

Semi-annual Environmental Monitoring Report

Loan No. 3350- BAN

June 2019

**Power System Expansion and Efficiency Improvement Investment
Program-Tranche-3**

ASHUGANJ 400 MW (EAST) COMBINED CYCLE POWER PLANT PROJECT

Ashuganj, Brahmanbaria

**Prepared by Ashuganj Power Station Company Limited (APSCL) for the Asian
Development Bank.**

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Environmental Monitoring Report

7th Semi-Annual (January – June 2019) Report



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Ashuganj Power Station Company Limited (APSCCL)

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Semi-Annual Monitoring Report

For Ashuganj 400 MW (East) Combined Cycle Power Plant (CCPP) Project (Ashuganj, Brahmanbaria)

Period: 7th Semi-Annual (January –June 2019)

Monitoring: Ambient Air, Water & Noise Quality

EXECUTIVE SUMMARY

During the period from January to June 2019, the EPC Contractor has carried out mainly the test piling, the piling including HRSG foundation works, Bypass stack, Central Control Building (CCB), Main Building and Turbine Base. In order to complete those works, they mobilize the equipment's, workers and materials. In this period there is no discharge and for this, there is no impact on the living things in the water body. Air Pollution caused by dust emission during construction traffic activities is controlled by good management practices like continuous water spray over the unpaved or bare surfaces, covering soil materials pile. Soil and water pollutions are also prevented by proper management like spill prevention and well drainage system. Solid waste is managed by the waste management plan. Noise pollution is also a regarding issue during Steel Structure Erection activities for using of demolition equipment's and also for traffic and transport. Noise level is reduced by using of fine-tuned low noise level construction equipment's and by the proper traffic management system. Every personnel uses personal protective equipment to ensure own safety. The remarkable achievement in this period is that till now there is no record of accident or injury. APSCL is committed to keeping the accident level in Zero by implementing its proper occupational health and safety management system. This project also has a positive effect on the socio-economic condition. Local skilled and semi-skilled peoples are engaged in different levels of construction activities and they are very happy about getting employment opportunities.

1.0 INTRODUCTION

The objective of the environmental safeguard management and monitoring is to record environmental impacts resulting from the project activities and to ensure implementation of the “mitigation measures” identified earlier in order to reduce adverse impacts and enhance positive impacts from specific project activities. Besides, it would also address any unexpected or unforeseen environmental impacts that may arise during construction and operation phases of the project.

The EMP clearly layout: (a) the measures to be taken during both construction and operation phases of the project to eliminate or offset adverse environmental impacts, or reduce them to acceptable levels; (b) the actions needed to implement these measures; and (c) a monitoring plan to assess the effectiveness of the mitigation measures employed. Environmental management and monitoring activities for the under-construction power plant project could be divided into management and monitoring: (a) during the construction phase, and (b) during the operation phase.

The application of this plan involved an environmental control and monitoring of the work by a technical team to verify compliance with all the indications, limitations or environmental restrictions set forth in the Environmental Management Plan (EMP), EIA and the Project, with the minimal damage caused by work on the environment.

The information obtained by the implementation of the Environmental Action Plan is required to define preventive measures or define corrective actions.

The information generated as a result of implementing the Environmental Action Plan must be duly forwarded to the Department of Environment (DoE).

1.1 Brief Project Description

A Combined Cycle Power Plant of Total net 400±5% MW capacity at site condition (35 °C, 1.013 bars, 98% R.H.) is intended to be set by Ashuganj Power Station Company Limited inside the existing premises. The Power Station will be connected with the Ashuganj 400 KV Gas Insulated Switchgear (GIS) Grid Sub-Station with necessary electrical equipment. The basic concept for the Ashuganj 400 MW CCPP (East) project shall be a CCGT Plant based on one Gas Turbine Generator unit (GTG), one Unfired Heat Recovery Steam Generator and one Steam Turbine Generator unit (STG). Water-steam cycle will be three pressure levels (HP, IP and LP) with reheat. The Ashuganj 400 MW (East) Combined Cycle Power Plant Project complex is located on the Southern bank of Meghna river, just outside and to the East of Bhairab Bridge. The power plant is located in Ashuganj Upazilla. The entire power plant is completely enclosed, covers an area of about 4.50 acres and is owned by the Ashuganj Power Station Company Limited (APSCL).

1.2 Project Progress Status and Implementation Schedule

The basic concept for the Ashuganj East project shall be a CCGT Plant based on one Gas Turbine Generator unit (GTG), one Unfired Heat Recovery Steam Generator and one Steam Turbine Generator unit (STG). Water-steam cycle will be three pressure levels (HP, IP and LP) with reheat.

General components of the proposed CCGT project include the following: (i) 400±5% MW CCGT unit complete with necessary auxiliaries including air intake filtration facilities, inlet and exhaust silencers, control systems, main stack with delivery damper, gas fuel treatment system, (ii) Power generator for the gas turbine unit with all auxiliaries including cooling system, control system, excitation system; (iii) one Steam turbine unit complete with necessary auxiliaries including heater, pumps, steam turbine bypass, control systems; (iv) Power generator for the steam turbine unit with all auxiliaries including cooling system, control system; (v) Heat Recovery Steam Generating system with auxiliaries including deaerators, pumps, exhaust stack, control system; (vi) Gas booster compressor system with all auxiliaries and control system; (vii) Di-mineralized water system complete with pumps, tanks, control system (viii) Effluent treatment system with all auxiliaries including, chemical dosing systems, settling units, control system, pumps; (ix) Other essential plant equipment including air compressor, natural gas supply system with 2200 m gas pipeline, circulating water system, cooling water pond, raw water intake structure, condensate system; (x) Construction of internal roads. (xi) Switch room (xii) Emergency generator and transformer.

A. Project Progress Status

The updated status of Ashuganj 400 Mw (East) Combined Cycle Power Plant Project (CCPP) from January 2019 to June 2019 is given below in Table:

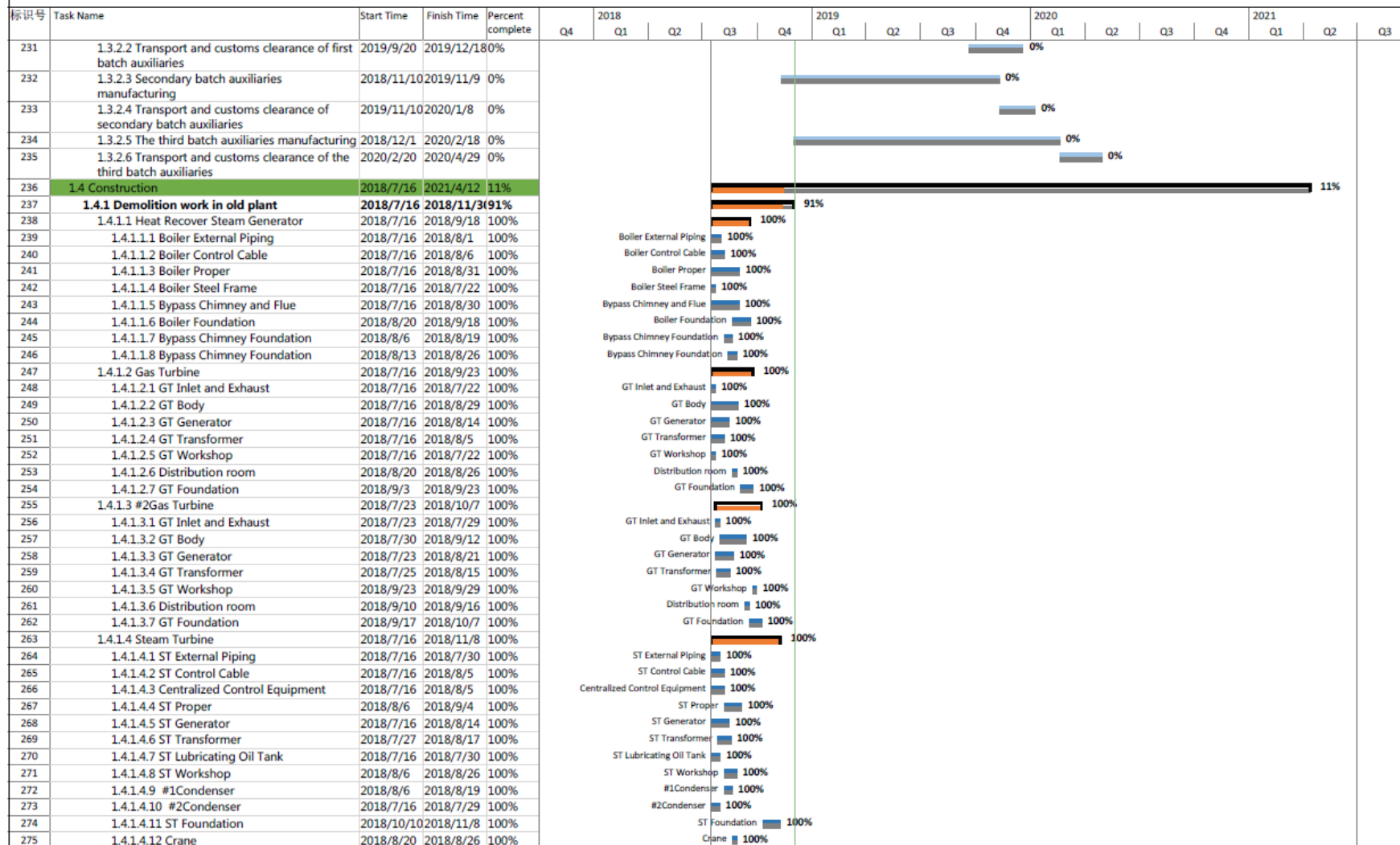
Sl. No.	Work Description	Status
1.	Demolition Schedule Demolition Schedule for old power plant	Completed 100%
2.	Demolition of Existing Power Plant The old power plant will be demolished	Completed 100%
3.	Civil Works: Piling works and superstructure/foundation works for all structures.	Test piling completed
4.	Mechanical and Electrical Facilities Consist of -Erection of HRSG, Steam Turbine, Generator, CW Pump House and all other BOP Equipment/Components of Power Plant. -Electrical and I&C works with commissioning	Not yet started

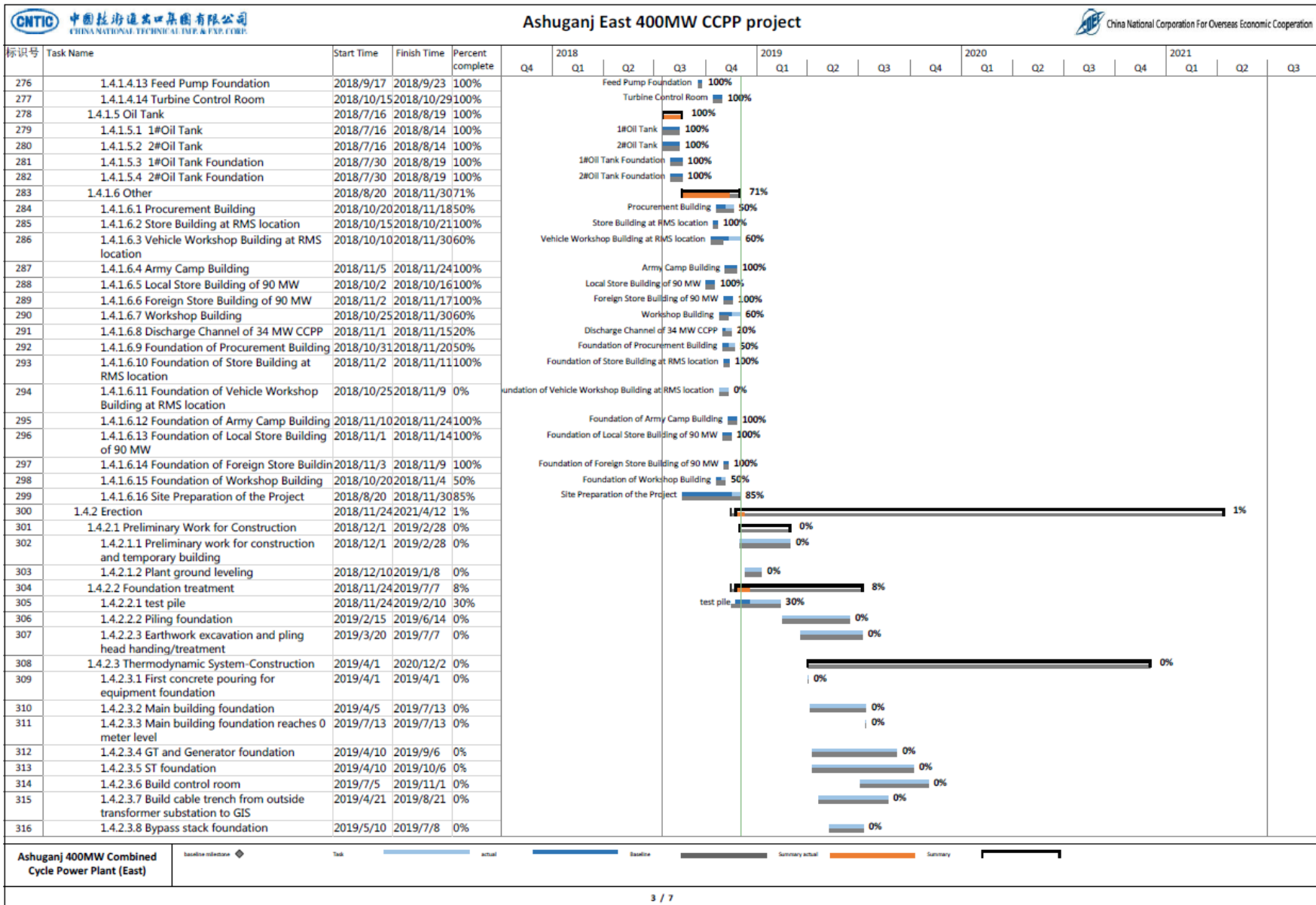
B. Implementation Schedule for the project:

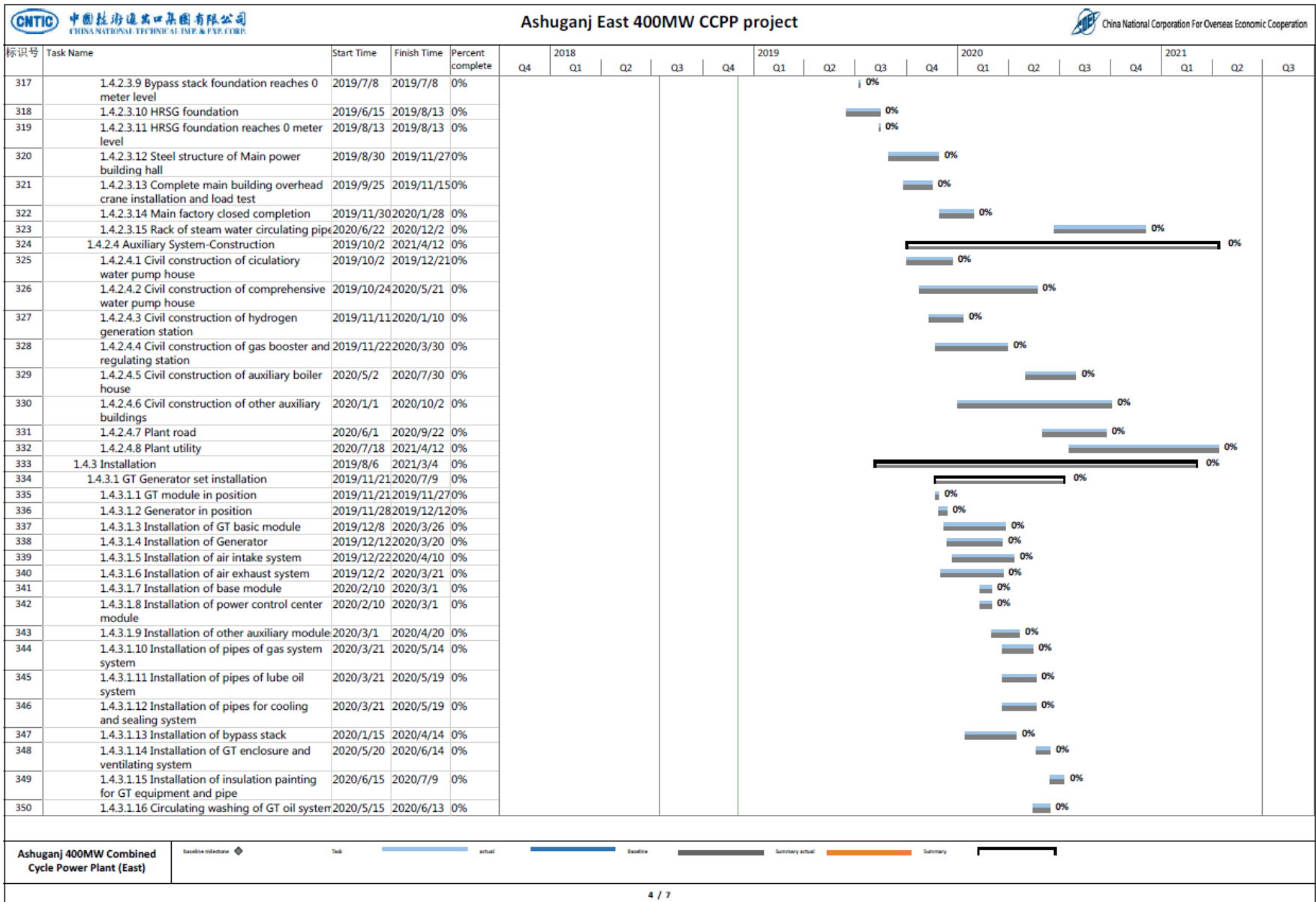
The tentative implementation schedule of Ashuganj 400 Mw (East) Combined Cycle Power Plant Project (CCPP) is given below:

Implementation Schedule (Tentative):



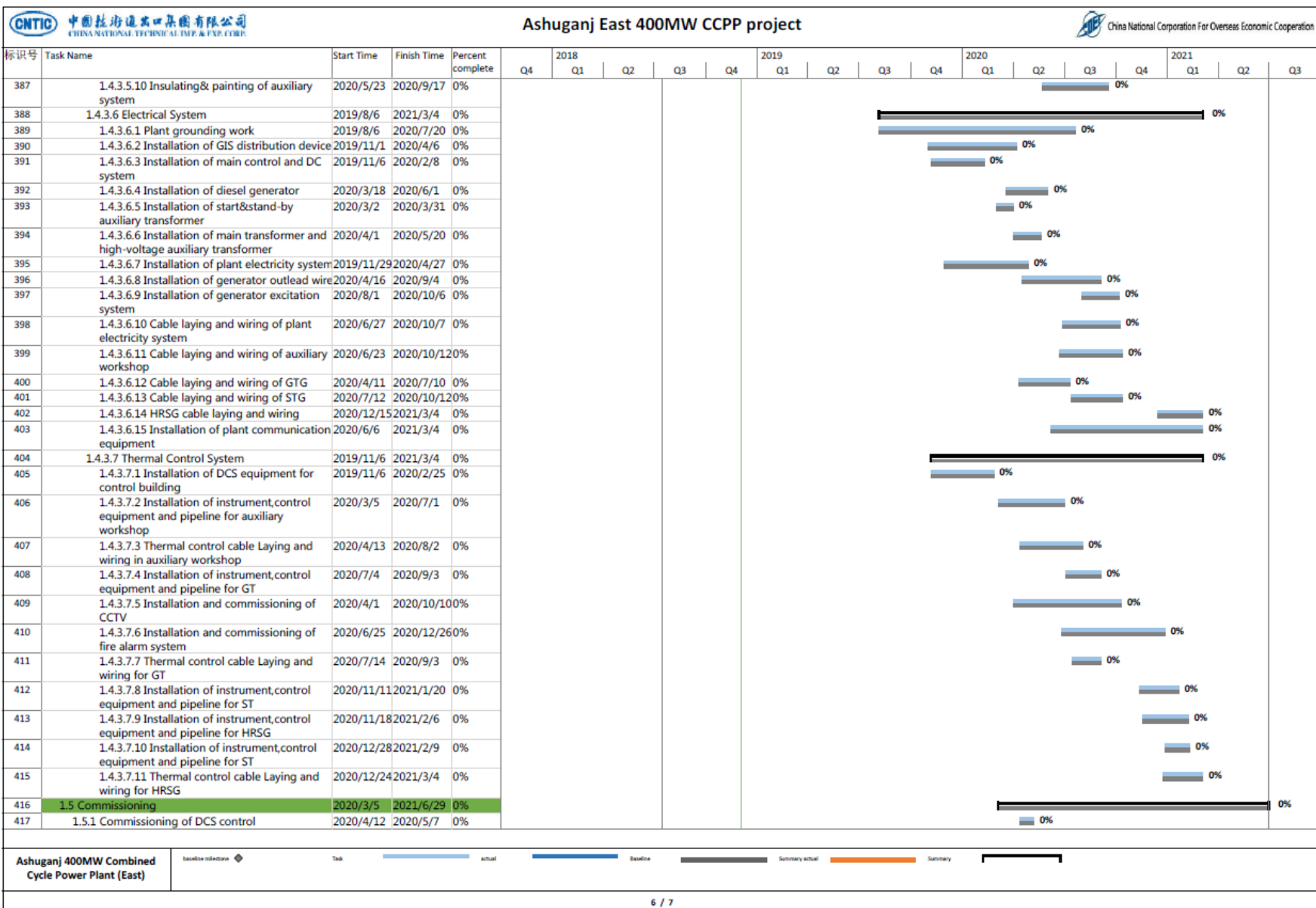


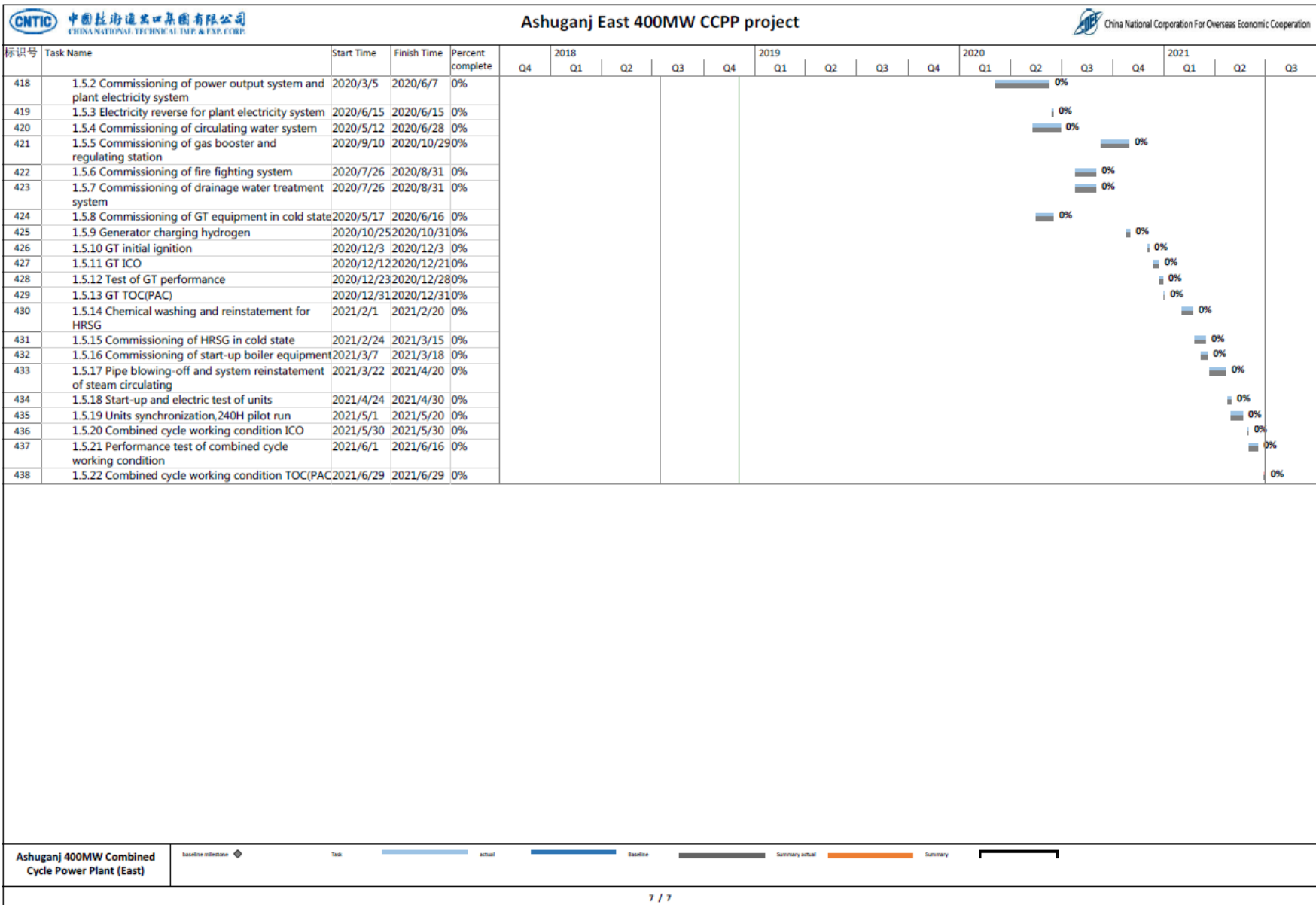




Ashuganj 400MW Combined
Cycle Power Plant (East)







A Synopsis of Work Needs to be undertaken during the Construction Period

According to environmental monitoring, during the construction phase and assignment, the main work will be to collect the ambient air samples to measure air pollutants and noise level data from the project area. For river water analysis the water sample will also be collected from the nearby Meghna River and for groundwater analysis the water sample will be collected from the project area.

Description of Work	7th Semiannually (January-June, 2019)	Frequency
Ambient Air Quality	Done with Measurement	Monthly
Noise Level	Done with Measurement	Monthly
Drinking Water Level	Done with Measurement	Monthly
River Water	Done with Measurement	Monthly
Groundwater Level	Done with Measurement	Quarterly
Soil Quality	Done with Measurement	Annually
Process Waste	Done with Measurement	Quarterly
Health Checkup	No Need to Measure	Daily

Project Environmental Key Personnel, Contact Names and Telephone Numbers

Sl. No.	Project Key personnel	Name of Key personnel	Telephone No.
01	Manager (HS&E), APSCL	Md. Atiqur Rahman	01717462670
02	Executive Engineer Electrical.)	Md. Imrose Islam	01711100873
03	Executive Engineer (Civil.)	Mohammad Asadujjaman	01712238642
04	Manager (Chemical)	Md. Ashraful Islam	01717650871
05	Deputy Manager (Chemical)	Md. Yasin Molla	01923606305
06	Assistant Manager (HS&E)	A.K.M. Humayan Kabir Dewan	01730025431
07	Assistant Engineer (Electrical)	Aminul Islam	01739653761
08	Operator (3 Nos.)	1. Milon Kanti Das 2. Md. Wasi Uddin 3. Ashiq Hasan	
09	Environmental Specialist	Mohammad Arifur Rahman	01711128593

2.0 COMPLIANCE OF NATIONAL REGULATIONS

2.1 Environmental Conservation Rules 1997

2.1.1 Regulatory Compliance progress:

Government of Bangladesh (GoB) Guidelines for Air and Noise Quality

For carrying out the production, the standard for air and noise quality of the environment shall be determined in accordance with the standard specified in Schedule 2 and Schedule 4 in the Environment Conservation Rules 1997, compiled by DoE, Ministry of Environment and Forest, GoB. Schedule 2 and 4 are presented in Table 5.1 and Table 5.2 respectively. The revised National Ambient Air Quality Standards Published in the Bangladesh Gazette (19 July 2005) and Noise Level Standard Published in the Bangladesh Gazette (7 September 2006) is shown in Table 2.1 and Table 2.2 respectively.

The guidelines for acceptable noise level, especially outside plant boundary have been considered as levels recommended by internationally acclaimed standards. Bangladesh has categorized the noise by the following levels.

Table 2.1: Bangladesh Standards for Ambient Air

Location	Unit	SPM (Suspended Particulate matters)	SO ₂ (Sulphur dioxide)	NO _x (Oxide of Nitrogen)
Industrial and mixed area	mg/m ³	500	120	100
Commercial and mixed area	mg/m ³	400	100	100
Residential and Rural area	mg/m ³	200	80	80
Sensitive area	mg/m ³	100	30	30

*Source: (Schedule-2, Rule 12, Environment Conservation Rules 1997)

Notes:

- The sensitive area includes national monuments, health resorts, hospital, archaeological sites, educational institutions and other government-designated area (If any).
- Any industrial unit located not in a designated industrial area will not discharge such pollutants, which may contribute exceed the ambient air quality above in the surrounding areas of residential and sensitive areas.
- Suspended particulate matters mean airborne particles of diameters of 10 microns or less.

Table 2.2: Bangladesh Standards for Noise

Location Category	Standards determined at dB(A) unit	
	Day	Night
Silent Zone	45	35
Residential Area	50	40
Mixed Area (basically residential and together used for commercial and Industrial purposes)	60	50

Commercial area	70	60
Industrial area	75	70

*Source: ECR Schedule 4, A Compilation of Environmental Laws, DoE

Notes:

- Limits presented are one-hour energy equivalent sound exposure limits;
- 'Daytime' is 06.00 AM to 09.00 PM, 'Nighttime' is 09.00 PM to 06.00 AM; and
- Sound exposure at a receptor resulting solely from the facility, irrespective of ambient sound levels, should not exceed the presented limits.

Table 2.3: Bangladesh Standards for Ambient Air (Revised 19th July in 2005)

Pollutant	Objective	Averaging Time
PM _{2.5}	15 µg /m ³	Annual (f)
	65 µg /m ³	24-hour (h)
PM ₁₀	50 µg /m ³	Annual (b)
	150 µg /m ³	24-hours(g)
SPM	200 µg /m ³	8-hours
SO ₂	80 µg / m ³ ; (0.03 ppm)	Annual
	365 µg / m ³ ; (0.14 ppm)	24-hour (a)
NO _x	100 µg /m ³ ; (0.053 ppm)	Annual
CO	10mg/m ³ ; (9 ppm) (a)	8-hours (a)
	40mg/m ³ ; (35 ppm) (a)	1-hour (a)
Lead	0.5 µg/m ³	Annual (i)
Ozone	157 µg /m ³ ; (0.08 ppm)	8-hour (e)
	235 µg /m ³ ; (0.12 ppm)	1-hour(d)

Notes:

- Not to be exceeded more than once per year
- The objective is attained when the annual arithmetic mean is less than or equal to 50µg/m³.
- The objective is attained when the expected number of days per the calendar year with a 24-hour average of 150µg/m³ is equal to or less than 1.
- The objective is attained when the expected number of days per the calendar year with the maximum hourly average of 0.12 ppm is equal to or less than 1.
- 3-year average of annual 4th highest concentration
- Spatially averaged over designated monitors
- From the 99th percentile.
- From the 98th percentile,
- Annual arithmetic average based on lead analysis of TSP samples operated on an every 6th-day schedule.

Table 2.4: Bangladesh Standards for Noise (Revised 7th September in 2006)

Schedule -1 Rules 5(2) (Area Based Noise level value)

Location Category	Standards determined at dB(A) Leq unit	
	Day	Night
Silent Zone	50	40
Residential Area	55	45

Mixed Area (basically residential and together used for commercial and Industrial purposes)	60	50
Commercial area	70	60
Industrial area	75	70

*Source: ECR Schedule 1 (Revised 7th September 2006), A Compilation of Environmental Laws, DoE

3.0 COMPLIANCE OF ENVIRONMENTAL COVENANTS FROM THE ADB LOAN AGREEMENT

3.1 Covenants from the ADB Loan Agreement

Covenants	Reference	Compliance status
Environment		
<p>The borrower shall ensure, or cause APSCL to ensure, that the preparation, design, construction implementation, operation and decommissioning of the project and all project facilities comply with</p> <p>(a) All applicable laws and regulations of the Borrower relating to the environment, health, and safety;</p> <p>(b) The environmental safeguards;</p> <p>(c) The EARF; and</p> <p>(d) All measures and requirement set forth in the respective EIA, IEE and EMP, and any corrective or preventive actions set forth in a safeguard monitoring report</p>	LA, Schedule 5, Para 2	The environmental monitoring will have been carried out in all three phase i.e. pre-construction, during construction and post-construction phase or operation phase
<p>Land Acquisition and Involuntary Resettlement</p> <p>The borrower shall ensure, or cause APSCL to ensure, that all land and all rights-of-way required for the project, and all project facilities are made available to the works contractor in accordance with the schedule agrees under the related works contract and all land acquisition and resettlement activities are implemented in compliance with</p> <p>(a) all applicable laws and regulations of the borrower relating to land acquisition and involuntary resettlement;</p>	LA, Schedule 5, Para 3	In the case of APSCL, this type of issues does not arise due to the project location. The project location is inside the premises of APSCL own land. So, there is no requirements of Land Acquisition and Involuntary Resettlement

<p>(b) the involuntary resettlement safeguards;</p> <p>(c) the RF; and</p> <p>(d) All measures and requirement set forth in the respective RP, and any corrective or preventive actions set forth in a safeguard monitoring report.</p>		
Safeguards – Related provisions in bidding documents and works contracts		
<p>The borrower shall ensure, or cause each projects executing agency to ensure, that all bidding documents and contracts for works contain provisions that require the contractor to:</p> <ul style="list-style-type: none"> (a) Comply with the measures and requirements relevant to the contractor set forth in the EIA, IEE, the EMP, the RP and any small ethnic community peoples plan (to the extent they concern impacts on affected people during construction), and any corrective or preventive actions set out in a safeguard 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 small ethnic community people risks or impacts that arise during construction, implementation or operation of the project that were not considered in the EIA, the IEE, the EMP, the RP or any small ethnic community peoples plan; (d) Adequately record the condition of roads, agricultural and other infrastructure prior to starting to transport materials and construction; (e) Fully reinstate pathways, other local infrastructure, and agricultural land to at least their pre-project condition upon the completion of construction. 	LA, Schedule 5, Para 7	The safeguards- related provisions in bidding documents and work contracts have been followed strictly and update time to time for further requirements.
Safeguards- Monitoring and Reporting		
The borrower shall do the following or shall	LA,	The Safeguards

<p>cause APSCL to do the following:</p> <ul style="list-style-type: none"> (a) Submit semiannual 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 EIA, the IEE, the EMP or the RP, promptly inform ADB of the occurrence of such risks or impacts, with detailed description of the event and proposed corrective action plan; (c) No later than the mobilization of the turnkey contractor for APSCL's power plant, engage qualified and experienced external experts or qualified non-governmental organizations under a selection process and terms of reference acceptable to ADB, to verify information produced through the project monitoring process, and facilitated the carrying out of any verification by such external experts; and (d) Report any actual or potential breach of compliance with the measures and requirements set forth in the EMP or the RP promptly after becoming aware of the breach. 	<p>Schedule 5, Para 7</p>	<p>monitoring will have been carried out in all three phase i.e. pre-construction, during construction and post-construction phase or operation phase</p>
<p>Labor standards</p>		
<p>The borrower shall ensure that all works contract documents to be prepared under the project incorporate provisions and budget to the effect that contractors</p> <ul style="list-style-type: none"> (a) Comply with all applicable labor laws and related international treaty obligations of the borrower and do not employ child labor as defined under Bangladesh law; (b) Provide safe working conditions for male and female workers; (c) Carry out HIV/ AIDS and human trafficking prevention and awareness 	<p>LA, Schedule 5, Para 10</p>	<p>The labor standards will have been followed strictly.</p>

campaigns in the campsites and corridors of influence; (d) Engage women worker as wage laborers depending on their skill; and (e) Provide equal wages for equal work between men and women		
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4.0 COMPLIANCE TO ENVIRONMENTAL MANAGEMENT PLAN

4.1 Major Environmental Activities of the Project

Major Environmental Activities of the project which will be during the construction period are given below:

- Influx of workers
- Transportation of equipment, materials and personnel; storage of materials
- Construction activities, including the operation of construction equipment.

4.1.1 Site-Specific Environmental Management Plan

Table 4.0.1: HS&E and Social Mitigation and Management Plan for Pre-construction and Construction Phase

Mitigation No.	Issue/Impact	Receptor	Mitigation	Responsibility		Key Performance Indicators
				Implementation	Supervision	
1	<ul style="list-style-type: none"> Dust emissions caused by construction activities, construction vehicle movements, transport of construction materials. Exhaust emissions from vehicles being used for transportation/operation of construction, materials/supplies and workforce. 	Air Quality	<ul style="list-style-type: none"> Appropriate siting and maintenance of stockpiles of materials so as to minimize dust blow (seek to achieve a distance of at least 500m from nearest sensitive receptors); The design of stockpiles will be optimized to retain a low profile with no sharp changes in shape; Minimizing drop heights for material transfer activities such as unloading of materials; All chutes, conveyors and skips will be covered at all times. Site access and roads will be regularly kept damp via a water browser; Wheel wash for all vehicles leaving the Project site will be provided; Open burning on the project site will be prohibited; Roads will be compacted and graveled if necessary; Site roads will be maintained in good order; Lorries transporting construction materials and soil will be covered appropriately to 	CNTIC (EPC Contractor)	<ul style="list-style-type: none"> APSCL; OE E&S Safeguard Consultants; Independent Local Environmental and Social Monitoring Consultant. 	<ul style="list-style-type: none"> SPM, PM_{2.5}, PM₁₀, NO₂, SO and CO monitoring at sensitive receptors in accordance with the requirements specified in Table 3; Vehicle, equipment and machinery checklists observed; Annual maintenance records observed. Community grievance mechanism implemented and records documented.

Mitigation No.	Issue/Impact	Receptor	Mitigation	Responsibility		Key Performance Indicators
				Implementation	Supervision	
			avoid soil dispersion; <ul style="list-style-type: none"> • Enforcement of vehicle speed limits within the APSCL site to not exceed 10 km/h; • All sand and aggregates will be stored in bounded areas and will not be allowed to dry out unless specifically required; • On-site and off-site haul roads will be inspected for integrity and necessary repairs to the surfaces will be undertaken as soon as reasonably practicable; • All vehicles, equipment and machinery will undergo a pre-use inspection prior to use; • All vehicles will undergo periodic maintenance inspections; • Implement community grievance mechanism shown in the stakeholder engagement plan in Annex D. • Monitoring of Suspended Particulate Matter (SPM), Particulate Matter 2.5 (PM_{2.5}) and Particulate Matter 10 (PM₁₀), Nitrogen Dioxide (NO₂), Sulphur Dioxide (SO₂) and Carbon Monoxide (CO) by third party consultant. 			
2	Increased noise in the Project area and at sensitive receptors a result	Noise	<ul style="list-style-type: none"> • Provision of a noise barrier around the project site to reduce off-site noise levels; 	CNTIC (EPC Contractor)	<ul style="list-style-type: none"> • APSCL; • OE E&S 	<ul style="list-style-type: none"> • Noise monitoring at sensitive receptors in accordance with

Mitigation No.	Issue/Impact	Receptor	Mitigation	Responsibility		Key Performance Indicators
				Implementation	Supervision	
	of the use of construction activities, machinery and increased vehicle movements.		<ul style="list-style-type: none"> Enforcement of vehicle speed limits which will not exceed 10 km/h within the APSCL site; Strict controls of vehicle routing; Diesel engine construction equipment will be fitted with silencers; Noisy construction activities will be limited at night; Light vehicle movements will be prohibited at night; Piling activities will be carried out during the daytime hours (i.e. 7AM to 6PM); Where possible the CCGT construction works and activities will conclude at 6PM daily; Implementation of a community grievance mechanism shown in the stakeholder engagement plan in Annex D; Monitoring of noise by a third-party consultant. 		<p>Safeguard Consultants;</p> <ul style="list-style-type: none"> Independent Local Environmental and Social Monitoring Consultant. 	<p>the requirements specified in Table 3;</p> <ul style="list-style-type: none"> Community grievance mechanism implemented and records documented.
3	Site Clearance-Vegetation removal and Habitat disturbance	Terrestrial Biodiversity	<ul style="list-style-type: none"> Hunting and poaching will be prohibited for staff, workers, all contractors and personnel engaged in or associated with the Project, with penalties levied, including fines and dismissal, and prosecution under the 	CNTIC (EPC Contractor)	<ul style="list-style-type: none"> APSCL; OE E&S Safeguard Consultants; 	<ul style="list-style-type: none"> Vegetation clearance areas marked/fenced; No. of floral species conserved or

Mitigation No.	Issue/Impact	Receptor	Mitigation	Responsibility		Key Performance Indicators
				Implementation	Supervision	
			<p>relevant laws for clearing vegetation;</p> <ul style="list-style-type: none"> • Training to staff and workers on all rules, regulations and information concerning restrictions related to hunting and poaching will be provided, as well as the punishment that can be expected if any staff or workers or other person associated with the Project violates rules and regulations; • All vehicles are to maintain a speed of a maximum of 10km/hr within the APSCL site to reduce the risk of fauna strike; • The planned vegetation clearance area for the construction works shall be clearly identified and marked/fenced to avoid accidental clearing. 		<ul style="list-style-type: none"> • Independent Local Environmental and Social Monitoring Consultant. 	<p>planted recorded, if any;</p> <ul style="list-style-type: none"> • Workers Training Records showing appropriate training.
4	<p>Site clearance, excavation and disposal of material activities resulting in exposure of potentially contaminated soils and impacting groundwater.</p> <p>Spillage or leakage of substances on land, movement of equipment and vehicles on site resulting in contamination</p>	Soils and Groundwater	<ul style="list-style-type: none"> • Development of an effective site drainage systems designed to include allowance for climate change; • Restrict site access only to construction site areas; • Disposal of waste materials unsuitable for reuse on-site, (e.g. for landfilling) at appropriately licensed sites; • Installation of oil and suspended solid interceptors; • Management of excavations during 	CNTIC (EPC Contractor)	<ul style="list-style-type: none"> • APSCL; • OE E&S Safeguard Consultants; • Independent Local Environmental and Social Monitoring Consultant. 	<ul style="list-style-type: none"> • Groundwater Monitoring in accordance with the requirements specified in Table 3. • Soil Quality Monitoring in accordance with the requirements specified in Table 3.

Mitigation No.	Issue/Impact	Receptor	Mitigation	Responsibility		Key Performance Indicators
				Implementation	Supervision	
	of soils and groundwater.		<p>construction to avoid the generation of drainage pathways to underlying aquifers;</p> <ul style="list-style-type: none"> • Provision of impermeable bases in operational areas to prevent absorption of spillages. • Scheduling clearance activities to avoid extreme weather events such as heavy rainfall, extreme dry and high winds. • Demarcate routes for movement of heavy vehicles to minimize disturbance of exposed soils and compaction of sub-surface layers. • Reuse topsoil within rehabilitation activities. • Control erosion through diversion drains, sediment fences, and sediment retention basins. • Stockpiles are to be located in areas surrounded by natural wind barriers to minimize the potential for wind erosion. • No septic tanks will be installed within 500m of a deep or shallow tube well used by the community for drinking water. • Septic tanks will be installed in well drained and permeable soils well above high groundwater level and where sufficient soil percolation exists for design wastewater loading rate. It will be appropriately 			

Mitigation No.	Issue/Impact	Receptor	Mitigation	Responsibility		Key Performance Indicators
				Implementation	Supervision	
			<p>designed to prevent hazards to human health or contamination of land or water. Regular maintenance will be undertaken. No overflow of septic tank is permitted.</p> <ul style="list-style-type: none"> Quarterly monitoring of groundwater wells within 1 km of septic tanks by third party consultant; Annual soil quality sampling by third party consultant. 			
5	Increased suspended sediment and pollutant loads, permanent loss and disturbance to aquatic flora and fauna due to the construction of the intake structure and water discharge structure.	Aquatic Environment and River Water Quality	<ul style="list-style-type: none"> Construction Method Statement to be produced by the CNTIC; Coffer dam to be used during in-channel works to minimize downstream sediment release; Inlet structure construction in river will be undertaken outside the breeding season of fishes; Dredged areas will be limited to the minimum area required; Disposal of dredged sediments to an agreed site only; All works will be made clearly visible using flags, beacons and/or signals; Bank area will be reinstated following construction; 	CNTIC (EPC Contractor)	<ul style="list-style-type: none"> APSCL; OE E&S Safeguard Consultants; Independent Local Environmental and Social Monitoring Consultant. 	<ul style="list-style-type: none"> Construction Method Statement by CNTIC River water sampling in accordance with the requirements specified in Table 3.

Mitigation No.	Issue/Impact	Receptor	Mitigation	Responsibility		Key Performance Indicators
				Implementation	Supervision	
			<ul style="list-style-type: none"> River water sampling during dredging and in river works by third party consultant. 			
6	Contamination of the aquatic environment as a result of construction activities on land e.g. spillages, disposal of liquid wastes; surface run-off, exposure of contaminated soils.	Aquatic Environment and River Water Quality	<ul style="list-style-type: none"> No discharge of effluents into the river. All effluents shall be collected and removed off site for treatment by approved firms or disposed after appropriate treatment at site (records of effluent transfers to be maintained); No discharge of surface water runoff direct into the river; Development of a temporary site drainage plan which reduces flow velocity and sediment load by passing discharge through a sediment pond; Protection of temporary stockpiles of soil from erosion by using a reduced slope angle where practical, sheeting and by incorporating sediment traps in drainage ditches; Stockpiles will be located at least 100 m from water bodies; All fuel, oil and chemicals will be stored in bounded area to accommodate 110% volume; Impermeable surfaces will be used for refueling; 	CNTIC (EPC Contractor)	<ul style="list-style-type: none"> APSCL; OE E&S Safeguard Consultants; Independent Local Environmental and Social Monitoring Consultant. 	<ul style="list-style-type: none"> Waste transfer note system to document transport of waste; Temporary Site Drainage Plan; Workers Training Records showing appropriate training; River water sampling in accordance with the requirements specified in Table 3.

Mitigation No.	Issue/Impact	Receptor	Mitigation	Responsibility		Key Performance Indicators
				Implementation	Supervision	
			<ul style="list-style-type: none"> Regular training of all workers in spill response; Provision of spill equipment at easily accessible locations around the site; River water sampling by third party consultant. 			
7	Generation, handling, treatment and disposal of solid and liquid hazardous and non- hazardous wastes.	Environmental Quality	<ul style="list-style-type: none"> All waste taken off-site will be undertaken by a licensed contractor and the CNTIC will audit the disposal procedure; Collection and segregation of wastes and safe storage onsite will be undertaken; Prior agreement of standards for storage, management and disposal with relevant authorities will be obtained. Construction of sanitary latrine and septic tank system (one latrine for 20 persons); Erecting “no litter” sign, provision of waste bins/cans, where appropriate; Waste minimization, recycle and reuse will be undertaken; Appropriate disposal of solid waste (in designated waste bins); Development of a Waste Inventory (hazardous and non-hazardous) detailing waste name, waste classification, waste type, 	CNTIC (EPC Contractor)	<ul style="list-style-type: none"> APSCL; OE E&S Safeguard Consultants; Independent Local Environmental and Social Monitoring Consultant. 	<ul style="list-style-type: none"> Waste Inventory (hazardous and non-hazardous) implemented. Waste transfer note system to document transport of waste.

Mitigation No.	Issue/Impact	Receptor	Mitigation	Responsibility		Key Performance Indicators
				Implementation	Supervision	
			<p>source of waste, waste storage area, storage quality, delivery quality, balance quality, agreement information with disposal company.</p> <ul style="list-style-type: none"> A system for documenting waste movements to be created. A trip ticket or waste transfer note system to be used to document all waste types leaving the Project area, their haulier, source, proposed disposal site etc. These tickets should be produced as counterfoil to create a full audit trail. 			
8	Health and Safety impacts due to construction traffic.	Local communities and workers.	<ul style="list-style-type: none"> Traffic Management Plan shown in Annex E to be implemented and updated as required; Adherence of abnormal load movements to prescribed routes, outside peak hours and advance publication to of movements to communities if required; Construction shifts will be staggered; Scheduling of traffic to avoid peak hours on local roads; Routing of transport to avoid residential areas; Provision of adequate signage and flagmen along transport route and at site entrance; Transportation of construction workers by 	CNTIC (EPC Contractor)	<ul style="list-style-type: none"> APSCL; OE E&S Safeguard Consultants; Independent Local Environmental and Social Monitoring Consultant. 	<ul style="list-style-type: none"> Traffic Management Plan implemented and updated; Survey of roads and bridges prior to start of works for safety; Vehicle checklists observed; Annual maintenance vehicle records observed; Driver training records observed; Speed test monitoring results

Mitigation No.	Issue/Impact	Receptor	Mitigation	Responsibility		Key Performance Indicators
				Implementation	Supervision	
			contract bus; <ul style="list-style-type: none"> • Ensure all roads and bridges used by construction traffic are maintained in at least their current state during construction with any damage immediately repaired; • Condition survey of roads and bridges to be undertaken by third party consultant prior to start of works to provide a baseline for monitoring compliance; • Installation of appropriate traffic sign and warnings; • Enforce speed limit regulations on off-site access roads; • Speed limit of 10 km per hour within APSCL site; • Vehicles will be kept in good condition, with regular checks of vehicle condition undertaken to ensure compliance with national standards; • Ensure all Project drivers are trained in safety awareness; • Implement a grievance mechanism for communities. 			(onsite and offsite) observed; <ul style="list-style-type: none"> • Community grievance mechanism implemented and records documented.
9	Health and Safety impacts due to unauthorized	Local Communities.	<ul style="list-style-type: none"> • Public access to the site will be restricted; 	CNTIC (EPC Contractor)	<ul style="list-style-type: none"> • APSCL; • OE E&S 	<ul style="list-style-type: none"> • Site Security Procedures

Mitigation No.	Issue/Impact	Receptor	Mitigation	Responsibility		Key Performance Indicators
				Implementation	Supervision	
	persons accessing the site.		<ul style="list-style-type: none"> Site security procedures to be established. 		Safeguard Consultants; <ul style="list-style-type: none"> Independent Local Environmental and Social Monitoring Consultant. 	established and implemented.
10	Health and Safety impacts due to influx of workers.	Local Communities.	<ul style="list-style-type: none"> Regular talks on communicable diseases including HIV to be held for all workers; Compulsory medical examinations for construction workers; Liaison with the local police and healthcare providers to ensure no additional pressure has been placed on them due to construction worker influx; Implement community grievance mechanism shown in the stakeholder engagement plan in Annex D. 	CNTIC (EPC Contractor)	<ul style="list-style-type: none"> APSCL; OE E&S Safeguard Consultants; Independent Local Environmental and Social Monitoring Consultant. 	<ul style="list-style-type: none"> Workers Health and Education Procedures established and implemented; Workers Training Records showing appropriate trainings. Medical Examination Records observed; Records of engagement with local police and healthcare providers Community grievance mechanism implemented and

Mitigation No.	Issue/Impact	Receptor	Mitigation	Responsibility		Key Performance Indicators
				Implementation	Supervision	
						records documented.
11	Potential chance finds of archaeological remains during Construction.	Cultural Heritage and Archaeology	<p>If remains are found, the following actions will be undertaken:</p> <ul style="list-style-type: none"> • Cease activities and consult archaeological department and DOE; • Protection in situ if possible; • Excavation of areas where protection not feasible following discussion and agreement of archaeological department and DOE. 	CNTIC (EPC Contractor)	<ul style="list-style-type: none"> • APSCL; • OE E&S Safeguard Consultants; • Independent Local Environmental and Social Monitoring Consultant 	<ul style="list-style-type: none"> • Cultural Heritage and Archaeology Site Find Records (if remains are found).
12	Occupational Health and Safety	Workers Health and Safety	<ul style="list-style-type: none"> • Sufficient and qualified HSE staff to ensure safe working practices. • Pre-construction and continued assessment of the HSE and social risks and hazards by implementing an HSE and social Risk Register; • Implementation of contractors HSE Plan which will consider the requirements of the WBG HSE Guidelines for Occupational, Health Safety; • Method Statement and Permit to Work procedures to be implemented. • Implementation of Fire Safety Plan prior to commissioning any part of the plant; 	CNTIC (EPC Contractor)	<ul style="list-style-type: none"> • APSCL; • OE E&S Safeguard Consultants; • Independent Local Environmental and Social Monitoring Consultant 	<ul style="list-style-type: none"> • HSE capacity and competency observed to be appropriate; • HSE and Social Risk Register established and reviewed; • Contractors HSE Plan established and implemented; • Method Statement and Permit to Work Procedures implemented

Mitigation No.	Issue/Impact	Receptor	Mitigation	Responsibility		Key Performance Indicators
				Implementation	Supervision	
			<ul style="list-style-type: none"> • Implementation of Emergency Response and Disaster Management Plan shown in Annex F. • Provision of appropriate training on HSE issues for all workers; • Provision of health and safety information; • Regular inspection, review and recording of HSE performance; • Appointment of site nurse and provision of free on-site medical care for all construction staff; • Pest and vector borne disease control procedures established and be implemented; • Maintenance of a high standard of housekeeping at all times. • Provision of first aid equipment at easily • No employee should be exposed to a noise level greater than 85 dB (A) for a duration of more than 8 hours per day without hearing protection. And no unprotected ear should be exposed to a peak sound pressure level of more than 140 dB(C). The use of hearing protection should be enforced actively when the equivalent sound level over 8 hours reaches 85 dB(A), the peak sound levels reaches 140 dB(C), or the average maximum 			<p>appropriately.</p> <ul style="list-style-type: none"> • Fire Safety Plan; • Emergency Response and Disaster Management Plan established and implemented; • HSE Training Plan established and implemented; • HSE Training Records showing appropriate training; • Pest and vector borne disease control procedures established and implemented • Incident Reporting Procedure (records of fatalities, incidents, accidents, near misses and corrective actions) established and

Mitigation No.	Issue/Impact	Receptor	Mitigation	Responsibility		Key Performance Indicators
				Implementation	Supervision	
			<p>sound level reaches 110 dB(A). Hearing protective devices provided should be capable of reducing sound levels at the ear to at least 85dB(A);</p> <ul style="list-style-type: none"> Monthly monitoring of the quality of workers drinking water by third party consultant. 			<p>implemented.</p> <ul style="list-style-type: none"> Drinking water quality monitoring in accordance with requirements shown in Table 4.0.1.

Table 4.0.1: HSE and Social Monitoring Plan for Construction

Mitigation No. Ref.	Environmental and Social Parameter	Aspect	Monitoring Activities	Duration and Frequency	Responsibility	Monitoring Locations	Methods	Reporting	Applicable Standards
1	Air Quality	Dust generation and exhaust emissions.	Implementation of mitigation measures and assessment of performance indicators.	Daily	CNTIC	Dust generation activities onsite and offsite.	Visual observation	<ul style="list-style-type: none"> CNTIC Monthly HSE Monitoring Report for APSCL and DOE. APSCL Semi-Annual Environmental Report for ADB 	<ul style="list-style-type: none"> Bangladesh Environmental Conservation Rules, 1997. WBG General EHS Guidelines for Construction and Decommissioning, 2007.
			Monitoring and supervision to ensure the	Weekly	APSCL	Dust generation activities onsite and offsite.	Visual observation	<ul style="list-style-type: none"> CNTIC Monthly HSE Monitoring Report for 	<ul style="list-style-type: none"> Bangladesh Environmental Conservation

Mitigation No. Ref.	Environmental and Social Parameter	Aspect	Monitoring Activities	Duration and Frequency	Responsibility	Monitoring Locations	Methods	Reporting	Applicable Standards
			implementation of mitigation measures by all contractors.					APSCL and DOE. • APSCL Semi-Annual Environmental Report for ADB.	Rules, 1997. • WBG General EHS Guidelines for Construction and Decommissioning, 2007.
			SPM, PM _{2.5} , PM ₁₀ , NO ₂ , SO ₂ and CO monitoring by third party consultant.	Once per month for a 24-hour period.	CNTIC	• South-West side of Project area near APSCL Admin building. Location: 24°02'38.5'' N and 91°1'0.0'' E • Settlement, near south east corner of the project – Location: 24°02'34.7'' N and 91°01'8.7'' E • PDB High School – Location: 24°02'30.5'' N and 91°0'42.2'' E • Hazi Jolil High School –	<u>Particulates</u> Respirable Dust Sampler (Model-Envirotech India APM-460BL) and Fine Particulate Sampler (Model-Envirotech India AAS-127BL). <u>Nitrogen Dioxide</u> Gravimetric <u>Sulphur Dioxide</u> Gravimetric <u>Carbon Monoxide</u> Gravimetric	• CNTIC Monthly HSE Monitoring Report for APSCL and DOE. • APSCL Semi-Annual Environmental Report for ADB	• Bangladesh National Ambient Air Quality Standards – Environmental Conservation Rules – Schedule 2 (Amended in 2005) by S.R.O. No: 220-Law/2005. Refer to Annex G.

Mitigation No. Ref.	Environmental and Social Parameter	Aspect	Monitoring Activities	Duration and Frequency	Responsibility	Monitoring Locations	Methods	Reporting	Applicable Standards
						Location: 24°02'31.7'' N and 91°0'30.3'' E <ul style="list-style-type: none"> • APSCL Dormitory – Location: 24°02'58.5'' N & 91°01'23.9'' E. 			
			Community Grievance Records	As received.	CNTIC	Not applicable	Visual observation	<ul style="list-style-type: none"> • CNTIC Monthly HSE Monitoring Report for APSCL and DOE. • APSCL Semi-Annual Environmental Report for ADB 	<ul style="list-style-type: none"> • ADB Safeguards Policy Statement: Environmental Safeguards, 2009.
2	Noise	Construction noise from machinery and vehicle movements	Implementation of mitigation measures and assessment of performance indicators.	Daily	CNTIC	Noise generation activities onsite and offsite.	Visual observation	<ul style="list-style-type: none"> • CNTIC Monthly HSE Monitoring Report for APSCL and DOE. • APSCL Semi-Annual Environmental Report for ADB 	<ul style="list-style-type: none"> • Bangladesh Environmental Conservation Rules, 1997. • WBG General EHS Guidelines for Construction and Decommissioning, 2007.

Mitigation No. Ref.	Environmental and Social Parameter	Aspect	Monitoring Activities	Duration and Frequency	Responsibility	Monitoring Locations	Methods	Reporting	Applicable Standards
			Monitoring and supervision to ensure the implementation of the mitigation measures.	Weekly	APSCL	Noise generation activities onsite and offsite.	Visual observation	<ul style="list-style-type: none"> CNTIC Monthly HSE Monitoring Report for APSCL and DOE. APSCL Semi-Annual Environmental Report for ADB. 	<ul style="list-style-type: none"> Bangladesh Environmental Conservation Rules, 1997. WBG General EHS Guidelines for Construction and Decommissioning, 2007.
			Noise monitoring of LAeq, one 1 hour noise levels by third party consultant.	Once per month for a 24 hour period.	CNTIC	<ul style="list-style-type: none"> South-West side of Project area near APSCL Admin building. Location: 24°02'38.5'' N and 91°1'0.0'' E Settlement, near south east corner of the project – Location: 24°02'34.7'' N and 91°01'8.7'' E PDB High School – Location: 24°02'30.5'' N 	Noise quality is being measured instantly on the site by CEM Sound level meter (Model DT8850. Continuous monitoring observed at each location.	<ul style="list-style-type: none"> CNTIC Monthly HSE Monitoring Report for APSCL and DOE. APSCL Semi-Annual Environmental Report for ADB. 	<ul style="list-style-type: none"> Bangladesh Standard for Sound – Environmental Conservation Rules – Schedule 4. Refer to Annex G. WBG General EHS Guidelines for Construction and Decommissioning, 2007.

Mitigation No. Ref.	Environmental and Social Parameter	Aspect	Monitoring Activities	Duration and Frequency	Responsibility	Monitoring Locations	Methods	Reporting	Applicable Standards
						& 91°0'42.2'' E • Hazi Jolil High School – Location: 24°02'31.7'' N & 91°0'30.3'' E • APSCL Dormitory – Location: 24°02'58.5'' N & 91°01'23.9'' E			
			Community Grievance Records	As received.	CNTIC	Not applicable	Visual observation	• CNTIC Monthly HSE Monitoring Report for APSCL and DOE. • APSCL Semi-Annual Environmental Report for ADB	• ADB Safeguards Policy Statement: Environmental Safeguards, 2009.
3	Terrestrial Biodiversity	Site Clearance - Vegetation removal and Habitat disturbance	Implementation of mitigation measures and assessment of performance indicators.	Daily	CNTIC	Construction Site	Visual observation	• CNTIC Monthly HSE Monitoring Report for APSCL and DOE. • APSCL Semi-Annual Environmental Report for ADB	• ADB Safeguard Policy Statement: Environmental Safeguards, 2009.

Mitigation No. Ref.	Environmental and Social Parameter	Aspect	Monitoring Activities	Duration and Frequency	Responsibility	Monitoring Locations	Methods	Reporting	Applicable Standards
			Monitoring and supervision to ensure the implementation of the mitigation measures.	Weekly	APSCL	Construction Site	Visual observation	<ul style="list-style-type: none"> • CNTIC Monthly HSE Monitoring Report for APSCL and DOE. • APSCL Semi-Annual Environmental Report for ADB. 	<ul style="list-style-type: none"> • ADB Safeguard Policy Statement: Environmental Safeguards, 2009.
4	Soils and Groundwater	Site clearance, excavation and disposal of material, exposure of potentially contaminated soils, spillage or leakage of substances on land, movement of equipment and vehicles on	Implementation of mitigation measures and assessment of performance indicators.	Daily	CNTIC	Construction Site	Visual observation	<ul style="list-style-type: none"> • CNTIC Monthly HSE Monitoring Report for APSCL and DOE. • APSCL Semi-Annual Environmental Report for ADB 	<ul style="list-style-type: none"> • WBG General EHS Guidelines for Construction and Decommissioning, 2007.
			Monitoring and supervision to ensure the implementation of the mitigation measures.	Weekly	APSCL	Construction Site	Visual observation	<ul style="list-style-type: none"> • CNTIC Monthly HSE Monitoring Report for APSCL and DOE. • APSCL Semi-Annual Environmental Report for ADB. 	<ul style="list-style-type: none"> • WBG General EHS Guidelines for Construction and Decommissioning, 2007.

Mitigation No. Ref.	Environmental and Social Parameter	Aspect	Monitoring Activities	Duration and Frequency	Responsibility	Monitoring Locations	Methods	Reporting	Applicable Standards
		site.	Groundwater monitoring for Groundwater level, pH, TDS, Ammonia, Nitrate, Phosphate, Arsenic (As), Iron (Fe), Manganese (Mn) and Coliforms by third party consultant.	Quarterly (every 3 months)	CNTIC	i. Inside the project area. Location: 24° 02' 38.1'' N and 91° 0' 58.0'' E ii. South-west side of Project area near PDB High School. Location: 24° 2' 30.5'' N and 91° 00' 42.2'' E. iii. South-East side of the project. Location: 24° 02' 34.1'' N and 91° 1' 9.3'' E iv. North-East side of the project area. Location: 24° 02' 47.2'' N and 91° 1' 12.3'' E	pH – pH meter; TDS – TDS meter Ammonia – Photometric. Nitrate – Potentiometric. Phosphate – Photometric. As – Atomic Absorption Spectroscopy. Fe – Spectrophotometer. Mn – Atomic Absorption Spectroscopy. Coliforms – Membrane Filter Techniques.	<ul style="list-style-type: none"> CNTIC Monthly HSE Monitoring Report for APSCL and DOE. APSCL Semi-Annual Environmental Report for ADB. 	<ul style="list-style-type: none"> Bangladesh Standard for Drinking Water – Environmental Conservation Rules – Schedule 3. Refer to Annex G.
			Soil quality monitoring for Chromium	Annual	CNTIC	One location on the construction site.	Cr - Acid digestion and AAS;	<ul style="list-style-type: none"> CNTIC Monthly HSE Monitoring Report for 	

Mitigation No. Ref.	Environmental and Social Parameter	Aspect	Monitoring Activities	Duration and Frequency	Responsibility	Monitoring Locations	Methods	Reporting	Applicable Standards
			(Cr), Cadmium (Cd), Lead (Pb) and Oil & Grease.				Cd - Acid digestion and AAS; Pb - Acid digestion and AAS; Oil & Grease - EPA 9071 B (Oil & Grease) in soil.	APSCL and DOE. • APSCL Semi-Annual Environmental Report for ADB.	
5, 6	Aquatic Environment and River Water Quality	Increased suspended sediment and pollutant loads, permanent loss and disturbance to aquatic flora and fauna due to construction of the intake structure and water discharge structure.	Implementation of mitigation measures and assessment of performance indicators.	Daily during dredging and in river works.	CNTIC	Dredging area and in river works.	Visual observation	• CNTIC Monthly HSE Monitoring Report for APSCL and DOE. • APSCL Semi-Annual Environmental Report for ADB	• WBG General EHS Guidelines for Construction and Decommissioning, 2007.
			Monitoring and supervision to ensure the implementation of the mitigation measures.	Weekly during dredging and in river works.	APSCL	Dredging area and in river works.	Visual observation	• CNTIC Monthly HSE Monitoring Report for APSCL and DOE. • APSCL Semi-Annual Environmental Report for ADB.	• WBG General EHS Guidelines for Construction and Decommissioning, 2007.
			River water	Weekly	CNTIC	i. North-West side of	Temperature – Mercury	• CNTIC Monthly	• Bangladesh

Mitigation No. Ref.	Environmental and Social Parameter	Aspect	Monitoring Activities	Duration and Frequency	Responsibility	Monitoring Locations	Methods	Reporting	Applicable Standards
			sampling during dredging and in river works for Temperature, pH, Chemical Oxygen Demand (COD), Biochemical Oxygen Demand 5 (BOD5), Dissolved Oxygen (DO), oil & grease, Chromium (Cr), Cadmium (Cd) and Lead (Pb) by third party consultant.	during dredging and in river works.		Project area near the project location (Upstream) Location: 24°02'53.1'' N and 91°01' 3.1'' E ii. North-West side of Project area and near Ashuganj Chor Sonarampur (Downstream) Location: 24°02'44.0'' N and 91°00' 33.2'' E iii. North-East side of Project area near APSCL power plant area (outfall) Location: 24°02'40.3'' N and 91°01' 10.8'' E	Filled Thermometer; pH – pH meter; COD – Open Reflux; BOD – 5-day BOD test; DO – DO meter. Oil & Grease – APHA – 5520. B Cr – Atomic Absorption Spectroscopy Cd- Atomic Absorption Spectroscopy Lead - Atomic Absorption Spectroscopy	HSE Monitoring Report for APSCL and DOE. • APSCL Semi-Annual Environmental Report for ADB	Standard for Inland Surface Water – Environmental Conservation Rules – Schedule 3. Refer to Annex G.
		Contamination of the aquatic environment as a result of	Implementation of mitigation measures and assessment of performance indicators.	Daily	CNTIC	Construction Site	Visual observation	• CNTIC Monthly HSE Monitoring Report for APSCL and DOE. • APSCL Semi-	• WBG General EHS Guidelines for Construction and Decommission

Mitigation No. Ref.	Environmental and Social Parameter	Aspect	Monitoring Activities	Duration and Frequency	Responsibility	Monitoring Locations	Methods	Reporting	Applicable Standards
		construction activities on land e.g. spillages, disposal of liquid wastes; surface run-off, exposure of contaminated soils.						Annual Environmental Report for ADB	ing, 2007.
			Monitoring and supervision to ensure the implementation of the mitigation measures.	Weekly	APSCL	Construction Site	Visual observation	<ul style="list-style-type: none"> • CNTIC Monthly HSE Monitoring Report for APSCL and DOE. • APSCL Semi-Annual Environmental Report for ADB. 	<ul style="list-style-type: none"> • WBG General EHS Guidelines for Construction and Decommissioning, 2007.
			River water sampling for Temperature, pH, Chemical Oxygen Demand (COD), Biochemical Oxygen Demand 5 (BOD5), Dissolved Oxygen (DO), oil & grease, Chromium (Cr), Cadmium	Monthly	CNTIC	i. North-West side of Project area near the project location (Upstream) Location: 24°02'53.1'' N and 91°01' 3.1'' E ii. North-West side of Project area and near Ashuganj Chor Sonarampur (Downstream) Location: 24°02'44.0'' N and 91°00' 33.2'' E iii. North-East side	Temperature – Mercury Filled Thermometer; pH – pH meter; COD – Open Reflux; BOD – 5-day BOD test; DO – DO meter. Oil & Grease – APHA – 5520. B Cr – Atomic Absorption Spectroscopy Cd- Atomic Absorption Spectroscopy Lead - Atomic Absorption	<ul style="list-style-type: none"> • CNTIC Monthly HSE Monitoring Report for APSCL and DOE. • APSCL Semi-Annual Environmental Report for ADB 	<ul style="list-style-type: none"> • Bangladesh Standard for Inland Surface Water – Environmental Conservation Rules – Schedule 3. Refer to Annex G.

Mitigation No. Ref.	Environmental and Social Parameter	Aspect	Monitoring Activities	Duration and Frequency	Responsibility	Monitoring Locations	Methods	Reporting	Applicable Standards
			(Cd) and Lead (Pb) by third party consultant.			of Project area near APSCL power plant area (outfall) Location: 24°02'40.3'' N and 91°01' 10.8'' E	Spectroscopy		
7	Waste Management	Generation, handling, treatment and disposal of solid and liquid hazardous and non-hazardous wastes.	Implementation of mitigation measures and assessment of performance indicators.	Daily	CNTIC	Construction Site	Visual observation	<ul style="list-style-type: none"> CNTIC Monthly HSE Monitoring Report for APSCL and DOE. APSCL Semi-Annual Environmental Report for ADB 	<ul style="list-style-type: none"> WBG General EHS Guidelines for Construction and Decommissioning, 2007.
			Monitoring and supervision to ensure the implementation of the mitigation measures.	Weekly	APSCL	Construction Site	Visual observation	<ul style="list-style-type: none"> CNTIC Monthly HSE Monitoring Report for APSCL and DOE. APSCL Semi-Annual Environmental Report for ADB. 	<ul style="list-style-type: none"> WBG General EHS Guidelines for Construction and Decommissioning, 2007.
8, 9, 10	Community Health and Safety	Construction Traffic;	Implementation of mitigation measures and	Daily	CNTIC	Construction Site and Offsite	Visual observation	<ul style="list-style-type: none"> CNTIC Monthly HSE Monitoring Report for 	<ul style="list-style-type: none"> WBG General EHS Guidelines for

Mitigation No. Ref.	Environmental and Social Parameter	Aspect	Monitoring Activities	Duration and Frequency	Responsibility	Monitoring Locations	Methods	Reporting	Applicable Standards
		Health and safety impacts due to influx of workers;	assessment of performance indicators.					APSCL and DOE. • APSCL Semi-Annual Environmental Report for ADB	Construction and Decommissioning, 2007.
		Health and safety impacts due to unauthorized persons accessing the site.	Monitoring and supervision to ensure the implementation of the mitigation measures.	Weekly	APSCL	Construction Site and Offsite	Visual observation	• CNTIC Monthly HSE Monitoring Report for APSCL and DOE. • APSCL Semi-Annual Environmental Report for ADB.	• WBG General EHS Guidelines for Construction and Decommissioning, 2007..
11	Cultural Heritage and Archaeology	Chance finds of archaeological remains.	Implementation of mitigation measures and assessment of performance indicators if archaeological remains discovered.	During the period when archaeological remains are found.	CNTIC and APSCL	Location of archaeological remains.	Visual observation	• CNTIC Monthly HSE Monitoring Report for APSCL and DOE. • APSCL Semi-Annual Environmental Report for ADB	• WBG General EHS Guidelines for Construction and Decommissioning, 2007.
12	Occupational Health and Safety	Workers Health and Safety	Implementation of mitigation measures and assessment of	Daily	CNTIC	Construction Site	Visual observation	• CNTIC Monthly HSE Monitoring Report for APSCL and	• WBG General EHS Guidelines for Construction

Mitigation No. Ref.	Environmental and Social Parameter	Aspect	Monitoring Activities	Duration and Frequency	Responsibility	Monitoring Locations	Methods	Reporting	Applicable Standards
			performance indicators.					DOE. • APSCL Semi-Annual Environmental Report for ADB	and Decommissioning, 2007.
			Monitoring and supervision to ensure the implementation of the mitigation measures.	Weekly	APSCL	Construction Site	Visual observation	<ul style="list-style-type: none"> • CNTIC Monthly HSE Monitoring Report for APSCL and DOE. • APSCL Semi-Annual Environmental Report for ADB. 	<ul style="list-style-type: none"> • WBG General EHS Guidelines for Construction and Decommissioning, 2007.
			Drinking water sampling for pH, Ammonia, Nitrate, Phosphate, Arsenic (As), Iron (Fe), Manganese (Mn) and Coliforms by third party consultant.	Monthly	CNTIC	Drinking water stations of the Project	pH – pH Meter; Ammonia – Photometric; Nitrate – Potentiometric; Phosphate – Photometric; As - Atomic Absorption Spectroscopy; Fe – Spectrophotometer; Mn - Atomic Absorption	<ul style="list-style-type: none"> • CNTIC Monthly HSE Monitoring Report for APSCL and DOE. • APSCL Semi-Annual Environmental Report for ADB. 	<ul style="list-style-type: none"> • Bangladesh Standard for Drinking Water – Environmental Conservation Rules – Schedule 3. Refer to Annex G.

Mitigation No. Ref.	Environmental and Social Parameter	Aspect	Monitoring Activities	Duration and Frequency	Responsibility	Monitoring Locations	Methods	Reporting	Applicable Standards
							Spectroscopy; Coliforms - Membrane Filter Technique.		
13	Plantation	Act as noise buffer, carbon sink,	Visual inspection to observe growth of saplings as per provided green belt design	Monthly	CNTIC	Project site	Visual monitoring	CNTIC Monthly HSE Monitoring Report for APSCL and DOE. APSCL Semi-Annual Environmental Report for ADB.	No standard.

4.2 Methodology

4.2.1 Methodology for Air Quality Assessment

During the operation phase of this power plant project, the important sources of emissions would include those from the operations of equipment and machinery, vehicles carrying materials to the site and taking debris out of the site and stack emission for electricity generation.

Particulate monitoring is usually accomplished with a **Respirable Dust sampler**, which is a vacuum type device that draws air with particulate matter through a filter paper. This sampling filter paper is dried up in the laboratory and the weight difference is the amount of SPM, PM₁₀ or PM_{2.5}, content measured in micrograms per cubic meter of air collected over a period of 24 hours. Sulfur dioxide and Oxide of Nitrogen sampling are conducted by using 20 ml absorbing reagent. Ambient Air Quality monitoring was done from five different places at Ashuganj 400 MW East Combined Cycle power plant project described in Table 4.1 and illustrated in Figure 4.1. Test Results of Ambient Air Quality from these different places are presented in Table 4.5.

Table 4.1: Measuring Points of Ambient Air Quality

SN	Location	Latitude	Longitude	Description of the Location
1.	Location 1	24°02'30.5" N	91°0'42.2" E	South-west side of Project area near PDB High School
2.	Location 2	24°02'31.7" N	91 °0'30.3" E	South-West side of Project area near Haji Abdul Jalil High School
3.	Location 3	24°02'58.5" N	91°01'23.9" E	North-East side of Project area near APSCL dormitory.
4.	Location 4	24°02'34.7" N	91°01'8.7" E	South-East side of Project area near APSCL power plant
5.	Location 5	24°02'31.1" N	91°0'3.8" E	South-West side of Project area near APSCL Admin building.

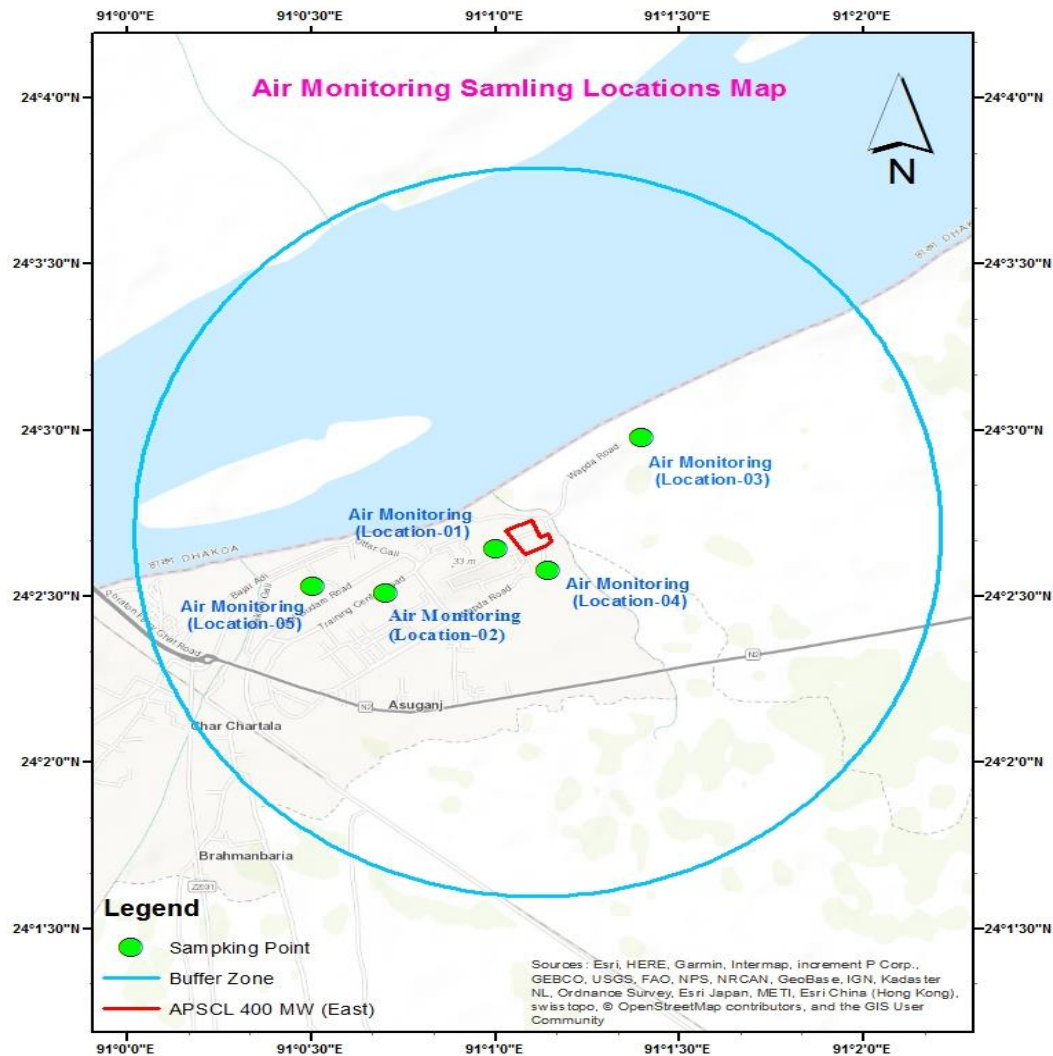


Figure 4.1: Sampling Points for Ambient Air Quality Measurement

4.2.2 Methodology for Ambient Noise Measurement

To assess the noise generated by different activities it is essential to identify the equipment to be used at various stages of the operation work. Therefore, an inventory of the probable equipment to be used and their reference noise generation data are of utmost importance. The noise level in the control room was tried to measure in the maximum silent condition. The noise was measured at different points of the project area at receptor levels; Table 4.2 and described in Figure 4.2; like a control room, turbine building, Water Treatment Area, Transformer area, GIS area and other outdoor places to determine the impact of noise generated from plant operational activities. The noise measurement was carried out with CEM Digital Sound Level Meter (Model No: DT 8850). Five noise reading was taken for each point placing the noise meter 1 meter above from the ground and 1 meter away from the source. The measured noise level in the operational sites is summarized in table 4.6.

Table 4.2: Measurement Points of Ambient Noise

SN	Latitude	Longitude	Description of the Location
1.	24°02'30.5" N	91°0'42.2" E	South-west side of Project area near PDB High School
2.	24°02'31.7" N	91°0'30.3" E	South-West side of Project area near Haji Abdul Jalil High School
3.	24°02'58.5" N	91°01'23.9" E	North-East side of Project area near APSCL dormitory
4.	24°02'34.7" N	91°01'8.7" E	South-East side of Project area near APSCL power plant
5.	24°02'31.1" N	91°0'3.8" E	South-West side of Project area near APSCL Admin building.

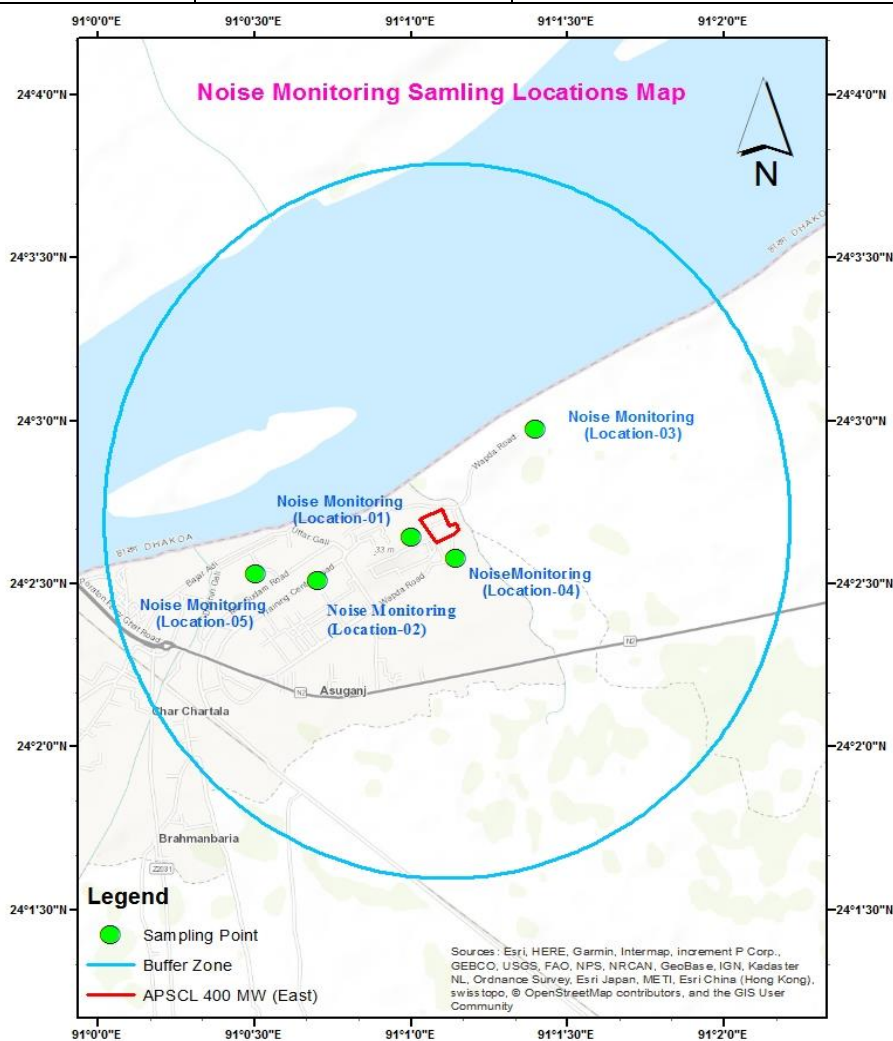


Figure 4.2: Noise Measuring Points in Project Area

4.2.3 Methodology for Water Quality Measurement

The drinking water, groundwater and a river water sample was collected from the tube well & supplied water, Tube Well & Pump and Meghna River (Table 4.3 & Figure 4.3, 4.4 and 4.5) respectively. After sampling, temperature, P^H , Total Dissolved solid and Dissolved oxygen was measured on the field and transferred immediately to Environmental Lab for further analytical experiment maintaining sampling protocol. The following Table 4.4, show here the parameters tested along with their method for drinking water, surface water and groundwater respectively. The tested results are presented in Table 4.7, 4.8 and 4.9 separately for drinking water, river and groundwater.

Table 4.3: Measuring Points of Drinking Water, Groundwater and River water

Location	Latitude	Longitude	Description of the Location
Drinking water			
Location-1 (D1)	24°02′43.22″N	91°1′3.52″E	Inside the project area
Location-2 (D2)	24°2′38.61″N	91°1′4.99″E	South-West side of the project at PDB High School
Location-3 (D3)	24°02′34.1″N	91°1′9.3″E	South-East side of the project at Local Settlement
Location-4 (D4)	24°02′57.9″N	91°1′24.3″E	North-East side of Project area near APSCL dormitory.
Groundwater			
Location 1: G1	24°02′38.1″N	91°0′58.0″E	Inside the project area
Location 2: G2	24°2′30.5″N	91°00′42.2″E	South-west side of Project area near PDB High School
Location 3: G3	24°02′34.1″N	91°1′9.3″E	South-East side of the project
Location 4: G4	24°02′47.2″N	91°1′12.3″E	North-East side of the project area
River water			
Upstream	24°02′53.1″N	91°01′3.1″E	North-West side of Project area near the project location
Downstream	24°02′44.0″N	91°00′33.2″E	North-West side of Project area and near Ashuganj Chor Sonarampur
Outfall	24°02′40.3″N	91°01′10.8″E	North-East side of Project area near APSCL power plant area

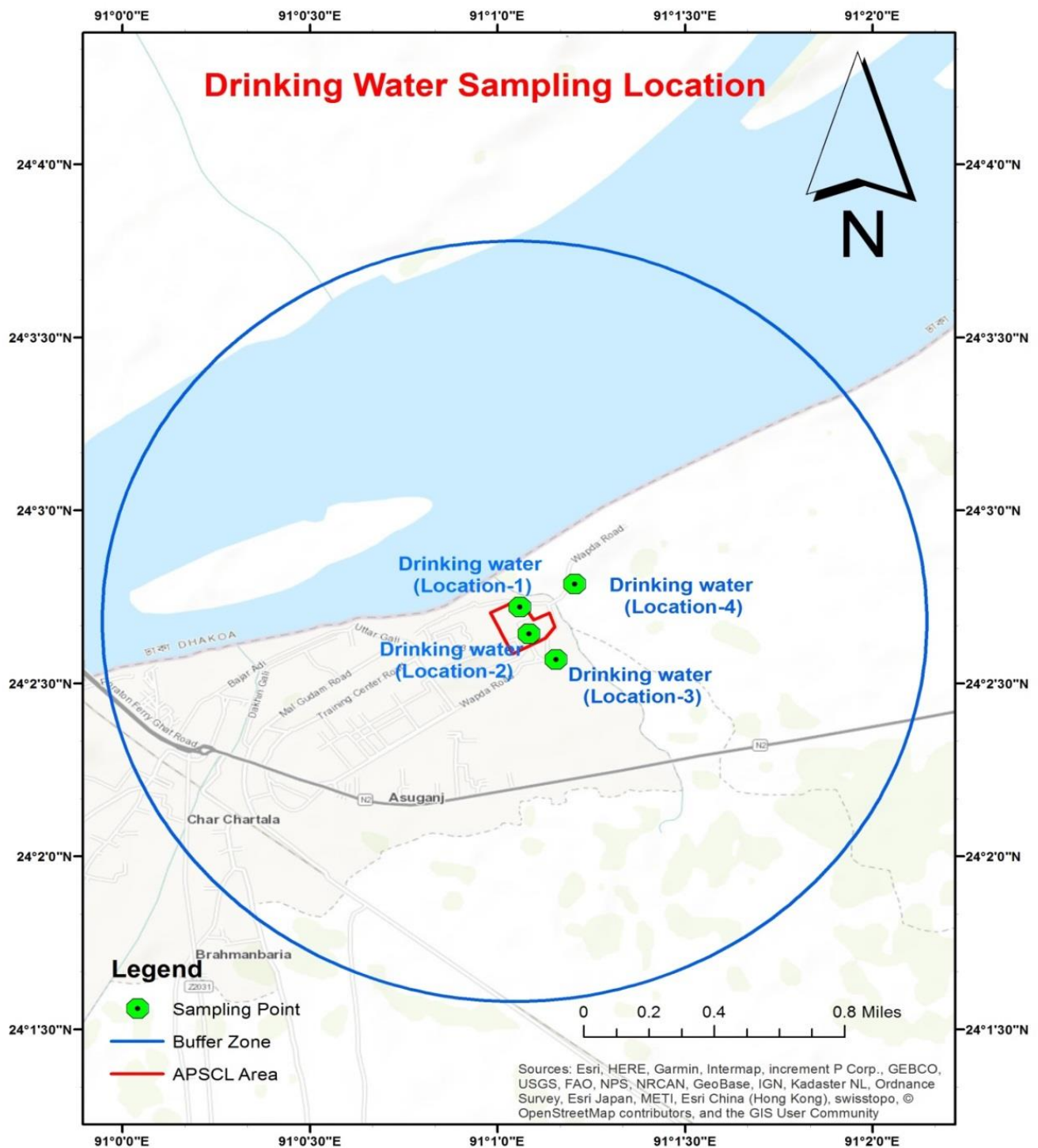


Figure 4.3: Drinking water Measuring Points in Project Area

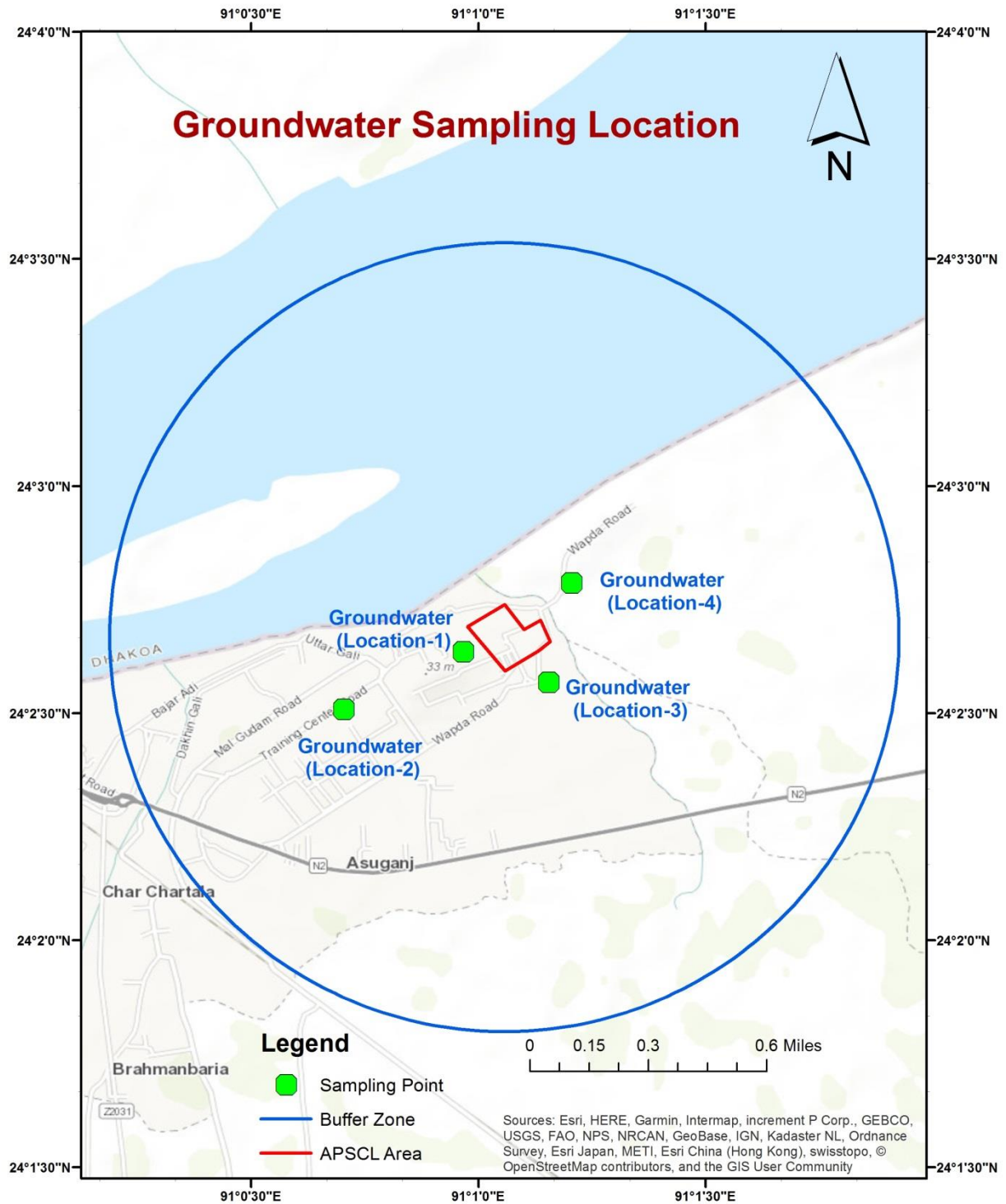


Figure 4.4: Groundwater Measuring Points in Project Area

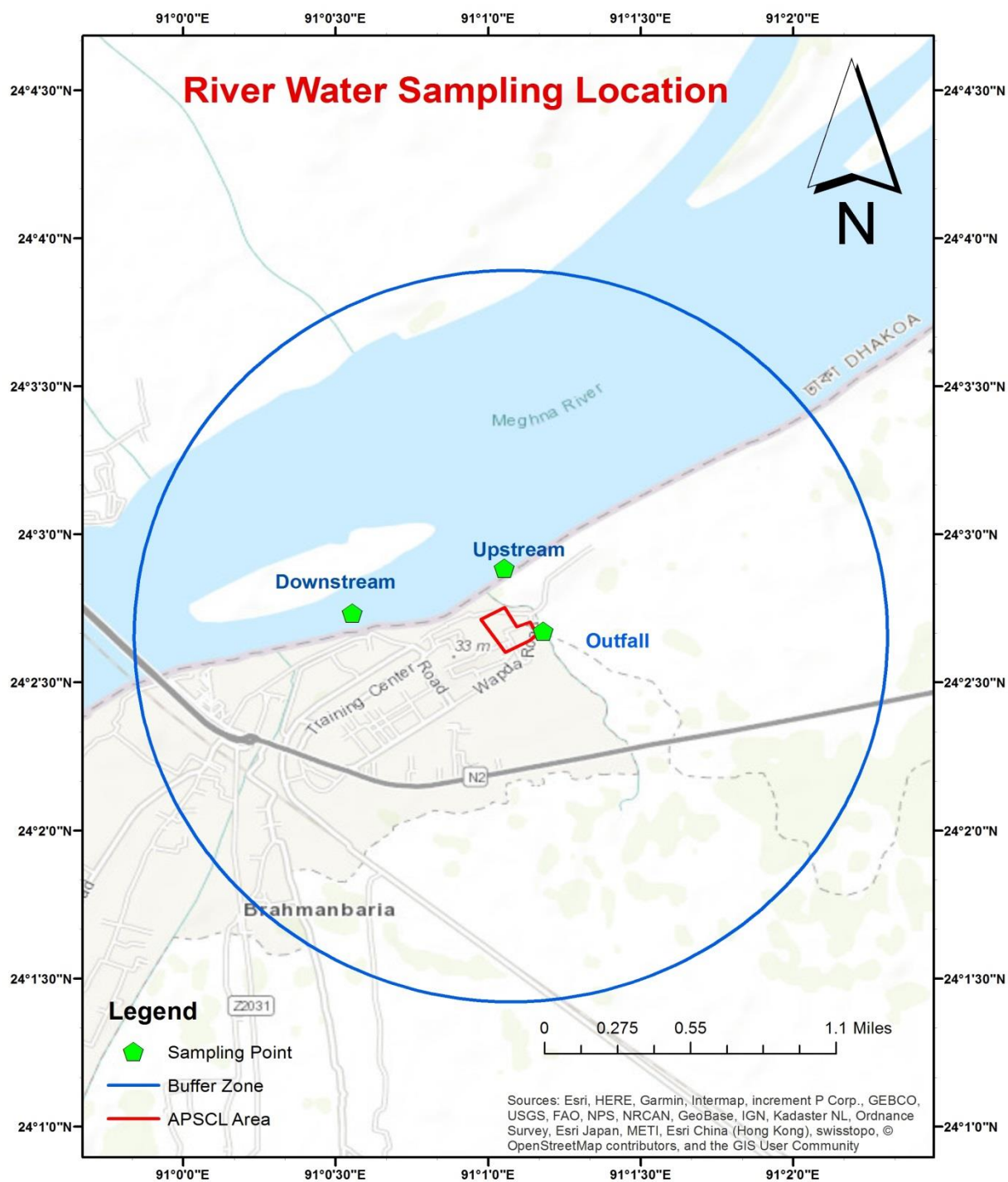


Figure 4.5: River water Measuring Points in Project Area

4.3 Semiannually Assessment of Construction Impact on Air, Water, Noise, Construction Waste and Labor Camp Management

4.3.1 Impact on Air Quality

During the construction phase of the proposed power plant project, the important sources of emissions would include those from the operations of construction equipment and machinery, vehicles carrying construction materials to the site and taking construction debris out of the site. If construction equipment, such as stone (aggregate) crusher is used at the site, this may result in significant emission of particulate matter during its operation. But to control it, the batching plant is situated in an isolated place outside of project area which has no impacts on the project and also its adjacent places.

Since the construction of the proposed power plant project would most likely involve significant earthworks, increase in particulate matter in the air from wind-blown dust is also a concern, to the project site. Ambient Air Quality was monitoring from four different places at Ashuganj 450 MW North Combined Cycle power plant project such as Northside and south side of the plant. Test Results of Ambient Air Quality from these different places are presented in Table 4.5.

The result for ambient air quality monitoring shows the SPM, PM₁₀, PM_{2.5}, concentrations of the ambient air. From the analysis it is observed that the concentration of SPM, PM₁₀, and PM_{2.5} is within the allowable limit, as in the proposed project area the different constructions activities, highway traffic movements were being done. So, the SPM and PM₁₀ are found higher level during movement of the vehicle but after spraying of water the dust level is reduced remarkably low. Having construction activities many diesel vehicles were moving around and three to four cranes were also under operation, so it can be thought that the NO_x level would be higher level. PM_{2.5} is composed of a mixture of primary and secondary particles, Primary particles are emitted directly into the atmosphere and include soil-related particles and carbon particles from fossil fuel combustion, and secondary particles are sulphate, nitrate, organic and elemental carbon, trace elements and ammonium. The under constructed project is at Ashuganj in Brahmanbaria district which is an unplanned urban and planned industrial area, so the cumulative air pollution is high in this area during the construction period.

4.3.2 Impact on Noise

During construction stage, major source of noise is expected to stem from transport vehicles which include barges and trucks. Also, noise is expected to be produced from plant construction activities. The construction phase may be broadly classified into two different groups:

- General Site and Plant Construction,
- Water and Effluent Treatment Plant construction, and
- Access Road Construction.

To assess the noise generated by different activities it is essential to identify the equipment to be used at various stages of construction work. Therefore, an inventory of the probable equipment to be used and their reference noise generation data are of utmost importance. The measured noise level in the construction site is summarized in table 4.6.

4.3.3 Impact on Water Quality

The drinking, surface and groundwater sample were collected from the supplied water, Meghna River and groundwater. The Meghna River passes through from East to West direction near the project area and there are few industries at the right bank of this river. So the water of this river is less polluted that was also found from environmental monitoring. The DO level of this water is more than 6.5 mg/L which is within DoE standard level. The BOD₅ is also in a lower level than DoE standards.

In some samples we found excess amount of Fe, Mn, nitrate and total coliform. Here is the probable causes:

Occurrence of high concentration of iron (Fe) in groundwater is very common particularly in areas of tropical climate. In groundwater, Fe generally occurs in the oxidation state - reduced soluble divalent ferrous iron (Fe²⁺). When groundwater comes in contact with oxygen of the atmosphere, the Fe is oxidized to the ferric state and is precipitated as Fe-mineral. The subsurface reducing conditions have significant influence on the high Fe content of groundwater.

The root causes of Nitrate concentrations increase due to human activities, such as agriculture, industry, domestic effluents and emissions from combustion engines.

Manganese (Mn) is a metal that occurs naturally in soils, rocks and minerals. In the aquifer, groundwater comes in contact with these solid materials dissolving them, releasing their constituents to the water.

Total coliforms include bacteria that are found in the water that has been influenced by surface water, and in human or animal waste. The presence of these bacteria indicates that drinking water is contaminated with feces or sewage, and it has the potential to cause disease.

In addition, there are different kinds of defects which can allow the Total Coliforms contaminations that are described below:

A missing or defective well cap - seals around wires, pipes, and where the cap meets the casing may be cracked, letting in contaminants.

Contaminant seepage through the well casing - cracks or holes in the well casing allow water that has not been filtered through the soil to enter the well. This seepage is common in the wells made of concrete, clay tile, or brick.

Table 4.4: Monitoring Parameters and Methods of Monitoring

Issue	Parameter Tested	Test Method
Ambient Air	PM _{2.5} , PM ₁₀ , SPM, SO ₂ , NO _x , CO	Gravimetric
Ambient Noise	Noise Level Assessment	Leq Value in dB (A)
Drinking & Ground Water	p ^H	p ^H Meter
	Ammonia	Photometric
	Nitrate	Potentiometry
	Phosphate	Photometric
	As	Atomic Absorption Spectroscopy
	Fe	Spectrophotometer
	Mn	Atomic Absorption Spectroscopy
	Coliforms	Membrane Filter Technique
River Water	Water temp.	Mercury filled thermometer
	DO	DO meter
	BOD ₅	5-day BOD test
	COD	Open Reflux
	Oil and Grease	APHA 5520.B
	Cr	Atomic Absorption Spectroscopy
	Cd	Atomic Absorption Spectroscopy
	Pb	Atomic Absorption Spectroscopy

Table: 4.5 Test Result of Ambient Air Quality

PARTICULATE MATERIAL	LIMITS		JANUARY 2019					
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	L5	AVERAGE JANUARY
PM 2.5	65 µg/m ³	75 µg/m ³	43.7	29.8	38.3	41.8	42.9	39.3
PM 10	150 µg/m ³	150 µg/m ³	144.4	115.9	104.6	138.8	122.9	125.32
SPM	200 µg/m ³	NF	192.3	157.5	177.5	181.1	179.4	177.56
SO ₂	365 µg/m ³	125 µg/m ³	13.7	10.9	11.2	12.2	12.7	12.14
NO _x	NF	200 µg/m ³	15.4	11.4	12.3	14.0	14.2	13.46
CO	9 ppm	NF	0	0	0	0	0	0
<p style="text-align: center;"><u>Comments</u></p> <p>From the result, it is observed that the concentrations of all these parameters are within the allowable limit according to DoE and IFC/ World Bank Standard.</p>								

PARTICULATE MATERIAL	LIMITS		FEBRUARY 2019					
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	L5	AVERAGE FEBRUARY
PM 2.5	65 µg/m ³	75 µg/m ³	19.4	19.6	35.9	16.2	32.8	24.78
PM 10	150 µg/m ³	150 µg/m ³	90.9	90.2	136.7	86.3	132.2	107.3
SPM	200 µg/m ³	NF	148.4	148.3	178.5	104.6	163.2	148.6
SO ₂	365 µg/m ³	125 µg/m ³	11.1	10.0	13.3	11.7	12.9	11.8
NO _x	NF	200 µg/m ³	13.1	12.4	14.0	12.9	14.5	13.38
CO	9 ppm	NF	0	0	0	0	0	0
<p align="center"><u>Comments</u></p> <p>From the result it is observed that the concentrations of all these parameters are within the allowable limit of DoE, Bangladesh & IFC Standard.</p>								
PARTICULATE MATERIAL	LIMITS		MARCH 2019					
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	L5	AVERAGE MARCH
PM 2.5	65 µg/m ³	75 µg/m ³	26.5	31.1	18.4	20.8	34.1	26.18
PM 10	150 µg/m ³	150 µg/m ³	122.7	115.9	60.6	74.2	139.2	102.5
SPM	200 µg/m ³	NF	141.8	163.2	100.3	121.5	184.7	142.3
SO ₂	365 µg/m ³	125 µg/m ³	13.9	12.6	9.8	7.8	15.1	11.84
NO _x	NF	200 µg/m ³	14.1	13.4	10.7	8.3	16.1	12.52
CO	9 ppm	NF	0	0	0	0	0	0
<p align="center"><u>Comments</u></p> <p>From the result, it is observed that the concentrations of all these parameters are within the allowable limit of DoE, Bangladesh & IFC Standard.</p>								
PARTICULATE MATERIAL	LIMITS		APRIL 2019					
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	L5	AVERAGE APRIL
PM 2.5	65 µg/m ³	75 µg/m ³	13.7	14.1	13.3	20.3	16.2	15.52
PM 10	150 µg/m ³	150 µg/m ³	58.3	56.7	42.6	64.4	52.5	54.9
SPM	200 µg/m ³	NF	96.1	95.4	83.6	112.2	96.6	96.78
SO ₂	365 µg/m ³	125 µg/m ³	9.1	9.0	7.8	11.7	10.6	9.64
NO _x	NF	200 µg/m ³	10.0	10.8	9.6	12.3	11.1	10.76
CO	9 ppm	NF	0	0	0	0	0	0
<p align="center"><u>Comments</u></p> <p>From the analysis, it is observed that the concentrations of all these parameters are within the allowable limit of DoE, Bangladesh & IFC Standard.</p>								

PARTICULATE MATERIAL	LIMITS		MAY 2019					
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	L5	AVERAGE May
PM 2.5	65 µg/m ³	75 µg/m ³	18.4	26.3	14.5	23.1	18.5	20.2
PM 10	150 µg/m ³	150 µg/m ³	60.6	69.4	41.2	63.6	59.7	58.9100.21
SPM	200 µg/m ³	NF	99.2	112.6	82.3	107.7	99.1	100.2
SO ₂	365 µg/m ³	125 µg/m ³	10.4	9.1	9.1	10.9	10.1	9.92
NO _x	NF	200 µg/m ³	11.8	14.0	11.5	13.7	11.5	12.5
CO	9 ppm	NF	0	0	0	0	0	0
Comments								
From the result it is observed that the concentrations of all these parameters are within the allowable limit of DoE, Bangladesh & IFC Standard								
PARTICULATE MATERIAL	LIMITS		JUNE 2019					
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	L5	AVERAGE JUNE
PM 2.5	65 µg/m ³	75 µg/m ³	13.6	26.4	14.7	13.6	22.5	18.2
PM 10	150 µg/m ³	150 µg/m ³	62.8	140.	62.2	43.9	95.2	80.9
SPM	200 µg/m ³	NF	81.9	189.	114.8	99.8	107.7	118.8
SO ₂	365 µg/m ³	125 µg/m ³	8.4	13.9	10.4	8.4	11.5	10.5
NO _x	NF	200 µg/m ³	9.6	14.4	11.2	9.1	12.9	11.4
CO	9 ppm	NF	0	0	0	0	0	0
Comments								
From the analysis it is observed that the concentrations of all these parameters are within the allowable limit of DoE, Bangladesh & IFC Standard.								

Table: 4.6 Test Result of Noise Quality

NOISE	LIMITS		JANUARY 2019					
(LAeq) dBA	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	L5	Avg. Jan.
DAY	75	70	68.1	63.8	64.1	66.2	68.3	66.1
NIGHT	70	70	66.4	61.9	62.6	63.7	66.9	64.3
Comments								
From these studies, it was found that the ambient noise qualities of the Project area were found within the allowable limit of DoE, Bangladesh & IFC Standard.								
NOISE	LIMITS		FEBRUARY 2019					
(LAeq) dBA	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	L5	Avg. Feb.
DAY	75	70	67.6	67.8	65.7	64.8	63.0	65.78
NIGHT	70	70	66.0	65.1	63.9	61.9	61.2	63.62

<u>Comments</u>								
From these studies, it was found that the ambient noise qualities of the Project area were found within the allowable limit of DoE, Bangladesh & IFC Standard.								
NOISE	LIMITS		MARCH 2019					
(LAeq) dBA	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	L5	Avg. March
DAY	75	70	58.8	56.4	58.2	64.7	58.8	59.38
NIGHT	70	70	53.4	50.1	54.7	56.7	53.3	53.64
<u>Comments</u>								
From these studies, it was found that the ambient noise qualities of the Project area were found within the allowable limit of DoE, Bangladesh & IFC Standard.								
NOISE	LIMITS		APRIL 2019					
(LAeq) dBA	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	L5	Avg. April
DAY	75	70	57.6	55.8	57.7	62.8	58.5	58.48
NIGHT	70	70	52.9	51.5	54.1	55.7	54.1	53.66
<u>Comments</u>								
From these studies, it was found that the ambient noise qualities of the Project area were found within the allowable limit of DoE, Bangladesh & IFC Standard.								
NOISE	LIMITS		MAY 2019					
(LAeq) dBA	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	L5	Avg. May
DAY	75	70	59.2	56.5	59.8	64.4	59.1	59.8
NIGHT	70	70	54.5	52.9	54.8	56.1	54.8	54.62
<u>Comments</u>								
From these studies it was found that the ambient noise qualities of the Project area were found within the allowable limit of DoE, Bangladesh & IFC Standard.								
NOISE	LIMITS		JUNE 2019					
(LAeq) dBA	DoE (Bangladesh) Standard *	IFC/World Bank Standard	L1	L2	L3	L4	L5	Avg. June
DAY	75	70	60.4	58.8	61.3	62.9	60.9	60.86
NIGHT	70	70	56.2	53.7	57.6	55.7	55.9	55.82
<u>Comments</u>								
From these studies it was found that the ambient noise qualities of the Project area were found within the allowable limit of DoE, Bangladesh & IFC Standard.								

Table: 4.7 Drinking Water Quality

DRINKING WATER	LIMITS		JANUARY 2019				
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	D1	D2	D3	D4	AVERAGE JANUARY
pH	6.5-8.5	6.5 -8.5	7.28	6.48	6.93	6.96	6.91
Ammonia	0.5 mg/l	---	<0.01	0.01	<0.01	<0.01	<0.01
Nitrate	10 mg/l	50 mg/l	4.2	15.7	<1.0	1.50	5.6
Phosphate	6 mg/l	---	<0.07	0.08	<0.07	<0.07	<0.07
As	0.05 mg/l	0.01 mg/l	0.015	0.05	0.003	0.003	0.03
Fe	0.3 -1 mg/l	0.3 mg/l	4.78	11.01	1.05	2.78	4.9
Mn	0.1 mg/l	0.5 mg/l	<0.1	0.2	<0.1	<0.1	<0.1
Total Coliform	0/100 ml	0/100 ml	0	0	0	0	0
Faecal Coliform	0/100 ml	0/100 ml	0	0	0	0	0
<p style="text-align: center;"><u>Comments</u></p> <p>From the analysis most of the parameters of drinking water were found within standard limit of DoE, Bangladesh & WHO except:</p> <ul style="list-style-type: none"> ➤ Concentration of Fe at all points exceeds the limit to some extent. ➤ Concentration of Nitrate at location D2, South-West side of the project area near PDB high school exceeds the limit of DoE (Bangladesh) Standard. <p>Mitigation Measure: CNTIC-CCOEC Consortium has informed the local peoples As well as workers surrounding the locations marked D1, D2, D3 & D4 for not to use this water for drinking purpose as the concentration of Iron and in location D2 concentration of Nitrate is high.</p>							
DRINKING WATER	LIMITS		FEBRUARY 2019				
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	D1	D2	D3	D4	AVERAGE FEBRUARY
pH	6.5-8.5	6.5-8.5	7.22	6.54	6.82	6.94	6.88
Ammonia	0.5 mg/l	---	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate	10 mg/l	50 mg/l	0.1	0.1	0.1	3.3	0.9
Phosphate	6 mg/l	---	0.07	0.07	0.08	0.08	0.075
As	0.05 mg/l	0.01 mg/l	0.003	0.003	0.003	0.056	0.016
Fe	0.3 -1 mg/l	0.3 mg/l	0.49	<0.05	0.26	2.66	0.865
Mn	0.1 mg/l	0.5 mg/l	<0.1	<0.1	<0.1	<0.1	<0.1
Total Coliform	0/100 ml	0/100 ml	0	0	0	0	0
Faecal Coliform	0/100 ml	0/100 ml	0	0	0	0	0

Comments

From the analysis most of the parameters of drinking water were found within standard limit of DoE, Bangladesh & WHO except:

- Concentration of Fe at D4 point exceeds the limit to some extent.

Mitigation Measure: CNTIC-CCOEC Consortium has informed the local peoples surrounding the locations marked D1, D2, D3 & D4 for not to use this water for drinking purpose as the concentration of Iron is high.

DRINKING WATER	LIMITS		MARCH 2019				
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	D1	D2	D3	D4	AVERAGE MARCH
pH	6.5-8.5	6.5-8.5	7.43	6.96	6.38	6.83	6.9
Ammonia	0.5 mg/l	---	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate	10 mg/l	50 mg/l	0.1	10.5	0.1	5	3.92
Phosphate	6 mg/l	---	0.08	0.1	0.08	0.1	0.09
As	0.05 mg/l	0.01 mg/l	0.003	0.03	0.003	0.041	0.02
Fe	0.3 -1 mg/l	0.3 mg/l	0.53	6.97	0.31	5.62	3.36
Mn	0.1 mg/l	0.5 mg/l	0.1	0.2	0.1	0.1	0.12
Total Coliform	0/100 ml	0/100 ml	4	2	0	0	1.5
Faecal Coliform	0/100 ml	0/100 ml	0	0	0	0	0

Comments

From the analysis most of the parameters of drinking water were found within standard limit of DoE, Bangladesh & WHO except:

- Concentration of Fe at D2 and D4 points exceeds the limit to some extent.
- Concentration of Total Coliform is within the limit at D3 & D4 point and the samples except inside the project area exceed the limit to some extent.

Mitigation Measure: CNTIC-CCOEC Consortium has informed the local peoples surrounding the locations marked D2, D4 and D1, D2 for not to use this water for drinking purpose as the concentration of Iron is high and Total Coliform.

DRINKING WATER	LIMITS		APRIL 2019				
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	D1	D2	D3	D4	AVERAGE APRIL
pH	6.5-8.5	6.5-8.5	7.50	6.92	6.42	6.79	6.9
Ammonia	0.5 mg/l	---	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate	10 mg/l	50 mg/l	1	1	1.5	1	1.12
Phosphate	6 mg/l	---	0.08	0.1	0.1	0.07	0.08
As	0.05 mg/l	0.01 mg/l	0.003	0.036	0.003	0.003	0.011
Fe	0.3 -1 mg/l	0.3 mg/l	0.05	0.05	2.84	0.05	0.75
Mn	0.1 mg/l	0.5 mg/l	<0.1	<0.1	<0.1	<0.1	<0.1
Total Coliform	0/100 ml	0/100 ml	10	0	0	0	2.5
Faecal Coliform	0/100 ml	0/100 ml	1	0	0	0	0.25

Comments

From the analysis most of the parameters of drinking water were found within standard limit of DoE, Bangladesh & WHO except:

- Concentration of Fe at D3 point exceeds the limit to some extent.
- Total coliform and fecal coliform at D1 point exceeds the limit of DoE (Bangladesh) Standard.

Mitigation Measure: CNTIC-CCOEC Consortium has informed the local peoples As well as workers surrounding the locations marked D1, D2 for not to use this water for drinking purpose as the concentration of Iron and in location D2 concentration of Nitrate is high

DRINKING WATER	LIMITS		MAY 2019				
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	D1	D2	D3	D4	AVERAGE MAY
pH	6.5-8.5	6.5-8.5	7.48	6.89	6.52	6.69	6.9
Ammonia	0.5 mg/l	---	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate	10 mg/l	50 mg/l	<1	<1	<1	<1	<1
Phosphate	6 mg/l	---	0.07	0.07	0.07	0.08	0.07
As	0.05 mg/l	0.01 mg/l	0.003	0.007	0.033	0.003	0.004
Fe	0.3 -1 mg/l	0.3 mg/l	0.05	0.2	0.15	0.48	0.22
Mn	0.1 mg/l	0.5 mg/l	<0.1	<0.1	<0.1	<0.1	<0.1
Total Coliform	0/100 ml	0/100 ml	0	0	0	0	0
Faecal Coliform	0/100 ml	0/100 ml	0	0	0	0	0

Comments

From the analysis all of the parameters of drinking water were found within standard limit of DoE, Bangladesh & WHO.

DRINKING WATER	LIMITS		JUNE 2019				
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	D1	D2	D3	D4	AVERAGE JUNE
pH	6.5-8.5	6.5-8.5	7.37	6.78	6.48	6.63	6.9
Ammonia	0.5 mg/l	---	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate	10 mg/l	50 mg/l	1	1	1	5.5	2.12
Phosphate	6 mg/l	---	0.07	0.07	0.07	0.1	0.09
As	0.05 mg/l	0.01 mg/l	0.003	0.013	0.015	0.263	0.074
Fe	0.3 -1 mg/l	0.3 mg/l	0.05	0.25	0.27	0.43	0.25
Mn	0.1 mg/l	0.5 mg/l	0.1	0.1	0.1	0.2	0.12
Total Coliform	0/100 ml	0/100 ml	8	0	0	0	2
Faecal Coliform	0/100 ml	0/100 ml	0	0	0	0	0

Comments

From the analysis most of the parameters of drinking water were found within standard limit of DoE, Bangladesh & WHO except:

- Concentration of As at D4 and Concentration of Mn at D4 point exceeds the limit to some extent.
- Concentration of Total Coliform is not within the limit at D1 point.

Mitigation Measure: CNTIC-CCOEC Consortium has informed the local peoples surrounding the locations marked D2, D4 and D1, D2 for not to use this water for drinking purpose as the concentration of Iron is high and Total Coliform.

Table: 4.8 River Water Quality

RIVER WATER	LIMITS		JANUARY 2019			
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	Upstream	Downstream	Outfall	AVERAGE JANUARY
Temperature	40°C	---	22.6	22.7	23.1	22.8
Dissolved Oxygen (DO)	4.5 -8 mg/l	---	5.5	5.4	4.8	5.23
BOD5	50 mg/l	50 mg/l	0.8	0.48	0.6	0.63
COD	200 mg/l	250 mg/l	3.7	2.7	3	3.13
Chromium (Total)	0.5 mg/l	0.5 mg/l	<0.02	<0.02	<0.02	<0.02
Cadmium	0.5 mg/l	0.1 mg/l	<0.002	<0.002	<0.002	<0.002
Lead (Pb)	0.1 mg/l	0.1 mg/l	<0.05	<0.05	<0.05	<0.05
Oil & Grease	10 mg/l	10 mg/l	<2.0	<2.0	<2.0	<2.0
<h3 style="text-align: center;"><u>Comments</u></h3> <p>From the analysis, it has been observed that all parameters were found within the acceptable limit DoE and IFC. These indicate that the project is not posing any detrimental effect to surrounding environment by surface water pollution.</p>						
RIVER WATER	LIMITS		FEBRUARY 2019			
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	Upstream	Downstream	Outfall	AVERAGE FEBRUARY
Temperature	40°C	---	22.3	22.5	23.2	22.67
Dissolved Oxygen (DO)	4.5 -8 mg/l	---	5.2	5.6	5.7	5.5
BOD5	50 mg/l	50 mg/l	0.2	0.2	0.4	0.27
COD	200 mg/l	250 mg/l	1.7	2.0	2.5	2.06
Chromium (Total)	0.5 mg/l	0.5 mg/l	<0.02	<0.02	<0.02	<0.02
Cadmium	0.5 mg/l	0.1 mg/l	<0.002	<0.002	<0.002	<0.002
Lead (Pb)	0.1 mg/l	0.1 mg/l	<0.05	<0.05	<0.05	<0.05

Oil & Grease	10 mg/l	10 mg/l	<2.0	<2.0	<2.0	<2.0
<p align="center"><u>Comments</u></p> <p>From the analysis, it has been observed that all parameters were found within the acceptable limit DoE and IFC. These indicate that the project is not posing any detrimental effect to surrounding environment by surface water pollution.</p>						
RIVER WATER	LIMITS		MARCH 2019			
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	Upstream	Downstream	Outfall	AVERAGE MARCH
Temperature	40°C	---	22.7	22.9	23.1	22.9
Dissolved Oxygen (DO)	4.5 -8 mg/l	---	5.7	5.5	6.1	5.77
BOD5	50 mg/l	50 mg/l	0.6	0.4	1.2	0.73
COD	200 mg/l	250 mg/l	2.7	1.0	3.8	2.5
Chromium (Total)	0.5 mg/l	0.5 mg/l	<0.02	<0.02	<0.02	<0.02
Cadmium	0.5 mg/l	0.1 mg/l	<0.002	<0.002	<0.002	<0.002
Lead (Pb)	0.1 mg/l	0.1 mg/l	<0.05	<0.05	<0.05	<0.05
Oil & Grease	10 mg/l	10 mg/l	<2.0	<2.0	<2.0	<2.0
<p align="center"><u>Comments</u></p> <p>From the analysis, it has been observed that all parameters were found within the acceptable limit DoE and IFC. These indicate that the project is not posing any detrimental effect to surrounding environment by surface water pollution.</p>						
RIVER WATER	LIMITS		APRIL 2019			
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	Upstream	Downstream	Outfall	AVERAGE APRIL
Temperature	40°C	---	23.5	23.5	23.3	23.43
Dissolved Oxygen (DO)	4.5 -8 mg/l	---	5.9	5.7	6.4	6
BOD5	50 mg/l	50 mg/l	0.2	0.2	0.4	0.27
COD	200 mg/l	250 mg/l	1.5	1.0	1.8	1.43
Chromium (Total)	0.5 mg/l	0.5 mg/l	<0.02	<0.02	<0.02	<0.02
Cadmium	0.5 mg/l	0.1 mg/l	<0.002	<0.002	<0.002	<0.002
Lead (Pb)	0.1 mg/l	0.1 mg/l	<0.05	<0.05	<0.05	<0.05
Oil & Grease	10 mg/l	10 mg/l	<2.0	<2.0	<2.0	<2.0
<p align="center"><u>Comments</u></p> <p>From the analysis, it has been observed that all parameters were found within the acceptable limit DoE and IFC. These indicate that the project is not posing any detrimental effect to surrounding environment by surface water pollution.</p>						

RIVER WATER	LIMITS		MAY 2019			
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	Upstream	Downstream	Outfall	AVERAGE MAY
Temperature	40°C	---	23.7	23.9	23.4	23.66
Dissolved Oxygen (DO)	4.5 -8 mg/l	---	6.1	5.9	6.5	6.2
BOD5	50 mg/l	50 mg/l	0.2	0.2	0.32	0.24
COD	200 mg/l	250 mg/l	1.0	1.7	2.7	1.8
Chromium (Total)	0.5 mg/l	0.5 mg/l	<0.02	<0.02	<0.02	<0.02
Cadmium	0.5 mg/l	0.1 mg/l	<0.002	<0.002	<0.002	<0.002
Lead (Pb)	0.1 mg/l	0.1 mg/l	<0.05	<0.05	<0.05	<0.05
Oil & Grease	10 mg/l	10 mg/l	<2.0	<2.0	<2.0	<2.0
<p align="center">Comments</p> <p>From the analysis, it has been observed that all parameters were found within the acceptable limit DoE and IFC. These indicate that the project is not posing any detrimental effect to surrounding environment by surface water pollution.</p>						
RIVER WATER	LIMITS		JUNE 2019			
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	Upstream	Downstream	Outfall	AVERAGE JUNE
Temperature	40°C	---	23.5	23.6	23.7	23.6
Dissolved Oxygen (DO)	4.5 -8 mg/l	---	5.9	5.4	5.6	5.6
BOD5	50 mg/l	50 mg/l	<0.2	0.4	0.6	0.4
COD	200 mg/l	250 mg/l	1.5	2	2.8	2.1
Chromium (Total)	0.5 mg/l	0.5 mg/l	<0.02	<0.02	<0.02	<0.02
Cadmium	0.5 mg/l	0.1 mg/l	<0.002	<0.002	<0.002	<0.002
Lead (Pb)	0.1 mg/l	0.1 mg/l	<0.05	<0.05	<0.05	<0.05
Oil & Grease	10 mg/l	10 mg/l	<2.0	<2.0	<2.0	<2.0
<p align="center">Comments</p> <p>From the analysis, it has been observed that all parameters were found within the acceptable limit DoE and IFC. These indicate that the project is not posing any detrimental effect to surrounding environment by surface water pollution.</p>						

Table: 4.9 Ground Water Quality

GROUND WATER	LIMITS		JANUARY 2019				
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	G1	G2	G3	G4	AVERAGE JANUARY
pH	6.5-8.5	6.5-8.5	7.74	7.0	6.48	6.29	6.88
TDS	1000 mg/l	1200 mg/l	290	244	308	235	269.25
Ammonia	0.5 mg/l	---	0.02	0.02	0.01	0.01	0.015
Nitrate	10 mg/l	50 mg/l	3.5	5.47	15.7	6.85	7.88
Phosphate	6 mg/l	---	0.1	0.2	0.08	0.1	0.12
As	0.05 mg/l	0.01 mg/l	0.009	0.152	0.05	0.004	0.054
Fe	0.3 - 1 mg/l	0.3 mg/l	2.24	8.80	11.01	1.76	5.9
Mn	0.1 mg/l	0.5 mg/l	0.1	0.1	0.2	0.1	0.125
Total coliform	0/100 ml	0/100 ml	0	0	0	0	0
Faecal Coliform	0/100 ml	0/100 ml	0	0	0	0	0
<p style="text-align: center;">Comments</p> <p>From the analysis most of the parameters of ground water were found within standard limit of DoE, Bangladesh & WHO except:</p> <ul style="list-style-type: none"> ➤ Concentration of Fe at all points exceeds the limit to some extent. ➤ Concentration of Nitrate at location G3, South-West side of the project area near PDB high school exceeds the limit of DoE (Bangladesh) Standard. <p>Mitigation Measure: CNTIC-CCOEC Consortium has informed the local peoples as well as workers surrounding the locations marked G1, G2, G3 & G4 for not to use this water for drinking purpose as the concentration of Iron and in location G3 concentration of Nitrate is high</p>							
GROUND WATER	LIMITS		APRIL 2019				
PARAMETER	DoE (Bangladesh) Standard *	IFC/World Bank Standard	G1	G2	G3	G4	AVERAGE APRIL
pH	6.5-8.5	6.5-8.5	6.10	6.38	6.53	6.92	6.48
TDS	1000 mg/l	1200 mg/l	238	319	257	232	261.5
Ammonia	0.5 mg/l	---	<0.01	<0.01	0.01	<0.01	<0.01
Nitrate	10 mg/l	50 mg/l	2.5	1.2	2.8	1	1.88
Phosphate	6 mg/l	---	0.1	0.08	0.18	0.07	0.12
As	0.05 mg/l	0.01 mg/l	0.112	0.075	0.025	0.003	0.054
Fe	0.3 - 1 mg/l	0.3 mg/l	1.43	1.76	5.50	0.05	2.19
Mn	0.1 mg/l	0.5 mg/l	0.2	0.1	0.2	0.1	0.15
Total coliform	0/100 ml	0/100 ml	0	16	0	0	0
Faecal Coliform	0/100 ml	0/100 ml	0	2	0	0	0

<u>Comments</u>
<p>From the analysis most of the parameters of ground water were found within standard limit of DoE, Bangladesh & WHO except:</p> <ul style="list-style-type: none"> ➤ Concentration of Fe at G1 G2 and G3 points exceeds the limit to some extent. ➤ Number of total coliform and faecal coliform at location G2, exceeds the limit of DoE (Bangladesh) Standard. <p>Mitigation Measure: CNTIC-CCOEC Consortium has informed the local peoples as well as workers surrounding the locations marked G1, G2 & G3 for not to use this water for drinking purpose as the concentration of Iron and in location G2 concentration of Total coliform and faecal coliform is high.</p>

4.3.4 Impact on Waste and Labor Camp

Construction debris and wastes to be generated during the construction phases are scrap iron, steel, wooden frames, piping, and other solid wastes. Most of them are generated toward the end of the construction phase during carrying out of the finishing works, while the site will be cleared of waste materials. The volume of such construction wastes is likely to be significant. Indiscriminate storage and disposal of this construction debris and wastes could create local waterlogging and ponding by blocking drainage lines and would be aesthetically displeasing. Proper disposal of these wastes is described in Section 4.3.

Solid waste of domestic nature that would be generated in the temporary labor sheds at the construction site is not likely to be significant in volume. But indiscriminate disposal of such solid waste would create environmental pollution and the unhealthy situation at the project site. These solid wastes are disposed of properly as outlined in Section 4.3.

Assessment of Construction Impact on Air, Water, Noise, Construction Waste and Labor Camp Management

Table 4.10 summarizes the effect of project activities on physicochemical environmental parameters during the construction phase of the project. The physicochemical environmental parameters that could be affected by the project activities include water, air quality and noise level. As discussed above, water quality could be affected mainly by project activities such as mobilization of equipment and personnel (e.g., solid and liquid waste from labor sheds), and site preparation. Effects of solid and liquid wastes generated during the construction phase would not be very significant, especially if mitigation measures as outlined in Section 4.3 are adopted. The overall negative impact of such activities is likely to be “short-term (Sh)” and of “low” intensity.

Deterioration of air quality during the construction phase may result from the increased concentration of particulate matter in the air from construction activities such as vehicular movement and wind-blown dust. However, these adverse impacts are greatly minimized by adopting mitigation measures as outlined in Section 4.3.

The likely noise level to be generated for different construction activities and its impact on the surrounding environment was assessed using a noise meter. Results of the assessment are presented in table 4.6 shows that different construction activities would generate significant noise and would produce some adverse impacts.

Similarly, the cumulative noise caused by the heavy trucks and excavator simultaneously during the construction of the access road is also of some concern. The adverse effect of project activities on noise level has therefore been categorized as “short-term (Sh)” and of “moderate” intensity.

Table 4.10: Effect of Project Activities on Physico-Chemical Environmental Parameters during Construction Phase

Physico-chemical parameters	Environmental Examination						
	Positive Impact			No Impact	Negative Impact		
	Low	Moderate	High		Low	Moderate	High
Air Quality				X			
Noise Level				X			
Drinking Water Quality					X (Sh)		
River Water Quality				X			
Ground Water Quality					X (Sh)		

Note: Sh=Short-term; Lo=Long-term

4.4 Visual Monitoring and Observations

4.4.1 Traffic Volume

The Project is now under construction phase. Construction activity has been started. The daily traffic details on day to day basis are being properly monitored and recorded in the registered book.

4.4.2 Site Security

During site visit on June, 2019, CNTIC-CCOEC Consortium have already constructed of site boundary fencing to isolate the project site. Marked passages for workers and visitors have not yet been done, necessary action to be taken to accomplish the same. Elevated platforms, walkways and ramps will be installed and equipped with hand rails, toe-plates, and non-slip surfaces. Safe walkway will be marked by color in respective area such as Turbine hall, store etc. Proper sign boards and pictorial safety are given mentioning with caution for the area of petroleum, spirit & highly flammable materials & general awareness prohibiting smoking inside the power plant.

With the incorporation of the security system at the main entry gate, overall site security system will come into a good shape and eventually will be under proper control.



Figure 4.6: Present Fencing Conditions of the Project Site



Figure 4.7: Sign Boards and Pictorial Safety at the Project Site

4.4.3 Personal Protective Equipment

The working personnel involved in the construction activities has to be under the safeguard of PPE properly. Figure 4.8 shows that, the workers were found to involve in construction works of pile. The workers involved in with these works were found with PPE, such as Safety Jacket, Safety Shoes, Helmet and Hand Gloves etc.



Figure 4.8: At the Construction Works, Workers were Found with Proper Apron, Helmet and Hand Gloves etc.

4.4.4 Incident Record & Reporting

Coordination of CNTIC-CCOEC Consortium with APSCL authority has been developed to monitor any incident, accident, near misses recording and reporting system with proper format. It was observed that the Incident Record & Reporting are being properly monitored

and recorded in the register book. At the time of visit, no accident record was found in the register book in the month of June. CNTIC-CCOEC Consortium assured that no Incident occurred during this month. Is it suggested that LED based Accident free Record Boards (displaying accident free days number, date from, hours or time etc.) has to be installed at the project side? If any incidental issue arises, immediately it has to be reported & recorded properly in the prescribed format. Remedial measures are to be proposed for such incident and accident.

4.4.5 Solid Waste

Solid wastes are generated from construction works (construction waste) and workers activities (kitchen waste, paper waste) at the project site. Solid waste log book for keeping record of this wastes in this plant are being properly maintained. It is necessary to erect all kinds of relevant signs regarding waste minimization in respective places of the project and main gate of APSCL. Transfer notes for all solid waste to be transported outside the project site should be recorded.

Solid Waste Management Plan

Step-01: Collection System

All solid wastes including construction wastes, waste generated by workers activities (kitchen waste, paper waste) and other waste will be accumulated on site after collecting from the source of generation.

Step-02: Segregation

There are various types of solid wastes; these will be segregated in the project site according to their natures as described below.

Construction waste: Electrical wiring, rebar, wood, plaster, scrap metal, cement, and bricks.

Organic waste: kitchen waste, vegetables, flowers, leaves, fruits.

Toxic waste: old medicines, paints, chemicals, bulbs, spray cans, fertilizer and pesticide containers, batteries, shoe polish.

Recyclable waste: paper, glass, metals, plastics.

Step-03: Transportation

After segregation of solid waste from the project site, proper solid waste log is maintained and transported to disposal point by trucks.

Step- 04: Disposal System

From the transported solid waste, the recyclable inorganic solid waste will be recycled and biodegradable organic solid waste will be deposited in open space and disposed with municipal solid waste and remaining non-biodegradable waste will be sold to secondary vendors. The disposal location has been shown in **figure 4.9**.

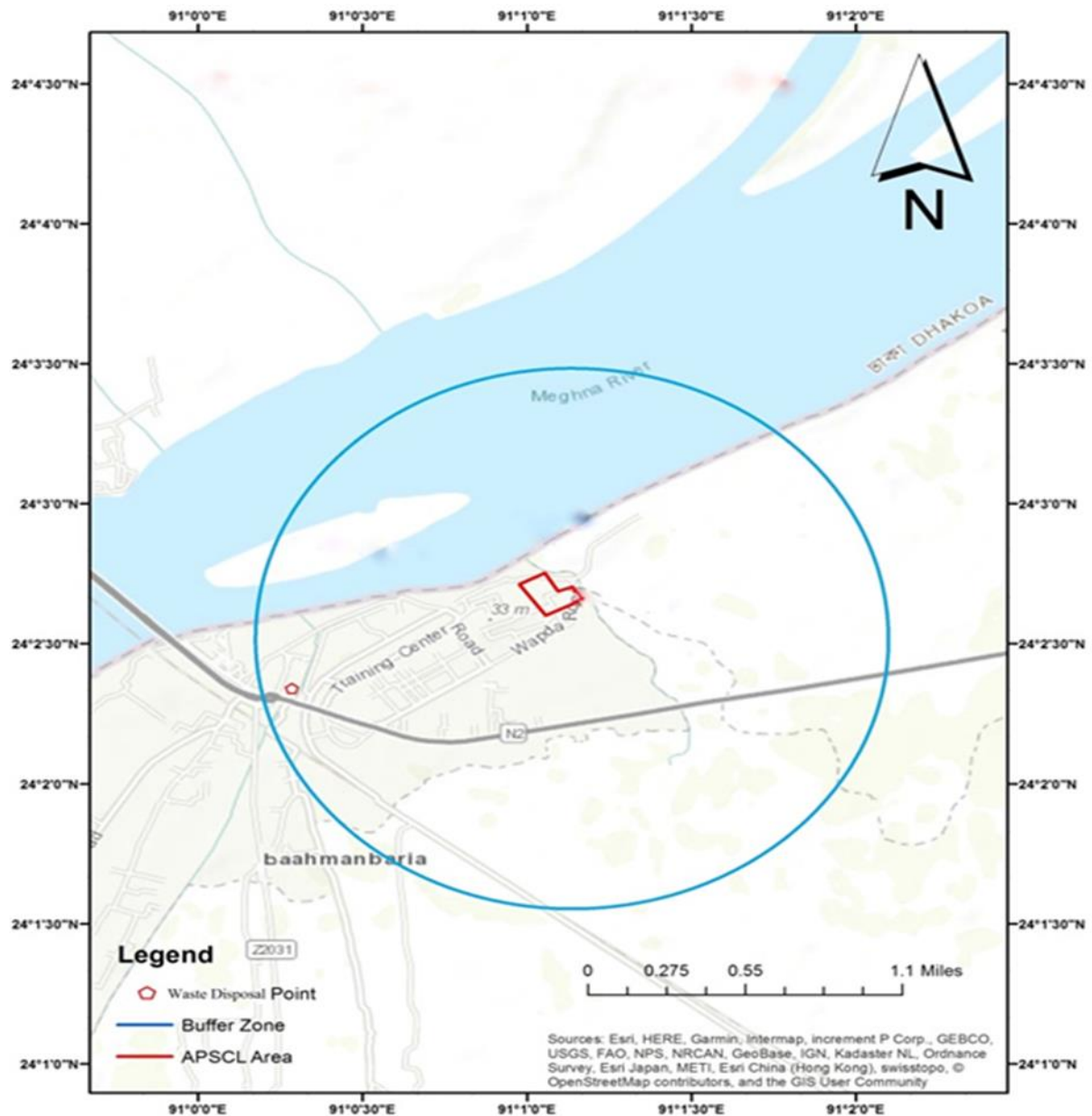


Figure 4.9: Solid Waste Disposal Location

4.4.6 Worker's Health

The CNTIC-CCOEC consortium will provide all kinds of treatment facilities and pay compensation according to Bangladesh Labor Law 2006. It is suggested that worker's health have to be checked properly once in a year. Besides, an understanding has to be built with a local hospital for the emergency incident related to the worker's health of the plant and CNTIC-CCOEC Consortium has to establish such health monitoring system of the workers shortly. In addition, necessary steps to be taken for arrangement of ambulance service in the plant area to support any emergency medical aid and shifting to the hospital/ medical centre. Necessary first aid facilities are available at site.



Figure 4.10: Photograph of first aid box

4.4.7 Grievance Redress Mechanism

CNTIC-CCOEC consortium assured that they already established mechanism for grievance redress. Its suggested that complain from neighbours has to be duly recorded & adequate measures should be taken accordingly. Though the project site is within the APSCL boundary, the North West side of the project site is near to some houses of neighbors. CNTIC-CCOEC Consortium has set up a suggestion box in front of the gates to facilitate the neighbours to raise complains and take immediate measure to resolve the complaints.



Figure 4.11: Project Grievance/Complain box

4.4.8 Safety Orientation & Training of Workers

Training is essential to maintain the employees' health and safety. Both theoretical and practical training will be conducted for the employees on the hazards, precautions, and procedures for the safe storage, handling, and use of all potentially harmful materials. Safety orientation & training for the workers have to be provided to all working personnel during the fresh enrolment/employment. Routine safety training on regular basis has to be maintained. It is suggested that CNTIC-CCOEC Consortium will arrange routine safety training at definite time interval for the workers throughout the construction phase of the project. In addition, Training procedure will incorporate information from the Material Safety Data Sheets (MSDS) for potentially harmful materials.



Figure 4.12: Daily Toolbox Meeting for Workers

4.4.9 Sanitation & Drinking Water Facility to Workers

Ground water is being supplied through the arrangement of piping network in the construction site and this water is available for the workers for the washing and toilet facilities. Besides, CNTIC-CCOEC Consortium Management will supply potable water Jar for drinking purpose of the workers. Robust drinking water purification system with reverse osmosis or UV and hot and cool water system will be installed at various locations in adequate number at the plant site for operational phase. Adequate toilets for male and female workers have already been constructed.



Figure 4.13: Sanitation & Drinking Water Facility to Workers

4.4.10 Site Drainage

In the Construction site, proper drainage system has to be developed for outer/inter drainage in the project site. At present, inside drainage has not yet constructed. As piling work is going on, rainy water is stored in a piling spoils water reservoir. After completion of piling works, necessary drainage will be constructed.



Figure 4.14: Existing Outer Drainage and Rainy Water Reservoir

4.4.11 Surface Water Drainage

The surface water drainage system should collect all run off of the project site through a system of underground pipes, manholes and finally discharge into the surface water body subject to ensuring the quality standard of Bangladesh.

4.4.12 Dust Control

There is dust around the project site due to on-going construction work. To control the dust nuisance during dry weather, CNTIC-CCOEC Consortium sprays water at prescribed interval regularly.



Figure 4.15: Water is sprinkled for dust control

4.4 Mitigation measure

4.4.1 Air Quality

Construction materials at the site are properly covered while hauled and stored, roads properly cleaned and water sprayed in order to minimize the concentration of dust in the air when dust increases. Vehicle movement to and from the site is properly managed to ensure that does not significantly aggravate the traffic problem and air pollution. Stone (aggregate) crushing activities are properly done in fine tune batching plant which is far away from the construction site and not allowed within the Ashuganj plant premises. Health status of all workers will be monitored regularly at the Health Center established at the project site.

4.4.2 Water Quality

The human wastes from the labour camp are appropriately disposed of through construction of sanitary latrines connected to an appropriately designed septic tank system (consisting of a septic tank and soakage pit). Wastewater generated from different construction activities is not likely to be significant in volume. Disposal of such wastewater is carried out by draining them in shallow pits (1 to 1.5 m deep) dug in the ground at appropriate locations, and filling them up with sand at the end of the construction phase. In all cases, the wastewater streams are separated from the stormwater stream, which is disposed of separately utilizing the existing stormwater disposal system at the Ashuganj complex.

4.4.3 Noise Level

- Use “quiet” equipment (i.e., equipment designed with noise-control elements);
- Route truck traffic away from noise-sensitive areas, where feasible;
- Install sound barriers for pile driving activity, where practicable (e.g., use an acoustic curtain or blanket around the point of impact);
- Unnecessary vehicle movement are avoided
- Switch off the engines while remaining unused.

4.4.4 Solid Waste

The solid wastes of domestic nature generated mainly in the labor sheds are collected and stored separately (i.e., without mixing it with construction wastes/debris) in appropriate containers within the construction site. The solid wastes are disposed of away from the site (e.g., in a municipal landfill/waste dumping ground) outside the complex, at the responsibility of the Contractor & monitored by APSCL.

4.5 Progress of Work

Ambient Air Quality Monitoring: Measurements of selected air quality parameters for PM_{2.5}, PM₁₀ and SPM has been carried out (January–June 2019) during the ongoing

construction work. Air samples were collected for measurements of selected air quality parameters for PM_{2.5}, PM₁₀ and SPM.

Drinking Water Monitoring: Drinking water sample was collected from supply water in January-June 2019 for analyzing pH, Ammonia, nitrate, phosphate, As, Fe, Mn, Fecal and total coliform. Test report also is shown in Annex II.

River Water Monitoring: River water sample was collected from Meghna River in January-June 2019 for analyzing temperature, dissolved oxygen (DO) along with BOD₅, COD, Oil and Grease, and selected heavy metals (Cr, Cd, Pb). Test report also is shown in Annex II.

Groundwater Monitoring: Groundwater sample was collected from supply water in January-June 2016 for analyzing pH, TDS, Ammonia, nitrate, phosphate, As, Fe, Mn, Fecal and Total Coliform. Test report also is shown in Annex II.

Noise Level Monitoring: Noise level monitoring is also necessary during the construction period, because the use of heavy construction equipment may increase the noise level at the work location. So, Noise level data were collected from selected 4 locations.

Waste Management and Process Waste Monitoring: Disposal of construction debris away from the site and their appropriate disposal sanitary landfill are ongoing. Hazardous waste and non-hazardous waste are also disposing of by proper way.

Trees Cutting: The project site is in a bare field. So, there was no scope of tree cutting. But tree plantation program and landscaping are going on for providing a better environment at the project site and APSCL area.

Others: There is no significant impact on the existing road network in the project area. Major transportation of plant and construction material are done by the Meghna River with unloading of materials by crane owned by APSCL and at the jetty which is within the existing APSCL complex.

All slopes are protected and suitable erosion protection measures are employed to reduce any impact from runoff during the monsoon rainy season.

Health and Safety: The general health and safety of workers is safeguarded with the provision of medical and health facilities on-site, the provision of personal protective equipment (hard hats, safety belt, full body safety harness, ear plugs, ear muff, welding shield, grinding shield, safety shoe, safety goggle, welding apron, hand gloves, safety jacket, anti-dust masks, anti-gas masks etc. as required). There is an emergency response system and workers and supervisors are received training on any accident and immediate medical facility in its own round the clock medical center. There is a full-time emergency ambulance to provide immediate service if required. Safe drinking water and sanitation facilities are established and provided to all project related employees (officer, staff and workers) at the site.

Set up of the in-House Monitoring System

APSCL is being set up of the in-house monitoring system and require manpower with its own staffs. In-house environmental monitoring system with manpower is as follows.

Manpower for Environmental Management Plan.

1. Manager (Health, Safety & Environment) – 1 no.
2. Asst. Manager (Health, Safety & Environment) -01 no.
3. Manager (Chemical) For ETP, WTP, etc. -1 no.
4. Assistant Manager (Chemical) For ETP, WTP, etc. - 1 no.
5. Operator – 3 Nos.
6. Independent Environmental Specialist – 1 no.

Environmental Clearance Certificate /Renewal of Environment Clearance:

APSCL received the EIA approval letter from the DoE, Bangladesh on 08.10.2015. Based on the EIA approval letter from DoE, APSCL has started construction activities. After completion of construction work, APSCL will apply for environmental clearance certificate for operation of the plant. DoE did not provide any environmental certificate or any condition in the EIA approval letter, hence no renewal issue arises.

4.6 WORKSHOP AND TRAINING MEETING AND DISCUSSION

At present an environmental team headed by Md. Atiqur Rahman, Manager (Health, Safety & Environment of APSCL) looking after an overall supervising the monitoring of 400 MW CCPP East Project environmental issues. The consultant conducted a training programmed on environmental issues for APSCL personnel and EPC contractors.

A training program for capacity building program of APSCL personnel and EPC contractors will be arranged upon the availability of requiring manpower. There will be environmental meeting performed in every month and will be discussed the overall performance of the environmental issues of under construction power plant. Beside this Mock drill on Fire and Earth Quake, Electric shock, Acid and chemical spillages are continuing regularly as per set schedule in the power plant.

Various training related to HSE usually conducted in this time period. The main topic of these training is headed by waste management, good housekeeping, induction, environmental issues, PPE and so on.

Some meetings have conducted in this time frame among EPC contractor, APSCL, Subcontractors regarding emergency cases, PPE, good housekeeping and so on. Also, some meetings regarding HSE monitoring have done between the consultants of APSCL and HSE representative of EPC contractor.

4.6.1 Audit and Visit

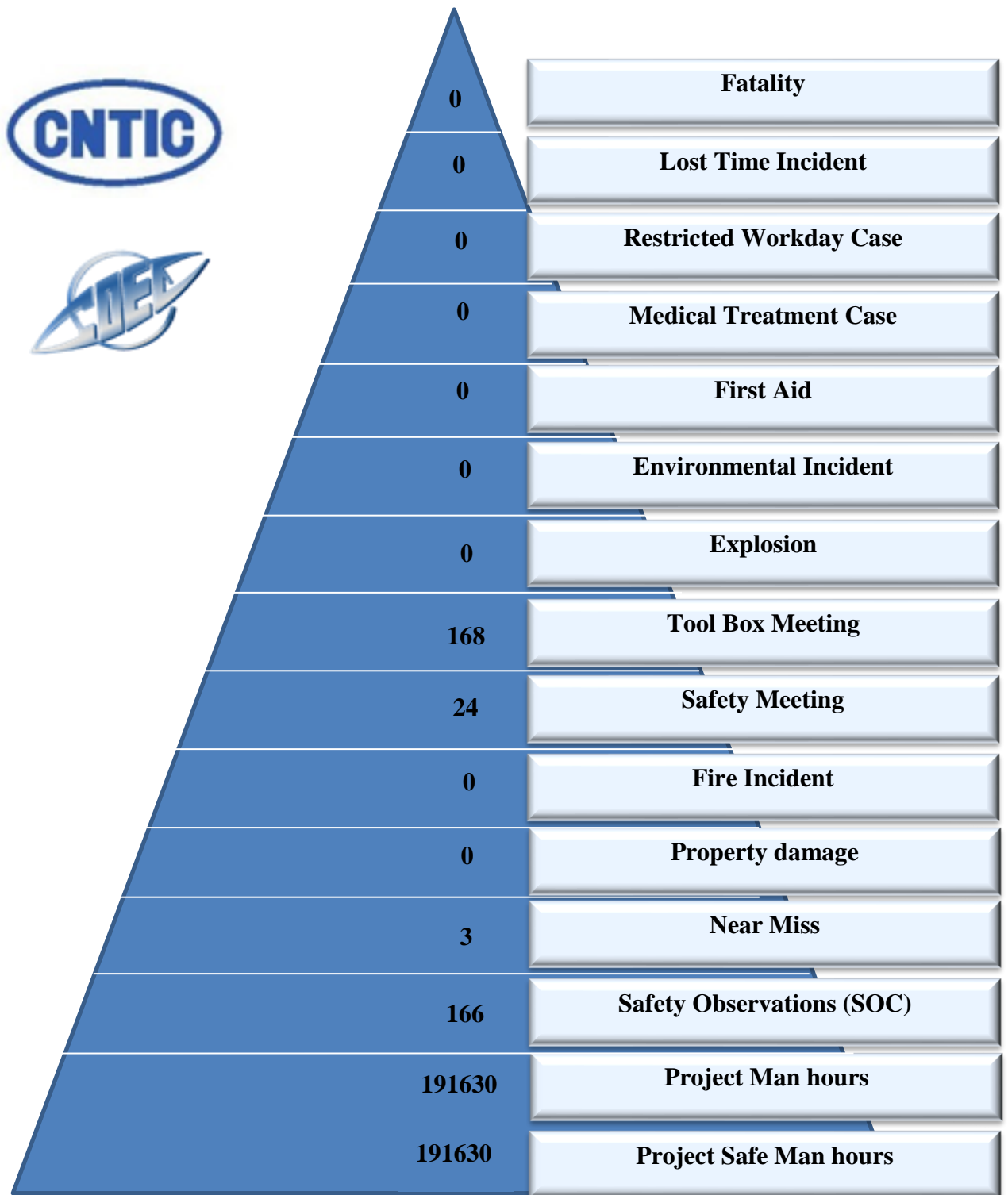
Senior secretary of Bangladesh Ministry of Power, Energy and Mineral resource team has visited the project site in the date of 22nd March 2019. In this visit he mentioned some topics regarding legal documents of vehicles and drivers. He also discussed regarding the improvement of Fire protection. He also mentioned about safety sign, environmental parameter monitoring, waste management. Few photographic evidences have attached in the Annex-I.

5.0 SAFEGUARD MONITORING RESULTS AND UNANTICIPATED IMPACTS

5.1 Safety Assurance of the Project Site

Personal Safety Equipment (PSE): Use of proper safety materials is mandatory for all at the project site. Workers use appropriate personal protective equipment, such as safety boots, helmet, safety jacket, safety belt, safety harness, gloves, protective clothing, goggles, grinding shield, welding shield, anti-dust mask, anti-gas mask and ear protection etc. Daily toolbox meeting before starting of work is a mandatory practice at the project site. So long as safety does not suffer due to this action. There is no fatality and another casualty (Zero accident) and detail of safety issue are described in the following HSE Statistics chart.

HSE STATISTICS



5.2 OTHERS

5.2.1 Weather condition

The weather condition during the ambient air quality and noise monitoring was cold and partly sunny during the sampling. Wind direction was found calm. Hence there is no impact on monitoring due to weather condition.

5.2.2 Other factors which affect the monitoring results

Air monitoring: Factors which affect the air monitoring results including:

- Topography
- Congested Space
- Physical and chemical properties of pollutants
- Air Pressure
- Air Turbulence

Water monitoring: Factors which affect the water monitoring results including:

- Soil erosion
- Waste discharge
- Surface runoff
- Large numbers of bottom feeders (such as carp), which stir up bottom sediments
- Excessive algal growth.

Noise Monitoring: Factors which affect the noise monitoring results including:

- Type of source (point or line)
- Distance from source
- Atmospheric absorption
- Obstacles such as barriers and buildings
- Ground absorption
- Reflections
- Humidity

6.0 IMPLEMENTATION OF GRIEVANCE REDRESS MECHANISM AND COMPLAINTS RECEIVED FROM STAKEHOLDERS

There is a grievance redress mechanism developed in the project site. But until now there is not received any grievance to address.

7.0 CONCLUSION AND RECOMMENDATION

The environmental monitoring report is consisting of 7th Semiannually environmental monitoring reporting based on monthly measured ambient air, noise, drinking water, ground and river water quality parameters. The work has been assigned EPC contractor CNTIC-CCOEC Consortium performed for the period of January to June 2019. Ambient air quality parameters were determined in the site with the help of high-volume sampler and noise quality was done by noise level meter. Drinking water, ground and surface water quality parameters were analyzed in the laboratory. All of the mitigation measures are taken following ADB Environmental Safeguard Policy 2009, IFC/World Bank Thermal Power plant guideline 2008 and DoE, Bangladesh guideline.

From the analysis, it is found that the ambient air quality results found within DoE standards. This value are cumulative with surrounding ambient air and noise level. SO_x and CO are not a problem of the construction period of the power plant. But SPM, PM_{2.5}, PM₁₀ level during the construction period of the power plant is controlled by taking proper mitigation measures and spraying of water.

Noise level quality of Ashuganj CCPP has also been measured by EPC contractor. According to the measurement, the noise level around the plant area found within the allowable limit of Industrial zone both day and also at night time. The noise level is controlled by using modern, new and fine-tuned equipment.

Surface water quality parameter at Meghna River was performed to evaluate whether this plant poses any detrimental effect on the water environment. From the analysis, it has been found that the project does not contaminate water pollution to the natural environment. Otherwise, any spill is not detected next to riverbeds around the worksite (oils, concrete waste or conglomerate asphalt, any colour changes of the water, etc.). Drinking and groundwater quality provided for project employees and in project sites are also found good.

House-keeping is also in good condition at the plant site. All solid, liquid and hazardous waste are disposed of the designated container at the plant site. Most of the solid wastes are disposed of by landfill. The usable solid wastes are handed over to proper party for recycling.

Finally, it can be concluded that the plant has a minor detrimental impact for short period on the environment in terms of ambient air during the construction period. The plant provides a good working environment for the workers.

ANNEX-I: PHOTO APPENDIX



Tool box meeting



Tool box meeting



Tool box meeting



First Aid Box



Workers with proper PPE



Waste storage in fix place



Washroom facility for Workers

Sl. No.	Name of the Person	Designation	Mobile No.	Address	Remarks	Signature	Date
1	Mr. A. S. S. S.	Driver	9876543210
2	Mr. B. S. S. S.	Driver	9876543210
3	Mr. C. S. S. S.	Driver	9876543210
4	Mr. D. S. S. S.	Driver	9876543210
5	Mr. E. S. S. S.	Driver	9876543210
6	Mr. F. S. S. S.	Driver	9876543210
7	Mr. G. S. S. S.	Driver	9876543210
8	Mr. H. S. S. S.	Driver	9876543210
9	Mr. I. S. S. S.	Driver	9876543210
10	Mr. J. S. S. S.	Driver	9876543210
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100	Mr. V. S. S. S.	Driver	9876543210

Traffic Volume Record Register

	
Water Spraying for dust control	Water Spraying for dust control
	
Site condition of February	Pile test period in February
	
Boundary Demolition at the end stage	On site drinking water facility
	
Test Pilling period	Pilling Period



Site visit by high officials of Ministry of Power, Energy & Mineral Resources



Site visit by high officials of Ministry of Power, Energy & Mineral Resources



Piling activity- rebar cage



Piling activity- Flashing



Fencing at site



Fencing at site



Safety Sign



Safety Sign



Air quality monitoring



Noise Monitoring at day time



Noise Monitoring at night time



River water Sampling



Drining water Sampling



Ground water Sampling



Ground water level measuring



Drining water Sampling

ANNEX-II: DoE Clearance of EIA

Government of the People's Republic of Bangladesh

Department of Environment

Head Office, Paribesh Bhaban

E-16 Agargaon, Dhaka-1207

www.doe.gov.bd

Memo No : DoE/Clearance/5484/2015/ 491

Date: 08/10/2015

Subject: Approval of Environmental Impact Assessment (EIA) Report for Ashuganj 400 MW Combined Cycle Power Plant (East) at Ashuganj under Brahmanbaria District.

Ref: Your Application dated 06/08/2015.

With reference to the above, the Department of Environment (DOE) is pleased to approve Environmental Impact Assessment (EIA) Report for Ashuganj 400 MW Combined Cycle Power Plant (East) at Ashuganj under Brahmanbaria District subject to fulfilling the following terms and conditions.


1. This EIA report is approved only for 400 MW Combined Cycle power plant. Any expansion or extension of this power plant will be required further/fresh EIA study for the Environmental clearance from the Department of Environment (DOE).
2. Project Proponent may undertake activities for land development and infrastructural development of the project.
3. Project Proponent may open L/C (Letter of Credit) for importing machineries for the project which shall also include machineries relating to waste treatment plant and other pollution control devices.
4. The activity under the Power Plant Construction Project shall not result in the loss of containment of any materials that would affect health or will have damaging impact on the environment or natural resources.
5. Proper and adequate mitigation measures shall be ensured throughout preparation, construction and operation period of the proposed Power Plant Construction Project activities.
6. Any heritage sight, ecological critical area, and other environmentally and/or religious sensitive places shall be avoided during project construction phase.
7. Proper construction and development practices shall be followed that minimize loss of habitats and fish breeding, feeding & nursery sites.
8. Construction works shall be restricted to day time hours so as to avoid/mitigate the disturbance of local lives as well as implementation schedules of the works shall be notified in advance to nearby residents.
9. Proper and adequate sanitation facilities shall be ensured in labor camps throughout the proposed project period.



10. In order to control noise pollution, vehicles & equipment shall be maintained regularly; working during sensitive hours and locating machinery close to sensitive receptor shall be avoided.
11. No solid waste can be burnt in the project area. An environment friendly solid waste management should be in place during the whole period of the project in the field.
12. Proper and adequate on-site precautionary measures and safety measures shall be ensured so that no habitat of any flora and fauna would be demolished or destroyed.
13. All the required mitigation measures suggested in the EIA report along with the emergency response plan are to be strictly implemented and kept operative/functioning on a continuous basis.
14. To reduce dust, spraying of water over the earthen materials should be carried out from time to time.
15. Storage area for soils and other construction materials shall be carefully selected to avoid disturbance of the natural drainage.
16. Adequate considerations should be given to facilitate drainage system for run off water from rain.
17. Adequate facilities should be ensured for silt trap to avoid clogging of drain/canal/water bodies.
18. Construction material should be properly disposed off after the construction work is over.
19. The project authority shall submit a detail work plan with time schedule of development activities at least 7 (seven) days ahead of the work commences in the field to the Brahmanbaria District Office, Chittagong Regional Office and Headquarters of the Department of Environment simultaneously.
20. Environmental Monitoring Reports shall be made available simultaneously to DOE Brahmanbaria District Office, Chittagong Regional Office and Headquarters on a monthly basis during the construction period of the project.
21. The following records must be kept in respect of any samples required to be collected for the purposes of environmental monitoring activities :
 - (a) the date(s) on which the sample was taken;
 - (b) the time(s) at which the sample was collected;
 - (c) the point at which the sample was taken; and
 - (d) the name of the person who collected the sample.
22. The results of any monitoring required to be conducted under this EIA report must be recorded.
23. In case of any emergency, the following information shall immediately be reported to Brahmanbaria District Office, Chittagong Regional office and Headquarters of the Department of Environment (DOE) simultaneously
 - a) Nature of incident (land slides, fire, accident, collision, etc.)
 - b) Personnel affected (injured, missing, fatalities, etc.)
 - c) Emergency support available and its location (standby transport, medical facilities, etc.)
 - d) Weather conditions



- e) Current operations (abandoning the site, fire fighting, etc.)
24. Appropriate permission would require to be obtained from the Forest Department in favor of cutting/felling of any plant/tree/sapling forested by any individual or government before doing such type of activity.
25. The project authority shall extend active cooperation to DOE officials to facilitate their visit to the site as and when necessary.
26. The project authority shall, after land development, infrastructural development and installation of the power plant, apply for Environmental Clearance to the Brahmanbaria District Office of DOE with a copy to the Head Office of DOE in Dhaka.
27. Without obtaining Environmental Clearance, the project authority shall not start the operation of the project.
28. Violation of any of the above conditions shall render this approval void.
29. The project authority shall, after land development, infrastructural development and installation of the plant, apply for Environmental Clearance Certificate without which proponent shall not start operation of the project.
30. This EIA Approval has been issued with the approval of the appropriate authority.



08.10.2015

(Syed Nazmul Ahsan)
Director (Environmental Clearance)
Phone # 02-8181778

Managing Director
Ashuganj 400 MW Combined
Cycle Power Plant (East)
Sunarampur, Ashuganj
Brahmanbaria.

Copy Forwarded to :

- 1) PS to Secretary, Ministry of Environment and Forests, Bangladesh Secretariat, Dhaka.
- 2) Director, Department of Environment, Chittagong Divisional Office, Chittagong.
- 3) Deputy Director/Office In-charge, Department of Environment, Brahmanbaria District Office, Brahmanbaria.
- 4) Assistant Director, Office of the Director General, Department of Environment, Head Office, Dhaka.


13.07.2019

Md. Atiqur Rahman
Manager (Health, Safety & Environment)
Ashuganj Power Station Co. Ltd.
Ashuganj, Brahmanbaria