

**GOVERNMENT OF PUNJAB
PUBLIC HEALTH ENGINEERING DEPARTMENT**



**REHABILITATION OF WATER
SUPPLY SCHEME FORT MUNRO,
D.G. KHAN**

(FEASIBILITY STUDY)

PC-II

SECTOR WATSAN

ESTIMATED COST Rs. 16.309 MILLION

July, 2021

**GOVERNMENT OF THE PUNJAB
PUBLIC HEALTH ENGINEERING DIVISION-II, D.G. KHAN.**

**GOVERNMENT OF THE PUNJAB
PUBLIC HEALTH ENGINEERING DEPARTMENT**

PC-II

| | | |
|---|--|---|
| 1 | Name by which survey/ feasibility will be identified | Rehabilitation of Water Supply Scheme Fort Munro, D.G. Khan (Through Funding facility for project Preparation) |
| 2 | Administrative Authorities responsible for: | |
| | i) Sponsoring | Government of Punjab |
| | ii) Execution | Punjab Public Health Engineering Department |
| 3 | Details of Survey / Feasibility Study: | |
| | i) General Description and Justification | <p>1. LOCATION</p> <p>Fort Munro is a hill station situated on the Quetta highway at a distance of 85 km from Dera Ghazi Khan in the Sulaiman Mountains Range at an elevation of 6320 feet above sea level.</p> <p>2. HISTORY OF THE PROJECT</p> <p>Fort Munro was originally known as Anari Mool, Balochi language words meaning hilltop with pomegranate trees. In 1880, the British Commissioner Mr. Munro developed this place and shifted summer headquarter of DG Khan Division here. The road from Dera Ghazi Khan to Fort Munro was constructed in 1880 and the name of place was changed to Fort Munro.</p> <p>BACKGROUND OF THE WATER SUPPLY SYSTEM</p> <p>Previously before establishment of the water supply scheme the only source for the potable water was Trimu Lake and Damas Lake where the rain water was stored.</p> |

| | | | | | | | | |
|------|--|---|----|--|-----|---------------------|------|---------------------|
| | | <p>In 1982, piped water supply system based on tube wells installed at Khar valley was established for the Fort Munroe only. Later on the Khar water field was enhanced with up to 5 No. tube wells. Two (02) no. ground storage tanks of 50,000 gallons capacity each at Khar water works & at Intermediate Pumping Station (IPS), one (01) no. GST of 30,000 gallons capacity at Fort Munroe hill top, one (01) no. OHR of 50,000 gallons capacity at hill top of Fort Munroe were constructed. Out of the five (05) No. tube wells installed in Khar valley, one (01) is functional, two (02) have been reported as functional but their electric connections are disconnected due to non-payment of WAPDA dues and other two (02) are reported as abandoned.</p> <p><u>Water Supply Scheme Fort Munroe with Source in Rakhni Stream (1996)</u></p> <p>Water supply scheme Fort Munroe with source in Rakhni Stream area, was approved on 24.04.1996 under the President's Directive. Before the implementation of this scheme, a study was conducted to explore the availability of groundwater and five (05) No. tube wells of 1 cusec discharge each were installed by WAPDA Hydrogeology Department. The project was executed after successful development of the source.</p> | | | | | | |
| | ii) Implementation Period | 03 Months | | | | | | |
| | iii) Year Wise Estimated Cost | Rs. 16.309 million for the year 2021-22 | | | | | | |
| | iv) Manpower Requirements | <p>Consultant shall be well conversant with the existing system and shall be recently involved in similar nature of studies at National levels. The following Manpower (key experts) will be required:</p> <table border="1" data-bbox="643 1841 1307 2087"> <tr> <td data-bbox="643 1841 818 1924">i)</td> <td data-bbox="818 1841 1307 1924">Team Leader/ Civil Engineer / Civil Engineer</td> </tr> <tr> <td data-bbox="643 1924 818 2007">ii)</td> <td data-bbox="818 1924 1307 2007">Water Supply Expert</td> </tr> <tr> <td data-bbox="643 2007 818 2087">iii)</td> <td data-bbox="818 2007 1307 2087">Ground Water Expert</td> </tr> </table> | i) | Team Leader/ Civil Engineer / Civil Engineer | ii) | Water Supply Expert | iii) | Ground Water Expert |
| i) | Team Leader/ Civil Engineer / Civil Engineer | | | | | | | |
| ii) | Water Supply Expert | | | | | | | |
| iii) | Ground Water Expert | | | | | | | |

| | | | |
|---|--|---|--|
| | | <p>iv) Civil Engineer (Structure Expert)</p> <p>v) Mechanical Engineer</p> <p>vi) Electrical Engineer</p> <p>vii) Environmental Specialist</p> <p>viii) Chief Surveyor</p> | |
| | v) Financial Plan | Funds shall be provided by P&D Department from its Project Funding Facility. | |
| 4 | Expected outcome of the survey feasibility study and details of projects likely to be submitted after the survey | <ul style="list-style-type: none"> ● Complete feasibility study of the project after considering all options recommending the most economical, feasible and viable solution. ● Need Based Plans for Proposed Water Supply system. ● Documentation of existing data and assets. ● Ground water and water resources investigation report. ● Preparation of the area indicating the levels & contours of the project area, marking of existing infrastructures such as water supply pipelines, system. ● Plan & design the proposed water Supply System showing the size/diameter, length, discharge of water supply pipes. ● Detail designing of water Supply System for Fort Munro ● Inception report, Concept Design Report, Detailed design report. ● SOP's for operation & maintenance of water supply system with latest technology for its efficient maintenance. Preparation of operation manual. ● Development of adequate monitoring & evaluation system. ● Detailed estimate of the project after administrative approval. ● Detailed Environmental Impact Assessment (EIA) Report. Present & defend the EIA Report during public hearing & assist PHE Department for arranging its approval from Environment Protection Department Punjab. ● Development of adequate monitoring & evaluation system. ● PC-I /Rough cost estimates/BOQ and drawings. ● Detailed estimate of the project after administrative approval. | |

| | | |
|--|----------------------------|--|
| | | • Tender Documents & BOQs |
| | Prepared by: | Executive Engineer, Public Health Engg: Division-II, D.G. Khan |
| | Checked by: | Superintending Engineer, Public Health Engg: Circle, D.G. Khan |
| | Recommended by: | Chief Engineer (South), Punjab, Public Health Engineering Deptt: Lahore. |
| | Forwarded to P&D Deptt. by | SECRETARY Govt. of the Punjab HUD & PHE Deptt. Lahore |

REHABILITATION OF WATER SUPPLY SCHEME FORT MUNRO, DISTRICT D.G. KHAN

TERMS OF REFERENCE

1.0 BACKGROUND OF PROJECT - GENERAL INTRODUCTION

Fort Munro was originally known as Anari Mool, Balochi language words meaning hilltop with pomegranate trees. In 1880, the British Commissioner Mr. Munroe developed this place and shifted summer headquarter of DG Khan Division here. The road from Dera Ghazi Khan to Fort Munroe was constructed in 1880 and the name of place was changed to Fort Munroe.

Fort Munroe is a hill station situated on the Quetta Road at a distance of 85 km from Dera Ghazi Khan in the Sulaiman Mountains Range and its elevation is 6320 feet above sea level. The climate of the scheme area is pleasant in the summer with temperature ranging from 22.7oC to 32.3o while in the winter; temperature falls down to freezing point with sporadic snowfalls. People come here for short stays during summer.

The socio-economic conditions of the area continued to be poor due to many factors such as scarcity of arable land and water resources.

1.1 History of the Project

Previously before establishment of the water supply scheme the only source for the potable water was Trimu Lake and Damus Lake where the rain water was stored. In 1982, piped water supply system based on tube wells installed at Khar valley was established for the Fort Munroe only. Later on the Khar water field was enhanced with up to 5 No. tube wells. Two (02) no. ground storage tanks of 50,000 gallons capacity each at Khar water works & at Intermediate Pumping Station (IPS), one (01) no. GST of 30,000 gallons capacity at Fort Munroe hill top, one (01) no. OHR of 50,000 gallons capacity at hill top of Fort Munroe were constructed. Out of the five (05) No. tube wells installed in Khar valley, one (01) is functional, two (02) have been reported as functional but there electric connections are disconnected due to non-payment of WAPDA dues and other two (02) are reported as abandoned.

1.2 Water Supply Scheme Fort Munroe with Source in Rakhni Stream (1996)

Water supply scheme Fort Munroe with source in Rakhni Stream area, was approved on 24.04.1996 under the President's Directive. Before the implementation of this scheme, a study was conducted to explore the availability of groundwater and five (05) No. tube wells of 1 cusec discharge each were

installed by WAPDA Hydrogeology Department. The project was executed after successful development of the source.

1.3 Rehabilitation of Rural Water Supply Scheme Fort Munroe (2015)

The Rehabilitation of Water Supply Scheme Fort Munroe was approved at the cost of Rs. 257.064 Million vide No. SO (PH-S) 10-13/2014 (DGK) dated 01.04.2015. It was technically sanctioned (T.S) at the cost of Rs. 243.664 Million vide No. 177/E/732/P&D dated 04.-05-2015.

1.4 GPS Coordinates

| | |
|------------------------------|---|
| Sauri Well Field: | 29°57'9.80"N, 69°54'18.15"E |
| Installations in Well Field: | Generator: 29°57'9.71"N, 69°54'19.70"E, TW-1: 29°57'9.71"N, 69°54'17.01"E, TW. No.2: 29°57'11.26"N, 69°54'19.33"E |
| Roghni Thall IPS: | 29°56'55.54"N, 69°55'13.01"E |
| Sherin Thall IPS: | 29°56'27.29"N, 69°56'51.25"E |
| Fort Munroe: | 29°55'51.12"N, 69°58'55.63"E |

2.0 OBJECTIVES

The objective of the project is to prepare a Comprehensive Plan for provision of safe drinking water to the residents of Fort Munro, Khar and allied abadies in line with Vision 2025, National Water Policy 2018, Punjab Water Policy 2018, Punjab Growth Strategy 2023 and Sustainable Development Goals.

3.0 SCOPE OF WORK

The consultant will be responsible for feasibility study, design & estimation for preparation of feasible, viable and sustainable rehabilitation of water supply scheme for provision of safe drinking water to the residents of Fort Munor, Khar and allied abadies.

3.1 Specific Activities

- Collection of primary as well as secondary data, to carry out requisite surveys.
- Study of existing water supply system and propose improvements in the existing system (if found feasible).
- Study, survey and investigation of Water Source and Site(s).
- Investigations and studies for selection of least cost, economical, sustainable and most viable option for rehabilitation of Water Supply System.
- Technical and Design Parameters / Standards, Specifications, Preliminary Designing and Costing for various options with their Cost and Benefit Analysis.

- Feasibility, Technical Specifications, Detailed Designing & Costing for the most viable option.
- Environment Impact Assessment (IEE/EIA).
- Standing Operation Procedures (SOP) for operation and maintenance.
- Bill of Quantities and Projects Documentation (PC-I etc.).
- Device implementation strategy.

3.2 Scope of Work-Main elements

Overall scope of the consultancy services would include, but not limited to the following:

3.2.1 Data Collection and Survey Work:

1. Collection of available data and other related information necessary to carry out the required feasibility study and construction work.
2. Consultants should collect statistics of all the water resources in the area.
3. Survey work shall comprise of necessary surveying, levelling and establishing bench marks with respect to Geodetic Traversing Survey(GTS) bench mark, drawing cross-sections where required, and other related works required for preparation of design and construction of water supply system. It shall take into account survey of the area where well center is going to be proposed. Survey plans etc. will be produced on Auto CAD, soft as well as hard form on scales acceptable to PHED.
4. Establish Survey of Pakistan Datum at key locations.
5. Carry out detailed contour survey required for infrastructure plans with field survey to be conducted for the design of services.
6. Gather existing network maps and information about the Services, infrastructure in the City.

3.2.2 Base Map – GIS Based with Asset Attribute:

1. Input Water Supply network information on the digitized maps of the network showing all existing/proposed, the extent of existing sewer or drain (if any) and water supply systems, The sizes/diameter of existing system should be indicated on the plans together with any area that are subject to acute shortage of water supply.
2. On the basis of field studies & surveys develop a detailed mapping of all the networks (including other services in coordination with concerned departments i.e. Gas, Electricity, Telephone lines, TV cables) in the route of Rising Main and Distribution Network.

3. Preparation of base maps on scale 1:1000 and other scales acceptable to PHED. It will also include marking of available data including existing structures, proposed water supply transmission lines to be laid from well center to the city and water supply distribution network. The consultant will furnish soft copies of these plans on AutoCAD, prepare and submit topographic plan for design and construction of water supply system.
4. Positioning of all wells and water structures on maps through GPS coordinates and preparation of GIS maps.

3.2.3 Soil Investigation:

Preliminary soil investigations required for the selection of site and construction of Ground Water Tanks/ Ground Storage tanks, pumping station/ pump house and laying of rising main. The consultant shall carry out appropriate Geo Technical Investigations of Soil through bore holes up to desired depth at suitable intervals with all related laboratory testing for Construction of GWT & laying of Rising Main / Feeder Main and pump houses.

3.2.4 Detailed study of failure of previous water supply schemes:

The consultant will study the failure of existing water supply schemes at Khar water field and Sauri water field and furnish report accordingly.

The consultant not only required to carry out detailed investigation for the failure/ non utilization of schemes but also work on the proposal for rehabilitation/ restoration/ re-designing of the schemes to explore the most feasible and viable option.

3.2.5 Ground Water Investigation:

Ground Water investigations is required for the selection of source of water for installation of tubewells. Ground Water Investigation will be conducted with both aspects i.e., Quality & Quantity. The consultant shall carry out appropriate ERS and trial bore up to desired depth at suitable locations with all related laboratory testing for Construction of tubewells on most feasible, viable, sustainable and economical locations. In this regard consultant will carry out hydrological and hydro geological study for the whole project area covering the activities which include but not limited to the following:

- Inventory of all existing tube wells in the area with GPS Coordinates, covering capacity, tentative depths, tentative discharge, quality of water, life / age and performance.
- Exploitation level of local water bodies / consumers in the areas of Fort Munroe,

Khar and upto Sauri Well Field / stream. Qualitative & Quantitative figures of all water users will be recorded.

- Data required with seasonal variations wherever possible.
- An appropriate inventory of wells tapping shallow, medium and deep aquifers shall be provided as possible.
- Static & Dynamic Water Level Monitoring.
- Hydrological and Hydrogeological Study of the Area.
- Demarcation of sweet, brackish & saline water zones.
- Thickness of the lateral extent of the aquifer
- Quantum of recharge in the project area.
- Current abstraction of water in the Project Area.
- Minimum two (02 No.) test bores. Each test bore may have minimum three number piezometers/observation wells with a specific distance from the test well to ascertain aquifer potential & its properties. Test Bore will be converted into tubewell(s) for Mega water Supply Scheme Fort Munroe.
- Trial Bores of size as desired by engineer, 500 feet deep including strata & water sampling testing (6 No.).
- To determine the safe and sustainable yield of sweet water aquifer. The consultant will workout & recommend safe sustainable yield of aquifer and submit detailed report alongwith consideration and implication for sustainable water supply and ground water recharge.
- Identification of sweet ground water at different level. Preparation of lithological logs.
- Geological and Hydro-chemical data.
- On site Hydro-chemical testing regarding PH, Electric Conductivity, Dissolved Oxygen, etc.
- Prepare a ground water flow model and Solute Model.
- Preparation of Ground Water Contour Map.
- Water sampling and testing (minimum 30 tests) against the against the following parameters:

| Type of Testing | Testing Parameters |
|-----------------|--------------------------------------|
| Physical | 1. Turbidity 2. Colour 3. Odor |

| | |
|-----------------|--|
| | 4. Taste |
| Chemical | 5. Electrical Conductivity 6. TDS 7. pH 8. Calcium 9. Magnesium 10. Chloride 11. Hardness 12. Fluoride 13. Sodium 14. Potassium 15. Sulphate 16. Nitrate 17. Nitrite |
| Bacteriological | 18. E Coli and Total Coliform |
| Heavy metals | 19. Iron 20. Arsenic 21. Other hazardous one element as desired by Client |

- Finally design & recommend the Sustainable Source of Drinking Water. Water Sustainability Analysis based on Recharge & Discharge. Details of Proposed Water Source may be added / provided including expected life of the sweet aquifer, safe / sustainable water yield to be abstracted, source of recharge and alternative source for future.

Electrical Resistivity Survey (ERS /VES)

Electrical Resistivity Survey by Schlumberger electrode configuration according to ASTM Standard D6431 interpretation of geophysical data or by equivalent method to determine the:

- Demarcation of fresh-saline water zones.
- Lithological nature of aquifer in the project area.
- Thickness of lateral extent of aquifer.
- Estimation of Ground Water Quality Profiles within the depth of interest.
- Selection of prospective sites for exploitation of ground water.
- Determination of Target Drilling Depth to avoid unnecessary exploratory drilling.
- Identification of nature and thickness and thickness of the aquifers in the project area.

3.2.6 **Feasibility to Supplementary Water From Khar & Damas Lakes**

Consultant will examine & prepare the feasibility for using of surface water from Khar and Damas Lakes to supplement the water supply to Fort Munroe & Khar. Consultant will carry out their work both aspects of Quality & Quantity. Quantum of water in both lakes, filling time with intensity of rainfall. Consultant will design the Surface Water Treatment Plant on least operational cost technology. Consultant will recommend the most appropriate, feasible and technically viable site to the client so that the Client may reserve / protect the site for future use..

3.2.7 **Technical and Design Parameters.**

After detailed investigations, the consultant will prepare design standards and specifications for:

- a. Selection of site(s)
- b. Selection of Route for Rising Main
- b. Optimal technology option Machinery, Equipment, Pipes and materials.

Based on the aforementioned survey(s) / studies/ feasibility, the consultant will get approval of PHED.

3.2.8 **Preliminary Engineering Design.**

At the stage of Preliminary Engineering Design which include but not limited to:

- i. Study of existing water supply system and its deficiencies.
- ii. Estimation of the water availability flows from different areas.
- iii. Planning and design of water supply system.
- iv. Domestic water supply, combined or zone wise including technical and financial comparison of different options suitable for the area and then complete design of the selected option.
- v. Workout the total requirement of water demand of the city up to 2050, availability of water from water resource(s).
- vi. Design water supply system, for future extension with its location and costing.
- vii. The consultant will examine sources to achieve the drinking water quality according to standards (NEQS) of EPA & WHO etc. A comparison of source(s) water quality and the desired final water quality is to be prepared by consultants.
- viii. The consultant must consider that environmental compatibility issues cover a broad spectrum of concerns.
- ix. The consultant will examine the health and aesthetic aspects of water quality.

- x. The consultant will explore all options in or around Fort Munro/Khar or away from Fort Munro i/c Sauri area and will submit feasibility study with recommendation for the most feasible/cost effective technical option.
- xi. Consultant will also carry out feasibility to supplement the water supply by using surface water from Khar and Damas Lakes.

3.2.9 Detailed Engineering Design.

- i. Detailed engineering design of the Rehabilitation of Water Supply System for Fort Munro. The design would be complete in all respects regarding Civil, Mechanical, and Electrical components and all ancillary works including details of landscaping/horticulture works etc, at water works.
- ii. Carryout network analysis and development of water supply computer model for proposing implementable / feasible / operational sub zones / sub zones on EPA net or other approved water supply distribution system design software.
- iii. Complete structural design of Ground Tanks, Tube well Chambers, Air Valve / Washout Chambers, Backing / Thrust Blocks, Quarters and all other structural related items.
- iv. Preparation of Technical Specifications for all proposed components in accordance with the PHED.
- v. Study & Design SCADA System for Water Supply System covering Well Center, Water Works and Other important areas.
- vi. Preparation of Engineers Cost Estimates based on latest MRS rates duly supported with Detail of Quantities, Bill of Quantities, Drawings (Structure + Construction) and PC-I etc.
- vii. The PC-I would be prepared on latest format duly supported with all requisite data and information including Economical Analysis etc.
- viii. The consultant will prepare Tender Documents / Bid Documents for floating Tenders etc.

3.2.10 Environmental Impact Assessment:

- i. Carry out requisite IEE / EIA Environmental Impact Assessment of proposed alternatives in accordance with Environmental Protection Department (EPD) /Government Guidelines and prepare necessary Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA) Reports and get approval from EPD Punjab. The consultant will also pay the processing Fee to EPA for getting approval of IEE/EIA.
- ii. The Consultant will examine the Environmental Impact of the proposed site on residents and environment.

3.2.11 Implementation Strategy:

Phased programmes / projects for gradual (short, medium and long term plans) for proposed water supply system.

3.2.12 Financial Analysis:

The consultant will carry out the Financial (Cost Benefit) and Economic analysis:

- i. Compute the Financial Internal Rate of Return (FIRR) and other financial indicators to assess the financial viability of the project.
- ii. Compute the Economic Internal Rate of Return (EIRR) and other economic indicators to assess the economic viability of various alternatives of Treatment.
- iii. Carry out sensitivity analysis for FIRR and EIRR with respect to important parameters such as project risks, revenues, capital investments, O&M costs, availability of land, nature / composition of waste water, climatic conditions, economization, energy bills etc.

3.2.13 Liaison with other Agencies / Department:

- (ii) The consultant will make liaison with all concerned agencies / departments working on urban services & infrastructure to ensure programme compatibility and to get data etc. related to the study.
- (iii) The consultant will also make liaison with Irrigation Department, C&W, WAPDA, Local Government, etc, on behalf of PHED for NOC.

3.2.14 Standing Operation Procedures (SOPs) For Operation & Maintenance

The consultant would prepare and submit O&M Manual and detailed Standing Operating Procedures (SOPs) for operation & maintenance of Water Supply System which include but not limited to:

- a) Study and review the performance of existing water supply system in the area at service delivery.
- b) Study effectiveness of complaint management system and response system
- c) Determine the future needs for betterment of operation and maintenance in the planning horizon. Prepare proposals to ensure adequate operation & maintenance of existing and proposed facilities.
- d) Study and suggest a phased action plan for automation of Tube wells and other such installations in the planning horizon.
- e) Suggest and develop a planned preventive maintenance programme for all electrical, mechanical and other installations.

- f) Prepare O&M Manuals & Design Manual for services.
- g) Prepare HR and Organizational Design of KSDA for city services delivery as defined and its needs for organizational design for implementation of comprehensive plan.

4.0 DELIVERABLES ALONGWITH TIME FRAME

| Sr. No. | NAME OF REPORT | Time Frame | NO. OF COPIES |
|---------|---|------------|------------------------|
| i. | Inception Report | 15-Days | 6 Hard Copies +3-CDs |
| ii. | Engineering Survey, Geo-technical and Mapping Report | 45-Days | 6 Hard Copies +3-CDs |
| iii. | Feasibility Report | 45-Days | 6 Hard Copies +3-CDs |
| iv. | Preliminary Engineering Design Report | 45-Days | 6 Hard Copies +3-CDs |
| v. | Environmental Assessment Report | 50-Days | 6 Hard Copies +3-CDs |
| vi. | Detailed Engineering Design Report i/c Executive Summary | 60-Days | 10 Hard Copies + 5-CDs |
| vii. | Technical Specifications, Cost Estimates, BOQ's and PC-I etc. | 90-Days | 6 Hard Copies +3-CDs |
| viii. | Construction Drawings and Quality Control Manual | 90-Days | 6 Hard Copies +3-CDs |
| ix. | O&M Manual and SOP's | 90-Days | 6 Hard Copies +3-CDs |

5.0 CORE TEAM FOR FEASIBILITY STUDY AND PROJECT FORMULATION

| S. No | Position | Qualification | Minimum Experience | Man Month | Duties/ area of work |
|-------|--|--|------------------------------|-----------|---|
| 1 | Project Manager / Team leader (Civil Engineer) | M.Sc. (Civil/Env) Engg with BSc. Civil | MSc -15 years & BSc-20 Years | 3 | Responsible Project Preparation and to co-ordinate and monitor the project and liaison with PHED and other Departments. |
| 2 | Water Supply Expert | BSc. (Civil) | MSc -10 years & BSc-15 Years | 3 | Responsible for preparation of Design of Water Supply System and SWTP. |
| 3 | Ground Water Expert | MSc. Geology with Specialization in Hydrogeology or equivalent | MSc. -12 years | - | Responsible for ground water investigation. Cost inclusive in Direct cost (Ground water investigation) |
| 4 | Civil Engineer (Structures) | M.Sc. (Civil/Env) Engg with BSc. Civil | MSc -15 years & BSc-20 Years | 1 | Responsible to Study & Design of all civil works i/c Ground Tanks, etc. |
| 5 | Mechanical Engineer | B.Sc., (Mech) Engg | 8-10 Years | 0.5 | Responsible for design of all mechanical installations. |

| | | | | | |
|----|--------------------------------------|----------------------------|------------|-----|---|
| 6 | Electrical Engineer | M.Sc., (Elect) Engg | 8-10 Years | 0.5 | Responsible for design of all Electrical installations. |
| 7 | Environmental Engineer | M.Sc./ B. Sc. (Envir) Engg | 8-10 Years | 1 | Responsible to prepare EIA/IEE reports, and Env. Input in Study & Design etc. |
| 8 | Assistant Engineer (Civil/Env) 2 No. | B. Sc. (Civil/Env) Engg | 5 Years | 4 | Responsible for study & design of civil works / water supply |
| 9 | Chief Surveyor | B.Sc. (Civil) Engg | 7 Years | 1 | Responsible to survey. |
| 10 | Quantity Surveyor | DAE Civil | 10 Years | 2 | Responsible for estimation of the scheme. |
| 11 | Office Manager | Qualified person | 5 years | 3 | Responsible for daily activities and providing support where necessary |
| 12 | CAD Operator | Qualified person | 7 years | 6 | Responsible to prepare CAD drawings of design of plant and other components. |
| 13 | Survey Khalisis | Qualified person | 5 years | 6 | Responsible for surveying of the scheme |
| 14 | Office Boys & Survey Staff | Qualified person | 5 years | 6 | Responsible for daily activities and providing support where necessary |

6.0 TIME PERIOD

The consultant shall undertake to complete services as stated in scope of work in all respects in three (03) months. No extension in time will be allowed except as a result of Force Majeure, or reasons beyond the control of the consultant. However, the consultant's remuneration shall not exceed the amount of Agreement Price in any case.

7.0 WORKING LANGUAGE

The working language of assignments, reports and works prepared by the consultant will be in "English".

8.0 MISCELLANEOUS

1. The presentations, as and when required during the whole period of assignment will be made by the consultant on multimedia to the satisfaction of PHED and Government of the Punjab.
2. No boarding, lodging, transport and office facilities will be provided by PHED to the consultants.
3. The interpretation of PHED on any clause of TOR will be final.

SUMMARY

SURVEY, FEASIBILITY STUDY AND PREPARATION OF PC-I FOR REHABILITATION OF WATER SUPPLY SCHEME FORT MUNRO, D.G.KHAN

SUMMARY OF COSTS

| Item | Description | Financial Cost (PKR) |
|--------------------|-------------|----------------------|
| A | Salary Cost | 4,180,000 |
| B | Direct Cost | 9,880,000 |
| Sub Total (A+B) | | 14,060,000 |
| Add 16% Sales Tax | | 2,249,600 |
| Grand Total | | 16,309,600 |

Water Supply Project

Salary Cost

| Sr. No | Position | Staff Month Rate | Nos | Input Staff Months | Total Rs. |
|--------------------|------------------------------------|--|-----|--------------------|------------------|
| 1 | Team Leader/ Civil Engineer | 400,000 | 1 | 3 | 1,200,000 |
| 2 | Water Supply Expert | 250,000 | 1 | 3 | 750,000 |
| 3 | Ground Water Expert/Hydrogeologist | Cost inclusive in Direct Cost (Ground water investigation) | | | |
| 4 | Civil Engineer (Structural Expert) | 250,000 | 1 | 1 | 250,000 |
| 5 | Mechanical Engineer | 250,000 | 1 | 0.5 | 125,000 |
| 6 | Electrical Engineer | 250,000 | 1 | 0.5 | 125,000 |
| 7 | Environmental Engineer | 200,000 | 1 | 1 | 200,000 |
| 8 | Chief Surveyor | 150,000 | 1 | 1 | 150,000 |
| 9 | Assistant Engineers (Civil/Env) | 125,000 | 2 | 4 | 500,000 |
| 10 | Quantity surveyor | 50,000 | 1 | 2 | 100,000 |
| 11 | Computer / AutoCAD Operators | 50,000 | 1 | 2 | 100,000 |
| 12 | Office Manager | 40,000 | 1 | 3 | 120,000 |
| 13 | Office Assistans / Drivers | 30,000 | 4 | 12 | 360,000 |
| 14 | Survey Khalisis | 25,000 | 4 | 8 | 200,000 |
| Sub Total:- | | | | 41 | 4,180,000 |

Breakdown
Direct Cost

| Sr. No | Description | Unit | Unit Cost | Amount (Rs) |
|----------------|--|-------------|------------------|--------------------|
| 1 | Local Transport Cost Including Vehicle POL & Maintenance (2 Nos) | Vehicle | 80,000 | 480,000 |
| 2 | Ground water investigation, inventory of wells, mapping, water sustainability analysis | LS | 500,000 | 500,000 |
| 3 | TA/DA & Accommodation of Experts | LS | -- | 300,000 |
| 4 | Telephone/Fax/Postage/Mobile Phone | LS | -- | 200,000 |
| 5 | Printing/Stationery | LS | -- | 300,000 |
| 6 | Water Sampling | LS | -- | 200,000 |
| 7 | Geotechnical Investigation | LS | -- | 400,000 |
| 8 | Topographic Survey | LS | -- | 600,000 |
| 9 | Electrical Resistivity Survey | 20 | 60,000 | 1,200,000 |
| 10 | Trial Bores | 5 | 500,000 | 2,500,000 |
| 11 | Test Tubewells | 2 | 1,600,000 | 3,200,000 |
| Total:- | | | | 9,880,000 |

**Core Team
CORE, TEAMS**

Following are the team of experts which needs to be hired by the consultant in order to complete the Project.

| Sr. No | Position | Qualification | Minimum Experience | Duties/Area of Work |
|---------------|---|---|---|--|
| 1 | Project Manager / Team leader (Civil Engineer) | M.Sc. (Civil/Env) Engg with BSc. Civil | MSc -15 years & BSc-20 Years | Responsible Project Preparation and to co-ordinate and monitor the project and liaison with PHED and other Departments. |
| 2 | Water Supply Expert | BSc. (Civil) | MSc -10 years & BSc-15 Years | Responsible for preparation of Design of Water Supply System |
| 3 | Ground Water Expert | MSc. (Geology with specialization in Hydrogeology or equivalent) | MSc -12 years | Responsible for ground water investigation |
| 4 | Civil Engineer (Structures) | M.Sc. (Civil/Env) Engg with BSc. Civil | MSc -15 years & BSc-20 Years | Responsible to Study & Design of all civil works i/c Ground Tanks, etc. |
| 5 | Mechanical Engineer | B.Sc., (Mech) Engg | 8-10 Years | Responsible for design of all mechanical installations. |
| 6 | Electrical Engineer | B.Sc., (Elect) Engg | 8-10 Years | Responsible for design of all Electrical installations. |
| 7 | Environmental Engineer | M.Sc./ B.Sc (Envir) Engg | 8-10 Years | Responsible to prepare EIA/IEE reports, and Env. Input in Study & Design etc. |
| 8 | Chief Surveyor | BSc. (Civil) | 7 Years | Responsible for topographic survey of the scheme |
| 9 | Assistant Engineer (Civil/Env) | BSc. (Civil/Env) | 5 Years | Assist Water supply expert and Environmental Engineers for Design and EIA of the scheme. |
| 10 | Quantity Surveyor | DAE Civil | 10 Years | Responsible for estimation of the scheme. |
| 11 | Office Manager | Qualified Person | 05 Years | Responsible for daily activities and providing support where necessary |
| 12 | CAD-Operator | Qualified Person | 07 Years | Responsible of CAD drawings of design of plant and other components. |
| 13 | Survey Khalisis | Diploma in Survey | 05 Years | Responsible for surveying of the scheme |
| 14 | Office Assistants+Drivers | Qualified Person | 05 Years | Responsible for daily activities and providing support where necessary |