



REPUBLIC OF MOZAMBIQUE

MINISTRY OF PUBLIC WORKS, HOUSING AND WATER RESOURCES



**DRIVE PROJECT
and
WATER SERVICES AND INSTITUTIONAL SUPPORT PROJECT II
(WASIS II)
IDA Grant D110**

**DESIGN CHECK AND SUPERVISION OF REHABILITATION
AND CONSTRUCTION OF NACALA WATER SUPPLY
SYSTEM**

Contract Nr. FIPAG/DRIVE/CON-1/19

TERMS OF REFERENCE

May 2020

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NACALA WATER SUPPLY SYSTEM**

Contents

1	BACKGROUND	1
1.1	General	1
1.2	Nacala Porto Water Supply System	1
2	GENERAL SCOPE OF SERVICES	4
2.1	Overview	4
2.2	Description of Works Contract	5
2.2.1	General overview	5
2.2.2	Design, rehabilitation and construction of intake, water treatment plant, transmission mains and pumping stations	7
2.2.3	Design, rehabilitation and construction of DCs and network	8
2.3	Scope of Services	8
2.4	Form of Contracts for Consultancy Services	9
3	CONSULTANT’S DESIGN CHECK RESPONSIBILITIES	10
3.1	General	11
3.2	Specific Responsibilities	12
3.3	Design check of rehabilitation and construction of intake, WTP, transmission mains and pumping stations	12
3.3.1	Electromechanical equipment of the Intake	12
3.3.2	Construction of WTP and pumping stations	12
3.3.3	Transmission mains	13
3.3.4	Additional Aspects Regarding the Intake, WTP, Transmission mains and Pumping stations Design Check Responsibility	13
3.4	Design Check of rehabilitation and construction of DCs and network in Nacala	14
3.4.1	Rehabilitation of DCs	14
3.4.2	New Distribution Centre at R8	14
3.4.3	Construction of Network	16
4	CONSULTANT’S SUPERVISION RESPONSIBILITIES	18
4.1	General	18
4.2	Regular Responsibilities	19
4.3	Responsibilities at Completion and Commissioning	19

4.3.1 Operations and Training:	20
5 OUTPUTS	20
Training Report	21
5.1 DESIGN CHECK – Specific Outputs	21
5.1.1 Inception Report for Water Production and Distribution	21
5.2 Reports for Water Production Works Contract	21
5.2.1 Concept Design and Integrity Review Report	22
5.2.2 Preliminary Design Check Report	22
5.2.3 Detailed Design Check Report	23
5.3 Reports for Water Distribution Works Contract	23
5.3.1 Concept Design and Integrity Review Report - Water Distribution	23
5.3.2 Preliminary Design Check Report	24
5.3.3 Detailed Design Check Reports	24
5.4 SUPERVISION – Specific Outputs for both Water Production Works and Water Distribution Works	25
(a) Quality assurance plan	26
(b) Monthly Progress Report	26
(c) Minutes of meetings	27
(d) Environmental, Social, Hygiene, Health and Safety (ESHS) Reports	27
(e) Inspection Report	27
(f) Training Report	28
(g) Completion Report	28
(h) Final Report	28
6 QUALIFICATIONS AND RESOURCE REQUIREMENTS	28
6.1 Consultants Qualifications	28
6.2 Level of Effort	29
6.2.1 Design Check Services	29
6.2.2 Supervision Services	30
7 OTHER REQUIREMENTS AND CONSIDERATIONS FOR THE SERVICES	32
7.1 General Reporting Requirements	32
7.2 Special Reports	32
7.3 Timing and Planned Implementation Schedules	32
7.4 Payment	33
7.4.1 Contract Nr FIPAG/DRIVE/ CON-1A/20: Design Check of intake, WTP, transmission mains, pumping stations, DCs and network in Nacala	33
7.4.2 Contract Nr FIPAG/DRIVE/ CON-1B/19: Supervision of intake, WTP, transmission mains, pumping stations, DCs and network in Nacala	33
7.5 DRIVE Application	34
APPENDIX A to the TOR	35
A – Site Office for the Engineer during the supervision phase	35
B - Vehicles for the Engineer during the supervision phase	36
C - Accommodation for the Engineer during the supervision phase	36
D – Services and Facilities during Design Check Phase	36

Acronyms

BoQ	Bill of quantities
DC	Distribution Centre
EB	Pumping Station reference
EBRD	European Bank for Reconstruction and Development
EDM	Mozambique Electricity Company
EHS	Environmental Health and Safety
EMP	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
FIPAG	Investment Fund and Water Supply Asset Holder
GBV	Gender Based Violence
GIS	Geographic Information System
GoM	Government of Mozambique
HIV	Human Immunodeficiency Virus
IDA	International Development Association
IFC	International Finance Corporation
ILO	International Labor Organization
MITADER	Ministry of Environmental and Rural Land Development
MOPHRH	Ministry of Public Works, housing and Water Resources
O&M	Operation and Maintenance
PS	Pumping station
RAP	Resettlement Action Plan
RPF	Resettlement Policy Framework
SEA	Sexual Exploitation and Abuse
UFW	Unaccounted for water
VO	Variation Order – applicable on works contracts
WTP	Water treatment plant

1 BACKGROUND

1.1 General

The Government of Mozambique (GoM) is implementing reforms in the urban water supply sector aimed at improving coverage, quality and efficiency of services. The reform program has involved the reorganisation of sector Governance mechanisms, which have facilitated a transition towards decentralised water supply operations and management, including service regulation, investment planning, and private sector participation in operations.

More specifically, the GoM has taken steps to provide for:

- Reduced operating costs and increased efficiency, particularly through involving private sector in operations for water supply services in 21 major cities; Maputo, Matola, Boane, Nacala, Quelimane, Nampula, Pemba, Dondo, Chokwe, Xai-Xai, Inhambane, Maxixe, Tete, Moatize, Chimoio, Manica, Gondola, Lichinga, Cuamba, Angoche and Nacala;
- Tariff adjustments that support financial sustainability; and
- Establishment of a Regulatory Board for the sector, which considers both service quality and financial performance.

The program for urban water supply also includes investments in rehabilitation and extension of systems. The GoM's implementation agency for the new urban water program is **Fundo de Investimento e Património do Abastecimento de Água – FIPAG** (Investment Fund and Water Supply Asset Holder).

FIPAG is responsible for the fixed assets of the city water supplies and for the future investment in the systems, including Nacala. It has the mandate to ensure that the public receives an adequate and safe water supply that meets Mozambique standards for health and hygiene (the public service obligation), and is empowered to ensure these systems achieve autonomous, efficient and financially sustainable water supply operations.

The Government of Mozambique has received financing from the Government of the Netherlands grant co-financing supplied under the so-called DRIVE facility and the World Bank toward the cost of WASIS II project to support FIPAG in implementing investments in the water supply system in Nacala, mainly the rehabilitation and expansion of the water supply system based on surface water from the Nacala dam. This investment aims to increase water production, transportation and distribution by: i) Constructing a new transmission main from the intake of the surface water reservoir of the Muecula dam to the WTP, ii) Construction of a new Water Treatment Plant (WTP), clear water reservoir and pumping station, iii) Construct a new transmission main from the WTP to Nacala City, iv) Rehabilitation of existing Distribution Centers (DCs) and the Construction of a new DC and v) Construction of distribution network.

A dual financing in order to implement the above works is as follows: the contribution will be through a DRIVE grant from the Government of the Netherlands which offer up to 50% of grant co-financing, that will be supplemented by a WASIS II grant financed by the World Bank.

1.2 Nacala Porto Water Supply System

The city of Nacala is currently served by a combination of surface water and ground water sources. Nacala receives potable water from 2 primary sources, namely:

- Muecula River dam – located about 30km southwest of the city,
- Wellfields at Mpaco and Mutuzi 1 – located about 10 km to the east of the city.

The first source is a dam on the Muecula River some 30 km south west of the city. The reservoir has a storage capacity of about 4.4 million m³. The dam was rehabilitated in 2013 and raised to expand the capacity of the reservoir. Water is treated through a six-unit pressure filter system with a capacity of 7,200 m³/day. This treatment system is at the end of its economic life and will be demolished after commissioning of the new WTP.

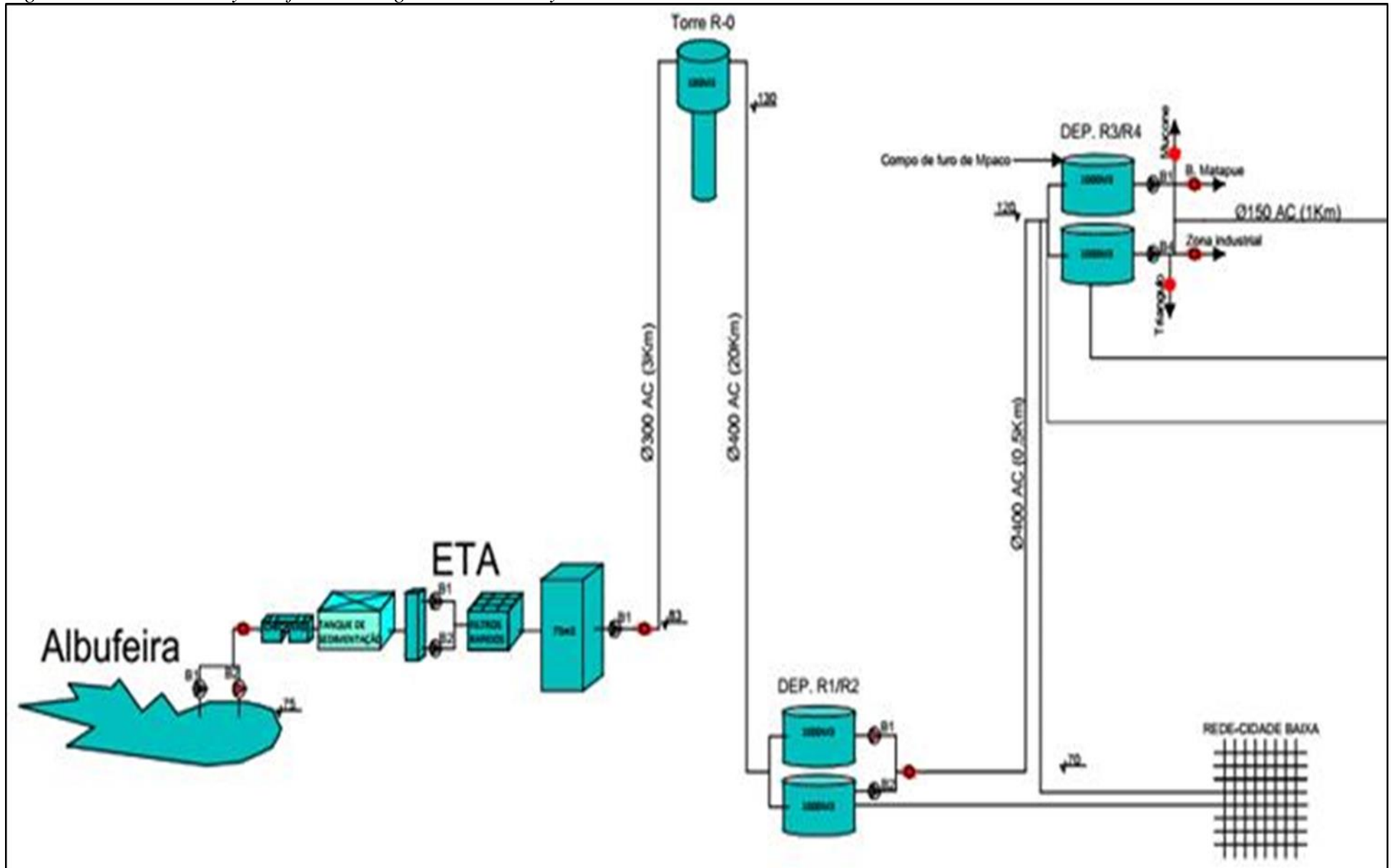
The second source for the distribution system is the Mpaco and Mutuzi well fields. These well fields have a total of ten boreholes with flows between 1,080 and 2,400 m³/day each, resulting in a combined capacity of 13,920 m³/day. Recently, another 13 wellswere drilled and works for installation of equipment and construction of transmission mains and pumping station are completed.

In 2014, at the start of the IGPP project, the combined quantity of water currently available from the system's two sources is therefore 16,200 m³/day. Consequently, through the investments under IGP Project the capacities of the existing Mpaco and Mutuzi I wellfields, together with the commissioning of Mutuzi II wellfield, were expanded with the boreholes tested to supply an additional 14,000 m³/day. The implementation of IGP Project including development of transmission and distribution facilities increased the supply of water to the city to 30,200 m³/day, The IGPP contract also improved the operational control of the supply system.

At the end of 2019, after completion of IGPP, a total of 121,947 people (39% of the population) had access to safe water through a total of 14,587 connections. With a design capacity of 25,000 m³/day, this WASIS II project will add a capacity of 17,900 m³/day treated water of which 10,700m³/day will be available for distribution (after unaccounted water) supplying an additional 80,000 people, resulting in a coverage of 56.2% at completion.

The sketch of the existing Nacala surface water supply system applicable to this service, is presented on the next page, with the intended amendment to the system reflected in figure 2.1.

Figure 1.1: Schematic layout of the existing Nacala water system.



2 GENERAL SCOPE OF SERVICES

2.1 Overview

The Consultant will be required to provide design check and supervision services for rehabilitation and construction of intake, water treatment plant, transmission mains, pumping station, distribution centre and network as part of the key water supply investments in Nacala, planned by FIPAG under the joint funded WASIS II Project. Works will be implemented by construction Contractors under two separate design-and-build civil works contracts.

This 25,000 m³/day water system of intake, WTP, transmission main and distribution centres were designed in 2011. Construction had started, based on that design, in September 2011, but progress was very slow and the contract was terminated in July 2013. It was mostly the piling and other foundations and slabs that had been completed at the end of the contract period. The same design, for a capacity of 25,000 m³/day, will now be implemented under the WASIS II contract. Although the work done had been tested and approved at the time of construction, it will be required from the Contractor to test, amend if required and accept the existing piling, foundations and slabs for use in the structures to be constructed now. In this regard, the Consultant shall be required to recommend and review the Contractors findings and related reports.

The Contractor should start off with evaluating the placements, layout, capacities as previously designed, improve and redesign motivated and approved changes if economically viable, design any outstanding foundations and redesign all steel and reinforces concrete structures. The Contractor shall carry full responsibility for the design of the water system, including for the network expansion, that were not designed before. The Consultant services shall include review of all reports prepared by the Contractor during design phase for each works contract.

An overview of the civil works contracts and general services to be provided by the Consultant are provided in the table below.

Ref	Works Contract No.	Description of Works	Status of Works Procurement	Services to be provided (this assignment)
1	FIPAG/DRIVE/W-1/19	Design, rehabilitation and construction of intake, water treatment, transmission main and pumping stations in Nacala	Bidding Documents will be prepared by FIPAG. The Contractor will be responsible for the design and construction.	Design Check and Supervision
2	FIPAG/DRIVE/W-2/19	Design, rehabilitation and construction of distribution centres and network, Nacala	Bidding Documents will be prepared by FIPAG. The Contractor will be responsible for the design and construction.	

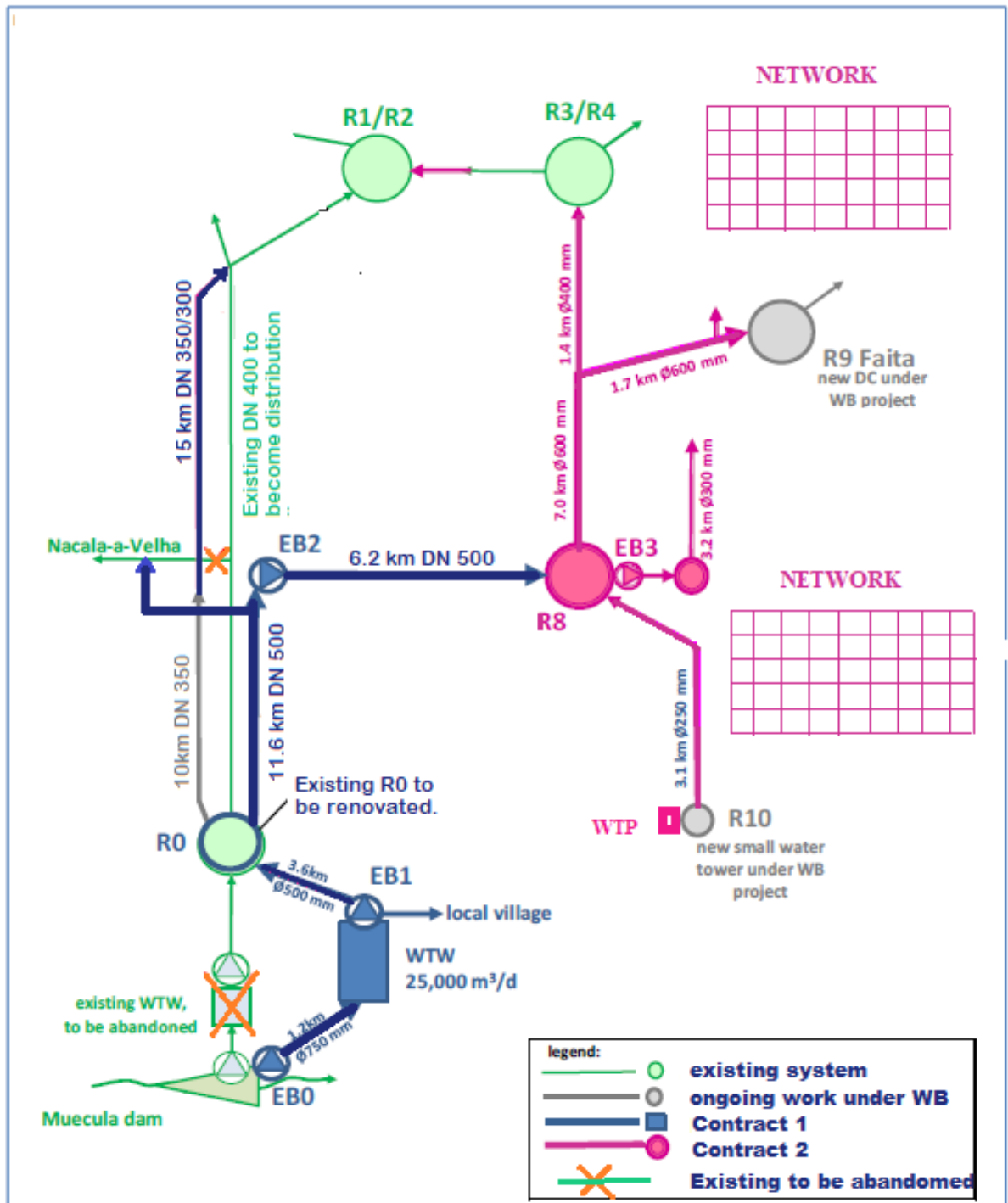
2.2 Description of Works Contract

2.2.1 General overview

The two works contracts are planned as illustrated in the figure on the next page and are described as follows:

- **Water production contract:** Elaboration of detailed design and equipment of intake pump station (EB0), water treatment plant, transmission main and pumping stations at EB1 and EB2, including the rehabilitation of the existing 200 m³ reservoir at R0, indicated in figure 2.1. Note that the existing transmission main will be retained as a distribution main to the communities along the pipeline.
- **Water Distribution Contract:** Elaboration of detailed design and construction of a new distribution centres (R8), distribution lines to existing DCs, including rehabilitation of existing DCs and expansion of the network,

Figure 2.1: Schematic layout of the works to be constructed.



These contracts can be awarded to the same Contractor or to two different Contractors.

As the foundations, floor slabs and some walls of the intended works had been started in the past, the Contractor(s) shall start by carefully examine and investigate the existing infrastructures, their quality and status (fit for purpose) and then design, construct, test, commission and handover in accordance with the Employer requirements, program and specifications all in compliance with the

WASIS II, ESMF, RPF, World Bank policies and procedures and local legislation. The work elements are described in more detail below.

2.2.2 Design, rehabilitation and construction of intake, water treatment plant, transmission mains and pumping stations

- a) The integrity of the following elements shall first be established before the start of the design phase;
1. *WTP*: filter slab and some walls
 2. *EB-2 Pump station*: floor slab and foundation walls
 3. *EB-2 Houses*: blinding slab for Guard house and personnel house

The Contractor shall address the integrity of each of the foundations and slab structures already constructed in the past, given attention to the following aspects as part of an assessment report:

- Description of the existing structure
 - Inspection and Integrity tests performed
 - Inspection and test results
 - Work required (rehabilitation/repair/demolishing)
 - Recommendations (on the integrity and use of the structures)
- b) The Contractors shall then undertake the following, but not limited to detailed design after his technical assessment of the constructed works:
- Supply and installation of electromechanical equipment of the intake pump station at Nacala dam
 - New WTP with 25,000 m³/day of capacity, including EB0, according to the planned components of up-flow roughing filters, slow sand filters and a 400 m³ clear water well,
 - Construction of pump station EB1 at the WTP to pump 25,000 m³/day from the clear water well to the R0 reservoir.
 - Construction of pump station EB-2, at the position and on the foundations prepared before, after the integrity of the foundations had been confirmed.
 - Construction of guard house and operator's houses at WTP and EB2, using existing foundation walls and floor slab after integrity had been confirmed.
 - New 190 m³/day WTP (to be extended as required) for the treatment of groundwater to remove iron and manganese from Mutuze II wellfield water, , to supply water to the Matibane small system and R8 reservoir.
 - New raw water transmission DI main of 1,200 m, from the intake pump station to the WTP with DN750
New DI transmission main of 3,600 m, from EB1 to R0 with DN500 (pressure line)
Rehabilitation of the R0 reservoir to restore full integrity.
 - New DI transmission main of 11,600 m, from R0 to EB2, DN 500 (gravity line)
 - New DI transmission main of 6,200 m, from EB-2 to R8, DN500 (pressure line)
 - Replacement of about 15,000 m of existing AC transmission main. Connections to communities should be formalized as required and connection to Nacala-Velha should be retained as an alternative supply.
 - Telemetry system to be managed from the WTP.

(Note that all placements, diameter and capacities recommended by previous design shall be followed or reviewed after proper motivation, if necessary).

2.2.3 Design, rehabilitation and construction of DCs and network

Again, the Contractor shall address the following aspects regarding the integrity of each of the foundations and slab structures already constructed in the past:

- Description of the existing structure
- Inspection and Integrity tests performed
- Inspection and test results
- Work required (rehabilitation/repair/demolishing)
- Recommendations (on the integrity and use of the structures)

The integrity of the following elements shall first be established before the start of the resign phase;

1. *DC R8 Reservoir*: piling foundation
2. *DC R8 Pumping station EB3*: foundation
3. *DC R8 Water Tower*: piling foundation
4. *R5 Water Tower*: piling foundation

The Contractors shall then undertake, but not limited to, the following detailed design after their technical assessment and construction works:

- Rehabilitation of distribution centres at R1/R2 as well as R3/R4.
- Construction of new DC, R8, composed by two 4,000 m³ ground level reservoir, 250 m³ water tower and pumping station including chlorination building and operator's house
- Construction of main distribution lines from R8 to distribution areas.
- A telemetry system for the water distribution system in Nacala, situated at R8 shall be designed and implemented by the Contractor.
- Construction of network including replacement of old network, transfer of connections from old to new network, expansion of network to new areas and creation of district metering zones as follows:
 - 12 km of main distribution lines (8.8 km of DN 600 mm from R8 to R3/R4 DC and 3 km of DN 300 mm along the highway N12 to service the expansion area from R8)
 - 150 km distribution network (20 km of expansion and 130 km replacement including transference of connections from old to new lines).
 - Creation of pressure zones and concept of district metering for non-revenue water (NRV).

It will be the Contractor's responsibility to ensure that the water system as a whole run as intended with the necessary attention to water hammer and other protection equipment. (Note that all placements, diameter and capacities recommended by previous design shall be followed or reviewed after proper motivation, if necessary).

2.3 Scope of Services

The overall scope of this consultancy assignment is to carry out:

- (a) Design check of rehabilitation and construction of intake, WTP, transmission mains, pumping stations, DCs and network.
- (b) Supervision of rehabilitation and construction of intake, WTP, transmission mains, pumping stations, DCs and network.

The Consultant shall act as the **“The Engineer”** and **“Engineer's Representative”** or **“Engineer”** with authorities and responsibilities as defined in the works contracts and specifications. The

supervision of the works on site and contract management activities shall be carried out in accordance with Contract Conditions and local legislation including the environmental and social safeguard’s framework.

2.4 Form of Contracts for Consultancy Services

The forms of Contract shall be lump sum for the design check activities and time based for construction supervision and contract management. The consultancy contract will be awarded to the same Consultant through two components which cover the scope of services as follows:

Ref	Consultancy Contract Nr	Description	Form of Contract
1	FIPAG/DRIVE/CON-1A/19	Design check of intake, WTP, transmission mains, pumping stations, DCs and network in Nacala	Lump Sum
2	FIPAG/DRIVE/CON-1B/19	Supervision of intake, WTP, transmission mains, pumping stations, DCs and network in Nacala	Time Based

The Consultant will be selected in accordance with the procedures set out in the World Bank’s Procurement Regulations for IPF Borrowers - Procurement in Investment Projects Financing of July 2016, revised November 2017 and August 2018

The durations of the various tasks are planned to be as reflected below, but the actual time required will also depend on the performances of the appointed Consultants and Contractors. The 365 days of defect liability period shall be included.

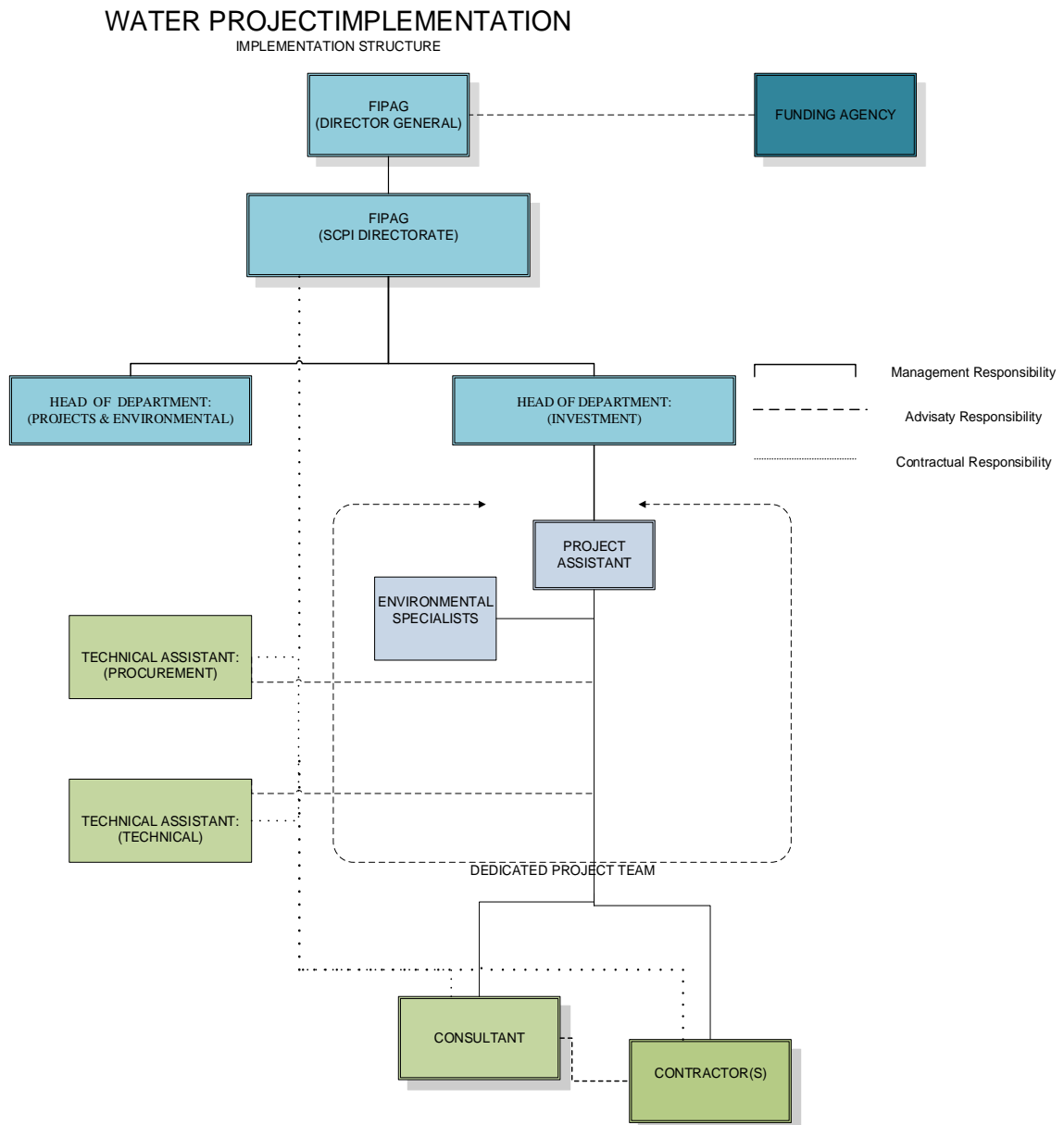
Table 2.2: *Expected Implementation Schedule.*

Contract description	Responsible	Months																											
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Contract 1; Water Production: (Intake, WTP, transmission mains and pumping stations)	Contractor	Design: 7 months +1 (Evaluation)							Construction by the contractor: 12 months												DLP 12 months								
	Consultant	Design check: 7 months +1 month for Client Evaluation							Construction Supervision: 12 months												DLP Management								
Contract 2: Water Distribution: Distribution centres and network	Contractor						Design: 7 months +1 (Evaluation)					Construction: 12 months												DLP					
	Consultant						Design check: 7 months +1 month for Client Evaluation					Construction Supervision: 12 months												DLP					

The two works contracts will be implemented by the winner contractor in different period. The above timeline is illustrative and can be adjusted based on final started date which will be defined for each works contract.

3 CONSULTANT’S DESIGN CHECK RESPONSIBILITIES

The following Organogram illustrates the relationship between FIPAG, the Consultant and the Contractor, with their responsibilities as detailed in the standard contracts of the World Bank.



The Contractor has the final design responsibility. The Consultant has the responsibility to guide, check and officially approve, under his professional liability, the design done by the Contractor, in consultation with FIPAG. The consultant shall review the contractor’s design and point out any design short-comings or mistakes to the Contractor who shall then redo the design until approved by the Consultant/Client. The role of FIPAG is to oversee the process in order to ensure that all aspects of the design is in line with the stated “Employers Requirements” and that the correct design criteria are used. FIPAG will carry no design or design check responsibility, but based on the recommendation of the Consultant, will give his no objection to the design approved by the Consultant.

3.1 General

The Consultant will be required to work in close cooperation with the Contractor's design teams and guide the concept, preliminary and detailed designs and assist first with the evaluation of the integrity tests done on existing infrastructure components such as piling, foundations and slabs. The review of the reports regarding the integrity of the existing construction work must be confirmed before the placement of the structures are finalized.

The Consultant will then continue his close cooperation with the Contractor and the design team to check and approve the outstanding works components namely, foundations, structures and reinforcement to be designed by the Contractor.

All placements, capacities and pump sizes shall be reviewed to ensure their effectiveness. This will include the intake at the dam, WTP, transmission mains, pumping stations, reservoirs, DCs as well as the preliminary designs of the total network for Nacala, followed by the detailed design of priority areas as well as pipe sections for rehabilitation.

The DCs and water supply network shall include recommendation regarding the rehabilitation works, length of network for expansion and for rehabilitation, number of possible connections to be transferred for new rehabilitated network as well as the installation of district water meters and control valves. The Consultant will then review and approve in consultation with FIPAG, the Contractor's final design for all elements of the water system.

Consultant shall carry out design review services in order to ensure an effective balanced water system for Nacala and the sizing/capacities of the intake, WTP, pump stations and transmission mains shall be aligned have been considered under the preparation of design. The proposed sizes, capacities, pipeline routes and placement of all elements, including required storage, primary and secondary distribution network as well as proposals regarding the construction of DC and rehabilitation of the existing network must be done as part of the Contractor's preliminary design.

The Consultant shall ensure an optimal design to be prepared by the Contractor. The Consultant shall also carefully review the recommendation regarding the rehabilitation works of R0 reservoir and the existing DCs and routing of the transmission main and network to ensure the designs are optimized with due consideration to the integrity of available foundations and slabs, technical aspects, and costs effectiveness in accordance with Resettlement Policy Framework and the Environmental and Social Management Framework (ESMF) prepared for the WASIS II project.

The new intake, WTP, transmission main and distribution centres were previously designed and construction had started based on that design. It was mostly the piling and other foundations and slabs that had been completed at the WTP, EB2 and the DC at R8. The existing detailed design prepared in 2011 will be made available to the winner Consultant and Contractor.

Regarding the network, there is an existing EPANET hydraulic model for Nacala network prepared in 2016 that will be made available to the winning Consultant and Contractor. It shall be the Contractor's responsibility to review, update, calibrate or renew the model, to the satisfaction of the design check Consultant, during the modeling of the existing network.

It is required that the consultant also review the Bill of Quantities to identify as soon as possible items not provided for that will require VOs and that quantities are in line with the work to be done.

3.2 Specific Responsibilities

The Contractor is responsible to ensure that the assessment of the existing infrastructure and the design of all contract elements are completed as stated in the works contract. The Consultant shall work closely with the Contractor during the design phase to ensure good progress is achieved and both parties shall attend regular progress meetings related to design review activities, that will be arranged, chaired by the Consultant, who shall also take minutes of the meetings.

3.3 Contract 1: Design check of rehabilitation and construction of intake, WTP, transmission mains and pumping stations

3.3.1 Electromechanical equipment of the Intake

The Consultant shall carry out design review of the electromechanical equipment to be installed on the intake pumping station at the Nacala dam to transfer raw water from the dam to the WTP, that will be prepared by the contractor. The design review shall include the review of pump sizes including standby pumps and complete with electricity supply and control.

3.3.2 Electricity Supply

Energy is already supplied up to the existing intake and pressure filters site at the dam, but it needs to be rehabilitated and upgraded to serve the new intake works. The new WTP, EB2 will be constructed on new sites that will require electricity power lines, transformers and standby power. It will be the responsibility of the Contractor to evaluate the status of the available electricity and to design this electricity supply to the satisfaction of Mozambique Electricity Supply (EDM) and the Consultant.

3.3.3 Construction of WTP and pumping stations

This WTP will treat water from the dam to be delivered to R8 DC passing by R0 and pumping station EB2.

This component of services shall start with the check of the Contractor's report on testing and assessment of the integrity of foundations and slabs already constructed and a final recommendation about their integrity. The review of the WTP design, with total capacity of 25,000 m³/day as per the available placement of the infrastructure will follow. It is a requirement that all outstanding foundations and reinforced concrete structures shall be redesigned.

The Consultant services shall consider that the water quality of the dam should form the base for design of the purification works to ensure a capacity to produce water of the required quality at a rate of 25,000 m³/day. For the design done in 2011, the raw water quality was as follows:

- raw water turbidity at 5 NTU;
- raw water, colour, 65 Pt.Co. units;
- after 24 h of settling, the turbidity was reduced to 3.5 NTU;
- after settling and filtration with a 0.45 micron paper filter, the turbidity was reduced to 0.5 NTU;
- colour was reduced to 33 Pt.Co.

However, since then the dam had been raised by two meters and the level of raw water withdrawal had changed. Water quality test should be redone by the Contractor and the WTP design adjusted if required.

The design check shall also include the pumping station, chlorination and the clear water tank at the WTP as well the required power supply, including transformers and standby generators.

Apart from the above mentioned WTP the Consultant shall check the WTP's design of the new 190 m³/day WTP for the treatment (iron and manganese removal) of groundwater from Mutuzi II wellfield, to supply water to the Matibane small system. The water quality as well as the sustainable abstraction from the existing boreholes, as well as the capacity of the aquifer should form the base of the purification works. It is anticipated that the WTP should have a capacity equal to the present supply from the Mutuzi II boreholes, but as this aquifer shows large potential, it should probably require to expand this capacity and construct a transmission main to R8. The Consultant shall also check the design, including the capacity of the intake works at Mutuzi II to accept water from the boreholes.

The Consultant shall ensure that the design prepared by the Contractor address the drainage of all sites where infrastructure is constructed and site access during all weather conditions.

3.3.4 Transmission mains

The existing pipeline route and detailed design shall be followed as far as possible. The Consultant shall ensure necessary designs checks consider surge protection requirements, and other operational and safety fittings such as air valves and washouts.

3.3.5 Additional Aspects Regarding the Intake, WTP, Transmission mains and Pumping stations Design Check Responsibility

- The Consultant shall attend the 1st Site Meeting for Works Contract with the Contractor on site and produce Minutes of Meetings.
- The Consultant shall, in consultation with FIPAG, be responsible for reviewing and approval of the Contractor's design, drawings and other proposals for the works. The design to be prepared by the Contractor and checked by the consulting Engineer shall include:
 - Testing and assessment of the related infrastructure already constructed,
 - Assessment of the field survey and reference points done by the Contractor,
 - Preliminary design review of all sections of the proposed connecting pipelines and transmission mains.
 - Detailed design review of all sections of the proposed water system.
- The Consultant shall insure that FIPAG stays informed of the findings, progress and recommendations before the submission of the preliminary and detail design check reports.
- The Consultant shall be involved in all design phases of the project by working closely with the Contractor.
- Comments on design should be sent continuously to the Contractor after FIPAG's comments and recommendations. The Consultant is required to send combined comments (Consultant and FIPAG) to the Contractor.
- Modifications on available detailed design such as alteration of pipe sizing, pipeline route, placement of infrastructure, foundations, etc, shall be immediately reported and the related motivations are required for approval of the Consultant and FIPAG.
- The Consultant should review the Environmental and Social Management Plan (ESMP) Implementation Plan and advise FIPAG of any deviation from the safeguard's instruments. Any deviation should be immediately informed to FIPAG; the Consultant has no write to authorize any deviation.

- Payment of possible compensations or resettlement will be managed by FIPAG. However, the Consultant shall ensure that the Contractor's design avoid compensations and/or resettlement as much as possible.
- The Consultant shall monitor the Contractor's design progress in accordance with the contractual program and will arrange, chair and take minutes of regular progress meetings. The Consultant shall take an active role in the design process to ensure that the Contractor complies with their work program / delivery schedule, including provision of timely advice to FIPAG regarding any potential constraints and risks which may lead to delays.

3.4 Contract 2: Design Check of rehabilitation and construction of DCs and network in Nacala

3.3.2 Electricity Supply

The R8 Distribution Center will be constructed on a new site that will require electricity power lines, transformers and standby power. It will be the responsibility of the Contractor to evaluate the status of the available electricity and to design this electricity supply to the satisfaction of Mozambique Electricity Supply (EDM) and the Consultant.

3.4.1 Rehabilitation of DCs

The Consultant will be required to check the Contractor's design considering the that:

1. The Contractor did a thorough evaluation of all existing distribution centres (DC).
2. The findings and recommendation of rehabilitation work is required to ensure the optimal working of the DC.
3. The detailed design report did address all design requirements.
4. The material and equipment to be used by the Contractor meets the latest applicable specifications.
5. The proposed methodology will ensure minimal interruption of the service and will include coordination with the operator.
6. The works schedule is realistic.
7. The BoQ is updated and that any new rates are realistic.

3.4.2 New Distribution Centre at R8

The Consultant will be required to check the detailed engineering and architectural design prepared by the Contractor for a new water distribution centre at R8 complete with two ground reservoirs, each with 4,000 m³ of capacity, pumping station, water tower (250 m³ capacity), operator's house and ancillary works, including the provision of the required power supply and to address the drainage of the site and ensure site access to all sites during all weather conditions.

The Consultant task will start with the checking of the Contractor's tests and integrity assessment of the piling and foundations already constructed by others. If their integrity is approved the preliminary design of the DC can be checked. It will be required to verify the Contractor's design as well as the design information provided by FIPAG, in the context of the projected yields of the water resources and the projected water demands, including confirmation of the suitability of the proposed site. The Contractor shall follow the available detailed design prepared for 2029 horizon.

The DC will consist of two 4,000 m³ ground level reservoir, a pump station and a 250 m³ water tower with facilities for the required chlorination in order to improve the storage capacity and water

pressure control. The DC must also be equipped with a standby generator and houses for the operator.

Review of structural design calculations including foundations which should be certified by a registered Mozambican Engineer for the approval by the relevant authorities in Mozambique.

3.4.2.1 Ground Reservoirs

Detailed design review shall be done for the reservoirs, including the Contractor's design of the outstanding reinforcement solutions, after verification of the pile foundation already constructed for the two cells 4,000 m³ circular ground reservoir at R8. The Consultant shall review and ensure that the Contractor design includes all necessary pipe work and fittings, chambers, drainage and access ways to be reviewed by the Consultant. The design must be to the approval of FIPAG and the relevant Mozambique regulations.

3.4.2.2 Water Tower

Following the Contractor's verification of the integrity of the pile foundation already constructed for the tower, the preliminary and detailed design review shall be done, including structural reinforcement for 250 m³ (or revised capacity) circular water tower. The Consultant shall ensure compliance with the Employer's requirements.

The height of the water tower is to be determined from the Contractor's hydraulic analysis to be reviewed by the Consultant and approved by FIPAG also during preliminary design. The review of preliminary design must also include all necessary pipe work and fittings, chambers, drainage and access ways. The Consultant shall ensure that the Contractor's design includes a pipe and fitting to bypass the tower in order to pump directly into the network and a proper space and connection to feed water trucks.

3.4.2.3 Pumping Stations

The Consultant is required to review the Contractor' integrity report of the foundations, constructed previously by others, which shall first be tested and approved before the preliminary design. Reviews is required of the structural redesign as well as appropriate foundation solution for pumping station if additional foundations are required. The Contractor's preliminary and detailed designs must be to the approval of FIPAG and the relevant Mozambique regulations.

The design to be checked shall include the detailed structural, mechanical and electrical design of the new pump station as well as to ensure sufficient capacity. The design of the pumps and pumping system is to be determined from the Contractor's hydraulic analysis to be checked by the Consultant and approved by FIPAG. Positive suction for the pumps should be ensured and any cavitation during operation shall be prevented. Thus, the Consultant is required to review the Contractor's design considering that no foot valves are allowed to be used.

Review the design which shall include all electrical supply and ancillary equipment to run the stations. The Contractor' design shall include all works required to allow the power connection to the grid line under the responsibility of EDM and related generators as part of the works contract. This should include the review and replacement of the transformers and the extension of the grid line to the transformer shall be approved by EDM. The reliability of the power supply should also be investigated to ensure better reliability and longer hours or water supply.

3.4.2.4 Operator's House

Design review of the housing and working facilities for the operating staff to be provided on the premises.

3.4.2.5 Ancillary Works

The Contractor will be required to include all ancillary work required for the safe and effective operation of the DC and this should be checked by the Consultant. This will include water plumbing and electricity supply where required, sanitation and storm water drainage, access roads sufficient for use in all wet weather conditions, security fences and access gates, etc.

3.4.3 Construction of Network

The Consultant carry out review services in order to ensure that the Contractor's design network including hydraulic modelling with EPANET software, is being prepared for the entire Nacala distribution network. The services shall include review of hydraulic calculations and detailed sizing of pipes. Due to the age and condition of the network, as well as smaller design populations used in the past, some parts of the network need to be replaced, or substituted with suitably sized mains as indicated by the design. The Consultant is required to work closely with contractor to ensure that the Design includes the identification of some of the old lines to be disconnected, the transfer of the existing metered connections from the old to the new pipelines of the network.

Review the preliminary design report which shall be prepared for a 10 years horizon for the entire Nacala city. Due to the source limitation to satisfy the 2030 demand, the Contractor will have to develop the design in order to allow construction of the network in two phases. The first phase shall utilize the funds available under the present WASIS II allocation to construct 150 km distribution network (20 km of expansion and 130 km replacement including transference of connections from old to new lines) that should satisfy the horizon up to 5 years and allow an additional 10,000 metered connections to serve an additional 53,00 people. Note that the installation of metered connections does not form part of the works contract. A future second phase shall satisfy the 10 years' horizon by reinforcing the first phase projected network. This will enable a more realistic sizing of the network for the available water and will guide the second phase of investments in network for which funding must still be obtained.

Another issue to consider in the design review is that the network is not well structured and that makes it difficult to manage Unaccounted for Water (UFW). The installation of control valves and district flow meters to isolate logical zones to measure water flow and manage water losses shall therefore be part of the design. The District flow meters shall be installed at the supply point to each of the water management "Districts" identified in conjunction with the Operator. The requirement for these Districts is that they could be isolated from other Districts by way of a limited number of control valves that will stay open during normal supply, but shall be closed when the UFW for that District is measured and evaluated. These Districts, supply point with flow meter and control valves (that should be closed to isolate the districts) shall be clearly indicated in a "UFW Management Map" covering all Districts of the total network.

Installation of new network or rehabilitation of the network's zone/district boundary valves as well as normal control valves in order to isolate pipe sections during repair work is essential. A systematic inspection and recording of network valves will be carried out resulting in detailed plans proposed for installation or rehabilitation of valves that will enable the isolation of these zones/districts or pipe sections in order to verify and repair leakages. Review the Contractor' guidelines on how to operate these valves and meters in order to manage and reduce UFW.

Design review considering that expansion of the network to new areas of development is further required. The network for the entire city of Nacala (all neighborhoods) should be designed by the Contractor's and checked by the Consultant. The design shall be divided in phases of implementation linked to the availability of funds. The priority areas of the network to be constructed now, shall be agreed in consultation with FIPAG and the Operator. These approved priority areas shall be addressed in the detailed design.

In addition, the review of the detailed design report shall include, but not restricted to:

- Maps with necessary data for the entire network with appropriated satellite image as background in A1, including clearly distinguish of (i) existing pipelines (ii) proposed expansion pipelines (iii) proposed rehabilitation or replacement and reinforcement of pipelines (iv) proposed diameters, (v) hydraulic results: diameters, pressure, head loss, velocities, etc
- Detailed hydraulic analysis diagrams and data (utilizing an approved computer program in English - EPANET), and pipeline longitudinal sections indicating pipeline sizes, levels and gradients, ground levels, chambers and valves for approval;
- Report with auditable calculations and copies of test data.
- Maps illustrating boundary of different metering zones (also known as ZMC's -Zones for Measurement and Control) and location of proposed bulk meters, pressure control unit and flow control valves. Total budget calculation (estimation) per each neighbourhood based on proposed pipelines for entire Nacala Distribution Network.
- Identification of all environmental and social aspects prior to start of works.
- Reports tables for quality assurance and version tracking with details on what, when, how and by whom the document was prepared (name and position of persons who prepared, revised and approved the Report including areas of responsibility, areas reviewed, number of revisions, start and completed dates and comments, etc).
- An updated Bill of Quantities, using rates in the Contractor's proposal. If new rates are required, the Consultant shall ensure that they are realistic and fair to all.

3.4.3.1 Additional aspects regarding the network Design Check responsibility

- The Consultant shall attend the Preliminary Design Report presentation by the Contractor's design team as well as the 1st site meeting for works contract with the Contractor on site. The Consultant shall produce minutes of this meeting.
- The Consultant shall be responsible for review and approve the methodology proposed by Contractor to assess the existing network, pipe sections to be replaced and all rehabilitation actions and transfer of metered connections required.
- The Consultant shall be responsible for reviewing and approval of all structural and hydraulic calculation used under design phase, including EPANET or other similar software approved by the Client.
- The Consultant shall ensure that the Preliminary and Detailed Designs are reviewed and points of doubt discussed with FIPAG before the submission to the Client with the Consultant's Design Check report.
- The Consultant shall be responsible for reviewing and approval of the Contractor's design, drawings and other proposals for the works. The design to be prepared by the Contractor and checked by the Consultant shall include:
 - Assessment of the existing situation: GIS information, etc. The hydraulic model for the Nacala network from a previous network expansion contract will be made available to the Contractor.

- Concept Design: definition of construction projects including realistic construction scheduling, preliminary proposals and sufficient basic planning, surveying, analyses and inspection of all relevant installations and preliminary study required for formulating the main extension packages, collating and verify all available data (including that provided in this document), drawings, maps and plans relating to the existing system and future extensions. The Contractor shall also collect all other data needed to complete his work including demographics and water demand and state the design criteria to be followed in the detailed design.
 - Preliminary Design: design of the entire distribution network in EPANET software including hydraulic model for the present situation, covering all populated areas of the City. It will further be required to include cost calculations for the various areas in order to agree on the existing lines and connections to be rehabilitated/replaced and the identification of the alternatives regarding priority areas for final design, to be balanced with the available funds and expansion targets.
 - Detailed Design: after finalization of Preliminary design, priority areas should be defined by the water companies and Municipalities, to be submitted for approval to FIPAG. The Detailed Design shall be developed for the priority areas in such a way that the targeted network length (150 km) will be met.
- The Consultant shall be involved in all design phases of the project by working closely with the Contractor and shall put in place practical communication and document flow arrangements in order to ensure an effective cooperation, review and approval process. It would be an advantage if the Consultant and Contractor’s designers have full time representatives in Mozambique.
 - Comments on design should be sent continuously to the Contractor after FIPAG’s comments and recommendations. The Consultant is required to send combined comments (Consultant and FIPAG) to the Contractor.
 - The Consultant should review the Environmental Management Plan (EMP) updated by the Contractor and advise FIPAG of any deviation from the safeguard’s instruments. Any deviation should be immediately informed to FIPAG. The Consultant has no right to authorize any deviation.
 - Payment of possible compensations or resettlement will be managed by FIPAG according to the Resettlement Policy Framework (RPF) prepared for the project. However, the Consultant is required to ensure that the design shall avoid compensations and/or resettlement as much as possible.
 - The Consultant shall monitor the Contractor’s design progress in accordance with the Contractual Program and will arrange, chair and take minutes of regular progress meetings. The Consultant shall take an active role in the design review process to ensure that the Contractor complies with their work program / delivery schedule, including provision of timely advice to FIPAG regarding any potential constraints and risks which may lead to delays.

4 CONSULTANT’S SUPERVISION RESPONSIBILITIES

4.1 General

To carry out the duties of “The Engineer” and “Engineer’s Representative” or “Engineer” as specified in the Conditions of Contract and Specifications. The Consultant shall also carry out the duties of the Environmental Control Officer, as specified in the Environmental Management Plan.

4.2 Regular Responsibilities

- The Consultant shall be responsible for the day-to-day supervision and contract management (including **quality, time and costs** control processes and procedures) for the civil works contracts listed above. This will include attending inspection and testing of equipment at the manufactured by one specialist, supervision of the construction and equipment installations, commissioning and hand-over of the Schemes, including defects liability period, in accordance with the Conditions of Contract, specifications, drawings, and compliance with the ESMP and RAP, if any.
- The Consultant should ensure that the various contracts / works of the WASIS II Project listed under 2.1, are integrated and well coordinate, including the introduction and operation of managing system / contract interfaces.
- The Consultant shall be responsible for supervising the Environmental and Social Management Plan (ESMP) implementation during the construction phase.
- The Consultant shall be responsible for instructing and monitoring the Contractor regarding compliance with health and safety precautions and actions to comply with all the environmental requirements of the Scheme during construction, as specified in the ESMP.
- The Consultant shall maintain all necessary Engineering and environmental records pertaining to civil Engineering works of this nature, including but not limited to rainfall and other climatic conditions, Contractor's manpower levels, minutes of meetings, photographic records, financial reconciliations, Environmental Method Statements etc.
- The Consultant shall verify and approve all shop drawings submitted by Contractor with final layout and exact dimensions prior ordering materials and equipment.
- The Consultant shall monitor the Contractor's work progress in accordance with the Contractual Program and will arrange, chair and take minutes of regular progress meetings.
- The Consultant shall plan and ensure the minimum disruption of the normal operation of the system and plan and get permission for any interruptions from FIPAG Operations in Nacala. Notification for the interruption must be given to the affected people.
- The Consultant shall review all payment applications and approve all eligible payments for the Employer's action. Also, the Consultant will maintain and submit to the Employer reconciliations of payments and cost predictions to the end of the scheme.
- The Consultant shall manage shall review all Engineering and environmental variations orders to the Contract by identified the need for variations as soon as possible and agree, as far as possible, with the Contractor on time and cost implications before issuing the VO instruction. It is further required that the Consultant consult FIPAG and submit all documentation including a motivation of the VO to FIPAG for their 'no-objection' before the VO is issued, if it does not pose any risk for the project.
- The Consultant shall manage all claims submitted by the Contractor's and make recommendations to FIPAG on the preferred resolution of the claim.
- The Consultant shall ensure at all times that the Contractor's Guarantees, Securities and Insurances are valid at all times during construction and that their validity is timely extended if required.

4.3 Responsibilities at Completion and Commissioning

- The Consultant shall ensure that the construction drawings are reviewed before the submission to the Client.
- The Consultant shall supervise and approve the commissioning before completion certificates are issued.
- Before and during the Defects Liability Period the Consultant shall be responsible for the issuance of defects lists and the supervision of remedial works by the Contractor.

- The Consultant shall ensure the provision of and take delivery of all “as-built” drawings, specifications, and certificates of testing relating to the completed projects and hand them to FIPAG.
- On satisfactory completion of the Scheme, the Consultant shall issue all necessary documents of completion.

4.3.1 Operations and Training:

As the effective operation of the, intake, WTP, DC and the network UFW management will depend to a large extent on the design, the Consultant shall review the general Operations guideline to be prepared by the Contractor with separate sections for each of the following infrastructure:

- The intake.
- The new WTP including filters and equipment.
- New DC including chlorination and reservoir level controls.
- The distribution networks.
- The operation and management of UFW reduction per region/district.
- Telemetry system.

5 OUTPUTS

The required outputs are summarized in the table below and detailed afterwards:

Ref.	<i>Design Check Stage</i>			
	Description	Water Production Works and Water Distribution Works		Format
	Output Documents	Target date from start date (SD)	Nr.	
1	Inception Report	45 days after SD	1	CD with PDF, MS Word, MS Excel.
			1	Hard copy

Ref.	Description	Water Production Works		Water Distribution Works		Format for both Reports
	Output Documents	Target date from start date (SD)	Nr.	Target date from start date (SD)	Nr.	
2	Concept Design and Integrity Review Report	2 months after Works Contract Start	1	2 months after Works Contract Start	1	CD with PDF, MS Word, MS Excel.
			3		3	Hard copy
3	Preliminary Design Review report	4 months after Works Contract Start	1	4 months after Works Contract Start	1	CD with PDF, MS Word, MS Excel and Drawings.
			3		3	Hard copy
4	Detailed Design & Bid Documents Review & Approval Report	8 months after Works Contract Start	1	8 months after Works Contract Start	1	CD with PDF, MS Word, MS Excel and Drawings.
			3		3	Hard copy

Ref.	<i>Supervision stages over the two works contracts</i>			Water Production Works	Water Distribution Works
	Output Documents	Target date from start date (SD)	Format	Nr.	Nr.
1	Quality assurance plan	Within 1 month from site handover	Hard copy	3	3
2	Monthly supervision progress report	Monthly by 7 th of the next month	Hard copy	2	2
3	Environmental, Social Health and Safety Monthly Report including GBV/SEA	Monthly by 7 th of the next month	Hard copy	3	3
4	Inspection report of materials	Within 7 days after the inspection	Hard copy	3	3
5	Training Report	Within 10 days prior to handover	Hard copy	3	3
5	Completion report	Within 4 weeks from handover	Hard copy	3	3
6	Final report	Within 4 weeks from end of DLP.	Hard copy	3	3

5.1 DESIGN CHECK – Specific Outputs

The following Output Documents will be required to be prepared in accordance with the Design Check's Responsibilities discussed in Section 3.3 and 3.4. Note that separate sets of reports will be required, one for each works contract namely, (1) rehabilitation and construction of intake, WTP, transmission mains and pumping stations and (2) rehabilitation and construction of DCs and network.

5.1.1 Inception Report for Water Production and Distribution

The Inception Report shall be prepared for both the water production works and the water distribution works in one report, but clearly address the content of the two contracts separately.

The consultant shall reflect his understanding of the services to be rendered, the methods to be followed, the staff to be allocated and the time required to complete the services. Description should address the "design review components".

The Consultant shall submit an **Inception Report** in **1** hard copy and an electronic copy on CD within **1 month** from commencement date of the first contract. It will also be required to make a formal presentation of the report content at FIPAG Head Office, one week after submission.

The remaining output reports shall be prepared separately for the water production contract and the water distribution contract.

5.2 Reports for Water Production Works Contract

Strict target dates are set for the completion of the design within 7 months from the commencement of each of the works contracts. The Consultant shall, at the start of the design, agree with the Contractor on a design schedule with dates for the Contractor to submit each document to the Consultant, the time for the Consultant to respond and when the documents will be submitted to

FIPAG. Please note that all correspondence between the Consultant and the Contractor shall be copied to FIPAG.

5.2.1 Concept Design and Integrity Review Report

(a) Concept design check

This report shall include an assessment of detailed data and design criteria, technical assessment of the existing information and proposals of design concepts, proposed by the Contractor to be used in the preparation of detailed design. The usability or rejection of the existing infrastructure shall be clearly stated.

(b) Review Report on integrity of the piling, foundations and slabs constructed by others

The works contract document will prescribe the minimum tests to be conducted by the Contractor on the piling, foundations and slabs constructed by others.

The Consultant's integrity review report shall check the contractor's findings of the assessment visit to the constructed infrastructure, description of the tests done, the test results and an interpretation of the results and a conclusion on the integrity of the infrastructure. The final conclusions and recommendations regarding the integrity of each element shall be confirmed by the Consultant.

The concept design and integrity review report (approved version) is required within **2 months** from commencement date of the contract. It will also be required to make a formal presentation of the report content at FIPAG Head Office, one week after submission.

5.2.2 Preliminary Design Check Report

The report shall include auditable calculations and copies of test data and survey reports, the assumptions and design criteria used by the Contractor's design team. The preliminary design review report (approved version) is required within **4 months** from commencement date of each contract. It will also be required to make a formal presentation of the report content at FIPAG Head Office, one week after submission.

The Report shall cover (but not be restricted to):

- Review the final recommendation regarding the use of the existing infrastructure.
- Review of findings and recommendations on infrastructure placements and pipeline routes, including review of environmental and social impacts, motivating all deviations from the original detailed design.
- Review of pumping capacity and infrastructure placement at the intake, including the electricity supply, generators and pump controls including Consultant's recommendation of Contractor's acceptability or motivation of all deviations from the original design.
- Confirmation that Contractor's design follows the defined pipe sized and pipe material for the different sections of the transmission main, including review the hydraulic analyzes and surge protection.
- Review of findings and recommendations regarding the proposed water treatment system, including chlorination, the required capacity and to point out and motivate any proposed changes to the original design and layout.
- Review of findings and recommendation on Contractor design regarding the placement of infrastructure elements such as pump station at the WTP, clear-water sump, electricity supply, standby generators and pump control.
- Attend to the presentation of Preliminary Design Report held by Contractor and produce the minutes of the presentation meeting.

The Consultant shall provide 3 hard copies of the final reports to be delivered to the Client together with two complete electronic versions on a CD, one in the PDF format for possible reproduction to interested parties or the public and one in the MS Word for text and MS Excel for tabular and financial data plus updated aerial photos covering all residential areas. The drawings and maps shall be submitted in electronic format compatible with AutoCAD and ArcGIS in 3 hard copies A1 size, respectively.

5.2.3 Detailed Design Check Report

The draft detailed design check report, to be prepared for the water production contract, including drawings, are required to be submitted for approval within **7 months** from commencement date of the water production contract.

The report shall, among others address at least the following:

- An overview of the criteria used by the Contractor in the revision of the design, the results of various analyses and surveys as well as its conclusion.
- Review of the detailed design, including completeness and correctness of construction drawings, bill of quantities, specifications, etc. for the intake, WTP, transmission mains and pumping stations.
- Review and approval of the water production system, including the intake, WTP placement, route and pipe material of the transmission mains, with special attention to surge protection.
- Review and approval of the supply of mechanical equipment and the supply of electricity including transformers, standby generators, in-house distribution and pump control boards.
- Review and approval of the proposed telemetry system to be operated from the WTP.
- Review the work plan for the implementation of the Works, with special attention to mobilization, the procurement, inspection and testing of material and equipment,
- Recommendations on environmental and social impacts.

The Consultant shall provide 3 hard copies of the final reports will be delivered to the client together with two complete electronic versions on a CD plus one in the PDF format for possible reproduction to interested parties or the public and one in the MS Word for text and MS Excel for tabular and financial data plus updated aerial photos covering all residential areas. The drawings and maps shall be submitted in electronic format compatible with AutoCAD and ArcGIS and in 3 hard copies A1 size, respectively.

5.3 Reports for Water Distribution Works Contract

5.3.1 Concept Design and Integrity Review Report - Water Distribution

(a) Concept design check

This report shall include an assessment of detailed data and design criteria, technical assessment of the existing information and proposals of design concepts to be used in the preparation of detailed design. The usability or rejection of the existing infrastructure shall be clearly stated.

(b) Integrity review of the piling, foundations and slabs constructed by others

The works contract document will prescribe the minimum tests to be conducted on the piling, foundations and slabs constructed by others.

The Consultant's integrity review report shall check the contractor's findings of the assessment visit to the constructed infrastructure, description of the tests done, the test results and an interpretation of the results and a conclusion on the integrity of the infrastructure. The final conclusions and recommendations regarding the integrity of each element shall be confirmed by the consultant.

The concept design check and integrity review report (approved version) is required within **2 months** from commencement date of each contract.

5.3.2 Preliminary Design Check Report

The report shall include auditable calculations and copies of test data and survey reports, the assumptions and design criteria used by the Contractor's design team. The preliminary design review report (approved version) is required within **4 months** from commencement date of each contract.

The Report shall cover (but not be restricted to):

- Review of the proposed method(s) and lengths of rehabilitation, including the environmental and social impacts.
- Ensure that the available routes for the network is being followed by the Contractor.
- Review the Contractor design regarding the pipe sized based on water demand.
- Specific review of the design regarding pressure zones, minimum and maximum pressures, connections to be transferred for new rehabilitated network, installation of District water meters and control valves required to isolate sections of the network to measure and manage UFW;
- Review and approval of the EPANET network model for the entire City's water supply to the 10 years' horizon.
- Review the Contractor's basis and cost estimates (BoQs) for identifying required alternatives for rehabilitation of existing network, including review of environmental and social Impacts.
- Review and recommendation on alternatives, motivation and selection of Priority Areas (in conjunction with Operator) for the "no-objection" of the Client.
- Attend to the presentation of Preliminary Design Report held by Contractor and produce the minutes of the presentation meeting.

The Consultant shall provide 3 hard copies of the final reports to be delivered to the Client together with two complete electronic versions on a CD, one in the PDF format for possible reproduction to interested parties or the public and one in the MS Word for text and MS Excel for tabular and financial data plus updated aerial photos covering all residential areas. The drawings and maps shall be submitted in electronic format compatible with AutoCAD and ArcGIS in 3 hard copies A1 size, respectively.

5.3.3 Detailed Design Check Reports

The draft detailed design check report, to be prepared for the water distribution contract, including drawings, are required to be submitted for final approval within **7 months** from commencement date of the water distribution contract.

The report shall, among others address at least the following:

- An overview of the criteria used by the Contractor in the revision of the design the, results of various analyses and surveys as well as its conclusion.

- Review of the detailed design, including drawings, bill of quantities, specifications, etc. for the agreed priority area, with attention to pressure zones and district metering.
- Review and approval of the supply of mechanical equipment and the supply of electricity including transformers, standby generators, in-house distribution and pump control boards.
- Review and approval of the proposed telemetry system to be operated from the WTP.
- Review and approval of EPANET network model for the City's water supply to the priority areas and rehabilitation and interventions under the DC and water tower based on available detailed design.
- Review the work plan for the implementation of the Works, with special attention to mobilization, the procurement, inspection and testing of material and equipment.
- Recommendations on environmental and social impacts.

The Consultant shall provide 3 hard copies of the final reports will be delivered to the Client together with two complete electronic versions on a CD plus one in the PDF format for possible reproduction to interested parties or the public and one in the MS Word for text and MS Excel for tabular and financial data plus updated aerial photos covering all residential areas. The drawings and maps shall be submitted in electronic format compatible with AutoCAD and ArcGIS and in 3 hard copies A1 size, respectively.

5.4 SUPERVISION – Specific Outputs for both Water Production Works and Water Distribution Works

The Consultant shall be responsible for supervision and overseeing commissioning (with the operator) and hand-over of the two works to FIPAG.

The Specific Outputs of the Consultant on each of the two contracts shall be:

- The Consultant shall submit a quality assurance plan/quality management system for the service consisting of a document, constructed by the project team in accordance with ISO 9001 or similar, meant to ensure the final products are of the utmost quality.
- The convening of an initial meeting with the Contractors and the production of an outline program for the implementation and completion of the schemes. The outline program is required to demonstrate the feasibility of completing the works on time and will not relieve the Contractor of his obligation to prepare and submit a detailed contractual program in terms of the conditions of contract.
- Agendas for the monthly progress meetings to be circulated to all participants no later than 4 days before the scheduled meeting. The agenda should also contain the important points discussed during the supervisor/contractor's weekly meetings, the important issues from the Contractor's monthly report as well as the unresolved issues standing over from the previous monthly meeting.
- Submission of monthly progress reports to FIPAG in a format and with content agreed with FIPAG, no later than the 7th day of the following month.
- The issuance of all certificates for payment to FIPAG including any necessary variation orders, pre- approved by FIPAG. Updated financial summary including forecast cost for completion of the works is required.
- Review and approval of method statement to prepared by the Contractor for the execution of the works.
- The management of any claims arising from the works and the recommendation of the preferred resolution of the claim to FIPAG. This should include a cumulative summary of the financial and time impact of these claims and variations on the contract.

- The issuance of certificates of substantial completion at the start and certificates of completion at the end, of the defect liability period.
- The receipt, checking and handing over of all “as-built” drawings, specifications and certificates of testing relating to the completed works.
- The management and recording of all events that could result in the Contractor’s request for extension of time.
- The completion of hand-over certificates signed by the private operator, FIPAG and the successful bidder.
- The submission of general operation guidelines.

The Consultant shall submit the following reports (3 hard copies plus one electronic copy in an agreed format) during the Supervision stage:

(a) Quality assurance plan

The quality assurance plan (QAP) shall be submitted to FIPAG **2 months** after the commencement of each construction supervision phase and shall include all quality related elements of the contracts to be controlled as well as the clear description of when and how QA shall take place, who should inspect/test, who should review and who should approve each element.

This QA plan shall start with the detail regarding the testing of material and equipment to be provided by their manufacturers (to be attended by one specialist from the supervision team), including their inspection and verification of all specifications against technical requirements. The QAP shall provide for the approval off all material on site, including the correctness of their size, materials and finishes as well as their unloading and storage in accordance with requirements.

The next element is to ensure that all works are done in accordance with specifications, including soil compaction, concrete mix design, slump tests, cube tests, reinforcing, spacing and cover. The quality control should include the submission and approval of shop drawings for both temporary and permanent works.

The final element of the QAP, is the testing of the completed works for elements like pressure resistance, water tightness and functionality. This should include all mechanical, electrical and telemetric works as applicable and all other final inspection and handover requirements.

(b) Monthly Progress Report

A brief, concise report format for monthly progress reports will be prepared by the Consultants and agreed with FIPAG during contract negotiations.

During the construction phase, the progress reports will consist of separate section for each works component (Intake, WTP, pumping station, transmission mains, DCs and network) of the contracts and will reflect Contractor’s monthly payments and provide a means of closely monitoring and forecasting implementation costs and time for completion. The monthly reports shall as a minimum present the progress of the works against the contractual program, environmental management issues, summary of payments, a schedule of claims and potential settlement, cost predictions to the end of the scheme.

A schedule of the work to be performed in the following month, a statement of expenditure both committed and forecast as well as the disbursement position shall also be included.

Monthly reports shall be delivered to FIPAG within **one week** from the end of the month being reported on.

(c) Minutes of meetings

The Consultant shall submit, to FIPAG, the minutes of all applicable meetings **within 7 days** after the event.

(d) Environmental, Social, Hygiene, Health and Safety (ESHS) Reports

During the construction phase a stand-alone monthly ESHS progress report shall be prepared by the Consultant and submitted to FIPAG within one week from the end of each month that is reported on. This report shall be done in accordance with a template that shall be provided by FIPAG to the Consultant and the report shall, at minimum present the status of but not limited to:

- i) Any incident occurred while carrying out the Services. Full details of such incidents shall be provided to the Client within the timeframe agreed with the Client
- ii) Any fatality or serious (lost time) injury;
- iii) Confirmed or likely violation of any law or international agreement;
- iv) Significant adverse effects or damage to private property (e.g. vehicle accident); or
- v) Any allegation of gender-based violence (GBV), sexual exploitation or abuse (SEA), sexual harassment or sexual misbehavior, rape, sexual assault, child abuse or defilement, or other violations involving children,
- vi) Ensure that Contractor immediate notifications on ESHS aspects are shared with the Client immediately;
- vii) Immediately inform and share with the Client any immediate notification related to ESHS incidents provided to the Consultant by the Contractor and as required of the Contractor as part of the ESHS report;
- viii) Share with the Client in a timely manner the Contractor's ESHS metrics, as required of the Contractor as part of the Progress Reports."
- ix) Reports (3 hard copies plus one electronic copy in an agreed format) as follows;
- x) Final reports shall be delivered in CD ROM in addition to the specified number of hard copies;

The Consultant shall consider, for the next report, all inputs and feed-back received from FIPAG and the World Bank.

(e) Inspection Report

The Consultant shall submit the pipes and fittings, pumps and valves, electromechanically and electrical equipment inspection report after assessment of the condition of the material to be used in the work.

The inspection report for each works contract is required. The report shall start with a summary of the works contract, stating all equipment and material that requires and will be inspected and tested, followed by the inspection and testing program. This will be followed with detail of the inspection and testing procedures per item to be inspected and tested. For each item there will be a reference to the required ISO (or similar) standards, the applicable specifications as per the contract, a summary of the applicable ISO (or similar) testing methodology with the required test results values and the acceptable tolerances. (This part of the inspection report shall be prepared and shared with the FIPAG team before departure).

The remainder of the report shall be finalized and submitted **within 7 days** after the teams return. It shall add a description of the actual test procedures followed and the results recorded. The consultant shall then address his findings regarding the procedures and acceptability of the results. In the event

of failed tests, the way forward shall be described. That can include adjustments on site and retest, up to total rejection of the material and equipment.

(f) Training Report

The Consultant shall submit the training of water system operators report for the newly installed equipment. This report shall include the procedures for operation, maintenance and repair of all mechanical, hydraulic and electrical components including controls and instrumentation, training materials, hands-on equipment training, performance of standard operation procedures and classroom equipment training. The date by which this report is required is 10 days prior to completion of works.

(g) Completion Report

A Completion Report shall be prepared by the Consultant and submitted to FIPAG with as-built drawings and EPANET Model, prepared by the implementation Contractor and reviewed and approved by the Consultant. The Completion report shall be delivered to FIPAG within four weeks from the date of Handover of each Contract. The completion report shall include a section on environmental management issues and summarize the environmental issues during construction.

Defects Liability Period

The Consultant shall assist FIPAG during the defect liability period according to the conditions of contract, securing all post-construction activities up to the final acceptance of the works, at the end of the liability period. The performance of the Consultant shall include:

- Supervision of project completion.
- Corrective measures.
- Final testing and inspection.
- Verification of project results.
- Finalization of schedules.
- Preparation of completion certificates.
- Final reporting on project activities including project financial costs.

(h) Final Report

The Final Report shall be prepared following the completion of Defects Liability Period (12 months) for each Contract. It shall include a summary of works and details of the Performance Certificate and the final payment certificate.

6 QUALIFICATIONS AND RESOURCE REQUIREMENTS

6.1 Consultants Qualifications

The Consultant shall be a reputable Civil Engineering Consultancy firm with at least 10 years' experience in water Engineering, including design and supervision of WTP, DC and distribution network based Urban Water Supply Systems. Specific experience in design check is necessary. The Consultant should be fully conversant with World Bank procurement documents, FIDIC Conditions of Contract and construction of projects in developing countries.

The above experience should include: i) experience in surface abstraction systems for urban use (7 years), ii) water treatment process design including rapid/ slow sand filters and iron removal (10 years), iii) transmission mains, distribution centres, network and pumping stations (7 years).

Details of expertise required are presented below. Inclusion of local Consultants in the Consultant team is encouraged.

6.2 Level of Effort

6.2.1 Design Check Services

The Consultant shall propose appropriate full time and part-time staff and time inputs for the assignment but it is anticipated that the following key personnel will be required as well as draughtsman and technicians.

(a) Design Check of rehabilitation and construction of i) intake, WTP, transmission mains, pumping stations and ii) DCs and network

The professional inputs required for the design check of the above work contract is estimated at **17.0 person months** for the Intake, WTP, transmission main and PS and **15.0 person months** for the DCs and Intake, excluding support staff. The minimum requirements for key staff are as detailed below:

Position	Description	Level of Effort (person-month)	
		Intake, WTP, transmission main and PS	DCs and network
Design Team Leader/ Water Supply Specialist	Qualified Civil Engineer, with a total of at least 15 years' experience in the design of Urban Water Supply Systems. This should include at least three design checks and design related to surface based to similar WTP, reservoir and pumping station capacities, diameter size and length transmission mains. At least 5 years' experience developing countries. Should preferable situated full time in Mozambique.		
Civil/ Hydraulic Engineer	Qualified Civil/ Hydraulic Engineer, 15 yrs total experience in design of Urban Water Supply Systems. This should include at least three projects of design of similar size transmission mains including protection against pipe corrosion, water hammer protection devices and other operational and safety fittings such as air valves and wash-outs, design checks and the installation of transmission mains, including experience in hydraulic modeling of transmission mains (EPANET, Hytran or similar software).		
Water Treatment Specialist.	Qualified civil/chemistry engineer with at least 15 years' experience in design or design check of water treatment plants. Three design or design check of similar WTP capacity is required. At least 4 years in developing countries. .		
Electrical Engineer	Qualified Electrical Engineer, 10 years' experience in design and supervision of installation of water pumping systems, at		

Position	Description	Level of Effort (person-month)	
		Intake, WTP, transmission main and PS	DCs and network
	least 3 projects urban water systems, including design check or design of medium and low voltage assignments. At least 5 years' experience of construction in developing countries.		
Electromechanical Engineer	Qualified Mechanical Engineer, 10 years' experience in design and supervision of installation of water pumping systems, at least 3 projects related to urban water systems. At least 5 years' experience of construction in developing countries.		
Instrumentation/ Automation Engineer	Qualified Engineer, 10 years' experience in design of a Telemetry and complimenting control for urban WTP and water pumping systems. At least 3 projects related to surface water based urban water systems in developing countries.		
Civil/ Structural Engineer with geotechnical expertise	Qualified Engineer, 15 years' experience in design of construction of WTP and reservoirs. At least 5 years' experience of design in developing countries.		
Environmental Specialist	Qualified Environmental Engineer, with 10 years appropriate experience, and good knowledge of national environmental legislation and environmental safeguard policies of the World Bank.		
Total		17.0	15.0

All key staff shall be fluent in English and experienced in the management of English based Contracts.

It should be noted that an individual can be offered for more than one position if he/she meets all qualifications and experience and can produce the service within the stated time limit.

6.2.2 Supervision Services

The Consultant shall propose appropriate full time and part-time staff and time inputs for the assignment but it is anticipated that the following key personnel including inputs for Defects Liability Period will be required:

(a) Supervision of rehabilitation and construction of i) intake, WTP, transmission mains, pumping stations and ii) DCs and network

The estimated number of professional staff-months required for the Supervision assignment of the above work contract, excluding supervisors, clerks of works, draughtsman and support staff is **37.0 person months** for the Intake, WTP, transmission main and PS and **35.5 person months** for the DCs and intake, both including the defects liability period.

Position	Description	Level of Effort (person-month)	
		Intake, WTP, transmission main and PS	DCs and network
Resident Engineer (Team Leader)	Qualified Engineer (Civil or Hydraulic), 15 years' experience in design and supervision of water engineering including surface water abstraction. Experience in contract management as well as at least Team leader on three similar WTP, transmission main and pumping station construction contracts is required. At least 5 years' experience of construction in developing countries.		
Hydraulic Engineer	Qualified Civil/ Hydraulic Engineer, 15 years' experience in design and supervision of urban water system including 3 similar transmission mains construction contracts. At least 5 years' experience of construction in developing countries.		
Instrumentation/ Automation Engineer	Qualified Engineer, 10 years' experience in design and supervision of control for urban water pumping systems. At least 3 projects related to groundwater based urban water systems in developing countries.		
Electrical Engineer	Qualified Electrical Engineer, 10 years' experience in design and supervision of installation of water pumping systems. At least 3 projects related to urban water systems. At least 5 years' experience of construction in developing countries.		
Electromechanical Engineer	Qualified Mechanical electro-technical Engineer, 10 years' experience in design and supervision of installation of WTP and water pumping systems. At least 3 projects related to urban water systems. At least 5 years' experience of construction in developing countries.		
Quantity Surveyor /FIDIC Contract Specialist	Qualified Quantity Surveyor/Engineer with 10 years' experience in FIDIC based contract management, claims, VOs and BoQ related work on urban water systems.		
Environmental Control Officer (Full time on Site)	Qualified Environmental engineer, with 5 years' experience, good knowledge of national environmental legislation and environmental safeguard policies of the World Bank, including experience with local legislation.		
Total		37.0	35.5

All key staff shall be fluent in English. The pipeline supervisors shall have a good knowledge of English.

The Resident Engineer and Environmental Control Officer should be full time on site during the construction period. Inputs for Resident Engineer should include one month for supervision of the defect liability period and an additional month on site after site handover to finalize all contractual requirements .

The Consultant shall show clearly and separately in their technical and financial proposals, the inputs proposed for the 12 months Defects Liability Period.

7 OTHER REQUIREMENTS AND CONSIDERATIONS FOR THE SERVICES

7.1 General Reporting Requirements

All documents, correspondence, instructions, communications, etc. Related to the project shall be in English and environmental related submissions translated to Portuguese where required. This principle shall apply to the employer, Consultant, suppliers, Contractors and any other associated party.

All other reports shall first be submitted in draft form for review and comments. Draft reports shall be submitted in English. The final detailed design report should be presented as two A4 size volumes (executive summary and main report) accompanied by separate volumes of appendices together with a set of A1 size drawings.

The Consultant will report formally to FIPAG's Director General Mr Victor Tauacale or his designated representative and liaise informally with the FIPAG's Project and Investments Director and his designated representative and counterpart.

7.2 Special Reports

Additionally, to the above-mentioned reports, the Consultant shall prepare the following special reports:

- Report on quality tests on construction materials and performance tests on installed equipment.
- Reports on witnessing of tests on equipment, performed at factory.
- Advising on the issue of any temporary acceptance certificates.
- Variation order justifications and claims management
- The Consultant shall prepare a detailed work program, broken down to individual tasks and indicating the contributions by all study personnel, that identifies the report milestones in his design program developed, which shall include due dates (both drafts and final) shall be outlined. Any proposed changes to the selected due dates during the course of the work shall be subject to the approval of the FIPAG.
- The timing of key reports, starting from the date of commencement of work, is given in the table 1 below, including fifteen days for client comments on each report.

7.3 Timing and Planned Implementation Schedules

It is anticipated that the Contracts for Design and Supervision will be signed, started and completed as per the dates set out in the Table below:

Description	Design Completed	Supervision/ Works Completion Date
	Design/ Design Check	
Intake, WTP, transmission mains and pumping station	8 months	12 months + 12 months for DLP:
Distribution Centres and network	8 months	12 months + 12 months for DLP:

The duration presented above for the design includes the comments and approvals by FIPAG.

7.4 Payment

7.4.1 Contract Nr FIPAG/DRIVE/ CON-1A/20: Design Check of intake, WTP, transmission mains, pumping stations, DCs and network in Nacala

Payments shall be made on the basis of agreed Lump Sums for each completed milestone of the assignment. The relative milestone payments in proportion to the total sum for the assignment is given below:

Milestone (After Approval by the Client)	Intake, WTP, TM and PS	DCs and network	Total	Period for Submission after Start Date
Advance Payment	10.0%		10.0%	
Inception Report	5%		5.0%	30 days after the Start Date (SD)
Concept Design and Integrity Review Report	5.0%	5.0%	10.0%	45 days after the Start Date (SD)
Preliminary Design Review Report	17.5%	12.5%	30.0%	3 months after start date of Works Contract
Handover of EPANET Hydraulic Model	-	10.0%	10.0%	5 months after the Start Date of Works Contract
Approved Detailed Design Review Report	20.0%	15.0%	40.0%	6 months after the Start Date of Works Contract
Total	50.0%	50%	100,0%	

7.4.2 Contract Nr FIPAG/DRIVE/ CON-1B/19: Supervision of intake, WTP, transmission mains, pumping stations, DCs and network in Nacala

Payment will be based upon a time-based staffing schedule related to the construction Contract duration (this to be submitted as part of the Consultants financial proposal for each works Contract). Variations will be permissible based upon actual circumstances related to the execution of the Contracts with the no objection of FIPAG. Payments will be made following approval of the Consultant's invoices which are to be submitted on a monthly basis.

7.5 DRIVE Application

The project is co-financed with a contribution from the programme DRIVE (Development Related Infrastructure Vehicle), a subsidy facility provided by the Dutch Ministry of Foreign Affairs under the responsibility of the Minister for Foreign Trade and Development Cooperation and implemented by the Netherlands Enterprise Agency (RVO).

The financial contribution from DRIVE is to support the Government of Mozambique and is a contribution towards the costs of the Project. The DRIVE contribution is effectuated in the form of a DRIVE subsidy to the Consultant (successful firm after signing the contract with FIPAG on the implementation of the Project), who will receive disbursements of the subsidy according to the disbursement schedule as agreed by FIPAG, DRIVE and the World Bank based on the Contracts Nr FIPAG/DRIVE/ CON-1A/20 and Nr FIPAG/DRIVE/ CON-1B/19.

The Successful consultant is therefore obliged to submit an application for this DRIVE subsidy to RVO after the evaluation, with the support from FIPAG. The Request for Proposal (incl. DRIVE application forms in Appendix B, - Application Forms) include all requirements that must be met in order to be eligible for DRIVE subsidy.

Before awarding the contract to the successful consultant, FIPAG will send a notification to RVO of the official decision proposing to give the assignment for the Project to the successful consultant. RVO will issue an administrative decision¹ on the application of the successful consultant within 4 weeks after having received the notification. A condition precedent in the administrative decision will be that the successful consultant comes to an agreement with FIPAG on the implementation of the project and that a contract is duly signed by FIPAG and the successful consultant within max. 12 months, after the date of the administrative decision.

After the final disbursement, the total subsidy to the project will be determined in accordance with the DRIVE Audit protocol. RVO reserves the right to claim the (part of) the final payment (and all other advances made during the project) if the audit reveals significant irregularities.

¹ Administrative decision (Subsidy Letter & Execution Agreement) DRIVE: If all DRIVE criteria are met (or can be addressed through conditions precedent), RVO submits an administrative decision (a formal letter) regarding the subsidy to the applicant, which constitutes a formal obligation of RVO towards the applicant to pay for a portion of the project costs, as defined in the contract, on behalf of FIPAG. In addition, RVO enters into an Execution Agreement with the subsidy applicant (signed by RVO and the winner of the tender) that lists the DRIVE conditions, as also referred to in the tender documents.

SERVICES, FACILITIES AND PROPERTY MADE AVAILABLE TO THE CONSULTANT

Design Check and Supervision of rehabilitation and Expansion of Nacala Water Supply System

Contract Nr. FIPAG/DRIVE/CON-1/20

A: Services and facilities made available by the Client for each of the two works contracts:

The Client shall make available free of any charge the services, facilities and property described below. This will be made available through the Works Contracts for the duration of the construction supervision period. Facilities, including transportation, hotel, and equipment, during the design check phase should be the responsibility of the Consultant.

The following facilities shall be provided during the supervision for each of the two works contracts, namely i) intake, WTP, transmission mains, pumping stations contract, and ii) DCs and network contract:

A1 – Site Office for the Engineer during the supervision phase

- A securely lockable Engineer's site office shall be provided in Nacala, including the costs of electricity, water and maintenance, a new functioning color printer/scanner / copy machine, air conditioning, telephone, fax and internet. The site office facilities will also include washing facilities with hot and cold water and hygienic toilet facilities.
- Effective guarding as well as all cleaning and servicing facilities for the office.
- The installation, commissioning and maintenance in use of two telephone lines to serve the Resident Engineer's Office from the public exchange. Three handsets, one at each desk and one at the conference table) shall be provided on one line and a plain paper fax / telephone on the other.
- The Office will be furnished with the following:
 - 2 (two) desks for the offices and 1 (one) meeting table for 8 persons,
 - 2 (two) office arm chairs and 8 (eight) office chairs,
 - 2 (two) lockable filing cabinets, one of them of big size with doors,
 - 1 (one) plan chest,
 - drawing material and office consumables,
 - printer, scanner, copier and internet.
- Photographic equipment (one digital camera with at least 15 Megapixels and a 20x optical zoom

lens will be made available for the duration of the Contract for the sole use of the Engineer or his staff when requested by the Engineer.

- The Contractor shall, when required by Employer or Engineer, supply labour and necessary measuring aids such as leveling instruments, theodolite for assisting the Engineer in various tasks such as measuring, leveling and setting out.

B: Services and facilities that the Consultant shall provide for in his financial proposal:

B1- Vehicles for the Engineer during the supervision phase

The Consultant shall make provision in his financial proposal for each of the two works contracts to purchase, operate and maintain at least 2 (two) 4x4 vehicles of which one is recommended to be a double cab. The provision for operating expenses shall include fuel, the yearly license and comprehensively insured for full replacement value and maintenance for the whole of the contract period. The vehicles shall be for the exclusive use of the Engineer and his staff during the contract period and shall be supplied with FIPAG's and the Consultant's logos.

B2 - Accommodation for the Engineer during the supervision phase

The Consultant shall include in his financial proposal for the rent / hire of suitable furnished accommodation for the Supervision Team Leader and his staff from the commencement and throughout the execution of the Construction Works. Provision for electricity and water services, including monthly consumption shall be made, as well as for effective security guarding and cleaning services.

B3 – Services and Facilities during Design Check Phase

No facilities, hotels, cars, equipment, etc. will be provided to the Consultant during the design check phase. The cost of need facilities and others should be part of the Consultant proposal.