					1920	48.9	**61.4**	54.1				
Mar 2015	A	0950	44	**70.8**	54.4					1840	43.6	**60.6**	50.5				
	B	1054	43.4	67.9	52.2					1918	42	59.4	49.1				
Oct 2015	A	0950	47.3	**70.7**	59.1					1913	45.1	**67.8**	52.2				
	B	1058	46.5	64.2	54.2					1949	43.2	**60.8**	50.4				
Result Status		**A** Max above/Avg & B OK								Max above/ Avg OK							
Project Effect		Minimal				Minimal				Minimal				Minimal			

Pubail Station		**Km: 55+920**															
Time		**Day**								**Night**							
GOB Noise Stndrd (2006).		**70 dBA (Commercial)**								**60 dBA (Commercial)**							
		No Train Passing				Train Passing				No Train Passing				Train Passing			
Value of Sample		Time	Min	Max	Avg	Time	Min	Max	Avg	Time	Min	Max	Avg	Time	Min	Max	Avg
Sep 2013	A	1013	45.6	61.6	53.6	1025	54.7	69.5	63.8	1850	48.6	**75**	59.6	1915	50.9	**87.9**	**73.9**
	B	1018	44.7	69.1	54.4	1057	51.4	**79.9**	64	1858	41.1	54.8	46.2	1942	55.8	**69.9**	**64.5**
Nov 2013	A	0705	29.1	**71.4**	53.8					2000	27.5	**65.0**	51.2				
	B	0816	30.5	**71.0**	55.3					2035	25.5	**67.0**	54.5				
Apr 2014	A	0947	45.1	**76.5**	60.8					1913	39.9	**77.1**	54.1				
	B	1056	45.5	**72.6**	56.9					1952	40.8	58.0	50.3				
Sep 2014	A	0710	48.2	**72.4**	63.5					1905	41.1	**69.2**	55.7				
	B	0816	44.8	69.6	57.1					1941	39.4	**61.3**	51.5				
Mar 2015	A	0700	46.5	**84.9**	66.2					1839	33.4	**79.3**	**61.7**				
	B	0806	46.5	64.6	52.4					1915	34.2	59.5	51.3				
Oct 2015	A	0915	45.9	**71.4**	61.4					1840	40.8	**63.1**	52.3				
	B	1022	45.7	66.5	57.2					1918	41.3	**60.5**	50.2				
Result Status		**A** Max above/Avg & **B** OK								**A** above/**B** OK							
Project Effect		Minimal				Minimal				Minimal				Minimal			

Table 1: Environmental Monitoring for the Generic Impacts

Environmental Impacts/Issues/ Parameters	Monitoring Parameters	Standards/ Guidelines	Means of Monitoring	Frequency	Location	Implementation Agency	Supervision Agency	Current status
Construction Stage:								
Air Pollution and Dust	• Checking whether air and dust are occurred	DOE	On site air/dust qualitative monitoring	• During dry period	Construction sites	Contractor	CSC and BR	Dust is controlled by spraying water manually
Noise Pollution	• Checking whether noise is generated due to construction activities or not.	DOE	On site noise monitoring (qualitative)	As & when required	At construction sites	Contractor	CSC and BR	No Noisy works are on going
Pollution due to Waste	• Checking collection, storage, transportation, and disposal of hazardous waste;and • Waste from construction site to be collected and disposed safely to the designated sites;	NA	Monitoring	During construction stage	At construction sites	Contractor	CSC and BR	Satisfactory
Siting of Construction Site	• Location of the construction site	NA	Monitoring	Before commencing construction work	NA	Contractor	CSC and BR	Satisfactory
Employment generation	• Local PAPs/poor people get employment	NA	Monitoring	During construction work	Subproject areas	Contractor	CSC and BR	Satisfactory
Occupational health and safety	Checking workers' health, use of PPE & first aid facilities	NA	Inspection	During construction work	At construction sites	Contractor	CSC and BR	Unsatisfactory. Advised to provide PPE & 1st aid box.
Community health and safety	Awareness of local people and safe stay from the project activities	NA	Inspection	Regular	At construction sites	Contractor	CSC and BR	Satisfactory

Table 2: Environmental Monitoring for the Subproject Specific Impacts (Loop Contract)

Environmental Impacts/Issues/ Parameters	Monitoring Parameters	Standards/ Guidelines	Means of Monitoring	Frequency	Location	Implementation Agency	Supervision Agency	Current status
Darsana Railway Station								
H&S of construction workers & passengers	Safety during track rehabilitation works	NA	Inspection	Regular monitoring	At the station yard	Contractor	CSC & BR	Safety done not satisfactorily (PPE & 1st Aid Box not yet provided)
Chuadanga Railway Station								
Safety at level crossing	• Ensure that trained personnel with flag are employed; and • Public safety at level crossing.	Safety	Monitoring	During construction	At the level crossing.	Contractor	CSC & BR	Safety measures done satisfactorily
Air Pollution & dust	• Measurement of parameters such as PM2.5, PM10, SPM, SOX, NOX & CO.	DOE Standard	On site air/dust monitoring by measurement	• During dry period	Loop construction site	Contractor	CSC & BR	Measurement value of the parameters are within the DOE standard. So air quality is satisfactory (Results are given in Annex-A)
Noise Pollution	• Checking whether noise is generated due to construction activities or not by noise meter.	DOE	On site noise monitoring	As & when required	At construction sites	Contractor	CSC & BR	Noise level within standard of DOE. (Results are shown in Annex-A)
Drinking Water Quality (DWQ)	Conduct drinking water quality testing for pH, Mn, As, CL, FC, TC	DOE standard for DWQ	Sampling and laboratory analysis	Quarterly	Sampling at the Pond and analysis in a recognized laboratory.	Contractor	CSC & BR	Water quality monitoring done during this period (results are given in Annex-A).

Environmental Impacts/Issues/ Parameters	Monitoring Parameters	Standards/ Guidelines	Means of Monitoring	Frequency	Location	Implementation Agency	Supervision Agency	Current status
Alamdanga Railway Station								
Dust monitoring during earthworks	Safety during earthworks	ADB & DOE guidelines	Inspection	Regular during execution	At the station yard	Contractor	CSC & BR	Qualitative dust monitoring is being done.
Replantation of trees	Ensure that tree replantation is done	FD/BR	Monitoring	During replantation of trees	At the station /railway embankment slopes	Contractor	CSC & BR	At up loop line 9 trees were cut. Replanting of min. 18 trees is yet to be done.
Halsha Railway Station								
H&S of the workers	Safety during construction	NA	Inspection	Regular during construction	At the construction sites	Contractor	CSC and BR	PPE & 1st Aid Box to be provided.
Mirpur Railway Station								
Surface water pollution of pond	Conduct surface water quality testing for pH, Turbidity, Temperature, DO, BOD_5, COD, TSS, TDS, oil and grease.	Inland surface water quality standard for fishes, ECR 1997 (Schedule 3)	Sampling and laboratory analysis	Quarterly	Sampling at the Pond and analysis in a recognized laboratory.	Contractor	CSC & BR	Water quality monitoring done during this period (Results are shown in Annex-A)
Air Pollution & dust	Measurement of parameters such as PM2.5, PM10, SPM, SOX, NOX & CO.	DOE Standard	On site air/dust monitoring by measurement	• During dry period	Loop construction site	Contractor	CSC & BR	Measurement value of the parameters are within the DOE standard. So air quality is satisfactory (Results are given in Annex-A)
Noise Pollution	Checking whether noise is generated due to construction activities or not by noise meter.	DOE	On site noise monitoring	As & when required	At construction sites	Contractor	CSC & BR	Noise level within standard of DOE.(Results are shown in Annex-A)

Environmental Impacts/Issues/ Parameters	Monitoring Parameters	Standards/ Guidelines	Means of Monitoring	Frequency	Location	Implementation Agency	Supervision Agency	Current status
Drinking Water Quality (DWQ)	Conduct drinking water quality testing for pH, Mn, As, CL, FC, TC	DOE standard for DWQ	Sampling and laboratory analysis	Quarterly	Sampling at the Pond and analysis in a recognized laboratory.	Contractor	CSC & BR	Water quality monitoring done during this period (results are given in Annex-A).
Replantation of trees	• Ensure that tree replantation is done	FD/BR	Monitoring	During replantation	At the construction site.	Contractor	CSC & BR	At up and down loop total 14 numbers of trees were cut. Replanting of min. 28 trees is yet to be done.
Bheramara Railway Station								
H&S of the workers	Safety during construction	NA	Inspection	Regular during construction	At the construction sites	Contractor	CSC & BR	PPE & 1st Aid Box to be provided.
Ishurdi Railway Junction								
Air Pollution & dust	• Measurement of parameters such as PM2.5, PM10, SPM, SOX, NOX & CO.	DOE Standard	On site air/dust monitoring by measurement	• During dry period	Loop construction site	Contractor	CSC & BR	Measurement value of the parameters are within the DOE standard. So air quality is satisfactory (Results are given in Annex-A)
Noise Pollution	• Checking whether noise is generated due to construction activities or not by noise meter.	DOE	On site noise monitoring	As & when required	At construction sites	Contractor	CSC & BR	Noise level within standard of DOE.(Results are shown in Annex-A)
Drinking Water Quality (DWQ)	Conduct drinking water quality testing for pH, Mn, As, CL, FC, TC	DOE standard for DWQ	Sampling and laboratory analysis	Quarterly	Sampling at the Pond and analysis in a recognized	Contractor	CSC & BR	Water quality monitoring done during this period (results are given in Annex-A).

Environmental Impacts/Issues/ Parameters	Monitoring Parameters	Standards/ Guidelines	Means of Monitoring	Frequency	Location	Implementation Agency	Supervision Agency	Current status
					laboratory.			
Sirajganj Bazar								
H&S of the workers	Safety during construction	NA	Inspection	Regular during construction	At the construction sites	Contractor	CSC & BR	PPE & 1st Aid Box to be provided.

Table 3: Environmental Monitoring for the Subproject Specific Impacts (Signalling Contract)

Environmental Impacts/Issues/ Parameters	Monitoring Parameters	Standards/ Guidelines	Means of Monitoring	Frequency	Location	Implementation Agency	Supervision Agency	Current status
Darsana Station								
H&S of workers (Drinking water & sanitation & PPE)	• Ensure that safe drinking water & toilet for workers at the site.	-	Monitoring	During construction	At the construction site	Contractor	CSC and BR	Safe DW, toilets & PPE need to be provided.
Replanting of trees	• Ensure that trees are replanted properly.	FD	Monitoring	During tree replanting	At the generator and relay room/railway embankment slopes.	Contractor	CSC and BR	Three trees have been cut at equipment room. Replanting of min 6 trees is yet to be done.
Darsana Junction								
Replanting of trees	• Ensure that trees are replanted properly.	FD	Monitoring	During tree replanting	At the generator and relay room/railway embankment slopes.	Contractor	CSC and BR	Three trees have been cut for equipment room. Replanting of min. 6 trees is yet to be done.
Jayrampur Station								
Replanting of trees	• Ensure that trees are replanted properly.	FD	Monitoring	During tree replanting	At the generator and relay room/railway embankment slopes.	Contractor	CSC and BR	One tree has been cut for equipment room. Replanting of min. 2 trees is yet to be done.

Environmental Impacts/Issues/ Parameters	Monitoring Parameters	Standards/ Guidelines	Means of Monitoring	Frequency	Location	Implementation Agency	Supervision Agency	Current status
Chuadanga Station								
Replanting of trees	• Ensure that trees are planted properly.	FD	Monitoring	During tree replanting	At the generator and relay room/railway embankment slopes.	Contractor	CSC and BR	Two trees at equipment room & one tree at ware house have been cut Replanting of min. 6 trees is yet to be done.
Munshiganj Station								
Replanting of trees	• Ensure that trees are planted properly.	FD	Monitoring	During tree replanting	At the generator and relay room/railway embankment slopes.	Contractor	CSC and BR	One tree has been cut for equipment room. Replanting of min 2 trees is yet to be done.
Alamdanga Station								
Site clearance	• Safety during clearing and disposal	-	Inspection	Regular monitoring	At the station yard	Contractor	CSC & BR	Site clearance done satisfactorily.
Cutting/replanting of trees	• Selected tree cutting in a proper way maintaining safety measures; and • Ensure that trees are planted properly.	FD	Monitoring	During tree cutting	At the generator and relay room/railway embankment slopes.	Contractor	CSC and BR	Two trees have been cut at equipment room. Replanting of min 4 trees is yet to be done.
Halsa Station								
Replanting of trees	• Ensure that trees are planted properly.	FD	Monitoring	During tree replanting	At the generator and relay room/railway embankment slopes.	Contractor	CSC and BR	One tree has been cut at equipment room. Replanting of min. 2 tree is yet to be done.
Poradah Station								

Environmental Impacts/Issues/ Parameters	Monitoring Parameters	Standards/ Guidelines	Means of Monitoring	Frequency	Location	Implementation Agency	Supervision Agency	Current status
Replanting of trees	• Ensure that trees are planted properly.	FD	Monitoring	During tree replanting	At the generator and relay room/railway embankment slopes.	Contractor	CSC and BR	Four trees have been cut for equipment room. Replanting of min. 8 trees is yet to be done.
Mirpur Station								
Replanting of trees	• Ensure that trees are planted properly.	FD	Monitoring	During tree replanting	At the generator and relay room/railway embankment slopes.	Contractor	CSC and BR	Four trees have been cut for equipment room. Replanting of min. 8 trees is yet to be done.
Bheramara Station								
Replanting of trees	• Ensure that trees are planted properly.	FD	Monitoring	During tree replanting	At the generator and relay room/railway embankment slopes.	Contractor	CSC and BR	One tree has been cut for equipment room. Replanting of min. 2 trees is yet to be done.
Paksey Station								
Replanting of trees	• Ensure that trees are planted properly.	FD	Monitoring	During tree replanting	At the generator and relay room/railway embankment slopes.	Contractor	CSC and BR	Two trees have been cut for equipment room. Replanting of min. 4 trees is yet to be done.