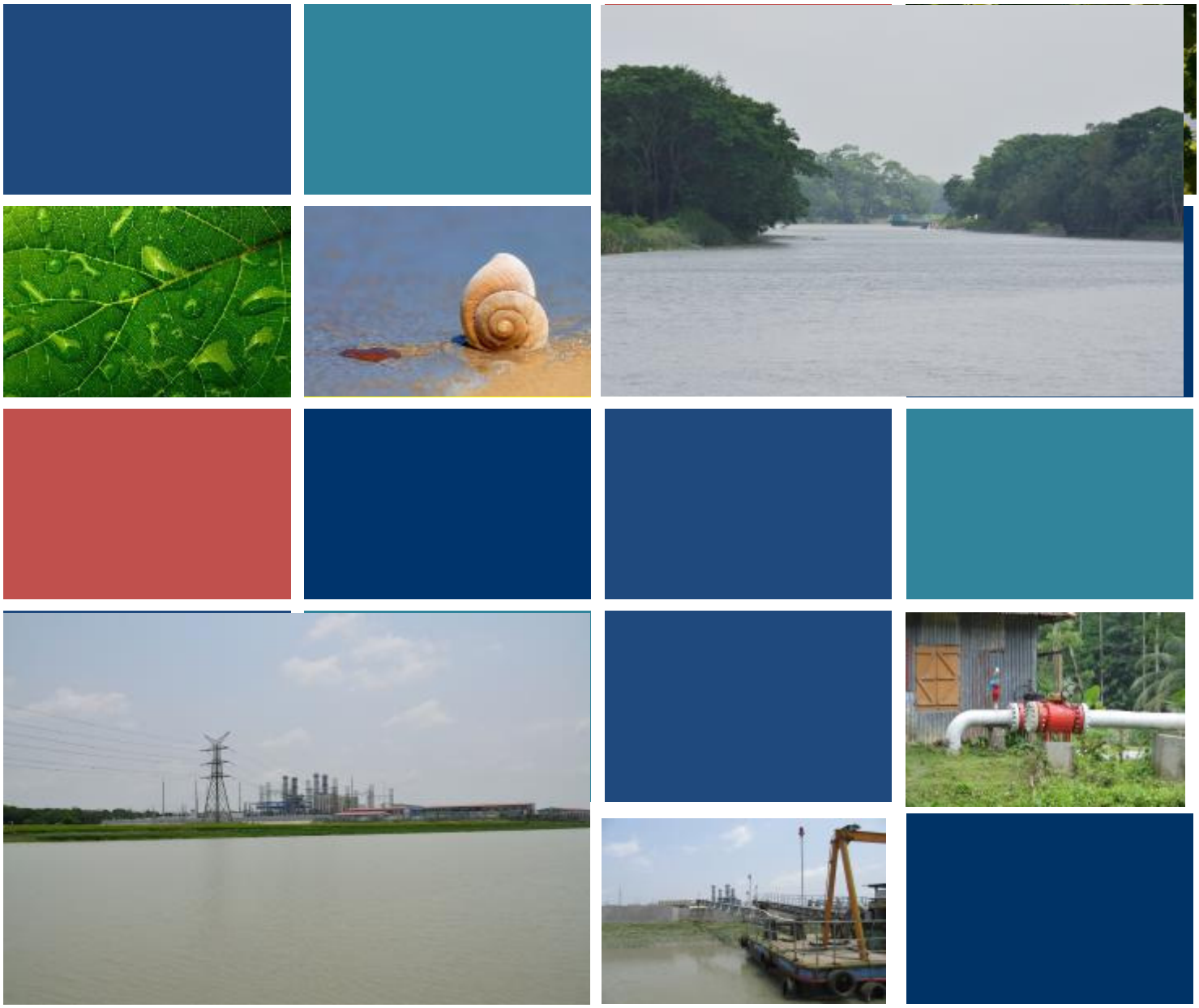

Environmental and Social Impact Assessment of 225 MW Dual Fuel (Gas and HSD based) Combined Cycle Power Plant (Bhola-II): *Burhanuddin, Bhola District, Bangladesh*

Nutan Bidyut (Bangladesh) Limited
[a subsidiary of Shapoorji Pallonji Infrastructure Capital Company Pvt. Ltd.]

Annexures to the Final Report

January 2018

www.erm.com

The business of sustainability

ERM

Central Secretariat
Bangladesh Power Development Board
WAPDA Building (1st Floor)
Motijheel C/A, Dhaka-1000.

বাংলাদেশ বিদ্যুৎ উন্নয়ন বোর্ড

Bangladesh Power Development Board

Memo No. 1164 -BPDB(Sectt.)/Dev- 197/2010 Dated: 18.04.2016.

Shapoorji Pallonji Infrastructure Capital Company Private Ltd., India.
Shapoorji Pallonji Centre, 41/44, Minoo Desai Marg, Colaba,
Mumbai-400005, India, Tel: +91-22-67 490154/67490153,
Fax: +91-22-67490017.

Subject: Letter of Intent (LOI) for the development of a Dual Fuel (Gas/HSD) Power Generation Facility of 220 MW (Gas)/ 212 MW (HSD) (Net) Capacity at Bhola, Bangladesh on Build-Own-Operate (BOO) basis under Private Sector Power Generation Policy of Bangladesh.

Ref: 27.00.0000.071.14.012.2014.137 Dated: 31/03/2016.

Dear Sir,

A. REFERENCE

This Letter of Intent, hereinafter referred to as the "LOI" is being issued to the addressee, pursuant to approval received from the Power Division, Ministry of Power, Energy and Mineral Resources (MPEMR), Bangladesh Secretariat, Dhaka vide memo referred above for the development of the project identified below (the "Project") under the special act, 2010 (Revised 2015) for enhancement of power & energy (বিদ্যুৎ ও জ্বালানীর দ্রুত সরবরাহ বৃদ্ধি (বিশেষ বিধান) আইন, ২০১০ (সংশোধিত ২০১৫)) on the terms described in this LOI.

B. AUTHORIZATION

The People's Republic of Bangladesh represented by the Power Division, Ministry of Power, Energy and Mineral Resources, hereinafter referred to as the "GOB" accords its approval on the following Levelized Tariff of Shapoorji Pallonji Infrastructure Capital Company Private Ltd., India (the "Sponsor") to design, finance, insure, construct, own, Commission, operate and maintain (the "Project") a 220 MW (Gas)/ 212 MW (HSD) (Net) (at Reference Site Condition) Dual Fuel (Gas/HSD) Power Generating Facility at Bhola, hereinafter referred to as the "Facility", as more fully described in the Proposal:

- Levelized Tariff (for gas operation) = 3.9830 US cents/kWh (at 84.6% plant factor, 12% discount factor, gas price 2.4 US dollar/GJ and exchange rate 1 USD = 80 taka) and
- Levelized Tariff (for HSD operation) = 16.9621 US cents/kWh (at 84.6% plant factor, 12% discount factor, HSD price 20.36 US dollar/GJ and exchange rate 1 USD = 80 taka)

The Facility will have a net electric power generating capacity of 220 MW (Gas)/ 212 MW (HSD). Net Dependable Capacity and Net Energy Output from the Facility will be sold under the Power Purchase Agreement, hereinafter referred to as the "PPA". The Company formed by the Sponsor shall be solely responsible for the financing, development and completion of the Project and development of the necessary related facilities in accordance with the requirements contained in the Proposal and the timetable and milestones contained in the Proposal, under the terms & conditions mentioned in this LOI.

Bidyut (Bangladesh) Ltd.

C. PROJECT IN BRIEF:

1.	Contracted Capacity	:	220 MW (Gas) / 212 MW (HSD)
2.	Shareholding of the Company formed by the Sponsor	:	Shapoorji Pallonji Infrastructure Capital Company Private Ltd., India. - 100%
3.	Location of the Project Site	:	Bhola area.

4.	Land of the Project	:	BPDB will provide its available land to the Sponsor in "as is" condition. Additional land apart from the BPDB's land shall be arranged by the Sponsor at its own cost and responsibility. The Sponsor shall also arrange the right of way as necessary for the entrance of the project at its own cost and responsibility. BPDB shall not incur any liability for delay in arranging the land by the Sponsor what so ever the reason.
5.	Fuel Type	:	Dual Fuel (Gas/HSD)
6.	Plant Type	:	Combined Cycle Power Project.
7.	Status of the Plant Equipment	:	New machine
8.	Gas Supply Facility	:	The Sponsor shall install necessary pipeline, Gas Booster Compressor (if required) and RMS to ensure supply of gas to its plant at its own cost and responsibility in consultation with Petrobangla/Shundarban Gas Company Ltd. and hand it over to Petrobangla after installation. The Sponsor shall also arrange the land required for construction of gas pipeline and RMS at its own cost and responsibility and handover the said land to Petrobangla/Shundarban Gas Company Ltd. BPDB shall not incur any liability for delay in construction of the said pipeline and RMS as well as supply of gas to the power plant what so ever the reason.
9.	HSD Supply Facility	:	Sponsor shall be solely responsible for procurement of HSD from Bangladesh Petroleum Corporation (BPC) including transportation and storage of the required HSD. The Sponsor shall install necessary pipeline and pumping station (if required) to ensure supply of HSD to its plant at its own cost and responsibility in consultation with Bangladesh Petroleum Corporation (BPC). The Sponsor shall also arrange the land required for construction of HSD pipeline and pumping station at its own cost and responsibility. BPDB shall not incur any liability for delay in construction of the said pipeline and pumping station as well as supply of HSD to the power plant what so ever the reason.
10.	Power Evacuation Facility	:	The evacuation voltage will be 230 kV. The power plant will be connected to the nearest BPDB's 230 kV attached sub-station. The Sponsor shall install all equipments and construct Interconnection Line (overhead or underground, as applicable) including bay extension at its own cost and responsibility as per requirement of PGCB. The Sponsor shall also arrange the right of way as necessary for evacuation of power at its own cost and responsibility. The Sponsor shall be responsible for the required compensation in getting the rights of way including land (if any) for this Interconnection Line.
11.	Project Effective Date	:	Date on which the last Project Agreement is executed
12.	Required Commercial Operations Date (RCOD)	:	28 months from the Project Effective Date in Combined Cycle Operation only, provided that, the Commercial Operations Date shall not occur prior to the RCOD. [N.B: Considering the implementation period of Barishal-Madaripur-230KV transmission line which is invariably required for power evacuation]
13.	Contract Period	:	22 years
14.	Financial Closing Date	:	9 (nine) months from the Project Effective Date
15.	Reference Date in relation to the inflation/indexation for invoice payment under PPA	:	January 27, 2016 (final offer submission date)

D. FORMATION OF COMPANY

The Sponsor shall form a "Company" for the purpose of this Project, which will be a special purpose vehicle i.e. a public/private limited company incorporated in the Joint Stock Companies, Bangladesh. The Project Agreements shall be executed by that "Company" which will be responsible for design, finance, insure, build, own, operate and maintain etc. of the Project. After the incorporation of the "Company", the rights and obligations of the Sponsor hereunder will be assigned to the "Company".

E. NO LIABILITY FOR REVIEW

No review, examination, evaluation or approval by BPDB of any document, instrument, drawing, specifications or design proposed or delivered by the Sponsor or the Company in connection with the delivering of its Proposal or BPDB's evaluation thereof or the issuance of this LOI shall relieve the Sponsor or the Company from any obligation or liability that it would otherwise have had for its negligence in the preparation of such document, instrument, drawing, specification or design or failure to comply with applicable laws of Bangladesh or to satisfy the Company's obligations under this LOI, the Project Agreements, or the other documents comprising the Security Package (as defined in the IA) with respect thereto, nor shall BPDB be liable to the Sponsor or the Company or any other person by reason of its review, examination, evaluation or approval of any document, instrument, drawing, specification, or design.

F. PROPOSAL SECURITY

The Sponsor shall be required to submit the Bank Guarantee as Proposal Security at the rate of USD 10,000.00 per MW for 220 MW upon acceptance of LOI.

G. VALIDITY OF THE PROPOSAL AND THE PROPOSAL SECURITY

The validity of the Proposal and Proposal Security shall have to be extended upon request from BPDB for an additional period of three (3) Months or more until such time as the Project Agreements are executed.

H. GOVERNING LAW

This Letter of Intent shall be governed by and construed in accordance with the Laws of Bangladesh.

I. ACCEPTANCE OF LETTER OF INTENT (LOI)

You are requested to communicate your unconditional acceptance (not acknowledgement) of this LOI within 7 (seven) days from the issuance of this LOI.

J. TERMINATION OF LOI

1. The Company formed by the Sponsor will sign the Implementation Agreement ("IA"), the Power Purchase Agreement ("PPA"), the Land Lease Agreement ("LLA"), the Gas Supply Agreement ("GSA") and the Fuel Supply Agreement ("FSA") for supplying of HSD (collectively, the "Project Agreements") with the GOB, BPDB, Gas Supplier and Fuel Supplier respectively, failure to which, BPDB shall reserve the right to terminate this LOI by written notification to the Sponsor & forfeit the Proposal Security. The draft PPA, LLA, IA, GSA and FSA will be available at the Office of the IPP Cell-1, BPDB, Dhaka on the date to be notified by BPDB.

2. The Sponsor shall be required to submit the Bank Guarantee as Proposal Security for the amount of USD 2.20 million (Two point two zero million) at the rate of USD 10,000.00 per MW for 220 MW upon acceptance of LOI. This Bank Guarantee shall continue till the Effective Date of the Project Agreements. If the Company fails to sign the Project Agreements within 7 (seven) Days following the notification of BPDB; BPDB shall have the right to terminate the LOI as well as to forfeit the Proposal Security.

3. The Sponsor will provide the Performance Security Deposit for the amount of USD 7.92 million (Seven point nine two million) only at the rate of USD 36,000.00 per MW for 220 MW (Contracted Capacity), Certificate of Incorporation (along with Memorandum and Articles of Association) for newly formed "Company" in Bangladesh no later than two (2) days prior to the date of signing of the Project Agreements, failure to which, BPDB shall reserve the right to terminate this LOI by written notification to the Sponsor as well as to forfeit the Proposal Security.

4. The Sponsor will provide its unconditional acceptance of LOI within seven (7) days and the initialed Project Agreements within 30 (thirty) days from the issuance of this LOI.

   If the Sponsor fails to furnish (i) the acceptance of LOI and (ii) initialed Project Agreements within stipulated time as mentioned above, BPDB shall reserve the right to terminate this LOI and forfeit the Proposal Security.

5. The Sponsor shall extend the Proposal validity & the Proposal Security validity at least 7 (seven) days prior to the expiration of the Proposal validity and Proposal Security validity until such time as the project Agreements are executed, failure to which, BPDB shall have the right to forfeit the Proposal Security.

6. Upon termination of LOI, neither the Sponsor nor the Company shall have any claim for compensation or damages against BPDB or any other governmental agency on any grounds whatsoever.

BPDB looks forward to working with you to make the Project a great success.

Golam Kibria
Director
IPP CELL-1, BPDB, Dhaka.

By order,

18.04.2016
(Md. Zahurul Haque)
Secretary (Joint Secretary)
Bangladesh Power Development Board
Dated: 19.04.2016.

Memo No. 1144 -BPDB(Sectt.)/Dev- 197/2010

Copy to:

1. Member, Finance/Company Affairs/Generation/Administration/P&D/Distribution, BPDB, Dhaka.
2. Managing Director, PGCB, IEB Bhaban, Ramna, Dhaka. Fax: 7171833.
3. Chief Engineer, Private Generation/Generation/P&D, BPDB, Dhaka.
4. Controller of Accounts & Finance, BPDB, Dhaka.
5. Director, IPP Cell-1/System planning/Finance/Contract and Consultant Administration, BPDB, Dhaka.
6. C S O to Chairman, BPDB, Dhaka.
7. P S to Secretary, Power Division, Ministry of Power, Energy & Mineral Resources, Bangladesh Secretariat, Dhaka.

(Pranob Kumar Ghosh)
ID No. 02-0240
Assistant Secretary (Dev.)
Central Secretariat, BPDB, Dhaka.

Issue No. 15943 Date:27/03/2016

Certificate of Incorporation
(under Act XVIII of 1994)

No. C-129866/2016

I hereby certify that ***NUTAN BIDYUT (BANGLADESH) LTD.*** *is this day incorporated under the Companies Act (Act XVIII) of 1994 and that the Company is Limited.*

Given under my hand at ***Dhaka*** *this* ***Twenty-Seventh*** *day of* ***March two thousand and sixteen****.*

By order of
Registrar

Assistant Registrar
Registrar of Joint Stock Companies & Firms
Bangladesh

N.B. This certificate is digitally signed. Please find the soft copy to verify the signature.

Government of the People's Republic of Bangladesh
Department of Environment
www.doe.gov.bd
Head Office, E-16 Agargaon
Dhaka-1207

Memo No: 22.02.1006.345.72.012.16/474

Date: 03/11/2016

Subject: Approval of Terms of Reference (TOR) for Environmental Impact Assessment (EIA) of Proposed 225 MW Dual Fuel (Gas and HSD) Based Combined Cycle Power Plant Project in Bhola.

Ref: Your Application received on 18/09/2016.

With reference to your letter dated 18/09/2016 for the subject mentioned above, the Department of Environment hereby gives approval of TOR for Environmental Impact Assessment (EIA) Study in favour of Proposed 225 MW Dual Fuel (Gas and HSD) Based Combined Cycle Power Plant Project in Bhola subject to fulfilling the following terms and conditions :

I. The project authority shall submit a comprehensive Environmental Impact Assessment (EIA) considering the overall activity of the said project in accordance with the TOR and time schedule submitted to the Department of Environment (DOE) and additional suggestions provided herein.

II. The EIA report should be prepared in accordance with following indicative outlines:

1. Executive summary.
2. Introduction: (Background, brief description, scope of study, methodology, limitation, EIA team, references).
3. Legislative, regulation and policy consideration (covering the potential legal, administrative, planning and policy framework within which the EIA will be prepared).

4a. Project activities:

- A list of the main project activities to be undertaken during site clearing, construction as well as operation
- Project Plan, Design, Standard, Specification, Quantification, etc.

4b. Project schedule: The phase and timing for development of the Project.

4c. Resources and utilities demand: Resources required to develop the project, such as soil and construction material and demand for utilities (water, electricity, sewerage, waste disposal and others), as well as infrastructure (road, drains, and others) to support the project.

4d. Map and survey information

Location map, Cadastral map showing land plots (project and adjacent area), Topographical map, Geological map showing geological units, fault zone, and other natural features.

5. Baseline Environmental Condition should include, inter alia, following: (Identification and Quantification of Physical Situation that has been proposed to be changed)

- Physical Environment : Geology, Topology, Geomorphology, Land-use, Soils, Meteorology, and Hydrology
- Biological Environment : Habitats, Aquatic life and fisheries, Terrestrial Habitats and Flora and Fauna
- Environment Quality : Air, Water, Noise, Vibration, Soil and Sediment Quality
- Relate baseline in both Quantitative and Qualitative term with the anticipated outcomes, achievement of goals, objectives and changes due to project interventions

6. Socio-economic environment should include, inter alia, following:
   - Population: Demographic profile and ethnic composition
   - Settlement and housing
   - Traffic and transport
   - Public utilities: water supply, sanitation and solid waste
   - Economy and employment: employment structure and cultural issues in employment
   - Fisheries: fishing activities, fishing communities, commercial important species, fishing resources, commercial factors.
7. Identification, Prediction and Evaluation of Potential Impacts (identification, prediction and assessment of positive and negative impacts likely to result from the proposed project).

   In identification and analysis of potential impacts'-the 'Analysis' part shall include the analysis of relevant spatial and non-spatial data. The outcome of the analysis shall be presented with the scenarios, maps, graphics etc. for the cases of anticipated impacts on baseline. Description of the impacts of the project on air, water, land, hydrology, vegetation-man maid or natural, wildlife, socio-economic aspect shall be incorporated in detail.

   Appropriate models shall be used for prediction of potential impacts of the project on surface water and ambient air quality using updated data. Model prediction shall be compared with national water and air quality standards and specific sensitivity data of the organisms known to be present in the project area (likely impacted area) for impact assessment.

8. Management Plan/Procedures:

   For each significant major impact, proposed mitigation measures will be set out for incorporation into project design or procedures, impacts, which are not mitigable, will be identified as residual impacts Both technical and financial plans shall be incorporated for proposed mitigation measures.

   An outline of the Environmental Management Plan shall be developed for the project.

   In Environmental Monitoring Plan, a detail technical and financial proposal shall be included for developing an in-house environmental monitoring system to be operated by the proponent's own resources (equipments and expertise).
9. Consultation with Stakeholders/Public Consultation (ensures that consultation with interested parties and the general public will take place and their views taken into account in the planning and execution of the project)

   Beneficial Impacts (summarize the benefits of the project to the Bangladesh nation, people and local community and the enhancement potentials)
10. Risk assessment, risk management, system of valuation of environmental and properties damage, damage compensation issues shall be addressed
11. Conclusion and Recommendations

III. Without approval of EIA report by the Department of Environment, the project authority shall not be able to open L/C in favor of importable machineries.

IV. Without obtaining Environmental Clearance, the project authority shall not be able to start the physical activity of the project.

V. The project authority shall submit the EIA report along with the filled-in application for Environmental Clearance in prescribed form, the applicable Environmental Clearance fee in a treasury chalan, the applicable VAT on clearance fee in a separate treasury chalan, the No Objection Certificate (NOC) from local authority, NOC from Forest Department (if it is required in case of cutting any forested plant, private or public) and NOC from other relevant agencies for operational activity etc. to the Barishal Divisonal Office of DOE in Barishal with a copy to the Head Office of DOE in Dhaka.

VI. A soft copy of the image data as well as the maps to be generated from the image shall be submitted to DOE Head Office along with the EIA report.

03.11.2016

(Syed Nazmul Ahsan)
Director (Environment Clearance, c.c)
Phone # 02-8181673

Senior Officer (Co - Ordination)
Proposed 225 MW Dual Fuel (Gas and HSD) Based
Combined Cycle Power Plant Project
Nutan Bidyut (Bangladesh) Ltd.
Suit No. 2C, 19 Chamelibag
Shantinagar, Dhaka-1217.

Copy Forwarded to :

1) PS to The Secretary, Ministry of Environment and Forests, Bangladesh Secretariat, Dhaka.
2) Director, Department of Environment, Barishal Divisonal Office, Barishal.
3) Assistant Director, Office of the Director General, Department of Environment, Head Office, Dhaka.

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
উপজেলা নির্বাহি অফিসারের কার্যালয়
বোরহানউদ্দিন, ভোলা।
(borhanuddin.bhola.gov.bd)

স্মারক নং- ০৫.১০.০৯২১.০০০.০০.০০১.১৬-৪৮০ তারিখ : ২৭ জুলাই ২০১৬ খ্রিস্টাব্দ

বিষয়: অনাপত্তি পত্র

সূত্র: INFRA এর ১৫ জুন ২০১৬ খ্রি. তারিখের SPICCL/2015/54 নং স্মারক।

উপরিউক্ত বিষয় ও সূত্রোক্ত স্মারকের আবেদনের প্রেক্ষিতে অদ্য ২৭ জুলাই ২০১৬ খ্রিস্টাব্দ তারিখ নিম্নস্বাক্ষরকারী এবং সহকারী কমিশনার (ভূমি), বোরহানউদ্দিন, ভোলা প্রস্তাবিত পাওয়ার প্লান্ট- এর প্রস্তাবিত স্থান সরেজমিনে পরিদর্শন করি। এ সময়ে দেখা যায় যে, "২২৫ মেগাওয়াট পাওয়ার প্লান্ট" এর জন্য প্রস্তাবিত লোকেশনে চাহিত জমির পরিমান ১৭.৬৮ একর। উক্ত জমির ১১.০০ একর বাংলাদেশ বিদ্যুৎ উন্নয়ন বোর্ড কর্তৃক পরিচালিত ২২৫ মেগাওয়াট পাওয়ার প্লান্ট এর অনুকূলে ইতোপূর্বে অধীগ্রহণকৃত জমির অংশ বিশেষ। অবশিষ্ট ০৬.৭৮ একর জমির মধ্যে কুতুবা মৌজার ২২ দাগে ০.৯৬ একর এবং ৫৭ দাগে ১.৯০ একর একুনে ২.৮৬ একর জমি ব্যক্তি মালিকানাগণ; যা কৃষি জমি হিসেবে ধান চাষ করে স্থানীয় কৃষকগণ ভোগদখলে বিদ্যমান রয়েছেন। বাকি ৩.৯২ একর খাস জমি যা তেঁতুলিয়া নদীর শাখা চন্দন বাড়ি খালের পাড়ে (মৌজা- কুতুবা, খতিয়ান নং- ০১, দাগ নং- ১৯২৩, ২৩১৩, ১৭৫৬) পলি জমে উচু চর হিসেবে পরিত্যাক্ত ভূমি হিসেবে বিদ্যমান রয়েছে। যেহেতু প্রস্তাবিত পাওয়ার প্লান্টটি বিপিডিবি (BPDB) এর চলমান পাওয়ার প্লান্ট এর দেয়ালঘেষা (উত্তর ও পশ্চিম পার্শ্ব) সেহেতু উক্ত জমিতে নতুন করে বেসরকারিভাবে পাওয়ার প্লান্ট হলে স্থানীয় জনস্বার্থের কোন প্রকার ব্যাঘাত ঘটবে না মর্মে প্রতীয়মান হয়।

২৭/০৭/১৬

(মো: আ: কুদদূস)
উপজেলা নির্বাহি অফিসার
বোরহানউদ্দিন, ভোলা।
☎ ০৪৯২২-৫৬১০৩
০৪৯২২-৫৬১১০
✉ unoborhanuddin@mopa.gov.bd

মো: আব্দুল কুদ্দুস
উপজেলা নির্বাহি অফিসার
বোরহানউদ্দিন, ভোলা।

সুরেশ ধাওয়ান
পরিচালক
নতুন বিদ্যুৎ (বাংলাদেশ) লিঃ

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার

উপজেলা চেয়ারম্যানের কার্যালয়

বোরহানউদ্দিন, ভোলা।

Web: borhanuddin.bhola.gov.bd Email: upzchairman.bor@gmail.com

সূত্র: উচেপক/বোর-২০১৬— তারিখ : ২২.০৬.২০১৬ খ্রি.

অবস্থানগত/পরিবেশগত ছাড়পত্রের জন্য স্থানীয় কর্তৃপক্ষ কর্তৃক প্রদেয় অনাপত্তিপত্রের ছক

১। আবেদনকারীর নাম : সুরেশ ধাওয়ান

২। পিতার নাম : মদন মোহন ধাওয়ান

৩। আবেদনকারীর ঠিকানা : ২/সি, ১৯, চামেলীবাগ, শান্তিনগর, ঢাকা।

৪। কারখানা/প্রকল্পের অবস্থানগত ঠিকানা : ভোলা ২২৫ মেগাওয়াট পাওয়ার প্লান্ট এর পার্শ্বস্থ বোরহানউদ্দিন, ভোলা।

৫। কারখানা/প্রকল্পের তফসীল :

জেলার নাম	থানার নাম	মৌজার নাম	খতিয়ান নং	দাগ নং	জমির ধরন	মোট জমির পরিমান
১	২	৩	৪	৫	৬	৭
ভোলা	বোরহানউদ্দিন	কাচিয়া ছাগলা কুতুবা	০১	২৬, ৩২৪, ৩২০৬, ৩২০৫, ৩২০৪, ২১, ৩২০৮, ৩২০৯, ৩২১০, ৩২১১, ৩১৪৪, ৩১৪৫, ৩১৪৬, ৩১৪৭, ৩১৯৪, ৩১৫৮, ৩১৫৯, ৩১৯১, ৩১৯১, ৩১৮৯, ৩১৭৭, ২৮০০, ২৭৯৯, ২৭৯৮, ২৭৬৮, ২৭৭৪, ২৭৬৭, ২৭৬৫, ২৭৬৬, ২৭৬২, ২৭৫৯, ২৭৫৮, ২৭৫৭, ২৭৫০, ২৭৫১, ২৮৩৬, ২৭৪৬, ২৪৪৬, ২৪৪৭, ২৪৪৮, ২৪৪৯, ২৪৫১, ২৮৯২, ২৩২২, ২৩৮৭, ২৩৮৬, ২৩৮৫, ২৩৮৪, ২৩৮৩, ২৩৪৭, ২৩৭৬, ২৩৪৮, ২৩৪৪, ২৩৩৯, ২৩৩৭, ৪০১২, ৪১০১, ৪১০০, ৪০৯৯, ৪০৯৪, ৪০৯০, ৪০৯১, ৪০৯২, ৪০৮৯, ৪০৮৮, ৪০৭৯, ৪০৭৮, ৪০৮০, ৪০৮৬, ৪০৮১, ৪০৬১, ৭৬৭, ৭৬৮, ৭৬৫, ৭৬৩, ৭৬২, ৬০৭, ৬৩৪, ৬৩০, ৬৩২, ৬২৮,৬২৭, ৬৩৬, ২২৬, ৬২৫, ৬২৯, ৬৫৯, ৬৫৮, ২৪৮, ২৬৭, ২৭৩, ২৭৪, ২৪৫, ২৫৭, ২৫৬৫৫, ৫৩, ২৪, ৫০, ৪১, ৪৪, ২৪৬, ৩০৪, ৩০৩৩০২, ২৪৭, ২৩১, ১৬০, ১৫৯, ১৬১, ১৬৩, ১৮৭, ১৮২, ১৮৫, ১৭৭, ১৭৩, ১৮০, ১৭৬, ১৭২, ৩৩২৭, ৩৩২৮, ৩৩২৯, ৩৮, ৩৯, ৪০, ৩৮৩৩,৩২৬৪, ৩১৬৩,	কৃষি	১৭.৭৮ একর

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার

উপজেলা চেয়ারম্যানের কার্যালয়

বোরহানউদ্দিন, ভোলা।

Web: borhanuddin.bhola.gov.bd Email: upzchairman.bor@gmail.com

				৩২৭৩, ৩২৫৭, ৫৬, ৫৫, ৩১৫৪, ৪৮, ৩২৪৭, ৮২, ৩২৪১, ৩২২৪, ৩০৮৯, ৩০৮৮, ৩০৭৭, ৩০৭৫, ৩০৪৬, ৩০৪৫, ২২৩০, ৩০৪৪, ২২৫৯, ২২৫৮, ২২৫৬, ২২৫৬, ২১৪৮, ২১৮৯, ২২৫৭, ২২৪৯, ২২৫০, ২২৩৮, ২২৩৬, ২২৩৫, ২২৩০, ২২৩৩, ৩০১৭, ৩০১৮, ৩০২২, ৩০২১, ৩০২৭, ৩০২৯, ৩০৩২, ৩০৩১, ৩০৩৫, ৩০৩৬, ৩১০৯, ৩০৩৮, ৩৫৮০, ৩৫০৯, ৩১১০, ৩১৫৬, ২৯৫৫, ২৯৫২, ২৯১২, ২৯২১, ১৯২৬, ২৯৫০, ২৯২৫, ২৯২৬, ২৯৯, ২৯২৮, ৩৯, ২৯২৯,২২, ২৯৩১, ৩৮		

৬। কারখানা/প্রকল্পের উৎপাদিত পণ্যের নাম : বিদ্যুৎ

উপরোক্ত তথ্যাদির আলোকে 'নতুন বিদ্যুৎ (বাংলাদেশ) লিমিটেড কারখানা/প্রকল্পকে নিম্নবর্ণিত শর্তসাপেক্ষে অনাপত্তিপত্র প্রদান করা হলো।

শর্তাবলী:

১. প্রকল্প/কারখানা স্থাপন ও পরিকল্পনার ক্ষেত্রে পরিবেশ সংরক্ষণ আইন ও বিধি যথাযথভাবে অনুসরণ করতে হবে।
২. পরিবেশ অধিদপ্তর হতে বিধি দ্বারা নির্ধারিত পদ্ধতিতে ছাড়পত্র গ্রহণ করতে হবে।
৩. কর্মরত শ্রমিকদের পেশাগত স্বাস্থ্য ও নিরাপত্তা নিশ্চিত করতে হবে।
৪. উপযুক্ত অগ্নি নির্বাপক ব্যবস্থা করতে হবে এবং অগ্নিকাণ্ড কিংবা অন্য কোনো দুর্ঘটনার সময় জরুরি নির্গমন ব্যবস্থা থাকতে হবে।
৫. বায়ু ও শব্দ দূষণ করা যাবে না।
৬. কারখানা/ প্রকল্প সৃষ্ট তরল বর্জ্য অপরিশোধিত অবস্থায় বাইরে নির্গমন করা যাবে না।

উল্লিখিত যে কোনো শর্ত লঙ্ঘন করলে যথোপযুক্ত কর্তৃপক্ষ কর্তৃক কারখানা/প্রকল্পের বিরুদ্ধে আইনানুগ ব্যবস্থা নেওয়া হবে।

(মহব্বত জানা চৌধুরী)
চেয়ারম্যান
উপজেলা পরিষদ
বোরহানউদ্দিন, ভোলা।
মোবাইল- ০১৭১২- ১৮৬৯১৫

কার্যালয়ের সীল

Rapid Environmental Assessment (REA) Checklist

Instructions:

(i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (RSES) for endorsement by the Director, RSES and for approval by the Chief Compliance Officer.

(iI) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.

(iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: Bangladesh/ Bhola II - 225 MW Dual Fuel Fired Combined Cycle Power Project

Sector: Thermal Power Plant

SCREENING QUESTIONS	Yes	No	Not Known	REMARKS
A. Project Siting Is the Project area adjacent to or within any of the following environmentally sensitive areas?				
▪ Cultural heritage site		☑		As per the information available from Department of Archaeology, Bangladesh (www.archaeology.gov.bd) and District Office website (www.dcbhola.gov.bd), there are reportedly no cultural heritage sites and archeological monuments in the Bhola District. However, there are religious structures such as local mosques and temples in the unions as well as in Borhanuddin Municipal Area (reconnaissance survey). The nearest religious structure (Kutba Janattul Firdues Mosque) is about 500 m from the Project boundary.
▪ Protected Area		☑		There is reportedly no protected area, such as National Park, Wildlife Sanctuary, Game Reserve, Safari Parks, Eco-Parks, Reserve and Protected Forests within the 10 km study area. The nearest wildlife sanctuary of Kukri Mukri is located at about 64 km from the project site on the Char Kukri Mukri Island. (Reference: IUCN directory of South Asian Protected Area compiled by World

SCREENING QUESTIONS	Yes	No	Not Known	REMARKS
				conservation Monitoring Centre)
▪ Wetland		☑		In Bangladesh wetlands area classified into river, streams, Baors, Haors and Beels. All of these are considered as wetlands and regarded as valuable fish and wildlife habitat. Bhola is an island, encompassed by the Tetulia river on the west and lower Meghna and Shahbazpur canal on east and contain many small beels. The project site is itself situated next the Dehular Canal. However none of the important wetlands are located in the 10 km study radius. The nearest major wetland is Sundarbans wetland about 128 km away from the project site.
▪ Mangrove		☑		The outside embankment of the Bhola Island is protected by a length of 100 km of mangrove and other plantations. The largest important mangrove forested area is on the Kukri Mukri Island about 64 km from the project site. (Inventory of Coastal and Estuarine Islands and Chars. (source: www. warpo.gov.bd).
▪ Estuarine	☑			The island of Bhola is itself situated in an area categorized as estuarine floodplains. It is infact a part of the lower Meghna river estuarine floodplain. However the project site is in the middle of the island though connected to the river system through a canal.
▪ Buffer zone of protected area		☑		None. The nearest protected area of Char Kukri Mukri is 64 km away from the project site.
▪ Special area for protecting biodiversity		☑		None
B. Potential Environmental Impacts Will the Project cause…				
▪ impairment of historical/cultural monuments and other areas, and loss/damage to these sites?		☑		No impairment of historical/ cultural monuments and loss/ damage to these sites envisaged due to the Project.
▪ encroachment into precious ecosystem (e.g. sensitive habitats like protected forest areas or terrestrial wildlife habitats?		☑		No encroachment into precious ecosystem is envisaged due to the Project, as there is reportedly no protected area, such as National Park, Wildlife Sanctuary, Game Reserve, Safari Parks, Reserve, and Protected Forests protected by law, within the 10 km study area.
▪ dislocation or involuntary resettlement of people?		☑		Bangladesh Power Development Board (BPDB) had already acquired about 31.23 acres of land for two

SCREENING QUESTIONS	Yes	No	Not Known	REMARKS
				power plants a decade ago. Out of that land, about 11.5 acres will be leased to NBBL for Bhola II project. This entire land was free from any structures, which was noticed based on review of historical imageries as well as site reconnaissance and consultations. Furthermore, the project is requiring about 5.78 acres of additional land for power plant and access road connection. The identified additional land is also free from any structures/ residential settlements. However, for gas pipeline from the nearest valve station to the project site (~ 2 km), NBBL has to acquire additional land for the Gas pipeline ROW and this may pass through settlements and plantation areas. The people's displacement and economic effects due to the cutting of trees has to be addressed. The route of this spur pipeline is not yet finalized.
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		☑		There is no reported social survey available for the project and surrounding areas. There is a possibility of vulnerable groups around the site – poor families, potential land less or marginal farmers, any community that is given protection by the government etc., which can be established only after a socio-economic survey.
▪ aesthetic degradation and property value loss due to establishment of plant and ancillary facilities?		☑		The Project is being developed next to an existing Power plant so aesthetically it has precedents. The area was identified and developed for power plants so property value loss due to establishment of plant is not expected.
▪ risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	☑			The occupational health and safety impacts during the construction and operation phase of the Project would be (i) heat, (ii) noise, (iii) confined spaces, (iv) electrical hazards, (v) fire and explosion hazards, (vi) chemical hazards and (vii) dust.
▪ noise and dust from construction activities?	☑			Noise and dust will be temporally generated due to civil works, movement of heavy machinery, transportation of man & material, excavation of earth and other construction activities.
▪ short-term soil erosion and silt runoff due to construction?	☑			As per the Bangladesh Meteorological Department (BMD), district Bhola receives heavy rainfall. Based on the rainfall record of 30 years (1980 – 2009), annual average rainfall varied from 1609 – 3080

SCREENING QUESTIONS	Yes	No	Not Known	REMARKS
				mm. Also, as mentioned in the site feasibility study conducted by BPDB, during the flood season, the whole plant area comes under 2' to 4' of water. Therefore, the BPDB plant area (Bhola I) has been raised more than 4 m from the mean sea level and an embankment is also constructed.
▪ fugitive dust during transportation, unloading, storage, and processing of coal, and polluted runoff from coal storage?		☑		The proposed power plant is based on natural gas as primary fuel and HSD will be used only in case of non-availability of natural gas supply as secondary fuel. No use of coal is envisaged in the project.
▪ risk of oil spills, which could pollute surface and groundwater and soil?	☑			Such risks exist during the construction as well as operation phase of the Project. HSD will be transported and stored at site in two HSD storage tanks during operation phase.
▪ hazards in gas pipeline operation and gas storage at power plant sites?	☑			The gas pipeline operation would have fire and explosion hazard, as the natural gas will be present in pipeline at high pressure (about 600 psig). However, no gas storage is required at site. The gas pipeline will be constructed in accordance with GSA specification and will be transferred to gas supplier after testing & commissioning. It will be gas supplier's property as part of the gas supply network during the plant operation. The pipeline will have a minimum cover of 1.0 m on top of it. Cathodic protection will be in place for the buried section of the pipeline and the design will be based on soil resistivity.
▪ changes in flow regimes downstream of the water intake due to abstraction for cooling purposes?		☑		The cooling system using cooling towers is basically a closed system which reduces the fresh water requirement for cooling purpose significantly in comparison of once through cooling system. The fresh water requirement for cooling water make-up and other plant water requirements will therefore be limited to 374 m^3/hr, which will be abstracted for the Dehular Canal. As per the feasibility study conducted by BPDB, maximum flow in the Dehular Canal is 162 cumecs (583,200 m^3/hr), where minimum flows vary from 62 to 124 cumecs (223,200 to 446,400 m^3/hr). Average discharge is calculated as 108 cumecs (388,800 m^3/hr). Therefore, as per the feasibility study ample quantity of water is available from this canal throughout the year, which can potentially meet the plant requirements.

SCREENING QUESTIONS	Yes	No	Not Known	REMARKS
				With the two plants operation, the total water requirement will be about 800 m^3/hr, which is only 0.35% of the total water availability in the Dehular Canal during lean season.
▪ pollution of water bodies and aquatic ecosystem from wastewater treatment plant for boiler feed, bleed-off from cooling towers, boiler blowdown and wash-water, and effluent from ash pond?	☑			The hot water discharge into the canal after cooling as well as treated domestic and industrial effluent may affect the aquatic ecosystem.
▪ air pollution from fuel gas discharged into the atmosphere?	☑			NOx and CO will be primarily emitted from gas based power generation, whereas SO2, NOx, CO, and PM will be emitted from HSD based power generation during non-availability of gas.
▪ public health and safety hazards due to solid waste disposal in sanitary landfills (see Matrix of Impacts and Measures for Solid Waste Disposal)?	☑			Solid waste generation from the project would be limited and only from the canteen and office complex. The solid and non-hazardous wastes generated from the various areas during operations will be collected and segregated at the point of generation and stored in proper designated areas and disposed of through waste disposal contractors or authorized recyclers. It is planned that hazardous wastes (such as Chemical Cleaning waste from the CT compressor, Waste/used oil from the power house and workshop, Oil/dust contaminated cloths and rags from the lube oil system and spill kit waste) generated from the proposed Project will be collected and stored in designated roofed-areas and/or barrels with concrete flooring and secondary containment and disposed of/ sold through contractors or treated prior to discharge.
▪ large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?	☑			The economic activity in the area is low and major occupations are agriculture and fishery. The proposed Power Plant is a unique project in the area and therefore there will be population influx both during construction and operation phases of the Project. There will be potential burden on local resources. Total manpower requirement is estimated to be 800 -1000 people during peak construction phase, with approximately 70% as unskilled/ semiskilled manpower. Most of the unskilled manpower will

SCREENING QUESTIONS	Yes	No	Not Known	REMARKS
				be sourced from the neighbouring areas. The skilled manpower will mainly be specialized personnel required to complete construction tasks, such as, installation of the combustion turbine and GTG, HRSG, steam turbine and STG, DCS and other plant control systems. NBBL will also deploy about 55 personnel for supervision of the construction and commissioning activities. During the operation phase of the Project, the total workforce will be 48. Furthermore, Contractors will be employed for other services like: plant overhaul, housekeeping, canteen, security service, staff transportation, etc.
▪ social conflicts if workers from other regions or countries are hired?			☑	
▪ risks community safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?	☑			Natural gas will be supplied to the project through underground pipeline, whereas A new natural gas pipeline will be constructed for that of about 2.0 km length. Fuel oil (HSD) required for gas turbines will be delivered by Bangladesh Petroleum Corporation. The oil will be delivered by barges to the Jetty on the Dehular Khal. The oil thus received will be stored in two distillate oil storage tanks
▪ community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project (e.g. ash pond) are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?	☑			The plant operation will require chemicals for water treatment and process requirements. A list of the hazardous chemicals which will be used in the Plant and the maximum quantity stored is presented below. • Hydrochloric Acid (HCl)-20 m^3 • Caustic Lye (NaOH)-20 m^3 • Sulphuric Acid (H_2SO_4) -20 m^3 • Chlorine - Storage is not required. It comes in cylinders which will be replaced when required

A Checklist for Preliminary Climate Risk Screening

Country/Project Title: Bangladesh/ Bhola II - 225 MW Dual Fuel Fired Combined Cycle Power Project

Sector : Thermal Power Project

Screening Questions		Score	Remarks[1]
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather related events such as floods, droughts, storms, landslides?	1	The project site falls in the active flood plain and is susceptible to floods. Flood protection measures have been taken into consideration while developing the site for power hub by the BPDB and embankments have been constructed.
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc)?	0	Dependency of the project on river water is limited for meeting the raw water requirement, which is limited due to the use of cooling towers in the project. As per the feasibility study conducted by BPDB, maximum flow in the Dehular Canal is 162 cumecs (583,200 m^3/hr), where minimum flows vary from 62 to 124 cumecs (223,200 to 446,400 m^3/hr). Average discharge is calculated as 108 cumecs (388,800 m^3/hr). Therefore, as per the feasibility study ample quantity of water is available from this canal throughout the year, which can potentially meet the plant requirements. With the two plants operation, the total water requirement will be about 800 m^3/hr, which is only 0.35% of the total water availability in the Dehular Canal during lean season.
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days,	0	Weather and current and future climate conditions are unlikely to impact the selection of project inputs (primarily natural gas).

[1] If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

	exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?		
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s) ?	1	It is possible that changes in weather and likely future climate conditions could affect the maintenance of project outputs.
Performance of project outputs	Would weather/climate conditions, and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	1	It is possible that changes in weather/climate conditions and related extreme events could affect the performance of project outputs.

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response, will be categorized as high risk project.

Result of Initial Screening (Low, Medium, High): **Medium**

Other Comments:_____
_____

Prepared by: _____

Involuntary Resettlement Impact Categorization Checklist

Probable Involuntary Resettlement Effects	Yes	No	Not Known	Remarks
Involuntary Acquisition of Land				
1. Will there be land acquisition?	☑			11.5 acres of project area is located within the already developed land of BPDB, with an existing 225 MW operational CCPP of BPDB. Land acquisition for the same was done about a decade ago and handed over to BPDB. Access road upto the BPDB site already exists. However, the project does require additional land for power plant (4.72 acres), access road connection to the Bhola II site (1.06 acres), as well as gas pipeline ROW (~ 5.5 acres). Most of the additional land required is agricultural land and the NBBL is planning to have direct purchase of these land parcels from the land owners.
2. Is the site for land acquisition known?	☑			Additional land requirement for power plant and access road connection are known. However, the gas pipeline alignment is yet to be finalised.
3. Is the ownership status and current usage of land to be acquired known?		☑		During the scoping site visit, the land department has confirmed that most of the additional land required is of private ownership. However, the ownership details are currently unknown.
4. Will easement be utilized within an existing Right of Way (ROW)?		☑		No existing ROW available along the LGED Road. Gas pipeline will follow existing ROW of Bhola I CCPP. However, additional ROW will be required to maintain safe distance between the two pipelines as per the Bangladesh Petroleum Rules.
5. Will there be loss of shelter and residential land due to land acquisition?		☑		The additional land identified for power plant and access road connection is free from any shelter/ residential land. The gas pipeline alignment is currently unknown.

6. Will there be loss of agricultural and other productive assets due to land acquisition?	☑			About 5 acres of agricultural land will be acquired/ purchased to meet the additional land requirement.
7. Will there be losses of crops, trees, and fixed assets due to land acquisition?	☑			The land identified is only having agricultural crop. No trees and other fixed assets were observed on that land during the site reconnaissance. The alignment of gas pipeline ROW is not known, but it has been observed during the reconnaissance survey that there is agricultural land as well as other productive assets between Valve Station and project site.
8. Will there be loss of businesses or enterprises due to land acquisition?		☑		
9. Will there be loss of income sources and means of livelihoods due to land acquisition?	☑			The additional land to be purchased/ acquired for power plant will have some impact due to loss of agricultural land of about 5 acres to the individual land owners. In addition to that there are coconut and Betel nut trees which maybe owned by people along the existing ROW of BPDB gas pipeline. Their destruction could have some impacts on livelihood.
Involuntary restrictions on land use or on access to legally designated parks and protected areas				
10. Will people lose access to natural resources, communal facilities and services?			☑	Typically, local people can lose access to natural resources, but the exact nature and scale is not known.
11. If land use is changed, will it have an adverse impact on social and economic activities?			☑	The Project will change landuse from agricultural to industrial. However, any adverse impact on social and economic activities is not know at this stage.
12. Will access to land and resources owned communally or by the state be restricted?		☑		
Information on Displaced Persons:				
Any estimate of the likely number of persons that will be displaced by the Project? [☑] No [ ] Yes If yes, approximately how many? _____				

Are any of them poor, female-heads of households, or vulnerable to poverty risks? [☑] Unknown [ ] No [ ] Yes
Are any displaced persons from indigenous or ethnic minority groups? [ ] Unknown [☑] No [ ] Yes

Indigenous Peoples Impact Screening Checklist

KEY CONCERNS (Please provide elaborations on the Remarks column)	YES	NO	NOT KNOWN	Remarks
A. Indigenous Peoples Identification				
1. Are there socio-cultural groups present in or use the project area who may be considered as "tribes" (hill tribes, schedules tribes, tribal peoples), "minorities" (ethnic or national minorities), or "indigenous communities" in the project area?		☑		Project site falls in Kutba Union of Burhanuddin Upazilla in Bhola District of Bangladesh. As per the Census of Bangladesh 2011, there is no population of tribes, ethnic minorities or indigenous communities. Whereas in Burhanuddin Upazilla, there are only two households with total population of 8 persons.
2. Are there national or local laws or policies as well as anthropological researches/studies that consider these groups present in or using the project area as belonging to "ethnic minorities", scheduled tribes, tribal peoples, national minorities, or cultural communities?		☑		Not applicable
3. Do such groups self-identify as being part of a distinct social and cultural group?		☑		Not applicable
4. Do such groups maintain collective attachments to distinct habitats or ancestral territories and/or to the natural resources in these habitats and territories?		☑		Not applicable
5. Do such groups maintain cultural, economic, social, and political institutions distinct from the dominant society and culture?		☑		Not applicable
6. Do such groups speak a distinct language or dialect?		☑		Not applicable
7. Has such groups been historically, socially and economically marginalized, disempowered, excluded, and/or discriminated against?		☑		Not applicable

KEY CONCERNS (Please provide elaborations on the Remarks column)	YES	NO	NOT KNOWN	Remarks
8. Are such groups represented as "Indigenous Peoples" or as "ethnic minorities" or "scheduled tribes" or "tribal populations" in any formal decision-making bodies at the national or local levels?		☑		Not applicable
B. Identification of Potential Impacts				
9. Will the project directly or indirectly benefit or target Indigenous Peoples?		☑		Not applicable
10. Will the project directly or indirectly affect Indigenous Peoples' traditional socio-cultural and belief practices? (e.g. child-rearing, health, education, arts, and governance)		☑		Not applicable
11. Will the project affect the livelihood systems of Indigenous Peoples? (e.g., food production system, natural resource management, crafts and trade, employment status)		☑		Not applicable
12. Will the project be in an area (land or territory) occupied, owned, or used by Indigenous Peoples, and/or claimed as ancestral domain?		☑		Not applicable
C. Identification of Special Requirements *Will the project activities include:*				
13. Commercial development of the cultural resources and knowledge of Indigenous Peoples?		☑		Not applicable
14. Physical displacement from traditional or customary lands?		☑		Not applicable
15. Commercial development of natural resources (such as minerals, hydrocarbons, forests, water, hunting or fishing grounds) within customary lands under use that would impact the livelihoods or the cultural, ceremonial, spiritual uses that define the identity and community of Indigenous Peoples?		☑		Not applicable
16. Establishing legal recognition of rights to lands and territories that are traditionally owned or customarily used, occupied or claimed by indigenous peoples ?		☑		Not applicable

KEY CONCERNS (Please provide elaborations on the Remarks column)	YES	NO	NOT KNOWN	Remarks
17. Acquisition of lands that are traditionally owned or customarily used, occupied or claimed by indigenous peoples?		☑		Not applicable

D. Anticipated project impacts on Indigenous Peoples - Not Applicable

Project component/ activity/ output	Anticipated positive effect	Anticipated negative effect
1.		
2.		
3.		
4.		
5.		

Note: The project team may attach additional information on the project, as necessary.

PROJECT:	**225 MW BHOLA COMBINED CYCLED POWER PROJECT AT BHOLA, BANGLADESH.**
OWNER:	**NUTAN BIDYUT (BANGLADESH) LIMITED**
ENGINEERING CONSULTANT (EC):	**TATA CONSULTING ENGINEERS LIMITED**
CONTRACTOR:	
DOCUMENT TITLE:	**DESIGN BASIS REPORT FOR WATER PRETREATMENT SYSTEM**
SP DOCUMENT NUMBER:	**SP-BCCP-00-C-E-M-118-GR-0001**
EC DOCUMENT NUMBER:	

REVISION STATUS

	SIGN											
	INITIALS											
R0	**SIGN**											**22-09-2016**
	INITIALS	**MS**	**MSN**	**JNR**								
P1	**SIGN**											**15-09-2016**
	INITIALS	**MS**	**MSN**	**JNR**								
P0	**SIGN**											**18-08-2016**
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REV		**DSN**	**CHD**	**APP**	**CV**	**EL**	**IC**	**ME**	**QA**	**APPROVED**	**DETAILS OF REVISION**	**DATE**
					CLEARED							
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ATTACHMENTS

DRAWINGS/DOCS.	**DESCRIPTION**
ANNEXURE-I	: Water Balance Diagram

1.0 INTRODUCTION

Nutan Bidyut (Bangladesh) Ltd intends to build a 225MW capacity combined cycle power plant in BHOLA II adjacent to the existing BHOLA I combined cycle plant of 225MW. BHOLA II, which is awarded to SPINFRA by the Bangladesh Government will be located adjacent to BHOLA I project.

This document provides the design criteria/ basis for raw water pretreatment system for 225 MW CCPP Bhola-II Bangladesh. A brief description and salient feature of the various sub system are defined here for the basis of design.

2.0 FUNCTION

The function of raw water pretreatment system is to treat raw water from canal through pontoon system and supply the clarified water to clarified water storage tank for further distribution to various plant consumptive points like service water, cooling tower make-up, portable water treatment plant, De mineralized plant, fire protection service etc.

3.0 SYSTEM DESCRIPTION

3.1 Pretreatment water system

Raw water from Dehular Khal Canal will be transferred to pretreatment plant by (3x50%) Intake pontoon water pump.

Flow control station at the upstream of Cascade aerator will be provided to control the inlet flow to the PT Plant. Flow control station will consist of one (1) no motorized butterfly valve (inching type) valve with isolation and by-pass arrangement.

From the flow control station raw water will pass through one (1) no cascade aerator to remove dissolved iron and manganese from raw water and then to one(1) no stilling chamber where the turbulence of raw water will be broken. Chlorination of raw water will also be done in the stilling chamber. Both will be suitably designed to handle 100% of total raw water requirements.

Water will flow to Parshall flume for flow measurements then flow to flash mixture. From flash mixture water will flow to clarifiers (2x50%) and each clarifier shall be designed for a total clarified water flow of 225 m^3/hr (rated capacity (186 m^3/hr) with 20% margin). The clarified water from each clarifier will flow through each indivisual channels and then combined to common channel which will finally discharge to clarified water storage tank (twin compartment) for further use. The clarified water storage tank will have an effective storage capacity of twelve (12) hours (8 hrs for plant operation & 4 hrs for fire water dead storage as per NFPA guideline). of clarified water requirement as per finalized water balance diagram.

The sludge from the clarifier collected by gravity into a sludge sump. One number telescopic type continuous bleed and intermittent bleed through valve on sludge line from clarifier to sludge sump shall be provided.

The sludge generated from all the Clarifiers as addressed above will be collected in a Sludge Sump. The sludge pit will have 2x100% air blowers for effective agitation in the sludge pit. Sludge will be pumped from Sludge Sump by means of 2X100% Sludge transfer Pumps to one (1) no. Thickener. The thickened sludge will be stored in Thickened Sludge Sump and from there the thickened sludge will be fed to one (1) no.

Centrifuge located in Raw Water Pretreatment Plant. The Thickener overflow and the centrate will be recycled back to the inlet channel of Stilling Chamber. The wet cake generated from Centrifuge will be disposed by the Owner through Trucks directly from Cetrifuge bottom.

Alum will be dosed as a coagulant to the raw water treatment system. Also , In addition lime dosing will also be done to reduce temporary hardness.

To optimize the consumption of alum and to increase the TSS removal efficiency Polyelectrolyte dosing will also be done in the PT Plant. All chemical will be dosed in flash mixture.

Water required for chemical solution preparation shall be provided from over head tank located at roof of chemical house.

All chemicals required for the entire plant will be stored in the ground floor of a two-storied Chemical House. Chemical house will be there for accommodating both dosing and chemical storage of 15 days storage capacity on continuous and full load basis. Chemicals will be directly unloaded from the trucks and thereafter be stacked in the respective storage space at ground floor by means of electrically operated hoist. However, preparation of chemical solution of Alum, Lime and Polyelectrolyte for injection to raw water shall be carried out in the first floor of the Chemical House. Chemicals will be lifted from ground floor to first floor by means of electrically operated monorail hoists .

A chemical house is located near the clarifier with Alum, Lime, polyelectrolyte dosing systems and Raw Water Chlorination plant. The solution preparation tanks, are on the first floor and space for storage of chemicals are on the ground floor. power supply requirement for PT plant shall be fed and controlled through WTP MCC located in DM plant control building.

The clarified water shall be stored in the clarified water storage tank for various uses in the Power Plant.

All the Pre-Treatment equipments shall be capable of running on 20% overloading.

In the clarified water pump house, following pumps will be installed to facilitate various plant clarified water requirements. In addition to that, fire pumps as per NFPA guidelines will also be installed in the same pump house.

i) 2x 100 % Capacity CT make-up pumps
ii) 3x 100% capacity Clarified water pumps
iii) Fire water pumps (Please refer DBR for Fire Protection and Detection System including any Inert gas systems SP-BCCP-00-C-E-M-130-GR-0001)

The service water requirement (Plant wash and HVAC etc) will be supplied by clarified water pumps. 3 x100% clarified water pumps (1 no. working for DM plant requirements and 1 no. working for Service water requirement and 1 no. common standby for both the system) shall be provided.

A minimum of 500 mm free board will be provided for sumps & RCC channels and 300 mm for atmospheric tanks.

4.0 SYSTEM COMPONENTS

4.1 Pretreatment System

The major components of the Pre-Treatment system are as follows

a. Cascade Aerator

Number of Unit	One (1)
Design Flow, cu.m/hr	Suitable capacity to handle flow requirement to produce clarified water at the rate of 450 m^3/hr (rated capacity with 20% margin)
Design surface flow rate cu.m/sqm/hr	20
MOC	RCC

b. Stilling Chamber

Number of Unit	One (1)
Design Flow, cu.m/hr	Suitable capacity to handle flow requirement to produce clarified water at the rate of 450 m^3/hr
Design residence time, Sec	60
MOC	RCC

c. Parshell flume

Number of Unit	One(1)
Design Flow, each cu.m/hr	Suitable capacity to handle flow requirement to produce clarified water at the rate of 450 m^3/hr
MOC	RCC

d. Flash Mixture

Number of Unit	One(1)
Design Flow, cu.m/hr	Suitable capacity to handle flow requirement to produce clarified water at the rate of 450 m^3/hr
Design residence time, Sec	60
MOC	RCC
Agitator	Turbine type A-C electric motor operated through reduction gear, MOC: SS316

e. Clarifier

Number of Unit	Two (2x50%)
Type	Clarifier
Rated Flow, cu.m/hr	186
Maximum design flow cu.m/hr	225 (rated flow with 20% margin)

Design surface flow rate cu.m/sqm/hr	1.5
Minimum residence time in clarification zone, min	150
Minimum residence time in flocculation zone, min	30
MOC of Rake Mechanism	MS epoxy complete with rubber squeezer
MOC of clarifier	RCC

f. Sludge sump

Number of Unit	One (1) (Twin compartment)
Effective capacity, cu.m	One (1) hour retention based on 3% of inlet raw water flow as clarifier underflow sludge.
MOC	RCC (Epoxy painted internally)

g. Sludge Disposal Pumps

Number of Unit	Two (1W+ 1S)
Type	Vertical sump pumps ,Non Clog type
MOC	Casing:CI, IS 210, Gr FG 260 Impeller : SSCF8M Shaft: SS304

h. Air Blower for Sludge sump

Number of Unit	Two (1W+ 1S)
Type	Centrifugal /Twin Lobe Type
Operation	Intermittent
Capacity & Head	As required
MOC of casing and lobe	CI as per IS 210 FG 260

i. Alum Solution preparation cum dosing tank

Number of Unit	Two(2)
Fluid to handle	10% of Alum solution
Capacity	Eight hours operation of two(2) clarifier set at 20% overloading + water loss through sludge from one clarifiers (Dosing rate of Alum is 20ppm or DDE)
MOC	RCC with internal acid proof tiles

j. Alum Dosing Pumps

Number of Unit	2 (1W+ 1S)
Type	Positive displacement type, Diaphram operated metering pump with stroke adjustment
MOC	All wetted parts: SS-316 Diaphragm: PTFE

k. Polyelectrolyte Solution preparation cum dosing tank

Number of Unit	Two(2)
Fluid to handle	1% of PE solution
Effective retention capacity of each tank	Eight (8) hours (Dosing rate of Polyelectrolyte is 1ppm)
MOC	CSRL

a. Polyelectrolyte Dosing Pumps

Number of Unit	2 (1W+1S) and polymer dosing for thickener
Type	Positive displacement type, Diaphram operated metering pump with stroke adjustment
MOC	All wetted parts: SS-316 Diapharam: PTFE

l. Lime preparation tank tank

Number of Unit	Two(2)
Fluid to handle	10% of lime solution
Effective retention capacity of each tank	Eight (8) hours of operation of two clarifiers each set at 20% overload condition water + water loss through sludge from two clarifier(Dosing rate of Lime is 20ppm or DDE)
MOC	RCC

m. Lime solution cum preparation cum dosing tank

Number of Unit	Two(2)
Fluid to handle	5% of lime solution
Effective retention capacity of each tank	Eight (8) hours of operation of two clarifiers each set at 20% overload water + water loss through sludge from two clarifier
MOC	RCC

n. Lime solution dosing cum recirculation Pumps

Number of Unit	Two(2) (1W + 1S)
Type	Horizontal centrifugal non clog
MOC	CI, IS 210 Gr FG 260 with rubber lined

o. Clarified water storage tank

Number	One (1) Twin compartments
Effective retention capacity	Twelve (12) hours of operation of two clarifiers / plant clarified water requirements including fire dead storage flow
MOC	RCC
Type	Partly above/under ground

p. Thickener

Number	One (1)
Type	Circular (Center Drive Mechanism).
Effective retention capacity	Suitable to handle the sludge in overloading condition with design margin based on suitable sludge consistency.
MOC	RCC
Thickened sludge consistency	(6%) Min
Full bridge	Provided. (MOC: MS with FRP coated)
Scrapper rake	Provided. (MOC: MS with FRP coated)
Torque switch for alarm and for tipping	Provided
Side water depth	As per requirement

q. Centrifuge

Number	One (1)
Type	Variable differential speed control type.
Effective retention capacity	Suitable to handle the sludge in overloading condition with design margin based on suitable sludge consistency.
Sludge consistency	20%

r. Thickened sludge sump

Number	One (1)
Effective retention capacity	One hour storage capacity
MOC	RCC

5.0 SYSTEM BOUNDARY

5.1 The Pretreatment system for 225 MW CCPP starts from the upstream of control station

5.2 The Pretreatment water system will have interfaces with the following systems:

a) Raw water intake pumps.

b) Chlorination plant feeding Stilling chamber.

c) Service and potable water.

6.0 DESIGN CRITERIA AND PERPORMANCE REQUIREMENTS

6.1 Raw Water Analysis

Design quality of raw water for PT Plant is envisaged as follows:

SL. NO.	CONSTITUENT	UNIT	VALUE
1.	Color and odor	-	
2.	Oil and grease	mg/l	
3.	BOD	mg/l	
4.	COD	mg/l	
5.	$KMnO_4$ value at 25^0 C	mg/l	
6.	Suspended solids	mg/l	
7.	Turbidity	NTU	
8.	Calcium hardness as $CaCO_3$	mg/l	
9.	Magnesium hardness as $CaCO_3$	mg/l	
10.	Sodium + Potassium as Na	mg/l	
11.	Chloride as Cl	mg/l	
12.	Sulphate as SO_4	mg/l	
13.	Sulphide as S	mg/l	
14.	M-Alkalinity (HCO_3) as $CaCO_3$	mg/l	
15.	P-Alkalinity as $CaCO_3$	mg/l	
16.	Nitrates as NO_3	mg/l	
17.	Nitrites as NO_2	mg/l	
18.	Silica as SiO_2 – Dissolved	mg/l	
9.	Silica as SiO_2 – Colloidal	mg/l	
20.	Carbon dioxide	mg/l	
21.	Iron as Fe-dissolved	mg/l	
22.	Iron as Fe-suspended	mg/l	

23.	Total dissolved solids	mg/l	
SL. NO.	CONSTITUENT	UNIT	VALUE
24.	Conductivity at 25^0C	μ-mho/cm	
25.	pH at 25^0C	-	
26.	Dissolved oxygen as O_2	mg/l	
27.	Boron as B		
28.	Manganese as Mn		
29.	Heavy metals		
30.	Any other		

6.2 Quality of Treated Water

Design quality of treated water from PT Plant is envisaged as follows:

Turbidity - <15 NTU at normal condition and <20 NTU at overload condition

TSS – 15 ppm

Free residual chlorine – 0.2 to 0.5 ppm as Cl_2.

6.3 Selection of Plant Capacity

The tentative requirement of clarified water will be estimated based on water balance diagram to meet following continuous requirements:

i) Supply to Make up Water to cooling tower

ii) Supply to DM and Potable system

iii) Supply to Service Water

6.4 PIPING DESIGN BASIS.

a. Design Pressure

The design pressure of raw water intake pumps discharge piping is the sum of the pump shutoff head and the maximum suction pressure.

b. Design temperature

The design temperature is equal to the maximum operating temperature rounded up to the next higher 10 deg C increment.

c. Design flow

The design flow for pipe sizing will be based on pump rated flow.

d. Design velocity

Design Velocity of different piping shall be guided by the following table.

Sizes of pipelines shall be selected such that the velocity of fluid in pipes does not exceed the following limits under conditions of maximum possible volumetric flow:

For Water

Pump suction	(0.5 - 1.5) m/s
Pump delivery	(1.5 – 2.5) m/s
Service Water	(0.5 - 1.5) m/s

For Air

Compressed air	15 m/s

Pipelines under gravity flow will be restricted to a flow velocity of 1.0 m / sec. Channels under gravity flow will be sized for a maximum flow velocity of 0.6 m / sec.

e. Pipe Pressure Drop

Pressure drop through the piping, valves and fittings will be derived by using Hazen-William's equation and Technical Paper No. 410 of Crane Company. Frictional drop through the piping, valves and fittings will be based on design flow with 10% margin to achieve total pumping head.

f. Pipe and Valve Material

Please refer -: Doc No : SP-BCCP-00-C-E-M-113-GR-0001

g. Wall thickness & Corrosion allowance

Please refer -: Doc No : SP-BCCP-00-C-E-M-113-GR-0001

h. Physical Requirements

All high points & low points in piping system will be provided with suitable vents and drains respectively along with isolation valves. Material of drain & vent will be as that of parent pipe.

Corrosion protection of underground pipe-work will be done with necessary protective coating & wrapping.

i. Hydro test pressure

All piping shall be subjected to the hydrostatic test pressure as stipulated by relevant applicable standards. Test pressure shall not be less than 1.5 times the Design Pressure

7.0 ELECTRICAL SYSTEM DESCRIPTION

The electrical power supply distribution for Pre-Treatment system shall be envisaged as per 1) Plant Key SLD Doc. No. SP-BCCP-00-C-E-E-200-EG-0002, 2) ELECTRICAL SYSTEM DESIGN BASIS REPORT SP-BCCP-00-CEE-200-GR 0001

8.0 INSTRUMENTATION AND CONTROL

The instrumentation and control (I&C) system envisaged for PT Plant is designed for safe, reliable, efficient and easy operation of PT plant and its associated auxiliaries. The I&C system permits operation of the entire PT plant from the DM Plant PLC located in the DM Plant control room.

PT plant supplied shall provide all necessary inputs to the DM plant supplier for the implementation of the PT plant control / protection / interlock in the DM plant PLC.

Please refer to the DM plant PLC details as specified in the DBR of DM plant system. DM Plant PLC system shall be capable of carrying out the functions of PT Plant measurement system, control system, protection and interlock system.

PT plant supplier shall specify the UPS and Non-UPS load requirement to the DM Plant supplier for considering the total load in the DM Plant UPS.

Specific Instrumentation & Control:

Storage Tanks shall be equipped with necessary Level Transmitter, Switches, gauges etc.

Dosing Pumps shall be provided with the auto stroke controllers and dose the chemicals proportionately according to the flow and Analyzer value.

All interlocks, protection, sequencing and feedback signals associated with motors for the PT plant system will be processed in the DM Plant PLC. DM Plant PLC shall issue control command to the MCC / SWGR via interposing relays.

Field instruments / PLC system features / PLC interfaces to main DCS etc. please refer to Design Criteria For Instrumentation & Control Doc. SP – BCCP–00–CEN–419–GR–0001.

All electrical I/Os required for electrical controls are hardwired only. Please refer to the drive typical interface document SP-BCCP-00-CEN-401-IJ-0001.

9.0 REFERENCE DOCUMENTS

- Water Balance Diagram
- Design Basis Report for Dematerialized Water Treatment Plant
- Design Basis Report for CW treatment and Chemical Injections skids

PROJECT:	**225 MW BHOLA COMBINED CYCLED POWER PROJECT AT BHOLA, BANGLADESH.**
OWNER:	**NUTAN BIDYUT (BANGLADESH) LIMITED**
ENGINEERING CONSULTANT (EC):	**TATA CONSULTING ENGINEERS LIMITED**
CONTRACTOR:	
DOCUMENT TITLE:	**DESIGN BASIS REPORT FOR DEMINERALISED WATER SYSTEM**
SP DOCUMENT NUMBER:	**SP-BCCP-00-C-E-M-118-GR-0001**
EC DOCUMENT NUMBER:	

REVISION STATUS

	SIGN											
	INITIALS											
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					CLEARED							
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ATTACHMENTS

DRAWINGS/DOCS.	**DESCRIPTION**
ANNEXURE-I	: Water Balance Diagram

1.0 INTRODUCTION

SPINFRA intends to build a 225MW capacity combined cycle power plant in BHOLA II adjacent to the existing BHOLA I combined cycle plant of 225MW. BHOLA II which has been awarded to SPINFRA by the Bangladesh Government will be located on a 12 Acre plot of land adjacent to BHOLA I project.

This document provides the design criteria/ basis for Demineralization water system for 1 x 225 MW Thermal Power Station Bhola-II Bangladesh. A brief description and salient feature of the various sub- system are defined here for the basis of design.

2.0 FUNCTION

The function of Demineralization system is to treat the clarified water, transferred from Clarified water storage tank through Clarified water Pumps, and produce boiler quality De-mineralized water required as make-up to HRSG and make-up water other miscellaneous consumer points such as for GT/ST area, Chemical feed system etc.

3.0 SYSTEM DESCRIPTION

3.1 Demineralized water system

Clarified water Pumps will supply the clarified water from clarified water storage tank to the DM Plant through filtration plant for producing DM water to cater to the requirement for the proposed unit.

Clarified water will be first fed to the Dual Media Filters (DMF) to remove suspended solids followed by Activated Carbon Filters (ACF) to remove the residual chlorine present in the water. Backwashing of DMF will be done by backwash tank (overhead) located at the roof of DM plant building. ACF backwash will be done by reversal of flow of DMF filtered water. The outlet water from ACF will first pass through Strongly Acidic Cation Exchanger (SAC) where cations will be replaced by hydrogen ions associated with the resin. On exhaustion, SAC unit will be regenerated in counter current mode with Hydrochloric acid (HCl).

Process water from SAC will then pass through Degasser Tower (DGT). In DG Tower, water will be allowed to fall through packed bed from top and air will be blown (by blowers) from the bottom. As a result, the unstable carbonic acid will be stripped into CO2 and same will be vented out from the top. Water from Degasser Tower will be collected to the Degassed Water Storage Tank by gravity. Degassed water from Degassed Water Storage Tank will be pumped to the Strongly Basic Anion Exchangers (SBA) for further exchange of anions. Resins in Strongly Basic Anion Exchangers will exchange remaining Chloride, Carbon dioxide, Reactive Silica etc. with hydroxyl ions. On exhaustion, Strongly Basic Anion Exchanger unit will be regenerated in counter current mode with Sodium Hydroxide (NaOH). SBA outlet process water will then pass through the Mixed Bed Exchangers.

The Mixed Bed (MB) Exchanger contains both strongly acidic cation and strongly basic anion resins. Any slip of cations / anions will be exchanged and removed in Mixed Bed Exchanger, which acts as polisher. On exhaustion, Mixed Bed Exchanger will be regenerated using Hydrochloric acid and Sodium Hydroxide for its respective resin bed. For regeneration of SAC, water will be supplied from Degassed water storage tank

and for regeneration of SBA & Mixed Bed, water will be supplied from DM water storage tank. After MB, the DM water, thus produced will be stored in DM Water Storage Tanks (2 nos.). The net capacity of each DM water storage tank shall be minimum 350 cu.m.

Cation & anion exchangers will be designed for 18 hours of operation cycle followed by 6 hours regeneration cycle in a day of 24 hours. Mixed Bed will be regenerated after 144 hours of operation. All regeneration wastes and other drainages from Ion Exchange Units will be led to Neutralization Pit which will be divided into two compartments and each compartment will be capable to hold regeneration effluent generated from one (1) complete chain (DM) plus 20% margin. The neutralized waste effluent from the neutralization pit will be pumped by means of neutralized effluent disposal pump to guard pond after necessary pH correction. The backwash water from DMF and ACF will be collected in neutralization pit and will be pumped to the guard pond.

The regeneration facilities as envisaged for Ion Exchange Units are as follows:

- Acid Unloading System through Acid Unloading Pumps, Acid Storage Tanks, Measuring Tanks, hydraulic ejector systems etc. for regeneration of Cation Resins. Cation resins will be regenerated by HCl acid (available in 30% W/W).

- Alkali Unloading System through Caustic Unloading Pumps, Caustic Storage Tanks, Brine Preparation tank, Measuring Tanks with heating system, hydraulic ejector systems etc. for regeneration of Anion Resins.

- All chemicals will be as per the requirements of technical grade as per relevant Indian Standard. The water after demineralization will be stored in DM water storage tanks for further distribution to meet the DM water requirement of the plant.

4.0 SYSTEM COMPONENTS

4.1 Demineralised System

The major components of the Demineralised system are as follows

a. Pressure Vessels

Description	**Dual Media Filter**	**Activated Carbon Filter**	**Strong Acid Cation Exchanger**	**Strong Base Anion Exchanger**	**Mixed Bed Exchanger**
Number of unit	Two (2)	Two (2)	Two (2)	Two (2)	Two (2)
Design filtration rate per unit, cum/sq.m /hr	10	15	40	40	40
Design inlet suspended solids	20 ppm .	Not more than 1ppm	NA	NA	NA
Design pressure in $kg/cm^2(g)$	Design pressures should be the maximum expected pressure to which the vessel may be subjected plus 5% extra margin. Maximum expected pressure for a vessel placed in the discharge line of a pump shall be based on the shut-off head of the pump plus static head at pump suction, if any				
Design code	ASME SEC-VIII-DIV-I/ IS-2825				
Hydro Test Pressure	Test pressure shall not be less than 1.5 times of design pressure				
MOC	MS Epoxy	MS Epoxy	MSRL	MSRL	MSRL
Percentage free-board	80%	80%	80%	100%	100%
Design flow, cum/hr	15 (net)	15 (net)	15 (net)	15 (net)	15 (net)

b. Degasser Tower

Number required	Two (2) nos. (mounted on Degassed Water Storage Tank)
Type	Vertical cylindrical forced draft type packed tower
Design capacity,	cum/hr 15 (Net)
MOC	MSRL

c. Degasser Storage Tank

Number required	One (1)
Type	Vertical Cylindrical with roof
Effective capacity 20% margin	Suitable to hold downstream requirement of water for two (2) nos. DM Chain for 1 hr. + water requirement for regeneration of one **(**1) no. DM Stream + overall 20% margin.

MOC	MSRL

d. Miscellaneous Tanks for Acid

	Bulk Acid Storage Tank	**Acid Measuring Tank For Strong Acid Cation Exchangers**	**Acid Measuring Tank For Mixed Bed Exchangers**	**Acid Measuring Tank For Neutralization Pit**
Number required	Two(2)	Two(2)	One(1)	One(1)
Type	Horizontal cylindrical with dished ends, over-ground	Vertical cylindrical with flat bottom, overground	Vertical cylindrical with flat bottom, over- ground	Vertical cylindrical with flat bottom, over- ground
Type of fluid to be handled	30 - 33 % Hydrochloric Acid	30 - 33 % Hydrochloric Acid	30 - 33 % Hydrochloric Acid	30 - 33 % Hydrochloric Acid
Effective capacity	Adequate to hold the quantity required for twenty one (21) days of operation of the plant at full load plus 20% margin.or one tanker capacity of 10 tons whichever is higher	Adequate to hold 120% of the quantity of regenerant acid required for a single regeneration of a Strong Cation Exchanger	Adequate to hold 120% of the quantity of regenerant required for single regeneration of a Mixed Bed Exchanger	Suitable to meet the requirements for neutralization of excess alkali present in regeneration waste effluent plus 20% margin
MOC	MSRL	MSRL	MSRL	MSRL

e. Miscellaneous Tanks for Alkali

	Bulk Caustic Storage Tank	**Caustic Measuring Tank For Strongly Basic Anion Exchangers**	**Caustic Measuring Tank For Mixed Bed Exchangers**	**Caustic Measuring Tank For Neutralization**
Number required	Two(2)	Two(2)	One(1)	One(1)
Type	Horizontal cylindrical with dished ends, over-ground	Vertical cylindrical with flat bottom, over ground	Vertical cylindrical with flat bottom, over-ground	Vertical cylindrical with flat bottom, over ground
Type of fluid to be handled	40 - 48 % Caustic	40 - 48 % Caustic	40 - 48 % Caustic	40 - 48 % Caustic
Effective capacity	Adequate to hold the quantity required for twenty one (21) days of operation of the plant at full load plus 20% margin. or one tanker capacity of 10 tons whichever is higher	Adequate to hold 120% of the quantity of regenerant required for single regeneration of SBA	Adequate to hold 120% of the quantity of regenerant required for single regeneration of a Mixed Bed Exchanger	Suitable to meet The requirements For neutralization of excess acid present in regeneration waste effluent plus 20% margin.
MOC	MSRL	MSRL	MSRL	MSRL

f. Pumps

	Number required	**Type**	**MOC**		
			Casing	Impeller	Shaft
Degassed Water Pump	Three (1W+1S)	Horizontal Centrifugal	SS-316	SS-316	SS-316
Acid unloading	Two (1W+1S)	Horizontal Centrifugal	PP	PP	EN-8, PP lined

Pump		(Non-clog type)			
Caustic unloading Pump Horizontal	Two (1W+1S)	Centrifugal (Non-clog type)	SS-316	SS-316	SS-316
Neutralized Effluent Disposal Pump	Four (1W+1S)	Horizontal Centrifugal/ Vertical Centrifugal (Non-clog type	SS-316	SS-316	SS-316
DM Plant Regeneration Water Pump	Two (1W+1S)	Horizontal Centrifugal	SS-316	SS-316	SS-316
Back wash Waste water transfer pump	Two (1W+1S)	Horizontal / vertical Centrifugal (Non-clog type)	CI - IS 210 FG 260	FG 260	SS-316

g. Neutralization Pit

Numbers Provided	One (1) with two (2) compartments
Location	Outdoor
Type	Underground and rectangular
Effective Capacity of each compartment	Suitable to hold waste effluent generated on one (1) complete chain plus plus 20% margin.
MOC	RCC with Acid / Alkali Proof tiles lining

h. Backwash Water Overhead Tank

Numbers Provided	One (1)
Location	Roof of DM Plant Building
Type	Rectangular
Effective Capacity	Suitable to hold the quantity required for a single backwash for one no. DMF of DM Plant + a single backwash for one no + 20% overall margin.
MOC	RCC

i. Filter Backwash Wastewater Collection Sump

Numbers Provided	One (1)
Location	Outdoor
Type	Underground and rectangular
Effective Capacity	Suitable to hold the quantity required for a single backwash for one no DMF of DM

	Plant with 20% margin.
MOC	RCC

j. Miscellaneous Tanks

	Alkaline Brine Solution	Hot water tank
Number required	One (1)	One (1)
Type	Vertical, cylindrical with flat bottom	Vertical, cylindrical with dished ends
Type of fluid to be handled	Alkaline brine solution	SBA treated water

5.0 SYSTEM BOUNDARY

5.1 The demineralised water system for 1x 225 MW unit starts from the upstream of filtration plant.

5.2 The demineralised water system will have interfaces with the following systems:

a) Alkali /Acid dosing.

b) Service and potable water.

6.0 DESIGN BASIS AND PERPORMANCE REQUIREMENTS

6.1 Clarified Water Analysis

Design quality of Clarified water for DM Plant is envisaged as follows:

SL. NO.	CONSTITUENT	UNIT	VALUE
1.	Color and odor	-	Later
2.	Oil and grease	mg/l	Later
3.	BOD	mg/l	Later
4.	COD	mg/l	Later
5.	$KMnO_4$ value at 25^0 C	mg/l	Later
6.	Suspended solids	mg/l	15
7.	Turbidity	NTU	15
8.	Calcium hardness as $CaCO_3$	mg/l	Later
9.	Magnesium hardness as $CaCO_3$	mg/l	Later
10.	Sodium + Potassium	mg/l	Later

	as Na		
11.	Chloride as Cl	mg/l	Later
12.	Sulphate as SO_4	mg/l	Later
13.	Sulphide as S	mg/l	Later
14.	M-Alkalinity (HCO_3) as $CaCO_3$	mg/l	Later
15.	P-Alkalinity as $CaCO_3$	mg/l	Later
16.	Nitrates as NO_3	mg/l	Later
17.	Nitrites as NO_2	mg/l	Later
18.	Silica as SiO_2 – Dissolved	mg/l	Later
19.	Silica as SiO_2 – Colloidal	mg/l	Later
20.	Carbon dioxide	mg/l	Later
21.	Iron as Fe-dissolved	mg/l	Later
22.	Iron as Fe-suspended	mg/l	Later
23.	Total dissolved solids	mg/l	Later
24.	Conductivity at 25^0C	μ-mho/cm	Later
25.	pH at 25^0C	-	Later
26.	Dissolved oxygen as O_2	mg/l	Later
27.	Boron as B		Later
28.	Manganese as Mn		Later
29.	Heavy metals		Later
30.	Any other		Later

6.2 Quality of Treated Water

Design Quality of treated water from ACF, all ion exchange units of DM Plant is envisaged as follows

Unit / Equipment	Parameters	Outlet Quality
DMF	Suspended solids	Less than 1.0 ppm (for inlet TSS of 20 ppm)
ACF	Residual Chlorine	Nil
SAC	a) Sodium	<1.0 ppm as CaCO3

	b) Hardness	Not Detectable
Degasser	CO_2 content	< 5 ppm as CO_2
SBA	a) Reactive	SiO_2 < 0.1 ppm as SiO_2
	b) Conductivity	< 5.0 micro mho/cm at 25 deg C
Mixed Bed	a) Conductivity	≤ 0.1 micro mho/cm at 25°C
	b) pH	7.0 + 0.2 at 25°C
	c) Reactive	Silica ≤ 0.01 ppm (max.) as SiO_2
	d) Colloidal	Silica ≤ 0.01 ppm (max.) as SiO_2

6.3 Selection of Plant Capacity

The basic functions of proposed DM Plant are to meet the requirements of the followings:

i) Make up water to Power Cycle is considered 3% of steam flow at 100% BMCR condition for the units continuous operation.

ii) Other miscellaneous DM water requirement are as follows:

- Closed cycle cooling water system makeup
- Chemical feed system

To produce the above quantity of DM water, 2nos. DM plant stream (2 x 100%) has been considered for the unit. The net capacity of each stream is 15 cu.m/hr. Each stream will have eighteen (18) hours service cycle and six (6) hrs. regeneration cycle.

The DM plant will consist of:

i) 3 nos. Clarified water pumps, each complete with electric drive motor
ii) 2 nos. Dual Media Filters
iii) 2 nos. Air blowers for DMF units of DM plant, each complete with electric drive motor
iv) 2 nos. Activated Carbon Filters
v) 1 no. Overhead backwash storage tank for DMF of DM plant
vi) 2 nos. Strongly acidic cation exchangers
vii) 2 nos. Degasser towers [Common tank]
viii) 3 nos. Degassed water transfer pumps, each complete with electric drive motor
ix) 4 nos. Degasser blowers, each complete with electric drive motor
x) 1 nos. Degassed water storage tank
xi) 2 nos. Strongly basic anion exchangers
xii) 2 nos. Mixed bed exchangers
xiii) 2 nos. Air blowers for Mixed Bed exchanger units (common for Neutralization Pit) , each complete with electric drive motor
xiv) 2 nos. hose stations for unloading Hydrochloric Acid
xv) 2 nos. Acid transfer pumps, each complete with electric drive motor
xvi) 2 nos. Bulk Acid storage tank
xvii) 2 nos. Acid measuring tanks for Cation Exchangers
xviii) 1 nos. Acid measuring tank for Mixed Bed Exchanger
xix) 2 nos. hose stations for unloading Caustic
xx) 2 nos. Caustic transfer pumps, each complete with electric drive motor

xxi) 2 nos. Bulk Caustic storage tank
xxii) 2 nos. Caustic measuring tanks for Anion Exchangers
xxiii) 1 nos. Caustic measuring tank for Mixed Bed Exchanger
xxiv) 1 no. Brine Preparation Tank
xxv) 1 no. Regeneration water heater for regeneration of anion resins
xxvi) 2 nos. Regeneration Water pumps , each complete with electric drive motor
xxvii) 1 nos. Caustic measuring tanks for neutralization pit
xxviii) 1 nos. Acid measuring tanks for neutralization pit
xxix) 1 no. Neutralization pit (with two compartment)
xxx) 2 nos. Neutralized Effluent Disposal pumps, each with complete electric drive
xxxi) 2 nos. safety shower
xxxii) 1 no. Instrument air receiver for suitable capacity
xxxiii) 1 no. Central sampling Rack
xxxiv) All integral and interconnected pipe works, valves, sump, gates, all type of pipe supports, pipe and cable rack, pipe and cable bridges, etc. for the entire Demineralization Plant
xxxv) First fill of filter media, resin, and degasser tower packings for all the units complete with make-up filter media, resin and packings for first three years of operation. Quantity of make-up resins shall be calculated on the basis of 3% and 5% attrition loss per annum for cation and anion resin respectively. For filter make-up a loss of 10% per annum shall be considered.

6.4 PIPING DESIGN BASIS.

a. Design Pressure

Suction: The maximum operating pressure in the pipe upstream of the pumps is based on atmospheric pressure in the clarified water storage tank plus the static head from the clarified water storage tank overflow pipe connection and the centerline of the pump(s). The design pressure of the pipe upstream of the pumps is a minimum of 20% higher than such maximum operating pressure.

Discharge: The design pressure of pumps discharge piping is the sum of the pump shutoff head and the maximum suction pressure.

b. Design temperature

The design temperature is equal to the maximum operating temperature rounded up to the next higher 10 deg C increment.

c. Design flow

The design flow for pipe sizing will be based on pump rated flow.

d. Design velocity

Design Velocity of different piping shall be guided by the following table.

Sizes of pipelines shall be selected such that the velocity of fluid in pipes does not exceed the following limits under conditions of maximum possible volumetric flow:

i. For Water

Pump suction	1.5 m/s
Pump delivery	3.0 m/s
Service Water	1.5 m/s

ii. For Air

Compressed air	15 m/s

Pipelines under gravity flow will be restricted to a flow velocity of 1.0 m / sec. Channels under gravity flow will be sized for a maximum flow velocity of 0.6 m / sec.

e. Pipe Pressure Drop

Pressure drop through the piping, valves and fittings will be derived by using Hazen-William's equation and Technical Paper No. 410 of Crane Company. Frictional drop through the piping, valves and fittings will be based on design flow with 10% margin to achieve total pumping head.

f. Pipe and Valve Material

Please refer -: Doc No : SP-BCCP-00-C-E-M-113-GR-0001

g. Wall thickness & Corrosion allowance

Please refer -: Doc No : SP-BCCP-00-C-E-M-113-GR-0001

h. Physical Requirements

All high points & low points in piping system will be provided with suitable vents and drains respectively along with isolation valves. Material of drain & vent will be as that of parent pipe.

Corrosion protection of underground pipe-work will be done with necessary protective coating & wrapping.

i. Hydro test pressure

All piping shall be subjected to the hydrostatic test pressure as stipulated by relevant applicable standards. Test pressure shall not be less than 1.5 times the Design Pressure

7.0 ELECTRICAL SYSTEM DESCRIPTION

The electrical power supply distribution for Pre-Treatment system shall be envisaged as per Plant Key SLD Doc. No. SP-BCCP-00-C-E-E-200-EG-0002.

8.0 INSTRUMENTATION AND CONTROL

The instrumentation and control (I&C) system envisaged for DM Plant is designed for safe, reliable, efficient and easy operation of DM plant and its associated auxiliaries. The I&C system permits operation of the entire DM plant from the DM Plant control room.

Operation, monitoring & control of complete Plant water system shall be achieved in DM plant PLC.

Dm Plant PLC system shall be capable of carrying out the functions of measurement system, control system, protection and interlock system and communication system.

The system shall be complete with hardware and software along with the Man Machine Interface (MMI) (1 nos. Of Operator Station & 1 no. of Engineering station & 1 nos. of A4 laser colour printer) capable of operating together as an integrated system along with panels, cables, control desk, cabinets to perform the various functions of the above system as specified.

Dedicated Uninterruptible power supply system (UPS System) shall cater to the complete instrumentation and control system loads of Plant water system (including DM plant). The UPS shall be sized considering full load plus 25% margin for Purchasers loads if any.

The instrumentation and control system envisaged includes the following and all other required items:

- Open Loop control system.
- Analog and binary data acquisition system.
- Control desk with other furniture.
- UPS Power supply system with distribution.
- Cables (prefabricated cables, Ethernet cable, fibre optic cable, remote I/O bus).
- System cabinets, marshalling cabinets.

Specific Instrumentation & Control:

Inlet and outlet pressure indicators for vessels and discharge pressure indicators for various pumps. Inlet (rate of) flow indicators and outlet flow totalizers. Flow switches at filter outlet, conductivity comparator at cation outlet. Density indicators for regenerant chemical solutions.

All the tanks for e.g. storage Tank, alkaline, Acid, Permeate Water, measuring etc. shall be equipped with necessary Level Transmitter, Switches, gauges etc.

Dosing Pumps shall be provided with the auto stroke controllers and dose the chemicals proportionately according to the flow and Analyzer value.

All interlocks, protection, sequencing and feedback signals associated with motors will be processed in the PLC. PLC shall issue control command to the MCC / SWGR via interposing relays.

Field instruments / PLC system features / PLC interfaces to main DCS etc. please refer to Design Criteria For Instrumentation & Control Doc. SP – BCCP–00–CEN–419–GR–0001.

All electrical I/Os required for electrical controls are hardwired only. Please refer to the drive typical interface document SP-BCCP-00-CEN-401-IJ-0001.

Criteria For Instrumentation & Control Doc. SP – BCCP–00–CEN–419–GR–0001.

9.0 REFERENCE DOCUMENTS

- Water Balance Diagram
- Design Criteria for CW Chlorination & Treatment System

PROJECT:	**225 MW BHOLA COMBINED CYCLED POWER PROJECT AT BHOLA, BANGLADESH.**
OWNER:	**NUTAN BIDYUT (BANGLADESH) LIMITED**
ENGINEERING CONSULTANT (EC):	**TATA CONSULTING ENGINEERS LIMITED**
CONTRACTOR:	
DOCUMENT TITLE:	**DESIGN BASIS REPORT FOR EFFLUENT TREATMENT PLANT**
SP DOCUMENT NUMBER:	**SP-BCCP-00-C-E-M-119-GR-0001**
EC DOCUMENT NUMBER:	

REVISION STATUS

	SIGN											
	INITIALS											
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	INITIALS	MS	MSN	JNR								30-08-2016
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ATTACHMENTS

DRAWINGS/DOCS.	**DESCRIPTION**
ANNEXURE-I	: Water Balance Diagram

1.0 INTRODUCTION

SPINFRA intends to build a 225MW capacity combined cycle power plant in BHOLA II adjacent to the existing BHOLA I combined cycle plant of 225MW. BHOLA II which has been awarded to SPINFRA by the Bangladesh Government will be located on a plot of land adjacent to BHOLA I project.

This document provides the design criteria/ basis for effluent treatment plant for 225 MW CCPP Bhola II Bangladesh. A brief description and salient feature of the various sub system are defined here for the basis of design.

2.0 FUNCTION

All the wastewater generated at various facilities within the plant will be segregated at the source of generation according to their type. Similar type of waste water will be collected at one point before treatment and then treated to meet the requirements for disposal.

The effluent discharge from the Effluent Treatment Plant (ETP) shall comply with the latest requirements specified by the IFC guidelines and the latest stipulation as laid by State & Central Pollution Control Board of Bangladesh.

3.0 SYSTEM DESCRIPTION

3.1 Cooling Tower Blow Down (CTBD)

Cooling tower blow down water will be provided from the cold discharge header of CW pump of the CW system before condenser. Cooling tower blow down shall be directly collected in a guard pond.

3.2 Sludge from PT Plant

The sludge from the clarifier collected by gravity into a sludge sump. One number telescopic type through valve on sludge line from clarifier to sludge sump shall be provided.

The sludge generated from Clarifiers as addressed above will be collected in a Sludge pit. Sludge will be pumped from Sludge pit by means of 2X100% PT Sludge transfer Pumps to one (1) no Thickener. The thickened sludge will be stored in Thickened Sludge Sump and from there the thickened sludge will be fed to one (1) nos Centrifuge located through thickened sludge transfer pump. The Thickener overflow and the centrate will be recycled back to the inlet channel of Stilling Chamber. The wet cake generated from Centrifuge will be disposed by the Owner through Trucks directly from Cetrifuge bottom.

3.3 Side Stream Filtration Waste

The backwash waste water contain mainly suspended solids shall be collected in a SSF Waste sump within the SSF area. The SSF backwash waste collection sump shall be suitable to handle SSF backwash flow at a time. This effluent will then be pumped by 2x100% capacity SSF Backwash Waste Transfer Pumps to Guard Pond.

3.4 Backwash waste water from filters for DM plant Water system

The water treatment plant waste (filter backwash of DM Plant) contains suspended particles in high concentration. These effluents will be collected in neutralization pit & will be sent to a guard pond by 2x100% N-pit Transfer Pumps.

Also Waste from chlorination plant, Acid & Alkali dosing from tanks area will led to N-Pit

3.5 HRSG Blow down Water

HRSG blow down Water from the HRSG sump will be quenched with service water for bringing down the temperature to acceptable degree and the same shall be discharge in cooling tower basin by 2x100% HRSG Blow down transfer pump.

3.6 Transformer Yard oily waste (Burnt Oil)

Oily waste from Transformer yard pit (Burnt Oil Collection pit) shall be pumped by 2 x 100% burnt oil pit dewatering pump to common oil collection pit. One no. Corrugated Plate Interceptor (CPI) type Oil-Water Separator (OWS) (1x100%) shall be provided to remove oil and sludge from the water.

In OWS, sludge will be separated at bottom and oil / grease at the top. The separated oil in the OWS will be collected in the slop oil tank (1 cum capacity) for final disposal by Owner. The sludge generated in the OWS will be collected in the trolley and will be disposed by manually. Clean water from the OWS will be led to guard pond.

3.7 Fuel Oil Unloading, Storage & Pump House Area Effluent

The oily water sump located in fuel oil area will collect oil and water mixture from floor washing of pump house, surface run off water from unloading area, and minor oil leakages from tank or during tanker unloading. This oil water mixture from the oily water sump will be pumped by 2x100% capacity pumps to common oily waste common collection pit.

3.8 GTG, STG & HRSG area oily and wash water effluent drain

The wash oily water from GTG & STG area, HRSG Area waste shall be collected in a common oil collection pit for further treatment to remove oil and sludge by oil water separator. Clean water from OWS will be led to guard pond.

3.9 Guard Pond

All the effluent as described above from the guard pond to be pumped to 1 x 100% Lamella Clarifier for the clarification of the waste water to reduce the suspended solids to the acceptable limit as per IFC guidelines. Necessary chemical dosing will also be done to the guard pond. Sludge from clarifier will be disposed to PT plant common sludge pit.

4.0 SYSTEM COMPONENTS

4.1 Effluent Treatment Plant (Major System Component)

S. No.	Description	Units	Parameter
A1	**Waste Water from Fuel Oil Pump House & Unloading Area**		
i)	Sump pit	Nos.	1
ii)	Effective capacity	M3	4
iii)	Material of Const.		RCC
iv)	Location		Outside the ETP battery limit
A2	**Fuel Oil Area waste Transfer Pumps**		
i)	Numbers Required	Nos.	2X100%
ii)	Type		Vertical Centrifugal Impeller – semi-open.
III)	Type of Fluid		Fuel Oil & Water Mixture
iv)	Rated Flow	M3/hr	2
v)	Head	MWC	As per requirement
VI)	Service		Intermittent
VII)	**MOC** Casing – 2% Ni Cast Iron Line shaft- SS-304 Pump shaft – SS-304 Impeller – SS-316 Base plate - MS to IS 2062 Gr. B with Epoxy Paint		
B1	**STG &GTG(1&2) Area Oily Waste water Sump**		
i)	Sump pit (For each)	Nos.	1
ii)	Effective capacity	M3	2
iii)	MOC		RCC
iv)	Location		Outside the ETP battery limit
B2	**STG & GTG (1&2) Area Oily Waste Collection Pit-1 Dewatering Pump**		
i)	Numbers Required (For each)	Nos.	2X 100%
ii)	Type		Vertical Centrifugal Impeller – semi open.
iii)	Type of Fluid		Oily Waste Water
iv)	Rated Flow	M3/hr	2
v)	Head	MWC	Later
VI)	Service		Intermittent

vii)	**MOC** Casing – 2% Ni Cast Iron Line shaft- SS-304 Pump shaft – SS-304 Impeller – SS-316 Base plate - MS to IS 2062 Gr. B with Epoxy Paint		
C1	**HRSG-(1&2) Blow down sump**		
i)	Sump pit (Each HRSG)	Nos.	One(1)
ii)	Effective capacity (Each HRSG)	M3	20
iii)	MOC		RCC
iv)	Location		Outside the ETP battery limit
C2	**HRSG (1&2) Sump Transfer Pumps**		
i)	Numbers Required (For each)	Nos.	2 x 100%
ii)	Type		Vertical Centrifugal Impeller – semi open
iii)	Type of Fluid		Blow down water
iv)	Rated Flow	M3/hr	20
v)	Head	MWC	Later
v I)	Service		Intermittent
VII)	**MOC** Casing – 2% Ni Cast Iron Line shaft- SS-304 Pump shaft – SS-304 Impeller – SS-316 Base plate - MS to IS 2062 Gr. B with Epoxy Paint		
D1	**HRSG (1&2) Area floor wash & oily waste**		
I)	Sump pit (For each)	Nos.	1
ii)	Effective capacity	M3	2
iii)	Material of Const.		RCC
iv)	Location		Outside the ETP battery limit
D2	**HRSG (1&2) Area floor wash sump Dewatering Pumps**		
i)	Numbers Required (For each)	Nos.	2 x100%
ii)	Type		Vertical Centrifugal Impeller – semi open
iii)	Type of Fluid		Oily waste water
iv)	Rated Flow	M3/hr	2
v)	Head	MWC	Later
vi)	Service		Intermittent
vii)	**MOC** Casing – 2% Ni Cast Iron Line shaft- SS 316. Pump shaft– SS 316.		

	Impeller – SS-316. Base plate - MS to IS 2062 Gr. B with Epoxy Paint.		
E1	**Transformer Yard (1&2) Area Sump**		
i)	Sump Pit (For each)	Nos.	1
ii)	Effective capacity	M3	50
iii)	MOC		RCC
iv)	Location		Outside the ETP battery limit
E2	**Transformer Area (Burnt Oil pit dewatering pump)**		
i)	Number of pumps	Nos.	2 X 100%
ii)	Type of Pumps		Vertical Centrifugal Impeller – semi open.
iii)	Type of Fluid		Oily waste water
iv)	Capacity of each pump	M3/hr	6
iv)	Head	MWC	As per requirement
vi	**Service**		Intermittent
vii)	**MOC** Casing – CI to IS 210 Gr.260 Line shaft- Duplex stainless steel AISI type 410. Pump shaft– Duplex stainless steel AISI type 410. Shaft Sleeve- SS 304. Impeller – SS-316. Base plate - MS to IS 2062 Gr. B with Epoxy Paint.		
F	**TPI Oil Water Seperator**		
i)	Numbers Required	Nos.	1
ii)	Type		Circular / rectangular of Steel construction & with plate separation zone
iii)	Location		Outside
iv)	Effective capacity	M3/hr	10
v)	Slop Oil Tank-TPI Separator		1 No. HDPE of 1m3 Capacity
G1	**Common GT Wash Water Collection Pit (1&2)**		
i)	Sump pit (For each)	Nos.	1
ii)	Effective capacity	M3	8
iii)	MOC		RCC
iv)	Location		Outside the ETP battery limit

G2	**Common GT Wash Water Collection Pit (1&2) Dewatering Pump**		
i)	Number of pumps (For each)	Nos.	2X 100%
ii)	Type of Pumps		Vertical Centrifugal Impeller – semi open
iii)	Fluid handled		Wash water
iv)	Capacity of each pump	M3/hr	4
v)	Head	MWC	As per Process Requirements
vi)	**Service**		Intermittent
vii)	**MOC** Casing – 2% Ni Cast Iron Line shaft- SS-304 Pump shaft – SS-304 Impeller – SS-316 Base plate - MS to IS 2062 Gr. B with Epoxy Paint		
H1	**Guard Pond**		
i)	Numbers	Nos.	(1) One in two compartments
ii)	Type		Underground
iii)	Capacity	Cu.M	500
iv)	MOC		RCC
H2	**Guard Pond Effluent Transfer Pumps**		
i)	Number of pumps	Nos.	2
ii)	Type of Pumps		Vertical Centrifugal Impeller – semi open
iii)	Fluid handled		Effluent waste
iv)	Capacity of each pump	M3/hr	90
v)	Head	MWC	Bidder to decide
vi	**Service**		Intermittent
vii)	**MOC** Casing - CI to IS 210 Gr. 260 Line shaft - Duplex SS 410 Impeller – SS 316 Pump shaft – - Duplex SS 410 Base plate - MS to IS 2062 Gr. B with Epoxy Paint		
I	**Measuring Tanks**		Acid | Alkali
i)	Type		Vertical
ii)	Useful capacity of each tank	M3	1.0
J	**Lamella Clarifier**		
i)	Number required	No.	One (1)
ii)	Distance between successive plates/tubes	Cum/hr	As per manufacturer design
iii)	Angle of inclination	NTU	50 – 80 degree.
K	**ETP clarified storage tank**		
i)	Numbers Required	Nos.	1
ii)	Effective capacity	M3	Later
iii)	Material of Const.		RCC

5.0 SYSTEM BOUNDARY

5.1 The guard pond will have a interface with following system.

- All plant wash water and oily water system
- CW blow down water
- N-pit waste water
- SSF backwash water

6.0 DESIGN BASIS AND PERPORMANCE REQUIREMENTS

6.1 System capacity

The ETP will be designed to treat the Plant effluent with the capacity based on the Final Water Balance Diagram during detail engineering.

Wastewater will be generated mainly from the following sources:

 Oily waste water from following areas:

- HRSG Blow down.
- HRSG Area Floor Wash waste.
- Service water waste from GTG area.
- Service water waste from STG area.
- Transformer Yard oily waste (Burnt Oil).
- GT wash water.

 Process waste water from following areas:

- N-Pit waste from DM Plant.
- Chemical House and Chemical Laboratory Waste
- Steam water analysis system (SWAS) drain
- Side stream filter backwash
- Cooling tower blow down
- HRSG blow down
- Pre-treatment Plant and DM Plant Filter Backwash Sludge

6.2 Quality of Treated Water

The final treated effluent from the ETP shall comply with the requirements specified by IFC guideline and latest stipulation as laid by State & Central Pollution Control Board for the Bangladesh.

IFC Effluent Guideline

S.No	Source of Waste	Unit	Maximum allowable Value for discharge in surface water
(1)	PH	mg/l	6.0 – 9.0
(2)	TSS	mg/l	50
(3)	Oil and Grease	mg/l	10
(4)	Total Residual Chlorine	mg/l	0.2
(5)	Chromium	mg/l	0.5
(6)	Copper	mg/l	0.5
(7)	Iron	mg/l	1.0
(8)	Zinc	mg/l	1.0
(9)	Lead	mg/l	0.5
(10)	Cadmium	mg/l	0.1
(11)	Mercury	mg/l	0.005
(12)	Arsenic	mg/l	0.5
(13)	Temperature increase by thermal discharge by cooling system	degree C	Site specific requirement to be be established by EA Elevated temperature areas due to discharge of once through cooling water (e.g , 1 Celsius above, 2 Celsius above, 3 Celsius above ambient water temperature) should be minimized by adjusting intake and additional outfall design through the project specific EA depending on the sensitive aqutic ecosystem around the discharge point.

Bangladesh Standards for waste from industrial Units or project waste

S.No	Source of Waste	Unit	Maximum allowable Value for discharge in surface water
(1)	Ammonical nitrogen(As elementary N)	mg/l	50
(2)	Ammonia (As free ammonia)	mg/l	5
(3)	Arsenic	mg/l	0.2
(4)	BOD 5 at 20 degree	mg/l	50
(5)	Boron	mg/l	2
(6)	Cadmium (As CD)	mg/l	0.50
(7)	Chloride	mg/l	600
(8)	Chromium (As total Cr)	mg/l	0.5
(9)	COD	mg/l	200
(10)	Chromium (As hexavalent Cr)	mg/l	0.5
(11)	Copper (As Cu)	mg/l	0.5
(12)	Dissolved Oxygen (As DO)	mg/l	4.5 -8
(13)	Electro conductivity (EC)	Micro mho/cm	1200
(14)	Total dissolved solids	mg/l	2100
(15)	Fluoride (As F)	mg/l	2
(16)	Sulfide (As F)	mg/l	1
(17)	Iron (As Fe)	mg/l	2
(18)	Total Kjeldahl Nitrogen (As N)	mg/l	100
(19)	Lead (As Pb)	mg/l	0.1

(20)	Manganese (As Mn)	mg/l	5
(21)	Mercury (As Hg)	mg/l	0.1
(22)	Nickel (As Ni)	mg/l	1.0
(23)	Nitrate (As Elementary N)	mg/l	10
(24)	Oil & Grease	mg/l	10
(25)	Phenolic Compound (As C6h5oh)	mg/l	1.0
(26)	Dissolved Phosphrous (As P)	mg/l	8
(27)	PH	mg/l	6 - 9
(28)	Selenium (As Se)	mg/l	0.05
(29)	Zinc (As Zn)	mg/l	5
(30)	Tempreture	mg/l	40- Summer, 45 Winter
(31)	Suspended Solids(SS)	mg/l	150
(32)	Cyanide (As Cn)	mg/l	0.1

Note: ETP vendor to ensure above effluent quality based on water analysis report.

6.3 PIPING DESIGN BASIS.

a. Design Pressure

Suction: The maximum operating pressure in the pipe upstream of the pumps is based on atmospheric pressure in the clarified water storage tank plus the static head from the clarified water storage tank overflow pipe connection and the centerline of the pump(s). The design pressure of the pipe upstream of the pumps is a minimum of 20% higher than such maximum operating pressure.

Discharge: The design pressure of pumps discharge piping is the sum of the pump shutoff head and the maximum suction pressure.

b. Design temperature

The design temperature is equal to the maximum operating temperature rounded up to the next higher 10 deg C increment.

c. Design flow

The design flow for pipe sizing will be based on pump rated flow.

d. Design velocity

Design Velocity of different piping shall be guided by the following table.

Sizes of pipelines shall be selected such that the velocity of fluid in pipes does not exceed the following limits under conditions of maximum possible volumetric flow:

For Water	
Pump suction	0.5 to 1.5 m/s
Pump delivery	1.0 to 3.0 m/s
Service Water	0.5 to 1.5 m/s
For Air	
Compressed air	15 m/s

Pipelines under gravity flow will be restricted to a flow velocity of 1.0 m / sec. Channels under gravity flow will be sized for a maximum flow velocity of 0.6 m / sec.

e. Pipe Pressure Drop

Pressure drop through the piping, valves and fittings will be derived by using Hazen-William's equation and Technical Paper No. 410 of Crane Company. Frictional drop through the piping, valves and fittings will be based on design flow with 10% margin to achieve total pumping head

f. Pipe and Valve Material

Please refer -: Doc No : SP-BCCP-00-C-E-M-113-GR-0001

g. Wall thickness & Corrosion allowance

Please refer -: Doc No : SP-BCCP-00-C-E-M-113-GR-0001

h. Physical Requirements

All high points & low points in piping system will be provided with suitable vents and drains respectively along with isolation valves. Material of drain & vent will be as that of parent pipe.

Corrosion protection of underground pipe-work will be done with necessary protective coating & wrapping.

i. Hydro test pressure

All piping shall be subjected to the hydrostatic test pressure as stipulated by relevant applicable standards. Test pressure shall not be less than 1.5 times the Design Pressure

7.0 ELECTRICAL SYSTEM DESCRIPTION

The electrical power supply distribution for Pre-Treatment system shall be envisaged as per Plant Key SLD Doc. No. SP-BCCP-00-C-E-E-200-EG-0002.

8.0 INSTRUMENTATION AND CONTROL

The instrumentation and control (I&C) system envisaged for ET Plant is designed for safe, reliable, efficient and easy operation of ET plant and its associated auxiliaries. The I&C system permits operation of the entire ET plant from the DM Plant PLC located in the DM Plant control room.

ET plant supplied shall provide all necessary inputs to the DM plant supplier for the implementation of the ET plant control / protection / interlock in the DM plant PLC.

Please refer to the DM plant PLC details as specified in the DBR of DM plant system. DM Plant PLC system shall be capable of carrying out the functions of ET Plant measurement system, control system, protection and interlock system.

All interlocks, protection, sequencing and feedback signals associated with motors for the ET plant system will be processed in the DM Plant PLC. DM Plant PLC shall issue control command to the MCC / SWGR via interposing relays.

Field instruments / PLC system features / PLC interfaces to main DCS etc. please refer to Design Criteria For Instrumentation & Control Doc. SP – BCCP–00–CEN–419–GR–0001.

All electrical I/Os required for electrical controls are hardwired only. Please refer to the drive typical interface document SP-BCCP-00-CEN-401-IJ-0001.

9.0 REFERENCE DOCUMENTS

- Water Balance Diagram
- Design Basis Report for CW Chlorination & Treatment System
- Design Basis Report for Pre-Treatment System
- Design Basis Report for Dematerialized Water Treatment Plant
- Design Basis Report for CW treatment and Chemical Injections skids

PROJECT:	**225 MW BHOLA COMBINED CYCLE POWER PROJECT AT BHOLA, BANGLADESH.**
OWNER:	**NUTAN BIDYUT (BANGLADESH) LIMITED**
ENGINEERING CONSULTANT (EC):	**TATA CONSULTING ENGINEERS LIMITED**
CONTRACTOR:	
DOCUMENT TITLE:	**DESIGN BASIS REPORT FOR SEWAGE TREATMENT PLANT**
SP DOCUMENT NUMBER:	**SP-BCCP-00-C-E-M-154/160-GR-0001**
EC DOCUMENT NUMBER:	

REVISION STATUS

	SIGN											
	INITIALS											
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REFERENCE DRAWINGS/DOCS.	DESCRIPTION
NA	---

1.0 INTRODUCTION

Nutan Bidyut (Bangladesh) Ltd intends to build a 225MW capacity combined cycle power plant in BHOLA II adjacent to the existing BHOLA I combined cycle plant of 225MW. BHOLA II, which is awarded to SPINFRA by the Bangladesh Government will be located adjacent to BHOLA I project.

This document provides the design criteria/ basis for sewage treatment plant for 225 MW CCPP Bhola-II Bangladesh. A brief description and salient feature of the various system are defined here for the basis of design.

2.0 FUNCTION

The purpose of the sewage treatment plant is to treat the sewage water suitable to reuse and shall comply with requirements specified by the Central Public Health Environment Engineering Organization, Government of India.

3.0 SYSTEM DESCRIPTION

3.1 Sewage treatment system

The raw sewage from main plant building shall be received at main Sewage Receiving sump cum lifting station. From this Sump the raw sewage will be pumped to Equalization Sump through Bar Screen Chamber as well as Oil & Grease Separation Chamber. The Equalization tank shall be equipped with air diffusers in order to have the effect of equalization and prevent settlement of the solids. From Equalization tank, sewage will be transferred to Moving Bed Biological Reactor / Fluidized Aerobic Bed unit by Sewage Transfer Pumps. The aerated water will overflow from MBBR to Tube settler by gravity.

Treated water from Tube settler Tank will be disinfected by injection of hypochlorite solution in Hypo contact tank and collected in a Clear Water Tank. Hypochlorite solution will be injected by means of Hypochlorite Solution Injection Pumps from Hypochlorite Storage Tanks.

Under Sludge from Tube settler Tank will be collected to Sludge pit. From Sludge pit the sludge will be pumped to sludge centrifuge for separation of the sludge and water. PE dosing will be done in the sludge centrifuge. Centrifuge centrate will be routed back to the equalization tank and the sludge cake will be collected in hand carts / trolleys and disposed off suitably.

Disinfected treated sewage from Hypo contact tank will be pumped to Dual Media Filter to remove the residual suspended solids present in it / for further reduction of BOD.

The backwash of Dual Media Filters shall be carried out for removal of the solids entrapped in filter media. The backwash waste will be recycled back to the Sewage Equalization Sump.

Treated Water from outlet of the Filters will be fed to Activated Carbon Filters for further removal of organics, color and COD. The filtrate from Activated Carbon Filters shall be collected in the Treated Water Tank and shall be used by means of Treated Water Transfer Pumps for Gardening.

4.0 SYSTEM COMPONENTS

4.1 Sewage main component System

One (1) main sewage receiving sump cum lifting station with Two (2) numbers Sewage Transfer Pumps, each complete with all accessories.

One (1) number Fixed Bar Screen Chamber and all other accessories.

One (1) number Oil & Grease Separation Chamber and all other accessories.

One (1) number Equalization tank Sump complete with all accessories.

Two (2) numbers Sewage Transfer Pumps, each complete with all accessories.

One (1) number MBBR/ FAB complete with all accessories.

Two (2) numbers Air Blowers, each complete with drive motor and all other accessories.

One (1) number Tube Settling Tank complete with all accessories.

One (1) number Sludge pit complete with all accessories.

Two (2) numbers Hypochlorite Solution Storage Tanks, each complete with all accessories.
Two (2) numbers Hypochlorite Solution Injection Pumps, each complete with drive motor and all other accessories.

Two (2) numbers Sludge Transfer Pumps, each complete with drive motor and all other accessories other accessories.

Two (2) numbers Filter press, each complete with drive motor and all other accessories.

One (1) number Hypo contact tank / Clear Water Storage Tank complete with all accessories.

Two (2) numbers Clear Water Transfer Pumps, each complete with drive motor and all other accessories.

Two (2) numbers Dual Media Filters complete with all accessories.

Two (2) numbers Activated Carbon Filters complete with all accessories

One (1) number Treated Water Storage Tank complete with all accessories.

Two (2) numbers Treated Water Transfer Pumps, each complete with drive motor and all other accessories.

5.0 SYSTEM BOUNDARY

5.1 NA

6.0 DESIGN CRITERIA

In Moving Bed Biological Reactor / Fluidized Aerobic Bed, there will be provisions for supply of air through diffusers by means of Air Blowers. Oxygen transfer takes place by molecular diffusion through the interface film between air and liquid. Bacterial growth shall be promoted by supply of air and the same shall reduce BOD, COD & Organic Pollutants. From Moving Bed Biological Reactor / Fluidized Aerobic Bed, the aerated sewage will overflow by gravity into a Tube settler Tank for removal of suspended solids.

Sewage from the canteen, toilets and other places of usage in the entire plant shall be collected at one centralized location by means of underground laid pipelines for treatment of sewage in the proposed sewage treatment plant. Neither plant effluent nor storm water discharges shall be mixed with the sewage.

Sewer lines shall be designed for a minimum self-cleansing velocity of 0.75m/sec and the maximum velocity shall not exceed 2.4m/sec and shall be connected for flow by gravity, to the sewage treatment plant.

Sewage treatment plant is to be designed as per the guidelines laid out in the Manual on Sewerage and Sewage treatment published by the Central Public Health Environment Engineering Organization, Government of India.

Almost all the water that is used in canteen and toilets will reach the sewage treatment plant. As per Table 1 of IS 1172 recommended water consumption in factories where bath rooms are not provided is 30 litres per head per day and since the plant is expected to be operated by a small work force of around 100 people, Compact Sewage Treatment plant of 5 KLD shall be installed for the project.

Sewage treatment plant shall consist of pumps for pumping of treated water for re-use in gardening and excess treated water shall be let into the adjoining canal

6.2 Characteristic of Sewage Water Quality

Influent Sewage water

Sr. no	Parameter	Unit	Data
1	BOD	ppm	<300
2	COD	ppm	<600
3	TSS	ppm	<300

Treated Sewage water

Sr. no	Parameter	Unit	Data
1	pH		6.5 – 8.5
2	BOD	ppm	<10
3	COD	ppm	<50
4	TSS	ppm	<20
5	Coliform	MPN/100ml	100

7.0 ELECTRICAL SYSTEM DESCRIPTION

The electrical power supply distribution for sewage treatment plant shall be envisaged as per Plant Key SLD Doc. No. SP-BCCP-00-C-E-E-200-EG-0002.

8.0 INSTRUMENTATION AND CONTROL

In general, the Sewage Treatment System shall be operated in semi-automatic / manual mode with supervisory instruments and safety interlocks through the DM Plant PLC located in the DM Plant control room..

Sewage treatment plant supplier shall provide all necessary inputs to the DM plant supplier for the implementation of the ET plant control / protection / interlock in the DM plant PLC.

Please refer to the DM plant PLC details as specified in the DBR of DM plant system. DM Plant PLC system shall be capable of carrying out the functions of Sewage treatment plant, control system, protection and interlock system.

Sewage treatment plant supplier shall specify the UPS and Non-UPS load requirement to the DM Plant supplier for considering the total load in the DM Plant UPS.

Specific Instrumentation & Control:

All the sumps is provided with one number (1) Level Transmitter Low and high set points shall be generated through Limit Value Monitors (LVM). The Backwash Waste Water Transfer Pump will be started when the sump level reaches high level and trips automatically when the level reaches low level. The Alarms (High & Low) shall be annunciated in DM Plant PLC.

All the pump shall be selected for standby duty, which would start remote manually in the event of failure of running pump.

All interlocks, protection, sequencing and feedback signals associated with motors for the Sewage treatment plant will be processed in the DM Plant PLC. DM Plant PLC shall issue control command to the MCC / SWGR via interposing relays.

Field instruments / PLC system features / PLC interfaces to main DCS etc. please refer to Design Criteria For Instrumentation & Control Doc. SP – BCCP–00–CEN–419–GR–0001.

All electrical I/Os required for electrical controls are hardwired only. Please refer to the drive typical interface document SP-BCCP-00-CEN-401-IJ-0001

9.0 REFERENCE DOCUMENTS

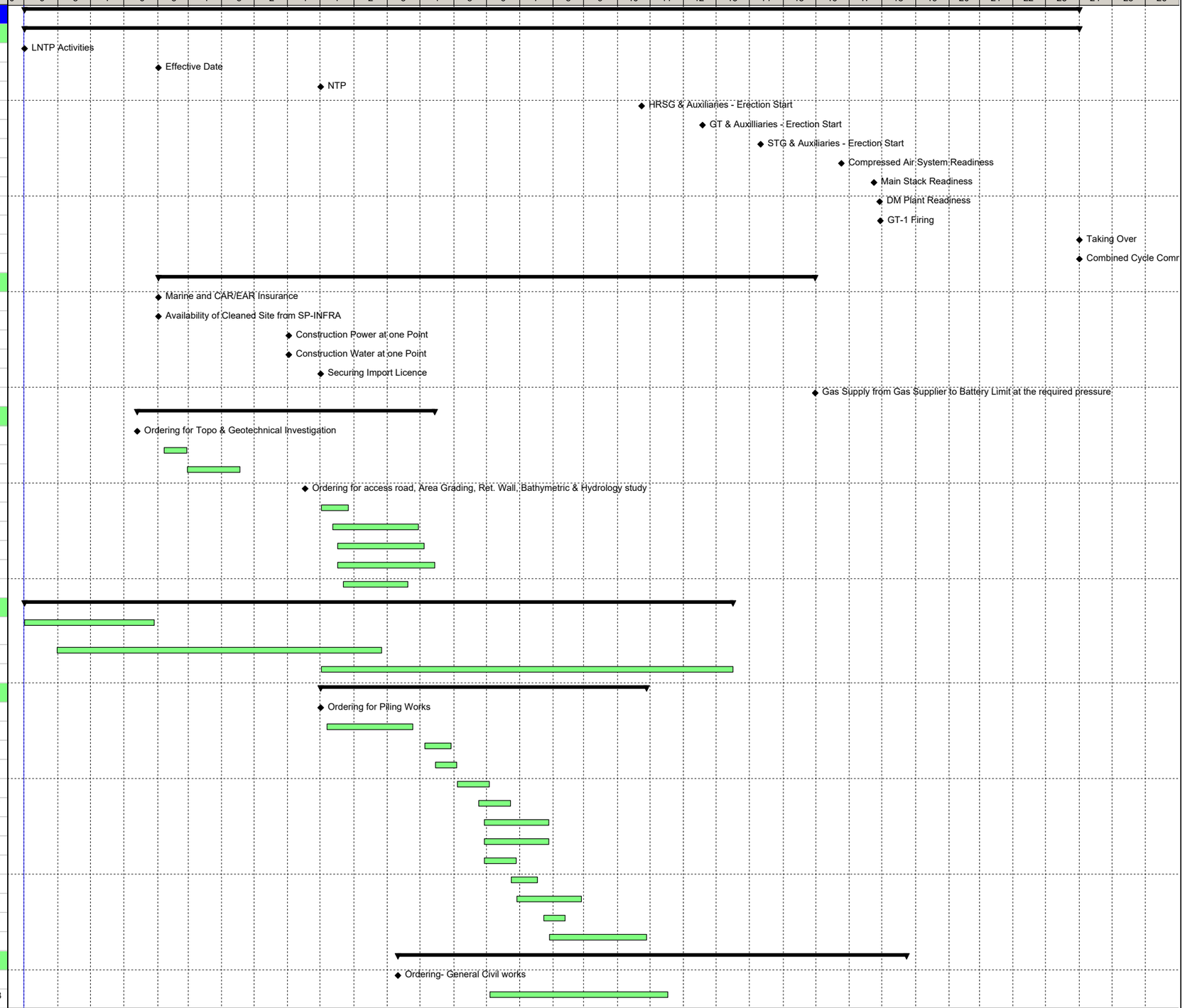
1) Water Balance diagram - SP-BCCP-00-C-E-M-E10-MI-0001
2) Plant control system Schematics / Configuration drawing - SP-BCCP-00-C-E-N-401-IJ-0001
3) Plot Plan - SP-BCCP-00-C-E-M-E15-MA-0001

NUTAN BIDYUT BANGLADESH LIMITED

225 MW COMBINED CYCLE POWER PLANT AT BHOLA BANGLADESH

SHAPOORJI PALLONJI & CO. PVT. LTD (EPC DIVISION)

Activity ID	Activity Name	Original Duration	Start	Finish
225MW CCPP BHOLA PROJECT BANGLADESH		973	01-Oct-16	01-Jun-19
Project Milestones		973	01-Oct-16	01-Jun-19
A5030	LNTP Activities	0	01-Oct-16	
A1090	Effective Date	0		01-Feb-17
A1100	NTP	0		01-Jul-17
A4890	HRSG & Auxiliaries - Erection Start	0	23-Apr-18	
A4870	GT & Auxilliaries - Erection Start	0	18-Jun-18	
A4880	STG & Auxiliaries - Erection Start	0	11-Aug-18	
A5010	Compressed Air System Readiness	0		24-Oct-18
A4900	Main Stack Readiness	0		23-Nov-18
A4910	DM Plant Readiness	0		28-Nov-18
A5400	GT-1 Firing	0	29-Nov-18	
A4940	Taking Over	0		01-Jun-19
A5050	Combined Cycle Commissioning	0		01-Jun-19
Inputs from Client		605	01-Feb-17	30-Sep-18
A1170	Marine and CAR/EAR Insurance	0		01-Feb-17
A1020	Availability of Cleaned Site from SP-INFRA	0		01-Feb-17
A1040	Construction Power at one Point	0		02-Jun-17
A1050	Construction Water at one Point	0		02-Jun-17
A1160	Securing Import Licence	0		01-Jul-17
A1130	Gas Supply from Gas Supplier to Battery Limit at the required pressure	0		30-Sep-18
Pre Construction Works		275	13-Jan-17	14-Oct-17
A1250	Ordering for Topo & Geotechnical Investigation	0		13-Jan-17
A1001	Topographical Survey & Report	21	07-Feb-17	27-Feb-17
A1005	Geotechnical Investigation Works	49	28-Feb-17	17-Apr-17
A1060	Ordering for access road, Area Grading, Ret. Wall, Bathymetric & Hydrology study	0		17-Jun-17
A1011	Bathymetric Study and Hydrology Report	25	02-Jul-17	26-Jul-17
A1080	Retaining Wall including piling	80	12-Jul-17	29-Sep-17
A1030	Area Grading	80	17-Jul-17	04-Oct-17
A1140	Boundary Fencing	90	17-Jul-17	14-Oct-17
A1070	Access road Construction	60	22-Jul-17	19-Sep-17
Engineering Consultancy		654	01-Oct-16	16-Jul-18
A1180	Approval of Basic Engineering Documents (Plot Plan, HMBD, SLD etc.)	120	01-Oct-16	28-Jan-17
A1190	Technical Specification for Packages	300	31-Oct-16	26-Aug-17
A1380	Detail Engineering from Engineering Consultant	380	02-Jul-17	16-Jul-18
Piling works		300	01-Jul-17	27-Apr-18
A5620	Ordering for Piling Works	0		01-Jul-17
A5042	Pile Testing	80	07-Jul-17	24-Sep-17
A5530	Main power house area - HRSG Package	25	05-Oct-17	29-Oct-17
A5510	Main power house area -GTG	20	15-Oct-17	03-Nov-17
A5540	Main power house area - STG Package	30	04-Nov-17	03-Dec-17
A5560	GIS	30	24-Nov-17	23-Dec-17
A5590	DO Tank foundation & fuel handling system	60	29-Nov-17	27-Jan-18
A5570	Water Pretreatment plant	60	29-Nov-17	27-Jan-18
A5520	Gas Compressor, Regulating and Metering Station	30	29-Nov-17	28-Dec-17
A5610	Main Steel stack Foundation	25	24-Dec-17	17-Jan-18
A5600	IDCT	60	29-Dec-17	26-Feb-18
A5550	Transformer Yard	20	23-Jan-18	11-Feb-18
A5630	Other Areas	90	28-Jan-18	27-Apr-18
Civil Works - Construction		470	10-Sep-17	23-Dec-18
A1220	Ordering- General Civil works	0	10-Sep-17	
A1400	Main power house area - HRSG Package	165	04-Dec-17	17-May-18

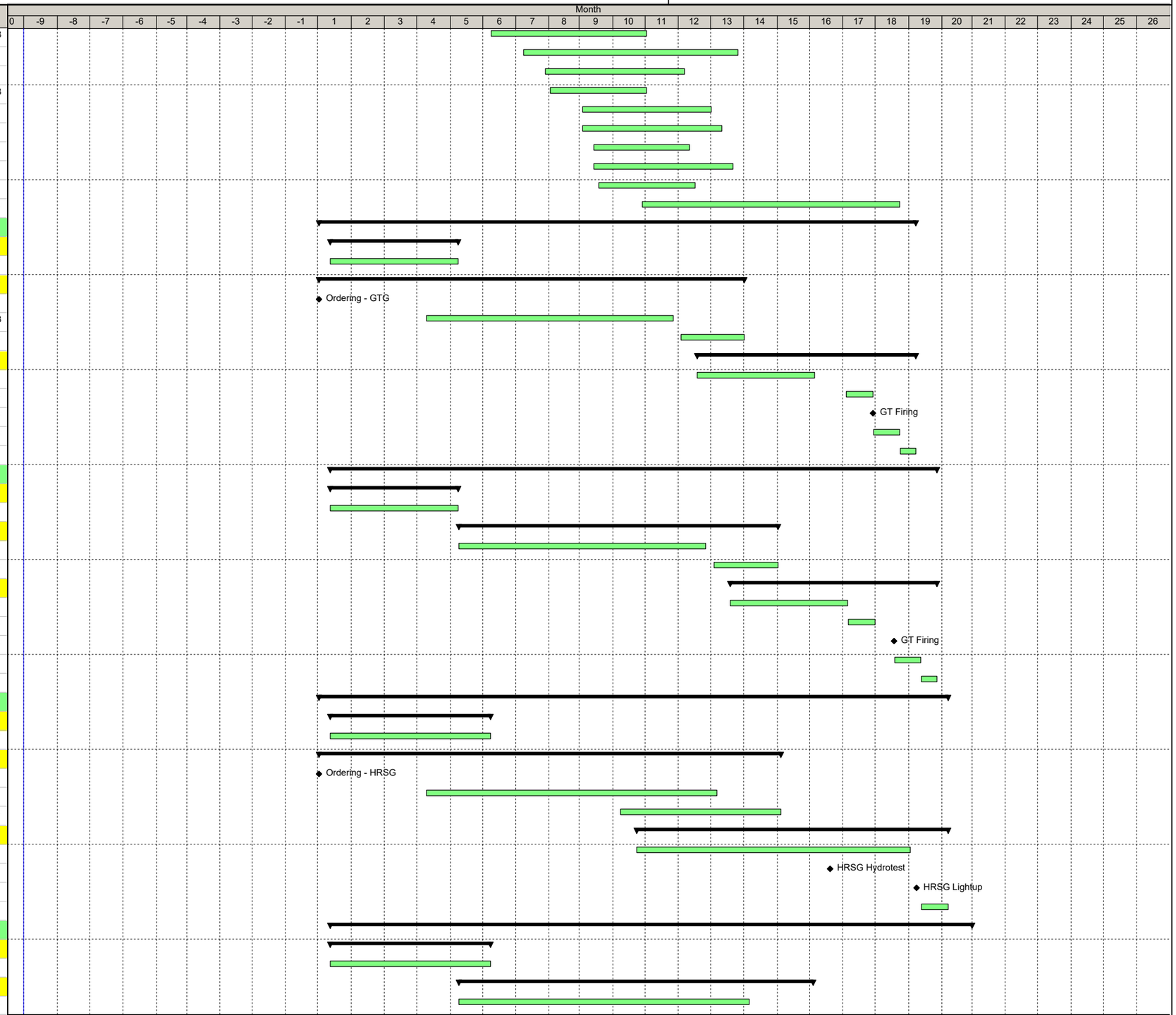


NUTAN BIDYUT BANGLADESH LIMITED

225 MW COMBINED CYCLE POWER PLANT AT BHOLA BANGLADESH

SHAPOORJI PALLONJI & CO. PVT. LTD (EPC DIVISION)

Activity ID	Activity Name	Original Duration	Start	Finish
A1230	Main power house area -GTG	145	09-Dec-17	02-May-18
A1390	Main power house area - STG Package	200	08-Jan-18	26-Jul-18
A1280	GIS	130	28-Jan-18	06-Jun-18
A1300	Gas Compressor, Regulating and Metering Station	90	02-Feb-18	02-May-18
A1260	DO Tank foundation & fuel handling system	120	04-Mar-18	01-Jul-18
A1310	Water Pretreatment plant	130	04-Mar-18	11-Jul-18
A1240	Main Steel stack Foundation	90	14-Mar-18	11-Jun-18
A1290	IDCT	130	14-Mar-18	21-Jul-18
A1270	Transformer Yard civil works	90	19-Mar-18	16-Jun-18
A1360	Roads & Drains inside Plant Boundary	240	28-Apr-18	23-Dec-18
Gas Turbine Generator Package Unit-1		555	02-Jul-17	07-Jan-19
Engineering		120	12-Jul-17	08-Nov-17
A1950	Submission & Approval of Vendor Engineering	120	12-Jul-17	08-Nov-17
Manufacturing & Dispatch		396	02-Jul-17	01-Aug-18
A1410	Ordering - GTG	0	02-Jul-17	
A1960	Manufacturing & Inspection of Material	230	10-Oct-17	27-May-18
A1970	Receipt at Site	60	03-Jun-18	01-Aug-18
Erection, Testing & Commissioning		204	18-Jun-18	07-Jan-19
A1980	Erection & Alignment	110	18-Jun-18	05-Oct-18
A1990	Testing & Pre-Commissioning	25	04-Nov-18	28-Nov-18
A2000	GT Firing	0		28-Nov-18
A2002	Hot Commissioning	25	29-Nov-18	23-Dec-18
A2120	Synchronization	15	24-Dec-18	07-Jan-19
Gas Turbine Generator Package Unit-2		565	12-Jul-17	27-Jan-19
Engineering		120	12-Jul-17	08-Nov-17
A5060	Submission & Approval of Vendor Engineering	120	12-Jul-17	08-Nov-17
Manufacturing & Dispatch		297	09-Nov-17	01-Sep-18
A5070	Manufacturing & Inspection of Material	230	09-Nov-17	26-Jun-18
A5080	Receipt at Site	60	04-Jul-18	01-Sep-18
Erection, Testing & Commissioning		193	19-Jul-18	27-Jan-19
A5090	Erection & Alignment	110	19-Jul-18	05-Nov-18
A5100	Testing & precommssioning activities	25	06-Nov-18	30-Nov-18
A5110	GT Firing	0		18-Dec-18
A5112	Hot Commissioning	25	19-Dec-18	12-Jan-19
A5130	Synchronization	15	13-Jan-19	27-Jan-19
HRSG Package Unit-1		585	02-Jul-17	06-Feb-19
Engineering		150	12-Jul-17	08-Dec-17
A2010	Submission & Approval of Vendor Engineering	150	12-Jul-17	08-Dec-17
Manufacturing & Dispatch		430	02-Jul-17	04-Sep-18
A1411	Ordering - HRSG	0	02-Jul-17	
A2020	Manufacturing & Inspection of Material	270	10-Oct-17	06-Jul-18
A2030	Receipt at Site	150	08-Apr-18	04-Sep-18
Erection, Testing & Commissioning		290	23-Apr-18	06-Feb-19
A2040	Erection	255	23-Apr-18	02-Jan-19
A2140	HRSG Hydrotest	0		20-Oct-18
A2160	HRSG Lightup	0	08-Jan-19	
A2070	Steam Blowing	25	13-Jan-19	06-Feb-19
HRSG Package Unit-2		597	12-Jul-17	01-Mar-19
Engineering		150	12-Jul-17	08-Dec-17
A5200	Submission & Approval of Vendor Engineering	150	12-Jul-17	08-Dec-17
Manufacturing & Dispatch		330	09-Nov-17	04-Oct-18
A5210	Manufacturing & Inspection of Material	270	09-Nov-17	05-Aug-18

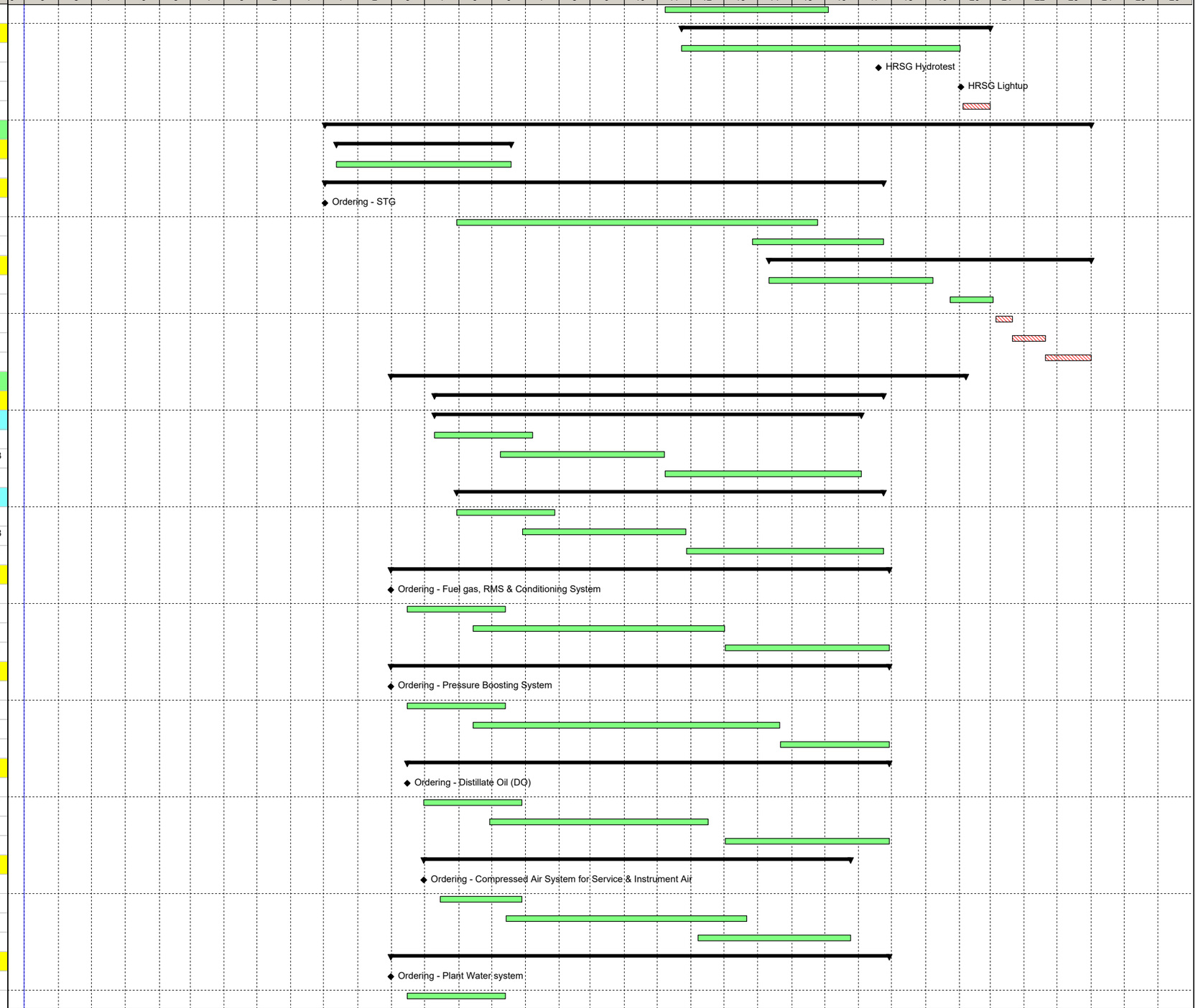


NUTAN BIDYUT BANGLADESH LIMITED

225 MW COMBINED CYCLE POWER PLANT AT BHOLA BANGLADESH

SHAPOORJI PALLONJI & CO. PVT. LTD (EPC DIVISION)

Activity ID	Activity Name	Original Duration	Start	Finish
A5220	Receipt at Site	150	08-May-18	04-Oct-18
Erection, Testing & Commissioning		282	23-May-18	01-Mar-19
A5230	Erection	255	23-May-18	01-Feb-19
A5370	HRSG Hydrotest	0		19-Nov-18
A5390	HRSG Lightup	0	02-Feb-19	
A5260	Steam Blowing	25	04-Feb-19	01-Mar-19
Steam Turbine Generator Package		699	02-Jul-17	01-Jun-19
Engineering		160	12-Jul-17	18-Dec-17
A2080	Submission & Approval of Vendor Engineering	160	12-Jul-17	18-Dec-17
Manufacturing & Dispatch		510	02-Jul-17	23-Nov-18
A1412	Ordering - STG	0	02-Jul-17	
A2090	Manufacturing & Inspection of Material	330	30-Oct-17	24-Sep-18
A2100	Receipt at Site	120	27-Jul-18	23-Nov-18
Erection, Testing & Commissioning		294	11-Aug-18	01-Jun-19
A2110	Erection	150	11-Aug-18	07-Jan-19
A2112	Testing & precommissioning activities	40	23-Jan-19	03-Mar-19
A4730	Synchronization	15	06-Mar-19	21-Mar-19
A4740	Load test	30	21-Mar-19	20-Apr-19
A5270	Reliability Run Test & Performance Guarantee Test	42	20-Apr-19	01-Jun-19
MBOP Packages		525	31-Aug-17	06-Feb-19
Stack		410	10-Oct-17	23-Nov-18
Byapass Stack		390	10-Oct-17	03-Nov-18
A218	Submission & Approval of Vendor Engineering	90	10-Oct-17	07-Jan-18
A219	Manufacturing & Dispatch of material (Receipt at Site)	150	09-Dec-17	07-May-18
A222	Fabrication , Erection, Testing & precommssioning activities	180	08-May-18	03-Nov-18
Main Stack		390	30-Oct-17	23-Nov-18
A223	Submission & Approval of Vendor Engineering	90	30-Oct-17	27-Jan-18
A224	Manufacturing & Dispatch of material (Receipt at Site)	150	29-Dec-17	27-May-18
A227	Fabrication, Erection, Testing & precommssioning activities	180	28-May-18	23-Nov-18
Fuel Gas pressure, RMS & Conditioning System		455	31-Aug-17	28-Nov-18
A1450	Ordering - Fuel gas, RMS & Conditioning System	0	31-Aug-17	
A2280	Submission & Approval of Vendor Engineering	90	15-Sep-17	13-Dec-17
A2290	Manufacturing & Dispatch of material (Receipt at Site)	230	14-Nov-17	01-Jul-18
A2320	Erection, Testing & precommssioning activities	150	02-Jul-18	28-Nov-18
Fuel Gas Pressure Boosting station		455	31-Aug-17	28-Nov-18
A5460	Ordering - Pressure Boosting System	0	31-Aug-17	
A5470	Submission & Approval of Vendor Engineering	90	15-Sep-17	13-Dec-17
A5480	Manufacturing & Dispatch of material (Receipt at Site)	280	14-Nov-17	20-Aug-18
A5490	Erection, Testing & precommssioning activities	100	21-Aug-18	28-Nov-18
Distillate Oil (DO) Supply		440	15-Sep-17	28-Nov-18
A1470	Ordering - Distillate Oil (DO)	0	15-Sep-17	
A2380	Submission & Approval of Vendor Engineering	90	30-Sep-17	28-Dec-17
A2390	Fabrication & Dispatch of material (Receipt at Site)	200	29-Nov-17	16-Jun-18
A2420	Erection, Testing & precommssioning activities	150	02-Jul-18	28-Nov-18
Compressed Air System for Service & Instrument Air		390	30-Sep-17	24-Oct-18
A5000	Ordering - Compressed Air System for Service & Instrument Air	0	30-Sep-17	
A4950	Submission & Approval of Vendor Engineering	75	15-Oct-17	28-Dec-17
A4960	Manufacturing & Dispatch of material (Receipt at Site)	220	14-Dec-17	21-Jul-18
A4990	Erection, Testing & precommssioning activities	140	07-Jun-18	24-Oct-18
Plant Water system including Raw water Intake, PT Plant, RO & DM Plant		455	31-Aug-17	28-Nov-18
A1510	Ordering - Plant Water system	0	31-Aug-17	
A2580	Submission & Approval of Vendor Engineering	90	15-Sep-17	13-Dec-17

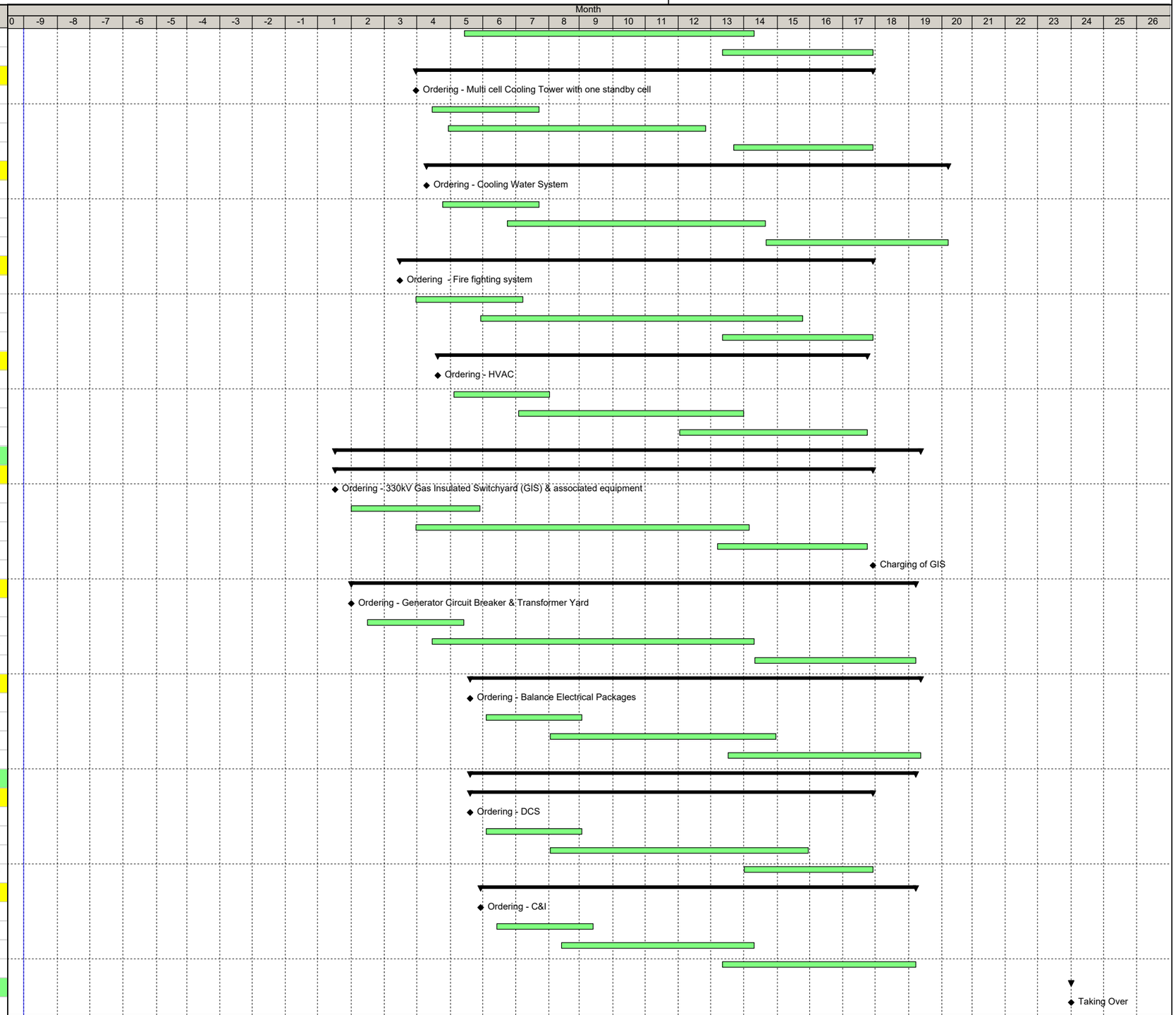


NUTAN BIDYUT BANGLADESH LIMITED

225 MW COMBINED CYCLE POWER PLANT AT BHOLA BANGLADESH

SHAPOORJI PALLONJI & CO. PVT. LTD (EPC DIVISION)

Activity ID	Activity Name	Original Duration	Start	Finish
A2590	Manufacturing & Dispatch of material (Receipt at Site)	270	14-Nov-17	10-Aug-18
A2620	Erection, Testing & precommssioning activities	140	12-Jul-18	28-Nov-18
Multi cell Cooling Tower with one standby cell (IDCT)		425	30-Sep-17	28-Nov-18
A1480	Ordering - Multi cell Cooling Tower with one standby cell	0	30-Sep-17	
A2430	Submission & Approval of Vendor Engineering	100	15-Oct-17	22-Jan-18
A2440	Manufacturing & Dispatch of material (Receipt at Site)	240	30-Oct-17	26-Jun-18
A2470	Erection, Testing & precommssioning activities	130	22-Jul-18	28-Nov-18
Cooling Water System including Make up water line for CT Basin		485	10-Oct-17	06-Feb-19
A1490	Ordering - Cooling Water System	0	10-Oct-17	
A2480	Submission & Approval of Vendor Engineering	90	25-Oct-17	22-Jan-18
A2490	Manufacturing & Dispatch of material (Receipt at Site)	240	24-Dec-17	20-Aug-18
A2520	Erection, Testing & precommssioning activities	170	21-Aug-18	06-Feb-19
Fire fighting system		440	15-Sep-17	28-Nov-18
A1500	Ordering - Fire fighting system	0	15-Sep-17	
A2530	Submission & Approval of Vendor Engineering	100	30-Sep-17	07-Jan-18
A2540	Manufacturing & Dispatch of material (Receipt at Site)	300	29-Nov-17	24-Sep-18
A2570	Erection, Testing & precommssioning activities	140	12-Jul-18	28-Nov-18
Air conditioning and ventilation systems		400	20-Oct-17	23-Nov-18
A1530	Ordering - HVAC	0	20-Oct-17	
A2680	Submission & Approval of Vendor Engineering	90	04-Nov-17	01-Feb-18
A2690	Manufacturing & Dispatch of material (Receipt at Site)	210	03-Jan-18	31-Jul-18
A2720	Erection, Testing & precommssioning activities	175	02-Jun-18	23-Nov-18
Electrical BOP Packages		545	17-Jul-17	12-Jan-19
330kV Gas Insulated Switchyard (GIS) & associated equipment		500	17-Jul-17	28-Nov-18
A1600	Ordering - 330kV Gas Insulated Switchyard (GIS) & associated equipment	0	17-Jul-17	
A3030	Submission & Approval of Vendor Engineering	120	01-Aug-17	28-Nov-17
A3040	Manufacturing & Dispatch of material (Receipt at Site)	310	30-Sep-17	05-Aug-18
A3070	Erection, Testing & precommssioning activities	140	07-Jul-18	23-Nov-18
A4800	Charging of GIS	0		28-Nov-18
GCB & Transformer Yard		525	01-Aug-17	07-Jan-19
A1840	Ordering - Generator Circuit Breaker & Transformer Yard	0	01-Aug-17	
A5280	Submission & Approval of Vendor Engineering	90	16-Aug-17	13-Nov-17
A5290	Manufacturing & Dispatch of material (Receipt at Site)	300	15-Oct-17	10-Aug-18
A5300	Erection, Testing & precommssioning activities	150	11-Aug-18	07-Jan-19
Balance Electrical Packages		420	19-Nov-17	12-Jan-19
A2060	Ordering - Balance Electrical Packages	0	19-Nov-17	
A5310	Submission & Approval of Vendor Engineering	90	04-Dec-17	03-Mar-18
A5320	Manufacturing & Dispatch of material (Receipt at Site)	210	02-Feb-18	30-Aug-18
A5330	Erection, Testing & precommssioning activities	180	17-Jul-18	12-Jan-19
C&I BOP Packages		415	19-Nov-17	07-Jan-19
DCS		375	19-Nov-17	28-Nov-18
A5420	Ordering - DCS	0	19-Nov-17	
A5430	Submission & Approval of Vendor Engineering	90	04-Dec-17	03-Mar-18
A5440	Manufacturing & Dispatch of material (Receipt at Site)	240	02-Feb-18	29-Sep-18
A5450	Erection, Testing & precommssioning activities	120	01-Aug-18	28-Nov-18
Balance C&I Packages		405	29-Nov-17	07-Jan-19
A1800	Ordering - C&I	0	29-Nov-17	
A5340	Submission & Approval of Vendor Engineering	90	14-Dec-17	13-Mar-18
A5350	Manufacturing & Dispatch of material (Receipt at Site)	180	12-Feb-18	10-Aug-18
A5360	Erection, Testing & precommssioning activities	180	12-Jul-18	07-Jan-19
Plant Commissioning		0	01-Jun-19	01-Jun-19
A4780	Taking Over	0		01-Jun-19



Shapoorji Pallonji

Built to last... since 1865

Shapoorji Pallonji EPC

An introduction




Shapoorji Pallonji Group

- One of the largest and most reputed Construction & Project Management Company in India
- Legacy of 148 years
- Active in
  - Power
  - Metals & Minerals
  - Material Handling
  - Real Estate
  - Construction
  - Infrastructure including Marine Works, Intake & Outfall system, Roads, Bridges, Tunnels, Jetties & Pipelines
  - Water, Effluent & Sewage treatment plant, Desalination
  - Shipping & Logistics
  - HVAC,
  - Firefighting & Alarm Systems,
  - DG Sets,
  - HT & LT Electrical Switchgear Panels,
  - Transmission Lines,
  - Electrical Substations,
  - Electrical Balance of Plant
  - Textiles
  - Ports & LNG Terminals
- Strong presence in India and Internationally
- Annual turnover of US$ 2.5 Billion with 23,000 Employees

SP Group

- **A Conglomerate** with **Multiple Business interests** with **Progressive Outlook** and **Professional Approach**
  - Engineering & Construction – Industrial, Commercial and Real Estate.
  - Infrastructure – Asset Owners / Developers: Power Plants, Ports and Roads.
  - Engineering, Procurement & Construction – Minerals & Metals and Power
  - Business Automation
  - Engineering / Manufacturing of Precision Tools
  - Others (Bio-fuels and Interiors, Textiles and Shipping and Logistics).

We have a global footprint…

Our Vision, Mission and Values…

Vision: "Fostering an environment that helps in the creation of knowledge and its application to work, we seek to excel in all of our business activities and strive to build Shapoorji Pallonji into a creative organization."

Mission: "Shapoorji Pallonji & Co. Ltd will be the company of first choice. We shall be driven by our commitment to customer satisfaction."

Core Values

Trust and reliability

Nurture people

Adaptive and agile

Service Values

Relationship with stakeholders

Synergy to enhance group value

Work Values

Quality

Safety

Innovation

Delivering the Project on time through ….

Shapoorji Pallonji EPC

- Design & Engineering Team ensuring Compliance to Technical Requirements, Codes and Standards
- Team with extensive experience & knowledge on the Power System and construction management
- Project specific Organization Structure with focus on Time, Quality & Safety
- Strong Engineering & Construction Culture; Associated with many landmark projects spread over geographies
- Vastly experienced personnel who delivered various complex Turnkey Projects of varied complexities
- Effective control over the project as In-house capability includes Civil & Structural, Water & Effluent treatment, HVAC, Fire fighting, eBOP

End to End Solution Provider



Committed to Deliver Lasting Value, Time & Again!!

Shapoorji Pallonji – Engineering, Procurement & Construction

- A leading EPC Company
- Division of SPCL, flagship company of SP Group
- Significant experience in Power and Metals & Minerals Segments

- Centre of Excellence at Kolkata & Pune
- Technology tie-ups with best in business OEMs & global technology providers
- In-house team of > 200 Design Engineers experienced in Mechanical, Metallurgy, Electrical, Civil & Structural Design
- Strong & Experienced team of Project Managers
- Fabrication Yard at Rourkela

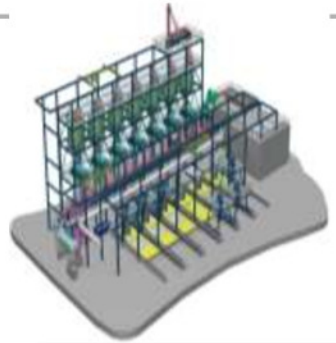
EPC Business Overview

All values in Rs. Crores, unless mentioned otherwise

EPC Business Segment

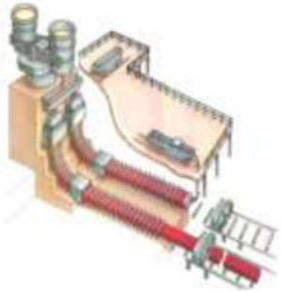
Metals & Minerals

Mineral Processing

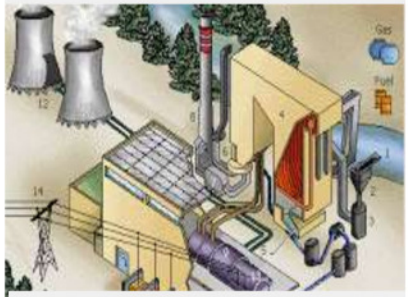


Material Handling Systems

Iron Making



Steel Making, Rolling Mills



Power

Coal Power Plants

Gas Power Plants

Hydel Power Plants

Special Projects

Coal Gasification

Semi Cryogenic Engine Test Facility

Certifications – SPCL


BUREAU VERITAS Certification

Certification
Awarded to

SHAPOORJI PALLONJI & CO. LTD.
Corporate office and Regional offices in India, Projects in India

Shapoorji Pallonji & Co. Ltd.

CORPORATE OFFICE: SHAPOORJI PALLONJI CENTRE, 41/44, MINOO DESAI MARG, COLABA, MUMBAI – 400 005, MAHARASHTRA, INDIA.

Bureau Veritas Certification (India) Private Limited certify that the Management System of the above organisation has been audited and found to be in accordance with the requirements of the standard detailed below

STANDARD
ISO 14001:2004

SCOPE OF SUPPLY
CONSTRUCTION OF STEEL/ CONCRETE STRUCTURES AS PER DESIGN AND SPECIFICATIONS OF CLIENTS/ CUSTOMERS, DESIGN AND BUILD PROJECTS IN INDIA.

Original Approval Date: 12 March 2012
Next Recertification Due Before: 11 December 2014

Subject to the continued satisfactory operation of the organisation's Management System, this certificate is valid until: 11 March 2015

To check this certificate validity please call: +91 22 6661 6666

Further clarification regarding the scope of this certificate and the applicability of the Management System requirements may be obtained by consulting the organisation.

Certificate Number: IND12.7196/E

R. K. SHARMA
Director

ISO 14001:2004


BUREAU VERITAS Certification

Certification
Awarded to

SHAPOORJI PALLONJI & CO. LTD.
Corporate office and Regional offices in India, Projects in India

Shapoorji Pallonji & Co. Ltd.

CORPORATE OFFICE: SHAPOORJI PALLONJI CENTRE, 41/44, MINOO DESAI MARG, COLABA, MUMBAI – 400 005, MAHARASHTRA, INDIA.

Bureau Veritas Certification (India) Private Limited certify that the Management System of the above organisation has been audited and found to be in accordance with the requirements of the standard detailed below

STANDARD
BS OHSAS 18001:2007

SCOPE OF SUPPLY
CONSTRUCTION OF STEEL/ CONCRETE STRUCTURES AS PER DESIGN AND SPECIFICATIONS OF CLIENTS/ CUSTOMERS, DESIGN AND BUILD PROJECTS IN INDIA.

Original Approval Date: 12 March 2012
Next Recertification Due Before: 11 December 2014

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Further clarification regarding the scope of this certificate and the applicability of the Management System requirements may be obtained by consulting the organisation.

Certificate Number: IND12.7196/S

R. K. SHARMA
Director

BS OHSAS 18001:2007


BUREAU VERITAS Certification

Certification
Awarded to

Shapoorji Pallonji & Co. Ltd

CORPORATE OFFICE AND REGIONAL OFFICES IN INDIA
PROJECTS IN INDIA & OVERSEAS

ADDRESS OF CORPORATE OFFICE:
SHAPOORJI PALLONJI CENTRE, 41/44, MINOO DESAI MARG, COLABA, MUMBAI – 400 005, MAHARASHTRA, INDIA.
TEL: +91 22 67480 000
FAX: +91 22 66338 178

Bureau Veritas Certification (India) Private Limited certify that the Management System of the above organisation has been audited and found to be in accordance with the requirements of the standard detailed below

STANDARD
ISO 9001:2008

SCOPE OF SUPPLY
CONSTRUCTION OF STEEL/ CONCRETE STRUCTURES AS PER DESIGN AND SPECIFICATIONS OF CLIENTS/ CUSTOMERS, DESIGN AND BUILD PROJECTS, IN INDIA AND OVERSEAS.

PERMITTED EXCLUSIONS
Nil

Original Approval Date: 20 November 1998
Next Recertification Due Before: 15 October 2015

Subject to the continued satisfactory operation of the organisation's Management System, this certificate is valid until: 02 December 2012

To check this certificate validity please call: +91 22 6661 6666

Further clarification regarding the scope of this certificate and the applicability of the Management System requirements may be obtained by consulting the organisation.

Certificate Number: IND10.7016

R. K. SHARMA
Director

ISO 9001: 2008

- ISO 140001:2004
- BS OHSAS 18001:2007
- ISO 9001:2008

We bring in a **total experience** of **> 550 years** with us..

Shapoorji Pallonji EPC

Shapoorji Pallonji EPC → **Client Project**

Shapoorji Pallonji INFRA

Shapoorji Pallonji
Built to last... since 1865

Construction

Experience: 148 years

Sea Works & other Infra Works

Experience: 54 years

eBOP, Fire Fighting & HVAC

Experience: 86 years

Logistics

Experience: 246 years

Water Systems

Experience: 31 years

Infra Developer

- **Owns**: 110 MW Power Plant for > 10 years
- **Building**: 1320 MW Power Plant at Chara

Plants & Equipments


Metso 200TPH Mobile Crusher


Hardrock Gripper


Wet Mix Plant


Hot Mix Plant


Concrete Boom Placer Pump


Conveyor Belt


Crushing & Screening Plant


Hydraulic Piling Rig

- Shapoorji Pallonji Group owns a large fleet of construction equipment for its broad range of projects.
- A full suite of machinery that is required for timely and quality execution of works.
- The company continues to invest in latest plant and machinery and leverages State of Art Technologies for excellent results .

Present worth of Plant & Equipment approx. USD 400 Million

Plants & Equipments

- Heavy duty mobile and tower cranes of various capacities
- Concrete batching plants & transit mixers
- Concrete placer boom & pumps
- bridge builder for segment erection
- Hydraulic rotary drilling rigs for piling
- Jack-up platforms
- Large capacity barge mounted cranes
- Excavation & compaction equipment of various capacities
- Hot mix & wet mix plants & allied equipment
- Asphalt pavers

Plants & Equipments

Marine

Jackup

6 Numbers of Large Capacity Jack Ups (200 – 750 Tons)

Samrat

One of the biggest Jack-Up of its kind in India

Barges

9 Numbers of Marine Barges ranging from 200 – 1200 Tons

Sahyandri Barge

Lifting capacity upto 1200 Tonnes

Transportation

TBM

7 Tunnel Boring Machines

Soft Ground EPB
TBM : 4 Nos
Mixed Face
TBM : 2 Nos
Hard Rock
TBM : 1 Nos

Other Key Equipment

- Piling rig (14 no)

- Jumbo Drill (02 no)

- Cranes (65 no)

SP Group – Safety Awards

"Best Contractor Safety Award" for EPC

Project: Lime and Dolomite Calcination Plant (LDCP) for SAIL Bhilai Steel Plant, Bhilai

NSCI Safety Awards – 2009

GOLDEN SAFETY AWARD (Golden Shield)
Shapoorji Pallonji & Co. Ltd., Pune, Maharashtra
Project : General Motors India, Talegaon

Projects executed / under execution

	Name of the project	Client	Location
1	EPC Contract for 2X55 MW Coal Fired Power Plant in Mauritius	CT Power	Mauritius
2	EPC Contract for 2X660 MW Coal Fired Power Project, India	SP Infra	Gujarat, India
3	Turnkey Contract for Lime & Dolomite Calcination Plant at Bhilai Steel Plant	SAIL	Bhilai
4	EPC Contract for New Ore Bedding & Blending Plant & Base Mix facilities for Rourkela Steel Plant	SAIL	Rourkela
5	EPC Contract for 2.9 MTPA Thin Slab Caster, Tunnel Furnace, and Inline Hot Strip Mill	NMDC	Naganargar
6	EPC Contract for Coal Pulverization and Dust Injection System	SAIL	Burnpur
7	General civil works for Main Plant & Auxiliary buildings for Unit 2 of 2 X 600 MW Power Plant	Bharat Heavy Electricals Ltd.	Chennai
8	Site and Infrastructure works and Main Plant Civil & Structural works for 1 X 600 MW TPP	Korba West Power CoLtd.	Raigarh, Chhattisgarh.
9	Construction of Pile, Pile Cap and Foundation in Main Plant- Power House, Boiler, ESP, TG, Fans and Transformer foundation etc. for 2x600 MW TPP	Bharat Heavy Electricals Ltd.	Tuticorin
10	Construction of BTG - Civil and Structural works for 5 X 270 MW Nasik thermal Power Project	Elena Power & Infra Limited	Sinnar, Nasik.

Projects executed / under execution

	Name of the project	Client	Location
11	Construction of BTG - Civil and Structural works for 5 X 270 MW Nasik thermal Power Project	Elena Power & Infra Limited	Amaravati, Maharashtra
12	Civil and Structural works of BTG and General Civil works of construction of 2 X 600 MW Coal based Thermal Power Plant.	Jindal India Thermal Power	Angul, Orissa
13	Civil works for 225 MW Gas based Combined Cycle Power Plant	Sravanthi Infratech Pvt.Ltd.	Kashipur, Uttarkhand.
14	Chimney height of 180 mtr. In Visaka steel Plant	RINL	Vizhahapattinam
15	General civil works for Main Plant & Auxiliary buildings for Unit 2 of 2 X 600 MW Power Plant	Bharat Heavy Electricals Ltd.	Chennai
16	Piling and General Civil works for 2X250 MW Lignite Based Thermal Power Project	Bhavanagar Energy Company Limited	Bhavnagar, Gujarat
17	Civil Works for 1 x 600 MW Thermal Power Project near Barela-Gorakhpur Village	Jhabua Power Ltd.	Seoni District, Madhya Pradesh
18	Construction of foundation of power house, boiler, ESP, Fans, TG deck of 2x250 MW Thermal power plant	Indure Private Limited	Chhabra, Rajasthan

Power Plants

CT Power, Mauritius: 2 X 58 MW Coal Power Plant, Mauritius

All values in Rs. Crores, unless mentioned otherwise

Client	The (Mauritius) C.T. Power Ltd.
Project	2 X 58 MW Coal Power Plant
Contract Type	EPC Fixed Price Contract
OEM	BHEL (Sub-contractor)
Order Value	$ 264 Million $ 270 Million (after revision)
Project Manger	Mr. Rajeev Aggarwal
Start Date (Expected)	Dec'14
Completion Period – Unit 1	33 months
Completion Period – Unit 2	36 months
Salient Features	• Largest capacity base load Power Plant in Mauritius • Conforming to the latest EU emission norms • Utilizing City Sewage Discharge as a raw water source for the plant

Other Power Projects

Torrent Power Generation Limited: 1100 MW CCPP, Surat, Gujarat

Shapoorji Pallonji EPC

Client	M/s Torrent Power Generation Limited
Type	Construction Contract
Location	Surat, Gujarat
Area	90 hectares of land
Completion	2008
Contract value	INR 1190 million
Scope of Work	• Earthworks • Under reamed Piling • TG Foundations & Decks • Boiler Foundations • Structural Steel Works • Ancillary Buildings • Architectural Finishes • Road Works & CW System

Other Power Projects

Shandong Electric Power Construction Co.: 540MW TPP, Chhattisgarh

Shapoorji Pallonji EPC

Client	M/s Shandong Electric Power Construction Co.
Type	Construction Contract
Location	Chhattisgarh
Description	540 MW (4 Units x 135 MW) Thermal Power Project
Completion	2005
Scope of Work	• Crusher foundation & deck • 28 M High RCC Frames Structure for Crusher House • 22.5 M High RCC Fly Ash Silo – 2 Nos. • WTP with DM Tank foundation • Air Compressor House • Power house Control Building • Refrigerating station, • Coal handling wash water pump house.

Other Power Projects

Lanco Infratech Limited : 1x300MW TPS, Chhattisgarh

Client	M/s Lanco Infratech Limited
Location	Chhattisgarh
Description	Civil works for TG foundations & allied buildings for 300MW Coal based Thermal power plat
Scope of Work	• Duration : 20 months • Excavation qty. (soil) : 4,54,442 Cu.m Excavation qty. (Hard) : 53,867 Cum • RCC qty : 1,23,756 cu.m • PCC qty : 14,874 cu.m • Reinforcement Steel : 13,907 MT • Shuttering : 2,75,809 Sqm. • Slip form shuttering : 3025 Sqm. • Embedded parts : 450 MT

Other Power Projects

Reliance Utility Engineers Pvt. Ltd

Client	M/s Reliance Utility Engineers Pvt. Ltd
Location	Samalkot,,Andhra Pradesh
Description	Construction of Main Plant building & Balance of plant for 2400MW CCPP
Contract value	INR 2350 Million
Major Quantities	Concrete quantity : 1,50,000 cum Structural Steel : 14000 MT
Scope of Work	• Main power block & Balance of plant civil works • Roads and Drains. • Erection of bolted structure for (14000 MT)

Tata Power

Client	Tata Power
Location	Jojobera
Description	Civil works for 2x120MW Thermal Power Plant

Other Power Projects

Shapoorji Pallonji EPC

LANCO Amarkantak TPS, Pathadih, Chhattisgarh
300 MW Thermal Power Station.

Tata Hydro Electric Power Plant, Khopoli

Torrent Power Generation Limited
1100 MW Sugen Combined Cycle Power Project

Tata power Co Ltd
Trombay Thermal Power Station: 2 x 500MW + 1 x 180MW

Landmark Projects

Ore Bedding & Blending Plant, SAIL Rourkela

All values in Rs. Crores, unless mentioned otherwise

Project Overview

- Modernizing & Upgrading to most latest technology in Raw Material Handling System
- Capacity enhancement by 7MTPA of the existing RMHS capacity of 5MTPA to 12 MTPA at RSP

Key Highlights & Challenges

- Complete Plant Layout and Process Engineering done by In-house engineering team of SP EPC
- Created a New record in single day wagon unloading of 435 wagons on 27th Nov'13
- Construction of Bridge Girder under difficult live railway track
- Construction of Wagon Tippler tunnel at a depth of 12m below rail track
- Erection of 19 nos of Silos on Load cells at 13m height

Landmark Projects

Ore Bedding & Blending Plant, SAIL Rourkela

All values in Rs. Crores, unless mentioned otherwise

Client	SAIL – RSP, Rourkela
Project	EPC contract for New Ore Bedding & Blending Plant & Base Mix Facilities- Pkg -90
Partner	HEC, Ranchi

Scope of Supply	
SPCL Scope	Basic & Detail engineering
	Mechanical & Electrical equipment supply
	Civil & Structural works
	Erection, Testing & Commissioning of the plant
Major Mechanical package	Complete Belt conveying system, Utilities feeder, screens & other associated equipments

Project Highlights	
Key Equipments	3011 MT
Excavation	9,86,000 m^3
Conveyors	99 Nos. total 14 Km length
Electrical Cabling (Power, C & I)	152 km
Conveying equipment	6000 MT
Structural work	20388 MT
RCC	53450 cum

Landmark Projects

Thin Slab Caster, NMDC Nagarnar

Shapoorji Pallonji EPC

All values in Rs. Crores, unless mentioned otherwise

Project Overview

- First of its kind Flexible Thin Slab Caster in the world
- Largest & technologically advanced Thin slab Casting & Rolling Plant in the country with a production capacity of 2.9 MTPA in 2 strands

Key Highlights

- It has a vertical curved caster ideally suited for high strength value added steels
- Compact layout for a volume of 2 lakh cum RCC & excavation volume of 9 lakh cum up to a max depth of 26 m
- Design capability: 100% engineering is being done within in house facilities for a approx. volume of 3500 drawings

Landmark Projects

Thin Slab Caster, NMDC Nagarnar

Shapoorji Pallonji EPC

All values in Rs. Crores, unless mentioned otherwise

Client	NMDC Iron & Steel Plant, Nagarnar
Project	EPC Contract for 2.9mtpa Thin Slab Caster, Tunnel furnace & Inline Hot strip Mill
Partner	Danieli & C, Italy, Danieli, India, Andritz Brickmont, US

Scope of Supply	
SPCL Scope	Detail design, supply & erection of all building structures
	Detail design & construction of all building & technological foundations
	Erection & commissioning of plant & equipment
Major mechanical package	Thin Slab Caster, Tunnel Furnace, Hot Strip Mill along with coil handling facilities, entire water treatment plant along with two hydro cyclones

Detailed Scope	
Excavation	8,50,000 m^3
Concreting Works	1,84,000 m^3
Mechanical & Electrical Equipment	40,000 MT
Steel Structures	32000 MT
Cabling	5000 km

Landmark Projects

Lime & Dolomite Calcination Plant, SAIL Bhilai

Shapoorji Pallonji EPC

All values in Rs. Crores, unless mentioned otherwise

Client	SAIL – BSP, Bhilai
Project	Turnkey contract for Lime and Dolomite Calcination Plant (Package – 028)
Partner	M/s Maerz Offenbau, Switzerland

Scope of Supply	
SPCL Scope	Basic & Detail engineering
	Mechanical equipment supply
	Civil & Structural works
	Erection, Testing & Commissioning of the plant
Major mechanical package	Kiln Proper, Vibro Feeder, Conveyors, Blowers, Gas Boosters, Hydraulics, ACVS, Fire Fighting, Dust Extraction etc.

Detailed Scope	
Excavation	80,000 m^3
Concreting Works	14,000 m^3
Piling	792 Nos
Technological & Building Structures	9600 MT
Mechanical Equipment	1000 MT
Electrical Equipment	1021 MT

Landmark Projects

Coal Pulverization & Dust Injection System, SAIL Burnpur

Client	SAIL – ISP, Burnpur
Project	EPC contract for Coal Pulverization and Dust Injection System (PKG No : 08)
Partner	M/s Central Iron & Steel Research Institute, China, M/s Beijing Sino Steel Industry and Trade Group Corporation, China

Scope of Supply	
SPCL Scope	Basic & Detail engineering
	Mechanical equipment supply
	Civil & Structural works
	Erection, Testing & Commissioning of the plant
Major mechanical package	Nitrogen Storage and distribution vessel, Fine Coal & raw coal silo, Conveyors and De-Dusting System

Detailed Scope	
Concreting Works	4920 m^3
Brick Works	793 m^3
Road & Flooring Works	2030 m^2
Painting Works	7000 m^2
Fabricated Structures	1440 MT
Mechanical Equipment	1055 MT

Landmark Projects

Palace of His Majesty, Sultan Qaboos, Oman

Landmark Projects

Cricket Stadium of Guyana

Landmark Projects

India's tallest Skyscrapers: The Imperial I & II

General information	
Construction started	2005
Completed	2010
Height	
Antenna spire	254 m (833 ft)
Roof	210 m (690 ft)
Technical details	
Floor count	2 x 60
Floor area	2 x 120,000 m^2 (1,300,000 sq ft)
Lifts/elevators	17

Landmark Projects

Seat of Ghana

Client	Government of Ghana
Name of the Project	Design & Construction of Seat of Ghana for Government & Presidency of Ghana
Country	Ghana
Location within country	Accra
Built Up Area	14000 Sqmt.
Start date (Month/Year)	February 2006
Completion date (Month/Year)	June 2008
Contract Value	US$ 36.90 million / INR 1660.50 million
Scope of services rendered by our company	Design & construction of buildings viz. President's office, Block A, Block B and President's Villa including MEP works. Design and Construction of Road s, Car parks, Storm water drains, Cloisters, Service channels and tanks.

Landmark Projects

AL Fatah Tower @ Benghazi, Libya

Client	Libya Investment & Development Company(LIDCO)
Name of the Project	Design & Construction of AL FATAH Tower (G+32 Floors)
Country	Libya
Location within country	Benghazi
Address of Client	Tripoli, Libya
Start date (Month/Year)	July 2009
Completion date (Month/Year)	April 2013
Contract Value	US$ 130.00 million
Total Built-up Area	78,000.00 Sq.m.
Name of Designer & Architect	Arch Group, Dubai, UAE

Landmark Projects

Cyber Tower at Ebene Triangle, Mauritius

Client	Business Parks of Mauritius Limited
Name of the Project	Construction of Cyber Tower, Utility Building and Site development
Country	Mauritius
Location within country	Ebene Triangle
Address of Client	Business Parks of Mauritius Limited, Ebene Triangle, Mauritius
Start date (Month/Year)	August 2002
Completion date (Month/Year)	December 2003
Contract Value	US$ 52.67 million / INR 2370 million
Name of Consultant	Software Technology Parks of India /TCE Consulting Engineers
Scope of services rendered by our company	• Construction of Cyber Tower comprising of Basement + Ground Floor + 11 upper floors.

Landmark Projects

Hotel Kabul Serena, Kabul, Afghanistan

Client	Hotel Kabul Serena
Name of the Project	Construction of Hotel Kabul Serena at Kabul
Country	Afghanistan
Location within country	Kabul
Area	25000 Sqmt
Start date (Month/Year)	November 2002
Completion date (Month/Year)	November 2005
Contract Value	US$ 26.00 million / INR 1170 million
Name of Consultant	ARCOP International, Paris
Scope of services rendered by our company	• Repair, Renovation, refurbishment, reconstruction & fitting out of 160 rooms • 12 suites, Conversion of the Bank street to the Piazza

Landmark Projects

Car manufacturing facility for Skoda and General Motors

Skoda India, Aurangabad

Client	Skoda India Ltd
Project	Car Manufacturing Facility, Aurangabad
Scope of work	Design & Construction of Assembly Building, Administration Building, Stores & Training Rooms, Logistics Fan Room & Finished Car Parking.
Build up area	1,07,608 sq.m.

General Motors, Pune

Client	GENERAL MOTORS INDIA PVT LTD
Project	Car Manufacturing Plant, Talegaon, Pune
Scope of work	Design & Construction of Body shop building, General Assembly, Trestle & Data center.
Build up area	1,67,000 sq.m.

Landmark Projects

Intake jetty and Intake & Outfall system

Jetty at Dhabhol

Intake at Dhabhol

Intake & Outfall Pipeline Civil Works for Tannir Bavi Power Project, Karnataka

1200 mm pipe of approx. 1 km

Construction of Intake Jetty for Bechtel at Dabhol Power Project

Projects involved

Bored R.C.C. Piles 1100	-72Nos.
Concrete	-260cum
Superstructures Precast	- 270cum
Insitu	- 1415cum
Earth Work	- 86000cum

Landmark Projects

Iron Ore Mining Project , Liberia

Client	M/s. ArcelorMittal Liberia Limited
Name of the Project	Civil and Erection works forming part of DSO Phase of Iron Ore Mining in Liberia
Client consultant	SNC Lavalin
Location	Buchanan, Liberia
Contract Value	US$ 55 Million
Salient Features	Installation of Material Handling System at Buchanan Port, Sheet Pile Driving and Anchoring, Assembly of Fender units, Mobile Ship loader Installation, Electrical Works, Civil and Structural Works at Port and Mine Site, Installation of Mechanical Equipments, Refurbishment of Berthing Structure.
Major Quantities	Sheet Piles: 2425Sq.m Concrete: 13,695 Cum Reinforcement: 1648 MT Structural Steel: 331 MT

Landmark Projects

Marine & Industrial Projects

Bulk Jetty, Port of Sohar, Oman

Client	Sohar International Development Company LLC
Project	Design and Construction of Bulk Jetty at Sohar Port, Oman
Scope of work	EPC of Bulk Jetty, Approach Trestle, Mooring & Dolphin Structures
Partnership	Afcons with Saipem, France / Italy
	Installation of 48 nos of Fenders and 47 nos of Quick Release Hook

Oil Jetty, Mauritius

Client	M/s. Mauritius Port Authority
Name of the Project	Construction of Oil receiving Jetty at Port Louis Harbour, Mauritius
Client consultant	CES
Location	Mauritius
Contract Value	US$ 16 Million

Landmark Projects

Marine & Industrial Projects

New Phosphate Rock Terminal in Aqaba, Jordan

Client	Jordan Phosphate Mines Company Ltd.
Project	New Phosphate Rock Terminal in Aqaba, Jordan
Scope of work	EPC for export jetty and onshore facilities for receiving bulk carriers from 5000 to 100,000 DWT

Sulphur Expansion Jetty, Ruwais, Abu Dhabi

Client	Dodsal Engineering & Construction
Project	Sulphur Expansion Jetty, Ruwais, Abu Dhabi, UAE
Scope of work	Construction of Ship loader pivot foundation & Quadrant beam, 4 Breasting dolphins , 4 Mooring dolphins and Construction of Catwalks between the dolphins, Access trestle, and Steel lattice towers 15 m high for 3 marine leading lights

Landmark Projects

Oil & Gas Projects

Shapoorji Pallonji EPC

Off Shore Process Platform- ONGC (ICP-R)

Client	Oil & Natural Gas Corporation (ONGC)
Project	Off Shore Process Platform- ONGC (ICP-R)
Scope of work	EPC (Engineering, Procurement, Fabrication, Load out, Installation Hook Up, and Commissioning of 4 legged offshore process platform. JV partner Gunanusa, Indonesia

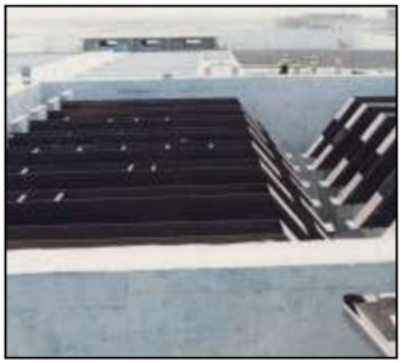
Jetty Modification Works – Reliance at Jamnagar

Client	Reliance Industries Ltd
Project	Jetty Modification Works
Scope of work	Fabrication and erection, testing and commissioning of Hydro Carbon pipelines, auxiliary mooring platforms, berth modifications works etc

Landmark Projects
Industrial Civil Works








Industrial Civil Work: Reliance Petroleum Ltd,Jamnagar

Projects Involves:

- TOTAL EXCAVATION - 8,70,360 Cu.m
  - Earth Work In Excavation/Filling - 4,67,750 Cu.m
  - Excavation In Rock - 3,64,610 Cu.m
  - Under Water Rock Excavation - 38,000 Cu.m
  (By Drilling & Blasting)
- Dredging - 4,17,900 Cu.m.
- Concreting Grade M10 To M40 - 1,37,250 Cu.m.
- Reinforcement Work - 13,500 MT
- Shuttering Work - 3,51,800 SQM.
- Structural Steel Fabrication - 3200 MT

Landmark Projects
Industrial projects

MEP solutions for Skoda Automobiles India

Client:	Skoda Automobiles India
Location:	Aurangabad
Contract value:	INR 10 Cr.
Scope:	Electrification of Auto plant including 33KV HT substation, 33KV VCB panel, 1250 KVA transformer, HT panels, Cables and cable trays, lighting fixtures

80000 CFM x 6 nos. masonry type air washer units, Air conditioners etc.

MEP solutions for Nokia Siemens

Client:	Nokia Siemens
Location:	Chennai
Consultant:	Granlund, Finland
Contract value:	INR 44.51 Cr.
Scope:	Supply, Erection, Testing and Commissioning of Chillers of 300TRx 1 No & 184 TR x 3 Nos, Pumps, AHU's Sewage treatment plant, Water treatment plant .

Landmark Projects
Industrial projects

Shapoorji Pallonji EPC

MEP solutions for Tata Motors

Client:	Tata Motors
Location:	Sanand, Gujarat
Contract value:	INR 25 Cr.
Scope:	Electrical work included SITC of 4x8MVA, 33/6.6KV & 26x2MVA, 33/.415KV transformers, 30 No.s HT panels, LT Panels etc.

Ventilation system of 300000 CMH Air washer in double skin construction, pumps, fans, cabling etc

MEP solutions for Supreme Industries

Client:	Supreme Industries Pvt. Ltd
Location:	Mumbai
Consultant:	Rumi Bharucha Consultants
Scope:	Electrical works of compact substation, HT metering, HT Panels, SITC of AHU, Ventilation fans, Chillers, pumps, BTU meter, Plumbing & Firefighting system

Landmark Projects
DG Sets

Shapoorji Pallonji EPC

DG solutions for Noamundi Iron Ore Mine

Client:	Tata Steel
Location:	Jharkhand
Contract value:	INR 6.5 Cr.
Scope:	Supply, Installation, Testing and Commissioning of Diesel Power plant with 1 no. 3000KVA, 3.3KV DG sets on Turnkey basis including civil construction of the plant

Supply, Installation, Testing and Commissioning of Diesel Power plant with 2 no. 1650 KVA, 3.3KV DG sets on Turnkey basis

DG solutions for Meghahatuburu Iron Ore Mine

Client:	SAIL
Location:	Jharkhand
Consultant:	CET, Ranchi
Contract value:	INR 6.81 Cr.
Scope:	Supply, Installation, Testing and Commissioning of Diesel Power plant with 5x1500KVA DG sets on Turnkey basis.

Landmark Projects

Substation & Distribution System

Shapoorji Pallonji EPC

EPC solutions for PGCCL /NTPC

Client:	Power Grid Corporation Company Ltd, Kanpur
Project Name:	132 KV & 220 KV Substation Projects of PGCIL / NTPC
Contract value:	INR 673.8 Cr.
Scope:	Design, engineering, manufacture, assembly, inspection, testing, supply, storage, erection & commissioning of 220 KV Orai Bay at 400/220 KV Bhauti Substation

EPC solutions for Durgapur Steel plant

Client:	SAIL, Durgapur
Project:	Durgapur Steel Plant 2.5 MT expansion plant, SAIL
Contract value:	INR 889.5 Cr.
Scope:	Design, Engineering, Project Management, Supply, Installation, Testing, Commissioning and Performance Guarantee Testing of Medium Voltage Distribution system

Landmark Projects

Industrial Water Purification System

Shapoorji Pallonji EPC

Vedanta Aluminum limited, Orissa

9.6 MLD Effluent Treatment Plant-clarification & filtration

Scottish Water

9 MLD Water Treatment Plant

Landmark Projects

Industrial Water Purification System

Shapoorji Pallonji EPC

Galfar Engineering LLC, Oman

Capacity 1.2 MLD
Brackish Water Reverse Osmosis, TDS : 30,000 ppm

Magarpatta City Corporation Pune

Capacity- 4 MLD
Clarification, Filtration and Softening

Landmark Projects

Industrial Water Purification System

Tata Coffee Ltd, Tamil Nadu

Capacity – 800 Kilo Litre per Day (KLD)
Ultra Filtration and Reverse Osmosis

Yorkshire water

90 MLD Water Treatment Plant

Why Shapoorji …

- A company with Sound Financial health & Excellent Goodwill
- International footprint
- Substantial own value addition for better control over execution
- Complete Engineering capability
- Effective sourcing control
- Impeccable Delivery, Quality & Safety track record
- Innovative approach to complex projects

Contact information

Pawan Parikh
Chief Executive Officer – EPC
Tel. No. :+91 22 6749 0173
Email ID: pawan.parikh@shapoorji.com

Address:

Shapoorji Pallonji & Co. Ltd.

SP Center, 41/44 Minoo Desai Marg,

Colaba, Mumbai – 400 005

Maharashtra – India

Tel. No. :+91 22 6749 0000

Annex M

Plant Species within Area of Influence

Table 1.1 Plant Species in Area of Influence

Sn	Scientific Name	Local Name	Habit	Habitat	Uses	Occurrence
1.	**Alismataceae**					
1	*Sagittaria sagittifolia*	hhotokul	Herb	Aquatic and Semiaquatic Vegetation		C
2.	**Amaranthaceae**					
2	*Achyranthes aspera*	Apang	Herb	Agricultural Lands		C
3	*Alternanthera sessilis*	Sachishak	Herb	Agricultural Lands		VC
4	*Amaranthus spinosus*	Kata note	Herb	Agricultural Lands		VC
5	*Alternanthera philoxiroides*	Helencha	Herb	Aquatic and Semiaquatic Vegetation		VC
3.	**Anacardiaceae**					
6	*Mangifera indica*	Am	Tree	Homestead Plantation	Fruit and Timber	VC
7	*Spondias dulcis*	Amra	Tree	Homestead Plantation	Fruit	C
4.	**Annonaceae**					
8	*Polyalthia longifolia*	Debdaru	Tree	Homestead Plantation	Fuelwood and Timber	R
5.	**Apocynaceae**					
9	*Alstonia scholaris*	Chatim	Tree	Homestead Plantation	Timber	R
10	*Carissa carandas*	Karamcha	Shrub	Agricultural Lands		R
6.	**Aponogetonaceae**					
11	*Aponogeton natans*	Ghentu	Herb	Aquatic and Semiaquatic Vegetation		C
7.	**Araceae**					
12	*Colocasia esculenta*	Kachu	Herb	Aquatic and Semiaquatic Vegetation		C
13	*Pistia stratiotes*	Topapana	Herb	Aquatic and Semiaquatic Vegetation		VC
8.	**Asclepiadaceae**					
14	*Calotropis gigantea*	Akand	Shrub	Agricultural Lands		C
15	*Calotropis procera*	Akand	Shrub	Agricultural Lands		C
9.	**Averrhoaceae**					
16	*Averrhoa carambola*	Kamranga	Tree	Homestead Plantation	Fruit	C
10.	**Barringtoniaceae**					
17	*Barringtonia acutangula*	Hijal	Shrub	Homestead Plantation	Fuelwood	C
11.	**Bombacaceae**					
18	*Bombax ceiba*	Shimul	Tree	Homestead Plantation	Cotton and Fuelwood	C
12.	**Capparidaceae**					
19	*Crataeva nurvala*	Baroon	Tree	Homestead Plantation	Fuelwood	C
13.	**Caricaceae**					
20	*Carica papaya*	Papaya	Shrub	Homestead Plantation	Fruit	C
14.	**Casurianaceae**					
21	*Casuarina equisetifolia*	Jahu	Shrub	Homestead Plantation	Ornamental	
15.	**Cearatophyllaceae**					

Sn	Scientific Name	Local Name	Habit	Habitat	Uses	Occurrence
22	*Ceratophyllum desmersum*	Jhangi	Herb	Aquatic and Semiaquatic Vegetation		C
16.	**Chenopodiaceae**					
23	*Chenopodium ambrosoides*	Chapali ghash	Herb	Agricultural Lands		VC
17.	**Combretaceae**					
24	*Terminalia arjuna*	Arjun	Tree	Homestead Plantation	Timber and medicine	C
25	*Terminalia catappa*	Katbadam	Tree	Homestead Plantation	Fruit	R
18.	**Compositae**					
26	*Cestrum nocturnum*	Hasnahena	Shrub	Homestead Plantation	Ornamental	R
27	*Mikania scandens*	Assamlata	Herb	Homestead Plantation	Medicine	VC
28	*Cotula hemispherica*	Kancha ghash	Herb	Agricultural Lands		C
29	*Eclipta alba*	Kalokeshi	Herb	Aquatic and Semiaquatic Vegetation		C
19.	**Convolvulaceae**					
30	*Cuscuta australis*	Swarnalata	Herb	Agricultural Lands		C
31	*Ipomoea aquatica*	Kalmi sak	Herb	Aquatic and Semiaquatic Vegetation		VC
20.	**Cruciferae**					
32	*Rorippa indica*	Bansarisha	Herb	Agricultural Lands		C
21.	**Cyperaceae**					
33	*Cyperus diformis*		Herb	Agricultural Lands		C
34	*Rhynchospora rufescens*	Shimbhatraji	Herb	Agricultural Lands		VC
35	*Cyperus sp.*	Mutha	Herb	Aquatic and Semiaquatic Vegetation		VC
36	*Enhydra fluctuans*	Helencha	Herb	Aquatic and Semiaquatic Vegetation		VC
37	*Fimbristylis milliaceae*	Joina	Herb	Aquatic and Semiaquatic Vegetation		C
38	*Scirpus juncoides*	hisra	Herb	Aquatic and Semiaquatic Vegetation		C
22.	**Dilleniaceae**					
39	*Dillenia indica*	Chalta	Tree	Homestead Plantation	Fruit	C*
23.	**Ebanaceae**					
40	*Diospyros discolor*	Bilatigab	Tree	Homestead Plantation	Fruit	C*
41	*Diospyros perigrina*	gab, deshigab	Tree	Homestead Plantation	Fruit and Timber	C
24.	**Euphorbiaceae**					
42	*Ricinus communis*	Reri	Shrub	Homestead Plantation	Oil	VC
43	*Trewia nudiflora*	Pitali/Latim	Tree	Homestead Plantation	Timber and fuelwood	VC
44	*Acalypha indica*	Muktajhuri	Herb	Agricultural Lands		C
45	*Croton bonplandianum*	Banjhal	Herb	Agricultural Lands		C
46	*Euphorbia hirta*	Dudhia	Herb	Agricultural Lands		VC
25.	**Fabaceae**					
47	*Dalbergia sissoo*	Sisso	Tree	Homestead Plantation	Timber and fuelwood	C
48	*Pongamia pinnata*	Karoch	Tree	Homestead Plantation	Fuelwood	R

Sn	Scientific Name	Local Name	Habit	Habitat	Uses	Occurrence
26.	**Gramineae**					
49	*Bambusa sp.*	Bans	Tree	Homestead Plantation	Thatching	VC
50	*Crotolaria retusa*	Ban-san	Herb	Agricultural Lands		VC
51	*Cynodon dactylon*	Durba	Herb	Agricultural Lands		VC
52	*Sacciolepis interrupta*	Nardulla	Herb	Agricultural Lands		VC
53	*Scleria lacustris*		Herb	Agricultural Lands		C
54	*Arundo donax*	Baranal	Herb	Aquatic and Semiaquatic Vegetation		VC
55	*Hygroryza aristata*	Putki	Herb	Aquatic and Semiaquatic Vegetation		C
56	*Phragmites karka*	Nol	Herb	Aquatic and Semiaquatic Vegetation		VC
57	*Vetiveria zizanioides*	Binna	Herb	Aquatic and Semiaquatic Vegetation		C
27.	**Haloraceae**					
58	*Myriophyllum tetrandrum*	-	Herb	Aquatic and Semiaquatic Vegetation		C
28.	**Hydrocharitaceae**					
59	*Hydrocharis dubia*		Herb	Aquatic and Semiaquatic Vegetation		C
60	*Nachamendra alternifolia*	Kaisa	Herb	Aquatic and Semiaquatic Vegetation		C
61	*Vallisnaria spiralis*	Biha	Herb	Aquatic and Semiaquatic Vegetation		C
29.	**Labiatae**					
62	*Ocimum americanum*	Tulshi	Herb	Homestead Plantation	Medicine	R
30.	**Leguminosae**					
63	*Albizia lebbeck*	Sirish	Tree	Homestead Plantation	Timber and fuelwood	VC
64	*Albizia procera*	Silkaroi	Tree	Homestead Plantation	Timber and fuelwood	C
65	*Albizia richrdiana*	Gogon Sirish	Tree	Homestead Plantation	Timber	C
66	*Cassia alata*	Dadmordon	Shrub	Homestead Plantation	Medicine and Fuel wood	
67	*Cassia fistula*	Badarlathi/Sonalu	Tree	Homestead Plantation	Ornamental and Medicine	R
68	*Cassia occidentalis*	Barahalkasunda	Shrub	Homestead Plantation	Fuelwood	C
69	*Cassia siamea*	Minjuri	Tree	Homestead Plantation	Fuelwood	
70	*Cassia tora*	Chakunda	Shrub	Homestead Plantation	Fuelwood	
71	*Erythrina ovalifolia*	Talimandar	Tree	Homestead Plantation	Fuelwood	C
72	*Sesbania grandiflora*	Bakphul	Shrub	Homestead Plantation	Medicine	R
73	*Tamarindus indica*	Tetul	Tree	Homestead Plantation	Fruit	C
74	*Sesbania rostrata*	Dhaincha	Herb	Agricultural Lands		VC
31.	**Lemnaceae**					
75	*Lemna perpusilla*	Khudipana	Herb	Aquatic and Semiaquatic Vegetation		C
76	*Spirodela polyrhiza*	Khudipana	Herb	Aquatic and Semiaquatic Vegetation		C
77	*Wolffia microscopica*	Guripana	Herb	Aquatic and Semiaquatic Vegetation		C
32	**Lentibulariaceae**					
78	*Utricualria exoleata*	Chotojhangi	Herb	Aquatic and Semiaquatic Vegetation		C

Sn	Scientific Name	Local Name	Habit	Habitat	Uses	Occurrence
33.	**Lythraceae**					
79	*Lagerstromia speciosa*	Jarul	Tree	Homestead Plantation	Ornamental and Timber	R
34.	**Marciliaceae**					
80	*Marsilea quadrifolia*	Susnishak	Herb	Agricultural Lands		C
35.	**Meliaceae**					
81	*Aponomyxis polystachya*	Rayna	Tree	Homestead Plantation	Timber and fuelwood	C
82	*Azadirachta indica*	Nim	Tree	Homestead Plantation	Timber and medicine	C
83	*Swietenia mahagoni*	Mahogoni	Tree	Homestead Plantation	Timber and medicine	VC
36.	**Menyanthaceae**					
84	*Nymphoides indicum*	Panchuli	Herb	Aquatic and Semiaquatic Vegetation		VC
37.	**Mersileaceae**					
85	*Mersilea quadrifoliata*	Susnisak	Herb	Aquatic and Semiaquatic Vegetation		VC
38.	**Mimisaceae**					
86	*Leucauna laucocephalata*	Ipil ipil	Tree	Homestead Plantation	Timber	C
39.	**Mimosaceae**					
87	*Acacia moniliformis*	Akashmoni	Tree	Homestead Plantation	Timber and fuelwood	C
88	*Inga dulcis*	Khai Babla	Tree	Homestead Plantation	Fruit, Timber and fuelwood	R
40.	**Moraceae**					
89	*Artocarpus heterophyllus*	Kathal	Tree	Homestead Plantation	Fruit, Timber and fuelwood	
90	*Ficus benghalensis*	Bot	Tree	Homestead Plantation	Fuelwood	
91	*Ficus heterophylla*	Bhui Dumur	Herb	Homestead Plantation		
92	*Ficus hispida*	Dumur	Shrub	Homestead Plantation	Fruit and Fuelwood	
93	*Ficus religiosa*	Assawath	Tree	Homestead Plantation	Fuelwood	
41.	**Moringaceae**					
94	*Moringa oleifera*	Sajna	Tree	Homestead Plantation	Vegetable	C
42.	**Musaceae**					
95	*Musa paradisiaca* var. *sapientum*	Kala	Shrub	Homestead Plantation	Fruit	VC
43.	**Myrtaceae**					
96	*Psidium guajava*	Peyara	Shrub	Homestead Plantation	Fruit	C
97	*Syzygium cumini*	Kalojam	Tree	Homestead Plantation	Fruit	C
98	*Syzygium samarangense*	Jamrul	Tree	Homestead Plantation	Fruit	R
44.	**Najadaceae**					
99	*Najas*. sp	Goisa	Herb	Aquatic and Semiaquatic Vegetation		C
45.	**Nymphaeaceae**					
100	*Nymphaea nouchali*	Shapla	Herb	Aquatic and Semiaquatic Vegetation		VC
101	*Nymphaea stellata*	Nilshapla	Herb	Aquatic and Semiaquatic Vegetation		R
46.	**Onagraceae**					
102	*Ludwigia abscendens*	Keshordam	Herb	Aquatic and Semiaquatic Vegetation		C
103	*Ludwigia hyssopifolia*	Keshordam	Herb	Aquatic and Semiaquatic Vegetation		VC

Sn	Scientific Name	Local Name	Habit	Habitat	Uses	Occurrence
47.	**Palmae**					
104	*Areca catechu*	Supari	Tree	Homestead Plantation	Fruit and Timber	VC
105	*Borassus flabelifer*	Tal	Tree	Homestead Plantation	Fruit, Fuel wood and Timber	R
106	*Calamus tenuis*	Lajibet	Shrub	Homestead Plantation	Thaching	
107	*Cocos nucifera*	Narikel	Tree	Homestead Plantation	Fruit and Fuelwood	VC
108	*Phoneix sylvestris*	Khejur	Tree	Homestead Plantation	Fruit and Fuelwood	C
48.	**Pandanaceae**					
109	*Pandanus sp.*	Keya	Herb	Homestead Plantation		R
49.	**Parkeriaceae**					
110	*Ceratopteris thalictroides*	-	Herb	Agricultural Lands		R*
50.	**Polygonaceae**					
111	*Polygonum barbatum*	Bishkatali	Herb	Aquatic and Semiaquatic Vegetation		C
112	*Polygonum glabrum*	Bishkatali	Herb	Aquatic and Semiaquatic Vegetation		C
113	*Polygonum lanatum*	Bishkatali	Herb	Aquatic and Semiaquatic Vegetation		C
51.	**Pontaderiaceae**					
114	*Eichhornia crassipes*	Kochuripana	Herb	Aquatic and Semiaquatic Vegetation		VC
115	*Monochoria hatata*	Kechur	Herb	Aquatic and Semiaquatic Vegetation		C
52.	**Pteridaceae**					
116	*Cheratopteris sp*	Fern	Herb	Aquatic and Semiaquatic Vegetation		C
53.	**Rhamnaceae**					
117	*Zizyphus mauritiana*	Baroi	Tree	Homestead Plantation	Fruit	C
54.	**Rubiaceae**					
118	*Anthocephalus chinensis*	Kadom	Tree	Homestead Plantation	Timber and fuelwood	C
119	*Dentella repens*	Hachuti	Herb	Agricultural Lands		C
55.	**Rutaceae**					
120	*Aegle marmelos*	Bel	Tree	Homestead Plantation	Fruit and Medicine	R
121	*Citrus grandis*	Jambura	Tree	Homestead Plantation	Fruit	C
122	*Glycosmis pentaphylla*	Daton	Shrub	Homestead Plantation	Medicine	VC
56.	**Salicaceae**					
123	*Salix tetrasperma*	Biash	Shrub	Homestead Plantation	Timber	R
57.	**Salviniaceae**					
124	*Azolla pinnata*	Kutipana	Herb	Aquatic and Semiaquatic Vegetation		C
125	*Salvina cucullata*	Kuripana	Herb	Aquatic and Semiaquatic Vegetation		C
58.	**Sapindaceae**					
126	*Litchi chinensis*	Lichu	Tree	Homestead Plantation	Fruit	C

Sn	Scientific Name	Local Name	Habit	Habitat	Uses	Occurrence
59.	**Scrophulariaceae**					
127	*Limnophila sessiliflora*	Bijatighas	Herb	Aquatic and Semiaquatic Vegetation		C
60.	**Solanaceae**					
128	*Datura suaveolens*	Dutura	Herb	Homestead Plantation	Medicine	R
129	*Physalis minima*	Bantepari	Herb	Homestead Plantation	nf	VC
130	*Nicotiana plumbaginifolia*	Bantamak	Herb	Agricultural Lands		C
131	*Nyctanthes arbortristris*	Sefali	Herb	Agricultural Lands		C
61.	**Trapaceae**					
132	*Trapa natans*	Singra	Herb	Aquatic and Semiaquatic Vegetation		R
62.	**Umbelliferae**					
133	*Abroma augusta*	Ulatkambal	Shrub	Homestead Plantation	Medicine	R
134	*Centella asitica*	Thankuni	Herb	Homestead Plantation	Medicine and Vegetables	C
63.	**Urticaceae**					
135	*Streblus asper*	Sheora	Shrub	Homestead Plantation	Fuelwood	C
64.	**Verbenaceae**					
136	*Cleorodendrum viscosum*	Bhat	Shrub	Homestead Plantation	Fuelwood	C
137	*Tectona grandis*	Segun	Tree	Homestead Plantation	Timber	C
138	*Clerodendrum inerme*	Bhant	Herb	Agricultural Lands		C*
139	*Vitex negundo*	Nishinda	Shrub	Homestead Plantation	Medicine	R

Annex N

List of Amphibian in AoI

SL#	Scientific Name	English Name	Local Name	Family	IUCN Status Global	IUCN Status Bangladesh	Wildlife (Conservation and Security) Act, 2012 Schedule
1.	*Duttaphrynus melanostictus*	Common Toad	Kuno Bang	Bufonidae	LC	LC	-
2.	*Euphlyctis cyanophlyctis*	Skipper Frog	Kotkoti Bang	Dicroglossidae	LC	LC	-
3.	*Euphlyctis hexadactylus*	Green Frog	Sabuj Bang	Dicroglossidae	LC	LC	Sch.I
4.	*Fejervarya syhadrensis*	Cricket Frog	Jhijhi Bang	Dicroglossidae	LC	LC	-
5.	*Hoplobatrachus tigerinus*	Indian Bull Frog	Sona bang	Dicroglossidae	LC	LC	Sch.-I
6.	*Microhyla ornata*	Ornate Microhylid	Cheena Bang	Microhylidae	NA	DD	-
7.	*Nasirana alticola*	Pointed-headed Frog	Pana Bang	Ranidae	LC	LC	-
8.	*Hylarana taipehensis*	Two-striped Grass Frog	Frog Kaad Bang	Ranidae	DD	DD	Sch.-I
9.	*Hylarana tytleri*	Leaping Frog	Pana Bang	Ranidae	LC	LC	-
10.	*Polypedates leucomystax*	Asian Brown	Tree Frog Gecho Bang	Rhacophoridae	LC	LC	-
11.	*Polypedates maculatus*	Indian Tree Frog	Gecho Bang	Rhacophoridae	LC	LC	-
12.	*Rhacophorus maximus*	Large Tree Frog	Oghalok Bang	Rhacophoridae	LC	VU	-

Note: IUCN Status code: CR – Critically Endangered, EN - Endangered, VU – Vulnerable, LC-Least Concern, DD-Data Deficient, NA-Not Assessed

Annex O

List of Reptiles

SL#	Scientific Name	English Name	Local Name	Family	IUCN Status Global-2016.3	IUCN Status Bangladesh 2015	Wildlife (Conservation and Security) Act, 2012 Schedule
1.	*Pangshura tectum*	Indian Roofed Turtle	Kori/Hali Kasim	Bataguridae	LC	LC	Sch-I
2.	*Pangshura tentoria*	South Indian Roofed Turtle	Kaitta	Bataguridae	NT	LC	Sch-I
3.	*Batagur kachuga*	Red Crowned Roofed Turtle	Kori Kasim	Bataguridae	CR	CR	Sch-I
4.	*Calotes versicolor*	Common Garden Lizard	Roktochosha	Agamidae	LC	LC	Sch-II
5.	*Gekko gecko*	Tokay Gecko	Tokkhak/Kokkay	Gekkonidae	LC	LC	Sch-II
6.	*Hemidactylus brookii*	Brooks House Gecko	Tiktiki	Gekkonidae	LC	LC	Sch-II
7.	*Hemidactylus flaviviridis*	Yellow-bellied House Gecko	Goda Tiktiki - -	Gekkonidae	LC	LC	Sch-II
8.	*Hemidactylus frenatus*	Common House Gecko	Tiktiki	Gekkonidae	LC	LC	Sch-II
9.	*Eutropis carinata*	Keeled Grass skink	Anzoni	Scincidae	LC	LC	Sch-II
10.	*Sphenomorphus maculatus*	Spotted Litter skink	Anzoni	Scincidae	LC	LC	Sch-II
11.	*Varanus bengalensis*	Bengal Monitor	Gui Shap	Varanidae	NT	LC	Sch-II
12.	*Varanus flavescens*	Yellow Monitor	Sona Gui	Varanidae	NT	LC	Sch-I
13.	*Typhlops jerdoni*	Jerdon's Blind Snake	Sutanoli Shap	Typhlopidae	LC	NE	-
14.	*Atretium schistosum*	Olive Keelback	Matia Shap	Colubridae	LC	LC	Sch-II
15.	*Amphiesma stolatum*	Striped Keelback	Chilu Shap	Colubridae	LC	NE	Sch-I
16.	*Enhydris enhydris*	Common Smooth Water Snake	Painna Shap	Colubridae	LC	LC	Sch-I
17.	*Lycodon aulicus*	Common Wolf Snake	Gharginni Shap	Colubridae	LC	LC	Sch-I
18.	*Ptyas mucosus*	Indian Rat Snake	Daraj Shap	Colubridae	LC	LC	Sch-I
19.	*Xenochrophis piscator*	Checkered Keelback	Dhora Shap	Colubridae	LC	LC	Sch-I
20.	*Bungarus caeruleus*	Common Krait	Kal-keute Shap	Elapidae	LC	LC	Sch-I
21.	*Naja naja*	Spectacled Cobra	Khoiya Gokhra Shap	Elapidae	NT	LC	Sch-I
22.	*Naja kaouthia*	Monocled Cobra	Gokhra Shap	Elapidae	NT	LC	Sch-I
23.	*Gavialis gangeticus*	Gharial	Ghorial/Baisha-	Crocodylidae	CR	CR	Sch-I

Note: IUCN Status code: CR-Critically Endangered, NT-Near Threatened, LC-Least Concern, NE-Not Evaluated, Sch-I-Protected Animals

Annex P

List of Birds and their Conservation Status within AoI

SL#	Scientific Name	English Name	Local Name	IUCN Status 2016.3	IUCN Bangladesh Status 2015	Wildlife (Conservation and Security) Act, 2012 Schedule
1.	*Acridotheres fuscus*	Jungle Myna	Jhuti Shalik	LC	LC	Sch.-I
2.	*Streptopelia chinensis*	Spotted Dove	Tila Ghughu	LC	LC	Sch.-I
3.	*Streptopelia decaocta*	Eurasian Collared Dove	Eurashio Konthighughu	LC	LC	Sch.-I
4.	*Streptopelia tranquebarica*	Red Turtle Dove	Lal Konthighughu	LC	LC	Sch.-I
5.	*Corvus macrorhynchos*	Large-billed Crow	Dar Kak	LC	LC	-
6.	*Corvus splendens*	House Crow	Pati Kak	LC	LC	-
7.	*Psittacula krameri*	Rose-ringed Parakeet	Modna Tia	LC	LC	Sch.-I
8.	*Ardea cinerea*	Grey Heron	Dhupni Bok	LC	LC	Sch.-I
9.	*Ardeola grayii*	Indian Pond Heron	Deshi Kanibok	LC	LC	Sch.-I
10.	*Butorides striata*	Striated Heron	Khude Bok	LC	LC	Sch.-I
11.	*Acridotheres tristis*	Common Myna	Bhat Shalik	LC	LC	Sch.-I
12.	*Sturnus contra*	Asian Pied Myna	Eshio Pakrashalik	LC	LC	Sch.-I
13.	*Sturnus malabaricus*	Chestnut-tailed Starling	Khoiralej Telshalik	LC	LC	Sch.-I
14.	*Alcedo atthis*	Common Kingfisher	Pati Machranga	LC	LC	Sch.-II
15.	*Ceryle rudis*	Pied Kingfisher	Pakra Machranga	LC	LC	Sch.-II
16.	*Halcyon smyrnensis*	White-throated Kingfisher	Dholagola Machranga	LC	LC	Sch.-II
17.	*Passer domesticus*	House Sparrow	Pati Chorui	LC	LC	-
18.	*Phalacrocorax carbo*	Great Cormorant	Boro Pankouri	LC	LC	Sch.-II
19.	*Phalacrocorax fuscicollis*	Indian Cormorant	Deshi Pankouri	LC	LC	Sch.-II
20.	*Phalacrocorax niger*	Little Cormorant	Choto Pankouri	LC	LC	Sch.-II
21.	*Copsychus saularis*	Oriental Magpie-Robin	Udoi Doel	LC	LC	Sch.-II
22.	*Amaurornis phoenicurus*	White-breasted Water hen	Dholabook Dahuk	LC	LC	Sch.-II
23.	*Chrysocolaptes lucidus*	Greater Goldenback	Boro Kaththokra	LC	LC	Sch.-II
24.	*Dinopium benghalense*	Lesser Goldenback	Bangla Kaththokra	LC	LC	Sch.-II
25.	*Dinopium javanense*	Common Golden back	Pati Kaththokra	LC	LC	Sch.-II
26.	*Cuculus micropterus*	Indian Cuckoo	Bokotakou Kokil	LC	LC	Sch.-II
27.	*Motacilla flava*	Western Yellow Wagtail	Holdey Khonjon	LC	LC	Sch.-II
28.	*Ketupa zeylonensis*	Brown Fish Owl	Khoira Mechopecha	LC	LC	Sch.-II
29.	*Tyto alba*	Barn Owl	Lokkhi Pecha (SA)	LC	LC	Sch.-II
30.	*Athene brama*	Spotted Owlet	Khuruley Kutipecha	LC	LC	Sch.-II
31.	*Nettapas coromandelianus*	Cotton Pygmy Goose	Dhola Balihash	LC	LC	Sch.-II
32.	*Dendrocitta vagabunda*	Rufous Treepie	Khoira Harichacha	LC	LC	Sch.-II
33.	*Orthotomus sutorius*	Common Tailorbird	Pati Tuntuni	LC	LC	-
34.	*Terpsiphone paradisi*	Asian Paradise-flycatcher	Eshio Shabulbuli	LC	LC	Sch.-II
35.	*Ploceus bengalensis*	Black-breasted Weaver	Bangla Babui	LC	LC	Sch.-II
36.	*Ploceus philippinus*	Baya Weaver	Deshi babui	LC	LC	Sch.-II
37.	*Ichthyophaga ichthyaetus*	Grey-headed Fish Eagle	Metematha Kuraeegol	NT	NT	Sch.-I
38.	*Spilornis cheela*	Crested Serpent Eagle	Tila Nag-eegol	LC	LC	Sch.-I

SL#	Scientific Name	English Name	Local Name	IUCN Status 2016.3	IUCN Bangladesh Status 2015	Wildlife (Conservation and Security) Act, 2012 Schedule
39.	*Elanus caeruleus*	Black-winged Kite	Katua Chil	LC	LC	Sch.-I
40.	*Columba livia*	Blue Rock Pigeon	Gola Paira	LC	LC	Sch.-II
41.	*Oriolus xanthornus*	Black-hooded Oriole	Kalamatha Benebou	LC	LC	Sch.-I
42.	*Haliastur indus*	Brahminy Kite	Shonkho Chil	LC	LC	Sch.-I
43.	*Gallicrex cinerea*	Water cock	Deshi Kora	LC	LC	Sch.-II
44.	*Milvus migrans*	Black Kite	Bhubon Chil	LC	LC	Sch.-I
45.	*Dendrocopos macei*	Fulvous-breasted Woodpecker	Batabi Kathkurali	LC	LC	Sch.-II
46.	*Alcedo atthis*	Common Kingfisher	Pati Maachranga	LC	LC	Sch.-II
47.	*Dicrurus macrocercus*	Black Drongo	Kala Fingey	LC	LC	Sch.-II
48.	*Pycnonotus cafer*	Red Vented Bulbul	Bangla Bulbul	LC	LC	Sch.-II
49.	*Athene brama*	Spotted Owlet	Khuruley Pecha	LC	LC	Sch.-II
50.	*Sturnus malabaricus*	Chestnut tailed Starling	Khoiralej Kathshalik	LC	LC	Sch.-II
51.	*Zoothera citrina*	Orange headed Laughing Thrush	Komla Dama	LC	LC	-
52.	*Pelargopsis capensis*	Stork billed Kingfisher	Meghou Machranga	LC	LC	Sch.-II
53.	*Ardea alba*	Great White Egret	Boro Boga	LC	LC	Sch.-II

Note: IUCN Global Status: VU- Vulnerable; EN-Endangered; CR- Critically Endangered; LC-Least Concern, IUCN Bangladesh Status: Same as IUCN Status Schedule I-Protected Animal

Annex Q

List of Mammals for AoI

SL#	Scientific Name	English Name	Local Name	IUCN Status 2016.3	IUCN Bangladesh Status 2015	Wildlife (Conservation and Security) Act, 2012 Schedule
1.	*Suncus murinus*	House shrew	Chika	LC	LC	-
2.	*Megaderma lyra*	Indian False Vampire	Bhua Daini Badur	LC	LC	Sch.-I-
3.	*Pipistrellus coromondra*	Indian Pipistrelle	Chamchika	LC	LC	Sch.-I-
4.	*Pipistrellus mimus*	Pigmy Pipistrelle	Khudey Chamchika	LC	LC	Sch.-I
5.	*Scotozous dormeri*	Dormer's Bat	Dormarer Chamchika	LC	LC	Sch.-I
6.	*Scotophilus kuhlii*	Lesser yellow Bat	Choto Holdey Chamchika	LC	LC	Sch.-I
7.	*Canis aureus*	Golden Jackal	Shial	LC	LC	Sch.-I
8.	*Vulpes bengalensis*	Bengal fox	Khek Shial	LC	VU	Sch.-I
9.	*Viverricula indica*	Small Indian Civet	Khatash	LC	NT	Sch.-I
10.	*Paradoxurus hermaphroditus*	Palm Civet	Gandhagakul,	LC	LC	Sch.-I
11.	*Herpestes edwardsi*	Indian Grey Mongoose	Boro Beji	LC	LC	Sch.-I
12.	*Herpestes auropunctatus*	Small Indian Mongoose	Chhoto Beji	LC	LC	Sch.-I
13.	*Felis chaus*	Jungle Cat	Ban Biral	LC	NT	Sch.-I
14.	*Prionailurus viverrinus*	Fishing Cat	Mechho Biral,	VU	EN	Sch.-I
15.	*Rattus rattus*	House Rat	Geso Indur	LC	LC	Sch.-III
16.	*Rattus norvegicus*	Norway Rat	Badami Indur	LC	LC	-
17.	*Mus musculus*	House Mouse	Nengti Indur	LC	LC	Sch.-III
18.	*Mus booduga*	Little Indian Field Mouse	Metho Nengti Idur	LC	LC	Sch.-III
19.	*Mus cervicolor*	Fawn Coloured Mouse	-	-	-	-
20.	*Bandicota indica*	Large bandicoot-Rat	Dhari Indur	LC	LC	Sch.-III
21.	*Lutra perspicillata*	Smooth-coated Indian Otter	Uud Biral	VU	CR	Sch.-I

Note: CR – Critically Endangered, EN - Endangered, VU – Vulnerable, NT-Near Theatened, LC-Least Concern, Sch.-I-Protected Animal, Sch.-III-Vermin

Annex R

Fishery Resources in AoI

SL#	Scientific Name	Local Name	Common/ English name	Habitat Type			Breeding period	IUCN Global 2016.3	IUCN Bangladesh 2015
				River	Khal	Wet land			
1	*Labeo rohita*	Rui	Rohu	P	P	P	April- August	LC	LC
2	*Catla catla*	Catla	Katla	P	P	P		NE	LC
3	*Ciprinus carpio*	Carpu		A	A	P			
4	*Labeo calbasu*	Calbaus	Black Rui	P	P	P		LC	LC
5	*Wallago attu*	Boal		P	P	P		LC	LC
6	*Channa panchtatus*	Taki		P	P	P		LC	LC
7	*Mystus vittatus*	Tangra	Striped Dwarf Catfish	P	P	P		LC	LC
8	*Puntius ticto*	Puti		P	P	P		VU	VU
9	*Lepidocephalichthys guntea*	Gutum	Guntia Loach	P	P	P		LC	LC
10	*Heteropneustes fossilis*	Shing		A	A	P		LC	LC
11	*Clarias batrachus*	Magur		A	A	P		LC	LC
12	*Macrognathus aculeatus*	Baim		P	P	P		NE	NT
13	*Amblypharyngodon mola*	Mola	Indian Carplet	P	P	P		LC	LC
14	*Pseudambassis baculis*	Chanda	Hymalian Glassy Perchlet	P	P	P		LC	NT
15	*Trichogaster fasciata*	Khalisa	Stripled Goyrami	P	P	P		LC	LC
16	*Chela cachius*	Chala		P	P	P	April –May	LC	VU
17	*Devario devario*	Patas		P	P	P		LC	LC
18	*Gudusia chapra*	Chapila		P	P	P	April & August	LC	VU
19	*Brachygobius nunus*	Nuna Baila	Short Goby	A	A	A		NE	LC
20	*Corica soborna*	Kaski		P	P	P		LC	LC
21	*Chitala chitala*	Citol	Humped Feather Back	P	P	A		NT	EN
22	*Barbonymus gonionotus*	Sorputi		P	P	P		-	-
23	*Ompok pabda*	Pabda		P	P	P		NT	EN
24	*Xenentodon cancila*	Kakila	Freshwater Garfish	P	P	P	March -April	NE	LC
25	*Glosoglobius guris*	Baila	Tank Gobi	P	P	P	May -July	LC	LC
26	*Tenualosa ilisha*	Ilish	Hilsa	P	A	A		LC	LC
27	*Raja raja*	Saplamas	Kite Fish	P	A	A		LC	LC
28	*Corica soborna*	Kachki	Ganga River Sprat	P	P	A		LC	LC
29	*Gonialosa manmina*	Chapila	Ganga River Gigard Shad	P	P	P		LC	LC
30	*Aspidoparia jaya*	Jaya	Piali	P	A	A		NE	LC
31	*Cirrhinus cirrhosus*	Mirka	Mrigel	P	P	P		NT	VU
32	*Cirrhinus reba*	Bata	Reba Carp	P	P	A		LC	NT
33	*Danio dangila*	Nipati	Danggila Danio	P	A	P		LC	VU
34	*Danio aequipinnatus*	Chebli	Giant Danio	P	A	A		LC	DD
35	*Esomus danricus*	Darkina	Flying Barb	P	P	A	April- May	LC	LC
36	*Garra gotyla*	Ghor Poia	Gotyla	P	P	A		LC	EN
37	*Labeo bata*	Bata	Bata Labio	P	P	P		LC	LC

SL#	Scientific Name	Local Name	Common/ English name	Habitat Type			Breeding period	IUCN Global 2016.3	IUCN Bangladesh 2015
				River	Khal	Wet land			
38	*Labeo boga*	Bhangon	Boga Labio	P	P	A		LC	CR
39	*Labeo boggut*		Boggut Labio	P	P	A		LC	VU
40	*Labeo nandina*	Nandil	Nandi Labeo	P	P	A		NT	CR
41	*Labeo pangusia*	Ghora Mass	Pangusia Labio	P	P	P		NT	EN
42	*Puntius chola*	Chala Puti	Chola Barb	P	P	P	May –October (Peak August)	LC	LC
43	*Pethia conchonius*	Puti	Red Barb	P	P	P	May –October (Peak August)	LC	LC
44	*Puntius guganio*	Mola Puti	Glass Barb	P	P	P	May –October (Peak August)	LC	LC
45	*Systomus sarana*	Sarputi	Olive Barb	P	P	P	May –October (Peak August)	LC	NT
46	*Puntius sophore*	Jat Puti	Soft Fin Barb	P	P	P	May –October (Pick August)	LC	LC
47	*Puntius terio*	Puti	One Spot Barb	P	P	P	May –October (Peak August)	LC	LC
48	*Puntius ticto*	Tit Puti	Ticto Barb	P	P	P		LC	VU
49	*Rasbora rasbora*	Leuzza Darkina	Gangetic Scissortail Rasbora	P	P	A		LC	NT
50	*Raiamas bola*	Bol	Indian Trout	P	P	A	April-May	LC	EN
51	*Salmostoma acinaces*	Chela	Silver Razorbelly Minnow	P	P	P	June –Sept.	LC	LC
52	*Salmostoma phulo*	Ful Chala	Fine Scaled Razor Belly Minnow	P	P	P		LC	NT
53	*Botia dario*	Beti	Necktie Loach	P	P	P		LC	EN
54	*Botia dayi*	Rani	Hora Loach	P	P	P		LC	EN
55	*Lepidocephalichthys guntea*	Puiya		P	P	P		LC	LC
56	*Sperata aor*	Aor	Long Whishkeper Cat Fish	P	P	A	June	LC	VU
57	*M. seenghala*	Guizza Ayer	Gaint River Catfish	P	P	A	June	LC	NT
58	*Batasio batasio*	Tangra	Tista Batasio	P	P	P		LC	NT
59	*Mystus cavasius*	Golsa	Gangatic Mystus	P	P	P		LC	NT
60	*Mystus gulio*	Guillya	Long Whiskered Cat Fish	P	P	P		LC	NT
61	*Hemibagrus menoda*	Gangmagur	Menoda Catfish	P	P	A		LC	NT
62	*Mystus tengara*	Bajaritengra	Tengara Mystus	P	P	A		LC	LC
63	*Ompok bimaculatus*	Kani Pabda	Indian Buutter Catfish	P	A	A	Monsoon	NT	EN
64	*Ompok pabda*	Modhu Pabda	Pabdah Catfish	P	A	A	Monsoon	NT	EN
65	*Ompok pabo*	Pabda	Pabo Catfish	P	A	A		NT	CR
66	*Aila coila*	Kajoli	Gangetic Aila	P	P	A		NT	LC
67	*Clupisoma garua*	Gharua	Garua Bacha	P	P	A		NE	EN
68	*Eutropiichthys murius*	Muri Bacha	Indus Garua	P	P	A		LC	LC

SL#	Scientific Name	Local Name	Common/ English name	Habitat Type			Breeding period	IUCN Global 2016.3	IUCN Bangladesh 2015
				River	Khal	Wet land			
69	*Eutropiichthys vacha*	Bacha	Batchwa Bacha	P	P	A		LC	LC
70	*Pseudeutropius atherinoides*	Batashi	Indian Potasi	P	A	A		LC	LC
71	*Bagarius yarrellii*	Bagghair	Gangetic Goonch	P	A	A	Monsoon (June)	LC	DD
72	*Gagata cenia*	Cenia	Indian Gagata	P	A	A		LC	LC
73	*Chaca chaca*	Cheka	Indian Chaka	P	A	A		LC	EN
74	*Monopterus cuchia*	Kuicha	Cuchia	P	P	P		VU	VU
75	*Chanda nama*	Nama Chanda	Elonget Glass Perchlet	P	P	A		LC	LC
76	*Pseudambassis ranga*	Ranga Chanda	Indian Glassy Fish	P	P	A		LC	LC
77	*Nandus nandus*	Meni	Mud Perch	P	P	P		LC	NT
78	*Trypauchen vagina*	Sada Chewa	Burrowing Goby	P	P	A		NE	LC
79	*Anabus testudineus*	Koi	Climbing Perch	A	P	P	April -July	DD	LC
80	*Ctenops nobilis*	Neftani	Indian Paradisefish	P	P	A		NT	LC
81	*Channa marulis*	Gajar	Giant Snakehead	P	P	P	April -June	LC	EN
82	*Macrognathus aral*	Tara Baim	One –Strip Spinyeel	A	P	P		LC	DD
83	*Macrognathus pancalus*	Baim	Striped Spinyeel	A	P	P		LC	LC
84	*Mastacembalus armatus*	Sal Baim	Tire-Track Spinyee	P	P	P	August -Sept.	NE	EN
85	*Tetraodon cutcutia*	Potka	Ocellated Pufferfish	P	P	P		LC	LC
86	*Hypophthalmichthys molitrix*		Silver Carp	A	A	P		NT	-
87	*Salmophasia bacaila*	Narkali chela	Large Razorbelly Minnow	A	A	A		LC	LC
88	*Odontamblyopus rubicundus*	Lal Chewa	Rubicundus Eelgoby	P	A	A		NE	LC
89	*Oreochromis niloticus*		Nile Tilapia	A	A	P	-	-	-
90	*Polynemus paradiseus*	Taposi,	Paradise Threadfin	P	P	A		LC	LC

Notes: CR-Critically Endangered; EN –Endangered; VU-Vulnerable; NT-Near Threatened; LC-Least Concern; NE-Not Evaluated

Annex S

Critical Habitat Assessment

1 IMPACT ASSESSMENT

1.1 CRITICAL HABITAT ASSESSMENT

To assess possible triggers of critical habitat as defined in IFC's Performance Standard (PS) 6 on Biodiversity Conservation and Sustainable Management of Living Natural Resources (IFC, 2012a) and the associated guidance note (IFC, 2012b), the baseline data on habitats and species described was assessed as described in the following section.

Species listed in ***Table 1.1*** are considered for possible triggers of critical habitats. '

Table 1.1 Potential Species triggers for Critical Habitat

Species	Bangladesh Wildlife (Conservation & Security) Act 2012	IUCN Bangladesh 2015. v 2.	IUCN Global 2016.v3.1
Reptile			
Gavialis gangeticus Gharial	Sch-I	CR	CR
Batagur kachuga Red Crowned Roofed Turtle	Sch-I	CR	CR
Mammal			
Prionailurus viverrinu Fishing Cat	Sch.-I	EN	VU
Lutra perspicillata Smooth-coated Indian Otter	Sch.-I	CR	VU
Fishes			
Two-spot Barb	-	VU	LC

1.1.1 Classification of Habitats

The IFC Performance Standard 6 classifies habitats into three major categories;

- Natural Habitats: Natural habitats are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition.
- Modified Habitats: Modified habitats are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. Modified habitats may include areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands. Definition of the modified habitat also includes significant biodiversity value, as determined by the risks and impacts identification process required in Performance Standard 1. The client should minimize impacts on such biodiversity and implement mitigation measures as appropriate.
- Critical Habitats; IFC PS 6 identifies critical habitats as areas with high biodiversity value, including (i.) habitat of significant importance to Critically Endangered and/or Endangered species; (ii.) habitat of significant importance to endemic and/or restricted-range species;

(iii.) habitat supporting globally significant concentrations of migratory species and/or congregatory species; (iv.) highly threatened and/or unique ecosystems; and/or (v.) areas associated with key evolutionary processes.

Table 1.2 Habitat Identification as per IFC 2012 PS 6

Land Use Class.	**Attributes**	**Habitat Type (IFC PS6, 2012)**	**Rationale**
Agriculture land	Paddy being the main agricultural crop in the AoI is the largest habitat available. Aman Rice is mono cultured all along the agricultural land along with some seasonal vegetables. A total of 26 species were enumerated from the AoI. The common weed occurring in the agricultural lands are *Ageratum conyzoides, Alternanthera sessilis , Clerodendrum inerme, Cotula hemispherica, Croton bonplandianum, Cynodon dactylon, Cyperus cephalotes, Dentella repens, Eupatorium odoratum, Euphorbia hirta, Heliotropium indicum , Nicotiana plumbaginifolia, Rorippa indica, Rumex dentate, Vernonia petula*.	Modified	Succession is relatively minimal and therefore no components of Agricultural lands can be considered Natural Habitat.
Homestead Plantation	Most of the houses are vegetated by local cultivated plants and a big portion of the coverage occupied by wild shrubs and herbs. A total of 72 species of trees, shrubs, herbs and grasses were enumerated. Common planted tree species are Raintree (*Samanea saman*), Aam (*Mangifera indica*), Supari (*Areca catechu*), Mehogani (*Swietenia mahagoni*), Kola (*Musa* sp) etc. Gogon Siris (*Albizia richrdiana*). Raintree (*Samanea saman*), Narikel (*Cocos nucifera*) and Supari (*Areca catechu*) occupied the top canopy. Homesteads are commonly found near wetlands which favour good growth of wetland trees like Pitali (*Trewia nudiflora*), Baroon (*Crataeva nurvala*), Hizal (*Barringtonia acutangula*) etc. Among the shrubs Dumur (*Ficus hispida*) is the most common of all species. Isolated patches of Borassus palm (*Borassus flabelifer)* can also be seen along the riverine belt.	Modified	All trees planted are for domestic use and no parts of the homestead plantations have succeeded into Natural Habitat
Dehular Khal	Includes entire natural area encompassing of the water of the Khal.	Natural	The Dehular Khal is confined within natural banks and has habitats, with no man made alteration such as concrete banks etc.

Note: We considered the Shannon Weaver's diversity index (H') during classification of natural and modified habitat. However due to diversity varying as a function of species introduced (and land use) and complexities due to the successional stages the habitats were in, interpretation of these indices were not useful. Diversity indices were therefore ultimately not used for classification of modified and natural habitat.

Based on the definitions given above and the rationale provided in ***Table 1.2*** habitats such as agricultural lands which include homestead plantations can

be considered modified habitats within the AOI. The Dehular Khal , due its relatively unaltered state, however qualifies as natural habitat.

1.1.2 Screening of Potential Critical Habitat

IFC PS 6 identifies critical habitats as areas with high biodiversity value, including

(i.) Habitat of significant importance to Critically Endangered and/or Endangered[(1)] species;

(ii.) *Habitat of significant importance to endemic and/or restricted-range species;*

(iii.) *Habitat supporting globally significant concentrations of migratory species and/or congregatory species;*

(iv.) *Highly threatened and/or unique ecosystems; and/or*

(v.) *Areas associated with key evolutionary processes.*

The criteria for critical habitats as defined in PS6 Guidance Notes (GN6) (IFC 2012b) is shown in ***Table 1.3***.

Table 1.3 Critical Habitat Criteria

Criteria	Tier 1[(1)]	Tier 2[(1)]
Criteria 1: Critically Endangered(CR)/Endangered (EN) Species	a) Habitat required to sustain ≥ 10 percent of the global population of an IUCN Red-listed CR or EN species where there are known, regular occurrences of the species and where that habitat could be considered a discrete management unit for that species. b) Habitat with known, regular occurrences of CR or EN species where that habitat is one of 10 or fewer discrete management sites globally for that species.	c) Habitat that supports the regular occurrence of a single individual of an IUCN Red-listed CR species and/or habitat containing regionally-important concentrations of an IUCN Red-listed EN species where that habitat could be considered a discrete management unit for that species. d) Habitat of significant importance to CR or EN species that are wide-ranging and/or whose population distribution is not well understood and where the loss of such a habitat could potentially impact the long-term survivability of the species. e) As appropriate, habitat containing nationally/regionally-important concentrations of an EN, CR or equivalent national/regional listing.
Criterion 2*: Endemic and Restricted-range Species	a) An endemic species is defined as one that has ≥ 95 percent of its global range inside the country or region of analysis.	b) Habitat known to sustain ≥ 1 percent but < 95 percent of the global population of an endemic or restricted-range species where that habitat could be considered a discrete management unit for that

(1) As listed on the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species. The determination of critical habitat based on other listings is as follows: (i) If the species is listed nationally / regionally as as critically endangered or endangered, in countries that have adhered to IUCN guidance, the critical habitat determination will be made on a project by project basis in consultation with competent professionals; and (ii) in instances where nationally or regionally listed species' categorizations do not correspond well to those of the IUCN (e.g., some countries more generally list species as "protected" or "restricted"), an assessment will be conducted to determine the rationale and purpose of the listing. In this case, the critical habitat determination will be based on such an assessment.

Criteria	Tier 1[1]	Tier 2[1]
		species, where adequate data are available and/or based on expert judgment.
Criterion 3: Migratory and Congregatory Species	a) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 95 percent of the global population of a migratory or congregatory species at any point of the species' life-cycle where that habitat could be considered a discrete management unit for that species.	b) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent but < 95 percent of the global population of a migratory or congregatory species at any point of the species' life-cycle and where that habitat could be considered a discrete management unit for that species, where adequate data are available and/or based on expert judgment. c) For birds, habitat that meets BirdLife International's Criterion A4 for congregations and/or Ramsar Criteria 5 or 6 for Identifying Wetlands of International Importance. d) For species with large but clumped distributions, a provisional threshold is set at ≥5 percent of the global population for both terrestrial and marine species. e) Source sites that contribute ≥ 1 percent of the global population of recruits.
Criterion 4: Highly Threatened and/or Unique Ecosystems	No Tiered system is prescribed a) that are at risk of significantly decreasing in area or quality; b) with a small spatial extent; and/or c) containing unique assemblages of species including assemblages or concentrations of biome-restricted species. Highly threatened or unique ecosystems are defined by a combination of factors which may include long term trend, rarity, ecological condition, and threat	
Criterion 5: Key Evolutionary Processes	The criteria is defined by a) Isolated areas (e.g., islands, mountaintops, lakes) are associated with populations that are phylogenetically distinct. b) Areas of high endemism often contain flora and/or fauna with unique evolutionary histories (note overlap with Criterion 2, endemic and restricted-range species). c) Landscapes with high spatial heterogeneity are a driving force in speciation as species are naturally selected on their ability to adapt and diversify. d) Environmental gradients, also known as ecotones, produce transitional habitat which has been associated with the process of speciation and high species and genetic diversity. e) Edaphic interfaces are specific juxtapositions of soil types (e.g., serpentine outcrops, limestone and gypsum deposits), which have led to the formation of unique plant communities characterized by both rarity and endemism. f) Connectivity between habitats (e.g., biological corridors) ensures species migration and gene flow, which is especially important in fragmented habitats and for the conservation of metapopulations. This also includes biological corridors across altitudinal and climatic gradients and from "crest to coast."	

Criteria	Tier 1[1]	Tier 2[1]
	g) Sites of demonstrated importance to climate change adaptation for either species or ecosystems are also included within this criterion.	

Note [1] No tier system is in place for Criteria 4 and Criteria 5.

* With regard to Criterion 2, it should be noted that an endemic and restricted range species is defined now by the IFC as one which possesses an extent of occurrence of 50,000 km2 (C. Savy pers. comms). Plant species may qualify as endemic if has ≥95% of its global range inside the country or region of analysis.

The IFC PS-6 also suggests that, "In areas of critical habitat, the client will not implement any project activities unless all of the following are demonstrated:

- No other viable alternatives within the region exist for development of the project on modified or natural habitats that are critical;
- The project does not lead to measurable adverse impacts on those biodiversity values for which the critical habitat was designated, and on the ecological processes supporting those biodiversity values;
- The project does not lead to a net reduction in the global and/or national/regional population of any Critically Endangered or Endangered species over a reasonable period of time; and
- A robust, appropriately designed, and long-term biodiversity monitoring and evaluation program is integrated into the client's management program."

Table 1.4 provides the species that were recorded in the area either through direct observations or through consultations with local communities. The screening for potential critical habitat species has been carried out against Criteria 1 to 3 which are

1. Habitat of significant importance to Critically Endangered (CR) and/or Endangered(EN) species;
2. Habitat of significant importance to endemic and/or restricted-range species;
3. Habitat supporting globally significant concentrations of migratory species and/or congregatory species

Table 1.4 *Project Area Critical Habitat Screening Assessment – Criteria 1 and 2 Critically Endangered or Endangered Species and Endemic and/or Restricted-range species*

Species Name	Common Name	Conservation Status	Criteria 1 CR or EN Species	Criteria 2 Endemic / Restricted Range Species	Criteria 3 Migratory / Congregatory Species	Critical Habitat Tier 1	Critical Habitat Tier 2	Critical Habitat Trigger or not	Rationale
Reptiles									

Species Name	Common Name	Conservation Status	Criteria 1 CR or EN Species	Criteria 2 Endemic/ Restricted Range Species	Criteria 3 Migratory/ Congregatory Species	Critical Habitat Tier 1	Critical Habitat Tier 2	Critical Habitat Trigger or not	Rationale
Gavialis gangeticus	Gharial	IUCN Global –CR IUCN BD-CR BWCSA2012-I	√				√ Cr1 Tier e	No	The taxon is found in the Padma, Jamuna and Tista River of northern part of Bangladesh. Presence of this species was indicated during the fishermen consultations in Dehular Khal. A distribution map enclosed below from IUCN Red List of Bangladesh (1) confirms that the species distribution does not overlap with the AoI. The species was not directly sighted by the ERM team. Consultations with fishermen suggested the juveniles of this species were once seen in Dehular Khal. It is expected that the sighting may be of a water monitor lizard wrongly identified as Juveniles of Gharial. Hence, the species presence in AoI is unlikely and scoped out based on the distribution map.. 

(1) IUCN Bangladesh. 2015. Red List of Bangladesh Volume 4: Reptiles and Amphibians. IUCN, International Union for Conservation of Nature, Bangladesh Country Office, Dhaka, Bangladesh, pp. xvi+320.

Species Name	Common Name	Conservation Status	Criteria 1 CR or EN Species	Criteria 2 Endemic/ Restricted Range Species	Criteria 3 Migratory/ Congregatory Species	Critical Habitat Tier 1	Critical Habitat Tier 2	Critical Habitat Trigger or not	Rationale
Batagur kachuga	Red Crowned Roofed Turtle	IUCN Global –CR IUCN BD-CR BWCSA2012-I					√ Cr1 Tier e	No	*B. kachuga* is an animal of deep flowing rivers with terrestrial nest sites. This species is entirely aquatic and found in large rivers. Presence of this species was indicated during the fishermen consultations in Dehular Khal. A distribution map enclosed below from IUCN Red List of Bangladesh (1) confirms that the species distribution does not overlap with the AoI. Secondary data also confirms the absence of species in Tentulia river. The habitats for the species nesting are not available in Dehular khal, however fishermen consulted are sure of the species sporadic presence in Charlands in the middle of Tentulia River. Hence The species presence in AoI is unlikely hence scoped out based on the distribution map and non-availability of habitats. 

(1) IUCN Bangladesh. 2015. Red List of Bangladesh Volume 4: Reptiles and Amphibians. IUCN, International Union for Conservation of Nature, Bangladesh Country Office, Dhaka, Bangladesh, pp. xvi+320.

Species Name	Common Name	Conservation Status	Criteria 1 CR or EN Species	Criteria 2 Endemic / Restricted Range Species	Criteria 3 Migratory / Congregatory Species	Critical Habitat Tier 1	Critical Habitat Tier 2	Critical Habitat Trigger or not	Rationale
Mammals									

Species Name	Common Name	Conservation Status	Criteria 1 CR or EN Species	Criteria 2 Endemic/ Restricted Range Species	Criteria 3 Migratory/ Congregatory Species	Critical Habitat Tier 1	Critical Habitat Tier 2	Critical Habitat Trigger or not	Rationale
Prionailurus viverrinus	Fishing Cat	IUCN Global – VU IUCN BD- EN BWCSA2012-I					√ Cr1 Tier e	No.	This species is widely distributed but based on its threats is presumed that a very small population exists nationally. It prefers wetlands, marshes and haor[1] areas. It is also recorded from the rural areas along river system or close to water bodies as well as in countryside thickets on banks of wetlands. It is nocturnal, solitary and shy. In the AoI the species presence in unlikely because of absence of preferred habitats. The species was listed in the baseline based on the community consultations. No direct observation of species was made by the ERM team. No secondary data in form of published literature is available to confirm its presence in AoI or nearby areas. The IUCN distribution map shows its wide distribution across Bangladesh and the presence is listed as sporadic. Hence, the species is scoped out based on non-availability of habitats in the AoI. 

(1) [1] Haor area are bowl-shaped large tectonic depression. It receives surface runoff water by rivers and khals, and consequently, a haor becomes very extensive water body in the monsoon and dries up mostly in the post-monsoon period.

Species Name	Common Name	Conservation Status	Criteria 1 CR or EN Species	Criteria 2 Endemic / Restricted Range Species	Criteria 3 Migratory / Congregatory Species	Critical Habitat Tier 1	Critical Habitat Tier 2	Critical Habitat Trigger or not	Rationale
Lutra perspicillata	Smooth-coated Indian Otter	IUCN Global –VU IUCN BD-CR BWCSA2012-I					√	Cr1 Tier e	The species is restricted to the hilly areas of the northeast and southeast and the coastal districts where its largest population possibly still thrives in the Sundarbans Mangrove forest in the southwest corner of the country. The Smooth-coated Otter inhabits major rivers, mangroves and estuaries. Despite the IUCN map shows its distribution overlap with AoI the preferred habitats such as Hilly streams and Mangrove vegetation is absent in AoI. The species has been recorded in the AoI community and fisherman consultations and they suggest its rare occurrence in the Bhola Island. They could not confirm its presence in AoI. It is more likely that the species may occur in southern tip of Bhola Island (Char Kukri Mukri Protected Area) which supports mangrove vegetation outside AoI. Hence, the species presence is ruled out from AoI. 

S. No	Project Component	Union	Mouza	Name of Owner	New Khatian	New Daag	Old Khatian	Old Daag	Quantity (in Decimals)
1	Plant	Kutba	South Choto Manika	Asad & others	B, S Khotian No.- 138	B, S Dag No.-57/93/176	S, A Khotian No.- 54	S, A Dag No.- 236	142.18
2	Plant	Kutba	South Choto Manika	Bilash Chandra	B, S Khotian No.- 81/80	B, S Dag No.- 56/50	S, A Khotian No.- 14	S, A Dag No.- 87	3.44
3	Plant	Kutba	South Choto Manika	Suvash Chandra	B, S Khotian No.- 135	B, S Dag No.- 61		S, A Dag No.-109/110	4.5
4	Plant	Kutba	South Choto Manika	Cunni Lal & others	B, S Khotian No.- 93	B, S Dag No.- 54		S, A Dag No.-103/104	8
5	Plant	Kutba	South Choto Manika	Noman Baklai & others	B, S Khotian No.- 106	B,S Dag No.66/69/70/75			28
6	Plant	Kutba	South Choto Manika	Momtaj Begum & others Chowdhuri Rani	B, S Khotian No.- 7	B, S Dag No.- 80			9
7	Plant	Kutba	South Choto Manika	Tofajjal's Sister		B, S Dag No.- 60			1.75
8	Plant	Kutba	South Choto Manika	Khokon		B, S Dag No.- 59			5
9	Plant	Kutba	South Choto Manika	Joyar Master		B, S Dag No.- 55			3
10	Plant	Kutba	South Choto Manika	Shampad		B, S Dag No.- 53			12
11	Plant	Kutba	South Choto Manika	Krishna Babu		B, S Dag No.- 52			20
12	Plant	Kutba	South Choto Manika	Lokman		B, S Dag No.- 51			11.5
13	Plant	Kutba	South Choto Manika	Tofajjal		B, S Dag No.- 22			98.22
14	Plant	Sachra	Char Gazipur	Shafijol Mridha & others	B, S Khotian No.-679	B, S Dag No.3514/3517	S, A Khotian No.- 285	S, A Dag No.- 972/973	43.77
15	Plant	Sachra	Char Gazipur	Shafijol Mridha & others	B, S Khotian No.-679	B, S Dag No.3514/3517	S, A Khotian No.- 120	S, A Dag No.- 978/979	29.76
16	Plant	Sachra	Char Gazipur	Babul & others	B, S Khotian No.-512	B, S Dag No.- 3512	S, A Khotian No.-297	S, A Dag No.-970/971	23
17	Plant	Sachra	Char Gazipur	Suvash & others	B, S Khotian No.- 379	B, S Dag No.- 3511	S, A Khotian No.-185	S, A Dag No.-967/968	3.73
18	Plant	Sachra	Char Gazipur	Mostofa& others	B, S Khotian No.- 478	B, S Dag No.- 3516	S, A Khotian No.-132	S, A Dag No.-976	35
19	Plant	Sachra	Char Gazipur	Kibria & others	B, S Khotian No.- 919	B, S Dag No.- 3515	S, A Khotian No.-86	S, A Dag No.- 974	46
20	Plant	Sachra	Char Gazipur	Serajol Haque Darbesh & others			S, A Khotian No.-297	S, A Dag No.-970/971	22
21	Plant	Sachra	Char Gazipur	Amir Hossen	B, S Khotian No.- 1348	B, S Dag No.- 3554	S, A Khotian No.-132	S, A Dag No.-977	28.44
22	Gas Pipeline	Kachia	Kachia	Mr. Shahjada Sikder	1191	3207/3208/3209			3.78
23	Gas Pipeline	Kachia	Kachia	Mr. Salem Mia	1191	3210			1.59
24	Gas Pipeline	Kachia	Kachia	Mr. Md. Azad Chowdhury		3211			6
25	Gas Pipeline	Kachia	Kachia	Mr. Haji Abdul Motleb Howlader	1047	3144			3.03
26	Gas Pipeline	Kachia	Kachia	Mr. Abdul Hai Miji	1047	3145			1.13
27	Gas Pipeline	Kachia	Kachia	Mr. Naju Baklai	1047	3146			0.83
28	Gas Pipeline	Kachia	Kachia	Mr. Abdul Khaleq	878/908	3147			1.82
29	Gas Pipeline	Kachia	Kachia	Mr. Abdul Haque Dubai	908	3149			1.66
30	Gas Pipeline	Kachia	Kachia	Mr. Md. Babul Miji	1047	3158			1.52
31	Gas Pipeline	Kachia	Kachia	Mr. Daimuddin Maitam	1047/908	3159			2.88
32	Gas Pipeline	Kachia	Kachia	Mr. Fazler Rahman		3191			1.58
33	Gas Pipeline	Kachia	Kachia	Mr. Abdul Motleb		3190			1.58
34	Gas Pipeline	Kachia	Kachia	Mr. Soleman Miji		3189			0.68
35	Gas Pipeline	Kachia	Kachia	Ms. Samsun Nahar Baccu Mia		3189			0.68
36	Gas Pipeline	Kachia	Kachia	Mr. Md Siraj		3177			2.42
37	Gas Pipeline	Kachia	Kachia	Mr. Abdul Khaleque Mandi	908	2800/2798/2762			1.06 2.35
38	Gas Pipeline	Kachia	Kachia	Mr. Akhter Hossain		2799			1
39	Gas Pipeline	Kachia	Kachia	Mr. Masjid Motowali	792	2768			4
40	Gas Pipeline	Kachia	Kachia	Mr. Fazle Karim	792	2767			1.36
41	Gas Pipeline	Kachia	Kachia	Mr. Kajal Dalal	908	2765			1.44
42	Gas Pipeline	Kachia	Kachia	Mr. Abdul Khaleque Munshi	876	2761/2762/ 2760/2759/2758			4.01
43	Gas Pipeline	Kachia	Kachia	Mr. Joinal Abedin	876	2758			0.68
44	Gas Pipeline	Kachia	Kachia	Mr. Abdul Mannan Majumder	577/82/83/680/1033	2757			0.9
45	Gas Pipeline	Kachia	Kachia	Mr. Abdul Khaleque Choukider		2756			1.21
46	Gas Pipeline	Kachia	Kachia	Mr. Md. Kabir Hossain Mr. Abdul Hai		2836			2.27
47	Gas Pipeline	Kachia	Kachia	Mr. Abdul Audud Rari		2746			3.33
48	Gas Pipeline	Kachia	Kachia	Mr. Abdul Aziz Mr. Shaha Alam	1029/936	2445			9.55
49	Gas Pipeline	Kachia	Kachia	Mr. Abul Kalam Howlader	19	2446			3
50	Gas Pipeline	Kachia	Kachia	Mr. Abdul Majid Mia	19	2447			3.33
51	Gas Pipeline	Kachia	Kachia	Mr. Samsu Baklai	910	2444 2448			2.8
52	Gas Pipeline	Kachia	Kachia	Mr. Delwar Hossain Talukder (Dalil Uddin Talukder)	340	2443 2448			2.8

S. No	Project Component	Union	Mouza	Name of Owner	New Khatian	New Daag	Old Khatian	Old Daag	Quantity (in Decimals)
53	Gas Pipeline	Kachia	Kachia	Mr. Abdul karim		2449			1.04
54	Gas Pipeline	Kachia	Kachia	Mr. Mohammad Rasel Mr. Shekh Farid Mr. Majnu Kazi	1240/1239	2451			3.33
55	Gas Pipeline	Kachia	Kachia	Mr. Abdur Rob Miji Mr. Fazlu Choukider Mr. Mostafa Miji Mr. Akhter Miji	403	2832/2388			10.53
56	Gas Pipeline	Kachia	Kachia	Mr. Khalil Baklai	557 1130	2386 3285			6.51
57	Gas Pipeline	Kachia	Kachia	Mr. Refazzal Hossain	473	2384 2348			2.50 4.39
58	Gas Pipeline	Kachia	Kachia	Mr. Samsal Baklai		2384			2.5
59	Gas Pipeline	Kachia	Kachia	Dr. Abul Kalam	546	2347			2.27
60	Gas Pipeline	Kachia	Kachia	Mr. Mahabub Alam Mr. Jahangir Sarder	546	2347			2.27
61	Gas Pipeline	Kachia	Kachia	Mr. Mohammad Idris	473	2348 2349			4.39
62	Gas Pipeline	Kachia	Kachia	Mr. Md Harun Councellor	551	2339			3.18
63	Gas Pipeline	Kachia	Kachia	Mr. Refajjal Hossain		4102 4101			4.09
64	Gas Pipeline	Kachia	Kachia	Mr. Haji Tofazzal Hossain	94	4102 4099			1.92
65	Gas Pipeline	Kachia	Kachia	Mr. Mohammad Yeasin		4100			1.06
66	Gas Pipeline	Kachia	Kachia	Mr. Md. Hadis Mr. Tofael Ahmed Ms. Shanur Begum (Abdul Barek Munshi)		4094			2.74
67	Gas Pipeline	Kachia	Kachia	Mr. Masjid Motoali Ward No. 2 , Kachia	953 641	4089 4092			3.18
68	Gas Pipeline	Kachia	Kachia	Mr. Mojibul Haque		4085			0.9
69	Gas Pipeline	Kachia	Kachia	Mr. Hafez Ahmed		4085			0.9
70	Gas Pipeline	Kachia	Kachia	Ms. Maksuda Begum		4086			0.25
71	Gas Pipeline	Kachia	Kachia	Mr. Md Hanif Shiuli Mr. Mintu Shiuli	655 963	4080			1.51
72	Gas Pipeline	Kachia	Kachia	Mr. Md Akbar Mr. Md. Rafiq Mr. Md Abdur Rahaman	961 884	4081 4061			3.5
73	Gas Pipeline	Kachia	Kachia	Mr. Akbar & Others Mr. Md Kamal	884	4061			1.82
74	Gas Pipeline			Mr. Mostem Baklaie & Others		B.S Dag No 766/767 768/763 762			12.57
75	Gas Pipeline	Pakhia	Pakhia	Mr. Sahe Alam Sail & Others		B.S Dag No 753			2.12
76	Gas Pipeline			Mr. Kabir Mia (Mr. Monimuzzaman)		B.S Dag No 752/ 751			3.78
77	Gas Pipeline	Kachia	Kachia	Mr. Akbar Hossain Siali		B.S Dag No 743			1.13
78	Gas Pipeline			Mr. Sahi Alam Khan		B.S Dag No 746			1.12
79	Gas Pipeline	Kutuba	Chagla	Mr. Farid Nakti Mr. Harun Baklai Mr. Azizul Haque Mr. Lutfor		B.S Dag No 747/ 748			8
80	Gas Pipeline	Kutuba	Chagla	Mr. Md. Zakir		B.S Dag No 749			4.24
81	Gas Pipeline	Kutuba	Chagla	Mr. Shah Imran		B.S Dag No 710			1.21
82	Gas Pipeline			Mr. Mohiuddin		B.S Dag No 607			4.24
83	Gas Pipeline			Mr. Satem Patwari (Member of Union Parishad)		B.S Dag No 607			4.24
84	Gas Pipeline			Mr. Abdur Rashid		B.S Dag No 607/ 633			3.33

S. No	Project Component	Union	Mouza	Name of Owner	New Khatian	New Daag	Old Khatian	Old Daag	Quantity (in Decimals)
85	Gas Pipeline			Mr. Nurul Islam		B.S Dag No 632/ 628			4.7
86	Gas Pipeline			Mr. Shahjahan Mal		B.S Dag No 627			2.88
87	Gas Pipeline	Kutuba	Kutuba	Mr. Shah Alam Howlader		B.S Dag No 636			2
88	Gas Pipeline	Pakhia	Pakhia	Mr. Bina Howlader		B.S Dag No 626			2.42
89	Gas Pipeline	Pakhia	Pakhia	Mr. Mintu Howlader		B.S Dag No 625			2.42
90	Gas Pipeline	Kutuba	Chagla	Mr. Sufia Begum & Others		B.S Dag No 224			1.81
91	Gas Pipeline	Kutuba	Chagla	Mr. Hazrat Ali & Others		B.S Dag No 267			3.48
92	Gas Pipeline			Mr. Shahjahan Mal		B.S Dag No 272			1.81
93	Gas Pipeline	Kutuba	Chagla	Mr. Md. Rafique		B.S Dag No 276			0.9
94	Gas Pipeline	Kutuba	Chagla	Mr. Sunil Chandra Dey		B.S Dag No 274			0.9
95	Gas Pipeline	Kutuba	Chagla	Mr. Kamal Majee		B.S Dag No 269			1.06
96	Gas Pipeline	Kutuba	Kutuba	Mr. Abdul Hasem Baiati	73	257/56			2.25
97	Gas Pipeline	Kutuba	Kutuba	Mr. Tofazzal Hossain	73	256/224			1.75
98	Gas Pipeline	Pakhia	Pakhia	Mr. Jahangir Howlader		250			1.5
99	Gas Pipeline	Kutuba	Kutuba	Mr. Ajud Howlader		250			1.5
100	Gas Pipeline	Kutuba	Kutuba	Mr. Manu Sarker	73	281/246			5.5
101	Gas Pipeline	Kutuba	Kutuba	Mr. Malek Howlader		239			1.75
102	Gas Pipeline	Kutuba	Chagla	Mr. Mostafa Mal	380	234/233			2.25
103	Gas Pipeline	Kutuba	Kutuba	Mr. Nurnabi	348	232			2.75
104	Gas Pipeline	Kutuba	Kutuba	Mr. Tofazzal Haque	348	232			1.25
105	Gas Pipeline	Kutuba	Kutuba	Mr. Daliluddin	31	159			3
106	Gas Pipeline	Kutuba	Chagla	Mr. Nurul Islam Golder	352	160			2.75
107	Gas Pipeline	Kutuba	Kutuba	Mr. Mohammad Bashir	31	161			1.25
108	Gas Pipeline	Kutuba	Chagla	Mr. Moslem Baklai Mr. Nurul Islam baklai	31	161			1.5
109	Gas Pipeline	Kutuba	Chagla	Mr. Mintu Mia		163			1.75
110	Gas Pipeline	Kutuba	Chagla	Mr Nuru Mia Howlader	40	187			2.5
111	Gas Pipeline	Kutuba	Kutuba	Mr. Daliluddin Talukder	379	182			2.75
112	Gas Pipeline	Kutuba	Kutuba	Mr. Daliluddin Talukder	181/143	179/183/181			4.25
113	Gas Pipeline	Kutuba	Kutuba	Mr. Chan Mia Howlader & Mr. Abdul Sahid Howlader		177			2.75
114	Gas Pipeline	Kutuba	Kutuba	Mr. Daliluddin Talukder	143	171			1.25
115	Gas Pipeline	Kutuba	Kutuba	Mr. Md Faruque Howlader & Mr. Rafique Howlader		175			2
116	Gas Pipeline	Kutuba	Kutuba	Mr. Abu Howlader Proprietor by purchase Mst. Taiba Begum	311 833/837	1327/1326/1328/1254/16139			3
117	Gas Pipeline	Kutuba	Chagla	Mr. Aminul Haque Chowdhury Proprietor by purchase Mr. Alamgir	279	3338/3339			1.75
118	Gas Pipeline	Kutuba	Kutuba	Mr. Giasuddin Chowdhury Proprietor by purchase Mr. Jasim Fakir		3333			1.75
119	Gas Pipeline	Kutuba	Kutuba	Mr. Badshu Mia		3264			1.5
120	Gas Pipeline	Kutuba	Chagla	Mr Salim Nakti	554/319	3163			1.75
121	Gas Pipeline	Kutuba	Kutuba	Mr. Dilu Member	554/319	3163			2
122	Gas Pipeline	Kutuba	Kutuba	Mr. Lutfar Rahman Howlader	554/319	3163			2
123	Gas Pipeline	Kutuba	Kutuba	Mr. Mozammel Haque Howlader		3156			2.75
124	Gas Pipeline	Kutuba	Kutuba	Mr. Aziaul Haque Howlader		3155			2.75
125	Gas Pipeline	Kutuba	Kutuba	Mr.Siddique Howlader		3154			2.25
126	Gas Pipeline	Kutuba	Kutuba	Mr. Ahid Howlader		3152			3.25
127	Gas Pipeline	Kutuba	Chagla	Mr. Fazle Karim		3182			1.25
128	Gas Pipeline	Kutuba	Kutuba	Mr.Kashem Sarder		3182			1.25
129	Gas Pipeline	Kutuba	Kutuba	Mr. Altaf Hossain Nakti		3182			1.75
130	Gas Pipeline	Kutuba	Kutuba	Mr.Kashem Sarder		3134			1
131	Gas Pipeline	Kutuba	Kutuba	Mr. Abdul jalil		3135			1.5
132	Gas Pipeline	Kutuba	Chagla	Mr. Abdul Barek Mr. Mohammad Chardi	292	3224 3089			2.25 1
133	Gas Pipeline	Kutuba	Kutuba	Mr. Jahanara Begum	292	3089			1
134	Gas Pipeline	Kutuba	Kutuba	Mr. Manir Hossain	292	3089			1
135	Gas Pipeline	Kutuba	Kutuba	Mr. Nasir Howladwer	1109	3088			1.75

S. No	Project Component	Union	Mouza	Name of Owner	New Khatian	New Daag	Old Khatian	Old Daag	Quantity (in Decimals)
136	Gas Pipeline	Kutuba	Kutuba	Mr. Manu Sarker		3077			3
137	Gas Pipeline	Kutuba	Kutuba	Mr. Siddique, Mr. Babul, Mr. Sahid, Mr. Jahangir		3077			9
138	Gas Pipeline	Kutuba	Kutuba	Mr. Yasin Driver		3075			2
139	Gas Pipeline	Kutuba	Kutuba	Mr. Daksin Chandra Bapari	624	3046			2.75
140	Gas Pipeline			Mr. Keramat Khan	624	3046			2.75
141	Gas Pipeline			Mr. Tapan, Mr. Swapan	624	3046			1.75
142	Gas Pipeline	Kutuba	Kutuba	Mr. Sanaullah haji	624	3056			3.75
143	Gas Pipeline			Mr. Abdul Gani Master	624	3046			3.75
144	Gas Pipeline			Mr. Abdul Malek	624	3046			1.75
145	Gas Pipeline	Kutuba	Kutuba	Mr. Mohammad Chardi		2252			2
146	Gas Pipeline	Kutuba	Kutuba	Mr. Jabal Haque Chaprashi		2252			2
147	Gas Pipeline			Mr. Khokan Patwari		2252			2.75
148	Gas Pipeline			Mrs. Joytun Bibi		2252			2.25
149	Gas Pipeline			Mr. Keramat Khan	1078	2148			1.5
150	Gas Pipeline			Mr. Oli Palowhan	1078	2148			1.5
151	Gas Pipeline			Mr. Badshu Raj	1078	2148			1.5
152	Gas Pipeline			Mr. Baccu Khan	1078	2148/2248			3
153	Gas Pipeline	Deula		Mr. Maidul Islam Mamun		2248			1.75

S. No	Project Component	Union	Mouza	J.L. No	Name of Owner	New Khatian	New Daag	Old Khatian
A	Plant		South Chotamanika	42/23	Chuni Lal Dey, Roymohan Dey, Motilal Dey and Others	B.S. Khatian No. 93	B.S. Plot No.-54	S.A Khatian No. 14
B	Plant		South Chotamanika	42/23	Md. Jaherul Islam. Hossain Mohammad Arafat and Md. Rizvan Hossain	B.S. Khatian No. 106	B.S. Plot No.-65 & 66	S.A Khatian No. 45
C	Plant		South Chotamanika	42/23	Khokan Chandro Dey and Putul Rani Dey	B.S. Khatian No. 123	B.S. Plot No.-44/47/59	S.A Khatian No. 42
D	Plant		South Chotamanika	42/23	Mohammad Lokman and Mohammad Bahar	B.S. Khatian No. 183	B.S. Plot No.-52	S.A Khatian No. 14
E	Plant		South Chotamanika	42/23	Monirul Islam, Safiqul Islam Sabuz, Raisul Islam, Khadiza Akter Shikha, Ashma Akter and Most. Rokeya Begum	B.S. Khatian No. 138	B.S. Plot No.-57/93/176	S.A Khatian No. 54
F	Plant		South Chotamanika	42/23	Nafisha Begum and Nazmun Nahar	B.S. Khatian No. 7	B.S. Plot No.-65 & 66	S.A Khatian No. 45
G	Plant		South Chotamanika	42/23	Noni Bala Rokthit	B.S. Khatian No. 80 & 81	B.S. Plot No.-56	S.A Khatian No. 14
H	Plant		South Chotamanika	42/23	Nitai Chad Dey	B.S. Khatian No. 130	B.S. Plot No.-24/31/53	S.A Khatian No. 14 &32
I	Plant		South Chotamanika	42/23	Rasheda Begum	B.S. Khatian No. 106	B.S. Plot No.-65 & 66	S.A Khatian No. 45
J	Plant		South Chotamanika	42/23	Rupon Chandro Dey	B.S. Khatian No. 138	B.S. Plot No.-93	S.A Khatian No. 55
K	Plant		South Chotamanika	42/23	Shubash Chandro Dey, Bivash Chandro Dey and Palash Chandro Dey and Others	B.S. Khatian No. 135	B.S. Plot No.-61	S.A Khatian No. 36
L	Plant		South Chotamanika	42/23	Tofazzal Hossain	B.S. Khatian No. 47	B.S. Plot No.-18/20/22/187/198/252/253	S.A Khatian No. 62
A	Plant		Chorgazipur	43	Altaf Hossain Mredha, Anowar Hossain, Kaysor Ahammad Mredha, Md. Selim, Salem Mredha and Md. Kamal			S.A Khatian No. 120
B	Plant		Chorgazipur	43	Babul Mazumder			S.A Khatian No. 297
C	Plant		Chorgazipur	43	Md. Abul Kalam Azad and Md. Mostafizur Rahman			S.A Khatian No. 185
D	Plant		Chorgazipur	43	Amir Hossain			S.A Khatian No. 132
E	Plant		Chorgazipur	43	Md. Mostafa Mredha, Md. Bashir, Md. Ripon, Md. Shahidul and Rahima Begum			S.A Khatian No. 132 & 133
F	Plant		Chorgazipur	43	Md. Nurul Islam Bahar, Most. Rehana Parvin and Most. Mamtaj Begm			S.A Khatian No. 297
G	Plant		Chorgazipur	43	Motahar Mredha, Md. Misir Mredha, Md. Alamgir, Md. Zahangir, Md. Safizol Haque Mredha, Md. Mozibol Haque, Md. Zakir Hossain, Md. Jasim Mredha, Md. Nirob Hossain Mredha, Abdul Majed Mredha, Md. Nasu Miah, Md. Nazim Uddin Mredha and Md. Nagor Mredha			S.A Khatian No. 45
H	Plant		Chorgazipur	43	Shubash Chandro Dey, Bivash Chandro Dey and Palash Chandro Dey			S.A Khatian No. 185
I	Plant		Chorgazipur	43	Md. Amirul Islam, Md. Abu Taher Humayan, Md. Golam Kibira, Rokeya Rahman, Jahanara Begum, Most. Jesmin Akter Setara, Most. Morijina Begum and Most. Hajera Bibiare			S.A Khatian No. 86 & 133

Old Daag	Mutation Khaitan No.	D.P Khaitan No.	Hal Plot No.	Quantity (in Decimals)
S.A Plot No. 103/106/102/104/105				20
S.A Plot No. 111/114/116/118 & 121				28
S.A Plot No. 83/84/85/108/110				5
S.A Plot No. 96/101/95/102	1793			11.5
S.A Plot No. 57/236/242/243/250				102
S.A Plot No. 111/114/117/116/118/121/122	212			9
S.A Plot No. 87/90				3.44
S.A Plot No. 83/85/88/89/93/96/97/100/101/104/105/108/110				20
S.A Plot No. 111/114//116/118 and 121	212			8
S.A Plot No. 236/234/243/249/250				40
S.A Plot No. 109/107				4.5
S.A Plot No. 129				100
S.A Plot No. 967/968/969/978/979				28.6
S.A Plot No. 970/971/789		612	3512/3548/3519	21
S.A Plot No. 967/968		338	3442/3467	7
S.A Plot No. 977/976		1348	3454	28.44
S.A Plot No. 976/977/359/993/1027/1025/1026/1023		478	2958/3007/3528/3516/2957	30
S.A Plot No. 970/971/989/990		866	3461/3513/3524	10.5
S.A Plot No. 962/967/968/969/978/979		478	2958/3007/3528/3516/2957	43
S.A Plot No. 967/968/962		872	3511/3518	3.75
S.A Plot No. 366/974/975/991/992/1011/1008/998/1005		929	3453/3484/3515/3508	45

Annex U

Stakeholder Consultation Records (Socio-economic Baseline)

This section includes the stakeholder consultations undertaken for developing the socio-economic baseline from 4th to 13th January 2017:

Table 1.1 Summary of Stakeholder Consultations

S. No	Date and Location	Stakeholder Group	Summary of Issues Discussed
1	5th January 2017, BPDB Plant	BPDB Project Director	Discussion with the BPDB (Project Director) • Employer of Power Development Board is Bangladesh; provision of utility service (205MW national grid) • Construction started on 13th April 2013, Contract thereafter in June 2013, COD – 2nd September 2015 and 2 years later - 2nd September 2017 • Warranty is effective from COD • Optimum generation is 105MW, 195:31 MW, 210MW, • O & M BPDB has 100 officers and staff, 30 contract workers including security and housekeeping • As per contract with O & M set up of 252 is approved • Employment/recruitment remains central, through BPDB and not from the plant directory, • Only blue collar worker can be hired directly • No specific commitment for local people through government • Land acquisition in 2008, total land acquired is 32.87 acre for the plant, Bhola I acquired 16acres • For township, road, gas pipeline land acquired is 16 acres in 2010-14 • Only agricultural/fallow field • Approach road owners are more than 500 • No details on share croppers and encroachers Discussion with Dy. Commissioner, Bhola • BPDB has an estate dept comprising of Bhoomi Mantra (Land ministry), that is headed by Dy. Commissioner under (A) section 3 to 7 • No compensation or legal cases (*sub* zila AC land) Bhola II • Land transfer is under process likely to be final by end of January 2017 • BPDB land bank – PPE process tender, 13 acres from Bhola I to SP, 5.78 acres purchase completed in early January 2017 with 63 persons and 21 deeds were formed • Access road is part of 5.78 (plant and access roads) acre just along the boundaries • Township capacity can occupy 70 families, 8 families, 2 bachelor dormitories (office and staff – 40/40) • BPDB civil maintenance will do maintenance – only swiping • Some local procurement • No CSR activities, school is hospital for BPDB in the plan which is open for local community • Tetulia river/estuary branches into Delmlal canal at 7km • Main issue is request for employment, • 33 KV transfer – 30 MW of power (local community transfer from town) • Bhola II also connected to national grid

S. No	Date and Location	Stakeholder Group	Summary of Issues Discussed
			• If government installs another transforms then can supply more than 30 MW including SP • BPDB does not do grievance redressal locally, no monitoring of socio economic indicators • Water intake is 400 tonnes/hour from Delmlal canal • Discharge of 250 tinnes/hour for both this and Bhola II • Drinking water is taken from 3 tube wells • 2 colling towers (temperature difference is 2-3^{o}C • Not sure about sanctuary • Reportedly no dredging to be required • Bhola I – Shabazpur – valve station – pipeline BPDB • Bhola II – direct from metering station through pipeline ~ 5km • 10 inch diameter ~ 5km (mostly straight, few diversions) • There is a Sunderban Gas Company Ltd on the way • 3m adjacent to 3m wide is the existing line and 3m width of new line will be built for the same
2	5th January 2017, Shahbazpur Gas Fields	Petroleum Engineer for Bapex	• There are four gas fields in the area – the main gas field premises have SBZ 1, 3 and 4 across 14 acres of land, • Shahbazpur 4 is 0.5 km away (7 acres); • All gas fields are in Kacchia Union. Sundarban Gas Distribution Company Limited is responsible for the sale and distribution of gas to customers such as BPDB and potentially NBBL; • Approximately 70 MCCT/day of gas is supplied through the present set up

3	6th January 2017, Kutuba Union	Local Community at Choto Monika Village, Kutuba Union	• Land tenure
			  o bargadari system where 1/4th of the cropped is given in barter
			  o land lease – 1 decimal 100 taka
			• Cropping pattern
			  o 2 paddy (monsoon and winter) along with 2 lentils and veggie cultivation in the village,
			  o general 10% land ownership and the other land users
			  ▪ land holding 2 acres on average
			  ▪ farming on fragmented pieces of land
			  o there is no specific link to plant's land acquisition
			• No specific feedback on the land purchase process. It is ongoing. Purchase rates are reported to be higher than the government rates;
			• Most people own land only for Bargad dari and or for cultivation
			• Many people have migrated to Bhola due to lack of income opportunities in their origin
			• *Dhaan Paan Chaash* (Bhola is world's biggest delta island)
			• Settlements for 30 years but cultivation since 100 years
			• People have been fragmenting land for a while
			• Agriculture labour (fisherman), daily labour (masonry)
			• Grazing land is reduced as most land is going into agriculture
			• No internal road, there are small culverts,
			• The school also functions as a cyclone centre (no major cyclones or cyclonic storms since 1991)
			• High school – Bruhanuddin sub zila health centre
			• 1 institutional delivery complex in Bruhanuddin
			• Maternal delivery happens at home (there are about 4-5 mid wives in villages)

4	6th January 2017, Kutuba Union	Fishermen Community at Choto Monika Village, Kutuba Union	• About 12 households are engaged in fishing • People use small fishing boat, there are no motors in these boats which are made of wood and 20-25 feet in length • 4 people in the boat (general habit is that a family travels along in a boat) • Fishing starts during high tide with the use of cast nets • People go to Tetulia river for fishing, twice a day • 10-20kg is the average catch per casting per taip • Peak catch season from May to September (summer to monsoons) • People in bruhanuddin have trawlers • Details of the catch – o Summer – 20kg, 3000 taka twice a day; o Winter – 10-12kg, 1500 taka twice a day; • Pushback jaal – shrimp, current jaal – good catch, goti jaal/Baila/main net (used for kata fishing with poles) car maache jaal – good catch • Income is divided between owner of the boat, and fish catcher who get 2 portions and3 portions of the catch respectively • People go for fishing every day in summer, except when there is cold weather (i.2. 20 days in a month) Tetulia river • More than 1000 villagers or settlements • There has been a decline in fishing due to fishing boats/trawlers in the river. Not due to sand mining • Dehular canal has also observed decrease in fishing • The reduction of fishing has occurred due to temperature increase that has led to warming up of the water resulting in reduction in shrimp
5	7th January 2017, Kutuba Union	Discussions with Women in South Kutuba Village, Ward 8	• Total settlements 2000 families in the village • More than 200 years old settlement • Ancestors had settled here and the women were married into this location from Bhola and Burhanuddin; • 80% Hindu comprising of Kayastha and De • Key livelihood is agriculture • 2 crops in a year • Earlier on their own land or as *barga chaashi* • Mixed income from business (petty trade) e.g. sale of betel leaves, stationary items and groceries • Men are not involved in any economic activities but are mostly involved in household chores • There are no handicraft, cottage industries • There are few women who rear cattle and no one undertakes fishing • Major health issues – gastric, diabetes, and water borne diseases • Durga Pooja is the main festival • Drinking water is mostly extracted from

6	8th January 2017, Kutuba Union	Discussion with local suppliers to BPDB's Chinese Village Labour Camp	• Supplying meat, vegetables, rice and gas cylinders to Chinese labour camp; • Local leaders used to supply labour and material to the contractors; • All camps were on site so there were no conflicts; • The availability of workers has now reduced therefore supply of labour has also reduced due to low margins • All labour camps were located inside • Amongst all workers working since 2 years, 700 are Bangladeshi, 350 are Chinese, 250 are local. Total workers engaged at one time are ~1300. • 500-600 BDT per day perform manual work • No specific skill development has been imparted. The workers learn on job • Skilled jobs are given to workers who are already skilled such as carpenters, masons • No serious accidents have happened as contractors and labourers reported • No specific encroachment has been carried out for the project
7	8th January 2017, Kutuba Union	Discussion with Betel leaf cultivators and betel nut farmers	• Mostly near the house on 1 decimal land there are 5-6 lines of palm trees • Annual production: o July to November plantation of the betel leaf, o Samplings are kept through vegetative propagation o The trees grow in January until Spring o By summer time the leafs are removed while the trees keep producing leafs o During winter season, the leafs become yellow faster than they become yellow in any other period • Locals mostly use organic fertilisers for agriculture • Primary income source remains cultivation of betel nut, coconut and paddy whereas other employment opportunities are supplementary to agriculture • 1 acre of betel nut plant can occupy 1200 trees o Each tree has a 50 years life in which it produces 500 taka per year • Farmers go to the Bruhanuddin to sell to the wholesalers • People who have more plantation land take paddy crop for self-consumption • In terms of occupation there is no major difference between communities of different religion

8	8th January 2017, Sacchra Union	Discussions with land owners at Chaar Gazipur Village	• Locals mainly engaged in agriculture • People purchased land 20 years back from Hindu community during 1970-1977. Land up to Demlal canal belonged to them already, hence the locals purchased land ahead of the canal • Char Gasipur has land in Kutuba and Sacchara Unions • People who own land, generally give the land for burga chaasi. Therefore as observed in terms of propagation, 50% are owners and the remaining are users • People leasing land and or share cropping is observed to be only at few places • The compensation to land users has not been given. Only land owners identified and rates are reportedly higher than the prevailing government rates; • Locals who are not able to find land for burga chaashi, they work as daily wage labourers • However land is generally available hence the plant has not created any major impact in this scenario
9	9th January 2017, Burhanuddin	Discussion with Local Government Departments and Upazilla Chairperson	• As the plant is gas based, SO2 to be released as a by-product • Acid rains have negative impact on agriculture • There has been a trend of decline of productivity in the area • LGEL is responsible for maintenance of rural roads. The carriageway capacity is 20-25 tonnes • Locals have an overall positive opinion about the project
10	9th January, 2017, Burhanuddin Upazila Office	Discussion with NGOs working in Bhola District, especially in Burhanuddin Upazila	• The NGOs are working for the upliftment of the common people of the Upazila. • Work in the field of water & sanitation, local governance, micro- finance, health, education, advocacy and rights, skill training, etc. • The area is very backward, literacy rate is low and awareness level is low • Scope of employment opportunities in the island very less, people usually do not get opportunity to get employed even after receiving training • Expectations are that more job opportunities be created on the inland so the community people may get employed.
11	9th January 2017, Kacchia Union	Discussions with Women at Shantipara Village	• The locals mainly comprise of Muslim community and there are 5-8 people per household • The mainstay livelihood option is agriculture, aquaculture, business (mainly involved traders, general stores, sale of produce e.g. betel nut), and household work • Some are also engaged in poultry business, cattle rearing • The people are aware of the gas pipeline • Practice of bargadari is prevalent in the area and the division of produce is 50% for each owner and cultivator • People also lease land for 1-5 years of period maximum • Key health concerns involve malnutrition, skin diseases, due to lack of hygiene and sanitation facilities • Generally women members of the households are not consulted at the time of decision making • Some women have bank accounts in ASA and BRAC etc. • Mainly the loans are taken for agriculture improvement • The average income of the people 5000 to 10000 BDT per month • The key demand for the village is gas and electricity as the village is located on an island and there is lack of such resources

12	10th January, 2017, Upazila Agriculture Office, Burhanuddin Upazila Office	Discussion with Upazila Agriculture Officer	• The area where additional land has been purchased for the power plant are triple cropped area – due to ample water resource. • Bhola is largely a natural-resource based economy with agriculture, fishing, and plantation agriculture being the main livelihoods. • Rice, wheat, pulses, and vegetables are the main crops. • Agriculture is the main source of livelihood to the majority of working population. • Rice is the main crop and land area under Amon cultivation is more. • Lots of beetle nut, beetle leaf and coconuts are grown in the region.
13	10th January, 2017, Upazila Hospital, Burhanuddin	Discussion with Upazila Medical Officer	• Health infrastructure facility at the Upazila level is inadequate. • Number of Medical Officers is only 2 when there is a requisition for 4. • The Upazila hospital is 20 bedded. • There are frequent outbreaks of diarrhoea in the upazila, due to improper sanitation arrangement. Although, almost all the houses have sanitation facilities but they are non-water sealed and are vulnerable to spread diseases fast. • Pneumonia, Respiratory Tract Infections, Typhoid, Tuberculosis, Diabetes, Malaria etc.
14	10th January, 2017, Cyclone Preparedness Programme (CPP) Office, Burhanuddin Upazila Office	Discussion with CPP Upazila official	• March, April, May and Oct. Nov. Dec. are the cyclone prone months, due to low pressure in Bay of Bengal • For any cyclone alarms they get information from the Meteorological Department on CPP Head Quarter. • At Burhanuddin Upazila there are 58 units of Union Level Volunteers who have been trained to cater to the community people when there is high alert signal and during any natural calamity. • The Volunteer team comprises of sub-teams for – signal, rescue, first-aid, shelter, relief
15	10th January, 2017, Fisheries Department, Burhanuddin Upazila Office	Discussion with Upazila Fisheries Officer	• There are a total of 18,570 government registered fishermen in the Upazila. There may be 10-15 % more fishermen in the Upazila who are not registered. • Total number of ponds in the Upazila is 8670 covering 3032.4 Acre area. • There are total of 263 varieties of fish available in the rivers of Bhola. • Fishing of Hilsa and Poa are famous to this region • The fishermen use many banned nets, which are very often confiscated by the Fisheries Department and they are burnt. Fishermen are fined for this. • Taking sand from the Tetulia river will not be a major problem for the fish habitat if the sand is harvested from the centre of the river bed. Rather this will help as desilting of the rivers and canals are not done. However, if the sand is taken from one side of the river, chances are high - that bank of the river may face erosion.

Enviro Consultants Ltd.

8, Garden Rose (1st Floor), Monipuripara
Tejgaon, Dhaka-1215, Bangladesh.
Phone : + (88-02) 8141439
Fax : +(88-02) 8141439
Cell : 01713117822, 01715327465
E-mail : ecl@enviroconsultant.org
Web : www.enviroconsultant.org

EQRL/Ambient Air/1512/2016

Enviro Quality Laboratory

Test Results of Ambient Air Quality Analysis

Description of Sample: Samples were collected from around the proposed 225 MW Combined Cycle Power Plant: Bhola District, Bangladesh

Sample Collector: Collected by ECL Personnel

Sampling Location: AQ1- Kutuba Village

Sampling Date: 18th, 25th April and 2nd May, 2016

Date of Analysis: 24th April, 1st and 8th May, 2016

Description of Analysis:

Location	Sampling Date	Ambient Air Pollutants Concentration in µg/m^3					
		SPM	PM_{10}	$PM_{2.5}$	SO_2	NOx	CO
AQ1	18/04/2016	160.62	56.73	38.23	12.58	22.74	170
	25/04/2016	150.41	46.24	31.81	16.34	23.82	180
	02/05/2016	164.17	60.32	36.44	11.45	28.12	160
Duration (hr)		**8**	**24**	**24**	**24**	**24**	**8**
ECR, 1997 Standard (Schedule-2)		**200**	**150**	**65**	**365**	**100**	**10000**
Method of Analysis		Gravimetric	Gravimetric	Gravimetric	West-Geake	Jacob &Hochheiser	CO Meter

Note:

*Regular Checkup and calibration of the equipments are done by the manufacturers and ECL personnel to avoid any error

Legend:

1. SPM Suspended Particulate Matter
2. PM10 Particulate Matter of a diameter of 10 micron or less
3. PM2.5 Particulate Matter of a diameter of 2.5 micron or less
4. SO2 Sulphur Di-Oxide
5. NOx Oxides of Nitrogen

Gperis. 08/05/16

Gabriel Ripon Peris
(Senior Chemist)

Enviro Consultants Ltd.

8, Garden Rose (1st Floor), Monipuripara
Tejgaon, Dhaka-1215, Bangladesh.
Phone : + (88-02) 8141439
Fax : +(88-02) 8141439
Cell : 01713117822, 01715327465
E-mail : ecl@enviroconsultant.org
Web : www.enviroconsultant.org

EQRL/Ambient Air/1513/2016

Enviro Quality Laboratory

Test Results of Ambient Air Quality Analysis

Description of Sample: Samples were collected from around the proposed 225 MW Combined Cycle Power Plant: Bhola District, Bangladesh

Sample Collector: Collected by ECL Personnel

Sampling Location: AQ2- South Kutuba Village

Sampling Date: 19th, 26th April and 3rd May, 2016

Date of Analysis: 24th April, 1st and 8th May, 2016

Description of Analysis:

Location	Sampling Date	Ambient Air Pollutants Concentration in µg/m³					
		SPM	PM_{10}	$PM_{2.5}$	SO_2	NOx	CO
AQ2	19/04/2016	179.55	43.75	30.7	13.72	24.48	160
	26/04/2016	130.34	46.21	34.83	10.32	19.94	130
	03/05/2016	140.97	52.1	26.58	8.34	23.48	120
Duration (hr)		**8**	**24**	**24**	**24**	**24**	**8**
ECR, 1997 Standard (Schedule-2)		**200**	**150**	**65**	**365**	**100**	**10000**
Method of Analysis		Gravimetric	Gravimetric	Gravimetric	West-Geake	Jacob &Hochheiser	CO Meter

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(Senior Chemist)

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Tejgaon, Dhaka-1215, Bangladesh.
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Fax : +(88-02) 8141439
Cell : 01713117822, 01715327465
E-mail : ecl@enviroconsultant.org
Web : www.enviroconsultant.org

EQRL/Ambient Air/1514/2016

Enviro Quality Laboratory

Test Results of Ambient Air Quality Analysis

Description of Sample: Samples were collected from around the proposed 225 MW Combined Cycle Power Plant: Bhola District, Bangladesh

Sample Collector: Collected by ECL Personnel

Sampling Location: AQ3- Char Gazipur Village

Sampling Date: 20th, 27th April and 4thMay, 2016

Date of Analysis: 24th April, 1st and 8th May, 2016

Description of Analysis:

Location	Sampling Date	Ambient Air Pollutants Concentration in µg/m^3					
		SPM	PM_{10}	$PM_{2.5}$	SO_2	NOx	CO
AQ3	20/04/2016	196.68	68.45	41.5	14.26	21.25	160
	27/04/2016	176.65	58.42	37.32	16.93	16.71	140
	04/05/2016	165.40	53.25	30.62	14.32	29.03	200
Duration (hr)		**8**	**24**	**24**	**24**	**24**	**8**
ECR, 1997 Standard (Schedule-2)		**200**	**150**	**65**	**365**	**100**	**10000**
Method of Analysis		Gravimetric	Gravimetric	Gravimetric	West-Geake	Jacob &Hochheiser	CO Meter

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(Senior Chemist)

Enviro Consultants Ltd.

8, Garden Rose (1st Floor), Monipuripara
Tejgaon, Dhaka-1215, Bangladesh.
Phone : + (88-02) 8141439
Fax : +(88-02) 8141439
Cell : 01713117822, 01715327465
E-mail : ecl@enviroconsultant.org
Web : www.enviroconsultant.org

EQRL/Ambient Air/1515/2016

Enviro Quality Laboratory

Test Results of Ambient Air Quality Analysis

Description of Sample: Samples were collected from around the proposed 225 MW Combined Cycle Power Plant: Bhola District, Bangladesh

Sample Collector: Collected by ECL Personnel

Sampling Location: AQ4- Char Gazipur Village

Sampling Date: 21st, 28th April and 5th May, 2016

Date of Analysis: 25th April, 2nd and 9th May, 2016

Description of Analysis:

Location	Sampling Date	Ambient Air Pollutants Concentration in µg/m³					
		SPM	PM_{10}	$PM_{2.5}$	SO_2	NOx	CO
AQ4	21/04/2016	172.76	48.53	31.47	10.28	17.56	140
	28/04/2016	181.92	46.21	28.54	12.58	20.55	170
	05/05/2016	155.85	37.47	21.73	10.76	16.50	150
Duration (hr)		**8**	**24**	**24**	**24**	**24**	**8**
ECR, 1997 Standard (Schedule-2)		**200**	**150**	**65**	**365**	**100**	**10000**
Method of Analysis		Gravimetric	Gravimetric	Gravimetric	West-Geake	Jacob &Hochheiser	CO Meter

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10/05/16.

Gabriel Ripon Peris
(Senior Chemist)

Enviro Consultants Ltd.

8, Garden Rose (1st Floor), Monipuripara
Tejgaon, Dhaka-1215, Bangladesh.
Phone : + (88-02) 8141439
Fax : +(88-02) 8141439
Cell : 01713117822, 01715327465
E-mail : ecl@enviroconsultant.org
Web : www.enviroconsultant.org

EQRL/Ambient Air/1516/2016

Enviro Quality Laboratory

Test Results of Ambient Air Quality Analysis

Description of Sample: Samples were collected from around the proposed 225 MW Combined Cycle Power Plant: Bhola District, Bangladesh

Sample Collector: Collected by ECL Personnel

Sampling Location: AQ5- Char Gazipur9 no. Ward

Sampling Date: 22nd, 29th April and 6th May, 2016

Date of Analysis: 25th April, 2nd and 9th May, 2016

Description of Analysis:

Location	Sampling Date	Ambient Air Pollutants Concentration in µg/m^3					
		SPM	PM_{10}	$PM_{2.5}$	SO_2	NOx	CO
AQ5	22/04/2016	183.30	62.41	42.35	15.35	23.40	180
	29/04/2016	166.61	56.36	39.72	16.43	21.25	200
	06/05/2016	173.63	66.36	35.82	12.66	25.09	160
Duration (hr)		**8**	**24**	**24**	**24**	**24**	**8**
ECR, 1997 Standard (Schedule-2)		**200**	**150**	**65**	**365**	**100**	**10000**
Method of Analysis		Gravimetric	Gravimetric	Gravimetric	West-Geake	Jacob &Hochheiser	CO Meter

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Gabriel Ripon Peris 16/5/16.
(Senior Chemist)

Project Name: 225 MW Combined Cycle Power Plant: Bhola District, Bangladesh
Project Address: Kutba Union of Burhanuddin Upazila in Bhola District
Monitored by: EQMS Consulting Limited (EQMS Team)
Description of Monitoring: Noise Level Monitoring
Monitoring Date: 13th April 2016 – 24th April 2016
Reporting Date: 10th May 2016 – 14th May 2016
Monitoring Location:

NL1 : East side of the Plant (Shah Alam Shordar house)
NL2 : Adjacent the Power plant (East) (Anwar Hossain house)
NL3 : North side of the Power Plant
NL4 : South-East side of the Power Plant (Kashem mia house)
NL5 : South side of the Power Plant
NL6 : Near Jetty-ghat of the Power Plant
NL7 : North side of the Power Plant
NL8 : Zakir Hossain's House, Char Gazipur Village
NL9 : Abdul Mazed mia house, Char Gazipur Village

Description of Analysis

Location	L_{min}	L_{max}	Leq_{day}	Leq_{night}	L90	L50	L10
NL1	46.2	69.4	53.5	51	49.3	51	54
NL2	59	77.9	65.4	66.1	63.5	65.5	67
NL3	47.5	84.1	62.1	54.4	52	56.6	62.5
NL4	43.2	75.8	58.3	53	46.9	51.1	58.9
NL5	45.9	75.8	56.9	53	49.4	52.9	57.7
NL6	40.2	54.1	46.3	46	43.9	45.9	47.8
NL7	53.6	79.4	64.8	63.2	58.9	63.4	65.9
NL8	40	72.2	56.8	49	49.5	53.6	57.4
NL9	42.5	63.2	53.9	49.4	46.8	51.6	55.4
Standard (ECR'1997)							
Silent area			50	40	-	-	-
Residential area			55	45	-	-	-
Mixed area			60	50	-	-	-
Commercial			70	60	-	-	-
Industrial area			75	70	-	-	-
World Bank/IFC Standard							
Residential; Institutional; Educational			70	70	-	-	-
Industrial			55	45	-	-	-

Collected by:
Toffazzal Hossain
Field Enumerator
EQMS Consulting Limited

Analyzed by:
TauhidulHasan
Consultant
EQMS Consulting Limited

Checked by:
KaziFarhadIqubal
Executive Director
EQMS Consulting Limited

EQMS Consulting Limited

Project Name: 225 MW Combined Cycle Power Plant: Bhola District, Bangladesh
Project Address: Kutba Union of Burhanuddin Upazila in Bhola District
Monitored by: EQMS Consulting Limited (EQMS Team)
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NL7 : North side of the Power Plant
NL8 : Zakir Hossain's House, Char Gazipur Village
NL9 : Abdul Mazedmia house, Char Gazipur Village

Description of Analysis

Hour	NL1	NL2	NL3	NL4	NL5	NL6	NL7	NL8	NL9
1:00-1:59 AM	52	66.4	51	51.1	51.3	46.3	63.2	46.9	47.9
2:00-2:59 AM	51.3	66.3	51.7	52.1	52	46.2	63.1	46.2	47.6
3:00-3:59 AM	51.4	65.7	53.8	54.8	54.8	46.5	63.7	47	47.9
4:00-4:59 AM	51	65.6	55.5	56.1	56.1	46.9	63.3	49.4	50.7
5:00-5:59 AM	50.3	65.6	54.7	54.3	54.2	47	62.3	49.9	51
6:00-6:59 AM	52	66	58.9	52	53.6	45.8	64.3	55.3	54.1
7:00-7:59 AM	52.6	66.1	60.9	62.8	56	45.6	64.2	57.2	53.6
8:00-8:59 AM	53.8	65.8	60.5	63	53.4	47.4	65.1	56.8	54.5
9:00-9:59 AM	55.6	65.3	61.3	57.3	54.4	47.7	64.5	58.5	56.1
10:00-10:59 AM	55.5	65	62.2	51	54.6	46.1	64.6	56.1	55
11:00-11:59 AM	54	64.9	63.3	47.3	57.9	46.5	64.4	57.8	55.1
12:00-12:59 PM	54.9	63.8	67	55.2	57.7	46.1	63.6	57.6	52.9
13:00-13:59 PM	54.5	63.7	62.6	59.5	57.7	46.4	67.3	57.2	53
14:00-14:59 PM	53.3	63.5	60.1	61.5	61.6	46.8	62.6	56	53.1

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Toffazzal Hossain
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EQMS Consulting Limited

EQMS Consulting Limited
Suit # C1, House # 76, Road # 5, Block # F, Banani, Dhaka -1213, Bangladesh.
Phone: +88-029873282; Mobile: + 88-01911702074; Email: info@eqmsbd.com, eqmsbd@gmail.com, Web: www.eqmsbd.com

Project Name: 225 MW Combined Cycle Power Plant: Bhola District, Bangladesh
Project Address: Kutba Union of Burhanuddin Upazila in Bhola District
Monitored by: EQMS Consulting Limited (EQMS Team)
Description of Monitoring: Noise Level Monitoring
Monitoring Date: 13th April 2016 – 24th April 2016
Reporting Date: 10th May 2016 – 14th May 2016
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Description of Analysis

Hour	NL1	NL2	NL3	NL4	NL5	NL6	NL7	NL8	NL9
15:00-15:59 PM	53.4	64	60.4	56.2	53.3	47.4	64	56.5	52.8
16:00-16:59 PM	54.9	66	59	54.1	55.5	46.3	66.6	54.5	53.3
17:00-17:59 PM	52	65.2	60.3	59.3	54.6	44.8	65.6	56.5	53.3
18:00-18:59 PM	49.9	65.8	64.7	53.5	57.4	45.1	64.3	57.5	54.1
19:00-19:59 PM	50	67.1	61	58.1	58	45.6	64.1	57.5	53
20:00-20:59 PM	52.6	66.4	60	54.6	54.6	45.4	65.2	55.5	52.7
21:00-21:59 PM	50.2	66.6	59.1	52.9	52.3	45.7	63.6	53.8	52
22:00-22:59 PM	50	66.5	53.5	51.1	50.7	45.1	64.8	48.2	48.6
23:00-23:59 PM	51.2	65.8	51.7	51.2	51.1	45.3	62.5	46.4	48.1
00:00-00:59 PM	51.2	66.3	50.2	49.9	49.9	44.9	61.6	45.4	47

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NL5	45.9	75.8	56.9	53	49.4	52.9	57.7
NL6	40.2	54.1	46.3	46	43.9	45.9	47.8
NL7	53.6	79.4	64.8	63.2	58.9	63.4	65.9
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Silent area			50	40	-	-	-
Residential area			55	45	-	-	-
Mixed area			60	50	-	-	-
Commercial			70	60	-	-	-
Industrial area			75	70	-	-	-
World Bank/IFC Standard							
Residential; Institutional; Educational			70	70	-	-	-
Industrial			55	45	-	-	-

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Phone: +88-029873282; Mobile: + 88-01911702074; Email: info@eqmsbd.com, eqmsbd@gmail.com, Web: www.eqmsbd.com

Government of the People's Republic of Bangladesh
Office of the Chief Chemist
Department of Public Health Engineering
Central Lab, 38-39, Mohakhali C/A, Dhaka-1212.
Phone: 880298881927, Fax: 88029882003, Email:wqmsc_central_lab@yahoo.com

Lab Memo: 268/CC, DPHE, CL, Dhaka

Date : 18/05/2016

Physical / Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2016040167	Sample Receiving date: 19/04/2016
Ref. Memo No: EQMS/2016/Nill & Dated: 19/04/2016	Sample Source: Surface water
Sent By: Md. Najmul Hossain, EQMS Consulting Limited	Dist: Bhola
Care taker: EQMS Consulting Limited (SW-01)	Location : 100m towards the power plant site from kheya ghat bridge GPS : 22°29'18.50"N 90°42'32.40"E
Sample collection date: 17/04/2016	Date of Testing : 19/04/2016– 15/05/2016

LABORATORY TEST RESULTS:

SL	Water sample parameters	Bangladesh Standard	Concentration present	Unit	Analysis Procedure	LOQ
1.	Biological Oxygen Demand (BOD)	50	4.5	mg/l	5 days Incubation	175
2.	Chemical Organic Demand (COD)	200	9.5	mg/l	CRM	315
3.	Nitrate	10	0.85	mg/l	Spectrophotometer	-
4.	Nitrite	<1	<0.05	mg/l	Spectrophotometer	-
5.	Manganese	0.1	BDL	mg/l	AAS	0.03
6.	Phosphate	6	0.72	mg/l	Spectrophotometer	-
7.	Iron	0.3-1.0	0.62	mg/l	AAS	0.05
8.	Turbidity	10	26	NTU	Turbidity Meter	-
9.	Oil and Grease	0.01	BDL	mg/l	Purge Trap GC	-
10.	Total Coliform	0	26	n/100ml	MFM	-
11.	Fecal Coliform	0	Present	n/100ml	MFM	-
12.	Alkalinity (HCO_3)	-	132	mg/l	Titrimetric	-
13.	Total Hardness (as $CaCO_3$)	200-500	32.5	mg/l	Titrimetric	-
14.	Chloride (Cl)	150-600	16.3	mg/l	Titrimetric	-
15.	Arsenic (As)	0.05	<0.005	mg/l	AAS	0.001
16.	Calcium (Ca)	75	10.4	mg/l	Spectrophotometer	-
17.	Chromium (Cr)	0.05	<0.01	mg/l	AAS	0.0003
18.	Fluride (F)	1	<0.10	mg/l	UVS	0.05
19.	Cadmium (Cd)	0.005	<0.005	mg/l	AAS	0.00015
20.	Lead (Pb)	0.05	<0.005	mg/l	AAS	0.02
21.	Mercury (Hg)	0.001	<0.001	mg/l	AAS	0.02

SL	Water sample parameters	Bangladesh Standard	Concentration present	Unit	Analysis Procedure	LOQ
22.	Potassium (K)	12	5.42	mg/l	AAS	-
23.	Sodium (Na)	200	18.51	mg/l	AAS	0.34
24.	Boron (B)	1.0	<0.05	mg/l	AAS	0.02

Comments: Sample was collected & supplied by client.

N.B: AAS-Atomic Absorption Spectrophotometer, UV-VIS: UV-Visible Spectrophotometer, MFM-Membrane Filtration Procedure, LOQ-Limit of Quantification

Test performed by:	Signature	Countersigned/Approved by:	Signature
1) Name : Mahabuba Sabina Motin Designation: Sample Analyzer	18-05-16	1) Name : Md. Biplab Hossain Designation: Chief Chemist	18/05/2016.
2) Name: Md. Saiful Alom Khoshru Designation: Sample Analyzer	18.05.16.	2) Name: Designation:	

নমুনা বিশ্লেষক
জনস্বাস্থ্য প্রকৌশল অধিদপ্তর
কেন্দ্রীয় পরীক্ষাগার
মহাখালী, ঢাকা।

মোঃ বিপ্লব হোসেন
চীফ কেমিস্ট
জনস্বাস্থ্য প্রকৌশল অধিদপ্তর
কেন্দ্রীয় পরীক্ষাগার মহাখালী, ঢাকা।

Government of the People's Republic of Bangladesh
Office of the Chief Chemist
Department of Public Health Engineering
Central Lab, 38-39, Mohakhali C/A, Dhaka-1212.
Phone: 880298881927, Fax: 88029882003, Email:wqmsc_central_lab@yahoo.com

Lab Memo: 268/CC, DPHE, CL, Dhaka

Date : 18/05/2016

Physical / Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2016040168	Sample Receiving date: 19/04/2016
Ref. Memo No: EQMS/2016/Nill & Dated: 19/04/2016	Sample Source: Surface water
Sent By: Md. Najmul Hossain, EQMS Consulting Limited	Dist: Bhola
Care taker: EQMS Consulting Limited (SW-02)	Location : 300m upstream from the power plant location GPS : 22°28'57.78"N 90°42'27.86"E
Sample collection date: 17/04/2016	Date of Testing : 19/04/2016– 15/05/2016

LABORATORY TEST RESULTS:

SL	Water sample parameters	Bangladesh Standard	Concentration present	Unit	Analysis Procedure	LOQ
1.	Biological Oxygen Demand (BOD)	50	4.8	mg/l	5 days Incubation	175
2.	Chemical Organic Demand (COD)	200	11.6	mg/l	CRM	315
3.	Nitrate	10	0.90	mg/l	Spectrophotometer	-
4.	Nitrite	<1	<0.05	mg/l	Spectrophotometer	-
5.	Manganese	0.1	BDL	mg/l	AAS	0.03
6.	Phosphate	6	0.69	mg/l	Spectrophotometer	-
7.	Iron	0.3-1.0	0.65	mg/l	AAS	0.05
8.	Turbidity	10	28	NTU	Turbidity Meter	-
9.	Oil and Grease	0.01	BDL	mg/l	Purge Trap GC	-
10.	Total Coliform	0	35	n/100ml	MFM	-
11.	Fecal Coliform	0	Present	n/100ml	MFM	-
12.	Alkalinity (HCO_3)	-	126	mg/l	Titrimetric	-
13.	Total Hardness (as $CaCO_3$)	200-500	34.7	mg/l	Titrimetric	-
14.	Chloride (Cl)	150-600	22.6	mg/l	Titrimetric	-
15.	Arsenic (As)	0.05	<0.005	mg/l	AAS	0.001
16.	Calcium (Ca)	75	14.4	mg/l	Spectrophotometer	-
17.	Chromium (Cr)	0.05	<0.01	mg/l	AAS	0.0003
18.	Fluride (F)	1	<0.10	mg/l	UVS	0.05
19.	Cadmium (Cd)	0.005	<0.005	mg/l	AAS	0.00015
20.	Lead (Pb)	0.05	<0.005	mg/l	AAS	0.02
21.	Mercury (Hg)	0.001	<0.001	mg/l	AAS	0.02
22.	Potassium (K)	12	4.76	mg/l	AAS	-

SL	Water sample parameters	Bangladesh Standard	Concentration present	Unit	Analysis Procedure	LOQ
23.	Sodium (Na)	200	21.45	mg/l	AAS	0.34
24.	Boron (B)	1.0	<0.05	mg/l	AAS	0.02

Comments: Sample was collected & supplied by client.
N.B: AAS-Atomic Absorption Spectrophotometer, UV-VIS: UV-Visible Spectrophotometer, MFM-Membrane Filtration Procedure, LOQ-Limit of Quantification

Test performed by:	Signature	Countersigned/Approved by:	Signature
1) Name : Mahabuba Sabina Motin Designation: Sample Analyzer	Motin. 18.05.16.	3) Name : Md. Biplab Hossain Designation: Chief Chemist	Bhossain 18/05/2016.
2) Name: Md. Saiful Alom Khoshru Designation: Sample Analyzer	18.05.16.	4) Name: Designation:	

নমুনা বিশ্লেষক
জনস্বাস্থ্য প্রকৌশল অধিদপ্তর
কেন্দ্রীয় পরীক্ষাগার
মহাখালী, ঢাকা।

মোঃ বিপ্লব হোসেন
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Phone: 880298881927, Fax: 88029882003, Email:wqmsc_central_lab@yahoo.com

Lab Memo: 268/CC, DPHE, CL, Dhaka

Date : 18/05/2016

Physical / Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2016040169	Sample Receiving date: 19/04/2016
Ref. Memo No: EQMS/2016/Nill & Dated: 19/04/2016	Sample Source: Surface water
Sent By: Md. Najmul Hossain, EQMS Consulting Limited	Dist: Bhola
Care taker: EQMS Consulting Limited (SW-03)	Location : 300 m downstream from power plant location GPS : 22°28'30.03"N 90°42'40.34"E
Sample collection date: 17/04/2016	Date of Testing : 19/04/2016– 15/05/2016

LABORATORY TEST RESULTS:

SL	Water sample parameters	Bangladesh Standard	Concentration present	Unit	Analysis Procedure	LOQ
1.	Biological Oxygen Demand (BOD)	50	4.7	mg/l	5 days Incubation	175
2.	Chemical Organic Demand (COD)	200	10.4	mg/l	CRM	315
3.	Nitrate	10	0.80	mg/l	Spectrophotometer	-
4.	Nitrite	<1	<0.05	mg/l	Spectrophotometer	-
5.	Manganese	0.1	BDL	mg/l	AAS	0.03
6.	Phosphate	6	0.65	mg/l	Spectrophotometer	-
7.	Iron	0.3-1.0	0.58	mg/l	AAS	0.05
8.	Turbidity	10	23	NTU	Turbidity Meter	-
9.	Oil and Grease	0.01	BDL	mg/l	Purge Trap GC	-
10.	Total Coliform	0	28	n/100ml	MFM	-
11.	Fecal Coliform	0	Present	n/100ml	MFM	-
12.	Alkalinity (HCO_3)	-	128	mg/l	Titrimetric	-
13.	Total Hardness (as $CaCO_3$)	200-500	28.7	mg/l	Titrimetric	-
14.	Chloride (Cl)	150-600	18.4	mg/l	Titrimetric	-
15.	Arsenic (As)	0.05	<0.005	mg/l	AAS	0.001
16.	Calcium (Ca)	75	18.3	mg/l	Spectrophotometer	-
17.	Chromium (Cr)	0.05	<0.01	mg/l	AAS	0.0003
18.	Fluride (F)	1	<0.10	mg/l	UVS	0.05
19.	Cadmium (Cd)	0.005	<0.005	mg/l	AAS	0.00015
20.	Lead (Pb)	0.05	<0.005	mg/l	AAS	0.02
21.	Mercury (Hg)	0.001	<0.001	mg/l	AAS	0.02
22.	Potassium (K)	12	5.10	mg/l	AAS	-

SL	Water sample parameters	Bangladesh Standard	Concentration present	Unit	Analysis Procedure	LOQ
23.	Sodium (Na)	200	19.42	mg/l	AAS	0.34
24.	Boron (B)	1.0	<0.05	mg/l	AAS	0.02

Comments: Sample was collected & supplied by client.
N.B: AAS-Atomic Absorption Spectrophotometer, UV-VIS: UV-Visible Spectrophotometer, MFM-Membrane Filtration Procedure, LOQ-Limit of Quantification

Test performed by:	Signature	Countersigned/Approved by:	Signature
1) Name : Mahabuba Sabina Motin Designation: Sample Analyzer	Mmotin 18-05-16	5) Name : Md. Biplab Hossain Designation: Chief Chemist	Bhossain 18/05/2016.
2) Name: Md. Saiful Alom Khoshru Designation: Sample Analyzer	18/05/16	6) Name: Designation:	

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মহাখালী, ঢাকা।

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Central Lab, 38-39, Mohakhali C/A, Dhaka-1212.
Phone: 880298881927, Fax: 88029882003, Email:wqmsc_central_lab@yahoo.com

Lab Memo: 268/CC, DPHE, CL, Dhaka

Date : 18/05/2016

Physical / Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2016040170	Sample Receiving date: 19/04/2016
Ref. Memo No: EQMS/2016/Nill & Dated: 19/04/2016	Sample Source: Surface water
Sent By: Md. Najmul Hossain, EQMS Consulting Limited	Dist: Bhola
Care taker: EQMS Consulting Limited (SW-04)	Location : 1 km downstream from power plant location GPS : 22°28'8.20"N 90°42'41.80"E
Sample collection date: 17/04/2016	Date of Testing : 19/04/2016– 15/05/2016

LABORATORY TEST RESULTS:

SL	Water sample parameters	Bangladesh Standard	Concentration present	Unit	Analysis Procedure	LOQ
1.	Biological Oxygen Demand (BOD)	50	5.0	mg/l	5 days Incubation	175
2.	Chemical Organic Demand (COD)	200	12.5	mg/l	CRM	315
3.	Nitrate	10	0.98	mg/l	Spectrophotometer	-
4.	Nitrite	<1	<0.05	mg/l	Spectrophotometer	-
5.	Manganese	0.1	BDL	mg/l	AAS	0.03
6.	Phosphate	6	0.78	mg/l	Spectrophotometer	-
7.	Iron	0.3-1.0	0.69	mg/l	AAS	0.05
8.	Turbidity	10	30	NTU	Turbidity Meter	-
9.	Oil and Grease	0.01	BDL	mg/l	Purge Trap GC	-
10.	Total Coliform	0	39	n/100ml	MFM	-
11.	Fecal Coliform	0	Present	n/100ml	MFM	-
12.	Alkalinity (HCO_3)	-	137	mg/l	Titrimetric	-
13.	Total Hardness (as $CaCO_3$)	200-500	37.3	mg/l	Titrimetric	-
14.	Chloride (Cl)	150-600	27.6	mg/l	Titrimetric	-
15.	Arsenic (As)	0.05	<0.005	mg/l	AAS	0.001
16.	Calcium (Ca)	75	16.8	mg/l	Spectrophotometer	-
17.	Chromium (Cr)	0.05	<0.01	mg/l	AAS	0.0003
18.	Fluride (F)	1	<0.10	mg/l	UVS	0.05
19.	Cadmium (Cd)	0.005	<0.005	mg/l	AAS	0.00015
20.	Lead (Pb)	0.05	<0.005	mg/l	AAS	0.02
21.	Mercury (Hg)	0.001	<0.001	mg/l	AAS	0.02
22.	Potassium (K)	12	4.95	mg/l	AAS	-

SL	Water sample parameters	Bangladesh Standard	Concentration present	Unit	Analysis Procedure	LOQ
23.	Sodium (Na)	200	23.67	mg/l	AAS	0.34
24.	Boron (B)	1.0	<0.05	mg/l	AAS	0.02

Comments: Sample was collected & supplied by client.
N.B: AAS-Atomic Absorption Spectrophotometer, UV-VIS: UV-Visible Spectrophotometer, MFM-Membrane Filtration Procedure, LOQ-Limit of Quantification

Test performed by:	Signature	Countersigned/Approved by:	Signature
1) Name : Mahabuba Sabina Motin Designation: Sample Analyzer	18-05-2016	7) Name : Md. Biplab Hossain Designation: Chief Chemist	18/05/2016
2) Name: Md. Saiful Alom Khoshru Designation: Sample Analyzer	18.05.16	8) Name: Designation:	

নমুনা বিশ্লেষক
জনস্বাস্থ্য প্রকৌশল অধিদপ্তর
কেন্দ্রীয় পরীক্ষাগার মহাখালী, ঢাকা।

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Phone: 880298881927, Fax: 88029882003, Email:wqmsc_central_lab@yahoo.com

Lab Memo: 268/CC, DPHE, CL, Dhaka

Date : 18/05/2016

Physical / Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2016040171	Sample Receiving date: 19/04/2016
Ref. Memo No: EQMS/2016/Nill & Dated: 19/04/2016	Sample Source: Ground water
Sent By: Md. Najmul Hossain, EQMS Consulting Limited	Dist: Bhola
Care taker: EQMS Consulting Limited (GW-01)	Location : Power plant's deep tube well GPS : 22°28'40.92"N 90°42'42.30"E
Sample collection date: 17/04/2016	Date of Testing : 19/04/2016– 15/05/2016

LABORATORY TEST RESULTS:

SL	Water sample parameters	Bangladesh Standard	Concentration present	Unit	Analysis Procedure	LOQ
1.	Alkalinity (HCO_3)	-	243	mg/l	Titrimetric	-
2.	Total Hardness (as $CaCO_3$)	200-500	17.2	mg/l	Titrimetric	-
3.	Chloride (Cl)	150-600	67.8	mg/l	Titrimetric	-
4.	Arsenic (As)	0.05	<0.05	mg/l	AAS	0.001
5.	Calcium (Ca)	75	42.1	mg/l	Spectrophotometer	-
6.	Chromium (Cr)	0.05	<0.01	mg/l	AAS	0.0003
7.	Fluride (F)	1	0.37	mg/l	UVS	0.05
8.	Cadmium (Cd)	0.005	<0.005	mg/l	AAS	0.00015
9.	Iron (Fe)	0.3-1.0	0.37	mg/l	AAS	0.05
10.	Lead (Pb)	0.05	<0.01	mg/l	AAS	0.02
11.	Mercury (Hg)	0.001	<0.001	mg/l	AAS	0.02
12.	Potassium (K)	12	1.28	mg/l	AAS	-
13.	Sodium (Na)	200	47.5	mg/l	AAS	0.34
14.	Boron (B)	1.0	0.16	mg/l	AAS	0.02
15.	Fecal Coliform	0	0	n/100ml	MFM	-
16.	Total Coliform	0	0	n/100ml	MFM	-

Comments: Sample was collected & supplied by client.

N.B: AAS-Atomic Absorption Spectrophotometer, UV-VIS: UV-Visible Spectrophotometer, MFM-Membrane Filtration Procedure, LOQ- Limit of Quantification

Test performed by:	Signature	Countersigned/Approved by:	Signature
1) Name : Mahabuba Sabina Motin Designation: Sample Analyzer	18-05-16.	1) Name : Md. Biplab Hossain Designation: Chief Chemist	18/05/2016
2) Name: Md. Saiful Alom Khoshru Designation: Sample Analyzer	18.05.16	2) Name: Designation:	

নমুনা বিশ্লেষক
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Phone: 880298881927, Fax: 88029882003, Email:wqmsc_central_lab@yahoo.com

Lab Memo: 268/CC, DPHE, CL, Dhaka

Date : 18/05/2016

Physical / Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2016040172	Sample Receiving date: 19/04/2016
Ref. Memo No: EQMS/2016/Nill & Dated: 19/04/2016	Sample Source: Ground water
Sent By: Md. Najmul Hossain, EQMS Consulting Limited	Dist: Bhola
Care taker: EQMS Consulting Limited (GW-02)	Location : Kutuba village GPS : 22°28'51.25"N 90°42'49.68"E
Sample collection date: 17/04/2016	Date of Testing : 19/04/2016– 15/05/2016

LABORATORY TEST RESULTS:

SL	Water sample parameters	Bangladesh Standard	Concentration present	Unit	Analysis Procedure	LOQ
17.	Alkalinity (HCO_3)	-	267	mg/l	Titrimetric	-
18.	Total Hardness (as $CaCO_3$)	200-500	15.4	mg/l	Titrimetric	-
19.	Chloride (Cl)	150-600	54.2	mg/l	Titrimetric	-
20.	Arsenic (As)	0.05	<0.05	mg/l	AAS	0.001
21.	Calcium (Ca)	75	35.6	mg/l	Spectrophotometer	-
22.	Chromium (Cr)	0.05	<0.01	mg/l	AAS	0.0003
23.	Fluride (F)	1	0.41	mg/l	UVS	0.05
24.	Cadmium (Cd)	0.005	<0.005	mg/l	AAS	0.00015
25.	Iron (Fe)	0.3-1.0	1.31	mg/l	AAS	0.05
26.	Lead (Pb)	0.05	<0.01	mg/l	AAS	0.02
27.	Mercury (Hg)	0.001	<0.001	mg/l	AAS	0.02
28.	Potassium (K)	12	1.37	mg/l	AAS	-
29.	Sodium (Na)	200	58.7	mg/l	AAS	0.34
30.	Boron (B)	1.0	0.27	mg/l	AAS	0.02
31.	Fecal Coliform	0	0	n/100ml	MFM	-
32.	Total Coliform	0	0	n/100ml	MFM	-

Comments: Sample was collected & supplied by client.
N.B: AAS-Atomic Absorption Spectrophotometer, UV-VIS: UV-Visible Spectrophotometer, MFM-Membrane Filtration Procedure, LOQ- Limit of Quantification

Test performed by:	Signature	Countersigned/Approved by:	Signature
1) Name : Mahabuba Sabina Motin Designation: Sample Analyzer	18-05-16.	3) Name : Md. Biplab Hossain Designation: Chief Chemist	18/05/2016
2) Name: Md. Saiful Alom Khoshru Designation: Sample Analyzer	18.05.16	4) Name: Designation:	

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Sampling Source: Drinking Water, Barhanuddin, Bhola
Sampling Location:

Code	Location	GPS
GW1	Power plant's deep tube well	22°28'40.92"N90°42'42.30"E
GW2	Kutuba village	22°28'51.25"N90°42'49.68"E

Sampling by: EQMS Personnel
Sampling Date: 17.04.2016
Analysis Date: 17.04.2016

Analysis Result

Sl.	Parameter	Unit	Bangladesh Standard	Concentration		Analysis Procedure
				GW1	GW2	
1.	Temperature	°C	20-30	29.1	28.8	Hanna Temperature Meter
2.	TDS	mg/l	1000	390	420	Hanna TDS Meter
3.	Salinity	mg/l	-	200	200	Lutron Salinity Meter
4.	EC	µmhos/cm	2250	570	620	Hanna EC Meter
5.	pH	-	6.5-8.5	7.32	7.24	Hanna pH Tester

Analyzed by
Tauhidul Hasan, Consultant

Checked by
Kazi Farhed Iqubal
Executive Director

EQMS Consulting Limited

EQMS Consulting Limited
Suit # C1, House # 76, Road # 5, Block # F, Banani, Dhaka -1213, Bangladesh.
Phone: +88-029873282; Mobile: + 88-01911702074; Email: info@eqmsbd.com, eqmsbd@gmail.com, Web: www.eqmsbd.com

Sampling Source: Dehular Canal, Barhanuddin, Bhola
Sampling Location:

Code	Location	GPS
SW1	100m towards the power plant site from kheya ghat bridge	22°29'18.50"N; 90°42'32.40"E
SW2	300m upstream from the power plant location	22°28'57.78"N; 90°42'27.86"E
Sw3	300 m downstream from power plant location	22°28'30.03"N; 90°42'40.34"E
Sw4	1 km downstream from power plant location	22°28'8.20"N; 90°42'41.80"E

Sampling by: EQMS Personnel
Sampling Date: 17.04.2016
Analysis Date: 17.04.2016

Analysis Result

Sl.	Parameter	Unit	Bangladesh Standard	Concentration				Analysis Procedure
				SW1	SW2	SW3	SW4	
1.	Temperature	°C	20-30	33.2	32.2	31.7	32.8	Hanna Temperature Meter
2.	TDS	mg/l	1000	340	340	350	330	Hanna TDS Meter
3.	Salinity	mg/l	-	300	300	300	300	Lutron Salinity Meter
4.	EC	µmhos/cm	2250	670	700	670	660	Hanna EC Meter
5.	DO	mg/l	>5	6.4	6.2	6.0	6.2	Lutron DO 5509 meter
6.	pH	-	6.5-8.5	7.83	7.87	7.87	7.82	Hanna pH Tester

Analyzed by
Tauhidul Hasan, Consultant

Checked by
Kazi Farhed Iqubal
Executive Director

EQMS Consulting Limited

EQMS Consulting Limited
Suit # C1, House # 76, Road # 5, Block # F, Banani, Dhaka -1213, Bangladesh.
Phone: +88-029873282; Mobile: + 88-01911702074; Email: info@eqmsbd.com, eqmsbd@gmail.com, Web: www.eqmsbd.com

মৃত্তিকা পানি ও পরিবেশ বিভাগ
ঢাকা বিশ্ববিদ্যালয়
ঢাকা-১০০০
বাংলাদেশ

DEPARTMENT OF SOIL, WATER & ENVIRONMENT
University of Dhaka
Dhaka-1000
Bangladesh

Report of Analysis

Reference No. : 7918/ SD/19/04/2016- 857
Sample ID : SD-1, SD-2
Sample Collection date : 17th April 2016
Sample Receiving Date : 19rd April 2016
Sample Supplied by : Mr. Rofiul Karim, Consultant, EQMS Consulting Limited
Sample Source : SD1: Dehular Canal (500 m towards plant site from kheyaghat bridge);
SD2: Dehular Canal (400 m downstream from power plant)
Date of Testing : 22nd April 2016 to 21st May 2016

Analysis Results:

Characteristics	Unit	Sediment Quality	
		SD1	SD2
GPS	-	22°29'6.12"N 90°42'30.33"E	22°28'26.1"N 90°42'40.5"E
Grain Size Distribution			
Sand	%	30	27
Silt	%	54	50
Clay	%	16	23
Texture	-	Silt loam	Silt loam
Organic content	%	0.30	0.28
pH	-	6.5	6.8
Permeability	cm/hr	$10^{-2} - 10^{-4}$ unsaturated soil in dry season	$10^{-2} - 10^{-4}$ unsaturated soil in dry season
EC	dS/m	0.50	0.48
Bulk Density	g/cm^3	1.40	1.39
Alkalinity as $CaCO_3$	mg/kg	162.7	158.2
Calcium (Ca)	mg/kg	6.8	6.3
Magnesium (Mg)	mg/kg	6.5	6.3
Sodium (Na)	meq/100g	1.60	1.68
Potassium (K)	mg/kg	1.7	1.5
Chloride (Cl)	mg/g	187.7	196.5
Copper (Cr)	mg/kg	13.6	12.8
Iron (Fe)	mg/kg	52.7	58.3
Manganese (Mn)	mg/kg	117.4	134.5
Zinc (Zn)	mg/kg	23.5	26.7
Lead (Pb)	mg/kg	27.3	23.6
Cadmium (Cd)	mg/kg	0.1	0.1
Arsenic (As)	mg/kg	0.65	0.72
Mercury (Hg)	mg/kg	0.2	0.2
Cation Exchange Capacity	meq of Na/100g soil	18.42	21.53

(Dr. Sirajul Hoque) 24/05/16
Professor and Chairman

Telephone: 9661920-73/7470, Fax: (880-2) 8615583, e-mail: swed@du.ac.bd

মৃত্তিকা পানি ও পরিবেশ বিভাগ
ঢাকা বিশ্ববিদ্যালয়
ঢাকা-১০০০
বাংলাদেশ

DEPARTMENT OF SOIL, WATER & ENVIRONMENT
University of Dhaka
Dhaka-1000
Bangladesh

Report of Analysis

Reference No. : 7917/ SQ/19/04/2016- 856
Sample ID : SQ-1, SQ-2
Sample Collection date : 15th April 2016
Sample Receiving Date : 19th April 2016
Sample Supplied by : Mr. Rofiul Karim, Consultant, EQMS Consulting Limited
Sample Source : SQ1: Inside the power plant boundary at Borhanuddin upazila, Bhola.
SQ2: Agricultural land (North side of the plant boundary)
Date of Testing : 22nd April 2016 to 21st May 2016

Analysis Results:

Characteristics	Unit	Soil Quality	
		SQ1	SQ2
GPS	-	22°28'40.03"N 90°42'32.79"E	22°28'49.34"N 90°42'33.04"E
Grain Size Distribution			
Sand	%	68	32
Silt		28	51
Clay		4	17
Texture		Sandy loam	Silt loam
Organic content	%	0.38	1.54
pH	-	5.62	6.1
Permeability	cm/hr	10^{-3} – 10^{-4} unsaturated soil in dry season	10^{-1} – 10^{-4} unsaturated soil in dry season
EC	dS/m	0.72	0.56
Bulk Density	g/cm^3	1.32	1.53
Alkalinity as $CaCO_3$	mg/kg	124.5	143.8
Calcium (Ca)	mg/kg	4.8	7.3
Magnesium (Mg)	mg/kg	3.4	5.8
Sodium (Na)	mg/kg	0.7	1.84
Potassium (K)	mg/kg	0.08	0.43
Chloride (Cl)	mg/g	82.6	124.2
Copper (Cr)	mg/kg	5.1	6.8
Iron (Fe)	mg/kg	57	87
Manganese (Mn)	mg/kg	36.7	25.3
Zinc (Zn)	mg/kg	7.82	4.23
Lead (Pb)	mg/kg	25.5	15.7
Cadmium (Cd)	mg/kg	1.56	<1.0
Arsenic (As)	mg/kg	1.53	0.45
Mercury (Hg)	mg/kg	0.4	0.1
Cation Exchange Capacity	meq of Na/100g soil	4.71	13.33

(Dr. Sirajul Hoque) 24/05/16.
Professor and Chairman

Telephone: 9661920-73/7470, Fax: (880-2) 8615583, e-mail: swed@du.ac.bd

Road Name: Barhanuddin Bazar to Power Plant Road
Station Name: In front of 1st gate of the power plant
GPS Location: 22°28'44.86"N 90°42'56.41"E
Duration: 24 Hours
Date: 13.04.2016

Time	1	2	3	4	5	6	7
	Rickshaw	Auto Rickshaw	CNG	Cycle	Van	Motor Cycle	Bus
06.00-07.00	4	3	2	3	0	6	0
07.00-08.00	6	4	2	8	2	9	0
08.00-09.00	13	9	2	14	2	9	0
09.00-10.00	12	7	0	2	0	4	0
10.00-11.00	13	0	0	6	0	12	0
11.00-12.00	9	0	0	10	0	14	0
12.00-1.00	3	0	0	8	0	10	0
13.00-14.00	13	6	0	3	0	8	0
15.00-16.00	0	1	2	3	0	8	0
16.00-17.00	3	0	0	0	0	9	0
17.00-18.00	18	6	0	7	0	36	0
18.00-19.00	12	3	0	8	0	27	0
19.00-20.00	22	16	7	15	10	17	0
20.00-21.00	8	12	3	8	1	11	0
21.00-22.00	6	5	2	6	0	7	0
22.00-23.00	3	2	1	3	0	3	0
23.00-00.00	3	4	1	2	1	7	0
00.00-01.00	2	1	0	0	0	3	0
01.00-02.00	2	1	0	0	0	2	0
02.00-03.00	0	0	0	0	0	0	0
03.00-04.00	0	0	0	0	0	0	0
04.00-05.00	0	0	0	0	0	0	0
05.00-06.00	0	0	0	0	0	0	0

Data Analyst
Tauhidul Hasan, Consultant

Checked by
Kazi Farhed Iqubal
Executive Director

EQMS Consulting Limited

EQMS Consulting Limited
Suit # C1, House # 76, Road # 5, Block # F, Banani, Dhaka -1213, Bangladesh.
Phone: +88-029873282; Mobile: + 88-01911702074; Email: info@eqmsbd.com, eqmsbd@gmail.com, Web: www.eqmsbd.com

Road Name: Barhanuddin Bazar to Power Plant Road
Station Name: In front of 1st gate of the power plant
GPS Location: 22°28'44.86"N 90°42'56.41"E
Duration: 24 Hours
Date: 13.04.2016

Time	8	9	10	11	12	13	14
	Truck (large)	Truck (small)	Trucktor/ Power Triller	Votviti/ Nosimon/ Korimon	Private Car	Micro	Jeep
06.00-07.00	0	0	0	0	0	0	0
07.00-08.00	0	0	0	0	0	3	0
08.00-09.00	0	0	0	0	0	2	0
09.00-10.00	0	0	0	1	0	2	0
10.00-11.00	0	0	0	0	0	1	0
11.00-12.00	0	0	0	0	0	0	0
12.00-13.00	0	0	0	1	0	4	0
13.00-14.00	0	0	0	0	0	2	0
14.00-15.00	0	0	0	2	0	1	0
15.00-16.00	0	0	0	2	0	0	0
16.00-17.00	0	0	0	0	0	2	0
17.00-18.00	0	0	0	0	0	3	0
18.00-19.00	0	3	2	5	0	7	0
19.00-20.00	0	3	4	2	0	2	0
20.00-21.00	0	1	0	3	0	2	0
21.00-22.00	0	0	0	0	0	0	0
22.00-23.00	0	0	0	0	0	0	0
23.00-00.00	0	0	0	0	0	0	0
00.00-01.00	0	0	0	0	0	0	0
01.00-02.00	0	0	0	0	0	0	0
02.00-03.00	0	0	0	0	0	0	0
03.00-04.00	0	0	0	0	0	0	0
04.00-05.00	0	0	0	0	0	0	0
05.00-06.00	0	0	0	0	0	0	0

Data Analyst
Tauhidul Hasan, Consultant

Checked by
Kazi Farhed Iqubal
Executive Director

EQMS Consulting Limited

EQMS Consulting Limited
Suit # C1, House # 76, Road # 5, Block # F, Banani, Dhaka -1213, Bangladesh.
Phone: +88-029873282; Mobile: + 88-01911702074; Email: info@eqmsbd.com, eqmsbd@gmail.com, Web: www.eqmsbd.com

Water Body Name: DehularKhal
Station Name: KheyaGhat Bridge
GPS Location: 22°29'20.86"N90°42'30.50"E
Duration: 24 Hours
Date: 13.04.2016

Time	1	2	3	4
	Boat	Burze	Engine Traller	Launch
06.00-07.00	2	0	4	0
07.00-08.00	1	0	2	1
08.00-09.00	1	0	2	0
09.00-10.00	1	1	2	0
10.00-11.00	1	0	0	0
11.00-12.00	2	1	5	0
12.00-13.00	1	0	2	0
13.00-14.00	0	0	0	0
14.00-14.00	0	0	1	0
15.00-16.00	2	3	2	0
16.00-17.00	7	2	2	0
17.00-18.00	0	0	2	0
18.00-19.00	5	0	8	0
19.00-20.00	7	1	2	1
20.00-21.00	2	0	3	0
21.00-22.00	3	0	6	0
22.00-23.00	0	3	3	0
23.00-00.00	1	2	1	0
00.00-01.00	0	0	3	0
01.00-02.00	1	1	0	0
02.00-03.00	0	0	3	0
03.00-04.00	0	3	7	0
04.00-05.00	1	1	3	1
05.00-06.00	0	3	2	0

Data Analyst
Tauhidul Hasan, Consultant

Checked by
Kazi Farhed Iqubal
Executive Director

EQMS Consulting Limited

EQMS Consulting Limited
Suit # C1, House # 76, Road # 5, Block # F, Banani, Dhaka -1213, Bangladesh.
Phone: +88-029873282; Mobile: + 88-01911702074; Email: info@eqmsbd.com, eqmsbd@gmail.com, Web: www.eqmsbd.com

মৎস্যবিজ্ঞান বিভাগ
ঢাকা বিশ্ববিদ্যালয়
ঢাকা -১০০০, বাংলাদেশ
ফোন ঃ +৮৮০-২-৯৬৬১৯২০-৭৩/৭৭৭৫
ফ্যাক্স ঃ +৮৮০-২-৯৬৬৭২২২
ই-মেইল ঃ fisheries@du.ac.bd

Department of Fisheries
University of Dhaka
Dhaka-1000, Bangladesh
Phone: +880-2-9661920-73/7775
Fax : +880-2-9667222
E-mail: fisheries@du.ac.bd

নং মবি/ /..... Date:

Sampling Area: Dehular Canal
Sampling Date:17.04.2016
Sample Collected by: EQMS Personnel
Monitoring Parameter: Phytoplankton
Analysis Date:21.04.2016-26.04.2016
Sampling Location:

PK1 : At the Confluence of the Dehular Canal and Tetulia River
PK2 : Dehular canal from 400 m west side of kheya ghat bridge
PK3 : At 500 m towards plant site from kheya ghat bridge
PK4 : at 400 m downstream from power plant

Description of Analysis:

Group	Genera	Number (individuals/100L)			
		PK1	PK2	PK3	PK4
Bacillariophyceae	*Cheatoceros*	8×10^3	11×10^3	4×10^3	2×10^3
	Thalassionema	60×10^3	23×10^3	67×10^3	29×10^3
	Ditylum	19×10^3	17×10^3	11×10^3	14×10^3
	Navicula	46×10^3	$30X\ 10^3$	21×10^3	18×10^3
	Synedra	3×10^3	18×10^3	35×10^3	102×10^3
	Cyclotella	11×10^3	14×10^3	3×10^3	7×10^3
	Coscinodiscus	120×10^3	170×10^3	215×10^3	100×10^3
Cyanophyceae	*Anabaena*	10×10^3	12×10^3	5×10^3	3×10^3
	Nostoc	-	$1X\ 10^3$	-	-
	Oscillatoria	18×10^3	16×10^3	9×10^3	12×10^3
Chlorophyceae	*Chlorella*	1×10^3	7×10^3	6×10^3	3×10^3
	Spirogyra	6×10^3	10×10^3	14×10^3	14×10^3
	Closterium	7×10^3	7×10^3	7×10^3	7×10^3
	Micrococcus	2×10^3	4×10^3	1×10^3	7×10^3

Analyzed By

23/4/2016

Mohammad Mamun Chowdhury
Associate Professor
Department of Fisheries
University of Dhaka
Dhaka-1000, Bangladesh

Mohammad Mamun Chowdhury
Associate Professor
Department of Fisheries
University of Dhaka, Dhaka-1000

মৎস্যবিজ্ঞান বিভাগ
ঢাকা বিশ্ববিদ্যালয়
ঢাকা -১০০০, বাংলাদেশ
ফোন ঃ +৮৮০-২-৯৬৬১৯২০-৭৩/৭৭৭৫
ফ্যাক্স ঃ +৮৮০-২-৯৬৬৭২২২
ই-মেইল ঃ fisheries@du.ac.bd

Department of Fisheries
University of Dhaka
Dhaka-1000, Bangladesh
Phone: +880-2-9661920-73/7775
Fax : +880-2-9667222
E-mail: fisheries@du.ac.bd

নং মবি/ /..... Date:

Sampling Area: Dehular Canal
Sampling Date:17.04.2016
Sample Collected by: EQMS Personnel
Monitoring Parameter: Zooplankton
Analysis Date:21.04.2016-28.04.2016
Sampling Location:

PK1 : At the Confluence of the Dehular Canal and Tetulia River
PK2 : Dehular canal from 400 m west side of kheya ghat bridge
PK3 : At 500 m towards plant site from kheya ghat bridge
PK4 : at 400 m downstream from power plant

Description of Analysis:

Group	Genera	Number (individuals/100L)			
		PK1	PK2	PK3	PK4
Rotifers	*Brachionus*	$15X\ 10^3$	$11\ X\ 10^3$	$6\ X\ 10^3$	$9\ X\ 10^3$
	Asplancha	$1\ X\ 10^3$	$3X\ 10^3$	$2\ X\ 10^3$	$1\ X\ 10^3$
	Philodina	43	17	14	17
	Hexartha	$1\ X\ 10^3$	$2\ X\ 10^3$	$2\ X\ 10^3$	-
Copepods	*Nauplius larvae*	$3\ X\ 10^3$	$1\ X\ 10^3$	-	-
	Copepodid stage	$2\ X\ 10^3$	$3\ X\ 10^3$	$1\ X\ 10^3$	$2\ X\ 10^3$
	Cyclops	$3\ X\ 10^3$	$9\ X\ 10^3$	$1\ X\ 10^3$	$8\ X\ 10^3$
	Mesocyclops	$4\ X\ 10^3$	$3\ X\ 10^3$	$2\ X\ 10^3$	$1\ X\ 10^3$
	Diaptomus	$3X\ 10^3$	$2X\ 10^3$	$1\ X\ 10^3$	$1\ X\ 10^3$
Cladocerans	*Bosmina*	$4\ X\ 10^3$	$1\ X\ 10^3$	$7\ X\ 10^3$	$6\ X\ 10^3$
	Moina	$9\ X\ 10^3$	$5\ X\ 10^3$	$11\ X\ 10^3$	$18\ X\ 10^3$
	Daphnia	$12\ X\ 10^3$	$16\ X\ 10^3$	$11\ X\ 10^3$	$9\ X\ 10^3$
Ostracods	*Cypris*	$1\ X\ 10^3$	$2X\ 10^3$	$1\ X\ 10^3$	$1\ X\ 10^3$

Analyzed By

27/04/2016

Mohammad Mamun Chowdhury
Associate Professor
Department of Fisheries
University of Dhaka
Dhaka-1000, Bangladesh

Mohammad Mamun Chowdhury
Associate Professor
Department of Fisheries
University of Dhaka, Dhaka-1000

মৎস্যবিজ্ঞান বিভাগ
ঢাকা বিশ্ববিদ্যালয়
ঢাকা -১০০০, বাংলাদেশ
ফোন ঃ +৮৮০-২-৯৬৬১৯২০-৭৩/৭৭৭৫
ফ্যাক্স ঃ +৮৮০-২-৯৬৬৭২২২
ই-মেইল ঃ fisheries@du.ac.bd

Department of Fisheries
University of Dhaka
Dhaka-1000, Bangladesh
Phone: +880-2-9661920-73/7775
Fax : +880-2-9667222
E-mail: fisheries@du.ac.bd

নং মবি/ /..... Date:

Sampling Area: Dehular Canal
Sampling Date:17.04.2016
Sample Collected by: EQMS Personnel
Monitoring Parameter: Benthos
Analysis Date:21.04.2016-04.05.2016
Sampling Location:

PK1 : At the Confluence of the Dehular Canal and Tetulia River
PK2 : Dehular canal from 400 m west side of kheya ghat bridge
PK3 : At 500 m towards plant site from kheya ghat bridge
PK4 : at 400 m downstream from power plant

Description of Analysis:

Genera	Number (individuals/m^2)			
	PK1	PK2	PK3	PK4
Viviparous sp.	3	8	5	2
Pila sp.	7	2	-	-
Chironomus larva	11	18	14	8
Tubifex sp.	-	-	5	7
Lamellidens sp.	16	8	1	3

Analyzed By

26/04/2016.

Mohammad Mamun Chowdhury
Associate Professor
Department of Fisheries
University of Dhaka
Dhaka-1000, Bangladesh

Mohammad Mamun Chowdhury
Associate Professor
Department of Fisheries
University of Dhaka, Dhaka-1000

Annex W

Public Consultation Minutes

The Public Consultation meeting was held on 6th March, 2017 at Upazilla Auditorium, Borhanuddin Upazilla, as a pre-requisite for obtaining Environmental Clearence from Department of Environment, Ministry of Environment and Forests, Government of the People's Republic of Bangladesh. The people were notified about the meeting through invitation letters issued by the Project Proponent – invitation letter and list of invitees are enclosed with the report as **Appendix 2 & 3**. The meeting was attended by a total of 37 participants – Upazila Nirbhahi Officer (UNO), representatives from other Government Departments, Ward Councilors Borhanuddin Upazila and Union Parishads, Teachers, eminent citizens, senior citizens and NGO representatives.

Public Consultation Meeting provides common platform where stakeholders and the Project Proponent can express their opinions and suggestions on the findings of the ESIA. This also gives an opportunity to all affected persons and other stakeholders to express their opinions, being part of the decision making process, ensure public participation and transparency. A presentation was made on the Project, Nutan Bidyut (Bangladesh) Ltd. (NBBL) and on findings of the ESIA conducted followed by question and answer session.

The Q&A session witnessed some technical questions being asked by the participants – especially on cumulative impact on environment due to operations of two similar plants, availability of sufficient natural gas from the gas field for running of two power plants, safety arrangements in case of fire hazards or other accidents, etc. Participants also expressed concern on insufficient electricity supply in the Upazila, even though power is being generated here. Participants were satisfied with the responses provide by NBBL.

The Public Consultation meeting ended with vote of thanks from representatives of NBBL. Public Consultation meeting minutes has been specified in **Table1.1-1**. Participants were invited one week before the commencing date of the Public Consultation Meeting. Attendance sheet of the public consultation meeting and photographs are provided in **Appendix 1 & 4.**

Table 1.1-1 Brief overview of the Public Consultation Meeting on 6th March 2017

S. No	Name	Occupation/ Designation	Comment/Question	Respose Addressed by Project PTeroponent
1.	Md. Abdul Kuddus	UNO, Borhanuddin Upazilla.	• Proposed power plant is very adjacent to existing Bhola I PDB power plant. We know that we have very limited gas supply in this locality and existing power plant is also dependent on gas for power generation. In that circumstances, have any assessments conducted which describes that this proposed power plant will not hamper the productivity or safety issues of the existing power plant? • How many barges will have to be accommodated in the Dehular Cannel per day? Will not this numbers pollute or hamper the cannel eco system? What will be the possible route for the barge transportation? We have Hilsha fish sanctuary on which most of the people of this locality are economically dependent. Proponent should consider this matter too. • This locality is very cyclone prone area. Hence, whether emergency response plan was designed considering this issue? • An existing power plant by BPDB is in place and a similar plant will be set up – will there be any cumulative impact on the environment, whether it has been assessed? • Last of all, it is expected that the proposed project will be developed in accord to all national/international compliance. Moreover, proponent may consider implementing CSR programs in this locality like tree plantation etc.	• SP representatives responded that they have collected records on gas availability in the island for running of the power plant and also as an fall back measure in absence of liquid natual gas the power plant has the capacity to run on High Seepd Deisel (HSD) for power generation. • SP representatives assured that the movement of the barges on Dehular Channel will not impact the Hilsa Sanctuary and it will be closely monitored even during construction period such that no impact is caused. • The project has been prepared considering all the risks associated with the area and the natural hazards related to it. • The project would be implemented in accordance with national and international compliances.
2.	Md. Nasrul Islam	Deputy Manager (Operations), Bhola 225 MW	• Bhola I power plant was set up after proper environmental assessment was carried out and environmental clearance from Department of	•

S. No	Name	Occupation/ Designation	Comment/Question	Respose Addressed by Project PTeroponent
		CCPP	Environment (DOE). In the similar manner Bhola II power plant by SP will also follow all the regulations. DOE is there and will monitor any environmental impacts caused.	
3.	Md. Mostafakamal Mahabbat	Head Master, Borhanuddin Govt. High School, Borhanuddin	• In the case of existing power plant, Bhola I, we, local people, took and are still taking all the adverse impacts - dust during construction period and sound pollution etc., due to project implementation. But at the end we don't get the outcome of the power plant. Will this happen again? We want the power generated from this proposed power plant should be used for fulfilling the local need. • Hiring of skilled and unskilled workers locally	• SP representatives informed that they are into generation of power and not distribution. The generated electricity from the power plant will be uploaded to the national grid. • It was mentioned that running of power plants is a technical job and skilled workers will be accordingly hired based on the requisite qualifications. Preference will be given to local unskilled laborers during the construction period. This has also been mentioned in the ESMP.
4.	Mrs. Makinjan Bibi	Secretary, Kutba Union Parishad, Borhanuddin Upazilla.	• We get electricity only 2 hours in a day. We want produced power of the proposed power plant will be used for meeting local people's need. • Women engagement in work force or equal opportunity in getting job should be ensured by the proponent.	
5.	Dr. Tishadur Rahman	Medical Officer, Upazilla Health Complex, Borhanuddin Upazilla	• Bhola is a disaster prone area. What will be the emergency plan if any disaster occurs? Is local Borhanuddin fire service and civil defense capable of giving emergency services if requires? Or is project's emergency plan sufficient for local community preventing from adverse impact of the disaster?	• It was explained by SP representatives that the power plant will have its own safety provisions to prevent any major emergency. • Following arrangements will be availble – ➢ Hydrant system (also includes the required number of hydrant pumps electrical motor driven and diesel engine driven). ➢ Automatic high velocity and medium velocity sprinkler system. ➢ Portable and mobile chemical extinguishers. ➢ Inert gas system ➢ CO_2 gas extinguishing system for Gas Turbine and its auxiliary equipment.

S. No	Name	Occupation/ Designation	Comment/Question	Respose Addressed by Project PTeroponent
				➢ Fire detection and alarm system
6.	Mr. Jakir Hossain	Teacher, Borhanuddin High School	• It is sometimes reported by the community people that the coconut and beetle nut produce have decreased – is it due to the environmental impacts due to the power plant. • Literacy level among the locals is very low and they should be made aware on the impacts and operations of the power plant.	• It is very natural that produce from fruit bearing trees are not same every year – in some year the produce is high and in some years it is low – this has nothing to do with the operation of the power plants. Bhola I power plat has just gone into generation from 2015, it is too early for any environmental impact.
7.	Mr. Mir Ruhul Kuddus	Chief Engineer, Bhola 225 MW CCPP	• From the discussions it is clear that if all the national and international regulations are followed and maintained properly, adverse impact and risk will be minimised to the extent. Hence, it is expected that adverse impact won't be incurred that much. • Now-a-days power plants are constructed in such a way that provides insulation so that if any accident happens, it won't impact the local community adversely.	•

Appendix 1
PHOTO DOCUMENTATION

Public Consultation Meeting at Upazila Auditorium, Borhanuddin Upazilla

Public Consultation Meeting held at Upazila Auditorium by NBBL

Meeting in progress and presentaion being made

Md. Abdul Kuddus, UNO, Borhanuddin Upazilla putting forth his point

Mrs. Makinjan Bibi, Secretary, Kutba Union Parishad, Borhanuddin Upazilla – during the Q&A session

Dr. Tishadur Rahman, Medical Officer, Upazilla Health Complex, Borhanuddin Upazilla – raised the safety and unforeseen accidents related issue and resource availability to counter it

Mr. Mir Ruhul Kuddus, Chief Engineer, Bhola 225 MW CCPP, putting forth his points

Mr. Jagannath Sinhamahapatra, Project Head, Nutan Bidyut (Bangladesh) Ltd. asnwering to one of the questions of potential risks

Mrs. Soumi Ghosh, Consultant, ERM, answering to one of the questions raised on impact on plantation and employment opportunity of locals

Appendix 2

INVITATION LETTER

Ref: NBBL/2017/Feb- 42 Dated: 27.02.2017

To,

.....
.....
Burhanuddin, Bhola

Sub: Invitation for Stakeholder Consultation Meeting regarding Environmental Impact Assessment of the 220 MW (Gas)/212 MW (HSD) basis Dual Fuel Operated Combined Cycle Power Plant to be set by Nutan Bidyut (Bangladesh) Ltd. **in Burhanuddin Upazilla on 6th March, 2017.**

Dear Sir,

Nutan Bidyut (Bangladesh) Limited has planned to set up a 220 MW (Gas)/212 MW (HSD) basis Dual Fuel operated Combined Cycle Power Plant in Burhanuddin Upazilla of Bhola District. A Study was commenced to assess the environmental and socio-economic impacts that may potentially be caused due to the proposed project; Department of Environment (DOE) issues Environment Clearance (EC) based on this ESIA Study.

ERM India Private Limited and its partner in Bangladesh, EQMS Consulting Limited, were assigned with the task of carrying out the Environmental and Social Impact Assessment (ESIA) Study by Nutan Bidyut (Bangladesh) Limited.

In this regard Nutan Bidyut (Bangladesh) Limited is organizing a Stakeholder Consultation meeting on **6th March, 2017 at 10:30 AM in the Upazilla Auditorium, Borhanuddin**, Bhola for sharing the findings of the Study and subsequently gathering stakeholder opinion on the same.

You are cordially invited to attend the above mentioned meeting and kindly share your opinions and suggestions on the Study that will help to finalize the Study Document.

Sincerely yours,

J. Sinhamahapatra
Project Head
Nutan Bidyut (Bangladesh) Limited

NUTAN BIDYUT (BANGLADESH) LTD.
C-129866/2016
Regd. Office: Gali No. 20, 19 Chamelibag, Shantinagar, Dhaka - 1217, Bangladesh
(T) +91 22 67190000 (F) +91 22 67190017 website: www.sp-group.co.in

Shapoorji Pallonji INFRA

Appendix 3

LIST OF INVITEES

List of Invited persons regarding meeting for Public Consultation Meeting

Sl no.	Name & Designation	Mobile no.
1.	Mr. Mahabbat Jan Chowdhury Upazilla Chairman, Burhanuddin	0088-01712186915
2.	Mrs. Mahafuza Tasmin Upazilla Mahila Vice Chairman, Burhanuddin	0088-01714969067
3.	Mr. Md. Rasel Ahmed Mia Upazilla Vice Chairman, Burhanuddin	0088-01712774434
4.	Mr. Md Abdul Quddus Upazilla Nirbahi Officer, Burhanuddin	0088-01918419632
5.	Dr. Jahirul Islam Upazilla Health & Family Planning officer, Burhanuddin	0088-01712569372
6.	Mr. Md. Ruhul Quddus Senior Fisheries officer, Burhanuddin	0088-01716355063
7.	Mr. Shafiul Azam Upazilla Engineer, LGED, Burhanuddin	0088-01724532603
8.	Dr. Partha Sarathi Dutta Upazilla Livestock officer, Burhanuddin	0088-01740865803
9.	Mr. Omar Faruque Upazilla Agriculture officer, Burhanuddin	0088-01771047904
10	Mr. Delwar Hossain Upazilla Officer, Social Welfare Department	0088-01708414720
11.	Mr. Mir Ruhul Quddus Chief Engineer, Bhola 225 MW CCPP, BPDB	0088-01749499488
12.	Mr. Himangshu Kumar Biswas PD, Bhola 220 MW/212MW Dual Fuel CCPP	0088-01733239200
13.	Mr. Moniruzzaman Asstt. Engineer, SGCL, Bhola 225 MW CCPP, Burhanuddin	0088-01787695858
14.	Mr. Kabir Chowdhury Head Master, Kutba High School, Burhanuddin	0088-01716100393
15.	Mr. Md. Abdullah Head Master, Burhanuddin Girls School	0088-01712562703
16.	Mr. Md. Mostafa Kamal Head Master, Burhanuddin High School	0088-01718200152
17.	Mr. Md. Salim Reza Commissioner, Burhanuddin Pourashava	0088-01726949071
18.	Mr. Md. Naznul Ahsan Chairman Kutba Union Parishad, Burhanuddin	0088-01716985991
19.	Mrs. Makinjan Bibi Secretary, Kutba Union Parishad, Burhanuddin	0088-01754070672
20.	Mrs. Rina Begum Member Ward no.1,2&3 Kutba Union Parishad, Burhanuddin	0088-01734191888
21.	Mrs. Jotsana Begum Member Ward no.4,5&6 Kutba Union Parishad, Burhanuddin	0088-01782406936
22.	Mrs. Bina Begum Member Ward no.7,8&9 Kutba Union Parishad, Burhanuddin	0088-0176600587
23.	Mr. Abdur Rob Kazi Chairman Kachia Union Parishad, Burhanuddin	0088-01787251961
24.	Mr. Md Hasan Secretary, Kachia Union Parishad, Burhanuddin	0088-01793199155
25.	Mrs. Rabeya Begum Member Ward no.1,2&3 Kachia Union Parishad, Burhanuddin	0088-
26.	Mr. Maina Begum Member Ward no.4,5&6 Kachia Union Parishad, Burhanuddin	0088-01791915855
27.	Mr. Rahima Jannat Member Ward no.7,8&9 Kachia Union Parishad, Burhanuddin	0088-01780568204
28.	Mr. Ismail Hossain Manager, COAST Burhanuddin	0088-01713164634
29.	Mr. Zahid Hassan Branch Manager, BRAC	0088-01758314831
30.	Mr. Tajul Islam Branch Manager, ASHA	0088-01730084692

Appendix 4

PARTICIPANTS LIST

A meeting held on 6th March,2017 at 11:00 AM in the Upazilla auditorium, Borhanuddin regarding consultation of Environmental Impact Assessment of the Bhola 220 MW (Gas) / 212 MW (HSD) basis Dual Fuel operated Combined Cycle Power Plant, Burhanuddin, Bhola. The following signatory were present the meeting.

Sl No.	Name & Designation	Mobile no	Signature
1	Md. Abdul Kuddus UNO, Borhanuddin	01918419632	[illegible]
2.	Md Delwar Hossain social services officer	01984509074	[illegible]
3.	Md. Mostafakamal Mahabbat. Head Master. Borhanuddin Govt High School. Borhanuddin.	01718-200152	[illegible]
4.	Sufia Begum UCO. Ebek	01796504156	[illegible] 05/03/17
5.	md [illegible]	01782797370	[illegible] 06-03-17
6.	A M Bashir	01739369869	[illegible]
7.	J. Sinhamahapatra	01724058446	[illegible]
8.	Dr. Vijay Kulkarni	+919619926980	Kulkarni
9.	Subash Ch. Banik NBPL	01819224963	[illegible]
10.	Liton Das NBPL	01716339143	[illegible]

Sl No.	Name & Designation	Mobile no	Signature
11.	জোৎস্না বেগম সদস্য, ০৪,০৫,০৬ ১০নং কুতুবা ইউপি	সদস্য ০৪,০৫,০৬ ১০নং কুতুবা ইউপি 01782406936	জোৎস্না বেগম
12.	রিনা বেগম সদস্য, ০১,০২,০৩ ১০নং কুতুবা ইউনি	01734191888	রিনা বেগম
13.	বিনু বেগম সদস্য, ০৭,০৮,০৯ ১০নং কুতুবা ইউনি	0176600587	বিনু বেগম
14.	রহিমা জান্নাত, সদস্য, ০৭.০৮.০৯ ৪নং কাঁচিয়া ইউনি	01780868207	রহিমা জান্নাত,
15.	মনোয়ারা সদস্য, ০৪,০৫,০৬ ৪নং কাঁচিয়া ইউ. পি	01791915865	মনোয়ারা
16.	[illegible] সদস্য ০১,০২,০৩ ৪নং কাঁচিয়া ইউ. পি	01712600691	[illegible]
17.	জাহিদুল ইসলাম (প্রোগ্রাম টেকনিক্যাল অফিসার)	01770-223306	[signature]
18.	মোঃ জিল্লুর রহমান মেডিকেল অফিসার উপজেলা স্বাস্থ্য কমপ্লেক্স, বোরহানউদ্দিন	01722-522650	[signature]
19.	Md. Monir - Uz - Zaman Asst. Manager (Operation) RMS 225MW CCPP. Sundarban Gas Co. Ltd.	01787695858	[signature]
20.	[illegible]		[signature]
21.	মকিমজান বিবি সচিব ১০নং কুতুবা ইউপি	01754070672	[signature]
22.	মোঃ তারেক হোসেন. টেকি ইনঃ (বোরহানউদ্দিন) বাঃ বিঃ	01713955820	[signature]

Sl No.	Name & Designation	Mobile no	Signature
23.	SOUMI GHOSH CONSULTANT	9830260743	
24.	TAZUL ISLAM AM- Manager	01730084692	
25.	Robiul Karim Consultant CSMS		
26.	Sohag Chandra Dey Upz. technician	01711938500	
27.	MD. RASEL S.S.O/Social office	01739199142	
28.	Md Mostofa	01771460 92772	
29.	Md. Hasan, Up Secretary Kachia.	01793199155	
30.	Md. Ruhal Kuddus. SUFO(AE). DOF.	01716-355063.	
31.	Md. Nasrul Islam.. DM (operation), Bhola 225MW CCPP.		
32.	Rahat Tanvir XEN(OPn.) Bhola 225MW CCPP	01911116390	
33.	Md Zahid Hossain Branch Manager Brac, Borhanuddin Bhola	01758314831	
34.	Mir Ruhul Quddus Chief Engineer. Bhda 225MW CCPP	01749-499488	

Sl No.	Name & Designation	Mobile no	Signature
35.	A. S. M. Nasir, Sub/Asstt. 22 R. M.W. C.E. R.P. Bhola. Borhanuddin	01721-430884.	[illegible]
36.	H. M. Faruque, R.R.C. M.W. C.E. R.P. Bhola. Borhanuddin.	01711468109	Faruque
37.	নাজমুল আহসান চেয়ারম্যান ১০নং কুকরী ইউপি	[illegible]	নাজমুল
38.			
39.			
40.			
41.			
42.			
43.			
44.			
45.			

Annex X

Social Framework Management Plans

1 STAKEHOLDER ENGAGEMENT PLAN

1.1 PREAMBLE AND PURPOSE

A Stakeholder Engagement Plan (SEP) has been prepared for the NBBL in order to ensure that a consistent, comprehensive, coordinated and culturally appropriate approach is taken to stakeholder engagement, information dissemination and grievance redressal through the life of the project.

NBBL is committed to full compliance with all Bangladesh Regulations as well as aligning to the international standards, namely the IFC Performance Standards and ADB SPS (2009), and any other directly relevant policies of the IFC and ADB. In line with current international best practice, this SEP aims to ensure engagement that is free of manipulation, interference, coercion and intimidation.

It also aims to ensure that stakeholder engagement is conducted on the basis of timely, relevant, understandable and accessible information, in a culturally appropriate format. In this way, the SEP seeks to ensure that stakeholder groups are given sufficient opportunity to voice their opinions and concerns, and that these concerns influence project decisions.

The SEP is developed to assist the project proponent and the contractors to meet the objectives of identification of various stakeholders and draw means to address the potential concerns that may arise during the project life-cycle. The SEP is based on the socio-economic baseline, identification of stakeholder groups during the ESIA process and applies to all activities that may involve, impact, interest or engage these groups through the pre-construction, construction and operations phase.

1.2 OBJECTIVES OF THE SEP

The key objectives for this project-specific SEP are as follows:

- Maintaining positive legal compliance to applicable stakeholder engagement and disclosure regulations and standards;
- Compliance to the applicable stakeholder engagement commitments in the ESMP and associated framework management plans;
- Providing an engagement mechanism to undertake meaningful consultations and mitigate any reputational risk arising from site activities and their impacts;
- Establishing and maintaining a social license to operate;
- Identifying engagement methods, in keeping with the profile of the stakeholders and principles of inclusiveness, transparency and cultural appropriateness;

- Allowing for information disclosure and stakeholder grievance resolution in a timely and culturally appropriate manner, to allow for informed and meaningful engagement; and
- Establishing clear accountability by assigning adequate resources and responsibilities for effective stakeholder engagement.

While identifying the objectives of the Stakeholder Engagement Plan, it is noted that this is a living document that will evolve over the course of the project lifecycle and the changes in the local community as well as the socio-economic context within which the project will operate. Thus, the Stakeholder Engagement Plan will have to be periodically reviewed and updated.

1.3 PRINCIPLES OF STAKEHOLDER ENGAGEMENT

The implementation of the SEP, its review and update will be aligned and guided by the following principles:

- Interests, influence, issues and concerns of the relevant stakeholders will inform the project's engagement levels and methods;
- All engagement levels and methods will be developed around the principles of inclusiveness and transparency. Where required, mechanisms on Stakeholder and Community Engagement will be tailored to stakeholder needs and modified for cultural appropriateness;
- NBBL will ensure informed consultation and participation of all stakeholder groups that are impacted and/or interested by the Company's environmental and social impacts, including land procurement, community health & safety, ecosystem services and influx management;
- NBBL commits to promote awareness of this Policy for its employees, partners and contractors through training and communication; and
- NBBL commits to documenting, monitoring and reporting on its stakeholder engagement performance;
- The engagement activities undertaken shall be in cognizance of the cultural norms and practices of the stakeholder groups as well as the differences in social position of the various groups;
- The stakeholder engagement process should demonstrate a commitment and persistence in the efforts to achieve real outcomes on the challenging issues and opportunities;
- As the project/site lifecycle progresses through the various stages, the engagement activities will evolve on the basis of the experiences and learnings from the previous engagement undertaken.

1.4 STAKEHOLDER MAPPING

Stakeholder mapping is a process of examining the relative influence that different individuals and groups have over a project as well as the influence of the project over them. The purpose of a stakeholder mapping is to:

- Identify each stakeholder group;
- Study their profile and the nature of the stakes;
- Understand each group's specific issues, concerns as well as expectations from the project that each group retains.
- Gauge their influence on the Project;

On the basis of such an understanding, the stakeholders are categorised into High Priority, Medium Priority and Low Priority. The stakeholders who are categorized as high influence are those who have a high influence on the project or are likely to be heavily impacted by the project activities, and are thus high up on the project proponent's priority list for engagement and consultation. Similarly, the stakeholders categorized as medium priority are those who have a moderate influence on the project or even though they are to be impacted by the project, it is unlikely to be substantial and is thus neither high nor low in the project proponent's list for engagement. On the other hand, the stakeholders with low influences are those who have a minimal influence on the decision making process or are to be minimally impacted by the project and are thus low in the project proponent's engagement list.
The following table provides brief profiles of the various stakeholders in the project as discussed in the previous sub section along with their key concerns in association of the project and their degree of influence.

The following table provides brief profiles of the various stakeholders in the project as discussed in the previous sub section along with their key concerns in association of the project and their degree of influence.

Table 1.1 Stakeholder Profile and Mapping

Stakeholder Group	Profile/Status	Concerns surrounding the project	Expectations from the project	Influence on Project	Rating of Stakeholder Priority
Physically Displaced and Economically Displaced	There are four (4) households who will be physically displaced due to the procurement of land having residential structures of these households. Three households are located on the pipeline route and one household is located on the access road route. Economically Displaced are those landowners who will lose complete or portions of their land holding as part of the land acquisition for the project. There will be 63 households who have been impacted for land procurement for the plant. In addition, 200-250 land owners will be impacted for right of way of the gas pipeline.	The primary concerns of these stakeholders pertain to the displacement process and resettlement options; adequacy of the mitigation measures to be undertaken by GMR in mitigating the project impacts on their livelihoods. Apprehensions revolve around the impacts the project may have on the PAFs in the absence of sound livelihood restoration programme. These concerns are the strongest amongst land owners who will lose access to their previous land holdings due to the land acquisition for the project. Concerns of these stakeholders pertain to adequate compensation for land purchase and compensation regarding crops and trees. These stakeholders expressed their concern regarding the adequacy of the mitigation measures to be undertaken by NBBL.	The expectations of these stakeholders are as follows: • Adequate compensation for mitigation of the project impacts • Formulation and implementation of livelihood restoration programmes and other community development programmes so as to mitigate the impacts of the project (landlessness, access loss) • Timely and complete sharing of information pertaining to the project by NBBL	This group would be the most impacted in terms of economic/livelihood impacts. Absence of a livelihood restoration programme and resettlement planning may result in the creation of negative opinion against the project.	High
Land users and Sharecroppers	The project area has been observed to have land users (bargadars) and tenants. There	The primary concerns of these stakeholders surround the apprehension that due to the	The expectations from the project pertain to the following:	Absence of adequate compensation and a livelihood restoration programme may	High

Stakeholder Group	Profile/Status	Concerns surrounding the project	Expectations from the project	Influence on Project	Rating of Stakeholder Priority
	are approximately 25 land users which will be impacted due to land procurement for power plant. .	fact that the land in question is not owned by them, compensation for the crops would not be provided and would thereby impact their livelihood	• Awarding of adequate compensation for the land lost. • Formulation and implementation of comprehensive livelihood restoration measures and community development programmes • Timely and complete sharing of information pertaining to the project by NBBL	result in the creation of negative opinion against the project.	
Vulnerable Communities	Vulnerable groups comprise of the traditionally backward and marginalized communities, women headed households, differentially abled people, old, infirm, Below Poverty Line (BPL) families	The primary concerns of these stakeholders pertain to the formulation of community development and mitigation measures in such a manner while keeping in mind their specific needs and vulnerabilities attached to economic and social capital. .	Expectations from the project are: • Formulation of mitigation measures (in terms Community Development Activities)which would cater to the specific requirements of	Despite the fact that these groups may not be able to exert much influence on the project & project activities, these are an important and most significant section of PAPs and their needs have to be understood in order to design specific measures to improve their vulnerability status.	High

Stakeholder Group	Profile/Status	Concerns surrounding the project	Expectations from the project	Influence on Project	Rating of Stakeholder Priority
			each of these groups • Timely and complete disclosure of information pertaining to the project by NBBL		
Fishing community	There are a few households identified in the project area who are engaged in fishing either only during peak season or throughout the year. The main fishing settlements in terms of fishermen population are closer to Tetuliya River and settlements of Dakshin Choto Monika, Char Ghazipur near Dehular Khal.	The primary concerns of these stakeholders pertain to the impacts of the project on their livelihood in terms of river flow, fish count and catch, size of fishes in operational phase and adequacy of the mitigation measures to be undertaken by NBBL.	The expectations of these stakeholders are as follows: • To be involved in the livelihood restoration measures • To be adequately informed and involved in the project implementation mitigation process at the project level	There are households engaged in fishing activities and their ability to exert influence on project related activities and opinion making should be comsidered.	Medium
Union Parishads (UP)	Union Parishads are lowest levels of local governance and consists of nine wards. The two (2) Unions Parishads, where private is to be procured from- Kutba and Kachia. Remaining five (5) UPs are equally important as UPs are representatives of local community and in order for the smooth and proper functioning of the project, the	The primary concerns of these stakeholders pertain to the impacts of the project on the villages, adequacy of the mitigation measures to be undertaken by NBBL.	The expectations of these stakeholders are as follows: • To be adequately informed and involved in the project implementation mitigation process at the project level • To be involved in	Most of the communication and development activities are routed through the UPs. Furthermore, the UPs are extremely important as opinion makers within the community and are thus critical in securing the support of the local community	High

Stakeholder Group	Profile/Status	Concerns surrounding the project	Expectations from the project	Influence on Project	Rating of Stakeholder Priority
	support of the UPs is imperative.		the formulation and implementation of the compensation and the livelihood restoration programmes and community development programmes • Formulation and implementation of livelihood restoration programmes and other community development programmes • Adequate compensation for mitigation of the project impacts • Project benefits to villages on the basis of the level of impact.		
Project Investors	Project investors may have requirements which must be fulfilled for various projects they invest in. These	The primary concerns of these stakeholders are the proper compliance of the project to their standards as well as the	The expectations of these stakeholders are as follows: • Compliance with	As the investors in the project, the influence of investor is high.	High

Stakeholder Group	Profile/Status	Concerns surrounding the project	Expectations from the project	Influence on Project	Rating of Stakeholder Priority
	requirements are enlisted as guidelines such as IFC Performance Standards (IFC PS) on Social and Environmental Sustainability and ADB SPS (2009)	government regulations. Another concern may be the adequate mitigation of the negative impacts of the project	the applicable standards • Adequate compensation for mitigation of the project impacts • Timely and complete disclosure of information pertaining to the project by NBBL • Provision of regular updates in regards to the progress of the project		
Regulatory Authorities	The regulatory authorities comprise of the DoE and district and upazila level bodies generally involved in the determination of compensation, providing environmental and land clearances for various project components. These include the departments of Upazilla Chairman, DM, forest, land revenue, agriculture, health, energy, irrigation, public works, sanitation amongst others	The primary concern of these stakeholders is that the project complies with all the regulatory requirements applicable on the project.	The expectations of these stakeholders from the project are: • Compliance with the regulatory requirements applicable • Timely and complete disclosure of information pertaining to the project by NBBL • Provision of regular updates in	Adherence with the various rules and regulations of such authorities and the various clearances required from the same are instrumental in the smooth functioning of the project	High

Stakeholder Group	Profile/Status	Concerns surrounding the project	Expectations from the project	Influence on Project	Rating of Stakeholder Priority
			regards to the progress of the project		
Villages within the project impact area	This stakeholder group comprises of the members of the study area, who even though will not lose any land to the project area are to be impacted by the project and other ancillary activities due to the project being located within a short distance. This is mostly central for villages located in the study area (within 5 km radius) where the project will result in environmental and social impacts.	The primary concerns of these stakeholders pertain to the project benefits which would percolate to them	Expectations from the project are: • Adequate community development measures and other project benefits	The support of these villages will enable the smooth functioning of the project	Medium-Low:
Political Parties	Political parties showcase a keen interest in the working of the various projects in the region. They play a key role in sensitising people and developing public opinion. The political parties also play a key role in the negotiation process.	The primary concerns of these stakeholders pertain to the provisioning of adequate compensation and community development measures to the impacted communities	The expectations of these stakeholders from the project are: • Compliance with the regulatory requirements applicable • Timely and complete disclosure of information pertaining to the project by NBBL • Provision of regular updates in	Political parties in any region are capable of influencing (to a varying degree) the public opinion regarding a project or a component of the project.	Medium-High:

Stakeholder Group	Profile/Status	Concerns surrounding the project	Expectations from the project	Influence on Project	Rating of Stakeholder Priority
			regards to the progress of the project • Adequate compensation for/ mitigation of the project impacts in terms of livelihood restoration and other Community Development Activities		
Local NGOs	The local NGOs have a very strong presence and primarily deal with issues of livestock, savings and micro credit, improvement of education and rural development.	The primary concerns of these stakeholders pertain to the provisioning of adequate mitigate measures and community development programmes by NBBL	The expectations of these stakeholders from the project are: • Adequate community development programmes in the area. • Timely and complete disclosure of information pertaining to the project by NBBL • Provision of regular updates in regards to the progress of the project	NGOs can play an extremely important role in forming public opinions regarding the project; Local NGOs can be partners in implementation of LRP and other community development measures.	Medium

Stakeholder Group	Profile/Status	Concerns surrounding the project	Expectations from the project	Influence on Project	Rating of Stakeholder Priority
			• Involvement of the local NGOs in the identification of these mitigate measures • Engagement of NBBL in the NGO activities so as to contribute towards the development of the region		
Media	The regional press (both print and audio-visual) has in the past showcased a keen interest in the projects coming up in the region and power sector. They are known to play important role in generating awareness in previous projects.	The primary concerns of these stakeholders pertain to the provisioning of adequate mitigate measures by NBBL as well as compliance of the project to the statutory requirements applicable.	The expectations of these stakeholders from the project are: • Timely and complete sharing of information pertaining to the project by NBBL • Provision of regular updates in regards to the progress of the project	These stakeholders play an important role in generating awareness and forming public opinion through the dispersion of information	Medium
Other Industries/ projects	There is one more power plant (BPDB) in the study area and one 35 MW power plant near Bhola. There may also be future projects in the pipeline.	The primary concerns of these stakeholders pertain to the issues which may arise due to differential compensations across projects. This is a concern as in cases of NBBL providing high compensation	The expectations of these stakeholders involve collaboration across the projects in terms of investments made in the community development activities as well as the	Collaboration with the other power companies in the region will allow for the optimization of the investments made by the project proponents towards the community development activities	Low

Stakeholder Group	Profile/Status	Concerns surrounding the project	Expectations from the project	Influence on Project	Rating of Stakeholder Priority
		packages or better community development programmes; it is likely to create benchmarks for the other companies. These benchmarks would then have to be matched by the others so as to ensure the smooth functioning of their projects.	compensation packages provided		
External Influences	These stakeholders comprise of residents from neighbouring villages or districts (such as community spoke persons, local leaders) who appear to be influential in the opinion formation amongst the impacted villages. These stakeholders would not only comprise of people who are working for the benefit of the community but also those who maybe opportunistic and on the lookout to achieve personal gains.	The primary concerns of these stakeholders pertain to the opinion that the present mitigation measures being undertaken appear to be insufficient	The expectations of these stakeholders involve Adequate compensation for mitigation of the project and overall benefit and community development of the area	These stakeholders may have an important role to play in terms of in forming public opinions regarding the project	Low

1.5 ENGAGEMENT MECHANISMS

The range of stakeholder groups identified within the ESIA can be grouped into the following:

- Project affected communities;
- Local communities;
- Local elected councils;
- Local Ups, Upazila and District authorities ;
- Other interested entities, including civil society organisations.

The engagement activities undertaken shall be aligned to the business objectives, priorities and the identified issues/impacts/risks associated with the project. This will also result in a variation in the engagement activities undertaken, across the various phases of the project/ business lifecycle, depending upon the impacts and risks associated with each phase.

As part of the planning, the engagement activities shall be prioritized on the basis of their material significance to immediate and long-term interests of the Stakeholder Engagement Plan.

Table 1.2 Stakeholder Engagement Mechanisms

Stakeholder Group	Issue/ Relevance	Themes and Focus Areas for Engagement	Engagement Strategies	Tools, Methods and Frequency
Project Affected Communities	• The incoming of the project has resulted into expropriation of livelihood opportunities from those who practiced agriculture on the current project land; • The community in the study area is primarily dependent on agriculture and livestock rearing for their livelihood, followed by wage labour and other activities etc. • There is anticipation that the project will generate adequate local employment. However, only the Needs based Assessment will help understand the available skill set to offer suitable employment; • There are several from the community member who have been indirectly dependent on the land sold to the project, as agricultural labourers, and	• Livelihood restoration activities; • Priority in local employment; • Project development timelines and milestones; • Grievance management; • Impacts and community feedback on mitigation	• The company could conduct a mid-term impact evaluation in order to understand the level of livelihood restoration achieved and also needs/prioritises for community investment; • Project representatives could identify training agencies to provide skill training for capacity building of this stakeholder group. This will provide diversified options of employment to the people and minimize any possibility of social discontent towards the project/company corresponding to the loss incurred; • The project could offer suitable employment, to this stakeholder group within company or refer the unemployed to other suitable employment opportunities in case there is lack of prospects within the project. By doing this the stakeholders will become a part of the project and the company will have strong support from	• Quarterly information disclosure through public meetings at each village; • Informal discussions during village visits; • Participatory decision making processes through NBBL and contractor; • Grievance Redressal Mechanism • Consensus building processes; •

Stakeholder Group	Issue/ Relevance	Themes and Focus Areas for Engagement	Engagement Strategies	Tools, Methods and Frequency
	hence have to be compensated through adequate entitlements. • This stakeholder group comprises of the members of the project area, who even though will not lose any land to the project area are to be impacted by the project and other ancillary activities due to the project being located close to the villages.		the affected families by having their representation in project operations.	
Vulnerable Communities	Vulnerable groups comprise of the traditionally backward and marginalized communities, women headed households, differentially abled people, old, infirm, Below Poverty Line (BPL) families and vulnerable households.	The primary concerns of these stakeholders pertain to the formulation of community development and mitigation measures in such a manner while keeping in mind their specific needs and vulnerabilities attached to economic and social capital.	• The mid-term impact evaluation should engage with the identified vulnerable groups and assess the implementation of safeguards developed for vulnerable households. • The vulnerable groups households should be given priority in LRP activities	• Informal discussions during village visits; • Participatory decision making processes through NBBL and contractor; • Grievance Redressal Mechanism • Consensus building processes
Fishing community	There are a few households identified in the project area who are engaged in fishing either only during peak season or throughout the year. The main fishing settlements in terms of fishermen population are closer to Tetuliya River and settlements of Dakshin Choto Monika, Char	The primary concerns of these stakeholders pertain to the impacts of the project on their livelihood in terms of river flow, fish count and catch, access issues during construction and operations phase, size of fishes in operational phase and adequacy of the mitigation	• Formulation of LRP activities and community development measures related to fishing communities as per the location i.e. Dehular Khal, Tetuliya River and related project impacts etc.	• Informal discussions during village visits; • Participatory decision making processes through NBBL; • Information disclosure

Stakeholder Group	Issue/ Relevance	Themes and Focus Areas for Engagement	Engagement Strategies	Tools, Methods and Frequency
	Ghazipur near Dehular Khal.	measures to be undertaken by NBBL.	• Profiling of fishing practices and households engaged in fishing;. • Formation of fishing representative groups or associations as per location and villages to engage with them in a collective manner.	during construction phase and operations phase for dredging, barge construction and operations of Jetty vis-à-vis health and safety and access control in Dehular Canal • Grievance Redressal Mechanism • Consensus building processes •
Union Parsihads and Upazila administration	Union Parishads are lowest levels of local governance and consists of nine wards. The two (2) Unions Parishads, where private is to be procured from- Kutba and Kachia. Remaining five (5) UPs are equally important as UPs are representatives of local community and in order for the smooth and proper functioning of the project, the support of the UPs is imperative.	The primary concerns of these stakeholders pertain to the impacts of the project on the villages, adequacy of the mitigation measures to be undertaken by NBBL.	• Engagement with UP and Upazila committee members in terms of upcoming development and welfare scheme and opportunities to partner with the government bodies in community development measures.	• Forma meetings and discussions; • Consensus building processes

1.6 GRIEVANCE REDRESSAL

The grievance redress mechanism under this SEP provides a formal forum to the aggrieved or interested stakeholders to deal with issues arising out of environmental and social related issues linked to the project. The proposed Grievance Redress Mechanism (GRM) has been developed for the Project to promote amicable dispute settlement through mediation to reduce/avoid the escalation of such issues to litigation.

1.6.1 Structure of the GRM

There will be a project-level Grievance Redress Cell (GRC) that will seek to resolve disputes arising out of various matters related to the implementation of the stakeholder engagement activities. The GRC will comprise of the following:

- Representatives of NBBL and the EPC contractor;
- Representatives of the local Union Parishad ;
- Representatives of local community in Kutuba and Kacchia Union.

The GRC meetings will be held in the Project Company's site office and the same will be widely publicised in project area for the knowledge of general public.

The responsibilities of the GRC will include:

- Review, consider and resolve grievances related to social and environmental aspects received by the Project and its internal stakeholders (including investors, employees, contractors and third-party workers);
- Entertain grievances of indirectly affected persons and/or persons affected during project implementation;
- Resolve grievances within a period of two weeks at the GRC level and communication of the resolution to the aggrieved party;
- The GRC shall not engage in any review of the legal standing of an "awardee" nor shall deal with any matters pending in the court of law;
- The GRC will not prevent or prohibit access to legal redress that is enshrined in the judicial system of Bangladesh ;
- Arrive at decisions through consensus, failing which resolution will be based on majority vote. Any decision made by the GRC must be within the purview of Environmental and Social Management Plan, Corporate EHS and Social Policies of NBBL or any such documents of relevance of that matter;
- In case the grievance relates to environmental monitoring results or engineering matters, the GRC will validate the information available to it, as provided by the Project Company's Project management team/ environmental monitoring team. However, GRC will not be in a position to question the validity of the data provided to it. The GRC team shall

meet at least twice a month for review of grievances registered and the resolution vetted out to the concerned parties. The frequency of meeting may increase or decrease depending on the number grievances received;
- If needed, may undertake field visits to verify and review the issues, dispute or other relevant matters.

1.6.2 Principles of Grievance Management

- NBBL will ensure proactive stakeholder engagement practices in order to avoid, wherever possible, a situation where a grievance may occur;
- Grievance mechanisms shall acknowledge and address concerns over both real and perceived impacts in the same way and with the same level or care;
- Grievance mechanisms shall address complaints, both formal and informal to avoid escalation into serious grievances;
- The engagement methods and mechanism will follow a transparent and easily understandable process along with access to several means of raising concerns;
- All grievance mechanisms that are put in place will incorporate the provision to raise concerns anonymously;
- No grievance mechanisms shall impede access to or seek to take the place of legal remedies, in case all the options are already exhausted; and
- All grievance mechanisms shall be readily accessible, culturally appropriate and proactively communicated to employees and other external stakeholders as appropriate.

1.6.3 Grievance Reporting

An aggrieved person, a group of persons or a community will be able to file grievances without any fear and intimidation. The grievances can be submitted in either in writing or may be submitted orally/ telephonically to the GRC; the whole purpose is to make the GRM easily accessible to the affected population.

Once the complaint is received, acknowledgement of the same will be made to the complainant, and tentative date of hearing may be communicated to him/her in advance. The complainant may be represented by him/her or appointed agent for hearing of grievance.

The decision made by GRC will be communicated to the concerned person/group/community in writing. If dissatisfied, with the decision of the GRC, the person/ group/ community may register the grievance at the administrative level in case there are necessary channels for the same.

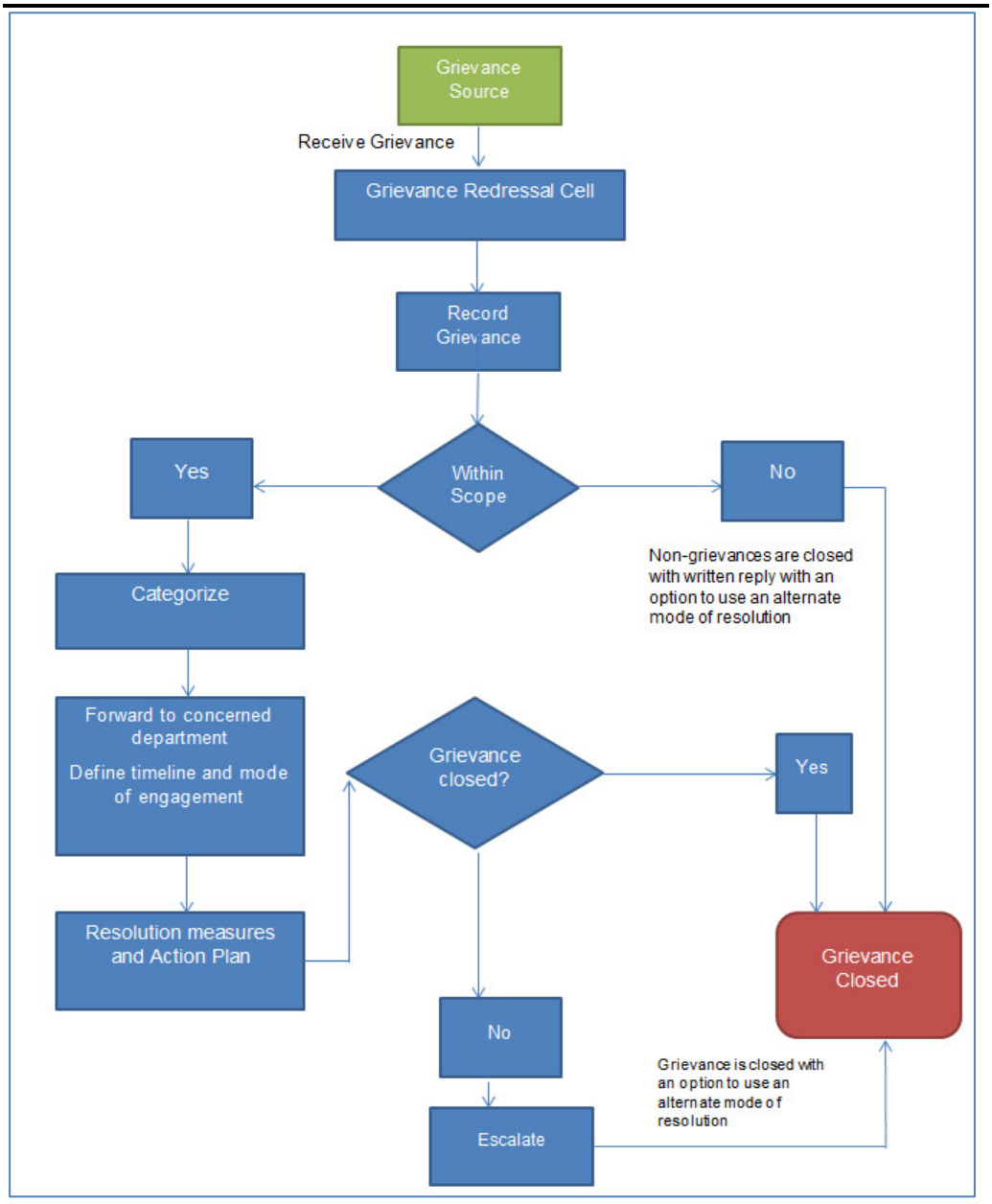
There may be situations where for a variety of reasons, the concerned party/parties may be reluctant to openly raise or discuss them with company representatives. The intention of constituting this grievance redressal

mechanism (GRM) is to encourage such party/parties to raise their concern as a first step to moving towards resolution and restoring maintaining trust in NBBL to deal with their complaints, concerns or grievances in a fair and just manner. This will also help bring transparency in the process of grievance redressal.

1.6.4 Redressal Process

The grievance redress procedure will include the stepwise procedure, to deal with any grievance that comes for redress before the GRC. A schematic representation of the grievance redresses procedure to be followed is illustrated subsequently:

Figure 1.1 Grievance Schematic



Grievances primarily related to any serious event such as accidents involving the community, labour related major disputes such as non-payment of wages or work related injuries or fatalities, major intrusion of project on any community resource, and other issues for which the aggrieved party in his or her free will wants to register a grievance or complaint.

The process followed will follow the following steps:

- On receipt of complaint the GRC shall give an acknowledgement to the complainant with date, time and venue of hearing of his/her grievance;
- The GRC shall prepare a brief note on the grievance for discussion on scheduled date. On the given date, the GRC shall hear the complainant and give its decision. A written copy of decision shall be provided to the complainant. If the complainant is satisfied with the decision, an acknowledgement of same shall be obtained from him on the decision copy and the case shall be closed. If not then the grievance should be escalated to senior management and a resolution measure should be decided with engagement with the aggrieved;
- While every effort shall be made to resolve the complaint amicably, if the complainant is not satisfied with the outcome of GRC's decision, he or she can opt for any grievance redress forum available at the administrative level or any other arbitration mechanism with mutual agreement. If these alternative mechanisms of resolution of conflict fails, then the aggrieved person may take legal recourse However, every effort shall be made to resolve the case amicably without resorting to legal course of action. While the process continues, a proper documentation of the records shall be maintained by the project company, pertaining to each of the grievance in a proper grievance register or record.

GRM procedures and operational rules will be publicized widely through community meetings and pamphlets in the local language so that people are aware of their rights and obligations, and procedure of grievance redress.

The procedures adopted, as well as resources allocated will be determined by the extent of impacts and perceived risk at a particular point of time. In general, grievances are minimal at the pre-construction stage, peak during construction, and will be comparatively moderate during operation. Accordingly, the decision on the scaling of the GRM shall be taken.

1.7 MONITORING, REPORTING AND REVIEW

The Human Resources Department/Community Liaison Officer of NBBL or an equivalent on-site team shall be responsible for identification of the stakeholders, documentation and maintenance of the database of all the engagement activities undertaken in the lifecycle of the site/business. In certain cases, documentation may be required by the applicable reference

framework, in which case, the documentation guidelines prescribed shall be followed.

It is the responsibility of the Stakeholder Engagement Cell to ensure the efficacy of the engagement efforts in terms of stakeholder groups covered and the purpose of engagement and to allow for the identification of any key issues or risks that may emerge during the engagement process. The team shall allow for revision of the SEP or the engagement plan as required during the lifecycle of the site/business.

1.8 ACCOUNTABILITIES

The leadership and overseeing of the implementation of the SEP shall be at the senior level of the NBBL Company Management. An Internal Task Force shall be appointed as a temporary body for the development of the SEP at the company level. For the implementation of the SEP, a Stakeholder Engagement Cell (SEC) shall be established.

1.9 REPORTING AND REVIEW

The documentation of the stakeholder engagement carried out shall include the following key aspects –

- Total number of stakeholders engaged in each group;
- Geographical location of such engagement activities;
- Key concerns and risks identified and reasons for the same;
- Actions to address these concerns and report back to the people in the next engagement phase;
- Grievances, type, category and their resolution;
- Examples of how engagement has worked or where engagement needs strengthening; and
- Recommendations.

The report should be presented to the NBBL management on a quarterly basis or based on urgency.

2 RESETTLEMENT FRAMEWORK

2.1 PREAMBLE

Nutan Bidyut Bangladesh Limited (NBBL) intends to develop a 225 MW dual fuel-based combined cycle power plant at Kutuba Union, Burhanuddin Upazilla, Bhola District. The proposed power plant is within the same power generation complex of BPDB's existing Combined Cycle Power Plant (CCPP) and will entail additional land requirement as described subsequently.

The key project components will include the following:

- Power plant within 11.5 acres of land in the possession of BPDB which will be leased to NBBL;
- Additional project facilities linked to the switchyard and HSD fuel storage along with an access road to connect with BPDB's main road which will entail purchase of 5.78 acres of land; and
- Right of way of 5.5 acres for the gas pipeline from the power plant location up to Shahbazpur Gas Fields.

In addition, the following project activities will also entail impacts that are relevant for the Resettlement Framework:

- Construction of a floating jetty;
- Dredging of Dehular Canal;
- Requirement of dredging sand and transporting it to the power plant site to raise the level of the land;
- Transport of construction material and power plant equipment through barges along the Dehular Canal; and
- Transport of HSD fuel through barges along the Dehular Canal during operations.

2.1.1 *Scope of Land-based and Resettlement Impacts*

Best designed projects often minimize resettlement impacts by avoiding or minimizing number of persons affected by physical relocation, loss of land or disturbance of income generating activities. NBBL, in consultation with BPDB has incorporated the following avoidance measures to minimize impacts:

- NBBL will use the existing access road constructed by BPDB up to the main gate of the power complex, at which point an access road will be constructed up to the specific project location;
- NBBL envisages minimum additional land requirement as the available land bank of BPDB will be raised and will be used for a majority of the components;

- The location of the jetty, inlet and outfall will be in close proximity to the existing facilities of BPDB instead of being significantly upstream or downstream;
- The pipeline route will largely be aligned to the existing corridor thereby minimizing the actual land required for laydown area and pipeline construction.

Although the program guidelines point to minimizing or avoiding involuntary resettlement, especially of the poor / vulnerable groups considering techno-economic, environmental and other social factors in subproject design, land acquisition and resettlement may not be eliminated altogether from the Program, and some relatively small areas may be required for the construction of project components.

Based on information provided by the project proponent (January 2017), NBBL has already commenced the procurement of 5.78 acres of land through the execution of sale agreements with approximately 63 land owners. The price of land is based on mutual negotiation and is reportedly at least five (5) times of the market price. The project will entail involuntary land requirement as the arrangement is in the form of negotiated settlements wherein the buyer can resort to government expropriation in case negotiations with the land owners fail. In addition, formal land acquisition will be triggered for the right of way.

Note: NBBL has indicated that the land procurement process was on the basis of voluntary land transactions and willing buyer, willing seller negotiations. However, considering that these specific land parcels were identified (linked to the plant configuration and the land already available with BPDB), the procurement is categorised as negotiated settlement. This is because; NBBL could have applied for land acquisition under ARIPO, 1982 in case the land owner had refused to sell. Although the portion of land purchased is triple cropped, this area was selected as it is in continuation to the land parcel that has is being transferred by BPDB to NBBL.

In this context, these impacts are summarised as follows:

Table 1.3 Summary of Land-based and Livelihood Impacts

Receptor	Impact Description	Approximate Entities/Units
Agricultural land and assets thereof	Loss of land; Loss of productive assets; Fragmentation of land parcels	Approximately 22.78 acres of land
Linear impacts of gas pipeline	Restrictions on land use; Implications of cumulative pipeline within the same land parcel; Loss of land value	Approximately 5 km of the gas pipeline through Kutuba and Kacchia Union
Physical Displacement	Impact on homestead land and residential structures	Approximately 5 households along the access road and gas pipeline

Receptor	Impact Description	Approximate Entities/Units
Economic Displacement	Impact on land owners; Impact on land users; and Loss of income and livelihood opportunities in case of economic vulnerability	• 63 land owners of the additional land of 5.78 acres; • 25 land users of the additional 5.78 acres of land; • 132 land owners and users of the gas pipeline corridor
Fishing Livelihoods	Temporary access interruption during construction; Potential reduction in fish catch in case of cumulative implications of BPDB and NBBL's inlet and outfall on Dehular canal	Villages along Dehular Khal in Kutuba Union and Saccha Union (approximately 5 villages/settlements)

2.1.2 Legal Framework

This Resettlement Framework (RF) is based on the Acquisition and Requisition of Immovable Property Ordinance (ARIPO), 1982 and its subsequent amendments in 1993 and 1994 and the ADB SPS 2009.

National Laws and Regulations of Bangladesh

The basic principles for the compensation of property in Bangladesh are founded in Articles 42 and 47 of the Constitution. The current legislation governing land acquisition in Bangladesh is the Acquisition and Requisition of Immovable Property Ordinance 1982 (ARIPO) and subsequent amendments during 1993-1994. The Ordinance requires that compensation be paid for (i) land and assets permanently acquired (including standing crops, trees, houses); and (ii) any other damages caused by such acquisition. The Deputy Commissioner (DC) determines the market price of assets based on the approved government procedure.

The first step in acquiring land is an application to the Ministry of Land (MOL) through the concerned project ministry requesting requisition and transfer of the land or the movable property in question. A detailed statement specifying whether the land mentioned in the application is needed for public or private purpose, the area of the land, sketch-map and purpose for which it could be used should be submitted as well. The MOL examines the application and sends it to the concerned DC for necessary action. The DC then authorizes the Additional Deputy Commissioner (ADC) related to land to prepare and execute a plan of action for requisition. The DC in turn issues a public notice for land requisition and at that time aims to settle matters relating to payment of compensation to the owner(s) of the property or other person(s) entitled to compensation, as well as attempt to settle any other related issues. When a movable property is required temporarily for a public

purpose or in the public interest, the DC may obtain requisition by an order in writing. In case of requisition of movable property as well, compensation shall be paid to the owner or owners of the property determined in accordance with legal provisions. Also, in case of requisition of movable property, the decision taken by the government is deemed to be final. Any contravention or attempts to contravene an order, or obstruction to the enforcement of an order, is punishable with imprisonment for a term that may extend to three months, or with a fine which may extend to three thousand taka, or with both.

The Deputy Commissioners (DC) in all cases, determine "market value" of acquired assets on the date of notice of acquisition (notice under Section 3 of the Ordinance). The DCs then add premium of the assessed value for cash compensation under law (CCL) of all acquired assets due to compulsory acquisition. The CCL paid for land is generally less than the "market value" as owners customarily report lower values during registration to avoid and/or pay fewer taxes. If land acquired has standing crops cultivated by tenant / sharecroppers under a legally constituted written agreement, the law requires that part of the compensation money be paid in cash to the tenants as per the agreement. Places of worship, graveyard and cremation grounds are not to be acquired for any purpose. The law requires that the salvaged materials upon payment of compensation will be auctioned out by the Government.

IFC Performance Standard 5

PS5 reaffirms the concepts of physical displacement (loss of shelter) and of economic displacement (loss of means of livelihood); both physically displaced and Economically Displaced People are to be considered in resettlement planning. The stated objectives of resettlement planning are:

- To avoid or at least minimize involuntary resettlement wherever feasible by exploring alternative Project designs;
- To mitigate adverse social and economic impacts from land acquisition or restrictions on affected persons' use of land by providing compensation for loss of assets at replacement cost and ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected;
- To improve or at least restore the livelihoods and standards of living of displaced persons;
- To improve living conditions among displaced persons through provision of adequate housing with security of tenure at resettlement sites.

The revised version of IFC PS 5 has expanded the scope of physical or economic displacement as resulting from the following types of land transactions:

- Land rights or land use rights acquired through expropriation or other compulsory procedures in accordance with the legal system of the host country;
- Land rights or land use rights acquired through negotiated settlements with property owners or those with legal rights to the land if failure to reach settlement would have resulted in expropriation or other compulsory procedures;
- Project situations where involuntary restrictions on land use and access to natural resources cause a community or groups within a community to lose access to resource usage where they have traditional or recognizable usage rights;
- Certain project situations requiring evictions of people occupying land without formal, traditional, or recognizable usage rights;
- Restriction on access to land or use of other resources including communal property and natural resources such as marine and aquatic resources, timber and non-timber forest products, freshwater, medicinal plants, hunting and gathering grounds and grazing and cropping areas.

Box 1.1 Important Obligations of PS 5

- Compensate displaced persons and communities for loss of assets at full replacement cost and provide other assistance to help them improve or at least restore their standards of living or livelihoods.
- "Where livelihoods of displaced persons are land-based, or where land is collectively owned, the Project or client will offer land-based compensation, where feasible".
- The Project will "consult with and facilitate the informed participation of affected persons and communities, including host communities, in decision-making processes related to resettlement. Consultation will continue during the implementation, monitoring, and evaluation".
- The Project is expected to "establish a grievance mechanism consistent with PS1(Social and Environmental Assessment and Management Systems) to receive and address specific concerns about compensation, resettlement and rehabilitation issues, including a recourse mechanism designed to resolve disputes in an impartial manner".
- The Project is expected to "carry out a census survey of impacted persons, to determine eligibilities for compensation, assistance and other benefits
- "If land acquisition for the Project causes loss of income or livelihood, regardless of whether or not the affected people are physically displaced, the client will meet the following requirements:
- Promptly compensate economically displaced persons for loss of assets or access to assets at full replacement cost
- Compensate economically displaced persons who are without legally recognizable claims to land for lost assets (such as crops, irrigation infrastructure and other improvements made to the land) other than land, at full replacement cost. The client is not required to compensate or assist opportunistic settlers who encroach on the Project area after the cut - off date
- Provide additional targeted assistance (e.g. credit facilities, training, or job opportunities) and opportunities to improve or at least restore their income-earning capacity, production levels, and standards of living to economically displaced persons whose livelihoods or income levels are adversely affected
- Provide transitional support to economically displaced persons, as necessary, based on a reasonable estimate of the time required to restore their income earning capacity, production levels, and standards of living.

**Source: IFC PS 5, 2012*

ADB Safeguard Policy Statement, 2009

The objectives of SPS with regard to involuntary resettlement are:(i)to avoid involuntary resettlement wherever possible; (ii) to minimize involuntary resettlement by exploring project and design alternatives; (iii) to enhance, or at least restore, the livelihoods of all displaced persons in real terms relative to pre-project levels; and (iv) to improve the standards of living of the displaced poor and other vulnerable groups. The SPS covers physical displacement (relocation, loss of residential land, or loss of shelter) and economic displacement (loss of land, assets, access to assets, income sources, or means of livelihoods) as a result of (i) involuntary acquisition of land, or (ii) involuntary restrictions on land use or on access to legally designated parks and protected areas. It covers displaced persons whether such losses and involuntary restrictions are full or partial, permanent or temporary.

For any ADB operation requiring involuntary resettlement, resettlement planning is an integral part of project design, from the early stages of the project cycle, taking into account the following basic principles:

a. Involuntary resettlement (IR) will be avoided or minimized as much as possible and where IR is unavoidable, displaced persons (DPs) will be compensated full replacement close [1]for their losses;
b. Improve, or at least restore the livelihoods of all DPs and provide physically and economically displaced persons with needed assistance.
c. Carry out meaningful consultations with affected persons, host communities, and concerned nongovernment organizations. Inform all displaced persons of their entitlements and resettlement options. Develop procedures in a transparent, consistent, and equitable manner if land acquisition is through negotiated settlement to ensure that those people who enter into negotiated settlements will maintain the same or better income and livelihood status.
d. Ensure that displaced persons without titles to land or any recognizable legal rights to land are eligible for resettlement assistance and compensation for loss of non-land assets.
e. Prepare and disclosure a resettlement plan elaborating on displaced persons' entitlements, the income and livelihood restoration strategy, institutional arrangements, monitoring and reporting framework, budget, and time-bound implementation schedule.
f. Conceive and execute involuntary resettlement as part of a development project or program. Include the full costs of resettlement in the presentation of project's costs and benefits. Pay compensation and provide other resettlement entitlements before physical or economic displacement. Monitor and assess resettlement outcomes, their impacts on the standards of living of displaced persons, and whether the objectives of the resettlement plan have been achieved by taking into account the baseline conditions and the results of resettlement monitoring. Disclose monitoring reports.

AIIBB ESS 2: Involuntary Resettlement

- Focuses on involuntary: 'as a result of: (a) involuntary acquisition of land; or (b) involuntary restrictions on land use or on access to legally designated parks and protected areas';
- Defines 'physical' (relocation, loss of residential land or loss of shelter) and 'economic' (loss of land or access to land and natural resources; loss of assets or access to assets, income sources or means of livelihood) displacements;
- Introduces notions of time, of proportion, and of direct correlation with project: "involuntary resettlement of the recent past or foreseeable future

[1] The replacement cost is based on the following elements – fair market value, transaction costs, interest accrued, transitional and restoration costs and other applicable payments, if any. Where market conditions are absent or in a formative stage, the borrower/client needs to consult the displaced persons and host population to obtain adequate information about recent transactions, land value, by types, land titles, land use, cropping pattern and crop production, availability of land in the project area and other related information.

that is directly linked to the Project"; "whether such losses and involuntary restrictions are full or partial, permanent or temporary";
- Includes notions of obligation and of quality of restoration: 'If these impacts are found to be adverse at any stage of the Project, the Client is required to develop and implement a management plan to restore the livelihoods of affected persons to at least pre-Project level or better;"

Requirements proportionate to risks and impacts of the involuntary resettlement:

- Resettlement Plan or Framework proportional to degree of impacts in accordance to scope of physical/economic displacement and vulnerability of the displaced;
- Abbreviated Resettlement Plan allowed where less than 200 people displaced or where entire displaced population not physically displaced and lose less than 10% of productive assets;
- Where impacts significant, consider transforming Involuntary Resettlement as a stand-alone project;
- Where risks and impacts highly complex and sensitive, encourages a social preparation phase before compensation and resettlement decision- making (involving consultation with affected people and host population): to build capacity of the vulnerable and address resettlement issues (include social preparation cost in resettlement budget);
- Can use existing formal or informal grievance mechanisms if well designed and implemented and seen suitable by the Bank. Grievance mechanisms process to be transparent and understandable, gender-sensitive, culturally appropriate and readily accessible to affected people;
- Information disclosure to include grievance redress and outcomes reports, draft and final resettlement plans/frameworks, updates, and monitoring reports to all stakeholders in the same manner;
- Specified client should improve the standards of living of the displaced poor and vulnerable to at least national minimum standards, including access to social protection systems, legal and affordable access to land and resources/housing in rural/urban areas, and appropriate income sources in urban areas;
- Specifies that should not include compensation for people on illegally settled land;
- Requires developing procedures for displaced people who are under administrative or legal review;
- Reminds to closely supervise implementation;
- Wait for compensation and other resettlement entitlements provision before any displacement.

Gaps between ARIPO, ADBB SPS, 2009, AIIBB ESS 2 (2016) and IFC PS 5, 2012

The Acquisition and Requisition of Immovable Property Ordinance (ARIPO), 1982 and its subsequent amendments in 1993 and 1994 are followed for acquisition and requisition of properties required for the development project, which is not consistent with the Government's commitment to reducing poverty. In this respect national laws and local laws and regulations to be applied to the present project and gaps between the law of the country and ADB and IFC policy requirements are identified:

Table 1.4 Comparison of National Requirements to International Standards

Issues	**GoB, ARIPO**	**ADBB SPS, 2009, IFC PS 5, 2012 and AIIBB ESS 2**	**Measures to bridge Gaps**
Payment of compensation	Land is handed over to the project proponent once payment of awards has been initiated Only land owners are considered	Requires affected persons to be compensated prior to start of land access Both formal and informal rights of titleholders are to be considered	Compensation of physical and economic displacement will occur after full compensation at replacement cost or resettlement benefits have been paid
Valuation of land	ARIPO determines the land price as the average market value during last 12 months of the land parcel from date of publication of the notice under section 3. Tax is deducted from the total land value and 50 percent premium is added	Valuation of land at replacement cost	Provisions to be adopted for additional top up payments to ensure replacement costs
Valuation of structure	As per law the structural cost is determined by deducting construction profit, overhead charge, value added tax (VAT) and depreciation, plus 50 percent premium is added	Structural cost at replacement cost of assets without taking into consideration the depreciation cost	-
Eligibility criteria	Eligibility of non-title holders are not recognized for compensation under the law	Non-title holders are eligible for compensation for loss of assets and income	All affected persons (APs) title holders and non-title holders to be compensated and provided with assistance
Relocation assistance	No provision for relocation assistance	Affected households to be assisted in the relocation process	Affected households (HHs) and businesses will receive relocation assistance in the form of additional lump sum as well as support

Issues	GoB, ARIPO	ADBB SPS, 2009, IFC PS 5, 2012 and AIIBB ESS 2	Measures to bridge Gaps
			by the project proponent in identifying and negotiating as alternative place to stay.
Economic displacement	No compensation for loss of income	Improve or at least restore the livelihoods of all displaced persons	Affected households, especially vulnerable HHs are eligible to participate in livelihood improvement trainings along with seed grants as outlined in resettlement plan.
Consultation/ disclosure	ARIPO does not emphasize on consultation/ disclosure	Affected Persons (APs) must be consulted during project design and resettlement plan preparation; disclosure of the resettlement plan (RP) including documentation of the consultation in an accessible place and languages understandable by the APs and other stakeholders. All documents must be disclosed locally and on the ADB website.	Extensive consultations have been carried out during design and the ESIA stage; consultations with APs and other stakeholders must be done during the RP preparation and its implementations. RP along with the Entitlement Matrix (EM) must be disclosed locally and also on the website of ADB and project proponent.
Safeguarding needs of vulnerable groups	ARIPO does not have any especial provision or assistance for vulnerable groups	RP must have provisions for vulnerable groups	Special assistance measures for vulnerable groups
Consideration of livelihoods impacted by loss of access to natural resources	No specific provisions in the legal framework	Overall, the project needs to improve or at least restore livelihoods of affected communities to pre-project levels	Development of livelihood restoration assistance

In reducing the gaps and failure to address the needs of the affected and displaced persons for acquisition and requisition of land the Ministry of Land (MOL), Government of Bangladesh with technical Assistance from ADB has prepared a Draft National Policy on Involuntary Resettlement and Rehabilitation (NPIRR). The draft policy awaits approval of the cabinet prior to being implemented or enforced.

According to NPIRR affected and displaced persons will be treated with dignity and assisted in an equitable manner that safeguards their welfare and livelihoods irrespective of title, gender and ethnicity. NPIRR recognises that:

- All those displaced involuntarily by development projects must be resettled and rehabilitated in a productive manner.
- People who are resettled must be able, through income and livelihood restoration programmes and other support as may be required, to restore or improve their living standards.
- Cash compensation shall be paid at replacement value for assets acquired for the project, for which those displaced can establish prior ownership and /or use rights. Similarly, affected persons and/ or on government leased land will be eligible for compensation for loss of access to land and sites.
- In addition to cash compensation and resettlement, a benefit sharing strategy will be considered in projects where feasible.
- Cultural and customary rights of people affected by projects are to be protected, particularly those belonging to ethnic minorities.
- Gender equality and equity in all stages and processes of resettlement and rehabilitation will be fully respected.
- Affected persons will be informed and consulted in transparent manner, including formal disclosure of projects and mitigation measures.
- Vulnerable groups including landless/ informal settlers, *adivasis*, poor women headed households, physically challenged people, elderly and those falling below the national defined poverty line, are entitled to additional benefits and assistance in a manner that addresses their specific needs related to socio-economic vulnerability.
- In case of sensitive projects or projects with large resettlement components, the project authorities will form independent panels of expert for annual review of resettlement.

Should households or any other affected person or entity require resettlement, support for relocation, compensation for the loss of assets and assistance with income restoration will be provided, according to the principles of resettlement, compensation and livelihood restoration provided in this Resettlement Framework that takes cognizance of The Acquisition and Requisition of Immovable Property Ordinance, 1982 and its subsequent amendments in 1993 and 1994; the draft NPIRR; IFC PS 5 on Land Acquisition and Involuntary Resettlement; and ADB's SPS 2009, in particular, SR 1 on Involuntary Resettlement.

2.2 *PROPOSED RESETTLEMENT AND LAND ACQUISITION POLICY*

The Project Sponsor will develop a formal Resettlement Action Plan and Livelihood Restoration Plan upon finalisation of the route of the pipeline and any other land requirements and will compensate affected or displaced persons in compliance with the following policy requirements:

2.2.1 *Scope of the Policy*

The policy applies to all land purchased and/or acquired by the project proponents (i.e. NBBL) or government agencies, such as the Sunderban Gas Company Limited or by any contractors across the footprint and associated infrastructure for project development, construction and operations that may be permanent or temporary by way of:

- Private land procurement including both outright purchases of property and severance of access rights, such as easements or rights of way;
- Restricted or reduced access to natural resources due to project development; and
- Future land requirements under/by any of the above, in the lifespan of the project.

2.2.2 *Principles*

Any project-induced compensation, resettlement and livelihood restoration will be implemented in accordance to the following principles:

- The Project will ensure compliance to applicable Government of Bangladesh regulations, IFC Standards and ADB Safeguards Policy Requirements;
- Impacts from permanent or temporary land acquisition on assets and livelihoods will be mitigated, with both physical and economic displacement (severance of livelihoods) taken into consideration;
- Security of tenure will be ensured through legal provisions and through a recognition of the existing community practices including for those without formal rights;
- The Project will compensate both physical and economic impacts of land acquisition at full replacement cost;
- Affected livelihoods will be restored as a minimum, or preferably improved, and living conditions of affected households will be improved;
- All components of the entitlements will include the integration of gender equity to ensure practical benefits for women such as necessary safeguards, increased income opportunities and greater financial security;
- The policy recognizes existing vulnerabilities in the project area of influence as a baseline condition, especially through criteria on social and economic vulnerabilities. These vulnerable households and social groups

will have access to additional safeguards to ensure that they are able to access their due entitlements;

- Any land transactions that are undertaken on a willing-buyer willing-seller basis will comply with the following requirements (as a minimum):
    - Land purchase value for the private land and the assets thereon at full replacement cost;
    - Facilitation to recognize rights for land owning entities without established legal title but with informal rights;
    - Resettlement support in case of physical displacement;
    - Adherence to good processes like prior information and disclosure;
    - Documentation of the land transaction process will be carried out to ensure transparency;
- Adverse impacts on access (severance or disruption) where unavoidable to be mitigated through the provision of alternative access;
- Transparency in disclosing information related to the project impacts and entitlements and people's participation across the project lifecycle;
- All project-related information dissemination, engagement and disclosure will be through informed consultation and participation (ICP);
- A timely, effective and accessible grievance redressal mechanism will be established to cover all stages;
- The implementation of the land acquisition, resettlement, compensation and livelihood restoration will be monitored in terms of its impacts, process and outcomes.

2.2.3 Avoidance Measures

For all project footprints that are yet to be finalised, located or designed (including the gas pipeline), the following avoidance criteria will be integrated:

- Avoid (to the extent feasible) any direct impact on homestead land and residential structures that may lead to temporary and/or permanent physical displacement;
- Minimize the use of productive land with a preference to purchase lower productive land;
- Minimize the impact on existing rights of way and easements; and
- Avoid impact on identified religious, cultural or heritage sites of local, national and international significance.

2.3 PROPOSED ENTITLEMENTS

2.3.1 Eligibility Criteria

All displaced persons will be entitled to compensation and resettlement assistance. Once the right of way of the gas pipeline is finalised, NBBL will

undertake a 100% socio-economic survey (households and asset inventory) of the affected land parcels of 22.78 acres in order to determine eligible entities. The date of completion of the survey will be the cut-off date for entitlements under the RAP and LRP.

The absence of legal title will not bar displaced or affected persons from compensation and assistance. Structures located on non-titled land, government land or requisitioned private land, if displaced, will be entitled for compensation under the project. Vulnerable displaced persons/ households will qualify for additional assistance to facilitate the relocation and restoration of their livelihoods.

Non-vulnerable households with affected structures will be entitled to compensation for structures and assistance for shifting and reconstruction of the same.

2.3.2 Entitlement Matrix

The Entitlement Matrix is based on the Acquisition and Requisition of Immovable Property Ordinance 1982 and its subsequent amendment in 1994, the draft NPIRR, AIIB ESS 2, IFC PS 5, 2012 and the ADB Safeguard Policy Statement, 2009. The matrix describes the units of entitlements for compensating lost assets and different resettlement benefits. The resettlement benefit for indirect losses and the difference between the replacement value and the cash compensation under the law will be paid by NBBL. The displaced households will be allowed to take all salvage materials of structures, trees and crops free of cost. A Livelihood Restoration Plan should be prepared for affected land owners, land users and fishermen community where a specific economic impact is established on the basis of the socio-economic survey.

Table 1.3 Proposed Entitlements

S. No	Impact	Eligible Entity	Proposed Entitlement
1	Loss of agricultural land	Legal owner(s) of land	• Compensation at full replacement value in order to document and demonstrative that the rates agreed are at par with the prevailing market rates. In addition to the compensation for land, Stamp duty and registration cost incurred for replacement land purchase at the replacement value; • For right of way acquisition, consideration of the implications of loss in land value due to multiple pipelines and the restrictions in use of the land within the compensation to be paid to land owners
2	Loss of houses (shelter)	Legal owner(s) of structures	As only 5 households/homestead lands are to be impacted, assisted self-relocation is proposed based on the following: • Cash compensation equivalent to replacement value of structure (or part of structure). Compensation will not take into account depreciation value; • Option to be compensated for entire structure if remaining structure is no longer viable; • Rights to salvage materials from structure; • Provision of all taxes, registration costs, and other fees incurred for replacement structure; • Shifting allowance based on actual cost of moving (e.g., truck hire, equipment, etc.); • One month rental allowance; • One time allowance for utility services such as gas supply and electricity connection; • Additional compensation for vulnerable households. • Assistance in finding alternate location.
3	Loss of houses (shelter)	Non-titled Displaced Persons residing as encroachers	• Cash compensation equivalent to replacement value of structure (or part of structure) constructed by the DP. • Compensation will not take in to account depreciation value. • Rights to salvage materials from structure. • Provision of all taxes, registration costs, and other fees incurred for replacement structure. • Shifting allowance based on actual cost of moving (e.g., truck hire, equipment, etc.). • One month rental allowance. • Additional compensation for vulnerable households. • Assistance in finding alternate location.
4	Loss of timber and fruit bearing trees	Legal owners and non-titled users of the land as determined	• 60 days advance notice to harvest standing seasonal crops, if harvest is not possible, cash compensation for crops (or share of crops) equivalent to prevailing market price. • Cash compensation for perennial crops and fruit bearing trees based on annual net product market value multiplied by remaining productive years.

S. No	Impact	Eligible Entity	Proposed Entitlement
		by DC	• Cash compensation equivalent to prevailing market price of timber for non-fruit trees.
5	Loss of Standing Crops	Cultivator (person who planted the crops) whether land owner, sharecropper, lessee unauthorised occupant of the land	• 60 days advance notice to harvest standing seasonal crops, if harvest is not possible, cash compensation for crops (or share of crops) equivalent to prevailing market price. • Cash compensation for perennial crops and fruit bearing trees based on annual net product market value multiplied by remaining productive years. • Cash compensation equivalent to prevailing market price of timber for non-fruit trees.Owners and growers will be allowed to take away the crops
6	Temporary impact during construction	Community / individual	• Minimum 60 days advance notice to be given. • The Project proponent or it's contractor shall bear the cost of any impact on structure or land due to movement of machinery and in connection with collection and transportation of construction materials • All temporary use of land outside proposed RoW to be through written approval of the landowner and contractor or project proponent • Temporarily requisitioned land will be returned to owner rehabilitated to original of preferably better condition
7	Temporary loss of livelihood	Business owner (s), tenant (s), leaseholder(s), employee(s), agricultural worker(s), and farmer(s) whose income is affected	• Minimum 60 days advance notice to be given. • Provision of temporary access where possible. • Provision of alternative sites for continued economic activity where possible. • Where provision of alternative sites is not feasible, a one-time assistance for lost income for period of disruption. • Compensation for agricultural losses. • Restoration of affected land, structure, utilities, common property resource.

S. No	Impact	Eligible Entity	Proposed Entitlement
8	Loss of fish stock (aquaculture)	Legal owner of the pond/ waterbody and lessee right holder socially recognised	• Legal owner will get compensation for land area - Cash compensation under law (CCL) as per ARIPO and cash grant to cover the difference between cash compensation under law and the replacement cost of land • Cash grant as transition allowance equivalent to 1 year income from the land for titled/ non-titled /lease holder or users as determined during socio-economic census and verified by the PVT
9	Loss of income due to impeded access to fishing	Fishermen Community	• Financial compensation of loss of income incurred as a result of the Project until fishing or alternative income is secured • Compensation of assets that can no longer be used at fair market price • Specific training programs for to address a trend of depletion of resources within territorial waters • Fund for local area development initiatives focusing on the fishermen community

2.4 *IMPLEMENTATION*

The project proponent will prepare a resettlement action plan (RAP) and LRP based on the social impacts identified and a 100% census survey of all affected land parcels and displaced persons along with villages in Kutuba and Sacchra Union along the Dehular Khal.

During the identification of the impacts of resettlement and resettlement planning, and implementation, NBBL will pay adequate attention to gender concerns, including specific measures addressing the need of female headed households, gender-inclusive consultation, information disclosure, and grievance mechanisms, to ensure that both men and women receive adequate and appropriate compensation for their lost property and resettlement assistance, if required, as well as assistance to restore and improve their incomes and living standards. The resettlement plan will specify the income and livelihoods restoration strategy, the institutional arrangements, the monitoring and reporting framework, the budget, and the time-bound implementation schedule.

The RAP and LRP will be prepared based on the results of the census and socio-economic survey; the database on affected persons should be completed before RAP preparation. The specific resettlement-related activities to be performed, such as SIA, census and socio-economic survey, resettlement planning, public consultation, development of mitigation and income restoration measures, implementation of RAP, and monitoring and evaluation, and their subproject implementation schedule, will all be detailed in the resettlement planning document. The RAP and LRP will be prepared and notified to the public, through information disclosure workshops and other means such as posters and/or resettlement booklets, notices in the local government offices etc.

2.4.1 *Self-Relocation Assistance*

Approximately 5 households are likely to be physically displaced due to linear impacts of the access roads and the pipeline. It is understood that these households are titleholders and have alternate land and would prefer self-relocation. In this scenario, the approach of NBBL will be to provide self-relocation assistance to the impacted households as follows:

- Shifting assistance, resettlement assistance and subsistence allowance, as required, will be provided to all relocated/physically displaced families;
- In situations when alternate houses are not ready, rental assistance will have to be provided until the alternate house is ready;
- Access to safeguards to enable security of tenure, salvaging construction material and awareness of house construction to include sustainable and locally available material.

2.4.2 *Negotiated Settlement*

ADB's Safeguard policy on negotiated settlement encourages acquisition of land and other assets through a negotiated settlement where ever possible based on consultation with affected persons including those without title to assets. This safeguard element, negotiated settlement, would help to avoid expropriation and eliminate the need to use governmental authority for eviction or to remove people forcibly. This policy offers an adequate and fair price for land and other assets to the APs/DPs. The policy encourages acquisition of land and other assets through a negotiated settlement wherever possible based on meaningful consultation with APs including those without title to assets.

In the case of a negotiated settlement, an independent external party will be engaged by NBBL to document the negotiation and settlement processes. Mechanisms for calculating the replacement cost of land and other assets affected due to the program implementation should be duly recorded and maintained during the negotiated settlement through a meaningful consultation.

2.4.3 *Livelihood Restoration*

Each affected household whose income or livelihood is affected by any project component will be assisted to improve or at least restore this income to its pre-project level. For vulnerable households, their living standards will be improved to national levels, including the provision of access to basic utilities and public services. AIIB's criteria under ESS 2, i.e. obligation and of quality of restoration: 'If these impacts are found to be adverse at any stage of the Project, the Client is required to develop and implement a management plan to restore the livelihoods of affected persons to at least pre-Project level or better' will be used as the basis for concrete measures under the LRP wherever a significant livelihood impact is established.

The approach to proposed livelihood restoration measures adapts the sustainable livelihoods approach (SLA [(1)]) promoted by the International Fund for Agricultural Development (IFAD). The following livelihood strategies have been recommended:

- Agricultural enhancement program, especially to improve productivity and horticultural development;
- Development of a basket of livelihood alternatives on Income Generation from (see below):
    - Enterprise-based livelihoods
    - Orchards and Plantation-based livelihoods
    - Agro-pastoral livelihoods

(1) http://www.ifad.org/sla/

    - Livelihood schemes for women;
- Fisheries development component; and
- Linkages to other employment, procurement and community development programs to be implemented by NBBL.

The key livelihood outcomes that are envisaged through this approach are: (a) restoring livelihoods to pre-project levels or better; (b) increased income; (c) reduced vulnerability; (d) promoting the sustainable use of natural resources. The LRP to be prepared as a part of the RAP will require to develop each of the above options into a concrete alternative for project affected persons and it will be converted into a tracker that can be monitored for implementation to the pre-project baseline.

All impacted households ascertained as economically vulnerable (including land less owners, fishermen and land users) would be eligible for livelihood restoration. These will be derived from detailed socio-economic survey information, conducted as a part of the RAP, and may include provision of income generating assets and/or training to operate them.

2.4.4 Gender Development

Female-headed households and female land owners and land users are considered a vulnerable group as per this RF. Any negative impacts of a subproject on female-headed households will be treated on a priority basis. The resettlement action plan will formulate measures to ensure that socio-economic conditions, needs and priorities of women are identified and the process of land acquisition and resettlement does not disadvantage women aligned to the Gender Action Plan provided in the ESIA. It will ensure that gender impacts are adequately addressed and mitigated. Women's focus groups discussions will be conducted to address specific women's issues. During disbursement of compensation and provision of assistance, priority will be given to female-headed households. Also ownership in the name of the wife will be provided in case of non-female-headed HHs.

2.4.5 Consultation and Participation

Consultation, participation and disclosure will ensure that information is provided and feedback on proposed subproject design is sought early, right from the project preparation phase, so that the views and/or preferences of stakeholders including potential beneficiaries and affected people can be adequately considered at each stage of project preparation, processing, and implementation.

By addressing stakeholder needs, there is greater awareness of the benefits and "ownership" of the project among stakeholders, which in turn contribute to sustainability. Relevant information about any major changes to project scope will be shared with beneficiaries, affected persons, vulnerable groups,

and other stakeholders. Consultation to be carried out through three tire project implementation – starting from designing phase - to optimize designs and minimize social impacts.

Key stakeholders to be consulted are:

- Project affected persons (land owners, land users, fishermen etc.);
- elected representatives of Union Parishads, community leaders, and representatives of community-based organizations;
- Chairman of Union Parishads, Upazila Nirbhahi Officer (UNO), Burhanuddin Upazilla;
- Local NGOs; Resident Welfare Associations (RWAs), community groups, women's groups
- Deputy Commissioner, Bhola District, ADC (Revenue), Bhola District and Land Acquisition Department officials;
- Local government and relevant government agency representatives, including local authorities responsible for land acquisition, protection, and conservation of forests and environment, and other relevant government departments.

The methodology followed for public consultations are summarized in the Stakeholder Engagement Plan. Information will be disseminated to affected households at various stages, including sub-project initiation phase and during the project implementation period. For the benefit of the community in general and APs in particular, a summary of the RAP and LRP will be made available in local language (Bengali) during consultation meetings and will be disclosed in public places prior to project appraisal. This will enable stakeholders to provide inputs on the resettlement process, prior to the award of civil work contracts.

The RAP and LRP will be disclosed, detailing information including measurement of losses, detailed asset valuations, entitlements and special provisions, grievance procedures, timing of payments, and displacement schedule. For people those who are illiterate other communication methods will be used, including verbally explaining the disclosed documents with some pictorial illustration in community meetings.

2.4.6 Grievance Redress Mechanism

The implementation of a project is a complex time and labour intensive process involving multitude of lifecycle phases and processes. Over the duration of the project, it encounters numerous instances of conflicts, allegation and dissatisfaction within the working and associated human capital and their interactions. Some of these issues could be related to

- compensation payment,

- improper estimation of affected assets,
- failure to fulfil commitments,
- poor management of construction activities,
- accidents due to inappropriate planning of vehicle movement, and
- Cultural conflicts between migrant workers and local communities etc.

Most of the conflicts and allegations may not appear to be of serious nature but if not managed appropriately from the beginning may snowball into a bigger issue.

In order to manage these risks, an internal mechanism is required to be in place where the aggrieved party/s can lodge their complaints and get it amicably settled prior to approaching the formal mode of solution available to them i.e. access to legal system through courts. In order to provide a formal forum to the aggrieved parties to deal with issues arising out of project, it is proposed that a joint grievance redress mechanism be instituted for both environmental and social related issues.

2.5 INSTITUTIONAL ARRANGEMENTS

2.5.1 Roles and Responsibility

The key stakeholders involved in the Resettlement Action Plan (RAP) and LRP are mainly the NBBL, the Deputy Commissioner's Office, the Agricultural marketing Directorate, the Department of Forestry, Public works Department (PWD) and the RP implementing NGO or Joint Venture (JV). The main task and responsibilities of the institutions are planning, negotiating, consulting, approving, coordinating, implementing, financing, monitoring and evaluating land acquisition and resettlement and rehabilitation.

In case of land acquisition and other resettlement impacts – representatives of DC, EA staff, PWD, Forest Department, NGO/JV and representatives from affected communities including women and members of vulnerable group will carry out joint verification of the inventory of affected persons and assets acquired to finalize the list for implementation purpose, especially for payments. An external Agency will be hired by NBBL for monitoring implementation activities of RAP.

2.5.2 Monitoring and Reporting

The RAP will have the scope of monitoring and reporting. NBBL will monitor the regular activities and oversee the timely implementation of RAP activities. NBBL will evaluate externally once through an independent appointed agency. NBBL will thus have the scope of both internal and external monitoring.

NBBL will establish a monitoring system internally for collection, analysis, reporting and use of information about the progress of resettlement based on the RAP. NBBL will gather information on RAP implementation covering relevant activities as per schedule.

The internal monitoring reports on RP implementation will be included in Project Progress Report (PPR). Besides, an annual report stipulating all efforts and outcomes will be sought by the lenders from the Project Proponent. The report will contain – (i) accomplishment to date, (ii) objectives attained and not attained during the period of reporting, (iii) challenges encountered and (iv) the targets for the next quarter. Internal monitoring will be based on some monitoring indicators.

An External Monitoring Agency (EMA) will be hired and engaged by NBBL to conduct external monitoring under a set Terms of Reference to be developed at detail design stage. The external monitoring agency will be qualified and experienced agency, which will not be involved in RAP implementation. The external agency would conduct periodic assessment of the RAP implementation and impacts to verify internal monitoring and to suggest adjustments in delivery mechanism and procedures as required.

The report of External Monitoring Agency is to be prepared biannually and submitted investors. External monitoring will be in two phases – compliance monitoring and social impact evaluation.

2.5.3 RAP Budget

Detailed budget estimates for RAP will be prepared based on the detailed designs of the project components and right of way finalization. The cost of resettlement activities, relocation and special assistance will be consistent and FGDs, surveys, training, monitoring and evaluation and income restoration must be included in the RAP budget.

Budget estimate of RP will be included in the overall project budget. The budget shall include:

- Detailed costs of land acquisition and livelihood and income restoration and improvement;
- Source of funding;
- Administrative and implementation cost;
- Cost for GRM and consultation/disclosure and
- Monitoring costs.

The resettlement benefits and assistance such as shifting cost, business/ income restoration allowance will be made available to all DPs irrespective of title as per the policy by NBBL. NBBL will ensure that the land acquisition and resettlement budgets are delivered on time to the DC and also ensure that the RAP should be submitted to the lenders for concurrence, and that fund for

compensation and entitlement under RAP are fully provided prior to award of civil work contract. All resettlement funds will be provided by the Project Proponent based on the financing plan.

3 GENDER ACTION PLAN

The Gender Action Plan for the *Nutan Bidyut (Bangladesh) Ltd*., Bhola has been developed in adherence to Gender and Development, 1998 and the Social Safeguards Policy (2009) of Asian Development Bank. The objective of the Gender Action Plan (GAP) is to ensure the mainstreaming of gender issues and concerns into all aspects of the project lifecycle through detailed planning, implementation, monitoring and evaluation activities. This will specifically be prioritised through the implementation of the ESMP for the project.

The Gender Action Plan will safeguard the interest of community women adjacent to the project site; promote their participation in project planning and activities (in any applicable form) and ensure safer and healthier living conditions for them. It will also contain actions related to construction related issues that affect women in the community as well labor and working conditions of women working involved in Nutan Bidyut (Bangladesh) Ltd. that is being implemented either through *Global Energy Ventures Mauritius (GEVM)* is a subsidiary of Shapoorji Pallonji Infrastructure Capital Company Ltd (SP Infra) or its contractors and subcontractors.

The Gender Action Plan that is discussed subsequently comprises of the following:

- An overview of the socio-economic profile of the women in the project area;
- Potential Gender-based impacts (adverse and beneficial) from the proposed slum rehabilitation scheme; and
- Recommended actions to incorporate a gender-sensitive approach for the Project.

3.1 SUMMARY OF SOCIO-ECONOMIC PROFILE OF WOMEN IN THE PROJECT AREA

The socio-economic baseline assessment that was conducted for the development of the ESIA and which has been developed on the basis of integrating existing quantitative data with some additional qualitative assessments that were undertaken through primary data collection of 206 families (approximmately20 from each of the above 10 villages) through a sampling strategy, has brought forth the following key observations on gender-based issues in the project area.:

Sex Ratio

Sex ratio of the Burhanuddin Upazila in Bhola District, where the project area is located is 97 male per 100 female as per 2011 Census, which is lower than

the sex ratio [1]of Bhola district (99 males per 100 females) and the national sex ratio is 100 (Table1.1). Sex ration is one of the most important indicators defining gender equality. This indicates improvement in one of the Human Development indicators that can enhance gender equality influencing progress in productivity, improve development outcomes and make institutions more representative.

Table 3.1 ***Comparative Sex Ratio Representation of Burhanuddin Upazila***

Social Indicator	Bangladesh	Barisal Division	Bhola District	Burhanuddin Upazila
Sex Ratio	100	97	99	97

Source: Population and Housing Census, 2011: Community Report- Bhola

The female sex ratio shows an improvement since 2001 Census (Table 1.2) at the Upazila level. The following table gives a comparative overview on the female sex ratio improvement status at the Upazila level.

Table 3.2 ***Comparative Overview on Improved Female Sex Ratio in Burhanuddin Upazila***

Key Indicator (Sex Ratio)	Census 2011	Census 2001
Urban	106	112
Other Urban	95	105
Rural	96	106
Total	**97**	**106**

Source: Population and Housing Census, 2011: Community Report- Bhola

Female Sex Ratio at the Union level, that majorly covers the rural population, also shows remarkable improvement as represented in the table 1.3.

Table 3.3 ***Sex Ratio at Union Level***

Union	Sex Ratio
Kachia	99
Kutba	96
Pakshia	97
Deula	89
Gangapur	97
Sachra	97
Tabgi	97

Source: Population and Housing Census, 2011: Community Report- Bhola

Education

Improving female educational levels has been demonstrated to have clear impacts on the health and economic future of young women, which in turn improves the prospects of their family and entire community. Yet, many barriers to education for girls remain.

[1] Sex Ratio is - Number of males per 100 females

The female literacy rate (49.4 percent) in Bangladesh is lower than the National rate (51.8 percent) and the same is reflected at the Barisal Division level and district level. However the literacy rate of Burhanuddin Upazila (location of the project area), is better than the district level (Table 1.4).

Table 3.4 Comparative Literacy Rate of Burhanuddin Upazilla

Social Indicator	Bangladesh	Barisal Division	Bhola Division	Burhanuddin Upazilla
Literacy Rate	51.8	56.8	43.2	47.9
Female Literacy Rate	49.4	55.9	42.9	46.7

Source: Population and Housing Census, 2011: Community Report- Bhola

The literacy rate of the Upazila shows an improvement as per Census 2011 in comparison to 2001, however the female literacy remains lower than the male literacy rate over the decade (Table 1.5).

Table 3.5 Literacy Rate by Sex in Burhanuddin Upazila

Item	1991	2001	2011
Both Sex	21.2	37.2	47.9
Male	26.3	40	49.2
Female	16	34.2	46.7

Source: Population and Housing Census, 2011: Community Report- Bhola

There remains a sex difference in the school attendance rates in various age groups. The school attendance rate of female students is higher than the male students upto Upper Primary level (Class VIII). The male students tend to dropout to do odd jobs for supporting family income. This has been reported during the community consultations. Again very few girl children pursue higher education.

The literacy rate in the sample households was recorded at 74 percent which is higher than the overall literacy rate of all unions in study area (48.2 percent). The female literacy rate was recorded as slightly lower than male literacy rate among the surveyed households i.e. 72 percent and 76 percent, respectively.

Livelihood Status

Community consultations and household survey reveals that most of the women in the study area are housewives. Their level of involvement into economic activity is limited upto rearing livestock in house. Cultural restrictions especially prevent them from entering into any livelihood options. However, some women reported that they work in their own agricultural fields during paddy sowing and in harvesting period. Consultation with the women's group revealed that they are very keen to learn different skills and vocations so that they can earn sitting back at home.

Women with Vulnerability

Women headed households, widows, households headed by women with physically challenged family members, single elderly women living alone, in the study area have been identified as the vulnerable women. As per 2011 Census 5.9 percent women are widow and 0.3 percent women are divorced or separated in Burhanuddin Upazila.

3.2 GENDER ISSUES

The key gender issues relating to women population in the project area can be classified into two sections: (i) women working in construction site, and (ii) women residing in the adjacent settlements of the project area who may potentially get impacted during the construction period due to movement of the construction materials and labour influx.

3.2.1 *Women working in construction site*

Consultations with the project proponent indicates that during the construction period the unskilled labors will be hired from the adjacent impacted unions in particular, however chances of women employment will be very negligible. Women's participation in construction and also in operation and maintenance phase in almost negligible due to the nature of the infrastructure development. The social, cultural barriers and physical abilities refrains women from taking part in various construction related activities. There may be presence of some female skilled workers during the construction or operation phase. Involvement of local community women may be required for washing, cleaning and helping the workers with their daily domestic chores at their quarters or dormitories.

3.2.2 *Women population from the Adjacent Settlements of the Project Area*

Consultations with the women's group from the settlements adjacent to the project area indicated the following issues:

Livelihood: Participation of women into income generating activities is very low. They have been refrained to work outside due to socio-cultural limitations.

Decision Making: Consultations revealed that the primary decision makers of the family are the male members and women are constrained from meaningfully participation for decision making either at family level or at community level.

Infrastructural barriers: Most of the households in the villages have sanitation facilities, but these are non-water sealed pit latrins (usually a makeshift arrangement with a pit in the ground); women and adolescent girls often suffer from urinary tract infection problems as because of it. This has been further confirmed by the Upazila Health officials.

Other Social Issues: Consultations with women's group indicated there are other concerns relating to welfare of the women: (i) dropout of girls from schools at upper-primary and secondary level due to financial constraints of the families, (ii) lack of initiative of the NGOs that forms thrift and credit groups to organise skill trainings that will help them to earn locally as girls and women mostly do not travel out for earning.

Overall, it can be ascertained that the *Project* will need to adopt a gender sensitive approach in order to improve, enhance and optimise gender features that will benefit the women population in the project area.

3.3 ADDRESSING GENDER-BASED CONCERNS

This section summarizes the specific actions that have to be undertaken during the planning phase and the recommended actions during construction and operations to ensure gender-based benefits of the proposed project. In general, the gender action plan underscores the importance of participation of women (across slum blocks) in a free, prior and informed manner across various activities of engagement.

The basic objectives of the Gender Action Plan are:

For Working Women in Energy Sector

- Identify and understand the reasons behind gender disparities in energy sector and make effort to bridge the gaps – wage gaps, non-discrimination in employment, sexual harassment, facilities available such as toilets, resting areas, crèche for children (especially at construction sites), etc.
- To ensure increased women participation in energy sector for reducing gender disparity and gender mainstreaming.

For Women Population of Project Area Adjacent Villages with special focus on Vulnerable Women

- Identify and understand the profile of women in the project area and whether they face any unique vulnerabilities;
- Mitigate impacts that are primarily felt by women;
- Ensure that rights and rehabilitation assistance is easily available to single and vulnerable women in general and those with unique vulnerabilities and/ or unable to prove eligibility;
- Use the opportunity in the project to address some root causes of gender based discrimination, participation in energy sector decision making; and
- Intervene to develop long terms programmes to improve the lives of the women working towards improving their incomes.

Measures for the Gender Action Plan

Issue	Measures of Engagement	Implementation & Resources	Monitoring Indicators
A. Women Population from the Adjacent Settlements of the Project Area			
Use of renewable energy as alternate source	• Help local women and men from adjacent villages of the project area in installation of solar panels for use of solar power • Technical training may be provided for operation and maintenance of the solar panels	The Executing Agency can facilitate and provide assistance for the training on renewable energy based electricity generation in small scale at household level with the help of any local NGO.	30% of women participation in trainings;
Women in energy decision making	• Women to be trained and empowered to be part of household energy solutions – their understanding and knowledge about their own household energy needs to be translated in defining the way forward on access to clean, affordable and sustainable energy.	Executing Agency to facilitate trainings with help of any local NGO working on sustainable renewable energy.	Minimum 100 women receive training and are empowered as energy decision makers
Improvement of local energy infrastructure for poor communities and households	• Number of newly electrified household increased, covering , especially women headed households • Improved street lighting facility in the adjacent project area, ensuring security and safety specially for girls and women	Executing agency with support of Rural Electricity Society	25 % women headed households
Eligibility of single women	It is recommended that the developer should identify women or women groups that are vulnerable due to a social or economic situation and ensure that their rights to tenure and/or other rehabilitation assistance as determined by their eligibility is made available/ensured.	Identification of women with unique vulnerabilities through survey	Proportion of women-headed households rehabilitated; Proportion of vulnerable women included in rehabilitation assistance;
Identification of Development Opportunities	Executing Agency with the help of NGOs to identify opportunities, such as self-help groups and entrepreneurial ventures, to facilitate gender-based initiatives to promote self-employment.	Specific programs need to be developed through NGOs and training will need to be conducted for supplementary income generation	Number of gender-specific programs each year and proportion in total CSR Budget; Number of women participating in the venture; Tracking impacts of such ventures
B. Working Women in Energy Sector			
Women workforce	Encourage contractors to prioritize the use of local materials and the employment of local workers and to maximize use of women (at least 30%) in labour-based work	Initiative to be taken by the developers and ensure policy alignment with the contractors hired	Minimum 30% of the workforce are women at the construction site

Issue	Measures of Engagement	Implementation & Resources	Monitoring Indicators
Equal wage	• Ensure equal pay for equal work for women and men for all construction and maintenance work • Also to be included in contractors agreement	Executing Agency and Contractors	All workers (both women and men doing same work) receive same wage and reflected in payroll
Employment Opportunities	Technical training can be provided to the local workforce, for inclusion in operation and maintenance phase	Executing Agency can take the initiative and implement it with the help of local NGOs, who are working in such skill training programmes. Training can be provided through the technical training institute present in Bhola.	Can target minimum 25 % women
Employment announcement	Announce employment opportunities and recruitment notices widely, targeted at women as well as men.	To be implemented by the contractor	Notice of employment opportunity published in local newpapers, cable channels, ward offices, housing society offices, outside the construction site, etc.
Availability of basic facilities	Ensure basic facilities (separate toilets, clean water, drinking water facilities, resting place, crèche) are provided for female as well as male workers at the construction site	To be implemented by the contractors and to be ensured by the developers	All facilities available at the construction site and used by the women workers
Community Audit Group	It is recommended that women are made to assist with the proceedings of the Community Audit Group (CAG) activities that are to take place on a monthly and/or quarterly basis. Developer should ensure that specific feedback from women gets heard as well as addressed during such initiatives	Sensitization as well as identification	Number of sensitizations workshops conducted on Community Audit Groups Number of audit visits undertaken in presence of women group members

3.4 Conclusion

The Gender Action Plan that has been formulated will need to be revisited and reassessed as the project continues. Emphasis will need to be made on the importance of women's involvement in energy decision making and leadership for community development.

The central role that women will need to play in the successful implementation of the Project is justified not only on the grounds of gender equity but also upon the demonstration of their skills as managers of the family. With their experience of running households on inadequate budgets, poor women take easily to managing projects when given exposure, training and opportunity.

Representative community organizations (self-help groups) are crucial for developmental initiatives that target the poor and a significant women's presence not only makes the representation more even but more effective as well.

NBBL will require an approximate workforce of 1500 persons during the construction phase. During the transition phase between construction and operations phase, there will be gradual decline in workforce (~600) which will come down to ~70 workers during the operations phase.

Several activities associated with the Project are expected to induce an influx of employment and business seekers into project's area. This Labour and Influx Management Plan (LIMP) has been compiled to address the specific impacts that are anticipated to occur as a result of the project and sets out a formal system by which the project proponent, i.e. NBBL, will implement mitigation measures that will reduce the adverse impacts of project induced influx.

4.1 PURPOSE, SCOPE AND OBJECTIVES

The purpose of the LIMP is to provide a clear set of actions and responsibilities for the control of impacts linked to project induced migration, primarily within the area, especially near the project footprint near Kutba and Dakshin Choto Monika villages of Kutba union.

The scope of the LIMP includes all direct and third-party workers and their amenities that are put in place by NBBL, their lead contractors and any sub-contractors.

The objectives of this LIMP are as follows:

- To monitor the scale of project-induced influx into project area and any specific migration "hotspots";
- To avoid unplanned and unmanaged influx into the area; and
- To mitigate and manage any adverse impacts and enhance any beneficial ones, especially impacts that may strengthen the local economy.

This LIMP should be read in the context of the Environmental and Social Management Plan of the ESIA and will be implemented in conjunction with and in relation to the Occupational Health & Safety Plan and Stakeholder Engagement Plan.

4.2 APPLICABLE STANDARDS

The Labour and Influx Management Plan of the project is designed to demonstrate that Bangladesh Labour Act 2006 (as per the Bangladesh Labour Rules 2015) and international requirements (including International Labour Organization -ILO Conventions, ADB SPS 2009, IFC Performance Standard 2) are consistently applied throughout the construction and operations phase. A summary of the legal requirements and standards relevant to the LIMP are provided subsequently:

1. Based on preliminary review, there is no relevant national Bangladesh legislation relevant to the requirements related to the management of project-induced influx;
2. ADB SPS 2009 Prohibited Investment Activities List (Appendix 5) excludes production or activities involving forced and child labour from qualification for ADB financing;
3. The IFC Performance Standard 2 focuses on the protection of the basic rights of workers, fostering constructive worker-management relationships, as well as promoting safe and healthy workplace.
4. The IFC PS 4 on Community Health & Safety and Security includes references to avoidance or minimising the transmission of communicable diseases that may be associated with the influx of Project labour;
5. The LIMP has also considered building on from good practice references as provided in:
    a. "IFC's Handbook on Project Induced In-migration - Projects and People: A Handbook for Addressing Project-Induced In-Migration";
    b. IFC and EBRD Guidelines on Worker Accommodation.

4.3 LABOUR ACCOMMODATION DURING CONSTRUCTION AND OPERATIONS PHASE

A labour camp will be established near the project site which will house migrant workforce. The project proponent will endeavour to maximise local employment, however, there will still be migrant workforce required depending on skill level available locally. The labour camp is expected to house approximately 600-800 migrant labourers during peak construction phase. This number can be go higher based on availability of local skilled labourers.

NBBL will not establish a project colony or provide leased accommodation for operations phase. The employees (~70 employees) will stay in Burhanuddin town or nearby areas on a rental basis.

4.4 COMPONENTS OF THE LIMP

4.4.1 Summary of Key Impacts

Economic Implications

- Increased price inflation and economic vulnerability due to the arrival of migrants into the project area, which may result in additional demand for goods and services causing an increase in the cost of basic goods;
- Decreased food security through diminished communal and natural livelihood assets;
- Increased competition for natural resources, land occupation and use, such as the proliferation of informal settlements around the project location;
- Increase in business and entrepreneurial activities and opportunities near the labour camp and construction site in form of service providers like

barbers, mechanics, carpenters, electricians, laundry, restaurant/food stall operators, vegetable and meat/fish shops, grocery stores etc.;
- Income earning opportunity through rent for owners of houses/flats in Burhanuddin town where NBBL employees may reside during the operations phase.

Pressure on Local Infrastructure

- Increased demand for potable water due to increased population sizes and proliferation of informal settlements in certain hotspots;
- Increased pressure on existing infrastructure, such as inadequate schools, health centres, waste disposal facilities and water supply network;
- Increased potential for the transmission of communicable diseases from immigrant populations to local communities, with potential for epidemics;
- The presence of migrants can lead to a large increase in the quantities of solid waste with impacts on environmental health conditions.
-

Social Implications

- Potential breakdown of traditional institutions, traditional leadership structures and cultural norms;
- Increased incidence of prostitution, increase in sexually transmitted diseases and specific anti-social behaviours (including violence against vulnerable social groups);
- Conflicts with community leaders and youth due to lack of knowledge of the local culture, beliefs, habits etc.

4.4.2 *Key Interventions under the LIMP*

Economic Interventions

- Employment of local labourers during the construction and operations phase will be given priority in order to reduce the need for a sizeable proportion of workforce to be recruited from outside the area. The project will seek maximum employment from local areas (within Bhola District) to meet its construction workforce requirement Subject to availability and necessary skills;
- The project will tie-up with Industrial Training Institute (ITI), Bhola for intake of semi-skilled and skilled workers for project work. The ITI runs various skill development courses for electrical work and repair, carpentry, welding, plumbing etc. NBBL will aim at upskilling the local workers to enable their engagement in specialised activities during construction and operations phase;
- Any requirements of semi-skilled and skilled workers will be first advertised in local newspapers and pamphlets should be displayed in ITI and colleges in Bhola and Burhanuddin to enable maximum intake of local workforce;

- Provide low-cost shopping opportunities at camp to prevent large scale price fluctuations and disequilibrium in demand and supply of important goods;
- Identify regional businesses that can supply the needs of the project. Consider packaging of contracts to enable local businesses to participate in supply of raw material, providing services and carrying out construction and operations related activities. This can be undertaken by:
    - Transparent bidding process for procurement of materials and upcoming bids and contract opportunities should be advertised in local newspapers;
    - Extra weightage to local businesses and contractors during bid qualification and selection. Furthermore, a list of pre-qualified local vendors can be prepared over time keeping in mind that scope for new entrants and healthy competition among local enterprises should be available;
    - Requirement of perishable food items and any other material available in Bhola District should be met locally;
    - Preference to enterprises or companies owned or operated by local women.

Site and Infrastructure Development

There will be one labour camp/worker accommodation located within or adjacent to the site and all workers to be engaged in construction activities will be stationed here. As a precedent, Bhola-I project set up a labour camp and worker colony within the premises and the same land was later transferred to this project. Therefore, local community has been introduced to labour influx in the area although with limited interactions with in-migrant workers as the labour camp was located inside the project site.

- The workers engaged by the Contractors and sub-contractors involved in manual labour and unskilled trades would reside in the construction workers camp established in the project site. The construction workers camp to be set up by NBBL and its contactors would ensure adequate living conditions with basic amenities. The facilities to be provided in the camp would include:
- Canteen/mess facilities for food;
- Electricity;
- Rooms should be well-ventilated with adequate lighting and electrical connections;
- Beds and bedding;
- Potable water supply and monthly water quality testing;
- Provision of cooking fuel;
- Provision of separate toilets and bathrooms for men and women (although, it is expected that there will very few or no in-migrant female labourers);
- Emergency Response Plan, fire extinguishers;
- Grievance mechanism;

- Waste management in the camp;
- Pest Management and Fogging during rainy season to prevent malaria;
- Medical facilities and education facilities.

A labour accommodation monitoring checklist is provided in ***Appendix A*** of this document.

Additional interventions will be required to document and monitor the proliferation of settlements and work with the local district and upazilla and union authorities to upgrade community infrastructure.

Stakeholder Sensitisation

NBBL will sensitise contractors and workers about the profile, characteristics and features of the local community as well as specific rules of conduct pertaining to substance abuse, avoidance of conflict etc. Specific interventions with the local agencies will also be explored to track influx.

The following table summarises the key interventions during the construction and operations phase:

Table 4.1 Influx Management Plan Measures

S. No	Objective	Management Measure	Monitoring	Responsibility
1	**Economic Interventions**			
1.1	Minimise influx of job seekers through clear communication of employment opportunities and human resources procedures.	Implement the following: • Plan recruitment and procurement to boost local benefits and avoid the in-migration of opportunistic in-migrants. • Implement employment policy forbidding informal labour hire; • Tie-up with local ITI in Bhola and advertising of jobs in local newspapers • Options to introduce construction and operations skill related to courses in local ITI in Bhola to enable absorption of local workers in the project should be explored; • Deploy signage in local language related to project hiring, skill development programs etc. in relevant locations (away from areas identified to be sensitive to in-migration); • Engage new migrants' close to NBBL worksites in a timely manner about hiring policies.	Register of local employment; Communication meetings and signage on local hiring policy Advertisements in local newspapers Number of workers sourced from local ITI and colleges	HR In-charge
1.2	Monitor food prices and rates of inflation	Monitor food prices through the review of the changing cost of a standardised basket of goods.	Database of price fluctuations	Procurement In-charge
1.3	Maximise local procurement strategies	• Develop an inventory on the type of goods required, their frequency and list of local vendors; • Undertake a quick check of local vendors on any child labour or forced labour and register them; • Develop a contracting strategy for consumables, equipment, services etc. and link to the CSR/Community Development activities. •	Registration and spend on local vendors in Burhanuddin, Bangla Bazaar and Bhola	Procurement in-charge
2	**Site/Infrastructure Development**			
2.1	Minimise dependence of project workers on local resources	• Develop worker accommodation for construction with all facilities that prevent pressure on local resources, including potable water, sanitation etc. • During the operations phase, a project colony will be set up to avoid proliferation of settlements in the vicinity of	Site plans, their maintenance and upkeep	HR In-charge

S. No	Objective	Management Measure	Monitoring	Responsibility
		the project area		
2.2	Monitor the rate of expansion in migrant hotspots in order to understand the rate of influx	Analysis of aerial / satellite imagery of the local settlements in order to assess their expansion. This assessment will focus on the villages of Kutba, Dakshin Choto Monika, Kachia etc.	Database of historical aerial / satellite photography compiled and updated	Community Liaison Officer
2.3	Prevention of informal settlements around the project site	• Develop buffer zones around NBBL/contractor infrastructure, including worker accommodation. • Develop culturally appropriate signage, in partnership with local government inside buffers directing new arrivals to areas planned for new development.	• Record zoned areas in maps • Engagement records with traditional leaders to discuss approach to in-migration and Project buffers; • Engagement records with inhabitants of new settlements within buffers	EHS/Compliance
3	**Stakeholder Sensitisation**			
3.1	Engagement to understand concerns on influx	• Develop a detailed engagement plan and schedule related to informing stakeholders of increases in workforce and potential for influx. • Engage with Government authorities and Upazilla and Union Parishad on issues, risks, and opportunities regarding influx; • Engage with local communities to understand their concerns, raise awareness of risks and opportunities, and identify solutions to issues relating to in-migration; • Engage local formal and traditional authorities around the development of new settlements along the access routes to site; • Develop a feedback and grievance mechanism to collect any feedback or grievances related to in-migration.	• Records of engagement undertaken; • Stakeholder engagement minutes; • Database of feedback and grievances; • Presence of a feedback and grievance mechanism that is clearly documented; • Feedback and grievances accepted and responded to within targeted timeframe	EHS and Community Liaison Officer
3.2	Collaborate with Upazilla and Union Parishad and local NGOs government authorities to provide education and awareness programmes focused on diseases and health practices related to sanitation and hygiene as well as anti-social behaviour and substance abuse	Develop information, education and communication campaigns around diseases and health practices related to sanitation and hygiene for workers as well as adjoining local communities	• Presence of Education Health and Awareness Programmes • Record of engagements • Presentation of programme materials	Community Liaison Officer

S. No	Objective	Management Measure	Monitoring	Responsibility
3.3	Develop and implement a camp management policy in order to limit outsider workforce interaction with local population.	Develop a camp management policy stating and ensuring that the worker's camp and the project colony during operations phase are closed spaces with access restrictions in place. This will prohibit unauthorised visitors and mean all employees are restricted to camp during off-duty hours. This will be supported by appropriate engagement with workforce, signage and security / sign-in /out procedures	Presence of camp management policy stating closed camp; Security records of workforce signing out	EPC Contractor
3.4	Develop and implement an integrated capacity building programme designed to empower local /and regional government to manage in-migration	• Provide technical support to relevant government authorities with the aim of assisting them in effectively administering land development and land use changes as appropriate. • Provide support for the establishment and operation of In-Migration Committees in settlements identified to be at high risk from in-migration. These committees will take part in promoting spatial planning, monitoring in-migration, identifying arising issues, and promoting good relations between local people and in-migrants. • Work with local authorities and village leaders to actively manage in-migration and its impacts, particularly through registering newcomers and directing them to appropriate accommodation options. • Provide opportunities for local authorities and village communities to plan, prioritise, build and maintain necessary infrastructure.	• Presence of capacity building programme • Record of training and development activities • Record of government officials in attendance • Record of engagements with communities • Qualitative feedback from beneficiaries	Community Liaison Officer
3.6	Develop measures to screen and test worker health to manage potential health impact related to community-worker force interactions (which may be worsened by influx).	• Pre-employment medical check-up; • Community health baseline monitoring camps in the project area; • Regular/ongoing alcohol and substance abuse tests and sensitisation/awareness on the effects and impacts	Health check-up records; Disease profile in local health centres and onsite clinic	EHS/ Compliance

4.5 INSTITUTIONAL SET UP

The institutional set up proposed for influx management would come under the purview of NBBL's Human Resources (HR) and Administration Department with reporting to the Construction Manager and the General Manager for Operations.

The Human Resources Manager at the site will coordinate with the Contractors' administration representatives and the Community Liaison Officers to monitor impacts at any hotspots where informal settlements come up and within the contractor worker areas and onsite worker facilities.

This core team will require support from representatives across civil engineering and utilities, EHS, Compliance and the Security Department to coordinate and implement measures identified for managing influx at site and for liaison with the government agencies.

4.6 MONITORING

In order to verify the management measures, NBBL will require several monitoring systems as part of its overall ESMS which will include (but not be limited to) the following:

- Local employment and local procurement repository and vendor details;
- **Labour Accommodation Monitoring**: labour accommodation monitoring checklist is provided in ***Appendix A*** of this document.
- **In-Migration Database –** this will track the results of project induced influx monitoring including aerial / satellite imagery, wide-angle photographs of settlements, interview responses with traditional leaders, local residents and local stakeholders in the area of health, education, and local community infrastructure, food prices, signage developed, zoning maps, and mid-term baseline monitoring results;
- **Stakeholder Engagement Database –** this will be used to track and record the dates, minutes and attendance at engagement activities. In addition the database will be used to log relevant stakeholders and contact details;
- **Community Feedback and Grievance Mechanism –** this will log all grievances, issues and concerns raised during engagement sessions. The system will also include areas to record information on measures to address issues, timeframes, personnel responsible and any subsequent feedback that is required;
- **Worker transport –** this will be controlled through the use of (for example) ID/access card along with tracking information with local law and order enforcement agencies.

4.7 REPORTING AND DOCUMENTATION

NBBL will comply with any Government of Bangladesh reporting requirements relating to influx management if any and as requested or ordered by the government. An internal reporting and monitoring program relating to influx management will be put in place and management reports will be published at least annually.

A summary report will be developed and disclosed to the local community on an annual basis that will focus on outcomes of any community complaints and actions taken to remedy significant impacts. This will be undertaken in non-technical languages and in suitable local language in a culturally appropriate manner.

Local communities and other stakeholder will have access to the Grievance Redressal Mechanism that is put in place for the project to report any concern resulting due to influx of project labour and other informal settlers into the area or conflicts between the local community and migrant workforce.

The labour accommodation checklist aims to provide a basis for evaluation of the accommodation facilities provided to workers. The intent of this checklist is to ensure that the labour accommodations satisfy at least the minimum prescribed international standards for worker housing.

Primary Responsibility: HR department, EHS & S departments as necessary.

Labour Accommodation Checklist				
Location:				
Date of inspection:				
Total Number of Labourers residing in the Labour Camp:				
Type of Accommodation and Number of dwelling units:				
Due Date of Inspection:				
Name and Designation of Assessor:				
	Yes	**No**	**NA**	**Remarks/Comments**
Labour Camp – General Requirements				
Is the location of the labour camp designed to avoid flooding or other natural hazards?	❒	❒	❒	
Is the labour camp location at significant distance from the nearby residential locality?	❒	❒	❒	
Is the project site adequately drained?	❒	❒	❒	
Is the labour camp designed as per approved plan ?	❒	❒	❒	
Is the building material used for the construction is safe and non-hazardous ?	❒	❒	❒	
Does labour camp provide sufficient thermal projection	❒	❒	❒	
Does labour camps are having proper access roads?	❒	❒	❒	
Sanitation Facilities	❒	❒	❒	
Does the labour camp have adequate sanitary and toilet facilities? If yes, are the number of toilets sufficient to suffice the number of labours.	❒	❒	❒	
Is the toilet facility provided with adequate supply of water is available?	❒	❒	❒	
Water, Wastewater and Waste Requirements	❒	❒	❒	
Are potable drinking water facilities available and provided to the labour camps? If yes, is it adequate for meeting domestic needs like bathing, washing and sanitation purpose?	❒	❒	❒	

Is the drinking water storage covered to prevent water stored therein from becoming polluted or contaminated?	❒	❒	❒	
Is adequate storage capacity available to store water for domestic purposes (storage of 48 hours reserve supply is adequate)?	❒	❒	❒	
Are their separate arrangements for sanitation and bathing facilities for men and women (in case of engagement of women workforce)?	❒	❒	❒	
Are the sanitation facilities maintained in good condition ?	❒	❒	❒	
Does the site have a proper drainage system?	❒	❒	❒	
Are all streams of wastewater generated from the camps leading to treatment and disposal facility (septic tanks and soak pits etc.)?	❒	❒	❒	
Do the labour camps have adequate number of dustbins for waste collection and disposal?	❒	❒	❒	
Are wastewater, sewage, food and any other waste material adequately discharged and disposed in compliance with local standards and without causing any significant impacts on camp residents, the environment or surrounding communities?	❒	❒	❒	
Living Conditions	❒	❒	❒	
Do the worker camps have adequate spacing inside to accommodate allotted number of individuals?	❒	❒	❒	
Are the labor camps properly illuminated?	❒	❒	❒	
Is labour camp designed considering safety from rain ?	❒	❒	❒	
Are the labour camps equipped to provide proper thermal comfort during winter seasons?	❒	❒	❒	
Are the labour camps provided with proper facility to keep valuables such as cloak room etc .?	❒	❒	❒	
Are the labor camps properly ventilated?	❒	❒	❒	
Have separate area for cooking being constructed/allocated for workers and proper hygienic conditions being maintained?	❒	❒	❒	
Have the workers been provided or allocated with proper sleeping arrangement like cots, mattresses, blankets etc.?	❒	❒	❒	
Health and Safety	❒	❒	❒	
Is the cooking facility separate from the living quarters to avoid any fire	❒	❒	❒	

hazards and is the LPG cylinders (if used) stored in well-ventilated area?				
Is the fire extinguisher been provided at the camps (If necessary)?	❒	❒	❒	
Are there adequate first aid facilities present at the camp and is it readily accessible at all times?	❒	❒	❒	
Are emergency contact numbers displayed prominently at the labour camp. The emergency contacts should include at least one number of principle employer?	❒	❒	❒	
Is a housekeeping register being maintained for the camps?	❒	❒	❒	
Are the workers sensitized on communicable diseases?	❒	❒	❒	
Are there staffs for general house keeping?	❒	❒	❒	
Vector Borne Disease control?	❒	❒	❒	
Are the workers provided with adequate personal protective equipments?	❒	❒	❒	
Community Related	❒	❒	❒	
Is the nearby community anyway getting affected by the labour camps and its activities?	❒	❒	❒	
What are the types of such activities?	❒	❒	❒	
Are there any sources through which there is a possibility of a disease spreading to the nearby community because of the unhygienic conditions at the labour camps? Has there been any? If yes, please specify and provide reasons.	❒	❒	❒	
Is the community getting affected due to the operation of any machinery in the labor camp premises?	❒	❒	❒	

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ERM India Private Limited

Building 10, 4th Floor,
Tower A, DLF Cyber City,
Gurgaon NCR – 122 002
India
Tel : 91-124-4170300
Fax: 91-124-4170301
Email: india@erm.com

Regional Office – West
801, 8th Floor, Windfall, Sahar Plaza,
J B Nagar, Andheri (East),
Mumbai – 400 059
Tel : 022 42107373
Fax: 91- 022- 4210 7474

Regional Office – West
702 Abhishree Avenue,
Near Nehru Nagar Circle,
Ambawadi Ahmedabad -380006 India
Tel: +91 79 66214300
Fax: +91 79 66214301

Regional Office -South
Ground Floor, Delta Block
Sigma Soft Tech Park
Whitefield, Main Road
Bangalore- 560 066, India
Tel: +91 80 49366 300 (Board)

Regional Office –East
4th Floor,
Asyst Park, GN-37/1, Sector-V,
Salt Lake City, Kolkata 700 091
Tel : 033-40450300

www.erm.com