
BHUTAN: HYDROMET SERVICES AND DISASTER RESILIENCE REGIONAL PROJECT – Sub-component B

Planning, Designing and Supervision of National Emergency Operation Centre (NEOC) Construction

Terms of Reference

Abbreviations and Acronyms

ASTM	American Society for Testing and Materials
BOQ	Bill of Quantities
BSR	Bhutan Standard Rates
DDM	Department of Disaster Management
EOC	Emergency Operation Center
HVAC	Heating Ventilation and Air Conditioning
MB	Measurement Book
NEOC	National Emergency Operation Center
RGoB	Royal Government of Bhutan
VHF	Very High Frequency Radio

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Project Background

The Bhutan Hydromet Services and Disaster Resilience Regional Project (HSDRRP) supported by the World Bank seeks to strengthen the Royal Government of Bhutan's capacity to improve national and district level capacity for disaster preparedness and response and provide weather and hydrological forecasting services including delivery in priority sectors and disaster related early warning systems.

The component B of the project on Disaster Preparedness and Response Capacity Improvement will help strengthen capacity for disaster preparedness and response. It is implemented by the Department of Disaster Management (DDM) under the Ministry of Home and Cultural Affairs.

Establishing a functional National Emergency Operations Centre (NEOC) is a requirement identified in the Disaster Management Act 2013 to be fulfilled by DDM and has been made a national priority by the Royal Government of Bhutan (RGOB). A national EOC is the lynch pin in any national effort to respond to a disaster that affects the country in whole or in part. The closer relationships with National Center for Hydrology and Meteorology and other ministries with hazard-specific expertise will be required to ensure 24/7 situational awareness and early warnings of potential events. This project will provide funding for the establishment of a fully operational NEOC through the following three phases:

Design phase - The primary output of this phase will be an actionable blueprint to enable construction of the facility to proceed. The structure will be designed to withstand the known hazards (eg. earthquake, windstorm, fire, flash floods, etc.) and will be capable of 24/7 operation for an extended period even during major disasters affecting the immediate area.

Build phase – The primary output of this phase will be the structure itself, exclusive of the equipment required for an EOC to function. This will include any site hardening required to ensure the safety and integrity of both the site and the structure.

Equip phase – Once the building phase is complete, the building will be supplied with the appropriate equipment to enable the full functionality required for disaster response coordination, even during times when the immediate area is directly affected. This may include monitor and projection systems, map displays, multi-layered telecommunications equipment (landline, mobile, satellite, radio), initial food and water stock, security systems, etc.

1.0 Project Objective

The objective of this Terms of Reference is to engage a qualified consulting firm with proven expertise and background on Emergency Operations Centre planning, designing and construction supervision to address, mainly Phase A (Design) as well as the supervision of Phase B (Build) and Phase C (Equip). The hiring of contractor firms for the phase B and phase C will be issued through separate procurement processes at a later date once Phase A has started.

The overall expected outcome of this project sub-component is to establish a fully functional National Emergency Operations center (NEOC). The success of the activity will be measured with the following three indicators:

- 1. Completion of the NEOC design:** Produce a complete design for the facility. The design and associated documentation should be comprehensive and sufficient to enable construction. It should also account for the necessary ICT and electrical systems and resilient infrastructure

that will ensure all equipment will be functional once installed and that the facility will operate despite catastrophic events.

- 2. Supervision of the NEOC construction:** Supervise the works for quality assurance and quality control, including approval of the materials and workmanship of the works in cooperation and in consultation with DDM to ensure timely completion of the project. Provide technical support and interpretation to ensure construction aligns fully with the approved design.
- 3. Equipping of the NEOC:** Prepare the technical specifications for the NEOC (operations centre only), support DDM procurement and supervise installation of equipment for the NEOC to ensure quality assurance and quality control. Provide technical support and design interpretation if required to ensure equipping of the NEOC aligns fully with the approved design.

2.0 Scope of Work

- 1. Detailed designing and drawings for the construction of NEOC – Four storey, maximum**
 - 2.1.1 The Consultants shall carryout the detailed designs and prepare working drawings of the NEOC Building for the foundation, structural layout of columns, slabs, beams, doors and windows, roof, walls, thermal insulation, floors, water supply, internal and external drainage system, sewer system, electrical system, IT and communication networking, audio/visual system, room layouts, furniture and fixtures, flooring, false ceiling and false partitioning, security system, fire security system, elevators and ramps, internal and external lighting, waterproofing, parking, landscaping, compound boundary walls, and any other features as required by DDM and statutory authorities for the purpose of the building and all aspects of daily and emergency response works to enable tenders/bids/quotations to be called wherever required and during the time of construction and equipping.
 - 2.1.2 The consultant shall submit a full set of drawings, designs and any other necessary documents both in hard and soft copy to the DDM for forward submission to the concerned authorities for approval of the construction. The DDM will be responsible to obtain any certificates and approvals required by the appropriate statutory authority from start to completion of the project.
 - 2.1.3 The Consultant shall be responsible for changes in the design, drawings for necessary approvals and requirement of details during the execution phase, at any stage of the project, throughout all project phases regardless of the supervisory role or circumstances. This is applicable even after the first formal approval from the Thimphu Thromde.
 - 2.1.4 The Consultants shall prepare detailed estimates for quantities, Bills of Quantities (BOQ) and project cost for the entire project based on BSR codes and market rate for the inputs

for all building works which includes civil works; electrical, mechanical, plumbing, HVAC services, IT & Networking/Communications, Acoustics, etc. and prepare acceptable tender/bid documents in accordance to The World Bank procurement guidelines. The estimation of quantities shall be based on detailed design of all the components of the project.

2.1.5 The Consultant shall make detailed analysis for computing the unit rates for the different items of works if not readily available in BSR.

2.1.6 The Consultant shall provide all required technical inputs for any additional works that may arise during the implementation of the project as a part of the NEOC construction.

2. Supervision of the NEOC Construction

2.1.7 Regular inspections of the construction materials to ensure structural integrity and design elements are being met according to design and engineering requirements. The testing requirements will be taken up by the construction contractor. The Consultant shall work with the DDM project focal person to ensure an agreed-to minimum number of joint inspections with DDM. In addition, DDM may participate in any inspection being conducted by the Consultant with minimal notice.

2.1.8 The Consultant shall oversee and ensure completion of the NEOC Building, including equipment and any required site modifications and landscaping, with the structure and landscaping completed prior to closure of the project.

2.1.9 The Consultant shall advise on and contribute to DDM payment decisions related to contractors undertaking the construction and equipping works as requested by DDM.

2.2 Facilitate equipping of the NEOC

2.2.1 The Consultant shall prepare technical documentation required for NEOC operations including detailed technical specifications, drawings where required and estimated costs associated with each equipment item to the satisfaction of DDM.

2.2.2 The Consultant shall provide technical support during DDM-led equipment procurement as well as supervision of equipment installation to ensure quality control and alignment with NEOC design.

3.0 Deliverables

Description of the expected outputs is provided in Annex 3

ToR stage	Output Number	Output Title	Frequency	Due Date	No. of Hard Copies	No. of Digital Copies
NEOC Design	A.1	NEOC Project Initiation Report	One time	Within six weeks of project initiation	3	1
	A.2	NEOC Risk Assessment and Conceptual Design Report	One time	Within two(2) months of project initiation	3	1
	A.3	NEOC Preliminary Design Report	One time – first design Revised till approved by DDM	Within eight (8) months of project initiation	3	1
	A.4	NEOC Final Design Report	One time	Within twelve (12) months of project initiation	3	1
Supervision of Build and Equip (Phase C)	B.1	Construction Supervision Manual	One time	Within two (2) months of Phase 2 commencement	10	1
	B.2	Quarterly Construction Progress Report	Every three (3) months	Every three months after Phase 2 commencement until end of project	3	1
	B.34	NEOC Building Maintenance Guide and Schedule	One time	Within thirty-six (36) months of project initiation / eighteen (18) months of Phase 2 commencement	3	1
	B.45	NEOC Building Design and Construction Final Report	One time	Within thirty-six (36) months of project initiation / eighteen (18) months of Phase 2 commencement	3	1
	B.56	NEOC equipment	one time	within 36 months of phase B	3	1

ToR stage	Output Number	Output Title	Frequency	Due Date	No. of Hard Copies	No. of Digital Copies
		specifications		commencement		

4.0 Specific Inputs to be provided by the Client

The Department shall provide the following documents to the consultant:

1. The site plan with topography map with the coordinates for the planning.
2. The geotechnical study report conducted for the NEOC site
3. Coordinate meetings as and when required.

5.0 Implementation Arrangements

The Consultant will work closely with the DDM project focal person. Reports generated as per this ToR will be submitted to DDM for review. The Consultant is expected to join meetings and other occasions as and when needed and coordinated by the DDM project focal person.

During the supervision and equipping phases, the Consultant will report to, and seek prior permission from DDM before taking any of the following actions, unless construction site security or worker safety will be immediately impaired:

- (i) Consenting to the subcontracting of any part of the works.
- (ii) Certifying additional cost determined necessary for continuity of construction or equipping works.
- (iii) Ordering suspension of work.
- (iv) Issuing the Notice to commence the work.
- (v) Approving an extension of time.
- (vi) Issuing a variation except if such variation would be within the limits as indicated in the civil contract document.
- (vii) Approving new rates either for existing items of work, which arises from variation quantities beyond the limit, defined in the contract or fixing rates of non-priced works involving any extra item and certifying any additional cost determined under the provisions of contract.
- (viii) Issuing the order for special tests not provided for in the contract and determining the cost of such tests, which shall be added to the contract price.

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- (ix) Issuing/approving the Technical Specification, if not provided for an item of works in the construction contract.

7.0 Selection Procedure and Form of Contract

The firm will be selected following the World Bank's Guidelines: Selection and Use of Consulting Firm by the World Bank for Operational Purposes and form of contract would be Complex Lump Sum Contract for scope A and time based for scope B and C.

Minimum qualifications of the firm to be selected for the required assignment include:

- a. More than 10 years of experience in the field of architecture, engineering and construction, including experience with governments in developing countries, and including prior successful engagements in the design and construction of emergency operations centres.
- b. The consulting firm should have a minimum annual financial turnover of USD \$ 300,000 .
- c. Demonstrated competency in conceptualization, formulation, and execution of resilient structure construction techniques of similar nature as the one specified here.
- d. Consulting firm should bring among its team demonstrated expertise in the following fields: architectural design, structural engineering, disaster/emergency management (especially EOC operations), construction trades, culturally-sensitive design, urban development, and earthquake engineering and construction supervision.
- e. The consulting firm should have enough capacity (including personnel) in handling similar assignment
- f. The firm should have experience with the planning, technical design and construction supervision of at least one EOC (Emergency Operations Center).
- g. The firm should have successfully completed the planning, technical design and construction supervision for at least two buildings, each with a minimum footprint of 8000 square feet, in the last five years.
- h. Competency in business administration, management consulting or equivalent.
- i. Transparent and audible procurement and documentation tracking system.

The Consultant Firm can be international, domestic or a strategic partnership, must demonstrate familiarity with international best practices for disaster and emergency preparedness and response operations and must tailor the NEOC design to enable these practices. Amongst others, these standards of practice include ISO 22320, NFPA 1600 and the Incident Command System.

The Consultant Firm shall have experience with developing and obtaining specific performance data (both quantitative and qualitative) to establish benchmarks at the onset of the project and to measure progress.

Position	Nos	Position-months
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8.0 Duration of Assignment

Duration of the contract is as follows:

1. Detailed designing and drawings for the construction of NEOC – 12 months
2. Supervision : Until the completion of construction
3. Equipping – 2 months

9.0 Staffing Requirements

The Consultant is encouraged to use the expertise available in Bhutan to the extent possible. However, international experience will be necessary to carry out to lead the assignment due to its highly-specialized nature. The Consultant is free to propose a staffing plan and skill mix necessary to meet the objectives and scope of the services. However, a strong competency in project management applications is expected. The skill sets expected for this project include architectural design, civil/structural engineering, project management, site supervision, specialist expertise in EOC design, disaster management and physical security, regulatory compliance, construction trades and quality control functions. If all the required skills are not available within the firm, the Consultant is encouraged to form joint ventures with other firms.

As part of the proposal, the Consultant Firms should identify the members of the project team noted in the following table, including where these roles are intended to be filled full-time throughout the project or engaged on an as-needed basis. For each role, the Consultant shall identify the expected person-months required from each role, including which project phase involvement is expected and whether the involvement will be full-time or intermittent and the expected monthly rate for each position.

The following table provides an indicative sample of the personnel that the Consulting Firm should propose, including suggested months required for each position. Note that given the nature of the project, each position may be continuous or intermittent as the Consulting Firm deems appropriate to the project tasks.

Overall NEOC Project Manager	1	18
NEOC Design/Supervision/Equipping and Delivery Subject Matter Experts: <ul style="list-style-type: none"> • Architect (12) • Disaster and Emergency Management / EOC Specialist (9) • Structural Engineer 6 • Civil/Structural Engineer (12) • Electrical Engineer (9) • IT Systems Specialist (6) • Interior Design Specialist (6) 	1 each	As indicated.

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Description for each position:

Over all NEOC Project Manager

The NEOC Project Manager needs to have an international breadth of experience in leading similar projects, ideally of a similar scope. The NEOC Project Manager will have a broad knowledge of all the components of the consultancy, and should have deep expertise in at least one of the required specializations. The person will assume leadership and responsibility for delivery of all project outputs and results. The NEOC Project Manager will have direct and regular communication with the DDM Focal Person, so strong written and verbal communication skills in English are required.

Subject Matter Expert – Architect

The Architect should have a minimum of 10 years of experience, including hazard-resilient design and EOCs. To ensure compliance and understanding of local design standards, a licensed architect based in Thimphu, Bhutan will be required. As well, given the nature of the project, and to ensure experience with EOC design and related projects, either the NEOC Project Manager or Deputy NEOC Project Manager should hold an architectural degree and license in

their country of practice. The individual should hold, at minimum a Bachelor or Architectural Studies or a Bachelor of Architectural Science and ideally will hold an advance degree in this field.

Subject Matter Expert – Disaster and Emergency Management / EOC Specialist

The Disaster and Emergency Management / EOC Specialist will hold an advanced degree in this field as well as significant operational experience working and/or managing EOCs. This expert will have a minimum of 10 years in the field of disaster and emergency management and will have experience working on EOC design teams, ideally at various jurisdictional scales.

Subject Matter Expert – Civil/Structural Engineer

The Civil/Structural Engineer should have a degree in civil engineering as well as appropriate international professional licensing credentials, i.e. P.Eng. The expert should have significant experience with structural mitigations for hazards as identified by DDM and including physical incursion, seismic, erosion, high winds, heavy rainfall, extreme wildland/structural fire, severe air quality degradation, etc. The Civil/Structural Engineer will have a minimum of 10 years of experience and demonstrated experience with similar projects utilizing structural mitigations, e.g. seismic base isolation, air purification systems, etc.

Subject Matter Expert – ICT Systems Specialist

The ICT Systems Specialist will have over seven years of experience with the design, layout and future compatibility of ICT systems with particular focus on emergency response services and EOC systems, especially with ensuring redundancy and system resilience. The specialist will hold appropriate education and professional certifications in this field.

Subject Matter Expert – Interior Design Specialist

The Interior Design Specialist will have over seven years of experience ensuring interior workplace functionality that promotes barrier-free access and accommodates safe and healthy extended use in high-stress situations. The specialist will hold appropriate education and professional certifications in this field/

10.0 Annexures

Annex 1: General Requirements

I. Preparation of designing and drawings for the construction of NEOC

A. Requirement of the NEOC structure

- i. The total site area is 10096.5 square feet. As per the Thimphu Thromde rules and regulation the department could avail 50% coverage for the NEOC construction which comes to 5048.27 sq. ft.
- ii. The preliminary design for the NEOC building should consider four floors with total built up area of 20193.08 square feet.

B. Drawings and design

- i. The general approach to development and associated timelines as noted by the Thimphu Thromde (City) is described below:
- ii. A Land User Right Certificate is made available by DDM .
- iii. A Site Plan that outlines the physical characteristics is prepared by the Thimphu Thromde and provided to DDM (Appendix B)
- iv. The Thimphu thromde infrastructure division provides service locations for use in the design process upon request from the owner or those working on the owner's behalf.
- v. An architectural firm, including engineering expertise, is engaged to develop the NEOC design and, once approved, provides the design to Thimphu City Corporation for review and approval.
- vi. The Thimphu City Corporation completes review of the proposed NEOC building design and grants approval for construction. The review typically will take one month.
- vii. The Consultant is required to consider and act upon the suggestions, recommendations, and directions given by the RGoB throughout the project until completion.
- viii. The Consultant shall provide detailed architecture layout and design of all interiors including all equipment and fittings, and all special purpose interiors. The Consultant shall use best design structure and specifications available in the modern building industry in coordination with best practices for establishment of emergency operation centers. Construction materials should be decided in consultation with DDM upon recommendations and market survey by the consultant. The Consultant is expected to supervise and provide guidance on the procurement and installation of the furnishings, equipment, communications systems, etc. during Phase C of the project.
- ix. In addition to the primary documents to be referred to an followed during the design and drawing process as per the requirements of the RGOB, ASTM E2668-10 Standard Guide for Emergency Operations Centre (EOC) Development and consultant's own EOC design experience should be followed. Where the RGoB agrees through documented discussion with the Consultant, certain elements of this standard guide may be bypassed as those elements may have already been completed by various RGoB ministries (e.g. geotechnical study), or condensed to better align with project timelines.
- x. The NEOC Building should be designed in such a way that all structural elements meet the requirements such that integrity is assured beyond the spectrum of expected hazard event probabilities. Prior to development of the design concept, the consultant should obtain hazard information from the appropriate government planning source through the designated project focal person in DDM.

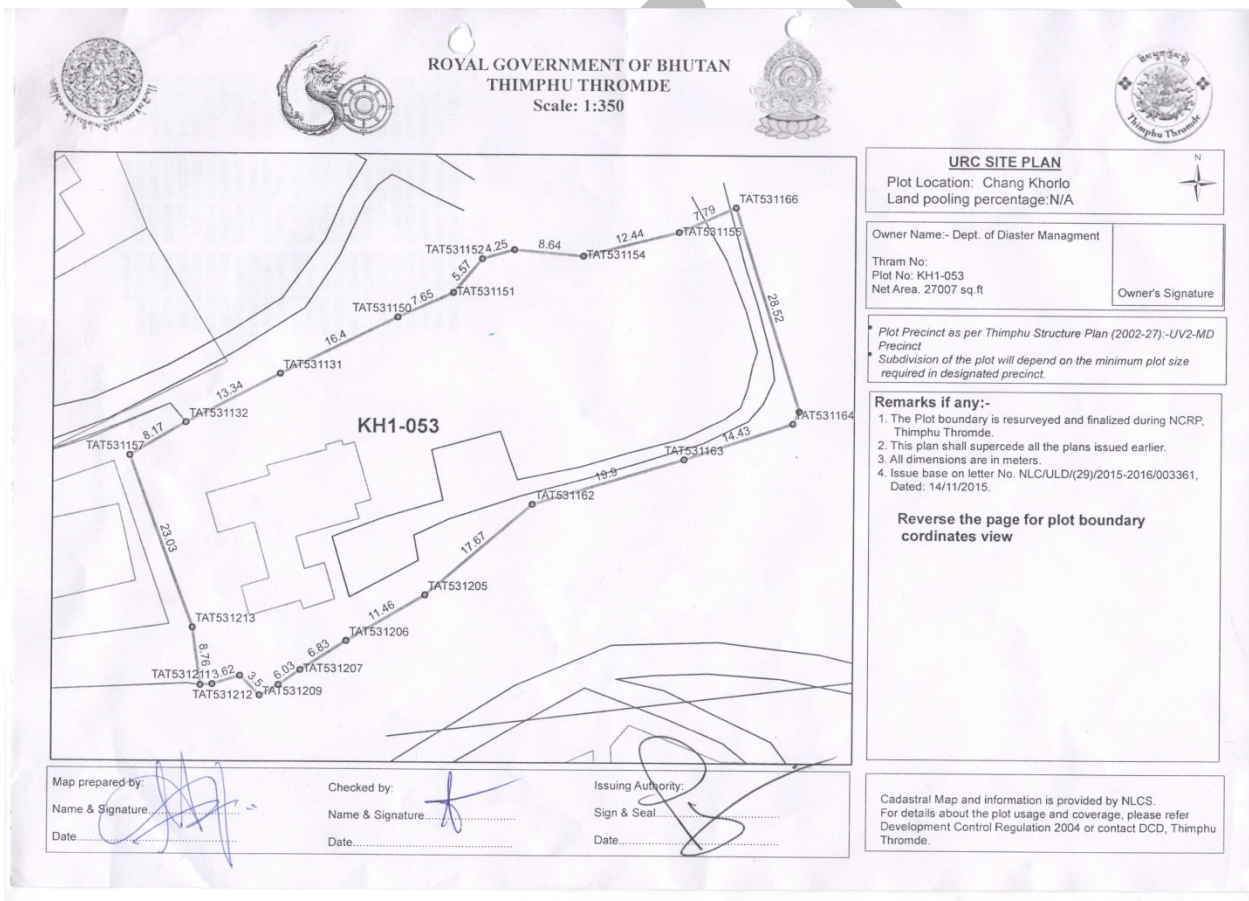
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- xi. The NEOC building should be energy efficient, depicting elements of the traditional Bhutanese architecture and must be able to respond to the functions of an EOC.
 - xii. The Consultant shall strictly follow the Environment and Social Management Plan provided by the DDM during the design and supervision process.
 - xiii. All services design and drawings related to plumbing, sewerage, drainage, fire hydrants, fire alarm, fire exit, HVAC (internal and external electrification, etc.) shall also be included for discussion with the government through the project focal person in DDM.
 - xiv. The NEOC Building design shall demonstrate and adhere to principles of universal design identified in selected international design standards to maximize accessibility for all people.
 - xv. The NEOC Building shall have high water efficiency that addresses economy of distribution, usage and discharge of water; maximum conservation and reuse of water; incorporation of waste water treatment techniques, rain water harvesting, water efficient landscaping, etc.
 - xvi. The NEOC Building shall have efficient and proper disposal of waste (including solid, liquid), preventing contamination of soil, water and air of the site and its surroundings by providing sewage treatment onsite, if required as per government building requirements.
 - xvii. The NEOC Building is the focal point of all disaster related emergency management activities. In addition to its primary function as the NEOC, the building will also be the head office of the department and shall ensure adequate office space and related facilities, e.g. washrooms, kitchen, dining area, meeting space/boardrooms, quiet room / rest area, etc.
 - xviii. Design should ensure adequate capacity for video conferencing, real time data exchange, video calling and facility-wide Wi-Fi as well as future connectivity-dependent ICT systems.
 - xix. The NEOC Building design should account for placement and size of furniture, video display, such that upon completion of Phase B (Build), the equipment procured and installed in Phase C (Equip) will be uncomplicated. The operations room video display should include a large video wall display that allows for simultaneous viewing of multiple information sources, such as news media, social media, hydromet and other hazard monitoring, response resource tracking, etc.
 - xx. The NEOC Building should be ergonomically adapted to long duration functioning and usage designed with resilient systems, including redundancies to ensure uninterrupted power supply, water supply, waste removal and multi-modal communication systems including satellite phone/data, digital VHF and HAM radios, surface lines and mobiles.
 - xxi. The NEOC Building shall include the GIS area that will enable collection and processing of applicable spatial data, mapping and associated analysis.
 - xxii. All the facilities should be designed to the highest levels of occupational safety according to local requirements and international standards.
 - xxiii. The NEOC Building should be designed to include both passive and active security considerations to address requirements for physical hardening and digital/electronic communications sensitivity.

C. Coordination

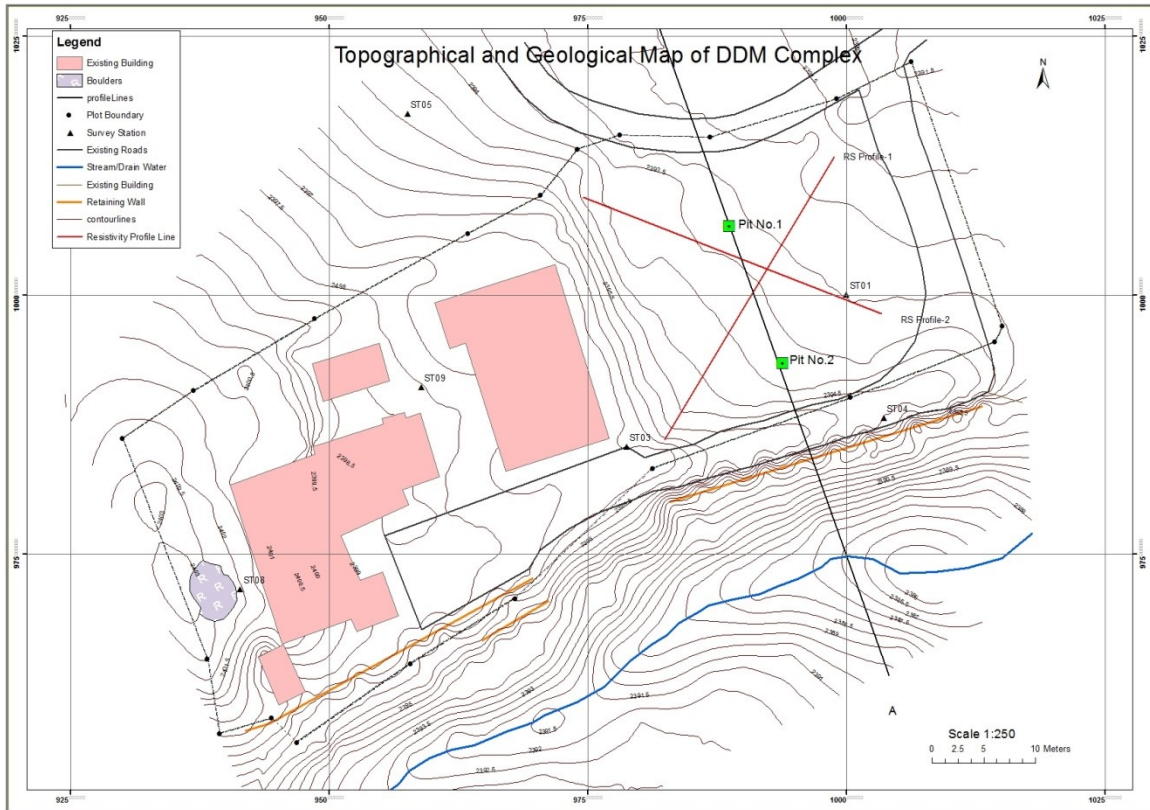
- i. During the project period (design phase), the Consultant shall arrange a minimum of one meeting per month with the DDM for coordination and planning purpose starting from the project initiation date. The Consultant's Team Leader, along with other necessary Team Members, shall attend these meetings. The Team Leader, or designate, will take the note of the meeting and issue minutes for review and approval by the DDM
- ii. During the supervision and equipping phase, the consultant should be available as and when needed.

Annex 2: Documents made available

- i. Municipally approved site plan for the proposed NEOC construction



2 Topography map of the site



Annex 3: Description of deliverables and Outputs

Unless expressly stated otherwise, all outputs are required both digitally and in hardcopy.

1. Detailed designing and drawings for the construction of NEOC

Task A.1: NEOC Project Initiation Report.

The report shall describe the understanding of the objectives and tasks, the design and construction approach, detailed project schedule including critical path, staffing plan, project management approach, and the quality control method to ensure the project reaches its goals.

Output: Project initiation report

Task A.2: Complete a Site Exposure Assessment.

The NEOC Building site should be assessed to determine exposure to the identified hazards. This exposure assessment shall be used by the Consultant to ensure the site and building design are sufficient to withstand the most severe hazard events to which the building may be exposed. The NEOC Building should be designed for redundant protections from the hazards to which it is exposed such that no single structural mitigation is exclusively relied upon for hazard resilience.

Output: The Report shall be representative of the Consultants approach to the NEOC Building and demonstrate initial consideration of the requirements for its design and layout. The report shall be accompanied by a presentation to DDM.

Task A.3: Complete preliminary NEOC Building design

The Consultant shall complete the conceptual NEOC Building design. A geotechnical and geophysical study and site contour map is available for the construction site. The contour map is attached in Annex 2. The geotechnical study and municipal site plan will be made available to the selected Consultant. This task will consist of but are not limited to the following:

- i. Prepare and submit conceptual design, 3D views from all directions and drawings with reference to the requirements given and in accordance with the standards of the concerned building, rough cost estimate, report giving details of useful area, circulation area, plinth area, ground coverage, Floor Area Ratio, services and broad specification etc.
- ii. Revise the concept drawings and associated reports based on feedback from DDM and the NEOC Design Advisory Team led by DDM. The revised design shall be considered as the preliminary design until such time as the necessary approvals are received from the appropriate statutory authorities.

Output: The report shall include, but not be limited to, the following:

- i. Executive summary, including project background, consultant role, identification of RGoB contact, etc.
- ii. Summary of advice, and anonymized minutes from, the NEOC Design Advisory Team meetings.
- iii. Recommendations on resilient structure and systems and how the preliminary design addresses those considerations.
- iv. Summary of expected NEOC services.
- v. Detailed note of how all design considerations have been addressed.
- vi. Time and Cost Analysis
- vii. Analysis and summary of materials to be used in major items
- viii. Summary briefs on architectural design, structural design, utility systems design, landscape and parking design, etc.
- ix. Debris management plan.
- x. Construction cost estimates for identified stages and for significant components.
- xi. All preliminary drawings along with topographical survey plan, master plan and 3D views.
- xii. Construction schedule of project with detail analysis and risk management plan to ensure project completion within the identified timeframe.
- xiii. The report shall be accompanied by a presentation.

Task A.4: Complete final NEOC Building design.

Once the RGoB has approved the preliminary design and associated plans, the Consultant shall prepare and submit required number of copies of drawings to the appropriate statutory authorities and obtain their approval as necessary according to the appropriate acts, laws and regulations etc. Any changes requested or required by these statutory authorities shall be made by the Consultant

without any extra cost and will be resubmitted until their approval is obtained.

Output: The Report shall include, but not be limited to, the following:

- i. Updates and finalized versions of the content generated and presented in the NEOC Preliminary Design Report (Output A.3).
- ii. Outline of the construction schedule.
- iii. Complete set of drawings and necessary documents ready to be submitted to the statutory authorities for approval
- iv. Any additional details required for approval shall be submitted by the Consultant with no additional costs
- v. Bills of Quantities and other necessary documents for the tendering process

2. Supervision of Construction work and Equipping of the NEOC

Task B.1: Construction Supervision Manual

The Consultant will produce a Supervision Manual outlining routines and procedures to be applied in contract management, construction supervision and administration.

Output: The Construction Supervision Manual, shall outline routines and procedures to be applied in construction contract management, construction site supervision, quality assurance metrics to be tracked weekly and general administration. The manual shall also include, but not be limited to, the following:

- i. The quality standards that apply to the project, with reference to the technical specifications and relevant construction codes and guidance.
- ii. Quality control, quality assurance and process improvement approaches for the project.
- iii. Quality control tools and techniques that will be applied during construction.
- iv. An accountability matrix that clearly demonstrates accountability and responsibility assignments, including who will be involved in managing quality, when and what their specific duties will be.
- v. The metrics that shall be used to measure quality and how this data will be collected, analyzed, stored and shared.
- vi. Check lists for inspection of material and processes.
- vii. Flow chart of processes to detect potential quality problems.
- viii. Scope for periodic quality audits completed by the Consultant in collaboration with the DDM project focal person and DDM engineer.

Task B.2: Initiate supervision of NEOC building construction and Progress tracking

The Consultant will begin supervising the construction and equipping of the NEOC Building as per the identified timeline. Monthly briefings will be provided by the Consultant to the DDM project focal person with additional on-site briefings provided as necessary, including site tours.

Output: The Consultant shall provide quarterly reports on the progress of the NEOC Building construction in relation to the project plan identified. In the event of forecasted construction delays and/or cost overruns, the Consultant shall provide a detail plan on how these will be mitigated to ensure successful completion of the project. The Consultant shall be available to discuss these reports with DDM upon request. The reports shall continue to be submitted

quarterly until the NEOC Building construction and equipping is complete. The progress tracking will consist of but not limited to:

- i. On-site briefings to demonstrate project advancement, discuss any deviations from the construction timeline and mitigating actions required, work site safety and ensure general situational awareness. These briefings and associated short report shall occur monthly.
- ii. Quarterly Construction and Equipping Progress Reports (Output B.3) will provide a detailed, written account of work completed over the last quarter and work forecasted to be completed in the following quarter. An explanation will be provided by the Consultant for any deviation from the identified project timeline. These briefings and associated report shall occur every three months.
- iii. Quarterly Work Site Safety Reports (Output B.2) will provide a detailed, written record of worker safety through the entirety of Phase B. These briefings and associated report shall occur every three months.
- iv. Ad-hoc meetings as requested by either DDM or the Consultant to address critical construction and equipping issues as they arise such that the overall project timeline is not compromised.

Task B3: Develop NEOC Building Maintenance Guide and Schedule

To ensure the NEOC Building is maintained at a high state of resilience, the Consultant shall develop a technical guide for DDM building maintenance staff. This Guide shall minimally include details on the utility and resilient systems included in the NEOC Building. Within the building envelope this may include systems such as HVAC, primary and secondary electrical, plumbing, etc. and externally this may include painting requirements to ensure concrete maintains its integrity, clearance of any rain water drainage systems, landscaping maintenance, etc. The Guide will also include technical specifications for the systems equipment used in the building, such as HVAC, generators, etc. as well as the model number, parts and services supplier and the warranty information associated with the equipment. This Guide is due within eighteen (18) months of the commencement of Phase B.

Task B.4: NEOC Building Design and Construction Final Report

The report shall provide details on the execution of the NEOC Construction (Design, Build and Equip) project, its achievements and accomplishments, its hazard resilience and environmental sustainability, its maintenance plan, its construction safety record and overall accomplishments. The final report should include a summary decade-long schedule for maintenance. As well, the report should highlight the collaborative nature of the NEOC development with both internal and external agencies. This Report is due within eighteen (18) months of the commencement of Phase B and will represent the final project output. It will serve as the identifying output that signifies the completion of the project.

Annex 4 : Principal Responsibilities for Supervision During Phase B (Build) and Phase C (Equip)

In addition to the tasks and outputs identified in Section 5, the principal responsibilities will be generally to carry out all the duties of the Consultant as specified in the construction and equipping contract documents, within the limitations specified therein, but not limited to the following. In case of any disparity, the stipulations made in the construction and equipping contract documents will prevail in the order of precedence mentioned therein:

- (i) To approve the Contractor's key superintendent personnel, construction mobilization programs, temporary land to be occupied by the Contractor.
- (ii) To approve the contractor's work program including activity scheduling and resource programming.
- (iii) Give the order to commence the work.
- (iv) Ensure that the construction works are in accordance with the technical specifications and other stipulation of construction contract documents and the construction methods proposed by the contractor are in compliance with the above stipulations particularly, in relation to Contractor's construction equipment and other resource deployment.
- (v) To approve setting out of the works.
- (vi) To verify and if necessary order correction of the drawings submitted by the Contractor.
- (vii) Ensure a system of Quality Assurance of works, approve materials, sampling and testing procedure and Quality Control measures to ensure required standard and consistency in quality, at the commencement of item.
- (viii) Check the laboratory and field tests carried out by the Contractor and develop a mechanism in consultation with DDM to carry out an adequate number of independent tests other than the regular testing done by Contractor laboratory personnel.
- (ix) Order special tests of materials and/or completed works, order removal and substitution of improper materials and/or works as required.
- (x) To make independent measurements and check all quantity measurements and calculations required for payment purpose and ensure that all measurements and calculations are carried out in a manner and at the frequencies specified in the contact documents.
- (xi) To issue a working drawing or modify the existing drawing (preferably within one month on request of the Contractor) or to supply a new/supplementary drawing which is not included in the contract, wherever required and to give appropriate associated instructions to the Contractor.
- (xii) To control and appraise the progress of the works, to order suspension of works and to authorize with DDM's approval, extensions of the period of completion of works.

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- (xiii) To monitor and check the day-to-day quality control and quantity measurements of the works carried out under the contract, keep all measurement records (in measurement books- MB's) as per the directions of DDM and issue payment certificates per agreed-to payment schedules, as identified in contract documents, when the quality of the works is satisfactory and the quantities are correct;
 - (xiv) To direct the Contractor in all matters concerning construction safety and care of the works and if required, to request the Contractor to provide any necessary lights, guards, fencing and watchmen, etc. to ensure a safe environment.
 - (xv) To direct the Contractor to carry out all such works or to do such things as may be necessary in his opinion to avoid or to reduce the risk in any emergency affecting the safety of life or of adjoining property.
 - (xvi) To direct the Contractor to take all necessary steps including those mentioned in the construction contract to protect the environment on and off the site which arise due to construction operations
 - (xvii) To inspect the works, during the construction period and at proper interval during an agreed-to defects liability period and to issue defects liability certificates after the rectification, by the Contractor, of possible defects and issue final payment certificates
 - (xviii) Issue interim certificates for monthly payments to the Contractor, and specify completion of parts of the totality of the works, details of progress. Payments are to be recorded in the measurement book (MB's) before issue of interim certificate.
 - (xix) To verify and correct the as-built drawings supplied by the Contractor.
 - (xx) To direct the Contractor to take all necessary steps to maintain the rate of progress of works as per the approved programme of the Contractor on monthly basis.
 - (xxi) To provide adequate supervision of the Contractor's work carried out in more than one shift thus matching the working hours to be the same as that of the Contractor(s);
 - (xxii) To ensure timely completion of the project without diluting the quality standards envisaged and be fully accountable to DDM in this regard.
 - (xxiii) Provide assistance to DDM in respect of contract implementation, claims and other matters.
 - (xxiv) Advise and assist the Client/Employer with respect to arbitration, litigation related with this project, if so required, during contract period or after the contract period.
 - (xxv) Review and ensure continuity of the Contractor's services in approved formats.
 - (xxvi) Update cost estimate in each six month or at quarterly completion (50 percent, 75 percent and 100 percent) of the project phase whichever takes place early; or as required by DDM.
 - (xxvii) Maintain records of all plan labour and material used in the construction and equipping of the works.
 - (xxviii) Regarding interim and final payments to the Contractor: The Consultant will process interim and final payments to the Contractor. Interim monthly payments shall be based on interim payment certificates processed by the Consultant following claims filed by the

Contractor. The Consultant will be responsible for ensuring that all measurements are taken as per specifications and drawings for the works and are recorded in presence of the representative of the Contractor and are countersigned by him. All measurements (100%) will be taken by the Consultant. In processing contractual payments, the Consultant will certify that at least 50% and 15% respectively, of the measurements and quality control tests have been satisfactorily completed.

Additional supervisory responsibilities of the Consultant will be to carry out all such duties which are essential for effective implementation of the construction and equipping contracts, including but not limited to, the following:

- (i) Assist/advise DDM on advance actions required to be taken for handing over of site and in achieving different milestones for completion of projects as per schedule.
- (ii) To verify the quantities of all items in the BOQ and suggest modifications to the same if necessary as per the prevailing site conditions, for the approval of DDM.
- (iii) Assist DDM in proper monitoring/progress of works and implementation of project through computer aided project management technique and management information systems.
- (iv) To write a day-by-day project log which shall record all events pertaining to the admission of the contract, requests from and orders given to the Contractor, any other information which may at a later date be of assistance in resolving queries which may arise concerning execution of the works.
- (v) To advise DDM on all matters relating to execution of the works, claims from the Contractor and to make recommendations thereon, including the possible recourse to arbitration
- (vi) To prepare detailed recommendations to DDM for contract change orders and addenda, as necessary, to ensure the best possible technical results are achieved with the available funds.
- (vii) To assist DDM in taking over from the Contractor of each section, in particular by preparing lists of deficiencies which need to be corrected, and assisting with monitoring of the performance of the works during the defects liability period
- (viii) Assist DDM in providing clarifications/explanations to observations made, from time to time, by the statutory authority or auditing body.
- (ix) Assist DDM in co-ordination of works with different agencies and hold meetings for proper and timely implementation of the project. Prepare and circulate the meeting minutes after receiving approval from DDM.
- (x) Preparation of revised estimate, etc., if required.
- (xi) Modifications in design and drawings.
- (xii) To carry out any other duties relevant to the project agreed during the negotiations.
- (xiii) The Consultant shall review findings from any independent safety audits and incorporate feasible minor modifications in final drawings and BOQ.
- (xiv) Any other important direction given by DDM to complete the project in taking view of good engineering and EOC equipping/operational practices.