REQUEST FOR EXPRESSIONS OF INTEREST

(CONSULTING SERVICES – FIRM SELECTION)

COUNTRY: Bangladesh.

NAME OF PROJECT: Bangabandhu Sheikh Mujib Shilpa Nagar (BSMSN) Development Project.

Credit No.: IDA-6676 BD

Assignment Title: Selection of Environmental & Social Consultancy Services.

Reference No. : PMC16-BSMSN-BEZA

The Government of the People's Republic of Bangladesh has received financing from the World Bank toward the cost of the Bangabandhu Sheikh Mujib Shilpa Nagar (BSMSN) Development Project under Bangladesh Private Investment & Digital Entrepreneurship Project (P170688), a project of the World Bank, and intends to apply part of the proceeds for consulting services.

Implementation period : 36 Months.

The detailed Terms of Reference (TOR) for the assignment can be found at the following website: www.beza.gov.bd

The Bangabandhu Sheikh Mujib Shilpa Nagar (BSMSN) Development Project now invites eligible consulting firms ("Consultants") to indicate their interest in providing the Services. Interested Consultants should provide information demonstrating that they have the required qualifications and relevant experience to perform the Services. The shortlisting criteria are:

1) The firm(s) should be registered for consultancy service. The firm has to establish an office in Bangladesh (if contract is awarded). The 'age of firm' in consultancy service is minimum 10 (Ten) years. It is preferable to limit the total number of firms/institutes in the association to three. In case of JV (Joint Venture), It is preferable to limit the total number of firms/institutes in the JV to three.

2) At least 10 years firm experience (years counting backward from the date of publication of REOI in the newspaper to 1st assignment of firm) in the field of Environmental & Social Consultancy Services etc. with verifiable success in the delivery of high-quality outputs within time and budget constraints (In case of JV, each member shall meet the requirement individually and jointly).

3) Experience in Consulting Services of similar assignment (Environmental & Social Consultancy Services e.g. preparation of Environmental & Social Impact Assessment, Resettlement Action Plan and Training on Environmental & Social compliance and Occupational Health Safety based on ESF of the World Bank and relevant GoB rules and policy) in terms of number of Contracts, Contract Value, Contract duration and complexity; The consultant will submit necessary supporting documents to understand the experience.

4) Staffing of the firm (organization) indicating availability of appropriate skills/ experts in the firm.

5) The firm who have similar experience in the Bangladesh and South Asia & South-East Asia will get priority.

6) Technical and managerial capability of the firm.

Key Experts will not be evaluated at the shortlisting stage.

The attention of interested Consultants is drawn to Section III, paragraphs, 3.14, 3.16, and 3.17 of the World Bank's "Procurement Regulations for IPF Borrowers" July 2016, Revised November 2020 ("Procurement Regulations"), setting forth the World Bank's policy on conflict of interest related to the assignment as per paragraph 3.17 of the Procurement Regulations.

Consultants may associate with other firms to enhance their qualifications but should indicate clearly whether the association is in the form of a joint venture and/or a sub-consultancy. In the case of a joint venture, all the partners in the joint venture shall be jointly and separately liable for the entire contract, if selected. In case of joint venture, each member of the joint venture should have specific Environmental & Social Consultancy Services experience in at least one similar work indicated above.

A Consultant will be selected in accordance with the **Quality and Cost Based Selection (QCBS) method; Market Approach-International** set out in the Procurement Regulations.

Further information can be obtained at the address below during office hours [i.e.,0900 to 1700 hours].

Expressions of interest must be delivered in a written form (hard copy along with a USB drive)/Email to the address below in person by 03 October 2022 before 2.00 pm (Bangladesh Local Time).

05/09/2022

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Bangladesh Economic Zones Authority (BEZA)
Prime Minister's Office

PMC-16-BSMSN-BEZA
Terms of Reference (TOR) for 'Environmental and Social Consultancy Services'

Background

1. Bangabandhu Sheikh Mujib Shilpa Nagar (BSMSN) will be the first multi sector economic zone comprising an area of around 30,000 acres, located in Mirsharai Upazilla of Chattogram district and Sonagazi Upazilla of Feni district. The BSMSN area is divided into several sub-zones. The BSMSN area is very potential due to its strategic location. It is only 10 Km west of the national highway (Dhaka-Chittagong highway) and 11.5 Km west of the nearby railway station[1]. The Government of the People's Republic of Bangladesh has received financing from the World Bank (WB) toward the implementation of the Bangabandhu Sheikh Mujib Shilpa Nagar (BSMSN) Development Project, a project of Bangladesh Economic Zones Authority (BEZA) under Bangladesh Private Investment and Digital Entrepreneurship (PRIDE) project of the World Bank. PRIDE would provide support for construction of some basic infrastructure (such as internal road network, gas pipeline connection, water supply, boundary wall, sewer and storm drainage system, CETP, Desalination Plant, Solar Power and environment friendly green Economic Zone etc.) on piece of land already developed under Private Sector Development Support Project (PSDSP), the predecessor of PRIDE. A new piece of land called International Master Development (IMD) zone would be developed under BSMSN Development Project (PRIDE) which may entail landfilling and similar basic infrastructure (Annex-A and B).

2. An Environmental and Social Management Framework (ESMF) was prepared during project preparation and sets out the procedure to be followed for identification, assessment and management of ES risks once sub-project location and design are finalized. During preparation of the project , an Environmental and Social Assessment (ESA) report was prepared and this will now be updated with site specific ESIA with finalization of ESMP and other instruments. The sites are now identified and the details are described in Annex B. BEZA intends to procure the services of a consulting firm/consortium of experienced consultants who are expected to be responsible for updating the existing ESA and ESMP as and when required. The firm would also be responsible for carrying out a detail environmental and social impact study for the IMD zone development and prepare Resettlement Action Plan (RAP) including living and livelihood impact assessment where necessary. The consulting services shall be provided by consulting firm(s) in compliance with Guidelines for the Employment of Consultants of the Government of Bangladesh (GoB) and the World Bank. Quality and Cost Based Selection (QCBS) method will be followed for this procurement under the financial assistance of World Bank administered by BEZA.

Scope of Consulting Services

3. The scope of this assignment are as follows:

a) To carryout ES screening and identify ES risks and impacts for all the eight sub-projects (except IMD Zone) under the project for which limited/or no information was available during project preparation phase and update the existing ESA report and ESMP following the procedure set out in the project ESMF. (Copy of the ESMF and ESA is available at BEZA website @https://www.beza.gov.bd/?s=PRIDE). A list of activities has been included in Annex-B. The updates will mainly focus on potential risk and impact not considered in previous studies, mitigation measures, update the baseline ES conditions with primary data and compare with secondary data where needed.

b) Carry out detail Environmental and Social Impact Assessments for the development of IMD zone including precinct B and part of precinct F, Gas Network and others support facilities as indicated in Annex-

[1] *The Project area map is given at Annex A.*

C. In the IMD zone, land filling is anticipated using dredged materials. As such, the firm should study effect of dredging/dredged materials on marine environment, soil, water and surrounding environment.

4. The updating of ESA and preparation of ESIA reports shall be prepared in light with the GoB rules and regulations and Environmental and Social Framework (ESF) (that includes ten ES standards) and Guidance Notes of the World Bank. An indicative outline of the ESIA report has been shown in Annex-D. A copy of the ESF and ESS Guidance Notes may be found at:

http://documents.worldbank.org/curated/en/383011492423734099/pdf/114278-WP-REVISED-PUBLIC-Environmental-and-Social-Framework.pdf

https://www.worldbank.org/en/projects-operations/environmental-and-social-framework/brief/environmental-and-social-framework-resources#guidancenotes

ESS1: ASSESSMENT AND MANAGEMENT OF ENVIRONMENTAL AND SOCIAL RISKS AND IMPACTS

The consulting firm would Identify Valued Environmental and Social Components (VESCs) which might be impacted by proposed activities, assess the impacts of the proposed activities on the VESCs. The consultant will collect and update existing ES baseline conditions of the study area if found necessary on the basis of reliable, recent secondary data and where necessary through primary data collection and assess impacts of the proposed activities. The assessment will cover:

Physical environment: Geology; topography; soil type and land use plan; meteorology; surface and groundwater hydrology; water quality and quantity; air quality; potential natural hazards and/or other related climatic events.

Socioeconomic and cultural environment based on primary surveys Population estimate; land use and patterns of land ownership and tenure practice; planned development activities; community structure; employment; distribution of income etc. It will also cover identification of the disadvantaged and vulnerable groups related to the project activities and propose how to integrate their concerns and needs into project design and ESMP . In addition, also cover gender-based violence (GBV) related issues and propose mitigation measures following the World Bank's Good Practice Note (GPN).

ESS2: LABOR AND WORKING CONDITION

The consulting firm will look at key labor risks such as hazardous work, child labor and forced labor, migrant or seasonal workers, discrimination against women, vulnerable workers etc, labor influx, occupational health and safety (OHS), possible accidents and emergencies, risks of GBV among others. Based on the assessment as well as the baseline information and situation of employment and livelihood options, the consulting firm will propose suitable measures leading to the improvement in the working conditions and OHS including policy and regulatory recommendations and setting up of OHS standards, where warranted, based on Good International Industry Practice (GIIP).

ESS3: RESOURCE EFFICIENCY AND POLLUTION PREVENTION AND MANAGEMENT

The consulting firm will broadly assess potential impacts on various environmental parameters such as air, surface and ground water and soil, hydrology, drainage etc. due to the land use plan/activities and recommend measures to reduce/mitigate such impact. The firm will address the issue of sustainable sourcing of construction materials throughout the implementation of the proposed activities and provide guidelines for sustainable material sourcing in line with

internationally accepted standards. The study would also consider the impact of climate change on the implementation of the proposed activities.

ESS4: COMMUNITY HEALTH AND SAFETY

The firm will assess the impacts of the proposed land use plan, growth of population and other activities on the health and safety of the communities in the project area of influence and will recommend measures and actions to efficiently handle the issue of universal access and community health and safety concerns (especially those emanating from potential labor influx, i.e. GBV etc) of the proposed activities. Reference may be made to the documents mentioned in ESS 2 above.

ESS5: LAND ACQUISITION, RESTRICTION ON LAND USE AND INVOLUNTARY RESETTLEMENT

The firm will carefully review the proposed activities to identify and assess risks and impacts related to land acquisition. If necessary, the consultant will also identify types and approximate number of project affected people (PAP) leading to an estimate of cost of resettlement and prepare Resettlement Action Plan (RAP).

ESS6: BIODIVERSITY CONSERVATION AND SUSTAINABLE MANAGEMENT OF LIVING NATURAL RESOURCES

The assessment will include identification of the types of habitats those might potentially be affected and consideration of potential risks to and impacts on the ecological function of the habitats. The firm will consider direct and indirect project-related impacts on habitats and the biodiversity they support. In planning and undertaking environmental and social assessment related to the biodiversity baseline, the firm will follow relevant GIIP utilizing desktop review, consultation with experts, and field-based approaches, as appropriate.

ESS7: INDIGENOUS PEOPLE/ SUB-SAHARAN AFRICAN HISTORICALLY UNDERSERVED TRADITIONAL LOCAL COMMUNITIES

The firm will update baseline information both by primary data collection and secondary data studies, on presence of IPs and/or ethnic minority communities in the study area meeting the definition of ESS7. The consulting firm will also analyse potential risks and impacts on IPs/ ethnic communities, if present in the area, due to any potential activities and suggest ways how the investments will meet the interests and concerns of these groups fully cognizant of their social, economic, religious and similar aspect as well as how they may have the opportunities to share in the benefits emanating from these investments. The firm will also suggest if free prior and informed consent will need to be taken from these communities following the criteria mentioned in the ESS7.

ESS8: CULTURAL HERITAGE

The firm will identify any significant archaeological and historical resources (including nontangible cultural heritages such as belief, experience, knowledge, traditional practice etc.) within the area of influence of the proposed activities, assess how these could be impacted and recommend steps to follow to address such impacts if found.

ESS10: STAKEHOLDER ENGAGEMENT AND INFORMATION DISCLOSURE

The firm would identify the key stakeholders related to the implementation of the proposed activities and carryout stakeholder consultation starting from the beginning of the assignment till finalization of report. The consultations will be in the form of workshop, face to face meeting, online collaboration as well field visits. The aim of the consultation will be to convey present, planned and potential projects/ activities' ES risk and impacts and incorporate their feedback in finalizing the report.

Analysis of Alternative: The consulting firm will include alternative analysis as necessary.

5. Additionally, in carrying out activities a) and b) above, the Consulting Firm will:
Follow the procedure set out in the ESMF of the project
Work closely with the design and supervision consultant and provide input into design and preparation of bidding documents by including environmental and social specification

6. To prepare RAP (including living and livelihood impact assessment) for any activities potentially requiring livelihood and living impact

7. To help BEZA in obtaining Environment Clearance Certificate (ECC) for ESIA of IMD zone including precinct B and part of precinct F , Gas Network, from the Department of Environment (DoE).

8. To provide capacity building support to BEZA on Environmental & Social issues by conducting a full-fledged training Program for BEZA staff, contractors, investors, workers, Private Economic Zones (PEZ) and other BEZA departments as necessary based on GoB ES related laws, policy and procedure as well as WB ESF and ESSs;

To prepare Occupational Health and Safety (OHS) Management Plan for all the proposed activities/ subproject. The OHS Plan should consider type of subproject and specific risk associated with the same and will include assessment of potential hazards, prevention of preventive measures, training, emergency procedure, documentation of incidents, remedies of adverse impact and monitoring,

9. To prepare Environment and Social (ES) specification to be included in the contractors'/suppliers' bidding documents for all the contract packages.

10. To undertake Stakeholder consultations in line with SEP during ESIA and preparation of ESMP and other instruments.

Design and implement Environmental & Social Training Program

11. The consultancy firm will design and deliver different training program as per Environment and Social Commitment Plan (ESCP) to the BEZA official, developers, investors, workers, contractors, adopting both online and face-to-face format. The duration of training will be 1 to 5 days. The firm will provide training to 300 officials and 800 workers in Economic Zones (EZ). Tentative training program would cover Basics of ESF, Occupational health and safety, labor and working condition, GRM, waste management, GBV etc

Expected Time Schedule

12. The total duration of consulting services will be 36 months. The implementation schedule expected is as shown in Table.

Key Activities	Duration in Months
Invitation of EOI	07/09/2022
Issue of RFP	30/09/2022
Commencement of Consulting Services	31/12/2022
Termination of Consulting Services	31/12/2025

Expertise Required

13. The consultant team will consist of both Key Expert and Non-Key Expert and will be engaged for the duration of consulting services. The team of key consultants is expected to be comprised of a Team leader (International), Environmental Expert, Social Expert, and Ecologist.

Key Expert

SN	Position	No	MM	Total
1	Team leader	1	36	36
2	Environmental Expert	1	30	30
3	Social Expert	1	30	30
4	Ecologist	1	10	10
Total		4	106	106

Non-Key Expert

SN	Position	No	MM	Total
1	Jr. Environmental Expert	1	36	36
2	Jr. Social Expert	1	36	36
3	Data collectors	3	8	24
4	Jr. Survey Expert	1	2	2
5	Jr. GS and RS Expert	1	2	2
6	Jr. Labor and OHS Expert	1	20	20
	Total	8	104	104

***Firm may propose additional non-Key expert as per requirement*

Qualification and Experiences:

14. The following tables provide minimum qualification for educational background and professional experiences. Qualification of Key Experts and Non-Key Experts

SN	Position	Qualification	Experience
KI-1	Team leader	Master's Degree in Environmental Engineering/ Environmental Science or equivalent degree.	• Minimum 15 years general experience in the similar position • Minimum 10 years specific experience in similar field in developing partner funded projects. Experience in World Bank financed project would be preferable.
KI-2	Environmental Specialist	Master's Degree in Environmental Science/Engineering.	• Minimum 10 years general experience in the similar position • Minimum 5 years specific experience in conducting

SN	Position	Qualification	Experience
			ESIA in developing partner funded projects. Experience in World Bank financed project would be preferable.
KI-3	Social Specialist	Master's Degree in Sociology/ Social Science/Social Welfare or similar subject.	• Minimum 10 years general experience in the similar position • Minimum 5 years specific experience in the similar field from a social perspective and have a proven track record with the WB ESF and Performance Standards or similar Multilateral Development Bank (MDB) requirements.
KI-4	Ecologist	Master's Degree in ecology, biology, botany (plant science) or marine biology. The client can also accept degrees in a related field such as conservation biology, environmental science, environmental planning, zoology, microbiology, geology or earth science.	• Minimum 10 years general experience in the similar position • Minimum 5 years specific experience in the similar field in assessing, managing, implementing ecology etc

Non-Key Expert (National)

SN	Position	Qualification	Experience
KN-1	Jr. Environmental Expert	Bachelor and Master's in Environmental Engineering/ Environmental Science, or equivalent degree;	• Minimum 5 years general experience in the similar position • Minimum 2 years specific experience in the similar field.
KN-2	Jr. Social Expert	Bachelor and Master's in Sociology/ Social Sciences/Social Welfare or any other similar subject	• Minimum 5 years general experience in the similar position • Minimum 2 years specific experience in the similar field
KN-3	Data collectors	Bachelor's in social science or arts or equivalent degree.	• Minimum 5 years general experience in the similar position • Minimum 2 years specific experience in the similar field
KN-4	Jr. Survey Expert	The survey Expert should have at least diploma in survey/civil/mechanical engineering	• Minimum 5 years general experience in the similar position • Minimum 3 years specific experience in the similar field
KN-5	GIS and RS Expert	The GIS and RS expert should have at least bachelor degree in Urban Planning or similar	• Minimum 5 years general experience in the similar position • Minimum 3 years specific experience in the similar field
KN-6	Jr. Labor and OHS Expert	Bachelor and Master's in Development Studies / Sociology/ Social Science/Social Welfare/ Environmental Engineering/ Environmental Science or any other similar subject	• Minimum 5 years general experience in the similar position • Minimum 2 years specific experience in the similar field

Supporting Staff

The consultant team may employ supporting staff for the supervision of the sub-projects and operation of the project office, if required. The supporting staff may include:

1) Inspector for quality control
2) Data collector
3) Administrator
4) Accountant
5) Typist
6) Surveyor

Reporting & Deliverables

15. Within the scope of consulting services, the Consultant shall prepare and submit reports and documents to the Project Director (PD), as shown in following Table. The Consultant shall provide hard and electronic copy of each of these reports.

List of submission of report

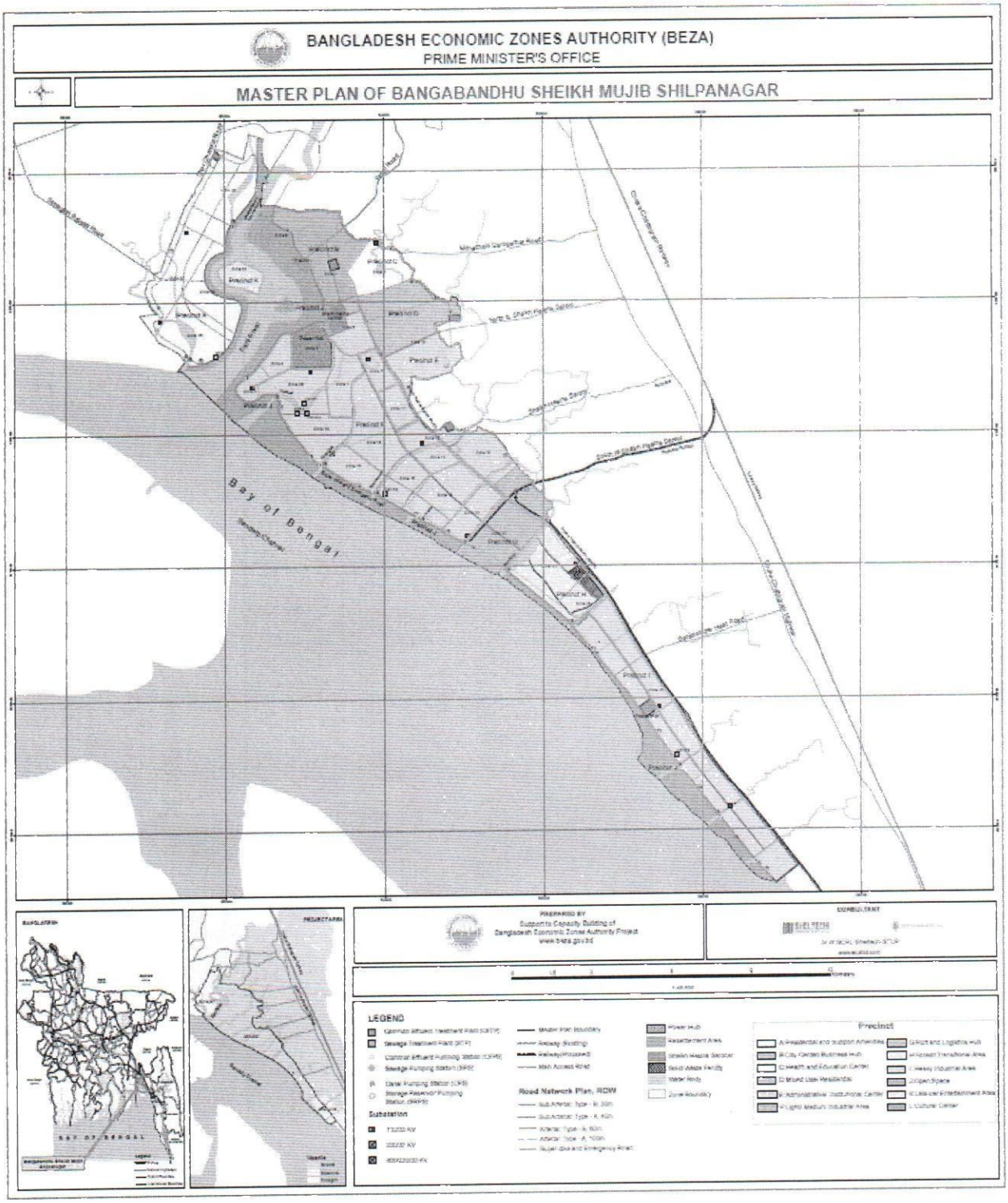
SL	Type of Report	Time Frame	Copies
1	Inception Report (including methodology, timeline, potential risk and impact, key issues identified on desk studies and field visits, responsibilities, etc)	Within 1 months after commencement of the services with presentation at project office including A list of all meetings and interviews with meeting notes and another list of studies and documents examined, gap analysis, work plan will be provided to BEZA.	07
2	Updating of ESA and ESMP (As per reference 2)	Within 3 months of finalization of location and design of any subproject Submit to BEZA and DoE for clearance and subsequent updating as per DoE's comments. (The consultant will update the ESA as per requirement and comment of BEZA, DoE and WB)	05 copies of each reports
3	Preparation of detail ESIA of IMD Zone including Precinct B & part of precinct F of BSMSN	Submit to BEZA, and DoE for review and approval. The drafts will be reviewed by DoE, BEZA and the World Bank and this will be finalized based on the comments .. (Within 6 Months of contract)	05 copies of each reports
4	Preparation of detail ESIA and route survey for Gas Network at BSMSN (as per ESS, Annex-D and E)	Submit to BEZA, World bank and DoE for clearance and subsequent updating as per DoE's and the World Bank comments. (Within 8 Months of contract)	05 copies of each reports
5	Preparation of Social Impact Assessment Report including	Submit to BEZA and World bank for clearance and subsequent updating as per BEZA and the	05 copies of

SL	Type of Report	Time Frame	Copies
	livelihood restoration plan and Resettlement Action Plan for construction of Boundary wall (if require)	World Bank comments. (Within 10 Months of contract)	each report
6	Preparation of detail ESIA for Super Dyke (Annex-C) under BWDB following same procedures of deliverable 3.	Submit to BEZA, World bank and DoE for clearance and subsequent updating as per DoE's and the World Bank comments. (Within 12 Months of contract)	05 copies of each reports
7	Preparation of detail ESIA for one other activity likely to be developed to support BSMSN during project implementation following same procedures of deliverable 3.	Submit to BEZA, World bank and DoE for clearance and subsequent updating as per DoE's and the World Bank comments. (Within 30 Months of contract)	05 copies of each reports
8	Environmental, OHS, and social Training Module	Within 06 months of the contract (One for officers and another for workers training)	100
9	Environmental, OHS, and social Training Plan for BEZA staff, contractors, investors, workers, Private EZs and conduct of training	Total 300 officers will receive training on ES & OHS (3-5 days) (Training will start after 6 months of contract) Total 800 workers will receive 1 day orientation training ES &OHS Submission of training assessment report.	5 copies of each report
10	Stakeholders' identification and consultation (Project Affected Parities-30 consultation, Investors of BSMSN- 20, Utility Service Provided-10, Local Communities- 35, Local Administration-20, Developers-05, NGOs-10, Workers-20)	According to Stakeholder Engagement Plan (SEP) of the project	As per requirement
11	RAP (if require)	02 months before invitation of Bids	
12	Final Report	Before 1 month of the closing of contract	20

REFERENCES

1. The Master Plan of BSMSN (http://www.beza.gov.bd/wp-content/uploads/2021/04/Master-Plan-of-BSMSN.pdf)
2. Environmental and Social Assessment (ESA) https://www.beza.gov.bd/wp-content/uploads/2021/04/12.-ESA-Main-Report-of-PRIDE-Project-BEZA.pdf
3. Resettlement Policy framework of PRIDE Project (http://www.beza.gov.bd/wp-content/uploads/2020/03/Resettlement-Policy-Framework-RPF-for-PRIDE-Project-of-BEZA.pdf)
4. Environmental and Social Commitment Plan (http://www.beza.gov.bd/wp-content/uploads/2020/03/Environmental-and-Social-Commitment-Plan-ESCP-BEZA-1.pdf)
5. Stakeholder Engagement Plan (http://www.beza.gov.bd/wp-content/uploads/2020/01/Stakeholder-Engagement-Plan-SEP-BEZA.pdf)
6. Labour Management Procedure (http://www.beza.gov.bd/wp-content/uploads/2020/01/Labour-Management-Procedure-LMP-for-PRIDE-Project-of-BEZA.pdf)
7. Environmental and Social Management Framework (http://www.beza.gov.bd/wp-content/uploads/2020/01/PRIDE_BEZA_ESMF_revised_Report_February-26-2020_clean.pdf)

Annex A : Master Plan of BSMSN



Annex B : Basic Infrastructure/Works

Si	Basic infrastructure	Description	Remarks
1	Road Network (30 km)	All Weather resilient arterial and non-arterial roads, footpath and plot entry culvert to increase readiness and resilience to natural hazard events (access and evacuation roads during natural disasters and extreme climate events).	Site selection done and ESA done previously and needs to be updated
2	Storm Water Network (31 km), resilient drains, infiltration & retention facilities	An integrated stormwater management network for BSMSN-2 including resilient drains, infiltration and retention facilities including nature-based solutions to drain the increased surface run-off from extreme precipitation and flooding.	Site selection done and ESA done previously and needs to be updated
3	Power Network (Distribution (OHT) Distribution, Transformer, Street Light (LED / Solar), and Internal Substation, 39 km	Construction of Internal Power Distribution (OHT) network (Transformer, Street Light (LED / Solar), Internal Substation, Fire Hydrant, etc)	Site selection done and ESA done previously and needs to be updated
4	Water Supply Network Water treatment plant with a capacity of 75 MLD with potential expansions up to 120 MLD, (together with the Desalination)	Construction of water supply network (A surface water treatment plant of capacity 50 MLD. Water will be withdrawn from Feni River. Construction of 25km water distribution network)	Site selection done and ESA needs to be prepared.
5	Sewer Network (25 km)	Green and climate resilient sewer network to enhance resilience against heavy rainfall and flooding.	Site selection done and ESA done previously and needs to be updated
6	Resilient Site upgrade and Building Development	Additional green and gray infrastructure and site development measures for BSMSN-2 to enhance resilience against flooding from the increase surface run-off from extreme precipitation and liquefaction resilience performance of flood prevention measures (super dike, embankments, site development) through green and gray investments (open Space/ Land scaping, Greenery along road; Percolation Pits, etc.), infrastructure maintenance, environmental lab and monitoring system, canal development and lining.	Site selection done and ESA done previously and needs to be updated
7	Security and	Security/boundary wall, key public buildings and facilities for BSMSN-2 such as fire stations,	Site selection done

Si	Basic infrastructure	Description	Remarks
	Support Amenities	administrative buildings, and emergency response center, security digital surveillance, including gender-sensitive infrastructure such as separate washrooms for women and men and proper lighting.	and ESA done previously and needs to be updated
8	Telecoms (25 km)	Connection of the zone with resilient telecommunication systems	Site selection done and ESA done previously and needs to be updated
10	Land development for BSMSN-IMD	Approximately 10,000,000 m3 for 500 acres.	Site selection done. ESIA to be developed

Annex-C : Super dyke adjunct to the Bay of Bengal by BWDB

Bangladesh Water Development Board (BWDB) is now constructing a coastal embankment (Super Dyke) and a slope protection embankment to protect the BSMSN area from flood, saline intrusion, erosion caused by tidal surge and natural disasters. In addition, the BWDB is constructing six sluice gates on the canals passing through the economic zone to Sandwip Channel in the Bay of Bengal.

Annex-D: Indicative Outline of the ESIA Report

1. **Executive Summary**
2. **Chapter 1: Introduction:**
   Background, Components of the Project, Objectives and scope of the Study, Approach and methodology
3. **Chapter 2. Regulatory Frame work:**
   Relevant regulations of GOB, World Bank ESF and Environmental and Social Standards, Comparison of GOB legislations and ESF and identification of gaps.
4. **Chapter 3. Description of Proposed Activities:**
   Description of the proposed activities with their locations
5. **Chapter 4. Environmental and Social Baseline:**
   Baseline Data Collection, Ambient air quality monitoring locations, Surface water quality sampling locations, Ground water quality sampling locations, Ambient noise level monitoring locations, Soil and sediment quality sampling locations, Assessment of Environmental Baseline (Physio-Chemical Environment, Ambient Air Quality, Water Resources, Drainage System, Ambient Noise Level, Land Resources, Seismicity, Assessment Biological Environment, Aquatic Flora and Fauna, Terrestrial Flora and Fauna, Ecological Assessment), Assessment Social Baseline (Demographic Profile, Income and Poverty, Assessment of infrastructure facilities, Housing Condition, Water Supply & Sanitation, Other Infrastructure facilities, Assessment of Baseline information on gender and women, Historical, Cultural and Archaeological sites).
6. **Chapter 7. Environmental and Social Impacts:**
   Determination of Impact Significance, Assessment of Environmental and Social Risks and Impacts, Impacts during Pre-construction, Construction and Operation phase of the proposed activities (E&S Risks and Impacts Related to 10 ESSs)
7. **Chapter 8. Environmental and Social Management Plan (ESMP):**
   Objectives, Mitigation Measures, Responsible Parties for Implementing ESMP, Environmental and Social Management Plan (ESMP), Monitoring Indicators, Environmental and Social Monitoring Plan, Labor Management Plan during Construction, Emergency Response and Disaster Management Plan, Guidelines on environmental and social conditions in the BOQ/contract documents, Estimated Budget for Implementing the ESMP
8. **Chapter 5.Analysis of Alternatives:**
   Introduction, Comparison of "Without Project" and "With project" Scenarios, Alternative Site/technology Consideration
9. **Chapter 6. Outcome of Stakeholder Consultation:**
   Consultation with stakeholders following SEP, Addressing recommendations from the consultation, ESA Disclosure, Grievance Redress Mechanism, GRM Monitoring and Reporting, GRM contact information
10. **Chapter 9. Implementation Arrangement:**
    Institutional Setting and Implementation Arrangement, Roles and Responsibilities of Various Organizations.

Annex-E: ToR of Route Survey for Gas pipeline Connection at BSMSN

1. BACKGROUND AND CONTEXT

As per the master plan, a large number of industries, factories including a couple of gas fired power stations, other establishments and residential areas will be developed in BSMSN. Approximately 584.9 Million standard cubic feet per day (***MMSCFD***) gas is required for around 1,200 customers to operate the industry inside BSMSN. At present, there is no gas connection network inside BSMSN. The local households use Liquefied petroleum gas (LPG) cylinder and firewood for cooking purpose. ***Therefore, Karnaphuli Gas Distribution Company Limited (KGDCL) is assigned to implement the establishment of establishing dedicated gas connection network to the Project Area.*** About 200 MMSCFD gas will be distributed to the site. For this, the company has planned gas pipeline network within the site, including other necessary infrastructure. It has already setup a Central Gas Station (CGS) at Barotakia (Mirsarai) to connect the proposed gas network inside the project area with the Gas Transmission Company Limited (GTCL) transmission network. The site is going to have natural gas connection from the existing CGS located at Noapara and two district regulating stations (Ichakhali Village and Char Sadar Bangla Bazar village) supported by 16 inches Bakhrabad-Chattogram Transmission line of KGDCL.

2. GAS PIPELINE SUB-PROJECT DESCRIPTION UNDER PRIDE

This subproject under PRIDE includes construction of gas pipeline networks to ***supply natural gas to 2A, 2B and adjacent industrial economic zones of BSMSN by KGDCL by connecting Bakhrabad-Chattogram Transmission line of GTCL along the Dhaka-Chattogram Highway via the Sheikh Hasina Saroni.*** This will be implemented under BEZA.

The gas pipeline works includes the following major items:

- 6 km gas pipeline of 24-inch diameter and 350 psig pressure.
- 6 km gas pipeline of 16-inch diameter and 350 psig pressure.
- 13 km gas pipeline of 10-inch diameter and 150 psig pressure.
- 7 km gas pipeline of 8-inch diameter and 150 psig pressure.
- Road/ River/ Canal/ Khal area crossing
- 5 nos. of Valve Station
- 2 nos. of HP-DRS
- Related Civil Works

The proposed gas distribution pipeline will be constructed along the utility corridor of the approach and internal roads connecting 2A and 2B zone which may require *some trench work and establishment of labour camp*. The installation of gas pipeline connection will involve:

i. Manpower Engagement, pipeline route and working area selection;
ii. Grading, stinging and coating of pipeline;
iii. Water body crossing through open cut system;
iv. Lowering in, tying in, cathodic protection;
v. Back filling;
vi. Commissioning;
vii. Land filling
viii. Metering station and other permanent structures above ground facilities.

The scope of the ESIA as related to this specific subproject is enumerated below.

3. Objectives

The main objective of the Route Survey is to identify the right of way (RoW), length, elevation and alignment of the proposed gas pipeline with accuracy and incorporate the associated technical, environmental and social issues into the ESIA study with a view to assess both positive and negative environmental impacts with mitigation measures due to the project activities. Assess the impacts and recommend appropriate mitigation measures during preconstruction, construction, and operation phases to minimize negative impacts of the project to acceptable levels. In the preparation phase, the Route Survey shall achieve the following objectives:

- To Physically verify the identified route and confirm its suitability for pipeline construction;
- To identify restrictive areas and suggest modifications/detours to the identified route;
- To establish the route on ground;
- Collection of development plans along the proposed pipeline route from BEZA KGDCL other relevant agencies having jurisdiction thereof;
- Collecting information required for obtaining clearance from various authorities including environmental clearance from DoE.
- To identify the right of way (RoW), length, elevation and alignment of the proposed gas pipeline and provide feedback to the EIA study;

4. SCOPE OF THE ASSIGNMENTS:

Preparation of Route Survey Report for the Gas Pipeline Connection at BSMSN project:

Task 1: Preparation of route map following the reconnaissance & Physical route survey;
Task 2: Preparation of physical survey and Topographic survey report.

4.1 Preparation of Route Survey Report for the Gas Pipeline Connection at BSMSN project:

Before start of construction of the abovementioned gas networks and associated facilities, selection of proper pipeline routes and location of associated facilities is very crucial for getting approval from concern departments, managing acquisition/requisition of land and starting tendering process of goods/works. This scope of work and specification covers the minimum requirements of topographical survey along the pipeline route including locating the centre-line of pipeline alignment on the ground & associated facilities, constructing survey monuments, field measurements for planimetry and profiles and preparation of drawings and documents for the appropriate route. This specification also covers the basic requirements for soil investigation for the purpose of visual engineering classification of soil and detection of geotechnical properties of soil for design & engineering of various structures/facilities required along the pipeline route.

4.1.1 Technical Details of the Route Survey:

This specification covers the following requirements of GPS technology-based survey (within 0.25-meter accuracy):

(i) Pipeline route centreline survey

(ii) Detailed Pipeline route survey

(iii) Soil investigation survey

All survey works shall be performed by or under the supervision of qualified land surveyor. All measurements shall be in metric units. The readings and noting shall be neat, legible and scorings.

Selection of route:

The following criteria will be used as minimum to select the pipeline route. If any contradiction between these criteria and the natural gas safety rules, 1991 of Bangladesh, then natural gas safety rules, 1991 of Bangladesh will prevail.

(i) Maximum route gradient

Along the pipeline alignment, 1:5 (excluding hill area)

Across the pipeline alignment, 1:10

(ii) Bend radius

Pipeline diameter ≤ 16 inch- 30D

Pipeline diameter > 16 inch- 40D

(iii) Minimum distance between Turning Point (TP), 100 meters
(iv) Maximum deflection angle at TP, 90°
(v) Width of Right of Way (ROW), 12 meters
(vi) Minimum distance from

Existing inhabited dwellings, 15 meters

Building/Structure/Monuments, 50 meters

(vii) Number of TP shall be kept minimum along the route. Additional traversing required for TP optimization shall be carried out before finalize the TPs

(viii) Chainages for pipeline shall start with 0.0 chainage in the direction of flow.

(ix) At Rail/Road/Khal crossing locations, nearest TP on either side shall be located at a distance not less than 50 meters from the ROW of the facility being crossed.

(x) In case of major river crossing, no TP shall be located within 150 meters from the defined bank on either side of the river

i) Pipeline route centerline survey :

The Surveyor is expected to make himself aware of the general conditions of the terrain before starting detailed survey. Route survey will be carried out considering Gas Safety Rule 1991 & Land Acquisition and Requisition of Immovable Property Act (ARIPA) 2017. Intelligent Total Station and satellite image will be used for the survey works. Surveyor must have to ensure that, "Land Acquisition & Requisition of Immovable Property Act 2017" and "Bangladesh Gas Safety Rule-1991" as well as "Environment and Safety Rule" are not violated in any way. In no way the pipeline route shall cross mosques, temples, churches, graveyards, school, bazar, market, electric substation & transmission line and mill factory etc. In order to avoid complexity, the information (in particular cases such as-houses/structures, institutions, mosques, madrasas, graveyards, crossings, amount of land, angle points, industries etc.) obtained from field survey will be jointly checked and scrutinized to ensure the authenticity of collected field data.

A. Alignment and location surveys

A preliminary survey for locating the centerline of pipeline alignment on the ground shall be carried out as follows:

5. Surveyor shall make a preliminary survey along the route of the proposed pipeline to establish the flag control points. Location of lands belong to different industries, Roads & Highway Department, Forest Department and other organizations or agencies that are on the finally selected route of the proposed pipeline should be clearly indicated.
6. Surveyor shall also locate and identify the existing features or obstructions along the route that are not shown in available maps or drawings. Archaeological sites, reserved forests, environmentally sensitive areas, mining sites and built-up areas shall be avoided.
7. Where it becomes apparent that a better route could be followed, the Surveyor shall consult the Employer for authorization to make a change.
8. Turning Points (TPs) shall be located by Surveyor in consultation with Employer considering the following:
    - To avoid obstruction along the line, by ranging on ground and shifting the Turning Point if needed.
    - Check for terrain gradient by using hand clinometer
    - Ensure proper angle of crossing by keeping as nearly right angle (to road /rail/streams, etc.) as possible.
    - To check from construction point of view and avoid objects like power, telephone and telegraph poles, walls, tube wells or such other structures falling in the strip of land, 25M on either side of pipeline alignment.

(ii) Detailed Pipeline route survey

a. Marking of Pipe Line

- The pipeline defining trench centreline shall be marked suitably at Turning Points (TPs) and at Intermediate Points (IPs) between consecutive TPs.
- The IPs and TPs shall be serially numbered form the starting point.
- Change in direction of line shall be marked.

b. Bench Marks

- Permanent Bench Marks (BM) should be placed at 5 locations along the Right of Way (ROW) preferably near the major pipeline crossing sites, Valve Stations and at DRSs.
- Location of Bench Marks shall be established in the field by using reinforced concrete blocks.

c. Crossings

As far as possible, crossings shall be made at right angles. The Surveyor shall record the angles of crossing for all fences, property lines, utilities, roads, railways, canals, streams, etc. that are crossed. In addition, the true bearings of the centreline of the road, railway, canal, as well as that of the pipe centre-line shall be recorded

- **Railway Crossings**
  The angles for all railway crossings shall be as close to 90 degrees as possible, but in no case less than 85 degres to the centre line of the railway.

- Primary Road Crossings
  Primary roads are the National & regional Highways, all-weather roads (paved /unpaved) and roads providing access to major installations. The angle of crossings shall be as close to 90 degrees as possible, but in no case less than 80 degrees to the centre line of the road.

- **Secondary Road Crossings**

  The angles of crossing for secondary roads shall be as close to 90 degrees as possible, but in no case less than 45 degrees to the centre-line of the roads. All seasonal roads, unpaved village roads, cart-tracks, etc. come under this category.

- **River / Stream/ Khal Crossings**

These crossings shall be established as close as possible to the locations shown on the route map. Crossings shall be located in a comparatively straight reach of the river where the banks are stable and there is sufficient area for construction. Angle of crossing shall be as close to 90 degrees as possible. Three (03) cross section data, one at the upstream location, one across the location and one at the downstream location need to be collected from secondary source.

- **Canals / Drainage Ditch/Nala Crossings**

  The angle of crossing shall be as close to 90 degrees as possible but in no case less than 60 degrees to the centre-line of the canal / drainage ditch.

- **Utility Crossings**

  Utilities crossed shall be located at their centrelines containing station numbers in the survey. The angle or crossings shall be measured and locations established relative to their above-ground facilities. The names and sizes of all utility lines shall be included in the survey notes. In the cases of overhead power lines, the distance to the poles and towers on each side of the survey line shall be measured, and the numbers of poles or towers noted. Line voltage shall also be recorded. Where possible, the survey shall be established so that there is a minimum distance of 25 meters from the survey line to the nearest High-Tension pole or tower. Underground utilities shall be located as far as possible and a minimum distance of 15 meters on each side of the survey line.

d. Accuracies in Measurement:

- Surveyor shall incorporate corrections to the linear ground measurement due to standard errors, variations from standard temperature and pull.
- The error for angular closure for the work shall not exceed one minute per station and for linear measurements it shall be read to the nearest 0.005 Metre.
- The error on closure for measurements on vertical distance to establish bench marks shall not be more than 24K millimetres (where **'K'** is the linear distance in KM). The observations for measurement of vertical distances on bench marks shall be read to accuracy to the nearest 5 mm and for Inter section Points and other points along the pipeline route and at crossings to the nearest 10 mm. The error of misclosure in vertical distance shall be distributed linearly.

e. Chainage:

- Slack distance measurement will be made using 50 M steel tape or 30 M chain. However, in case of abrupt slope change the tape / chain is straightened parallel to the probable grading.
- Distance between Intersection Points along the pipeline route shall be measured and recorded. In addition, distance between level points shall also be measured and recorded.
- Chaining will be continuous in the direction of survey.
- The true bearing of all straights shall be observed and recorded.
- Data on nature of terrain, viz. sandy, stony, vegetation, etc. and type of ground will also be recorded along with chainages of change points.
- Check on distance measurements will be by stadia method at the time of levelling.
- Standard chain survey format will be used for record keeping.

f. Measurement of Horizontal Angles

- Horizontal angles are measured to indicate the change in direction of alignment and specify the horizontal bend at the Turning Points. Theodolite, reading direct to 10 seconds or better, shall preferably be used. Angles shall be measured clockwise from back station to fore-station. Mean of two readings-one on face left and other on face right shall be taken as the horizontal angle.
- The line at both ends shall be tied to the grid control system being used for end facilities. True bearing at the beginning, end and every 5 KM shall be observed to keep a check on errors in angular measurements.

g. Profile

- The continuous profile of the proposed pipeline route shall be established from the reduced levels taken.
    - At the starting point
    - At all Turning Points (TPs)
    - At all Intermediate Points on the ground,
    - At all points on the pipeline route where there is a change in slope.
- When the terrain is flat, reduced level shall be additionally recorded along the pipeline route at 100m interval.
- When the terrain is undulating observation of reduced level shall be made at a sufficient number of points so as to give an accurate plotting of the ground profile along the route.
- For road and railway crossings, the reduced levels shall be recorded at all points along the pipeline alignment wherever there is a change in slope within the entire width of the Right of-Use of the road/ railway. Consultant shall prepare a detailed drawing for the crossing in scale 1:100 (in both horizontal and vertical directions) which shall be truly representative of the crossing profile.
- For river / stream/ nalla / canal crossings, levels shall be taken at intervals of 5M up to 30M beyond the highest banks on both sides. Levels shall be taken at closer intervals, if there is a change in slope. Consultant shall prepare a detailed drawing for the crossing in scale 1:100 (in both Horizontal and Vertical directions) which shall be truly representative of the crossing profile.
- For major water crossing sites, cross section as above shall be observed at both banks.
- Method of RISE and FALL shall be used to compute reduced levels of various points. Check on computation shall be made by using the following formula:
- Back site - Fore Site = Σ Rise - Σ Fall = First R.L. - Last R.L
- Maximum misclosure shall not exceed 24K MM where 'K' is the distance in KMs. Maximum length of line of sight shall not exceed 100 M.
- All levels shall be with respect to Mean Sea Level (MSL)

h. Monuments and Properties

The pipeline alignment shall run clear of the existing monuments, properties and structures etc., as indicated in Pipeline Route Survey Data Sheet. For congested areas, closer distance may be adopted; however, location shall be approved by Employer.

- Parallel Alignment

  The pipeline alignment wherever runs parallel to an existing or planned under / above ground facility will be treated as parallel alignment. For underground facilities surveyor shall identify and locate them with suitable special ground laths. The following clearances shall be observed in case of parallel alignment defined above.

- Between existing/planned electrical power cables / lines and the proposed line - 50.0 meters

- Between existing / planned communication cables / lines and the proposed line - 25.0 meters

i. Parallel Encroachment

Unless otherwise stated, when the pipeline alignment runs generally parallel to a road or railway it shall be kept sufficiently clear of the Right of Way limits of the facility.

j. Azimuth Observations

Azimuth control shall be maintained by observation of azimuth at every ten to fifteen kilometres by closing the traverse on existing control points. Azimuth may be obtained by making observations to sun or star depending upon the location of the area and direction control. In case of azimuth from sun, the computed values must be within one minute. In case of stars the computed values should agree within 10 to 15 secs. Horizontal misclosure between two azimuth stations shall be equally distributed among TPs in between.

B. Survey Notes, Observations and Computations

- The procedures followed both for field and office calculations shall be such that the results obtained shall be readily understood and retraceable.
- All up-to-date notes and observations related to the basis for determination of boundary lines and corners shall be maintained by surveyor.
- Survey records must contain schematic diagrams of all horizontal controls pertinent to the project showing all existing and established control points, bench marks, any triangulation station and boundary lines.
- Geo-graphical and UTM co-ordinates of all Turning Points and starting / end points of the pipeline shall be computed and furnished to the Employer.

C. Maps and Drawings:

Surveyor shall perform mapping and drawing work so as to contain all relevant data consistent with the survey notes and observations. The drawings shall also contain details of roads, streets, highways, structures, all types of crossings, terrain, surface vegetation and all other details which will be required for the purpose of engineering design.

Following types of detailed survey drawings will be made.

- Right-of-Way Planimetry in UTM grid - 1:5000 along the line, 1:1000 across the line
- Ground Profile - 1:5000 Horizontal, 1:500 Vertical
- Crossing Details Road & Railway - 1:100 Horizontal Crossings, 1:100 Vertical
- Crossing details River / Stream / Khal - 1:100 Horizontal Nala / Canal Crossings 1:100 Vertical
- Detailed Route Map - 1:50,000
- Additional Route Map for Hilly, Ghat - 1:15,000 and ravenous regions
- Cross Section for sloping Right-of-Way - 1:100 Horizontal 1:100 Vertical

D. Presentation of Field Survey Data

Survey drawings shall contain the following data as a minimum requirement:

E. Pipeline Route Map

Pipeline route map shall show all features including, but not limited to roads and railroads, canals, streams, khal, lakes, rivers, villages, towns, and cities that are located within a distance of 5 KM from the pipeline centre line on either side of it. For the entire region, contours shall be plotted on the route map at 1 M contour interval.

Additional information like cultivated areas, barren land, areas prone to flooding, rocky areas and forests including access paths / roads to Right-of-Way shall also be shown on the route maps.

Additionally, for areas which are undulating such as hilly areas, Ghat regions, ravines, and other areas as directed by KGDCL, Pipeline route map to a scale 1:15,000 shall be drawn over a distance of 1.0 Km from the pipeline centre-line on either side of it. For such areas, contours shall be plotted at 10m contour interval.

- Right-of-Way Planimetry drawings shall show all objects within 50 meters on either side of the Pipeline in Plan.
- In case of all rail, road, river, stream, canal, khal and utility crossings, the angle of crossing shall be mentioned.
- In case or rail, road, river, stream, canal and khal crossings wider than 10m, the distances at the start and at the end of the crossing from the nearest IP shall also be mentioned. For crossings less than 10m, the distance of the centre line of crossing from the nearest IP shall be given.
- For all river, stream and khal crossings, the level of water at the time of survey and the approximate surface velocity of the flowing stream shall be observed and recorded and reported in the survey drawings. Also, the general nature of the surface soil (soft / hard, normal soil or rock/boulders) at the bed and banks of the river / stream / khal shall be observed and mentioned in the drawings

4.1.2 Reporting & Deliverables 02:

All drawings shall be prepared using Auto CAD. All drawings, reports, formats etc. to be submitted to KGDCL shall be colour printed. Soft copy of the same also to be submitted.

The Route Survey Report shall consist at a minimum the followings:

- Route description.
- Topographic features
- Major crossing details
- Extent of reserve forest
- Land use pattern and soil strata along route
- Developments plans
- Estimate for land acquisition for route where needed
- General metrological details
- Site photograph (Photograph shall be in sufficient number to represent the entire terrain features
- Ground profile
- Soil Investigation report (As per Annexure-I)
- Comparison of alternative routes considered.
- Valve station sites with land demarcation and land filling volume from EGL to FGL.
- DRS sites with land demarcation and land filling volume from EGL to FGL.

Deliverables with report at a minimum:

(i) Route map on top of sheet in a scale of 1:25000 with a distance of 5 KM width on either side of the route centreline

(ii) Route Alignment on Bangladesh map and relevant district maps.

(iii) Overall route map in a scale of 1:500000 scale.

(iv) Ground profile drawing and ground elevation v/s pipeline changes

(v) Alignment sheets covering

ROW in UTM grid (scale 1:2500) and ground profile (horizontal scale 1:2500, vertical scale 1:250)

(vii) Crossing details of Road/Rail/Khal/Canal/Utility crossings (horizontal scale 1:100, vertical scale 1:100)

(viii) Cross section for slopping ROW (horizontal scale 1:100, vertical scale 1:100)

(ix) Crossing details of river

- Up to 250-meter width (horizontal scale 1:200, vertical scale 1:200)
- More than 250 to 500-meter width (horizontal scale 1:500, vertical scale 1:500
- More than 500-meter width (horizontal scale 1:1000, vertical scale 1:1000)

Indicative Outline of the Route Survey Report:

The Route Survey report contains the following major elements depending on the nature of the project. The substantive aspects of this outline will guide the preparation of ESIA reports although not necessarily in the order shown.

Executive Summary

1. Introduction
2. Route Description
3. Length of Pipeline
4. Total number of Turning Points
5. Details of Take-off and Terminal Points (TPs)
6. Site Photographs (Photographs should be sufficient in numbers to cover the entire terrain features including 7. Take-off and Terminal)
7. Type of Terrain/Topographic Features
8. Land Use along Routes
9. Details of Pipeline Alignment
10. Crossing Details
11. Guideline for pipeline Route Selection
12. Desktop Study including Analysis of Alternatives
13. Pipeline Route and Options
14. Detailed reconnaissance survey
15. Detailed route survey
16. Ground Profile along the route (including Route Map)
17. Pipeline Route Description
18. Salient Points of the Identified Pipeline Routes (take-off/terminal)
19. Details of Take-off and Terminal
20. Elevation
21. Implementation Development Plan
22. Conclusion and Recommendation
23. Drawings

Specification for Soil Investigation

1.0 General

This specification covers the minimum requirements for soil investigation for the purpose of visual engineering classification of soil and detection of geotechnical properties of soil for design & engineering of various structure/ facilities required along the pipeline route

2.0 Scope

The objective of soil investigation is to determine visual engineering classification and geotechnical properties of soil for design & engineering of various structure/facilities required along the pipeline route. It includes:

i) Boring
ii) Collection of distributed samples from boreholes
iii) Carrying out Standard Penetration Test (SPT) at specified locations, and
iv) Testing of soil samples at laboratory for specified engineering properties.

At each **DRS minimum 5** (Total 10) boreholes have to be done.

3.0 Detailed Report

Borehole sample shall be laboratory tested for the following items:

- Type of soil
- Bulk & Dry density of soil
- Maximum level of water table
- Angle of internal friction
- Un-drained shear strength in case of clayey soil

Pipeline Route Survey Data Sheet

Pipeline size OD (mm):

Gradient (ROW): (max) Along pipeline alignment

Bend radius:

Minimum distance between TPs:

Maximum deflection angle at TPs:

Permissible variation in pipeline length:

ROW width to be acquired:

Pipeline location in the ROW:

Minimum distance from existing habitable dwellings:

Buildings / structures / monuments

Structures:

Property corners / monuments:

Co-ordinates of starting point: To be established

Note:

Number of TPs / Bends in the pipeline, whether in horizontal or in vertical direction shall be kept to a minimum

Location of the proposed gas pipeline network with DRS for Zone 2A and 2B at BSMSN