Bharat Heavy Electricals Limited

Monthly Monitoring Report - 13

(April, 2019)

Environment Compliance Monitoring
During Construction Period
of 2x660 MW Maitree Super Thermal Power Project
Rampal, Bagerhat

Submitted in May, 2019

CEGIS

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Acknowledgements

The Center for Environmental and Geographic Information Services (CEGIS), a Public Trust under the Ministry of Water Resources, is grateful to Bharat Heavy Electricals Limited (BHEL) for awarding the contract of consultancy for “Monthly Environment Compliance Monitoring during the Construction Period for 2x660 MW Maitree Super Thermal Power Project at Rampal in Bagerhat District, Khulna Division” for a period of twenty nine month.

CEGIS greatly acknowledges the extensive support of Mr. Surojit Mandal, General and Construction Manager, BHEL (Power Sector – Eastern Region: Maitree 2x660 MW STPP) extended to CEGIS as an independent agency during April 2019 for 13th monthly environmental compliance monitoring activities. CEGIS is thankful to Mr. Sartaj Husain, Dy. Engineer, BHEL (BIFPCL 2x660 MW MSTPP) for his cooperative insistence for accelerating this Monthly Environment Compliance Monitoring Project. Additionally, CEGIS is also grateful to Mr. Ratnadeep Kumar, Asst. Engineer (Safety), BHEL (BIFPCL 2x660 MW MSTPP) for mobilizing the activities at the field level.

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Abbreviations and Acronyms

BHEL	Bharat Heavy Electricals Limited
BIFPCL	Bangladesh-India Friendship Power Company Limited
BOD	Biochemical Oxygen Demand
BPDB	Bangladesh Power Development Board
CEGIS	Center for Environmental and Geographic Information Services
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COD	Chemical Oxygen Demand
DO	Dissolved Oxygen
DoE	Department of Environment
EC	Electric Conductivity
EIA	Environmental Impact Assessment
EHS	Environmental Health Safety
EMP	Environmental Management Plan
EPC	Engineering, Procurement and Construction
HSE	Health Safety and Environment
MW	Mega Watt
NO_x	Oxides of Nitrogen
NTPC	National Thermal Power Corporation
PM	Particulate Matter
PP	Power Plant
PPE	Personal Protective Equipment
SO_2	Sulfur Dioxide
SPM	Suspended Particulate Matter
TDS	Total Dissolved Solid
ToR	Terms of Reference
USEPA	United States Environmental Protection Agency

Glossary

Term	Definition
Compliance	When construction activities are being conducted in accordance with the Environmental Requirements (standards) of the Project.
Environmental Requirements	Environmental Specifications set out in the Environmental Management Plan (EMP) and relevant Environmental Protection Plan (EPP). Conditions included in the Environmental Assessment Approval for the Project.
Non-conformance	A construction activity conducted in a manner that deviates from a best management practice, compliance with which is required in the EPP for that construction activity.
Non-compliance	A construction activity conducted in a manner that deviates from a legal condition under a permit, an enactment, or a regulation, compliance with which is required in the EPP for that construction activity.
Reportable Environmental Incident	An incident of non-conformance or non-compliance which has caused or has the potential for causing an impact on the quality of air, land or water, human life, wildlife, aquatic species, species at risk or heritage resources, and is reportable under a permit, an enactment, or a regulation.

Unit Conversion

General Units

1 meter = 3.28 ft

1 kilometer = 0.621371192 mile

1 nautical mile = 1.852 kilometer

1 kilogram = 2.20 pound

1 metric ton = 1000 kg

1 barrel = 42 U.S. gallons = 159.0 liters

1 liter = 0.264172052 gallon (US)

1 square mile = 640 acres = 2.590 km^2

1 hectare = 10^{-2} km^2 = 2.471 acres

1 Pascal = 1 N/m^2= 0.01 millibar

1 liter = 0.001 cubic meter

1^0C = 274.15K=33.8^0F

1 mg/m^3 = 1 µg /L

1 mg/L ≈ 1 g/m^3 ≈ 1 ppm (w/w)

1 ≈ g/L ≈ 1 mg/ m^3 ≈ 1 ppb (w/w)

1 knot = 0.514444 m/s

1µg/m^3 = 1 ppb*(12.187)*(M) / (273.15 + °C)

Energy Units

1 Cal = 4.19 J

1 Btu = 1055.87J

1 Btu = 251.9958 cal

1 joule = 0.239 cal

1 kWh = 3412 Btu.

1MW=1000KW=10^6 W

1 kWh = 3.6 x 10^6 J

1 kWh = 859.85 kcal

1 horsepower = 746 W

1 GWyr = 8.76 x 10^9 kWh

1. Introduction

1.1 Background

The Maitree Super Thermal Power Plant is a joint venture Project of Bangladesh Power Development Board (BPDB), and National Thermal Power Corporation (NTPC) Ltd., India and is run by Bangladesh-India Friendship Power Company Pvt. Ltd. (BIFPCL). Bharat Heavy Electricals Limited (BHEL) hasbeenawarded with the contract of all Engineering, Procurement and Construction works of the Power Plant to be completed within the specified time schedule. BHEL has already initiated the construction works. In order to fulfil the environmental consequences, BHEL has decided to engage a third party for monthly monitoring of the environmental compliance within the Project area as per the requirement of Department of Environment (DoE), Bangladesh EIA approval condition no.-44 which is: "Environmental Monitoring Reports according to specific format specified in the EIA Report shall be made available simultaneously to DoE Bagerhat District Office, Khulna Divisional Office and Headquarters on a monthly basis during the construction period of the Project.". In this regard, monitoring of environmental parameters as well as the status of Environmental Health and Safety (EHS) should be conducted in accordance with the EMP as stated in EIA Study Report.

Accordingly, CEGIS has been appointed by BHEL for conducting the monthly monitoring of the environmental compliance of Maitree Super Thermal Power Plant of BIFPCL for a period of one year starting from April 2018. According to the contract, CEGIS has already conducted environmental compliance monitoring from April 2018 till March, 2019 and submitted all the monthly reports to BHEL. As the monitoring activities need to be continued for the entire construction period and the reports need to be submitted to DoE on monthly basis, another contract has been signed between BHEL and CEGIS for conducting the monthly monitoring of the environmental compliance of Maitree Super Thermal Power Plant of BIFPCL for a period of twenty-nine months starting from April 2018. Accordingly, CEGIS conducted the thirteenth monthly monitoring activities during April, 2019 and this 13th monitoring Report has been prepared for submission to BHEL for their consideration. The aforementioned format of the Report specified in the EIA study along with the monitoring results has been appended in the **Annex-I.**

1.2 Brief of the Project

The construction works of BIFPCL 2x660 MW Maitree STPP has been progressing well and the Project is now in the infrastructure development stage. The Project area includes 366.40 hectares (905 acres) of land (Block-A) which is just beside the BPDB Project area (Block-B). The MSTPP Project area is connected with a 6 km long two-lane access road from the Khulna-Mongla Highway to the MSTPP area. Expansion works are going on to convert this access road into a six-lane road. A number of construction companies are now working at the BIFPCL Project site to complete the civil works within the stipulated time schedule. The Project activities conducted at various stages include:

- Extension work for increasing the width of the access road within the Project area;
- Passage of road for traffic movement for construction purposes;
- Construction works of some roads and permanent drainage network in the Project area;

- Construction materials are aggregated for major mechanical construction works;
- Pile driving, soil compaction, base and sub-base construction activities;
- Construction works in the Jetty area;
- Labor shed construction and also construction of new labor sheds;
- Service works;
- Power supply from the national grid and also from generator at Project site;
- Concrete Batching Plant and concrete pouring operations; and
- Development of various infrastructure works like store, material shed, labor shed, office complex, residential complex etc.

1.3 Selection of Sample Collection Site

This thirteenth Monthly environmental compliance monitoring has been conducted from 23th April, 2019 to 26th April, 2019. One Environmental Expert and one Engineer along with two Technicians of CEGIS visited the Project area and conducted the field investigation. They collected samples from the pre-selected site and monitored the sampling equipment continuously.

The Team maintained communication with Mr. Sartaj Husain, Dy. Engineer, BHEL for informing him about the routine monitoring activities. A discussion meeting was held on 23 April 2019 with the proponent regarding the storm discharge water collection location, monitoring schedule and significant issues of ambient air quality and noise level. During this field visit of CEGIS monitoring team from 23-26th April, 2019, Mr. Sartaj Husain, Dy. Engineer, BHEL assisted the monitoring team in collecting data and information and facilitated the field monitoring activities. During this field trip, the monitoring team has successfully conducted the field activities and eventually, generated the monitoring results after laboratory analysis that has been presented in this thirteenth monthly monitoring Report.

1.4 Location of the Project

The MSTPP is located in between latitude 22^0 37' 0''N to $22^0$34'30''N and longitude $89^0$32'0''E to $89^0$34'5''E and at about 23 km south of the Khulna City and 14 km north-eastward from the Sundarbans. The location of the MSTP Project area is presented in **Figure 1.1** and **Figure 1.2** respectively.

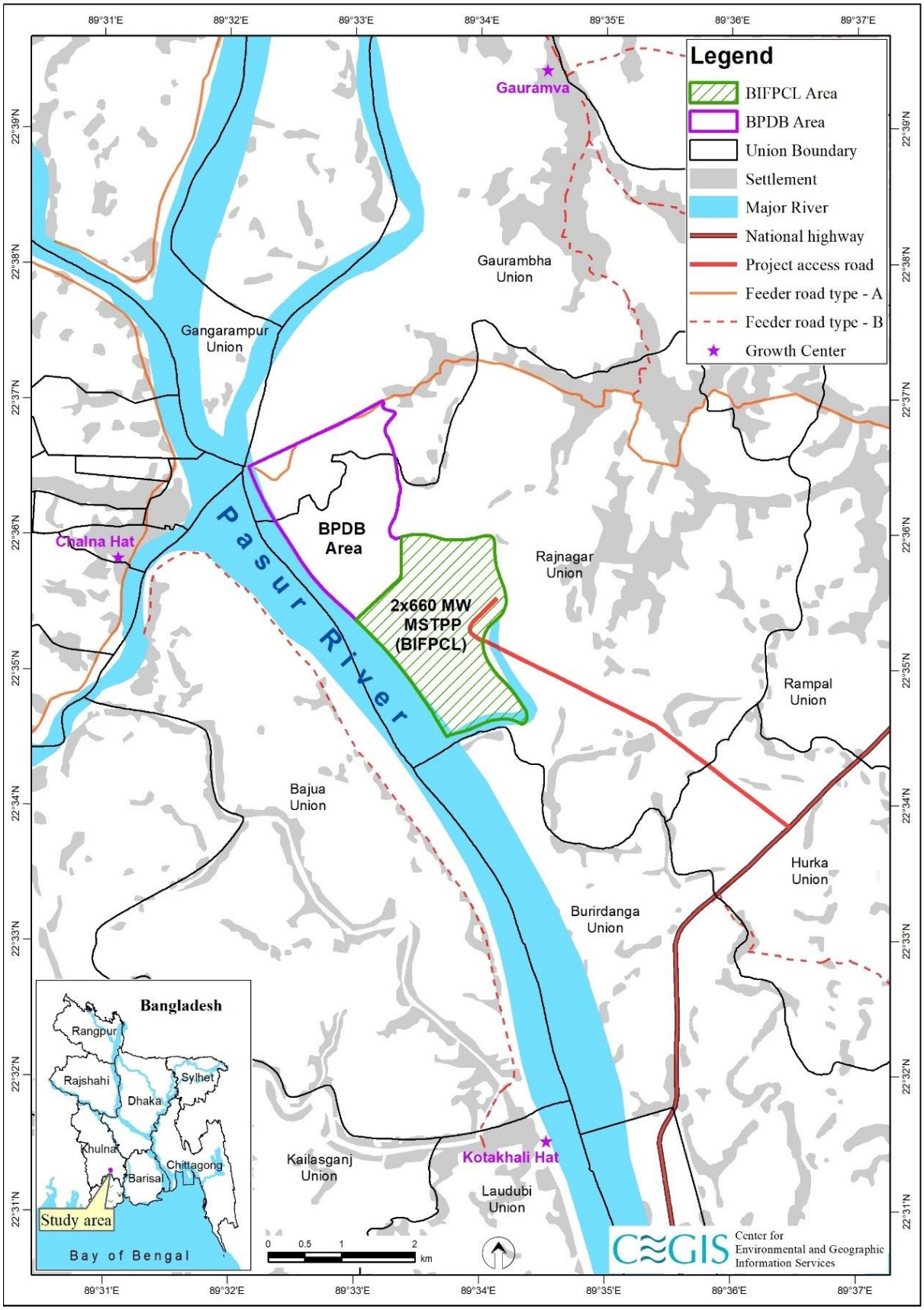

Figure 1.1: Location of 2x660 MW Maitree Super Thermal Power Plant

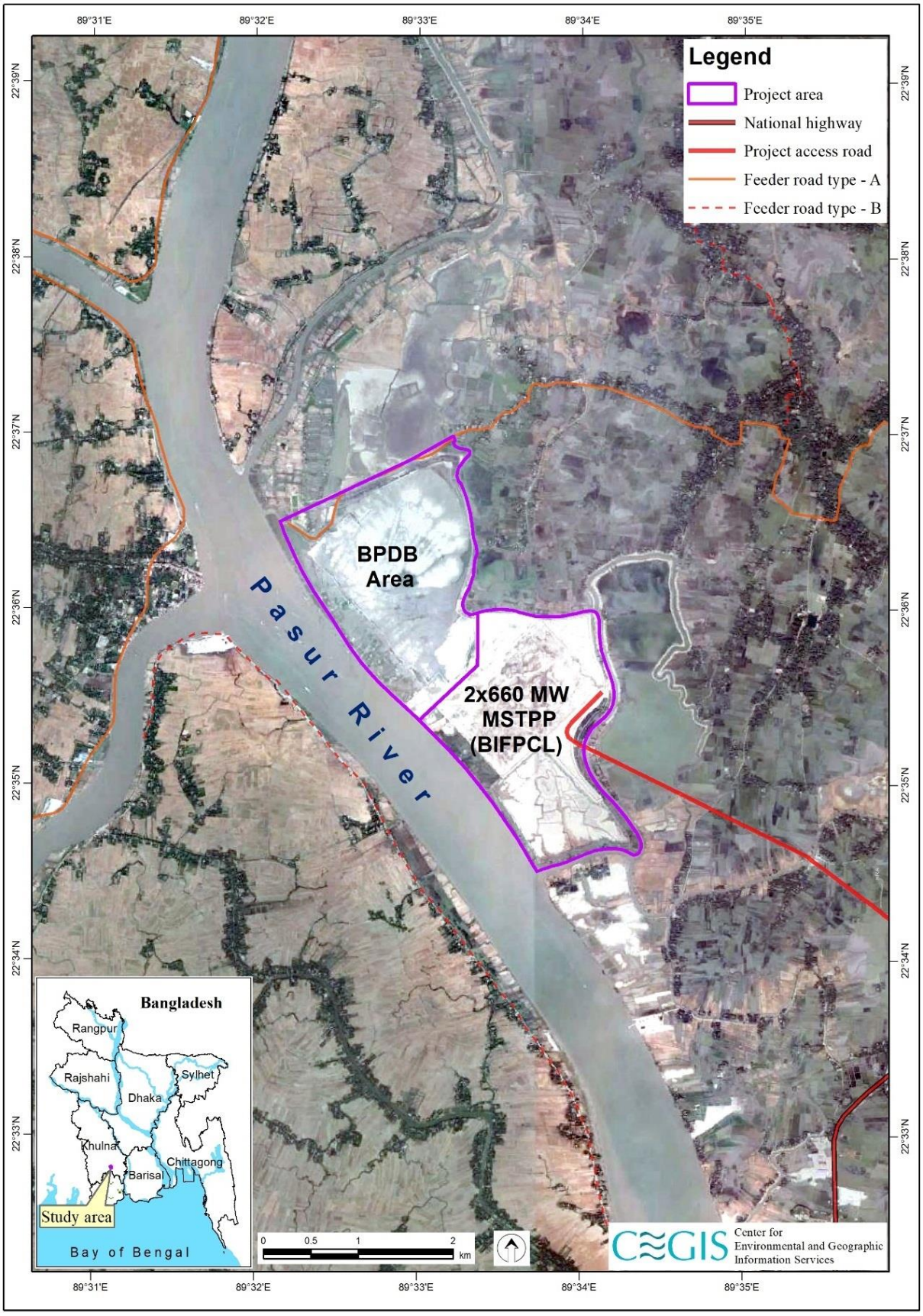

Figure 1.2: Location of Maitree Super Thermal Power Plant in Google Map

1.5 Study Objectives

The overall objective of this study is to monitor the environmental compliance of certain parameters during the construction phase of this Power Plant Project.

- Monitoring of the certain environmental parameters of air quality, water quality and noise level at the sensitive receptor (point) in and around the Project site;
- Comparing the monitoring results with national (ECR, 1997) and international standard (IFC, 2007); and
- Identifying the causes behind non-compliance and suggesting mitigation measures accordingly.

1.6 Scope of the Services

The scope of the study are as follows which are specified in **Table 1.1**

- Conducting monthly air quality monitoring continuously (24 hrs.) at the sensitive receptors within the project boundary. Air quality monitoring stations are to be set at least one in every location near the labour shed, one in major construction works area, and one at the Jetty area. Air quality monitoring parameters to be monitored include PM_{10}, $PM_{2.5}$, SPM, SO_2, NOx, CO and O_3.
- Conducting monthly water quality monitoring in the project area, especially at the discharge points. At least three samples are to be collected from the project area, which include discharge outlet point and drinking water, etc. The monitoring parameters are pH, DO, Salinity, Temperature, BOD_5, COD, Hardness, Electric Conductivity (EC), TDS, NO_3, PO_4, SO_4, and CL^- after grab sampling.
- Conducting monthly monitoring of noise level as Leq, (dBA) values both for day and night time. Noise level will be monitored at ten locations through USEPA approved standard procedure. Monitoring locations will be determined because of site-specific work and location sensitivity.

Table 1.1: Environmental Parameters Measurement during Monthly Monitoring Visit

Parameters		Number of Location	Frequency of Sampling	Quantity of Samples	Guidance and Acceptance of the tests
Air Quality	PM_{10}, $PM_{2.5}$, SPM, SO_2, NOx, CO and O_3	• North west corner of the Power Plant/Jetty Location • Shed area. • Major Construction area	1	3	As per the guidelines provided in approved EIA reports for 2x660 MW, Coal based Thermal Power Construction Project at Rampal Upazila, under Bagerhat District of Bangladesh and in line with the relevant Environmental Acts and Rules
Water Quality	BOD_5	• Outlet point-1 • Outlet point-2 • Outlet point-3	1	3	
	COD		1	3	
	Total Hardness		1	3	
	Chlorine		1	3	
	pH		1	3	
	DO		1	3	
	Salinity		1	3	
	Temperature		1	3	
	EC		1	3	
	Nitrate		1	3	

Parameters		Number of Location	Frequency of Sampling	Quantity of Samples	Guidance and Acceptance of the tests
	Sulphate		1	3	of Govt. of Bangladesh.
	Phosphate		1	3	
	TDS		1	3	
Noise Level	Noise level	10 sites (considering the major sensitive area/ construction activities)	1	10	

1.7 Purpose of the Study

Environmental Compliance Monitoring is immensely necessary for a project to assess the environmental status, non-compliance and non-conformance issues as per national environmental standards and good international practices. Additionally, with the aim of complying the EIA approval condition (Condition no.: 44) of Department of Environment, Bharat Heavy Electricals Limited (BHEL) has engaged Center for Environmental and Geographic Information Services (CEGIS) for carrying out the Monthly Environmental Compliance Monitoring study of the Maitree Super Thermal Power Plant. The Environmental Monitoring report presents the results of physical environment, particularly ambient air quality, ambient noise level and water quality, during the construction phase of the proposed Power Project. These monitoring activities has already started from the month of April 2018 and has been continued for one year. Then under a separate contract signed between BHEL and CEGIS monthly monitoring has been conducted since April 2019. Moreover, quarterly monitoring of environmental parameters is already being conducted by BIFPCL since February 2014. The results of the monitoring are being presented on a monthly basis to BHEL reflecting the compliance status of the environmental parameters along with the follow-up actions.

1.8 Team Mobilization

An Environmental Compliance Monitoring Team consisting of one Environmental Expert, one Junior Environmental Engineer and two technicians conducted the monitoring study in the field (**Table 1.2**). The monitoring Team worked at the BIFPCL 2x660 MW MSTPP site for 4 days i.e., from 23th to 26th April 2019. The monitoring activities have been performed independently as per standard practices.

Table 1.2: Composition of Environmental Compliance Monitoring Team

Position Assigned	Number	Responsibilities
Environmental Expert	1	Preparation of the Monitoring Plan, maintaining effective communication with BHEL and preparation of the Report.
Junior Environmental Engineer	1	Implementation of the compliance monitoring and preparation of the Report
Technician	2	Operation of the machineries and equipment, sampling etc.,

Samples collected from the field have been submitted to laboratory for analysis and testing. The results were checked meticulously. The root cause of changing environmental parameters over period has been assessed after analysis of the results and field observation. Additionally, a compliance monitoring Report for the month of April 2019 has been prepared, which is reviewed by the internal and external experts. A number of internal professional man power inputs have been used within the Consultant's Team for the efficient functioning and completion of the services.

2. Approach and Methodology

2.1 Overall Approach

The Study approach is prepared based on the scope of services. According to the ToR, this monitoring report has been prepared for the month of April 2019. The environmental parameters for air quality, water quality and noise level have been selected based on the monitoring framework of the EIA study of 2x660 MW Coal based Thermal Power Plant Project at Rampal, Bagerhat which is also recommended in the scope of the services.

The location of air, water and noise monitoring sites (stations) were selected depending on the recommendation of the EIA study, location sensitivity and impact potentiality of that particular area in a specific time period. The **Figure 2.1** below provides an understanding of the different activities, which were carried out during the monthly monitoring of Environmental Compliance of Maitree Super Thermal Power Plant.

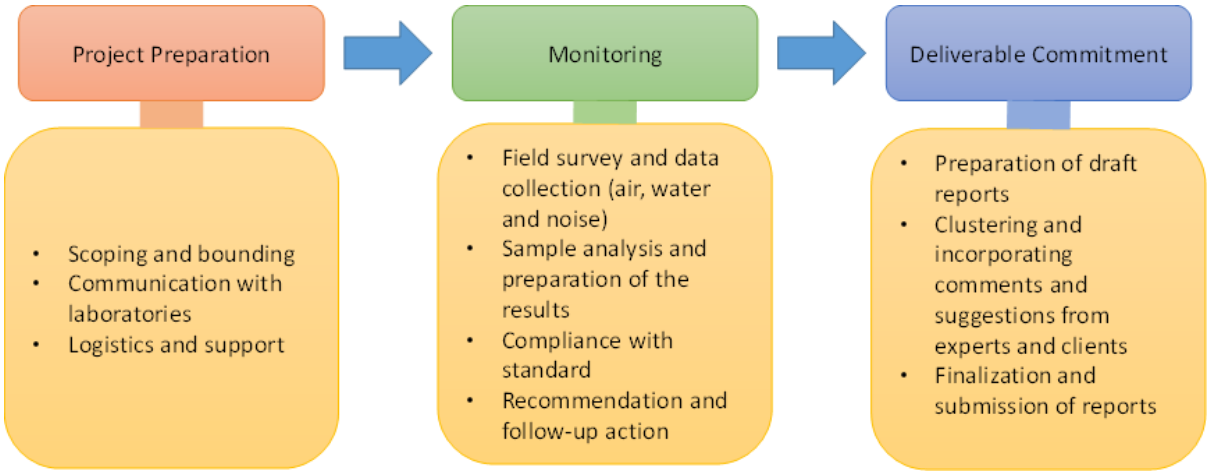

Figure 2.1: Monitoring Framework

Monitoring of environmental parameters like air quality, water quality and noise level have been investigated though different monitoring equipment and tools. For air quality monitoring volumetric sampler has been used, water quality parameters have been tested in-situ in the field and grab sample has been collected for laboratory analysis and finally the sound pressure level meter has been used to estimate the present noise level equivalent in the surrounding areas. The monitoring activities have been conducted continuously at specified locations by skilled technicians and professionals.

2.2 Methodology of Environmental Compliance Monitoring

The monitoring activities have been performed through a methodological framework. QA/QC procedure have been maintained during the field investigation and sampling of all the environmental parameters. The locations of air quality, water quality and noise level monitoring are shown in **Figure 2.9** and **Figure 2.10**. The locations are subjected to change in future depending on the potentiality of the impacts and its magnitude, sensitivity of the receptors and capturing the worst-case scenarios. The procedures associated with the monitoring of each of the environmental parameters are described in the following sub-articles.

2.2.1 Ambient Air Quality

The ambient air quality has been monitored in three locations as specified in Figure 2.9. Air quality monitoring has been performed at locations adjacent to the labor shed, jetty areas and construction site where construction and installation works as well as transportation of materials for working might affect the ambient air quality. The air samples have been collected at the construction areas to test the environmental parameters to ensure that the EPC contractor BHEL complies with the terms and conditions of environmental protection.

Emission of particulate matters and gaseous pollutants from the construction site have been monitored for 24 hours continuously. All of the criteria pollutants (PM_{10}, $PM_{2.5}$, SPM, SO_2, NOx, CO and O_3) have been monitored at specified places. Respirable Dust Sampler (Model-Envirotech India APM-460BL) and Fine Particulate Sampler (Model-Envirotech India APM-550) have been used to collect the air samples. The $PM_{2.5}$, PM_{10}, and SPM have been tested by gravimetric method. The SO_2 has been absorbed in a specified chemical and tested by West-Gaeke method. The NO_2 has also been absorbed in specified chemicals and tested by Jacob and Hochheiser method. Finally, CO and O_3 have been measured using a Metravi CO-10 meter and Tongdy O_3 monitor, respectively.

Figure 2.2: Ambient Air Quality Monitoring during Day time

2.2.2 Water Quality

Reverse osmosis technology is being used for producing fresh water by treatment of saline water of the Passur River as per suggestion of the EMP of EIA study. In this process, high concentrated saline water called brine is produced which is ultimately discharged to the Passur River. At present there are two RO based Water Treatment Plants supplying water to the officials of BIFPCL, BHEL and the workers. The workers usually collect their drinking water from Jetty Side RO drinking water point during two times in a day. Large quantity of water barrel, jars are used to reserve water at the worksite after filling them from the RO drinking water supply point. At the time of field investigation, the RO based Water Treatment Plant near the Jetty area was in operation.

During this 13th monthly compliance monitoring program three water samples were collected, one from RO technology (near jetty area) based Water Treatment Plant discharge outlet, one from storm water discharge outlet near the North-East corner of the Project Boundary which

is located in latitude 22^0 35' 59.5''N and longitude $89^0$33' 42.2''E and one from drinking water outlets from RO Plant near the Plant jetty site for analysis. The locations of samples collected for water quality monitoring are shown in **Figure 2.3, Figure 2.5**: RO Drinking Water Sample Collection **, Figure 2.5, and Figure 2.6.** A sample of water discharged from the Project site to Passur River was collected to determine the status of discharge water quality.

Water quality field investigation was conducted in April 2019. Storm water discharge outlet has been observed at different places around the project site. Therefore, one sample from storm water discharge outlet, one from RO discharge water outlet and one from RO Drinking water outlet has also been collected.

Figure 2.3: In-situ parameters Testing

Figure 2.4: RO Discharge Water Sample Collection and Discharge outlet

Figure 2.5: RO Drinking Water Sample Collection

Figure 2.6: Storm Discharge Water sample collection and Discharge outlet

Standard practices have been followed for monitoring the water quality. In-situ testing was done at field and collected samples were brought and submitted to the laboratory for various analysis. The parameters that were analysed include pH, DO, Salinity, Temperature, BOD_5, COD, EC, TDS, NO_3, PO_4, SO_4, and Chloride as recommended in the EIA study done for the BIFPCL Project. Detail methodology for testing the water quality parameters are shown in **Table 2.1.**

Table 2.1: Methods Followed in Analyzing Water Samples

Sl. No	Parameters	Unit	Methods	Reference
01	Temp	^{0}C	Electrode	HORIBA, U-50 Multi-parameter Water Quality Meter
02	pH	pH	Electrode	HORIBA, U-50 Multi-parameter Water Quality Meter
03	EC	µS/cm	Electrode	Multi-parameter meter (Instrument Catalog)
04	TDS	mg/L	Electrode	Multi-parameter meter (Instrument Catalog)
05	Dissolved Oxygen (DO)	mg/L	DO Meter	Lutron DO 5519 (Instrument Catalog)

Sl. No	Parameters	Unit	Methods	Reference
06	Biological Oxygen Demand (BOD_5)	mg/L	DO Meter	Lutron DO 5519 (Instrument Catalog)
07	Chemical Oxygen Demand (COD)	mg/L	Colorimetric Method (COD Reactor: Et 125 SC and Spectrophotometer: UNICO 4802)	APHA, (1992)
08	Total Hardness (TH)	mg/L	Titrimetric Method	APHA, (1992)
09	Chloride (Cl^-)	mg/L	Moh's Titration	APHA, (1992)
10	Sulfate (SO_4^{2-})	mg/L	Turbidity metric Method	APHA, (1992)
11	Phosphate (PO_4^{3-})	mg/L	Ascorbic Acid Method	APHA, (1992)
12	Nitrate (NO_3^-)	mg/L	Ultraviolet Spectrophotometric Screening Method	APHA, (1992)
13	Salinity	ppt.	Electrode	HORIBA, U-50 Multi-parameter Water Quality Meter
14	Turbidity	NTU	Electrode	HORIBA, U-50 Multi-parameter Water Quality Meter

2.2.3 Ambient Noise Level

During the construction stage, the major source of noise is expected to stem from the construction site, movement of vehicles, electricity producing, generator etc. For the sake of this study, ambient noise levels have been monitored at ten locations. Noise levels have been measured during day (Error! Reference source not found.) and night time (Error! Reference source not found.) at each of the 10 locations based on the location sensitivity, importance and impact potentiality. Each time the noise level was recorded for fifteen minutes continually by using portable noise level meter. The sites are subject to change in future monitoring schedule based on the changing of working areas, types of work and importance of the location.

Noise is described by a weighted sound intensity (or level) and is measured in units called decibels (dBA). However, in this circumstance the noise level has been measured in terms of A- weighted equivalent continuous sound pressure level (L_{eq}) and recorded by Sound Level Meter (kanomax-4431). Depending on the site condition and acoustic environment, the noise meter was set up and calibrated each time following the manufacturer's instruction manual.

Figure 2.7: Ambient Noise Level Monitoring during Day Time

Figure 2.8: Ambient Noise Level Monitoring during Night time

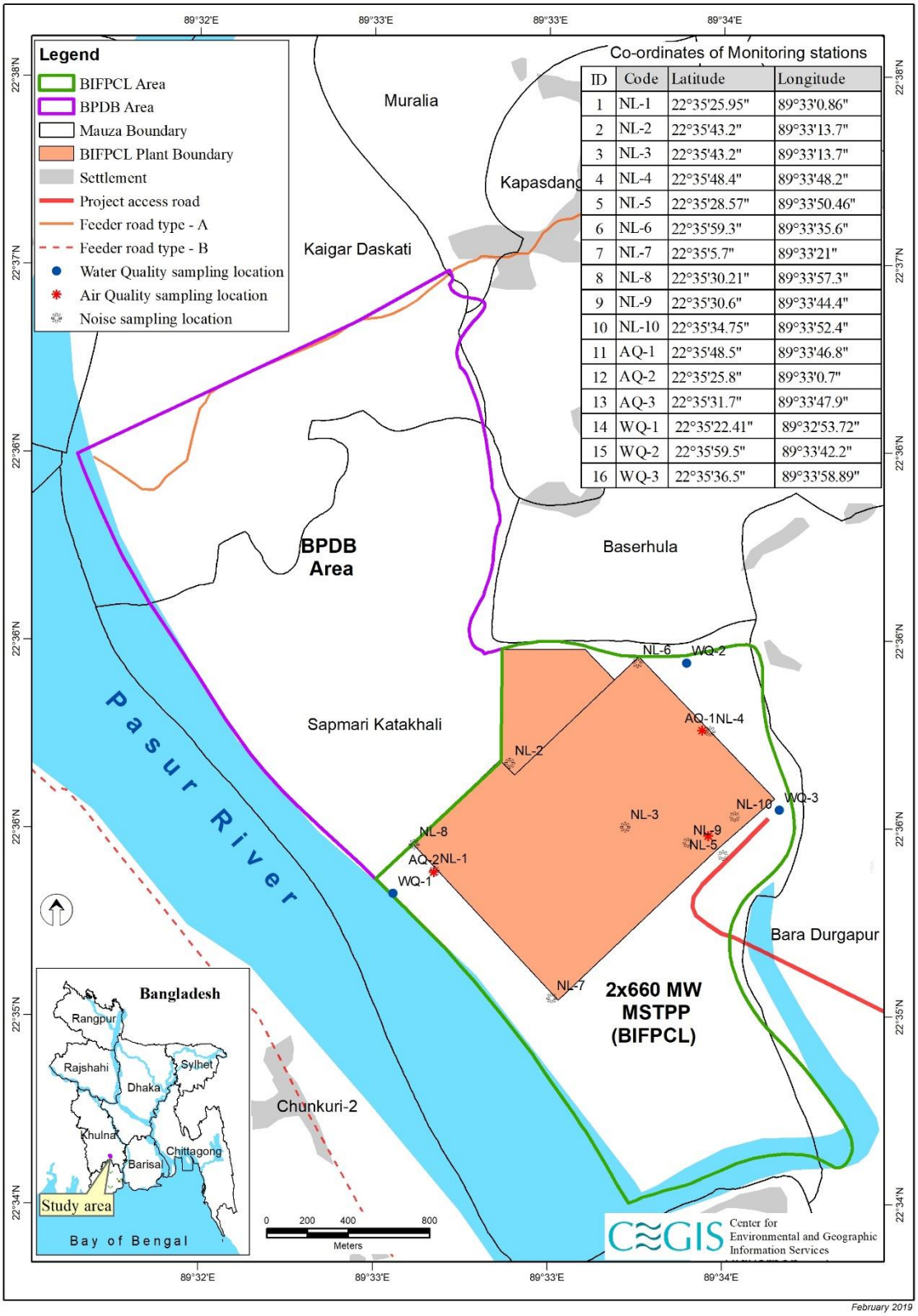

Figure 2.9: Sampling Locations Map

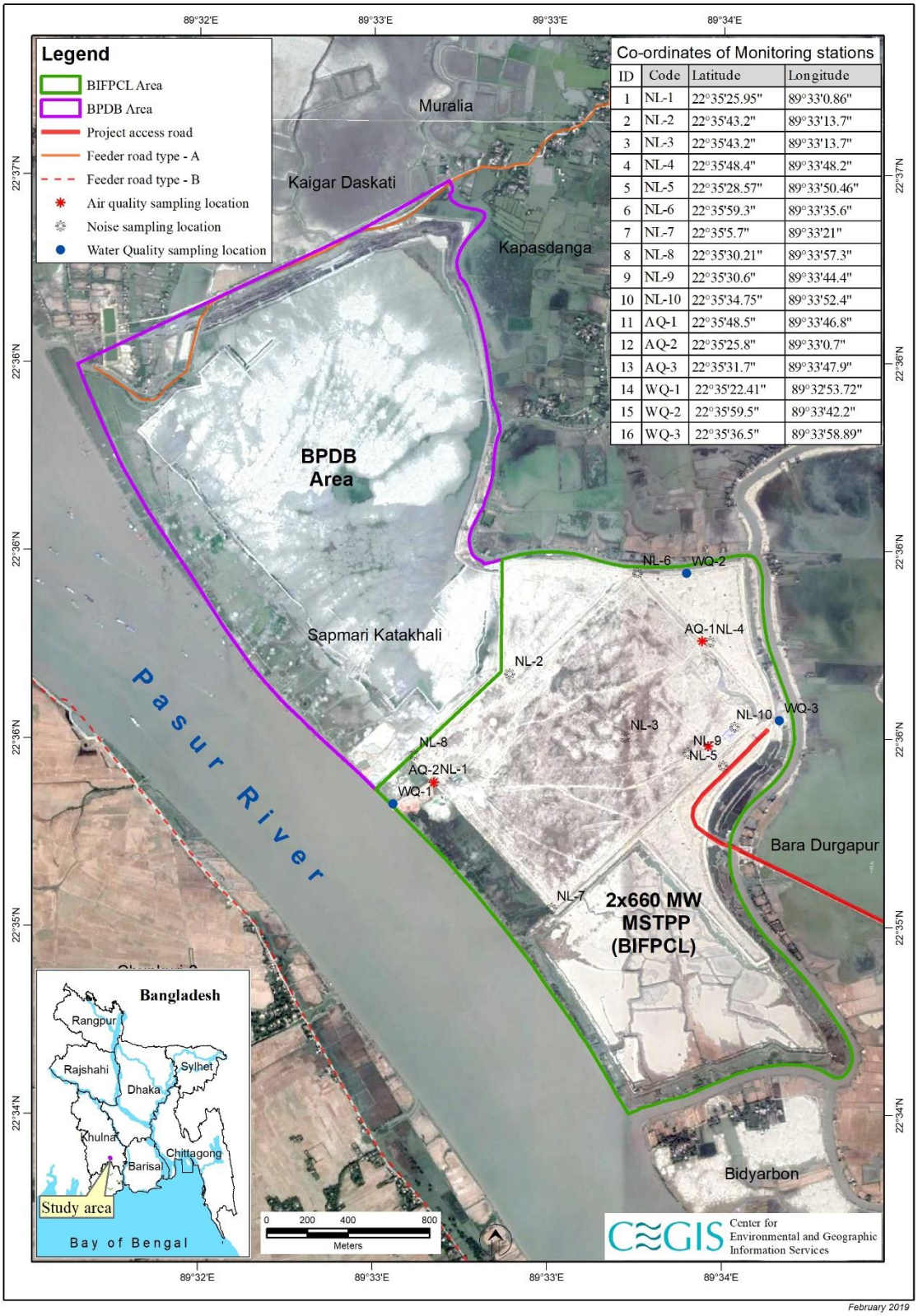

Figure 2.10: Sampling Locations in Google Map

3. Results and Discussion

Environmental compliance monitoring has been implemented by an independent organization, CEGIS under a contract signed between BHEL and CEGIS. In line with the directives of the ToR of the contract, the environmental compliance monitoring has been performed. The monthly environmental monitoring results have been generated through in-situ testing and analysis of samples at the laboratory. This report also compares the sample results with the standard limits and provides commentary on environmental issues during the month of April, 2019. Results of the previous investigations (1st to 12th month) have also been incorporated in this Report so as to compare the overall trend of the concerned environmental compliances.

3.1 Ambient Air Quality

Air quality has been sampled through volumetric sampling procedure. Samples have been collected for 24 Hours continually at three places namely labor shed, Jetty area and major construction areas inside the project site. All of the criteria pollutants have been checked in the Project site in order to assess the baseline situation as well as for the compliance standard. **Table 3.1** shows the monitoring results of the criteria pollutants.

Table 3.1: Ambient Air Quality Monitoring Results

Monitoring Locations	Criteria Pollutant (µg/m³)	SO_2	NO_x	SPM	PM_{10}
Labor Shed AQ-1 (24hr)	1st MM (Apr. 2018)	13.3	15.4	174.1	149.1
	2nd MM (May, 2018)	11.5	15.1	148.9	115.1
	3rd MM (Jun. 2018	14.2	16.5	160.1	140.2
	4th MM (Jul. 2018)	11.9	13.9	134.1	109.3
	5th MM (Aug. 2018)	10.9	12.9	102.1	89.9
	6th MM (Sept.2018)	6.6	7.6	94.7	85.6
	7th MM (Oct.2018)	7.4	8.9	109.1	95.2
	8th MM (Nov.2018)	12.5	14.2	153.7	114.9
	9th MM (Dec.2018)	12.0	13.6	166.0	119.9
	10th MM (Jan.2019)	13.8	14.0	168.9	134.7
	11th MM (Feb.2019)	13.5	14.2	192.1	145
	12th MM (Mar.2019)	10.7	11.8	119.1	79.7
	13th MM (Apr.2019)	11.1	13.3	133.9	82.6
Jetty Location AQ-2 (24hr)	1st MM (Apr. 2018)	15.3	16.7	187.1	134.3
	2nd MM (May, 2018)	11.2	13.6	112.3	103.4
	3rd MM (Jun. 2018	12.0	13.7	165.0	130.3
	4th MM (Jul. 2018)	6.2	7.1	95.2	74.9
	5th MM (Aug. 2018)	6.8	7.4	97.4	69.6
	6th MM (Sept.2018)	6.2	7.5	89.7	73.1
	7th MM (Oct.2018)	9.5	10.8	110.1	98.0
	8th MM (Nov.2018)	11.7	13.8	154.6	128.3
	9th MM (Dec.2018)	10.5	12.2	138.8	96.0
	10th MM (Jan.2019)	14.0	15.5	186.5	142.0
	11th MM (Feb.2019)	14.4	16.1	198.4	150.0
	12th MM (Mar.2019)	12.6	14.6	190.8	144.9
	13th MM (Apr.2019)	12.5	13.9	160.9	104.5
Major Construction Area AQ-3 (24hr)	1st MM (Apr. 2018)	10.7	12.9	164.6	91.9
	2nd MM (May. 2018)	8.9	10.2	108.7	69.2
	3rd MM (Jun. 2018	11.2	13.1	143.6	101.0
	4th MM (Jul. 2018)	12.2	14.5	149.1	122.5
	5th MM (Aug. 2018)	11.5	13.5	118.5	98.9
	6th MM (Sept.2018)	10.8	11.7	102.5	95.0
	7th MM (Oct. 2018)	6.7	8.4	96.9	84.9
	8th MM (Nov.2018)	13.6	14.8	167.5	130.6
	9th MM (Dec.2018)	12.6	14.3	179.7	134.7
	10th MM (Jan.2019)	13.6	15.0	172.1	128.5
	11th MM (Feb.2019)	11.3	12.1	129.4	88.7
	12th MM (Mar.2019)	9.10	10.5	98.2	79.0
	13th MM (Apr.2019)	14.5	15.2	187.0	138.8
Standard Limit	ECR, 1997 and subsequent amendment	365 (24hr)	100 (Annual)	200 (8hr)	150 (24hr)
	IFC, 2007	125 (IT-1), 20 (24hr)	200 (1-Hr)	-	150 (IT-1), 50 (24hr)

Criteria Pollutant (µg/m³)	Monitoring Locations																													Standard Limit	
	Labor Shed AQ-1 (24hr)													Jetty Location AQ-2 (24hr)												Major Construction Area AQ-3 (24hr)													
	1st MM (Apr. 2018)	2nd MM (May, 2018)	3rd MM (Jun. 2018	4th MM (Jul. 2018)	5th MM (Aug. 2018)	6th MM (Sept.2018)	7th MM (Oct.2018)	8th MM (Nov.2018)	9th MM (Dec.2018)	10th MM (Jan.2019)	11th MM (Feb.2019)	12th MM (Mar.2019)	13th MM (Apr.2019)	1st MM (Apr. 2018)	2nd MM (May, 2018)	3rd MM (Jun. 2018	4th MM (Jul. 2018)	5th MM (Aug. 2018)	6th MM (Sept.2018)	7th MM (Oct.2018)	8th MM (Nov.2018)	9th MM (Dec.2018)	10th MM (Jan.2019)	11th MM (Feb.2019)	12th MM (Mar.2019)	13th MM (Apr.2019)	1st MM (Apr. 2018)	2nd MM (May. 2018)	3rd MM (Jun. 2018	4th MM (Jul. 2018)	5th MM (Aug. 2018)	6th MM (Sept.2018)	7th MM (Oct. 2018)	8th MM (Nov.2018)	9th MM (Dec.2018)	10th MM (Jan.2019)	11th MM (Feb.2019)	12th MM (Mar.2019)	13th MM (Apr.2019)	ECR, 1997 and subsequent amendment	IFC, 2007
$PM_{2.5}$	32.2	24.6	34.0	28.9	22.2	19.8	23.5	35.9	35.7	31.9	40.2	21.7	18.6	35.7	25.2	36.3	20.2	19.8	13.8	26.2	34.2	27.4	34.8	42.2	39.0	31.7	23.0	15.0	26.2	32.7	27.8	24.9	24.2	41.6	39.8	34.5	21.2	24.8	37.8	65 (24hr)	75 (IT-1), 25 (24hr)
CO	35.0	25.0	29.0	31.0	28.0	23.0	21.0	19.0	20.0	15.0	25.0	19.0	22	41.0	32.0	21.0	36.0	30.0	27.0	25.0	21.0	17.0	20.0	22.0	20.0	25	29.0	21.0	23.0	26.0	21.0	19.0	19.0	20.0	19.0	13.0	18.0	15.0	31	10000 (8hr)	-
O_3	4.0	6.0	8.0	06	07	08	06	04	02	01	05	05	07	2.0	10.0	10.0	04	02	06	04	01	01	05	06	04	04	6.0	11.0	07	08	01	04	02	03	04	02	01	03	06	157 (8hr)	160 (IT-1), 100 (8-hr)

Source: CEGIS, 2019;

Note: MM: Monthly Monitoring; AQ: Air Quality

Ambient air quality for all the pollutant gases () have been recorded as well below the standard limit during this month of April, 2019. But the concentration of each of the criteria pollutants were higher than the air quality monitoring result of previous month i.e. March,2019. SO_2, NOx, SPM and PM_{10} were recorded significantly higher because of seasonal effects. During the air quality monitoring period, it was observed that the construction activities of the Plant were slower than the previous month. The construction activities were limited or scattered possibly due to high summer temperature (nearly 40^0 C). The exposed dry soil at the project site eroded with the wind increased the SPM and PM_{10} in ambient air of the project site. Exposed dry soil Block –B area were also contributing significantly to increase the particulate matter in the ambient air. The main sources of SO_2 and NOx were located outside the projects boundary like vehicular movement, vessel movement, industries etc. in the airshed. Emission from the vehicular or vessel movement, industrial emission etc. were responsible for the raising concentration of the criteria pollutants in the ambient air. Lack of rainfall during the dry season were responsible for increasing pollutants' concentration in the ambient air. However, the potential sources of air pollutants during the 24 hrs. sampling are presented below:

- Particulate matter emission form the exposed dry soil at site;
- Exposed/uncovered dry soil at the Block-B area;
- Construction works such as piling, excavation, surface levelling, building construction and other civil works etc.;
- Particulate matter blown from the Stockpile of sand, stone, debris due to speedy blowing wind etc.;

Since maximum project works are limited during the daytime, the pollutants' concentrations increases during the daytime and reduces during the night time. Therefore, the collective pollution concentration for each of the criteria pollutants represents the average values for 24 hrs. However, the ambient air pollutants were found within the standard limit as set by the ECR'97 and subsequent amendments. The Project authority should take further necessary actions, such as, use of covered van, regular water spraying over the exposed / uncovered top soil of the Project site, avoiding unpaved road for vehicular movement. Furthermore, the project authority should ensure the use of dust musk for the labourers etc. during working hours at the construction site for their occupational health and safety.

3.2 Water Quality

As per the Environmental Management Plan (EMP) of the EIA Report and EIA approval condition, "the Project Authority will not use ground water during construction as well as operation purposes of the Power Plant." Therefore, BHEL has to use desalinized Passur River water during this construction stage of the Power Plant. Accordingly, a small scale Reverse Osmosis (RO) desalinization Plant near the BHEL office has been operating to supply the required drinking water. Additionally, a large scale desalinization Plant based on Reverse Osmosis (RO) technology has been established near the proposed Jetty of the Project and is under operation for supplying the required water for construction at site. Moreover, this desalinization RO technology based Plant is also used for supplying drinking water for the laborers as well as officials working at the Project site.

During this monitoring period it was observed that the permanent drainage network construction is ongoing which will be used for discharging storm water of the Project area to

the adjacent river. During this dry period, the available water is re-used for sprinkling for controlling dust or for curing purpose. As mentioned earlier, during this 13th monitoring program, three samples were collected, one from RO technology based Water Treatment Plant discharge outlet, one from storm water discharge outlet and one from drinking water outlets from Plant jetty site for analysis.

The analysis results have been presented in Table 3.2, Table 3.3 and Table 3.4.

Table 3.2: Discharge Water Quality Monitoring Result (RO Discharge Point)

Parameters	1st MM Result (April, 2018)	2nd MM Result (May, 2018)	3rd MM Result (June, 2018)	4th MM Result (July, 2018)	5th MM Result (August, 2018)	6th MM Result (September, 2018)	7th MM Result (October, 2018)	8th MM Result (November 2018)	9th MM Result (December, 2018)	10th MM Result (January, 2019)	11th MM Result (February, 2019)	12th MM Result (March, 2019)	13th MM Result (April, 2019)	ECR , 1997 for Inland SW	IFC 2007, Effluent Guidelines
Temp (^{0}C)	30.80	32.10	34.32	32.04	31.81	31.50	31.22	30.5	26.50	21.42	22.14	26.87	31.96	45^0 (Winter)	3degC the edge of the mixing zone
pH	7.70	7.90	7.86	8.71	8.43	7.73	8.09	7.85	7.78	7.20	7.88	7.50	7.53	6-9	6-9
EC (µS/cm)	28,000	48,800	30,700	1180	577.00	498.00	822	1000	9480	23,300	26,600	27,100	2,180	1200	-
TDS (mg/L)	14,000	24,600	18,040	757	369.00	319.00	419.0	520	4740	14,500	16,500	16,500	1,390	2100	-
DO (mg/L)	4.50	4.90	4.34	7.86	7.32	6.84	6.64	6.15	7.84	6.35	7.88	10.20	9.84	4.8-8	-
BOD_5 (mg/L)	2.30	2.41	2.00	1.00	1.00	1.00	1.00	12.00	11.00	50.0	60.00	68.00	6.00	50	30*
COD(mg/L)	417.25	520	480	4.00	4.00	4.00	4.00	44.00	40.00	204.00	244.00	260.00	24.00	200	125*
TH(mg/L)	4,900	5,220	4520	300	240	240	295	865	1255	2740	5300	3000	163	-	-
Cl^-(mg/L)	514	14,500	11800	225	105	140	76.00	2120	2910	7850	9200	9220	370	600	-
SO_4^{2-}(mg/L)	1209	1520	1360	43.00	16.00	53.00	26.00	650	740	760	237.30	238.06	15.17	-	-
PO_4^{3-}(mg/L)	0.299	0.450	2.06	0.35	0.53	0.22	0.27	0.31	2.30	1.17	1.17	0.054	0.06	-	2*
NO_3^-(mg/L)	5.07	5.40	3.20	2.10	3.00	2.90	1.50	3.70	6.50	7.7	7.95	2.378	3.15	10	10*
Salinity (ppt)	15.80	25.80	19	0.60	0.30	2.70	1.80	1.76	5.44	14.10	16.2	16.6	1.10	-	-
Turbidity (NTU)	13.00	10.60	10.7	41.9	28.90	12.6	7.56	9.15	16.50	10.00	2.73	6.08	21.10	-	-

Source: CEGIS field visit and laboratory analysis, 2019

Note: WQ – Water Quality; SW – Surface Water; MM: Monthly monitoring

**Sanitary Sewage Discharges of IFC, 2007*

It has been observed that all of the water quality parameters in the discharge from RO Plant (near the jetty site) contains relatively lower concentration of the selected parameters than the previous month. It may be mentioned here that, the intake river water chemical composition (parameters) were play the key role for the discharge of RO water quality. However, the analysis results of the reaming parameter have been found within the standard limit of ECR, 1997 except (EC and TDS) The intake water of RO has been withdrawal from ground water. Lower salinity intake water for RO is responsible for decreasing the concentration of EC, TDS and Salinity than previous month. However, the total daily maximum load is so minute with respect to Passur river tidal flow that the effects would be insignificant.

Table 3.3: Storm Water Discharge Quality Monitoring Result

Parameters	3rd MM Result (April 2018)	4th MM Result (July 2018)	5th MM Result (August 2018)	6th MM Result (September 2018)	7th MM Result (October 2018)	8th MM Result (November) 2018)	9th MM Result (December) 2018)	10th MM Result (January 2019)	11th MM Result (February 2019)	12th MM Result (March 2019)	13th MM Result (April 2019)	ECR , 1997 for Inland SW	IFC 2007, Effluent Guidelines	Remarks
Temp (^{0}C)	31.98	35.80	32.67	31.02	32.2	30.00	27.00	21.95	25.64	29.17	33.20	45 (Winter)	3^0C at the edge of the mixing zone	
pH	8.16	7.94	7.56	7.80	7.53	7.15	7.04	7.96	8.10	8.32	7.75	6-9	6-9	
EC (µS/cm)	1190	12,500	3830	823	7510	5500	2108	5,710	5,140	4,170	5,500	1200	-	
TDS (mg/L)	593	7,780	2450	519	3650	2715	1052	3,600	3,240	2,670	3,380	2100	-	
DO(mg/L)	4.63	6.84	6.89	6.92	7.31	6.95	6.89	8.51	6.84	6.25	10.07	4.8-8	-	
BOD_5 (mg/L)	2.00	3.00	12.00	4.00	5.00	7.00	26.00	14.00	12.00	2.00	9.00		30*	
COD(mg/L)	8.00	16.00	50.00	1.00	16.00	24.00	80.00	52.00	48.00	8.00	40.00		125*	
TH(mg/L)	300	3900	655	765	770	325	495	715	2500	585	713		-	
Cl^-(mg/L)	290	3850	880	1360	1660	305	505	1540	1410	950	1750		-	
SO_4^{2-}(mg/L)	69	750	190	480	250	57.00	120	360	153.86	151.20	162.03		-	
PO_4^{3-}(mg/L)	1.91	0.37	0.43	0.36	0.18	0.31	0.42	0.67	0.80	0.02	0.02		2*	
NO_3^-(mg/L)	5.60	4.20	3.30	0.40	3.20	2.00	1.726	10.00	2.694	1.83	3.09		10*	
Salinity (ppt)	0.6	7.10	2.00	0.40	1.60	1.10	1.12	3.10	2.80	2.20	3.00		-	
Turbidity (NTU)	334	89.3	15.30	11.60	2.15	3.30	5.24	25.00	12.20	6.17	87.50		-	

Source: CEGIS 2019

Note: WQ – Water Quality; SW – Surface Water; MM: Monthly monitoring

**Sanitary Sewage Discharges of IFC, 2007*

Storm water discharge consists of the waste water from the site, rainfall runoff, sub-surface flow and other sources within the project area. No national or international standards have been fixed for storm water discharge quality. Since the storm water was released from the Project Site, the standard for effluent has been used for compliance.

Table 3.3 shows the measured storm water discharge quality. Most of the measured water quality parameters were recorded higher than the previous month which implies that for the Project Authority should look for better waste management of the project. Except EC and TDS, other water quality parameter have been found within the standard limit. The EC and TDS value was still higher than the standard limit. Wash out form the filling materials of site development are the key cause of higher TDS and EC of the Storm water. Moreover, Solid and liquid waste disposal from the construction yard, shed and other sources might be responsible for EC and TDS increase. Moreover, the discharge from construction waste water, batching Plant water, washing water, curing water, subsurface water increases the EC and TDS of the storm water discharge.

Drinking water is supplied to the workers continuously. The laborers usually take their required drinking water from the RO supply line established near the Jetty location. **Table 3.4** shows the quality of drinking water supplied to the laborers living near the Jetty Area.

Table 3.4: Drinking Water Quality Monitoring Result (Near Jetty Area)

Parameters	1st MM Result (April 2018)	2nd MM Result (May 2018)	3rd MM Result (June 2018)	4th MM Result (July 2018) Near BHEL Office	5th MM Result (August 2018)	6th MM Result (September 2018)	7th MM Result (October 2018)	8th MM Result (November 2018)	9th MM Result (December) 2018)	10th MM Result (January 2019)	11th MM Result (February 2019)	12th MM Result (March 2019)	13th MM Result (April 2019)	ECR , 1997 standard for Drinking Water
Temp (^{0}C)	31.8	31.70	31.86	33.93	31.63	30.2	31.81	30.3	27.15	25.86	22.60	26.40	31.64	20-30
pH	8.70	8.97	8.80	6.08	8.09	8.70	8.32	8.10	8.19	6.64	9.04	8.07	8.28	6.5-8.5
EC (µS/cm)	70.50	176.00	272	1.00	13.00	54.25	112.0	105.0	52.40	222	733.00	112.00	119	-
TDS (mg.L-1)	34.80	87.00	135	0.00	9.00	26.14	53.0	50.00	26.20	140	470.00	73.00	78.00	1000
DO (mg.L-1)	4.10	5.14	4.5	7.63	7.56	7.10	7.35	7.20	7.34	7.50	8.15	10.46	10.05	6.0
BOD_5 (mg.L-1)	2.10	2.08	1.00	1.00	1.00	8.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	2.00
COD (mg.L-1)	bdl	4.00	4.00	4.00	4.00	3.00	4.00	4.00	8.00	4.00	4.00	4.00	4.00	4.00
TH ($mg.L^{-1}$)	bdl	105.00	220	105	115	120.00	135	125.0	145.0	70.00	105.00	135.00	83.00	200-500
Cl^- ($mg.L^{-1}$)	102.80	36.00	70.00	10.00	10.00	11.00	10.00	24.00	18.00	52.00	120.00	15.00	15.00	150-600
SO_4^{2-} ($mg.L^{-1}$)	11.65	4.00	2.00	1.00	1.00	1.00	1.00	2.00	1.00	1.00	6.98	0.54	0	400
PO_4^{3-} ($mg.L^{-1}$)	0.0795	0.18	0.66	0.25	0.50	0.23	0.10	0.24	0.25	0.12	0.36	0.001	0	6.00
NO_3^- ($mg.L^{-1}$)	1.83	0.10	0.4	4.6	2.1	1.70	0.70	1.60	0.128	5.2	1.70	1.726	1.01	10.00
Salinity (ppt.)	1.00	0.20	0.10	0.00	0.00	0.21	0.0	0.15	0.026	0.10	0.40	0.10	0.10	-
Turbidity (NTU)	5.08	8.81	9.60	0.001	10.00	4.02	0.50	1.50	1.24	0.92	0.29	0.34	0	10.00

Source: CEGIS 2019

Note: WQ – Water Quality; SW – Surface Water; MM: Monthly monitoring

**Sanitary Sewage Discharges of IFC, 2007, bdl- beyond detectable limit; MM: Monthly monitoring*

The drinking water quality is considered acceptable as most of the parameters were well within the standard limit. However, EC and TDS, were recorded little higher than that of previous month. However, all of the parameters were recorded within the standard limit except Temperature. The proponent should take necessary steps for reducing temperature of drinking water.

3.3 Ambient Noise Level

The ambient noise level has been monitored at 10 locations inside the Project area, which has been presented in **Figure 2.9 and Figure 2.10**. The locations were selected based on the sensitivity of the areas and potentiality of the impact magnitude. Monitoring results of the ambient noise is shown in **Table 3.5.** Results were recorded from 10 sampling locations during both day and night time as the equivalent noise level (Leq) in dBA scale.

Table 3.5: Ambient Noise Level from In and Around the Project Site

Location Name	Types of Area	Time	Noise Level dB(A) Leq (1st MM)	Noise Level dB(A) Leq (2nd MM)	Noise Level dB(A) Leq (3rd MM)	Noise Level dB(A) Leq (4th MM)	Noise Level dB(A) Leq (5th MM)	Noise Level dB(A) Leq (6th MM)	Noise Level dB(A) Leq (7th MM)	Noise Level dB(A) Leq (8th MM)	Noise Level dB(A) Leq (9th MM)	Noise Level dB(A) Leq (10th MM)	Noise Level dB(A) Leq (11th MM)	Noise Level dB(A) Leq (12th MM)	Noise Level dB(A) Leq (13th MM)	ECR, 2006 dB(A), Leq	IFC 2007 dB(A) Leq	Remark
Jetty Site NL-1	Industrial	D	59.3	59.0	66.6	62.5	61.0	52.9	58.6	65.9	68.1	66.8	61.9	65.1	58.4	75	70	Movement of heavy vehicles, Excavators running, WTP running, crane activities and human chattering etc.,
		N	55.0	66.9	47.3	58.6	59.2	53.3	63.8	55.1	63.0	61.5	65.0	68.5	46.2	70	70	Movement of vehicles, noise from water treatment plant and AQ machine running etc.
Township Construction Area NL -2	Industrial	D	59.5	55.5	56.6	62.9	59.3	62.9	59.8	64.4	65.8	52.8	59.1	64.2	50	75	70	Noise generated due to construction activities, Compressor machine running, Bulldozer machine running and Mixing machine running etc.
		N	55.3	63.3	66.6	69.3	63.1	59.1	59.1	51.5	55.0	58.4	60.2	57.1	61.5	70	70	Noise generated due to vehicle movement, Soil damping and small generator running etc.
Construction Area NL-3	Industrial	D	58.7	68.8	70	73.6	67.0	60.7	55.2	60.0	65.6	60.1	59.6	58.9	57.3	75	70	Noise generated due to crainactivities, Welding, hammering, soil compaction and vehicle movement etc.

Location Name	Types of Area	Time	Noise Level dB(A) Leq (1st MM)	Noise Level dB(A) Leq (2nd MM)	Noise Level dB(A) Leq (3rd MM)	Noise Level dB(A) Leq (4th MM)	Noise Level dB(A) Leq (5th MM)	Noise Level dB(A) Leq (6th MM)	Noise Level dB(A) Leq (7th MM)	Noise Level dB(A) Leq (8th MM)	Noise Level dB(A) Leq (9th MM)	Noise Level dB(A) Leq (10th MM)	Noise Level dB(A) Leq (11th MM)	Noise Level dB(A) Leq (12th MM)	Noise Level dB(A) Leq (13th MM)	ECR, 2006 dB(A), Leq	IFC 2007 dB(A) Leq	Remark
		N	63.2	70.3	51.3	61.4	62.8	56.4	60.1	66.7	67.0	62.4	61.8	56.8	67.6	70	70	Noise generated due to construction activities, welding, vehicle movement and Crain activities etc.
labor Shed (Area) NL-4	Residential	D	58.2	65.6	49.6	57.5	54.1	50.0	58.9	55.0	54.9	52.8	59.4	62.9	61.1	55	55	Noise generated from Human chattering, Music and Vehicle movement, etc.
		N	44.4	59.9	60.6	61.1	61.9	69.0	51.0	62.2	56.7	59.8	60.0	58.0	53.2	45	45	Generator running, Human chattering and vehicle movement etc.
Near Entrance Gate in front of Health Care Center NL-5	Commercial Area	D	59.6	60.6	62.5	63.6	51.5	60.6	62.0	65.0	64.2	60.9	60.3	55.4	55.8	70	70	Noise generated from Vehicle movement, running of construction machine and human chattering etc.
		N	49.2	52.8	57.3	64.7	65.2	60.9	63.5	63.3	62.5	61.8	60.9	63.8	52.6	60	70	Noise generated from Mixing machine, Vehicle movement and human chattering etc.
North-East corner of the PB NL-6	Industrial	D	53.8	51.6	45.3	46.6	44.5	52.4	58.6	58.0	54.6	47.5	48.5	52.3	46.9	75	70	Noise generated due to Construction work and Vehicle movement
		N	45.9	49.7	48.3	54.8	46.0	46.8	47	44.8	49.1	49.5	49.1	51.5	48.8	70	70	Noise generated due to Piling, generator running and vehicular movement etc..
South –West Corner NL-7	Industrial	D	60.6	55.8	44.5	53.2	53.0	52.3	52.0	74.3	68.4	50.9	65.5	58.5	61.5	75	70	Noise generated due toCrain activities, compressor machine running and vehicular movements etc.

Location Name	Types of Area	Time	Noise Level dB(A) Leq (1st MM)	Noise Level dB(A) Leq (2nd MM)	Noise Level dB(A) Leq (3rd MM)	Noise Level dB(A) Leq (4th MM)	Noise Level dB(A) Leq (5th MM)	Noise Level dB(A) Leq (6th MM)	Noise Level dB(A) Leq (7th MM)	Noise Level dB(A) Leq (8th MM)	Noise Level dB(A) Leq (9th MM)	Noise Level dB(A) Leq (10th MM)	Noise Level dB(A) Leq (11th MM)	Noise Level dB(A) Leq (12th MM)	Noise Level dB(A) Leq (13th MM)	ECR, 2006 dB(A), Leq	IFC 2007 dB(A) Leq	Remark
		N	53.5	52.4	49.7	55.9	51.5	57.7	52.6	70.0	64.7	66.9	66.0	63	57.4	70	70	Construction activities, hammering, welding and vehicular movements etc.
North west corner of the Project boundary NL-8	Industrial	D	49.8	54.4	57.4	59.5	62.5	49.2	47.5	47.2	47.1	48.2	51.9	62.9	54.5	75	70	Noise generated due to Construction works and vehicular movements etc.
		N	63.4	50.5	42.3	62.0	49.4	46.8	49	64.5	62.3	57.9	49.0	52.7	44.7	70	70	Noise generated due to vehicular movement, Piling generator running and Hamering etc.
Major construction Area NL-9	Industrial	D	58.5	71.1	66.8	72.1	70.0	72.5	65.5	72.8	71.4	65.2	72.0	65.7	62.8	75	70	Noise generated from construction activities, crane operation, bulldozing activities, and running of generators
		N	55.1	73.3	61.5	70.3	66.2	65.2	70.7	62.8	69.5	70.7	63.1	63.2	64.8	70	70	Noise generated from construction activities, Crain activities, welding and Vehicular movement etc.
Near BIFPCL Area NL-10	Commercial	D	62.8	62.8	59.9	51.3	62.4	45.6	53.3	52.8	57.1	56.2	62.3	62.3	49.5	70	70	Vehicular movement Nearby construction works, Human passing by and excavators running
		N	49.4	51.1	45.9	55.7	56.4	54.0	56	63.8	66.8	70.2	62.9	60.8	59.4	70	70	Vehicular movement, Honking, Construction Activities and noise of nocturnal animals (such as, insects and frogs)

Source: CEGIS, 2019

Massive civil construction activities and mechanical construction are being carried out at the project site by BHEL as per design and stipulated time schedule. The sources of noise have been identified and presented in **Table 3.5.** The construction activities, vehicular movement, running of generator, Crane activities, soil compaction machineries, excavators' activity, Soil levelling activity and wind blowing are the major sources of noise generation. As seen from the above Table, the night-time and day-time noise level at labor shed areas (NL-4) has exceeded the national standard limit. Operation of generator, construction works, human passing by, crane operation, bulldozing activities, pile driving and vehicular movement are responsible for increased noise level at shed area. Proponent was informed about this situation and suggestions provided for necessary improvement of this situation.

4. Follow-up Action

The monitoring activities have been performed independently in order to capture the worst-case scenarios of the vital environmental parameters. The result of the environmental parameters shows that most of the monitored environmental parameters are within the permissible limit of Bangladesh standard. A few water quality parameters e.g. EC, TDS and Cl^- from RO Plant discharge water and EC value of storm water discharge and COD value of drinking water have been recorded to be higher than the standard limit. The night time and day time noise level at the labor shed area exceeds the Bangladesh national standard.

In order to reduce the water pollution and noise level and to keep the parameters within the Bangladesh standard the following measures should be adopted in the coming months of construction phase of the Project.

- Due to use of ground water, the RO rejected water quality has been improved. However, the sludge from the RO has to be managed properly by the RO operator i.e. AB Water.
- The captive generators should be shut down or moved at a distance from the labor shed area after 9:00 pm for reducing the noise level.
- Ensure use of the PPEs by the laborers working at construction yard.

Annex I: Compliance Monitoring Form for 2x660 MW MSTPP, Rampal, Bagerhat, BIFPCL

Book No. _____ **Monitoring Report No._____**

Date: _____ Time: _____

Location Id/GPS point: _____

Weather Condition: _____

Name of the Investigator: _____ Signature: _____

A	Monitoring	Description of equipment/ Indicators	Standard/Situation	Observed Situation(µg/m$^{3)}$	Deviation / Change (± %)	Performance / Comments	Remarks
Checking of the Equipment							
1	Air quality measuring instrument	i. Respirable Dust Sampler (Model-Envirotech India APM-460 BL) ii. Fine Particulate Sampler (Model-Envirotech India APM-550) iii. Metravi CO-10 meter and Tongdy O3 Monitor	1. CO (8hrs)- (10000µg/m^3-ECR)) 2. Oxides of Nitrogen (NOx)-100 µg/m^3 (Annual)- ECR; [200 (1-Hr)- IFC] 3. Ozone (O_3) - 157 µg/m^3 (8 Hrs.)-ECR; 160-(IT-1), 100-(8-hr)-IFC 4. $PM_{2.5}$-65 µg/m^3-ECR; 75 (IT-1), 25 (24 hr)-IFC 5. PM_{10}-150 µg/m^3-ECR; 150 (IT-1), 50 (24 hr)-IFC 6. SPM- 200 µg/m^3 (8 Hrs.)-ECR;	**AQ-1 (Shed):** a. SO_2 = 11.1 b. NO_x = 13.3 c. SPM = 133.9 d. PM_{10} = 82.6 e. $PM_{2.5}$ = 18.6 f. CO = 22 g. O_3 = 07 **AQ-2 (Jetty area):** a. SO_2 =12.5 b. NO_x = 13.9 c. SPM = 160.9 d. PM_{10} = 104.5 e. $PM_{2.5}$ = 31.7	N/A	**AQ 1-** Within the standard limit **AQ 2-** Within the standard limit	

A	Monitoring	Description of equipment/ Indicators	Standard/Situation	Observed Situation(µg/m$^{3)}$	Deviation / Change (± %)	Performance / Comments	Remarks
			7. Oxides of Sulfur (SOx)-365 µg/m^3	f. CO = 25 g. O_3 = 04 **AQ-3(Major Construction area):** a. SO_2 = 14.5 b. NO_x = 15.2 c. SPM = 187.0 d. PM_{10} = 138.8 e. $PM_{2.5}$ = 37.8 f. CO = 31 g. O_3 = 06		**AQ 3-** Within the standard limit	
2	Water quality measuring instrument	HORIBA U-50 Multi-meter and Lab Analysis	**Standard (Effluent Guidelines)** a. Temperature.= 3^{0}C at the age of the mixing zone, IFC2007; 40^{0}C (ECR, 1997) b. pH=6-9 (ECR**,** 1997; IFC,2007) c. EC=1200 (µS/cm) (ECR, 1997) d. TDS=2100 mg/L(ECR,1997) e. DO=4.8-8 (mg/L) (ECR,1997) f. BOD_5=50 (mg/L) (ECR,1997)/30 (mg/L) (IFC, 2007) g. COD=200 mg/L (ECR, 1997)/125 (mg/L) (IFC, 2007). h. TH=N/A Cl^- =600 mg/L (ECR, 1997) i. SO_4^{2-} =N/A	**WQ-1: RO Discharge Water** a. Temp = 31.96 (^{0}C), b. pH = 7.53 c. EC = 2,180(µS/cm) d. TDS = 1,390(mg/L) e. DO = 9.84(mg/L) f. BOD_5 = 6.00 (mg/L) g. COD = 24.00(mg/L) (std. 125, IFC-2007) h. TH = 163(mg/L) i. Cl^- = 370(mg/L) j. SO_4^{2-} = 15.17(mg/L) k. PO_4^{3-} = 0.06(mg/L) l. NO_3^- `= 3.15(mg/L) m. Salinity = 1.10 (ppt.) n. Turbidity = 21.10 (NTU) **WQ-2: Drinking Water** a. Temp = 31.64 (^{0}C) b. pH = 8.28	N/A	**WQ -1** All of the parameter within the standard limit except EC, TDS and Cl^- **WQ-2** Drinking water	The intake water of Passur river was higher EC, TDS and Cl^- due to dry season

A	Monitoring	Description of equipment/ Indicators	Standard/Situation	Observed Situation(µg/m$^{3)}$	Deviation / Change (± %)	Performance / Comments	Remarks
			j. PO_4^{3-}= 2 mg/L (IFC, 2007) k. NO_3^- =10 mg/L (ECR, 1997) l. Salinity= N/A m. Turbidity=N/A **<u>Drinking water standard</u>** a. Temp =20-30 (^{0}C) b. pH=6.5-8.5 c. EC=N/A d. TDS =1000 (mg/L) e. DO=6.00 (mg/L) f. BOD_5 =0.20 (mg/L) g. COD =4 (mg/L) h. TH=4 (mg/L) i. Cl^- =150-600 (mg/L) j. SO_4^{2-} =400 (mg/L) k. PO_4^{3-} =6 (mg/L) l. NO_3^- =10 (mg/L) m. Salinity =0 (ppt) n. Turbidity=10 (NTU)	c. EC = 119.00(µS/cm) d. TDS = 78.00 (mg/L) e. DO = 10.05 (mg/L) f. BOD_5 = 1.00(mg/L) g. COD) = 4.00 (mg/L) h. TH = 83.00 (mg/L) i. Cl^- = 15.00 (mg/L) j. $SO4^{2-}$ = 0.00 (mg/L) k. $PO4^{3-}$= 0.00(mg/L) l. NO^{3-} = 1.01 (mg/L) m. Salinity =0.10 (ppt.) n. Turbidity = 0.00(NTU) **<u>WQ-3: Storm Water Discharge</u>** a. Temp = 33.20 (^{0}C) b. pH = 7.75 c. EC = 5,500 (µS/cm) d. TDS = 3,380(mg/L) e. DO = 10.07(mg/L) f. BOD_5 = 9.00(mg/L) g. COD = 40.00(mg/L) h. TH= 713(mg/L) i. Cl^- = 1750(mg/L) j. SO_4^{2-} = 162.03(mg/L) k. PO_4^{3-} = 0.02(mg/L) l. NO_3^- = 3.09 (mg/L) m. Salinity = 3.00(ppt) n. Turbidity= 87.50 (NTU)		parameter were found within the standard limit **<u>WQ-3</u>** All the analyzed results of the parameter were found within the standard limit except EC and TDS	Mixing of construction wastage with the storm water and use of river water for dust suppression may responsible for increasing the EC and TDS

A	Monitoring	Description of equipment/ Indicators	Standard/Situation	Observed Situation(µg/m$^{3)}$	Deviation / Change (± %)	Performance / Comments	Remarks
3	Noise quality measuring instrument	Kanomax Sound level meter-MODEL 4431	1. std. ECR 2006, day= 75dB(A), Night=70 dB(A) IFC2007, day=70 dB(A), night=70 dB(A) 2. std. ECR 2006, day= 75 dB(A), Night=70 dB(A) IFC2007, day=70 dB(A), night=70 dB(A) 3. std. ECR 2006, day= 75 dB(A), Night=70 dB(A); IFC2007, day=70 dB(A), night=70 dB(A) 4. std. ECR 2006, day= 55 dB(A), Night=45 dB(A); IFC2007, day=55 dB(A), night=45 dB(A) 5. std. ECR 2006, day= 70 dB(A), Night=60 dB(A); IFC2007, day=70 dB(A), night=70 dB(A) 6. std. ECR 2006, day= 75 dB(A), Night=70 dB(A); IFC2007, day=70 dB(A), night=70 dB(A) 7. std. ECR 2006, day= 75 dB(A), Night=70 dB(A); IFC2007, day=70 dB(A), night=70 dB(A) 8.. std. ECR 2006, day= 75 dB(A), Night=70 dB(A);	1. Jetty Site NL-1, Day = 58.4 dB(A), Night = 46.2 dB(A) 2. Township Construction Area NL -2, Day = 50 dB(A), Night = 61.50 dB(A) 3. Construction Area NL-3, Day = 57.3 dB(A), Night = 67.6 dB(A) 4. Shed (Area) NL-4, Day = 61.1 dB(A), Night = 53.2 dB(A) 5. Near Entrance Gate in front of Health Care Center-NL-5, Day =55.8 dB(A), Night = 52.6 dB(A) 6. North-East corner of the PB NL-6, Day = 46.9 dB(A), Night = 48.8 dB(A) 7. South –West Corner NL-7, Day = 61.5 dB(A), Night = 57.4 dB(A) 8. North west corner of the Project boundary NL-8, Day = 54.5 dB(A), Night = 44.7dB(A)	N/A	All values were within standard limit except at NL-4 (Night time and Day time) and NL-5 (Night) where it exceeded the standard limit	Vehicular movement and operation of diesel generator, human chattering and heavy construction works at night were responsible for slightly higher of noise level at the residential areas

A	Monitoring	Description of equipment/ Indicators	Standard/Situation	Observed Situation(µg/m$^{3)}$	Deviation / Change (± %)	Performance / Comments	Remarks
			IFC2007, day=70 dB(A), night=70 dB(A) 9. std. ECR 2006, day= 75 dB(A), Night=70 dB(A); IFC2007, day=70 dB(A), night=70 dB(A) 10. std. ECR 2006, day= 70 dB(A),Night=60 dB(A); IFC2007, day=70 dB(A), night=70 dB(A)	9. Major construction Area NL-9, Day = 62.8 dB(A), Night = 64.8 dB(A) 10. Near BIFPCL Area NL-10, Day = 49.5 dB(A), Night = 59.4dB(A)			
Activities of monitoring							
4	Digital process and online system						
5	Documentation/ archiving the monitoring data						
6	Number of accidental events						
7	Sampling of biota to the susceptible zone						
8	LCA of bio indicators						
9	Toxicity magnitude						
10	Behavioral/ attitude in all changes of fauna						
11	Performance of the Ecosystem management plan						

A	Monitoring	Description of equipment/ Indicators	Standard/Situation	Observed Situation(μg/m$^{3)}$	Deviation / Change (± %)	Performance / Comments	Remarks
Interrogating to the investigator							
12	Regularity and authenticity check						
13	Continuation of training and capacity building and awareness, motivational program						
14	Ensure PEPs, ISO standards and ILL during operation of the projects						
15	Ensure the social development program and CSR during the operation of the project						
Interviews of the stakeholders							
16	Socio-economic Progress investigation						
17	Assessing Environmental pollution related problems						
18	Assess the changes of bio-						

A	Monitoring	Description of equipment/ Indicators	Standard/Situation	Observed Situation(µg/m$^{3)}$	Deviation / Change (± %)	Performance / Comments	Remarks
	diversity and ecosystem fragility						
19	Achievement of the social development program						
20	Checking of the Proper implementation of the EMP						

B. Evaluation (of any of above points)

C. Steps to be Taken:

Non Compliance	Action	Tine Frame
1. Minor:		
2. Moderate:		
3. Major:		
4. Critical:		