



**TERMS OF REFERENCE  
FOR  
PREPARATION OF MASTER PLANS FOR THE WATER,  
WASTEWATER & STORM WATER DRAINAGE OF  
LAHORE DISTRICT**

**Water And Sanitation Agency (WASA)  
Lahore Development Authority (LDA)**

**Mar 2013**  
*(Amended on April-2014)*



# 1 BACKGROUND INFORMATION

## 1.1 Beneficiary

All the inhabitants of Lahore District.

## 1.2 Contracting Authority

Water and Sanitation Agency (WASA), Lahore Development Authority (LDA)

## 1.3 Relevant Background

### 1.3.1 *Project Description*

Urbanization presents one of the key challenges and, at the same time, opportunities in the new millennium. Urbanization is taking place at a rapid pace and is beyond the effective control of most government across the world. The scale and complexity of urban problems are increasing everywhere and out of those most challenging is to meet the water and sanitation demands. All cities must plan ahead to enable a sustainable future in the rapidly changing urban environment. Cities must review their strategic plans to develop better economic, social and environmental future. Those cities that fail to plan ahead and execute the plans will not be competitive in the globalized world.

In the same context, Water and Sanitation Agency (WASA), Lahore Development Authority intends to hire consultants for preparation of Master Plan with 25-year planning horizon and identification/prioritization of projects for provision of physical infrastructure for water supply, sewerage, storm water drainage and waste water treatment with detailed designing and costing for the **Lahore District** to meet the present & future requirements for efficient and effective service delivery.

The consultant shall consider, as appropriate, alternative options and analyze these in terms of their institutional, technical and financial merits.

### 1.3.2 *Geographical Area to be Covered*

Lahore is the capital of the province of Punjab and the second largest city of Pakistan. Major portion of the city lies towards east and south of River Ravi, a tributary of mighty River Indus. The average elevation of the city is 700 ft. above mean sea level. Lahore is situated on the flood plain of River Ravi which has a gradual slope towards South West.

At the time of independence, Lahore had an estimated population of about 0.775 million. After independence in 1947, the growth of city further accelerated. Lahore continued to grow and by 1998, Lahore was transferred into a metropolis city. The current WASA Lahore service area is about 350 Sq. Km with an estimated population of 6.152 million. However for the Master Planning purpose, whole of the district is the study area.



## **1.4 Previous Master Plan and Studies Conducted**

The consultants should study and review the previous Master Plan suggestions, provisions and their implementation during 1975 to 2011, the physical targets achieved, deviations from the plan, shortcomings and suggestion about works being executed at present as briefly described below:

### ***1.4.1 Master Plan for Water Supply, Sewerage & Drainage System of Lahore (1975)***

Previous Master Plan for WASA Lahore was prepared in 1975 with World Bank Assistance with 25-year planning horizon. Major interventions made under the previous plan were:

- a) Direct pumping through the network of main well centres along the River Ravi Bed. Construction of Old Ravi, National Ravi, Bhogiwal, and Salamat Pura Well Centres.
- b) Water supply to the city through big feeder mains of Ductile Iron Pipes.
- c) Provision of main sewerage pumping stations and trunk sewers
- d) Laying of 12” to 32” dia Ductile Iron feeder mains from well centres to inside city.
- e) Construction of Disposal Stations at Mahmood Booti, Sadbagh, Khokhar Road, Gulshan-e-Ravi, Farrukhabad, Multan Road and Main Outfall.

### ***1.4.2 Sewerage and Drainage System for Central Lahore (2002)***

Comprehensive engineering study for sewerage & drainage system of Central Lahore was conducted with planning horizon upto year 2027.

### ***1.4.3 Sewerage and Drainage System for South Lahore (2007)***

Comprehensive engineering study for sewerage & drainage system of South Lahore was conducted with planning horizon upto year 2057.

### ***1.4.4 Sewerage and Drainage System for Southwest Lahore (2008)***

Comprehensive engineering study for sewerage & drainage system of Southwest Lahore was conducted with planning horizon up to year 2058.

## **1.5 Current State of Affairs in the Relevant Sector**

### ***1.5.1 General***

Master Plan for water, waste water and storm water drainage services was last prepared by M/s Camp, Dresser & Mckee (CDM) in 1975. The city has since grown many times in size and population. LDA now wants to assess not just the current situation but to forecast future needs, which calls for exhaustive studies and planning on several counts to make water supply, sewerage & storm water drainage system sustainable. It includes:



- To recycle the wastewater after its treatment and its use for arboricultural / irrigation purposes.
- To use the rainwater for recharging the ground water.

Investment in the sector over many years has been at a level well below that needed for sustainability and consequently the infrastructure cannot meet the standards needed to achieve compliance with the environmental requirements. The standards of service have declined to a point where a large proportion of the population receives water on an intermittent basis and of a quality which is not up to the standards of potability. Wastewater is discharged without licenses thus causing significant environmental risks.

### ***1.5.2 Drinking water sector***

Lahore District, its main 9 towns and surroundings areas are located over water aquifer. The water supply in the city is purely based on the ground water. The water is abstracted through a number of tubewells installed in all parts of the district which is generally pumped directly into the distribution system. Due to ever increasing number of tubewells, the water table is depleting rapidly. The organization and management of the services lacks coherence, and investment has been far below the level needed both for long term sustainability of the existing assets, and to bring the systems up to modern standards in terms of water conveyance, storage, level of losses and treatment.

In addition to these general statements about the service, the other problems of the water supply sector includes the following:

- Regulations are weak in terms of the definition of responsibilities and the allocation of them.
- Monitoring, inspection and enforcement powers are also very weak.
- There is no clear separation of the regulatory functions and the service provision functions after the devolution and 18<sup>th</sup> amendment.
- Water supply is on an intermittent basis.
- Study and review the existing levels of service
- The resource situation is not exactly known because there are no recent and detailed hydrological and hydro-geological studies of sustainable yields.
- Main traditional source is under increasing threat from saline intrusion (due to over-pumping) and pollution (due to absence of sewerage and sewage treatment over an unconfined aquifer, and the intensive use over many years of agro-chemicals such as nitrogenous fertilizers and pesticides).
- The levels of non-revenue water are considerable, and the components (physical leakage, technical and commercial losses) are not separately estimated
- There isn't a clear policy on the allocation of water resources between the competing needs for drinking water and those of irrigated agriculture.



- The pricing policy for the drinking water service is not sufficiently in line with the scarcity of water. Tariffs are not explicitly set at cost recovery levels – either to cover resource costs and operation and maintenance, or asset depreciation and any investment financing charges.
- All water services are not metered, and there is no policy on periodic re-calibration of meters. Bill collection rates are very poor. Continuation of the services is dependent solely on central and local annual budgets.
- No records are kept of assets, their condition, book value or remaining service life. No asset management (business) planning is carried out. Recent investments in the sector have been mainly on pipe replacements.

### ***1.5.3 Wastewater sector***

Presently, no waste water treatment services exist and the raw waste water is directly discharged into the River Ravi which creates environmental problems especially when significant dilution is not available in the river. The sewerage service generally suffers from:

- Failure to keep up with the development of the district or because of piecemeal extensions. The result is that capacity is inadequate in many places and leading to overflowing on to the surface and hence drainage to low lying (ponded) areas with resultant contamination of near surface groundwater
- No records are kept of assets, their condition, book value or remaining service life. No asset management (business) planning is carried out. Recent investments in the sector have been mainly on pipe replacements
- Lack of effluent standards and enforcement
- Poor maintenance of pumping stations – no preventive maintenance
- Combined systems of sewerage and storm water, which can't cope with heavy rainfall, which leads to surface flooding and ponding.
- Absence of any sewage treatment

### ***1.5.4 Storm-water Sector***

Storm water drainage has also become a major environmental concern particularly in urban areas of the Lahore where mostly partially combined drainage/sewerage systems are in use. The situation becomes worse in the monsoon which normally extends from July to September. It is not only an issue for low lying areas but also for some developed localities. The other related issues are:

- Poor maintenance of pumping stations again leading to overflows and ponding
- Combined systems of sewerage and stormwater, which can't cope with heavy rainfall, which leads to surface flooding and ponding
- Dumping of Solid Waste into drains.



### **1.5.5 Waste Water Treatment Sector**

A greater area of concern is the lack of waste water treatment which could not meet the requirements of national Environmental Quality Standards. With very few exceptions the problem of safe disposal of domestic and other industrial effluents has not been addressed. The ground situation is that bulk of the waste water (domestic/industrial) is discharged untreated into natural water bodies (streams, canals, rivers, seepage drains, and other channels) and /or used for irrigation purposes.

## **2 OBJECTIVES**

### **2.1 Overall objective**

The overall objective of preparation of new Master Plan for water supply, sewerage & storm water drainage of Lahore District is to improve Lahore's water supply, sewerage, and drainage services and enhance environment and public health. This broader goal will be achieved through the following specific objectives and activities.

### **2.2 Specific objectives**

- To review the legal and regulatory frame work and suggest improvements.
- To assess the existing and proposed institutional arrangements and human resource requirements and to make recommendations for making the organization efficient and self-sustaining.
- To assess the state of the physical infrastructure and make recommendations for rehabilitation and expansion.
- To develop GIS based asset inventory on freshly acquired satellite imagery of at least 0.6 meter resolution along with thematic maps.
- To review tariff, introduce sound financial management practices and based on that develop Financial MIS
- To prepare specific master plans for water supply, wastewater & its treatment and storm-water and
- To develop implementation plan and phasing of measures



## 3 SCOPE OF WORK

### 3.1 General

#### 3.1.1 Project description

The consultant will be responsible for preparing comprehensive master plans for water, waste water & its treatment and storm water drainage within the context of meeting the requirements of the environment and public health. The consultant is to take into account the opinion of relevant authorities and shall seek to reach agreement with them on the proposals. This means working closely with all relevant stakeholders to ensure that all reports and plans reflect the needs and priorities of the District. The consultant shall consider, as appropriate, alternative options and analyze these in terms of their legal, institutional, technical and financial merits.

#### 3.1.2 Geographical area to be covered

The whole of the Lahore District is to be included for the study.

### 3.2 Specific activities

The scope of consulting services to be rendered by the consultant would comprise (*but not limited to*) the following Specific Activities:

- Review of the Master Plan(s) of LDA and WASA for Lahore and various studies already undertaken for Lahore District.
- Review of Institutional and legal Framework in the context of Organizational setup of WASA Lahore and propose new institutional arrangements for efficient service provision in the context of new master plan.
- Description and inventory of existing water, wastewater and storm water drainage systems.
- Preparation of GIS based maps for existing water supply, sewerage and drainage services in multi-layer system for whole district.
- Diagnostic analysis & surveys, data collection and carrying out requisite studies regarding water supply, sewerage & storm water drainage and waste water treatment system for master planning horizon up to the year 2040.
- Population projections, service area projections, present and planned land use, water demand projections and new source identification, and future sewerage & storm water drainage demand; and waste water treatment requirement for Lahore District with short, medium and long term goals, objectives, strategy and projects.
- Master Plan for Surface Water as alternative water source: Study & preparation of master plan for alternative water source(s), all possible sites / locations of surface water (BRB, Ravi Syphon & Marala etc.)
- **Ground Water:** Hydrological and hydro geological study for the whole District regarding ground water aquifer which is being depleted rapidly due to over-exploitation and reduction in recharge.
- Identification of areas of over-exploitation of ground water.



- **Arsenic Contamination:** Arsenic Contamination and identification of zones of Arsenic contamination.
- **Water Supply Network:** Zoning of water supply distribution areas. Evaluation of NRW level for each zone. Pilot project for one water supply distribution zone.
- **Comparative analysis of water supply distribution system through water storage tanks Vs direct pumping:**
- Detailed Engineering Design of sewerage system (left over areas / not covered in the studies recently conducted) including North Lahore, North East & East (Upto BRB Canal), Shahdara, South East, etc.
- Preparation of proposal for integration of sanitation of non WASA areas like Cantonment Boards, DHA, Railways, Model Town, Universities, Private Housing Schemes etc.
- Alternative material for RCC pipes due to crown failure incidences in RCC pipes.
- Quantity of storm water likely to be generated in the planning horizon at different stages of development with reference to 2 year & 5 years recurrence intervals.
- Study and evaluate the capacity of existing drains with reference to 2 year & 5 years recurrence intervals.
- Comprehensive engineering proposal for separation of sewage from open / storm water drains.
- Detailed Engineering Design of drainage system (left over areas / not covered in the studies recently conducted) including North Lahore, North East & East (Upto BRB Canal), Shahdara, South East, etc.
- Design of primary secondary and tertiary drainage network alongwith identification of new routes of primary drains in the city and in the district.
- Review of sites for waste water treatment plants proposed by M/s Balfour Maunsell and not covered by M/s NESPAK under the current study. Study and identification of new sites for WWTP in the remaining districts of Lahore.
- Detailed engineering designing and costing of water supply, sewerage & storm water drainage and waste water treatment projects for whole **Lahore District**.
- Detailed engineering designing and costing for rehabilitation of existing water supply, sewerage & storm water drainage infrastructure.
- Justification of selection of particular system improvement (based on needs, cost effectiveness, constructability, reliability, operation, maintenance, etc).
- Maps showing improvement components and service areas.
- Master plans must include Short term Infrastructure Investment Programmes (SIPs) and Long term Investment Programmes (LIPs).
- Prepare terms of reference for the preparation of priority investment projects.
- Prepare detailed sound financial practices strategies.
- Prepare detailed procurement strategies.
- Conduct Environmental impact assessments (EIAs).
- Prepare viable outsourcing proposals for operation & maintenance of tubewells, disposal stations and revenue collection.
- Improvement in customer services including establishment of Centralized Customer Center linked with Field Customer Centers. Conduction of exercise for Citizen Report Card (CRC) and devise Citizen Feedback Mechanism.
- Develop action plan for Master Plan implementation.



### **3.3 Scope of Work – Main elements**

The following sections describe the specific activities to be undertaken by the consultant.

#### ***3.3.1 Review of Existing Documentation and Data to Develop Water, Sewerage and Storm Water Drainage Profile of District Lahore***

The consultant would analyze and assess the quality of existing documentation and data in terms of its relevance to the current studies and identify data gaps to develop Water, Sewerage and Storm Water Drainage Profile of District Lahore.

The consultant would also suggest how these gaps might be overcome and collection of additional data that would be of benefit both to the present studies and subsequent studies that will be needed to prepare the investment projects.

#### ***3.3.2 Assess the Existing Institutional Arrangements***

The 1973 Constitution assigns responsibility for the sector to provinces and service provision to local governments. The 18th Amendment (April 19, 2010) has resulted in fiscal, administrative and functional decentralization of the sector to the province. Urban water supply operations are managed by Tehsil Municipal Administrations (TMAs) for small and medium sized towns and by Water and Sanitation Agencies (WASAs) in five large cities that includes Lahore.

In rural areas, with the reinforcement of the Local Government Ordinance (LGO) of 2001 urban – rural divide has been abolished and as a consequence prescribed the dissolution of rural water and sanitation institutions i.e. PHED at all levels.

The consultant would assess the effects of the decentralization process and bring clarity among roles of different departments involved in the sector through legal and regulatory framework and how these agencies would interact with each other to improve overall governance and administration.

#### ***3.3.3 Prepare a Study for Restructuring Water/Wastewater Service Provision***

The consultant is to prepare a study for restructuring the organizations that provide water and wastewater services. The study should consider and advise on *inter alia*:

- Governance arrangements
- Management and organizational structure
- Manning and resources
- Financial matters including budgets, accounts and funding as described at Section 3.3.4
- Contractual arrangements with administrative departments
- Responsibility for capital investment

#### ***3.3.4 Prepare Financial Management Plan***

Financial Management Plan should cover the following areas:

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- I. Revenues/Resource mobilization
  - a) User fee and such other sources of income
  - b) Transfers, grants and loans
  - c) Collection mechanisms and gaps
  - d) Political economy of the subsidies
  - e) Recommendations
  
- II. Expenditures
  - a) development schemes
  - b) operational expenditures
  - c) capital investments
  - d) utility bills
  - e) liabilities
  
- III. Accounting and reporting
  - a) accounting systems
  - b) monitoring and reporting systems of finances
  - c) automation of the system and recommendations etc
  
- IV. Budget
  - a) Budget formulation process
  - b) Estimates and allocations of past three years
  - c) Medium Term frameworks
  - d) Gaps
  - e) Recommendations
  
- V. Financial Analysis
  - a) Complete Financial Analysis of each zone operating expenditures vs operating income

### ***3.3.5 Assess the state of water supply, water quality and wastewater infrastructure assets***

The consultant will describe and assess the present water and wastewater systems throughout the district. This is to be done with reference to all relevant directives and other legal documents. For the water supply systems (including water quality) the assessment will include:

- Water sources, water treatment plants, conveyance, pumping, storage and distribution. Details to be shown on GIS based maps and presented schematically
  - For the main components determine the capacity, condition and serviceability, age, materials etc. so far as this can be deduced from existing data and from field observations
  - Identify bottlenecks, assess the level of leakage and the detection and repair policy
  - From basic hydraulic modelling of the networks assess performance of the systems in terms of existing and future levels of service
  - Water quality as delivered and investment needed to meet the requirements of the drinking water directive
  - Consumption per capita per day for different consumer groups
  - Scope for reducing operational costs including those of labour, materials, energy etc.
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For the wastewater systems the assessment will include:

- Areas served by piped drainage systems whether separate or combined. Details to be shown on GIS based maps and schematics
- Industrial areas discharging wastewater to sewerage systems, flows and loads and describe any pre-treatment systems. Disposal systems used when there is no connection to sewerage
- For the main components determine the capacity, condition and serviceability, age, materials etc. so far as this can be deduced from existing data and from field observations
- From basic hydraulic modelling of the networks assess performance of the systems in terms of existing and future levels of service. Identify existing and potential bottlenecks
- Analyze compliance with applicable water quality and effluent standards and regulations. Describe the environmental impact of current systems of wastewater disposal, including sludges and toxic wastes

### **3.3.6 Preparation of GIS Based Maps:**

- i) Preparation of GIS based maps for existing water supply, sewerage and drainage services along with road network and important POIs in multi-layer system for whole district.
- ii) Consultants would also develop GIS Based Asset Management System for the district and provide GIS based complete inventory of assets regarding water supply, sewerage and storm water drainage system and infrastructure to the scales as required by WASA. It would facilitate WASA-L in tracking of asset at design, construction, repair, or replacement stages.
- iii) GIS mapping of the existing water supply, sewerages and drainage infrastructure of various private and public sector housing schemes including areas served by other agencies like Railways, Cantonment Boards, DHA, Model Town Society, other private housing schemes and villages covering the whole District Lahore for purpose of their proper integration.
- iv) Preparation of Contour Map (Contour interval 2 feet) for the Lahore District (on scale 1:2000 for urban areas (530 Sq.Km) and 1:5000 for rural areas (1070 Sq.Km)).
- v) Procure and process latest Satellite Imageries (Quick bird) for Base/GIS mapping.
- vi) GIS maps should be in such a way that zone or sub division may act as a complete unit. Zone wise boundary may be marked on the plan.

### **3.3.7 Master Plan for Surface Water:**

- i) Study and evaluate the other potential water sources especially surface water alongwith their technical, economic and financial comparison with suggestions for their effective utilization for the district Lahore outside the project area of “Feasibility Study for Surface Water Induction and Construction of Water Treatment Plan, Lahore (PC-II) falling at ADP G.Sr.No.1357”.
- ii) Consultant would look into various options / sources with locations for induction of surface water in water supply system for the district Lahore outside the project area of “Feasibility Study for Surface Water Induction and Construction of Water Treatment Plan, Lahore (PC-II) falling at ADP G.Sr.No.1357” and make recommendations for the



most viable proposal alongwith cost estimates. The consultant will carry out the feasibility study regarding use of surface water with special reference to the spread basin, study the water quality of surface water and examine the possibility of using the surface water from sources like Lahore Branch Canal at Jallo, BRB Canal near Ravi Siphon or Marala or installation of battery shallow pumps along the said sources.

- iii) Storm and Rain Water Harvesting Pilot Project in various areas of the district Lahore outside the project area of “Feasibility Study for Surface Water Induction and Construction of Water Treatment Plan, Lahore (PC-II) falling at ADP G.Sr.No.1357” including creation of storage capacities of raw water.

### 3.3.8 *Ground Water:*

Consultant would carry out hydrological and hydro geological study for the whole District Lahore regarding ground water aquifer.

- i) Consultant would carry out hydrological and hydro geological study for the whole District Lahore regarding ground water aquifer which is being depleted rapidly due to over-exploitation and reduction in recharge. 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 from the rain water/storm water for the study area (Lahore District) by considering (but not limited to) the following parameters:
- Prevention: To prevent run off and pollution.
  - Source Control: Control of run off for ground water recharge.
  - Site Control: Management of storm water towards large soak away or infiltration basin for the catchments.
  - Management of runoff from several sites / areas.
- ii) Consultants would also work out and recommend safe sustainable yield of aquifer for the design of Water Supply system. The consultant will carry out:
- Identification of different strata(s) at different depth horizon (stratification) upto the required depth. The change in lithology will exactly be marked and will be presented in the form of lithological logs. The consultant will study the water behavior in boreholes and carry out the exercise throughout their period and prepare the guidelines for WASA staff to continue the study in selected strata(s).
  - Review geological, hydro-chemical data. The review should include previous studies carried out so far.
  - Make inventory of all the existing tubewells of WASA and other agencies i.e. PHA, Pakistan Railways, MES, Cantonment Boards, DHA, Hospitals, GORs, Government Buildings, PHED, TMAs & tubewells installed for agriculture & industrial purposes, giving their discharge and water level observations in order to assess the abstraction from the aquifer of Lahore district and stress on the same. Inventory of tubewells operated by agencies other than WASA must include level of service delivery in terms of both quality and quantity.
  - On site hydro-chemical testing regarding  $p^H$ , EC, Dissolved Oxygen etc.



- Prepare a ground water flow model and solute transport model for forecasting the flow path, potential, sustainability from deep aquifer and sites of new tubewells for safe and good quality large scale exploitation.
  - Training of the Hydrology Directorate staff of WASA to run the ground water flow and solute transport models in future including provision of training materials.
  - Analysis of strata samples and water samples with special reference to the variation of arsenic.
  - Analysis and examination of geological formation and water samples collected from the bore holes for arsenic contamination under the investigation phase.
  - Determination of interaction / hydraulic linkage between fresh water and arsenic contaminated water.
  - Determination of interaction / hydraulic linkages between fresh water and saline ground water from other sides like Kasur Raiwind, etc.
  - Study on the sources and Arsenic contamination levels and requisite mitigation measures to address water quality issues. Determination of source of arsenic in different zones (aquifer system) with the help of isotopic analysis and mobilization of arsenic in deep aquifer.
  - Identification of arsenic affected areas by confirmative test.
  - Assessment and identification of arsenic free areas for future exploitation production wells.
  - Determination of sustainability from deep aquifer in case of large scale exploitation. It must incorporate expected draw down in case of:
    - Current extraction rate.
    - Expected extraction rate during the planning horizon.
    - Improved ground water recharge.
  - The quantification of surface run-off and pollution load besides identification of impacts on receiving bodies.
  - Zoning of Lahore District on the basis of quality, quantity of available water, preparation of future plans, design criteria and standards on the basis of zonal attributes.
- iii) Consultant would professionally analyze the results of the hydro-geological & hydro-chemical, studies to provide a conclusive assessment regarding sustainability and arsenic free ground water availability. This is also required to assess the safe and adequate supply of good quality potable water free of odour & taste to the inhabitants in the study area in planning horizon. The consultant shall analyze and write reports on the following,
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however, the consultant may suggest / use other sound engineering practices, techniques / equipments to achieve the desired results:

- Ground water flow model and solute transport model.
- Hydraulic and chemical characteristics of the aquifer of Lahore district.
- Water quality from test holes and its suitability for human beings.
- Consumption with special reference to the variation of arsenic.
- Source of arsenic contamination.
- Interaction between arsenic contaminated aquifer zones.
- Mobilization of arsenic in different zones / aquifer system.
- Assessment of potable water quality which may include but not limited to the following:
  - Inventory of water pints to demarcate polluted ground water zone between Mehmood Booti and Babu Sabu on both sides of River Ravi.
  - Analysis of water sample from the River Ravi at different locations to know the concentration of pollutants and heavy metals in the water of the River Ravi, which is infiltrating into the aquifer of Lahore.
  - **Drilling of required test bore holes in selected areas**, collection of water samples at specified depth horizon for ascertaining water table/aquifer levels and water quality with reference to taste, odour, and heavy metals including arsenic and fluoride.
- Sustainability of the deep aquifer as a result of large scale exploitation.
- Based upon the results of the hydrological / hydro-geological study, technical concepts shall be reviewed and recommendations be made of the most economic alternatives in the development of water source, future tubewell requirements, distribution and transmission system.
- Identify the different zones of fluoride contamination of ground water, its affect on water abstraction and its vertical & lateral variations.

Prepare proposals with approved alternatives including design of new well centres, tubewells and reservoirs etc.

iv) Identification of areas of over-exploitation of ground water.



### **3.3.9 Comparative analysis of water supply distribution system through water storage tanks Vs direct pumping:**

- The original water supply system was based on supply through Overhead Reservoirs (OHRs). During the implementation of World Bank Project the major part of the capital investment was spent on sewerage disposal stations and construction of new Reservoirs was proposed to be delayed upto 1980. With the passage of time the most of the existing Reservoirs have outlived their lives and at present are not in use. The present water supply is generally & mostly based on direct pumping of water by the tubewells into the distribution system. The consultant will map and analyze the present direct pumping system, examine its flaws, pros & cons with respect to financial impact, water quality and pressure. The consultant will compare the present system with the supply through Overhead Reservoirs (OHRs) and will prepare a proposal for induction of Overhead Reservoirs in the system, if found feasible.
- While exploring the use of OHRs, study the use of existing OHRs (functional / non functional) and location of new OHRs may be determined through the detailed computer modeling of the distribution system considering the available water sources, their location, pipe network and water demand etc.
- Study the shortcomings of distribution network through computer aided analysis and prepare proposals for replacement of inadequate water lines, additional linking and looping to improve the system for equitable/ balanced supply distribution to all service areas.

Overdue study of the comparative analysis of water distribution system through water storage tanks at water source / tubewell and water treatment plant (ground level and overhead reservoirs) instead of direct pumping.

### **3.3.10 Water Supply Network:**

Zoning of water supply distribution areas, evaluation of NRW level for each zone, proposal for Pilot project for one water supply distribution zone. Each sub division will be dealt as one zone with isolated water supply network.

- i) Zoning of WASA Served areas into WASA Districts / Sub Districts with Isolated Service Delivery Networks instead of Comprehensive Water Supply System as per detailed requirements given in Section 3.3.10.1.
  - ii) Preparation of detailed engineering design/cost estimates for the whole district for improvement of water supply system.
  - iii) Carryout network analysis and development of water supply computer model for proposing implementable / feasible / operational sub division (zones) of Lahore district for further examination. Each sub division / zone may be divided into metered districts and sub districts.
- Each sub division / zone would comprise a number of District Management Areas (DMAs) through which the supply of water, evaluation of losses and control on



unaccounted for water (UFW) would be managed. The DMAs should have a size between 2000 to 5000 water connections, further divided into sub DMAs.

- Design each water district keeping in view the following parameters for each water district:
  - Define the area and periphery of water districts.
  - Define the O&M standards and procedures.
  - Define the location of water district meters.
  - Prepare functional and administrative scope for water districts working and their interaction with WASA as a central command and control.
  
- The design of DMAs would include but not limited to:
  - Proposal for existing OHRs in Lahore to make them functional and usable in the planning horizon after studying and carrying out proper tests to ensure their structural stability, proposal for new OHRs as per design requirement, combination of OHRs with well centers and isolated wells pumping into elevated storage feeding the distribution system.
  - Proposals for re-structuring the network of isolated DMAs which could easily be manageable, operative and maintainable.
  - Mapping of network for isolated DMAs on GIS including location of flow and pressure equipments etc.
  - Proposal for leak detection and management programme.
  - Proposals for 100% consumer and bulk water metering.

The consultant will analyze the financial sustainability of each zone. They will examine the water balance of each zone i.e. water production vs water consumption and will suggest remedial measure to improve the situation. The consultant will work out the cost of creation of zones along with detailed drawings for implementation.

- Duration of Water Supply to the consumers: Consultant would be required to study viability and chalk out detailed plan/ proposals to achieve internationally accepted 24/7 water supply service level along with detailed engineering design and cost estimates for the city area in phases and the supply of water for fixed durations a day in short term keeping in view the energy crisis and depleting water aquifer. He will also give recommendations for both the systems.
  
- Study and prepare the proposal for Pilot Project for one of WASA Districts / Zone with isolated water supply system with 100% metering at source and consumers level with complete command and control of single authority for construction & maintenance of the infrastructure for production of water, its supply and collection of water and sanitation charges. Consultant will also describe the assessment and complete methodology for preparation of proposal.



### **3.3.10.1 Zoning of Water Supply Distribution System:**

WASA intends to split the entire water supply system into small, feasible, isolated, manageable and sustainable units, which will be called “Zones”. Each zone will be fully administered by Sub Divisional Officer (SDO) who will be responsible for its operation & maintenance. Activities in zones will also be looked after by concerned Executive Engineer (XEN), Director (O&M) and Dy. Managing Director (O&M). Zoning of water supply distribution system would be made keeping in view the following factors and requirements:

- i. Boundaries of each zone would be proposed / marked in such a way that each zone would be isolated from the other zones easily and can perform its function regarding water supply independently and in sustainable manner.
  - ii. Existing infrastructure of each zone will be recorded and marked on the plan.
  - iii. Workout the water requirement of each zone at different stages of development upto the planning horizon. The upper limit of water requirements per person would be 50gpcd (227-lpcd), which will be gradually reduced with efficient use of water, metering practices and by adoption of reduction of Non Revenue Water (NRW) strategies & practices.
  - iv. Workout the tubewells requirement of each zone keeping in view the discharge & life of each tubewell and possibility of rehabilitation of bore during planning horizon.
  - v. Workout the storage requirements (Overhead / Ground Reservoirs) of each zone. The possibility of rehabilitation / reuse of existing reservoirs may also be explored.
  - vi. Workout the metering requirement for each zone. This will include domestic, commercial and Bulk Flow Meters (BFM). The existing meters and net requirements may be recorded.
  - vii. Workout the lengths, sizes & material of each existing and proposed water supply pipe. GIS based map may also be prepared showing proper scale, sizes and material of each water supply pipe. The requirements for the replacement of pipelines may be worked out and same may be shown on GIS based maps. The consultant will prepare / chalk out, replacement of outlived water supply lines for each zone to address the water quality issues or water borne diseases. (The information collected / prepared will be used for the preparation of project Gastroenteritis-III).
  - viii. Carry out water supply distribution system network analysis for each Zone. Prepare proposal for replacement / augmentation of undersized lines and induction of new lines as per results of water supply distribution network.
  - ix. Chalk out the complete and comprehensive plan for carrying out exercises for Water Audit / Water Balance, Unaccounted for Water (UFW) & Non Revenue Water (NRW), etc.
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- x. Water entering / leaving a zone from the other areas, if required, may be recorded through installation of Bulk Flow Meters (BFM).

### **3.3.11 Sewerage System:**

- i. Prepare comprehensive schemes for leftover areas not included in Central, South West and South Districts (this may include but not limited to North Lahore, North East & East (Upto BRB Canal), Shahdara, South East, etc.) in addition to the all remaining areas of the district outside present WASA's jurisdiction. This will also include rehabilitation proposals of existing system, proposals of additional trunk sewers, rehabilitation and augmentation of existing pumping stations and proposals for additional pumping stations in the district. The sewerage deficient areas will be critically examined. The proposals will include detailed engineering design and estimates of all the schemes, including Bhogiwal pumping station and sewerage scheme for areas on both sides of Lahore Branch Canal between BRB canal and Harbanspura Bridge for elimination of sewage inlets in the canal.
- ii. Proposals alongwith detailed engineering design / cost estimates for the remaining whole district outside present WASA area.
- iii. The proposals conceived for remaining District should be such that it can be integrated in future, if required.
- iv. Evaluate the use of RCC sewer pipes in the planning horizon after studying their on-site conditions at different age stages, behavior of concrete against foul gases especially to the upper half of sewer pipes. Provision of ventilating shafts for emission of foul gases may be examined. Study other pipe materials and suggest their use for future works with technical and financial comparison. Study the design of manholes, other appurtenances and bedding materials under pipelines presently in vogue and suggest changes and improvements.
- v. Study and review the precast RCC pipes and cast in situ RCC conduit sewer laying techniques presently in practice and recommend other sophisticated methods of construction keeping in view the latest advancement and technology. Trench-less technology may be examined for busy city areas.

### **3.3.12 Drainage System**

- i. Study and evaluate the capacity of existing drains viz-a-viz their design capacities for 2-years and 5-years frequency storm. Special emphasis may be given on right of ways (*ROWS*) on both sides of drains, encroachments and existing drainage stations.
- ii. Identify & study all the ponding areas, suggest the measures for their elimination and include in the overall proposals. The consultant will prepare comprehensive proposals for elimination or minimization of ponding time after detailed engineering study for all ponding areas of the city.



- iii. Study the use of off-line storage and seepage wells in formulation of new drainage schemes. The possibility of underground storage tanks may be examined especially for depression areas like Lakshmi etc.
- iv. Study, review and evaluate merits/demerits of covering of storm water drains in the present scenario with sewage inflows in drains and in the future scenario after separation of the sewage. Maintenance difficulties with mechanical means may be kept in view.
- v. Study core issue of dumping solid waste / plastic bags in drains and suggest remedial measures including fencing and plantation.
- vi. Study the existing drainage system regarding encroachments, reduction of water ways and inadequate clearance for water passage underneath bridges/culverts. Suggest and prepare the appropriate proposals to conduct the future design flows effectively.
- vii. Study sewage inflows in storm water drains, the effect on their performance during conduction of storm flows, environmental problems with other related issues and prepare proposals for complete separation of sewage from the drains.
- viii. Study and chalk out proposal for draining the flows of Cantonment Drain in the river under gravity during high floods at some downstream location of the river.
- ix. Prepare proposals for primary, secondary and tertiary drainage network with cost estimates capable of conducting designed storm water flows anticipated in the planning horizon. This will include remodeling and rehabilitation of existing drainage system to cope with the increased storm flows in the coming times effectively and efficiently. This will also include provision of new drainage stations, if required. Already prepared proposals in different districts will be studied, integrated and made part of the overall plan.
- x. Prepare the detailed engineering design for proposals of separation of sewage from drains.
- xi. Prepare proposals along with detailed engineering design/cost estimates for the whole district.

### ***3.3.13 Integration of WASA area with the Non-WASA areas:***

Preparation of proposal for integration of sanitation of present non WASA areas like Cantonment Boards, DHA, Railways, Model Town, Universities, Private Housing Schemes, other towns, colonies, villages, etc.

### ***3.3.14 Waste Water Treatment Plants:***

Consultant will study and identify new sites for WWTP in the remaining district of Lahore outside the project area of Ravi River Front.

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- i. Study and evaluate the waste water treatment needs of the area of the remaining district of Lahore outside the project area of Ravi River Front in different stages of planning horizon. Study the mixed domestic and industrial waste water flows, their effects on the working and performance of proposed treatment plants and suggestions for their separation. In case of non separation of these flows, suggest the necessary modifications in design of treatment plants.
- ii. Study and review all the treatment methods and workout their technical and financial comparisons, merits / demerits with environment problems and sustainability with least O&M cost in the remaining district of Lahore outside the project area of Ravi River Front. Suggest means to attract financing for construction of treatment plants and arrangement of recurring expenditures, as there is no likelihood of generation of any revenue in this regard. Production of electricity, fuel gases and bi-products such as fertilizers etc., may be examined in order to meet O&M expenditures.
- iii. Study the existing industrial areas in the remaining district of Lahore outside the project area of Ravi River Front keeping in view the future industrial growth, explore and prepare an action plan for industrial waste water disposal, treatment and management.
- iv. Detailed engineering design of identified waste water treatment plants alongwith cost estimates required for the remaining district of Lahore outside the project area of Ravi River Front
- v. Study of the waste water discharges of industrial units and hospitals in the remaining district of Lahore outside the project area of Ravi River Front (unit wise breakup), status of their treatment plants and their untreated sewage flows to WASAs System with necessary mitigation plans.

**3.3.15 Operation & Maintenance of Water Supply, Sewerage & Storm Water Drainage System:**

- i) Study and review the performance of existing Water Supply, Sewerage and Storm Water Drainage System in the study area at micro level.
  - ii) Determine the future needs for betterment of operation & maintenance of water supply, sewerage & storm water drainage system in the planning horizon. Prepare proposals to ensure adequate operation and maintenance of existing and proposed facilities.
  - iii) Suggest and develop a planned preventive maintenance programme for all electrical, mechanical and other installations.
  - iv) Study and suggest a phased action plan for automization of tubewells, disposal stations, drainage stations and other such installations in the planning horizon alongwith cost estimates.
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- v) Evaluate the efficiency and skill level of existing O&M field staff and suggest optional requirements of human resources and their training modules alongwith tentative cost.
- vi) Preparation of training materials for better operation & maintenance.
- vii) After examining and reviewing the current operational and maintenance practices in WASA, consultant will suggest improvements for betterment of operation and maintenance through MIS facilities. Study and suggest the introduction of telemetry & SCADA system in WASA O&M in phased manner keeping in view the latest developments in IT field and to use it in Energy Audit of tubewells and sewerage and drainage pumping installations alongwith cost estimates.
- viii) Preparation of maintenance proposal including desilting of sewers and drains, SOPs, mechanical & procedural improvements and other innovations to minimize the man entry in sewers & manholes and to minimize the threat to human lives.

### ***3.3.16 Improvement in Customer's Services:***

- i) Prepare work plan for WASA to run as a utility, with primary focus at customer satisfaction, preparation of Citizen's Charter for service delivery,
- ii) Prepare design, drawings, cost estimates & working schedule of a centrally located Customer Services Centre compatible to the customer services centre of good water utilities in the region and in the world. The proposal should also include the setup of One Window Operation System.
- iii) Linkage of centrally located customer centre with all field complaint centers.
- iv) The proposal should contain the improvement in the service delivery level for satisfaction of Government, customers and other stake holders.
- v) Prepare the comprehensive proposal for establishing the citizen feedback mechanism. This may include but not limited to:
  - Instituting periodic consumer surveys using tolls like citizen report cards and citizen score cards; induction of complaint boxes at Head Office, Directorate and Division level.
  - Establishing call centers for feedback;
  - Establishing website for online citizen feedback;
- vi) Explore the possibility of free basic water for poor people to be covered with multiple levels of service & Tariff or through subsidy from the Government of Punjab.
- vii) Prepare the proposal for mechanism of access to information and public record by the customers. This may also include provision of requisite information to public if not restricted under the prevalent law. Standard forms may be developed which



may include payment/fees, as may be levied from time to time. Time frame for each type of application may also be prescribed. Cost may be worked out alongwith implementable plan.

### ***3.3.17 Prepare water, wastewater and storm water drainage Master Plans including short term infrastructure investment programmes (SIPs) and long term investment programmes (LIPs)***

The demand for water should be assessed on a component basis to 2040. The components are to include the drinking water (piped water supplies), industrial demand, commercial business demand and irrigation demand placed on those sources currently used conjunctively for drinking water. The assumptions made are to be clearly explained and high, median and low demand estimates prepared for each component. Consideration is to be given to demand management measures such as stepped tariffs and leakage reduction strategies.

The consultant will concentrate on an assessment of the investments needed to achieve compliance with the existing rules, regulations and directives regarding drinking water, waste water treatment and the levels of service (frequency of supply, flooding incidences from sewers etc.) set by the administration for a time horizon of 25 years for LIPs.

Investments are to be prioritized and costed. The most urgent needs should be included in the SIPs with a time horizon of 5 years. Investments are to be prioritized using an approach which considers all key issues such as urgency of need, cost effectiveness, health and environmental benefits etc.

Further, the consultant is to prepare a master plan for the storm-water drainage for 1) the urban areas 2) for the entire district. The consultant will identify low lying ponding areas and shall also assess possibility of reuse of the storm-water and will provide alternatives for reuse and or disposal.

The consultant would submit complete engineering design drawings and their costing for all the rehabilitation works of existing infrastructure, new SIPs/ LIPs projects and their components mentioned in the Master Plan.

### ***3.3.18 Environmental Impact Assessment (EIAs)***

The consultant will determine whether there is a requirement for EIAs for any or all of the investment projects. Where this requirement exists, the consultant will undertake EIA studies.

### ***3.3.19 Outsourcing of Functions:***

Prepare viable outsourcing proposals for operation & maintenance of tubewells, disposal stations and revenue collection.

### ***3.3.20 Advise on Implementation and Procurement Strategies***



As an integral part of the work to develop an affordable investment programme, the consultant shall prepare an implementation plan and a procurement strategy for the investment measures and their supervision accordance to applicable laws and existing legal framework.

### 3.3.21 Terms of Reference for the Preparation of Priority Investment Projects

The consultant is to prepare terms of reference for preparation of the priority investment projects in the SIPs and LIPs. The preparation of those projects will include inter alia the collection of additional data (if needed), designs, drawings and specifications, EIAs, bills of quantities, financial appraisals and tender dossiers including conditions of contract etc.

## 3.4 Communication & Consultation Plan

The water, waste water & its treatment and storm water drainage Master Plan needs to be well communicated to all stakeholders for their ownership as well as successful implementation. The consultants are therefore required to prepare a comprehensive communication plan. The consultants are required to have extensive stakeholder's consultations before and during preparations of the Master Plan. The stakeholders include but not limited to government officials, elected representatives, professionals, practitioners, civil society members, builders & developers, academia, students and citizens of Lahore Region.

- i. The consultants are required to carry out at least the following consultative sessions:

Name of Workshop	No. of Workshops
<b>Inception Workshop</b>	<b>01</b>
<b>Consultation Workshops on:</b>	<b>08</b>
• <i>Finalization of District's Profile</i>	<i>01</i>
• <i>SWOT Analysis</i>	<i>02</i>
• <i>Finalization of Assessment Report</i>	<i>02</i>
• <i>Draft Master Plan</i>	<i>02</i>
• <i>Finalization of Master Plan</i>	<i>01</i>

- ii. The consultants will be required to include wide dissemination of findings and recommendations from time to time during plan preparation in their communication plan.

## 4 LOGISTICS AND TIMING

### 4.1 Project location

The study areas comprises of Lahore District as a whole. The consultant shall make his own arrangements in terms of arranging offices and equipment including computers, printers, photocopiers etc.

The relevant departments of the administration, municipalities, district offices and their water and wastewater departments will provide assistance to the consultant throughout the assignment



in respect of data collection; however the consultant shall provide all necessary office equipment and supplies and arrange for any translation of documents.

## 4.2 Commencement date and period of execution

1. Commencement date\* June- 2014
2. Completion period\* 18 months from the date of commencement.

Within one month of signature of the contract, the consultant will mobilize and start work.

*\*Actual dates to be agreed at time of contract signature.*

## INDICATIVE TIME FRAME

Indicative timeframe for services to be provided by the consultants:

Sr. No.	Scope of Services	Time
1.	Inception report	1 Months
2.	Water, Sewerage and Storm Water Drainage Profile of District Lahore (including all data collected and analyses in soft format). This includes maps and drawings mentioned at Sr.No.3 & 4 of Article 6.2 (Reports) Sectoral Assessment Report (Water, Sewerage, Drainage, Institutional Arrangement, Organizational Structure, Legal and Regulatory Framework, Financial Management etc.)	4 Months
3.	Draft Water, Sewerage and Storm Water Drainage Master Plan & Priority Investment Projects along with supporting maps and drawings. This includes updated WASA Design Criteria.	5 Months
4.	Environmental Impact Assessment	1 Month
5.	Implementation and Procurement Framework/ Strategies	2 Months
6.	Monitoring and Evaluation Framework	
7.	Communication Plan, Consultation Plan & Workshops Report	
8.	Final Water, Sewerage and Storm Water Drainage Master Plan 2040 for District Lahore including maps of existing and proposed Infrastructure, Architectural & Engineering Design as per Sr.No.14, 15 & 16 of Article No.6.2 (Reports)	04 Months
9.	Cost Estimates, Drawings and Executive Summary.	1 Month

**Note:**

- a) Total time period to complete the job for the assignment is **18** months.
- b) Time of approval of the documents shall not be included in the above time schedule.
- c) Approved TORs shall be an integral part of the contract agreement to be executed between the client and the Bidder.

## 5 CONSULTANT'S EXPERTISE

### 5.1 General

### 5.2 Personnel

#### 5.2.1 Key experts

Key experts are individuals that have a crucial role in implementing the contract. The key experts required for this project are:

- Team leader / Project Manager
- Water Supply Expert
- Ground Water Expert
- Surface Water Treatment Expert
- Wastewater Expert
- Drainage Expert
- GIS Expert
- Electrical Expert
- Mechanical Expert
- Structure Expert
- Environmental Expert
- Sociologist / Customer Services Expert
- Institutional Expert
- Financial Management Expert

Details of the requirements and the indicative inputs of the key experts are set out in the following table and the consultant is to include a full CV of his nomination for each position, with his proposal.

Key Position	Experience (indicative)
Team Leader	At least 15 years of experience
Water Supply Expert	At least 15 years of experience
Ground Water Expert	At least 15 years of experience
Surface Water Treatment Expert	At least 15 years of experience
Wastewater Expert	At least 15 years of experience
Drainage Expert	At least 15 years of experience
GIS Expert	At least 15 years of experience
Electrical Expert	At least 15 years of experience



Mechanical Expert	At least 15 years of experience
Structure Expert	At least 15 years of experience
Environmental Expert	At least 15 years of experience
Institutional Expert	At least 15 years of experience
Sociologist / Customer Services Expert	At least 15 years of experience
Financial Management Expert	At least 15 years of experience

### 5.2.2 Short Term Experts

The following expertise is to be provided by short term experts (7 to 10 years experience) unless the nominated long term experts can demonstrate that they have this expertise:

- Drinking Water Quality and Treatment
- Wastewater Treatment
- Civil Engineering – pipelines and structures
- Mechanical Engineering – waste water treatment
- Geotechnical Engineering
- Environment Expert
- Urban Planning
- Information Management System
- Financial Management
- Human Resource
- Monitoring and Evaluation
- Communication
- Environmental/EIA
- Hydraulics
- Financial and Economics
- Contracts and Procurement
- Operation & Management

## 6 REPORTS

### 6.1 Reporting Requirements

The consultant shall prepare the reports detailed in the following sections. They will be prepared in both hard copy and electronic formats.

The reports are to be submitted to the contracting authority (WASA-LDA) only and not distributed to other parties. Language of the reports is English.

### 6.2 Reports to be submitted (deliverables)

The consultant will describe the situation as found at the start of the assignment, discuss key issues and suggest any revisions to the approach presented in his proposal including the schedule of tasks and programme.



The final report should be submitted two weeks before the completion date. It should describe the activities carried out under the assignment and the extent to which the consultant has delivered the expected results. It will identify further TA needs to carry the priority projects forward to implementation.

Sr. No.	Scope of Services	No. of copies / Deliverables
1.	Inception report	<b>20 Hard Copies + 10 Sets of CDs.</b>
2.	(A) Water, Sewerage and Storm Water Drainage Profile of District Lahore (including all data collected and analyses in soft format)	<b>10 Hard Copies + 10 Sets of CDs.</b>
	(B) Sectoral Assessment Report (Water, Sewerage, Drainage, Institutional Arrangement, Organizational Structure, Legal and Regulatory Framework, Financial Management etc.) <ul style="list-style-type: none"> <li>• Institutional &amp; Organizational</li> <li>• Legal &amp; Regulatory Guidelines.</li> <li>• Financial Management.</li> </ul>	<b>10 Hard Copies + 10 Sets of CDs.</b>
3.	Maps of Lahore District (Base Map-along with GIS vector and raster data base) @ scale of 1:10,000 & 1:2400 including Plan on A0 size.	<b>10 Hard Copies + 10 Sets of CDs.</b>
4.	Engineering Drawings (along with AutoCAD files) of Existing Infrastructure @ scale of 1:10,000 & 1:2400 including one sheet each on A0 size for complete existing water supply, sewerage and storm water drainage system. (Separate sheets for City area and District Area alongwith Index Sheets)	<b>10 Hard Copies + 10 Sets of CDs.</b>
5.	Updated WASA Design Criteria	<b>50 Hard Copies + 10 Sets of CDs.</b>
6.	Preliminary Design Report and Draft Water, Sewerage and Storm Water Drainage Master Plan & Priority Investment Projects along with supporting maps and drawings ( <i>This includes the zoning of water supply distribution system</i> )	<b>10 Hard Copies + 10 Sets of CDs.</b>
7.	Environmental Impact Assessment	<b>10 Hard Copies + 10 Sets of CDs.</b>
8.	Implementation and Procurement Framework/ Strategies	<b>10 Hard Copies + 10 Sets of CDs.</b>
9.	Monitoring and Evaluation Framework	<b>10 Hard Copies + 10 Sets of CDs.</b>
10.	Communication Plan & Workshops Report	<b>10 Hard Copies + 10 Sets of CDs.</b>
11.	Consultation / Workshop Report	<b>10 Hard Copies + 10 Sets of CDs.</b>
12.	Final Water, Sewerage and Storm Water Drainage Master Plan 2040 for District Lahore	<b>10 Hard Copies + 10 Sets of CDs.</b>
13.	Map for existing & proposed Infrastructure (along with GIS vector and raster data base) of District Lahore @ scale of 1:10,000 & 1:2400 including one sheet each on A0 size for complete existing & proposed water supply, sewerage and storm water drainage system. (Separate sheets for City area and District Area alongwith Index Sheets.)	<b>20 Hard Copies + 10 Sets of CDs.</b>
14.	Architectural & Engineering Drawings (along with AutoCAD files) of Proposed Infrastructure suggested for rehabilitated or new construction respectively. Index Sheet may be added.	<b>20 Hard Copies + 10 Sets of CDs.</b>



Sr. No.	Scope of Services	No. of copies / Deliverables
15.	All collected processed and unprocessed data (along with GIS vector and raster database) and analysis models in CDs / DVDs	05 Sets of CDs / DVDs.
16.	Executive Summary	100 Hard Copies + 10 Sets of CDs.

**Ownership:** All data, models, softwares, soft & hard files of all design, supporting data and documents etc. which were used for this study will be handed over to WASA.

## 7 MEETINGS

### 7.1 General

For the success of the project it is important that the stakeholders are closely involved in the progress of the study and the development of proposals. Therefore, throughout the assignment the team leader and other experts should be available for meetings called by the contracting authority and for *ad-hoc* telephone consultations on any matter concerning the contract.

### 7.2 Presentation of Master Plans

The consultant is to prepare a formal presentation on the results of assignment. This should be based on the draft final reports. The audience for the presentation will be decided by the contracting authority and may include funding agencies and the press.

## 8 MONITORING AND EVALUATION

### 8.1 Definition of indicators

The primary indicator used for monitoring the project will be progress achieved against the programme prepared by the consultant in his proposal and as modified (if at all) in contract negotiations.

Secondary indicators will be the timely submission of the required outputs of an acceptable quality standard and the minutes of progress meetings.

### 8.2 Special requirements

The scope of work may be increased and the associated budget as well, at the request of the contracting authority. In such a case a contract addendum, justifying the change in scope will be issued.



## 9 BIDDING

Selection of consulting firm will be carried out using “One Stage - Two Envelope Bidding Procedure” as per Consultants Selection Guidelines of the Planning & Development Department, GoPb.

## 10 GENERAL CONDITIONS

- i. Selection of consultant would be through transparent and international competitive bidding under Consultants Selection Guidelines (Article 2.5.1) of P&D Department, Government of the Punjab. International / foreign consultant would, however, be required to associate local consultant or form a consortia as per instructions / guidelines of Federal Government for capacity building of the local expertise and vice versa (local firm’s association / consortium with international consultant). In case if the Local consultant has the leading role then they would, however, be required to associate International / foreign consultant or form a consortium as per the instructions / guidelines of Federal Government for capacity building of the local expertise and vice versa (local firm’s association / consortia with international consultant).
- ii. The time period for the completion of the study shall be 18 months from signing the contract.
- iii. All documents shall be prepared in English and submitted on electronic media as Adobe PDF files.
- iv. All documents produced / software used in the consultancy service shall be the property of the LDA and Consultant shall not use for any other purpose without the permission of the DG LDA.
- v. All Engineering Drawing and Maps shall be submitted in hard and soft formats (compatible with AutoCAD and ESRI’s ArcGIS respectively)
- vi. The Consultants may be required to perform any other services deemed necessary by the Client during the execution of this Contract towards the achievement of general objectives as given above.
- vii. The consultant will be required to work in close coordination with the LDA & other Government Department / Agencies.
- viii. The Consultant will be required to hold extensive consultations and presentations with the stakeholders.