POLLUTION MANAGEMENT PLAN

Hybrid Wastewater Treatment System in Juba City

Project No SSUWC/0001/2023

South Sudan Urban Water Corporation

Republic of South Sudan

South Sudan Urban Water Corporation

FINAL

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Abbreviations and Acronyms

AfDB	African Development Bank
BOD	Biological Oxygen Demand
C&D	Construction and Demolition
CMP	Contractor Management Plan
CO	Complaint Owner
COD	Chemical Oxygen Demand
CPA	Comprehensive Peace Agreement
DPR	Detail Project Report
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
ESMP	Environmental and Social Management Plan
ERM	Environmental Resources Management
ERP	Emergency Preparedness and Response Plan
ESIA	Environment and Social Impact Assessment
E&S	Environment and Social
ESAP	Environmental and Social Action Plan
ESDD	Environment and Social Due Diligence
FC	Fecal Count
FS	Fecal Sludge
FSTP	Fecal sludge treatment Plant
GBV	Gender based Violence
GoSS	Government of South Sudan
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
HSE	Health safety and environment
IFC	International finance corporation
JCC	Juba City Council
OS	Operation standard
PAP	Project Affected Person
PS	Performance standard
LS	Lifting station
LMP	Labour Management Plan
MLD	Million Liter per day

MOEF	Ministry of Environment and Forestry
MLHUD	Ministry of Land, Housing and Urban Development
MWRI	Ministry of Water Resources and Irrigation
MPS	Main pumping station
NOS	No objection Certificate
OHS	Occupational Health and safety
O&M	Operation and Maintenance
PAP	Project affected Person
PMP	Pollution Management Plan
PPP	Public Private Partnership
RAP	Resettlement Action Plan
QHSE	Quality, Health, Safety and Environment
ROW	Right of way
SBR	Sequential Batch Reactor
SEP	Stakeholder Engagement Plan
SOP	Standard Operating Procedure
SR	Safeguarding requirements
SS	Suspended solids
STP	Sewerage Treatment Plant
SSUWC	South Sudan Urban Water Corporation
WWTP	Wastewater Treatment Plant
TSS	Total Suspended Solids

1. INTRODUCTION

1.1 Hybrid Wastewater Project in Juba - Conceptualization and Context

In April 2023, South Sudan Urban Water Corporation (SSUWC) and the main Consultant, NIRAS A/S (Denmark), entered into a Consultant's Services Contract for the "Feasibility Studies and Preliminary Engineering Design of a Hybrid Wastewater Management System in Juba City'' with the support of Swedfund International AB. The objective of the Feasibility Study and the Preliminary Engineering Design was to develop a 'bankable' integrated (hybrid) wastewater management project(s), comprising both sewerage (water-borne sanitation) infrastructure and fecal sludge (FS) management systems. This should include both pumpable and non-pumpable FS from septic tanks, lined and unlined pit latrines.

The activities for project preparation has included, among others: (i) Conducting feasibility studies and developing alternatives and proposed solutions for identified wastewater problems; (ii) Defining appropriate locations for one or more wastewater treatment plants (WWTP); Carrying out preliminary engineering design of the selected option; assessing the environmental and social impact; preparing a Stakeholder Engagement Plan (SEP); and as well preparing a **Pollution Management Plan (PMP)**.

1.2 ESIA Study, including SEP and PMP – Purpose and process

An Environmental and Social Safeguards Consultant team was mobilised to carry out on-site field work which has continued up to end of April 2024 and to prepare an Environmental and Social Impact Assessment (ESIA), Stakeholder Engagement Plan (SEP) and Pollution Management Plan (PMP) for the proposed integrated wastewater system in Juba city. The objective of the ESIA study is to evaluate the environmental and social impacts of the proposed project, including mitigation and management measures in line with the national laws and regulations as well as the requirements laid out in the Integrated Safeguards System (ISS) of the African Development Bank to facilitate preparation of the Project.

1.2.1 Specific Purpose of Pollution Management Plan

The PMP is a comprehensive strategy and plan developed to identify, assess, and control pollution in order to minimize environmental impacts and includes a set of measures and actions aimed at preventing, mitigating, or managing pollution in various forms, such as air, water, soil, and noise pollution from the project. In preparing the PMP consultation has been conducted widely with all stakeholders identified.

1.3 Introduction to PMP – overall considerations

This Pollution Management Plan (PMP) has been developed to document the processes required to prepare for and respond to pollution incidents and ensure that hazards to the environment, human health and safety are minimized, if not eliminated. The full proposed wastewater system is considered, i.e. the Rokwe (Roton) Wastewater Treatment Plant (WWTP), sewage pipeline system and pumping stations – and in principle all project phases 1, 2 and 3 leading up to 2041, but refinement and consolidation in the PMP may be required when the Project matures and changes during progression and further development.

At the onset, Project construction activities all have the potential to generate a range of pollution sources/impacts and hence require proper planning and monitoring from the outset to avoid activities resulting in negative impacts to human, biological or other environmental receptors. These includes accidental emissions to air, water and soil amongst others. The project and this PMP specifically seek to proactively manage such potential pollution sources and to this effect has included specific

obligations regarding pollution prevention.

Subsequently, the project operations (and also a potential decommission) have the potential to generate a range of pollution risk and actual incidents. All major risks must be identified and mitigation or elimination of risks pursued, and plans as well need to be in place for handling eventual actual pollution incidents.

This PMP has been prepared in accordance with the environment and social requirements of South Sudan (legislation, policies, regulations etc.) and AfDB safeguard requirements (most recently updated in 2023). [1]

1.4 Outline, contents and Scope of the Pollution Management Plan

The potential pollutants that could arise from the Project interventions – as per feasibility study and preliminary design conducted in 2023 and 2024 – requires careful management to avoid negative impacts on human health, and environmental factors such as groundwater, soils, surface water and ecology. This PMP therefore:

- Outlines the key policies, legislation and standards relating to wastewater management;
- Defines roles and responsibilities;
- Outlines actions and measures necessary for the effective prevention of pollution;
- Covers both accidental and intended emissions to air, noise, water and soils;
- Details specific control measures to be implemented by and its contractors (and subcontractors), to achieve this;
- Incorporates the requirements of the ESIA findings, Supplemental Environmental Assessment, international standards, South Sudan legislation, Lenders requirements and Project-specific construction permits; and,
- Considers approach and plans for the WWTP and other elements of the wastewater system planned in the Project on pollution prevention procedures and methodologies.

1.4.1 Scope of the Pollution Management Plan

This Pollution Management Plan (PMP) applies to all Rokwe WWTP Staff, operators, contractors and subcontractors and others engaged in the hybrid wastewater system (as per Project outline). While the PMP will act as a framework to determine what all engaged stakeholders are expected to adhere and refer in regard to both plans and actual activities, any contractor will further be required to ensure all the PMP requirements are adopted within their own management plans. Information about roles and responsibilities is provided in subsequent section(s) of this PMP.

2. PROJECT DESCRIPTION

2.1 Project Outline – Intro Overview

The project is a hybrid wastewater treatment plant (WWTP) designed for 15 years period but with the anticipation of implementing it in phases, i.e. in three sub-phases. The sewage treatment plant is conceptually designed to handle sewage flow of 38,000 m^3/day, while the faecal sludge plant is sized to treat 320 m^3/day. The treatment site chosen is the existing Rokwe (Roton) WWTP which will be expanded and upgraded from the (presently only) fecal sludge treatment to a hybrid treatment system for both actual piped wastewater and increased amounts of fecal sludge. There were however 4 options considered at Rokwe for the more detailed preliminary design of the upgraded WWTP. For further details please refer to final Feasibility Study Report, December 2023, and final Preliminary Engineering Design Report, April 2024.

[1] https://www.afdb.org/en/documents/african-development-bank-groups-integrated-safeguards-system-2023

2.2 Existing wastewater (fecal sludge) system

The current WWTP for fecal sludge (FS) treatment includes an inlet chamber, channel, anaerobic pond and facultative pond. The treatment plant, which is also known as Rokwe (Roton) Wastewater Lagoon, is located approximately eight kilometres away from central Juba town in Nyaying Village, North Juba.

Figure 1: Existing Faecal Sludge treatment plant at Rokwe (Roton)

The two main ponds are reportedly 4 m (anaerobic) and 3 m (facultative) deep, respectively, and are as per observations currently full of sludge. The last known wastewater effluent analysis (prior to the ESIA study for the new proposed Project) was conducted in 2015. The 2015 analysis, among others concluded that the effluent had very high and problematic levels of COD and BOD, and the 2024 ascertains that the discharge does NOT meet standards in regard to parameters such as TDS, phosphates, Colour and COD. These results clearly point to a detrimental and insufficient treatment process currently in operation.

There is no final disposal or recycling/reuse of treated FS (solid waste) at Rokwe at present.

Figure 2: Existing Anaerobic Pond at Rokwe (Roton)

Figure 3: Existing effluent from the facultative pond

Major issues and constraints: While the Rokwe WWTP operates at present within its capacity (in principle), it does not produce the quality of effluent that would be expected as it is not at present a properly maintained and operated facility. A short-circuiting of the influent wastewater is obvious and consequently limited blending is done with the lagoon wastewater, but rather large quantities flow out almost untreated. It is also evident that one of the causes for the short circuiting is the accumulation of sludge which has an adverse effect on performance both in the anaerobic and especially in the facultative ponds. This means that the current lagoon system operation state is of primary concern. In fact, the situation is becoming worse with time - the desludging of the ponds until a new one is constructed is therefore a crucial step that need to be taken to improve the effectiveness of the system.

2.3 Further consideration and overview of Project Phases

Sub-phase 1 of the project: The preliminary engineering design for the FS treatment is prepared until the design Year 2041. It includes the layout of the treatment plant facility after conducting topographical survey of the area, a preliminary design for a receiving tank, the design and sizing of the multi-disc screw presses, including concrete plinths for screw press placement, the design and sizing of feed pumps, design of buffer tanks, the design of waste stabilization ponds, including the rehabilitation of the existing ponds, and the design of the auxiliary buildings.

Sub-phase 2 of the project: The preliminary design of the sewage management system is designed for the design Year 2036. It includes the sewage network system and the sewage treatment plant. The preliminary design includes the topographical survey of the sewer routes, the hydraulic analysis and sizing of the sewer pipes, the preparation of the sewer network layout as well as presenting the layout and profile for the trunk/transmission main from the pumping station to the sewage treatment plant. It also includes sizing of pumps and the preliminary design of the pumping stations. In regards to the Sewage Treatment Plant, the Consultant has calculated the sizing, preparation of the layout and of the preliminary engineering design and structural analysis of all the components of the sewage treatment plan, which include screening, preliminary and secondary clarification units, trickling filter and disinfection and sludge stabilization units.

Sub-phase 3 of the project: The preliminary engineering design work carried out and the remaining tasks required to bring it to realization during Sub-phase 3 are like those outlined in Sub-phase 2 above, with the only distinction being the timing of their implementation.

Establishment of a Project Management Unit (PMU): Further to above more technical aspects, the project entails as a key planning aspect/proposal that a PMU be established in SSUWC to fulfil the

administration, management and supervisory responsibilities of the project at the time of implementation. This will, among others, require the assignment or recruitment of professionals. The PMU will have the responsibility of implementing the project in compliance with the procurement, financial management and safeguards procedures of the African Development Bank (AfDB).

This document, i.e. the PMP, takes notes of all above plans and considerations. They are further considered in regard to assessment and planning, among others for the assessment of risks, and also for outline of the PMP where it indeed is a fundamental assumption that a PMU be established and increased capacity be secured for operation and monitoring (for among others pollution and environmental concerns).

2.4 Project Facility Location

The project is located in Roton, Luri Block, Juba County, Central Equatoria State It's within the existing facility at coordinates 4°54'00" N 31°36'16" E. The land already acquired by the government. The available area is 200,000 m^2 or 20 Ha. There is furthermore (presumably) an additional land area available for expansion around the existing Rokwe treatment plant. It's at an elevation of 461m above sea level and it's located where there is no much settlements except some few inhabitants that went to settle near the facility. It's 500 meters away from any designated (and observed) wetlands, and further away from Roton Lake - and importantly to note, the effluent outflow does not directly lead to the wetland or the lake, but rather downhill and ultimately into the White Nile. The site has a slight slope of 6% to the east toward a small stream where the current wastewater from the treatment plant is flowing into (which leads to the White Nile).

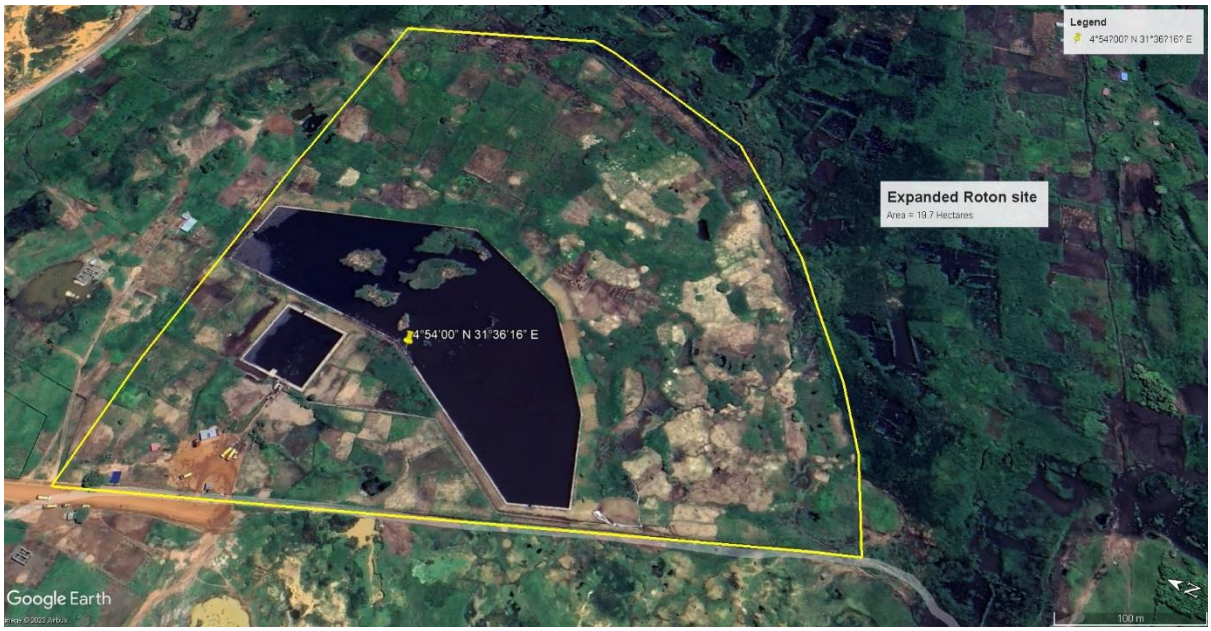


Figure 4: Project map (the full designated site of the wastewater treatment facility at Rokwe)

2.5 Outline of Sewer System and Pumping Stations

The chosen option for sewerage network involves pumping all the sewage via two pumping stations to the WWTP. The first pumping station will pump the wastewater within its gravity catchment to the second pumping station and the second pumping station will convey all the sewage within its own gravity catchment area and sewage from the first pumping station to the WWTP. Please see figure below for location of the pumping stations and layout of the piped sewage system.

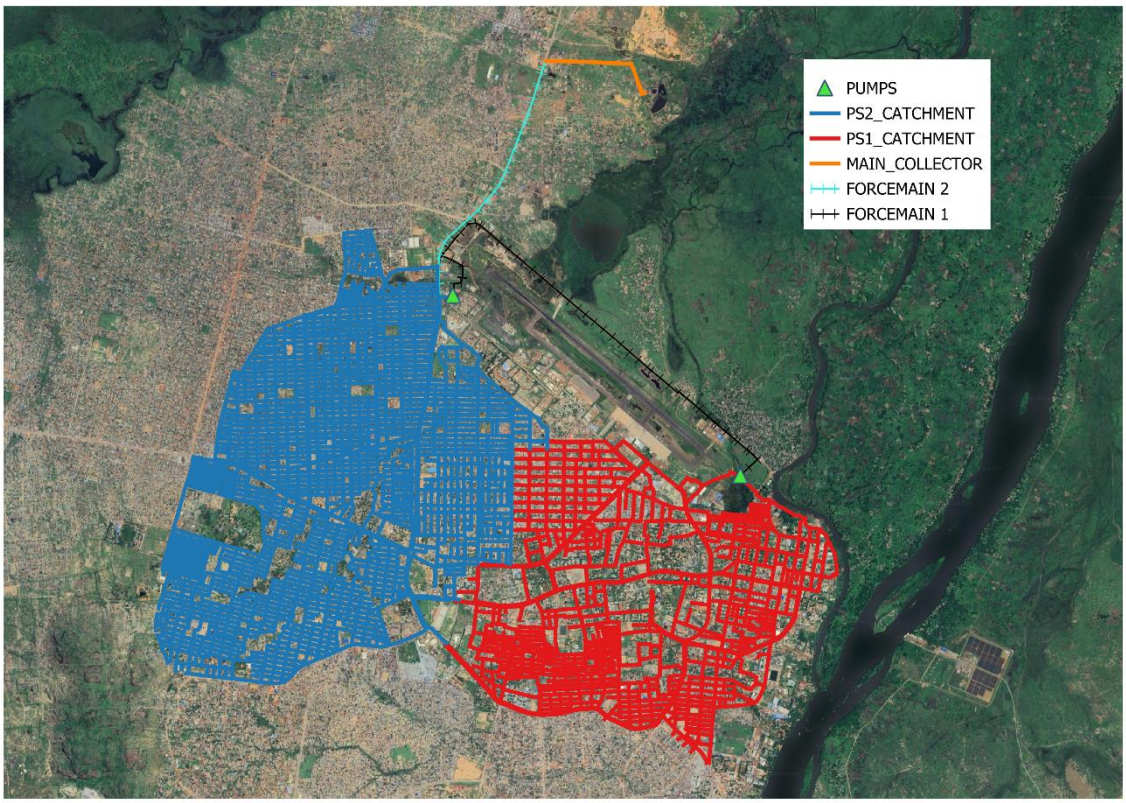


Figure 5: Sewerage Network Design

2.6 Project Components

The design as well as a design period for sizing the septage and wastewater treatment plants and deciding the number of collection and transportation equipment is assumed to be 15 years up to Year 2041. The construction of the units is expected to be phased. While designing the sewer system, flow for the Year 2051 was checked to see if it is economical to either use one large diameter pipe suitable for the final planning horizon 2051, or multiple smaller diameter pipes installed at various intermediate planning horizon/s say 2041.

The Sewage Treatment Plant shall include the following unit operations, including all inter-connecting pipework, valving, instrumentation, and necessary control system:

- Inlet pump station
- Coarse screening
- Fine Screens
- Grit removal
- Primary sedimentation tanks, incl. scraper bridge, scum boards, effluent weirs
- Trickling filters including filter material and associated recirculation pump station.
- Secondary settling tanks and sludge return pump station, incl. scum collection and transport to inlet works.
- Sludge dewatering, incl. polymer system
- Anaerobic tank for co- stabilization of sludge from primary and secondary sedimentation tank incl. mixing units , gas collector and gas flare
- Sludge disposal area, incl. screening and grit storage,
- UV Disinfection

Faecal Sludge System Design Scope: The Faecal Sludge System shall include the following unit operations, including all inter-connecting pipework, valving, and instrumentation:

- Volume Control System (Weight/flow)
- Inlet structure
- Coarse Screening
- Fine Screening
- FS Dewatering units (Option)
- Anaerobic Ponds
- Facultative Ponds
- Maturation Ponds
- Effluent Station

Auxiliary Components: Combined for the two treatment lines are the following elements:

- Buildings and associated mechanical and electrical equipment, including building for power supply, incl. associate electrical switchboards and control system, incl. associate electrical switchboards and Motor Control Panels.
- Building for Sludge dewatering and Mechanical and electrical workshop, incl. maintenance equipment.
- Storage area for dewatered and stabilized sludge .
- Administration and Operations building, incl. SCADA system,
- Staff service building,
- Laboratory and associated equipment.

2.7 Establishment of design criteria for treatment and final safe disposal/reuse

The effluent quality is based on the water body into which the effluent will be discharged. As South Sudan does not have a valid discharge criterion, in this design, it is proposed to adopt effluent standards as the East African standards shown below.

Table 1: Effluent Standard for Discharging to the environment

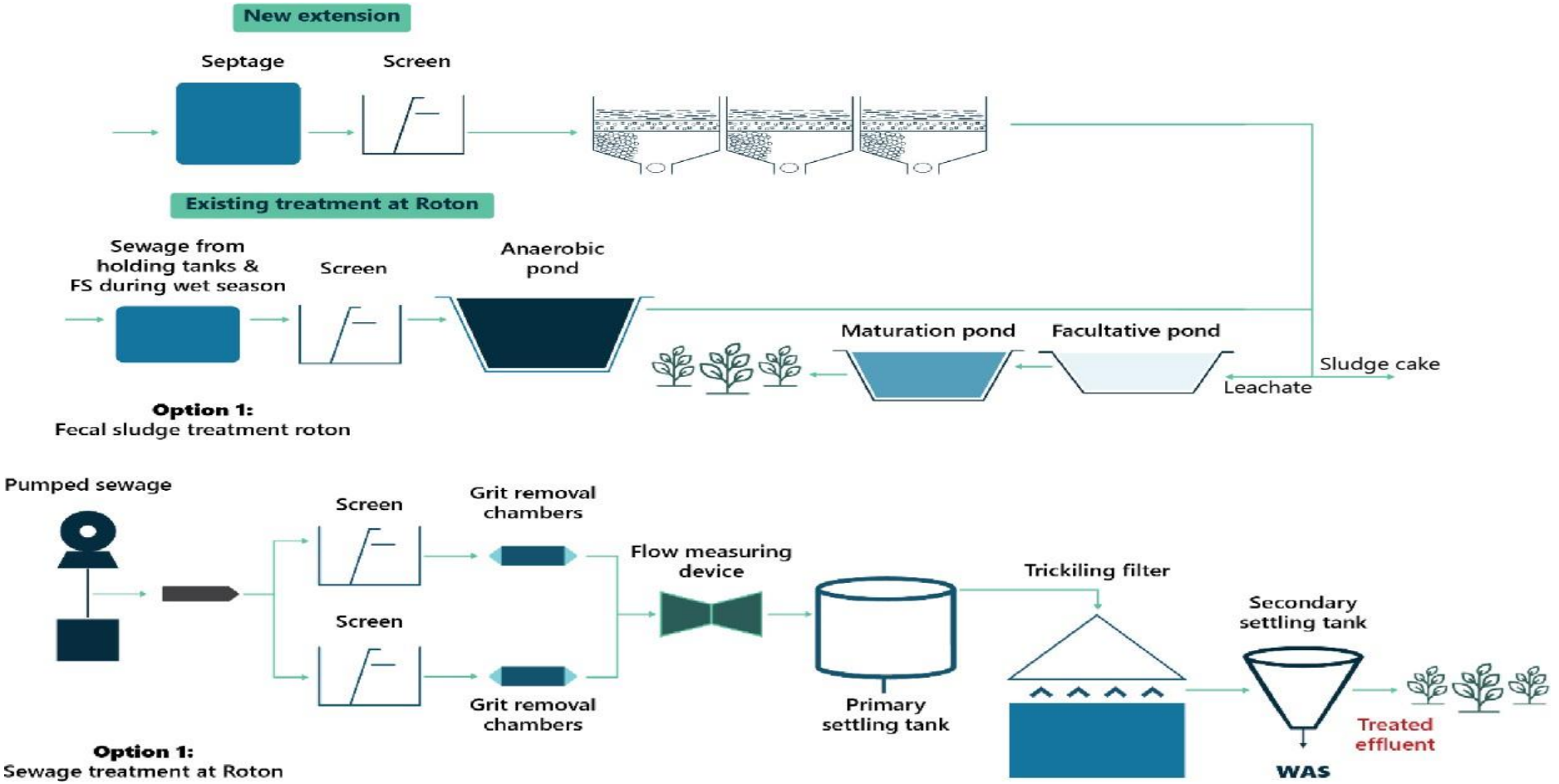
Parameter	Unit	Allowable limits for Pollutant Substance
pH	`	6.5 – 8.5
Biological Oxygen Demand BOD5 (5 days at 20 C)	mg/L	< 30
Chemical Oxygen Demand COD	mg/L	< 50
Total Suspended Solids	mg/L	< 30
Total Dissolved Solids	mg/L	< 1200
Ammonia (NH4) + Nitrate (NO3) + Nitrite N02	mg/L	< 100
Max E. Coli	mg/L	Nil/100
Total Coliform	mg/L	1000/100

Source: NEMA, Kenya Gazette supplement No 68 - Sixth Schedule

2.8 Proposed Faecal Sludge and Wastewater Treatment (as per chosen Option for Project)

The option chosen involves treatment of both sewage and faecal sludge at Rokwe (Roton) site using drying bed for FS and Trickling filter for Sewage as shown in the flow diagram below. Rokwe's rehabilitated and modified treatment plant will be used to treat faecal sludge along with drying beds and ponds for treating leachates. Trickling filters will be used to treat sewage that isconveyed by sewers and from hotel holding tanks.

Figure 6*:* Treatment plant Option 1 (chosen option for preliminary design)



2.9 Main Project Activities

The activities for the Project can be divided into two (2) stages/phases, namely: a) Construction; and b) Operations and maintenance. The key project activities and associated aspects with direct relevance for pollution and environmental aspects during these stages of the Project are summarized below.

Construction Phase:

The construction activity will involve construction of anaerobic pond, trickling filter facility and laying of gravity sewer line and raising main and construction Treatment Facility. The construction work will include excavation, pilling, backfilling etc. Construction work shall also encompass desilting of the existing gravity sewer lines. replacement and installation of pumps along with electrical works (i.e. wiring, cable dressing, installation of electrical panels etc.) shall also be carried out during construction phase. The length, diameter, and depth and the of the gravity pipes and the number of manholes for the first stage shall be done. Laying of gravity pipes and the number of manholes shall be done for the second project Phase.

Operation and Maintenance Phase:

During Operation and Maintenance the sewage water from Rokwe treated at the new WWTP will follow AfDB prescribed standards. Biogas and sludge will be generated from the treatment of sewerage water. Biogas will be utilised in the bio-gas plant for power generation whereas the dry sludge cakes can be utilised for composting after dewatering of the sludge, though this aspect has not been considered in scope of work for Operation & Maintenance (O&M) contractor as per Concession Agreement. The treated water will comply with effluent discharge standards set by AfDB and East African standards shall be discharged into a water system (stream) leading to the White Nile 2-3 km downslope from the treatment plant.

Sludge handling for pond system:

The pond systems are not producing any regular sludge to be removed. Sludge are basically almost completely digested in the ponds and only after interval of years it needs to be removed. No sludge handling system are foreseen in this solution.

Sludge handling for trickling filter:

The total sludge production from the Trickling filter system are estimated to 8,914 kg TSS/day (say 9,000 kg TSS/day) with a DS% of 1.0%. The following proposal are made for handling of sludge: Pre-dewatering of sludge: Digestion of Sludge Dewatering of sludge and Disposal of sludge.

When sludge are digested mesophilic in a digester, the sludge are hygienized and can be applied as agricultural fertilizer if it does not contain hazardous components (heavy metals etc.).It is recommended that there are made a quality test of FS that can reveal if the digested sludge can be used as a fertilizer.

Biogas/energy potential:

- Biogas production rate = 0.4 m3 biogas/kgTS: = 3,600 m^3/day
- Methane: = 65 %
- Heating value of biogas: = 22,400 kJ/m3Total energy yield: = 80,640 MJ/day
- Potential CHP electric power: = 300 kW

2.10 Pollution Source and Planned Control Measures – as per Design

Air Emissions: Construction activities will generate emission of fugitive dust caused by construction material handling, on-site excavation and movement of earth materials, contact of construction machinery with bare soil, and exposure of bare soil and soil piles to wind. Biogas will be generated

during the operation phase which may partially require to be flared under certain circumstances resulting in flare combustion products. In addition, WWTP of the proposed configuration are expected to emit Bio-aerosols (which may include microorganisms such as viruses, pathogenic bacteria, and fungi) during operations phase and may pose a health risk to WWTP workers and neighbouring communities. The Control Measures include;

- Sprinkler systems/water bowsers will be used to suppress the fugitive dust emission during construction phase.
- Biogas-scrubber(s) will be used to remove the hydrogen sulphide (H_2S) traces present in the biogas generated during anaerobic digestion process.
- Appropriate flaring system should be installed to ensure efficient combustion of Bio-gas through flaring burners
- The quantification of health risks from bio-aerosols is difficult to predict and can be better characterised through monitoring (in terms of colony-forming units per unit volume of air (CFU/m^3)) when the WWTP commences operations.

Noise Generation*:* During construction activities, noise and vibration will be caused by the operation of pile drivers, earthmoving and excavation equipment, concrete mixers, cranes and the transportation vehicle. During operations phase, noise will be generated from high noise equipment and machineries like hydraulic pumps, mixing pit pump, digestor loading pump, HGV movement, material tipping, air blower and compressor. The Control Measures include;

- No construction activity will be done during night time to maintain ambient noise quality.
- Provision for noise enclosures or barriers for high noise machineries, equipment.

Wastewater Discharge*:* During Construction Phase, no liquid discharge has been envisaged for the proposed WWTP. During the operations phase, the WWTP will be treating sewage water and discharged into the Drainage Channel so that it doesn't cause significant adverse impact to the environment or surrounding community – in fact by discharging treated waste water, the WWTP is expected to result in a minor improvement of the existing water quality of the receiving surface water stream (and the Drainage Channel, and ultimately the White Nile). The treated sewage water from the proposed Trickling filter operation will be discharged into the Drainage Channel maintaining the stipulated regulatory limits set for WWTP operation under Environment (Protection) Bill 2013 by Ministry of Environment and Forestry.

Solid Waste Generation*:* Solid wastes will be generated during construction phase activities i.e. packaging materials, cement bags, ready mix concrete discards, excavated materials, empty barrels etc.

During operation phase, periodic maintenance of the sewer line will generate de-silted sludge. De-watered sludge will be generated due to treatment of sewage water.

All non-hazardous solid wastes generated will be stored temporarily at respective location and then disposed to designated landfill sites assigned by Juba City Council(JCC) Authorities. The Control Measures include;

- Contract with SSUWC approved vendor for disposal of hazardous waste;
- Disposal of solid waste through municipal waste collection trucks;

- Dry sludge will be disposed to landfill site as designated by the Juba City Council within a radius of 10 km from the relevant Site

Hazardous Waste*:* activities may result in the potential for generation of small quantities of petroleum-based wastes, such as used oil including lubricants, hydraulic fluids, or fuels during their storage, transfer, or use in equipment. Quantity of the used oil generation due to periodic maintenance of the equipment during the WWTP operational phase will be estimated at a later stage after equipment finalization. The Control Measures include:

- Making arrangement for proper segregation, storage and disposal of such wastes;
- Providing adequate secondary containment for fuel storage tanks and for the temporary storage of other fluids such as lubricating oils and hydraulic fluids;
- Using impervious surfaces for refueling areas and other fluid transfer areas;
- Providing portable spill containment and clean-up equipment on site and training in the equipment deployment; and
- Training workers on the correct transfer and handling of fuels and chemicals and the response to spills.

3. POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK (RELEVANT FOR PMP)

South Sudan has several policies, legal and administrative structures that govern relevant activities in context of the proposed Project. The current fundamental policy framework is the Interim Constitution of South Sudan. Most fundamentally, it stipulates that every person have a right to Health, Safety and Clean Environment.

Since the signing of the Comprehensive Peace Agreement (CPA), policies and legislation developed under the Government of Sudan in Khartoum have gradually been replaced and renewed by the Government of Southern Sudan and now by the Republic of South Sudan. However, various policies and legislation are still in the final consultation and approval phase, and hence have draft status. Currently, de facto procedures, standards and enforcement of environment regulations follows the procedures of respective development partners. There are key legislations that play a role in regulating pollution and prevention of the environment, the most essential laws and regulatory framework relevant to this PMP are provided below

3.1 National Legislation, Plans, Regulations and Permits

This Project, and hence this PMP, is subject to South Sudan legislation and the AfDB Operation Standards. The specific regulations for the PMP include:

National occupation, safety and health policy, 2022: Section 4.2 on Hazard Classification and Categorization calls for Protection, Prevention and Control Mechanisms Risk Protection and Prevention Risk Preventive and Control Mechanisms. The risk prevention mechanisms include:

- Engineering Controls (Personal Protective Equipment (PPE)), Administrative Controls. Control Systems to track Hazard Correction, Preventive Maintenance systems and Emergency Preparation systems. The NOSH policy and regulations shall focus on all the Control Mechanisms where applicable. This is in relation to protection of workers on site.

Draft Environmental Protection & Management Bill, 2013: Although this bill is at draft stage, Section 75 regarding Offenses relating to Pollution states that;

1. Any person who discharges any pollutant into the Environment contrary to the provisions of this bill, commits an offense and shall on conviction, be liable to fine of a not less than five thousand (5,000 SSP) South Sudanese Pounds and not more than One Million (1,000,000 SSP) South Sudanese Pounds or to imprisonment for a term not exceeding twelve (12) months or both.
2. In addition to any sentence that the court may impose upon a polluter an Environmental Restoration Order may also be ordered.

For Effluent discharge standards, the effluent quality is based on the water body into which the effluent will be discharged. Currently, South Sudan does not have a valid discharge criterion, However it is proposed that it will adopt the NEMA effluent standards as the East African standards.[2]

National Adaptation Programme of Actions (NAPA), 2016: Republic of South Sudan's National Adaptation Programme of Actions (NAPA) to Climate Change is a cross-cutting national policy with the overarching objective to communicate to the international community priority activities that will address South Sudan's urgent and immediate needs for adapting to the adverse impacts of climate change. South Sudan's NAPA specifies 5 priority activities (referred to as Priority Adaptation Projects), namely: i) Environment; ii) Water Resources; iii) Agriculture; iv) Disaster Risk Reduction; and v) Policy and Institutional Framework. Regarding governance, the Ministry of Environment is the responsible authority for implementation of the NAPA framework.

3.2 African Development Bank (AfDB) Safeguard Policies

All projects funded by AfDB must follow their environmental and social safeguards. AfDB updated their Integrated Safeguards Statement in 2023 which now lists 10 Operational Safeguards (OS) relating to the identification and assessment of E&S risks and impacts. By following these OS, it is possible to minimize, mitigate and avoid adverse impacts on people and the environment. from unintentional harm, as well as sustainably reducing poverty and increasing prosperity for the benefit of the environment and communities. The key AfDB OS in context of the PMP are listed in the table below along with a description of their applicability to the project, most especially OS3 (please see below).

Table 2: AfDB's Operational Safeguards (with most relevance for the PMP)

Operational safeguards	Rationale
OS1: Assessment and Management of Environmental and Social Risks and Impacts	This safeguard governs the environmental and social assessment process which sets out responsibilities for assessing, managing, and monitoring E&S risks and impacts, and provides an opportunity for stakeholder engagement, as well as considerations to how impacts can be mitigated. Measures shall also be in place so vulnerable people are not impacted disproportionally.

[2] The effluent standards adopted for East Africa (Kenya) are in Annex of this PMP

	The potential environmental (and social risks) are described and mitigated through the ESIA and PMP for the Project.
OS3: Resource Efficiency and Pollution Prevention and Management	*This safeguard covers the impacts of pollution, waste, and resource efficiency. Pollution, emissions and generation of waste will be minimized. There will be prevention and control measures consistent with national legislation and standards, applicable international conventions, and internationally recognized standards and good practice.* *The water quality will be monitored and a Pollution Management Plan will be developed for the WWTP. The contractor during construction will also be responsible for having a waste management plan in place.*
OS4: Community Health, Safety and Security	OS4 ensures that project affected communities' health, safety, and security risks to and impacts are considered. This includes risks related to traffic, road safety, diseases, influx of workers, exposure to hazardous materials, and how communities shall respond to emergencies.
OS6: Habitat and Biodiversity Conservation and Sustainable Management of Living Natural Resources	This safeguard aims to conserve biological diversity and promote the sustainable use of natural resources. It also translates the commitments in the Bank's policy on integrated water resources management into operational requirements. The project is not expected to pose any danger to the conservation of biodiversity and sustainable management of living resources. The upgraded WWTP will treat the water before discharge which will improve the water quality (The project is also implementing this PMP to avoid any contamination).

The most essential Operational Safeguards (OS) in relation to the PMP is OS3. Among others, it specifies that throughout the different phases of the project's life cycle, i.e. planning and design, construction, commissioning, operations, and decommissioning, the Borrower is required to assess and evaluate resource-efficiency and pollution-prevention techniques and implement them, taking into consideration their technical and financial feasibility and cost-effectiveness.

Further, the Borrower shall avoid the release of pollutants or, when avoidance is not feasible, minimize and control the concentration and mass flow of their release using the performance levels and measures specified in national law or the EHSGs, whichever is most stringent. This applies to the release of pollutants to air, water, and land due to routine, non-routine, and accidental circumstances, and with the potential for local, regional, and transboundary impacts. Its therefore prudent that control measures are in place for pollution prevention from the WWTP.

3.3 Multilateral Environmental Agreements/Treaties

United Nations Framework Convention on Climate Change (UNDCCC): The Paris agreement is a legally binding international treaty on climate change within the United Nations Framework

Convention on Climate Change[3]. The treaty deals with greenhouse gas emissions, mitigation and adaptation. The Rokwe WWTP will emit Methane from the treatment processes which is a main pollutant and Carbon emissions from the pumping stations and generators etc. This will however be mitigated in the PMP.

South Sudan Initial National communication: Article 12.5 of the UNFCCC states that Parties that are LDCs, such as South Sudan, may make their initial communication/commitment at their discretion. This communication represents the commitment of the Government and its people to address global warming and climate change, along with the strong belief that all countries must make an effort to greatly reduce greenhouse gas (GHG) emissions in order to avoid the dangerous and potentially catastrophic impacts of climate change. The PMP covers mitigation of GHGs and the contractor of the WWTP, supervised by SSUWC, will be able to mitigate impacts of pollutants from the WWTP.

3.4 Institutional Framework

The Ministry of Water Resource and Irrigation, Water, Sanitation & Hygiene (WASH) Sector Strategic Framework that was prepared in August 2011 proposed that Urban Water Corporation (UWC) be mandated to manage urban sanitation (including sewerage systems as well).

Currently four ministries at national level – Ministry of Water Resources and Irrigation (MWRI), Ministry of Land, Housing and Urban Development (MLHUP), and Ministry of Health (MoH), Ministry of Environment and Forestry, and the City Council/County (Local Government), two at Central Equatoria State level, Juba County and Juba City Council – have a role in Juba urban sanitation. South Sudan Urban Water Corporation (SSUWC) is indirectly involved.

The Ministry of Water Resources and Irrigation (MWRI) was formed with the mandates for safeguarding and conserving fresh water systems; carrying out and supervising hydrological studies, flood control works, irrigation and hydropower developments and water storage facilities.

The organization scheme for the ministry is provided in the figure below. Southern Sudan Urban Water Corporation (SSUWC) is administrated directly under the Minister.

South Sudan Urban Water Corporation: South Sudan Urban Water Corporation (SSUWC) established by a Decree in 2007 and by Presidential Order Act in 2011, is mandated for the production of safe drinking water and capable distribution network and sale, to any customer according to the agreements, contracts, tariffs and the conditions of supply. The Corporation is headed by a Managing Director and has a Board of Directors which is chaired by the Minister of Water Resources and Irrigation. The main function of the SSUWC is production.

[3] The international Paris Agreement was ratified on 23rd February 2021

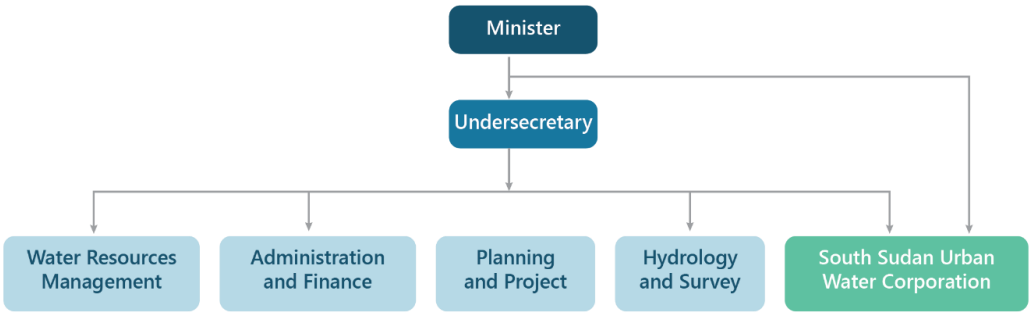


Figure 7: Organization Chart of MoWRI

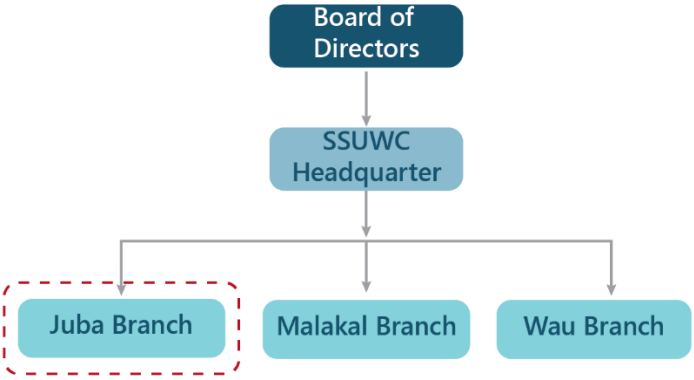


Figure 8: Organization chart of SSUWC showing the Juba Station

Operating under MWRI, the South Sudan Urban Water Corporation (SSUWC) holds the official designation as the urban waterworks entity for South Sudan. It is entrusted with the responsibility of delivering water supply services to the urban population of South Sudan. The legal framework and governance structure of SSUWC are established by the "SSUWC Provisional Order, 2011". However, in this order water supply services has been covered only and wastewater services has not been yet included.

Importantly, in context of pollution prevention and management, it should be noted that it is indeed anticipated/suggested that SSUWC be the leading agency going forward for the hybrid wastewater management system proposed. Other entities and institutions will also have responsibility (as per outline in this section), but the PMP is prepared with this main assumption.

Ministry of Land, Housing and Urban Development: One of MLHUP's key function is providing or ensuring that households in urban areas have access to appropriate sewerage disposal and treatment schemes. The state directorate of Ministry of Land and Housing and Urban development in Juba has been involved, among others, in the construction of the Rokwe (Roton) Wastewater Lagoon in Juba town.

Ministry of Environment and Forestry: In 2010, the Ministry of Environment and Forestry was established to protect the environment. One of the ministry's Waste Management departments is responsible for preparing and enforcing environmental guidelines, and its ESIA team for executing Environmental Impact Assessment Studies, controlling waste management, conducting inspections, and providing technical assistance and advice to developers.

Organization of Sanitation at Juba County Level: Even though Juba County is not directly responsible for Juba city sanitation, it is currently partnering with the City Council since Rokwe Wastewater Lagoon is located in one of the Blocks under the county administration. During the construction of the lagoon, the entire area was governed by Juba County as Juba City Council had not been established yet. The county therefore manages the wastewater lagoons at Rokwe, including its day-to-day operation, fecal sludge disposal fees, and administers the account into which these fees are deposited. Private vacuum truck owners are also registered, licensed and regulated by the County.

Organization of Sanitation at Juba City Council Level: The Juba City Council is divided into three blocks (Juba, Munuki, Kator) and 55 bomas (quarters). A mayor heads the Juba City Council, which represents the State Governor before the Legislative Council. A mayor organizes the executive institutions of the city to carry out their duties diligently, implements policies and bylaws passed by the legislature, introduces legislation to the legislative council and signs it into law, mobilizes and organizes the public in order to provide effective services, and coordinates activities with government.

Central Equatorial State

The Government's Policy of decentralization has devolved a number of central Government functions to local Governments. Some of these functions include the enactment of environment related byelaws such as those related to matters of the environment.

5. POTENTIAL POLLUTION RISKS AND INCIDENTS, AND ROLES AND RESPONSIBILITIES

5.1 Main Identified Pollution Risks

The potential pollution related risks and hazards that emanate from the proposed hybrid wastewater system – most especially of course the actual treatment plant at Rokwe (Roton), but also pumping stations and sewage pipeline to be established in Phase 2 and 3 – include chiefly:

- Sewage overflow (raw or partially treated) – potentially caused by severe weather (lightning/heavy rainfall/wind) causing power failure or infrastructure damage
- Reticulation blockages
- Damage to reticulation (contractors or other damage during excavations, etc.)
- Infrastructure failure due to age, or insufficient maintenance
- Communications failure (leading to malfunction etc.)
- Excessive flows, e.g. if design not appropriate
- Mechanical break down
- Power outage
- Treatment plant blockage
- Chemical spill – potentially caused by delivery incident, inappropriate chemical use
- or damage to chemical reticulation
- Tank/storage failure
- Vandalism
- Bund failure
- Groundwater contamination
- Accidents leading to leakage, spillage and pollution from tankers with fecal sludge
- Accidents, corrosion or wrong design/construction of pipes and pipeline system leading to leakage, spillage and pollution

A detailed assessment of risks is provided in subsequent Section on *Risk assessments and actions*. Furthermore, reference is made to Section on *actions to reduce risks - Preventive Measures*.

5.2 Key Roles and Responsibilities

An integrated approach to pollution prevention involves a range of stakeholders, including the client, the contractors (and subcontractors), local authorities, regulatory agencies and the general republic. Such a system requires robust process with clear roles and responsibilities regarding information dissemination, training and designation of responsibility, management actions, monitoring control and remedial actions. Assuming as also anticipated in the Project proposal that SSUWC be charged with a leading role and responsibility, the general roles and responsibilities of SSUWC and the contractors for pollution management are detailed below.

Table 3: General roles and responsibilities of SSUWC and Contractors for Pollution Management

Activities	SSUWC	Contractors	External providers
Planning	x	x	
Dissemination of information	x	x	
Management of pollution	x	x	x
Spill response & treatment		x	x
Professional training	x	x	x
Surveillance and control	x	x	
Monitoring and audit	x	x	
Corrective actions	x	x	
Management of cooperation	x	x	

5.3 Human health or Safety Incident – Action Required

If there is immediate serious threat to Human health or Safety, call South Sudan Urban water corporation (Hotline), If required, evacuate the site or Report the incident to Human Resources Unit (details of emergency contacts attached in Annex).

5.4 Community and general public notification – Actions Required

Impacts on the community due to sewage system and treatment plant incidents will be “variable” and very much depend on location, volumes of spills or other factors. Communication methods will correspondingly be used on a case by case basis, but a key feature for all situations will be that SSUWC will provide early warning to potentially affected communities and individual. Among others, this can involve site/community visits, phone calls, door-to-door activities etc. Early warning, or directing advice and instructions in case of on-going pollution event, is to include details of what the incident is, how those affected can prepare and respond, and provide important advice such as avoiding contact and use with sewage, wastewater or polluted substances.

Where early warning is not possible Operation & Maintenance (O&M) units, operators or SSUWC staff appointed will provide notification and communication during and after an incident to advise

those affected with information, advice and updates. Notification and communication methods will be determined on a case by case basis. In summary, the following methods may be used:

- Phone calls
- Media releases (radio/television/newspaper/internet/social media as required – only O&M staff with appropriate delegations are permitted to speak to the media)
- Community and site visits / door knocking
- Warning signs (e.g. 'Potential Sewer Contamination – Do Not Enter Water')
- Other methods as the situation requires

In the event of a chemical or sewage spill into stormwater or waterway systems, O&M staff are to go to prominent and/or high use areas of the affected waterway and area and put up signs and start communication "on site". The signs are to warn water users of the contamination and advise them to avoid activities such as swimming, fishing, and boating until contamination has cleared.

Contaminated land affected by sewage spills is to be clearly demarcated and if possible disinfected. Ponded sewage may be pumped out for treatment or otherwise handled, e.g. with tankers, Fecal coliforms and other biological and physical features will be closely monitored until safe standards are reached.

Regular communication and notification is to be provided until the incident and clean-up of impacted site and affected areas has been complete (e.g. fecal coliforms have returned to background levels) at the site.

The O&M is to take signs down and advise the public that regular activities can be resumed by when and area is safe again. This may require:

- Phone calls
- Media releases (radio/television/newspaper/internet/social media as required)
- Other methods as the situation requires

5.5 Specific Incidents at the Wastewater Treatment Plant

The Rokwe WWTP is located on government land, but close to the Nanyin community land area. The main residential areas of Rokwe are however located at least 500m south and west of the actual WWTP, approximately 2km from the Airport, and also with relatively good spacing to various small scale businesses and constructions made in recent years on the access road to the WWTP. There is as such nothing actually "on site" and inherent in the planned treatment processes that under normal circumstances would foreseeably create an emergency for any neighbours. However, if an incident did occur and any community members or neighbours were affected then the processes listed in Section above "Community notification" should be implemented as required.

5.6 Incident Investigation

All significant incidents emergencies must be investigated and recorded. For all smaller incidents, the on-site manager (with guidance from review personnel from SSUWC or WWTP hired personnel, if in doubt) will decide whether an incident investigation will be conducted. When an incident investigation is required, the relevant manager is responsible for:

- Forming the investigation team

- Co-ordinating the investigation
- Recording in standard forms to be provided for incident reporting

A de-brief is to be conducted for all emergency and pollution incidents. However, the responsible manager may also initiate de-briefs for other incidents, very importantly also for "near incidents and pollution events", where they feel it is appropriate.

5.7 Preventive Measures

Physical and preventative measures: First priority for pre-emptive measures is to eliminate substances that can become potential pollutants. If this is not possible, physical barriers should be installed to prevent pollutants from entering the environment such as bunding and spill drainage containment. At Rokwe WWTP, all chemical storages should be bunded to ensure that if the storage fails the pollutant is contained and treatment process by passes are installed to prevent partially treated sewage spills due to reticulation issues. The Rokwe WWTP should have multiple alarm systems to alert operators of conditions that may result in incidents, which include:

- High level alarms
- Communication failure
- Motor issue alarm
- No flow/high flow alarms

In the event that these systems fail, O&M staff must have portable bypass pumps and should have either containment options available. Power failures can for instance occur at any time and can be planned or unplanned interruptions. Where generator inlets are not installed, O&M electricians can hard-wire a generator if required for emergency situations, and this should be "ready at hand".

5.8 Preventative inspection, monitoring and maintenance

Operation and Maintenance (O&M) functions and procedures must also embrace monitoring and proper maintenance of preventative systems to reduce the potential for pollution incidents at the WWTP, pumping stations and elsewhere as required. Many specific actions should occur in a regular cycle, from daily checks (e.g. chemical quantities, check pump stations, check functionalities) to monthly checks (e.g. valve exercising, inspection of controlled overflow/surcharge points), and annual checks. More detail on approach to be followed and regular operational/maintenance related monitoring is provided in tables below.

Table 4: Regular operation/maintenance activities

Activity	**Frequency**
Wastewater Treatment Plant / Pumping Stations	
Operate the WWTP and Pumping Stations as per operation and maintenance procedures (manual to be prepared). Check among others chemical quantities/leakage check, check pump stations, check functionalities etc.	**Daily**
Operate the WWTP and PSs (prepare manual): Valve exercising, inspection of controlled overflow/surcharge points etc.	**Monthly / Annual**

Reticulation	
Monitoring of pressure units on properties by residents (each Pump unit equipped with audible and visible alarms)	**Continuous**

Table 5: Monitoring provisions and approach

SN	OBJECTIVE	APPROACH
1	**Risk based**	• Monitoring programmes to address material issues (based on the approach outlined in the ESIA for the wastewater system). This is commensurate with Scale of nature of activity • The assessed potential level of impact and; • The sensitivity of the local environment within the activity Area of Influence (AOI)
2	**Compliance based**	Additional monitoring programmes to meet specific regulatory needs

5.9 Action plans to minimise harm

To address the risk of pollution incidents, in particular sewage spillage and overflows which all other things equal are a significant and relatively likely occurring risk, O&M should have a number of management actions comprising of one or more of the following:

- Further detailed Investigations of very high and extreme risks
- Augmentation of Sewerage Assets to Increase Capacity
- Planned Maintenance of Existing Assets
- Planned Renewal of Existing Assets
- Community engagement and education regarding observations and actions to take if spillage is occurring – and for at least some community members training on the use of pressure sewer systems and the fault reporting process
- Continuous Improvement of Sewerage System Operations
- Emergency Response Procedure to Power Failures

6. RISK ASSESSMENTS AND ACTION PLAN

For details on actions to reduce risks see the comprehensive table included in pages below.

Table 6: Risk assessments and actions

SN	RISK	IMPACT	Controls
Rokwe/Roton Reticulation, Pumping Stations and sewage system network			
1	**Sewage overflow due to inflow/infiltration**	Land contamination Possibly enter waterway	• Property plumbing audit and inspection prior to sewer connection • Reticulation maintenance and rehabilitation to reduce infiltration and inflows • Spare capacity in pump wells • Monitoring and maintenance
2	**Sewage overflow due to power failure**	Land contamination Possibly enter waterway	• Backup generators, can also be used for running pump units at major community facilities if required. • Preventive measures (see also text Section)
3	**Sewage overflow due to storm damaging infrastructure**	Land contamination Possibly enter waterway	• Back up generators, can be used in case of power failure • Preventive measures (see text Section)
4	**Sewage overflow due to an external persons excavation hitting the sewers**	Land contamination Possibly enter waterway	• Provide underground service locations to external persons • Vacuum trucks (for cleanup) Portable pumps (for cleanup)
5	**Sewage overflow due to Infrastructure failure (e.g. due to age)**	Land contamination Possibly enter waterway	• Reasonably young network
6	**Sewage overflow due to pump failure**	Land contamination Possibly enter waterway	• Spare capacity in pump wells • Portable pump to bypass site and vacuum truck to maintain flows • Preventive measures (see text Section)

SN	RISK	IMPACT	Controls
Rokwe/Roton Wastewater treatment Plant, Pumping Stations, Sewage network			
1	**Sewage overflow (raw) due to heavy rainfall**	Land contamination, possibly enter waterway	• Property plumbing audit and inspection prior to sewer connection to reduce infiltration and inflows • Spare capacity in pump wells • Overflow storage at the WWTTP • Bypass systems to overflow storage • Monitoring and maintenance • Preventive measures (see text Section)
2	**Sewage overflow (raw) due to damage to onsite reticulation (e.g. during excavations, etc**	Land contamination, possibly enter waterway	• Locate services prior to excavations • Appropriate supervision of contractors • Bypass systems
3	**Sewage overflow (raw) due to system/Communications failure**	Land contamination, possibly enter waterway	• System testing and alarming • Preventive measures (see text Section)
4	**Sewage overflow (raw) due to Infrastructure failure (e.g. due to age)**	Land contamination, possibly enter waterway	• Maintenance and renewal programs • Preventive measures (see text Section)
5	**Sewage overflow (raw) due to excessive flows**	Land contamination, possibly enter waterway	• Reticulation maintenance to reduce infiltration and inflows • Spare capacity in pump wells • Overflow storage at the WWTP • Bypass systems to overflow storage pond • Monitoring and maintenance • Preventive measures (see text Section)
6	**Sewage overflow (raw) due to Treatment plant blockage**	Land contamination, possibly enter waterway	• Bypass systems • Gross solid screening

7	**Chemical spill due to Tank/storage failure**	Land contamination, possibly enter waterway	• Bunding • Alarms Inspection and maintenance of tanks
8	**Chemical spill during delivery**	Land contamination, possibly enter waterway	• PPE •
9	**Chemical spill due to damage to chemical reticulation**	Land contamination, possibly enter waterway	• Locate services prior to excavations • Appropriate supervision of contractors • Bypass systems Shut off valves for chemicals
10	**Chemical spill due to vandalism**	Land contamination, possibly enter waterway	• Site security fences
11	**Chemical spill due to bund failure**	Land contamination, possibly enter waterway	• Bund inspections • Annual bunding tests • Maintenance and renewal
12	**Chemical truck incident outside of bunded area**	Land contamination, possibly enter a waterway	• Only use transport companies with evidence of driver licensing and training Operator onsite during deliveries (or at minimum direct contact with deliver in exceptional circumstances)

7. TRAINING, CAPACITY BUILDING

It falls beyond the scope of this PMP to outline a detailed training or capacity building programme, but this is a (future) key aspect of the detailed preparation for the proposed hybrid wastewater system in Juba. Indeed a pre-requisite, as all other things equal, the designated lead entity, SSUWC, does not currently have the capacity and the trained personnel required to implement and monitor the system (and this PMP). The following is thus provisional guidance notes.

All staff required to implement this Pollution Management Plan (PMP) and associated documents must have training in its use and be inducted into it. This is to ensure they are aware of the content, processes and requirements of this plan and can competently implement it, when and if necessary.

Further, whenever (if) a significant pollution incident occurs, a full and proper investigation and debrief will be conducted, and if required additional training and capacity building is provided to aid re-occurrence. Documentation and manual(s) will be updated if required and staff will be re-inducted.

Concurrently, all incidents are to be registered into registers and O&M staff records and training records is sent to personnel for filling.

Training will be provided for all new staff. An in addition, refresher/update training is undertaken annually, as a minimum, to ensure that all key staff are at all times properly trained for pollution prevention and mitigation in case pollution events occur.

8. KEY PERFORMANCE TARGETS AND INDICATORS

Both general monitoring and management systems verification processes require robust key performance Indicators (KPIs) to be developed. These are quantitative or qualitative measurements used to gauge performance overtime and can be used to assess the effectiveness of control measures The KPIs considered relevant to this PMP are shown in table below.

Table 7: Key performance targets and indicators

SN	KPI	TARGET	MONITORING MEASURE
1	**Number of non-compliances with the requirements of this PMP**	Long term: Zero incidents Short-Medium Term: Continuous 50% improvements year to year	See section on potential incidents
2	**Number of non-compliances with project standards identified during monitoring**	As above	See the ESMP in ESIA Study report
3	**Number of noise monitoring reports**	Observe monitoring period for Noise	See the ESMP in ESIA Study report

4	**Number of non-compliances to noise admissible limits**	Observe non-compliances for Noise	See the ESMP in ESIA Study report
5	**Number of air monitoring reports**	Observe air monitoring	See the ESMP in ESIA Study report
6	**Number of non-conformities to air admissible limits**	Observe non conformities through environmental agreements	See the ESMP in ESIA Study report
7	**Number of water monitoring reports and monitored indicators**	Observe water monitoring periods and indicators required for emissions into water	See the ESMP in ESIA Study report
8	**Number of non-conformities / non-compliance to water admissible limits**	Observe admissible limits through the relevant environmental agreements	Regular measurements
9	**Number of non-compliances closed due to corrective actions being taken with the defined time frame (set on a case by case basis)**	100% of all non-conformities remedied within the defined time frame	Reports
10	**Percentage of staff who have received adequate and relevant training**	100% compliance with training requirements	Reports
11	**Number of reports of near misses reviewed for root cause and corrective action identified and shared across all spreads within 48 hours to prevent future occurrence**	100% of near misses reports reviewed and shared	Reports

9. CONCLUSIONS AND RECOMMENDATIONS

The implementation of the PMP solely lies on the management of implementing agency, currently presumed to be SSUWC, and the contractor carrying out operation and maintenance of Rokwe WWTP and other wastewater system(s) envisaged including pumping stations and piped sewage system in Phase 2 and 3 of the Project. Both SSUWC, the contractor, and all employees engaged have lead roles and responsibilities as per the PMP. They must ensure that there is code of conduct put in place for all engaged, including workers, and they must ensure adherence and compliance with this PMP. Furthermore, they must ensure appropriate reporting and monitoring systems be put in place, also complying with this PMP.

9.1 Recommendations and further Perspective

Environmental monitoring programs for this project is essential (refer to the ESIA). It is suggested that the PMP monitoring program be linked to and/or be supportive to the general environmental monitoring program that will be established. Any pollution incident (and risks identified) will have direct significance and relevance for environmental, and a as well often also social, issues. The PMP will thus be prepared and implemented to address all incidents that have been identified to have potentially significant impacts.

Yet, despite the above recommendation, it is noted that the PMP requires special attention and is a special and very specific plan and requirement in the Project. It is thus recommended that an Environmental and Social Officer should be hired to specifically engage with and monitor the implementation of the PMP.

Additional actions are recommended for successful management and implementation of the PMP. A primary focus relates to having a legal framework in place and a new approach/system in place for sewage related management actions. Due to the lack of institutional and legal provisions in sewage management in South Sudan, the establishment of institutional and legal framework of sewage management will be indispensable to commence and sustainably implement full-scale sewage management. Particularly in regard to the upgrading and upscaling of Rokwe WWTP and the full hybrid wastewater system envisaged and proposed.

It is recommended in the PMP, as a perspective/proposal, that an approach of “Start small and grow big” be pursued. After the establishment of an O&M Office, ideally anchored in SSUWC, phased implementation plans be established for a legally and institutionally establishing independent sewage implementing body, in parallel with continued human resource development (presumably also anchored in SSUWC). In parallel with the establishment of institutional and legal framework of sewage management, phased construction plan is formulated to gradually accumulate experience and knowledge of sewage management. Phased establishment of institutional and legal framework, along with implementation of the Preparatory Project, will realize the smooth and sustainable implementation of subsequent sewage project(s) in Juba.

10. REFERENCES

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11. APPENDIXES

Appendix 1: East African Effluent discharge standards to be adopted

Parameter	Unit	Discharge unit
Biological Oxygen Demand BOD_5	**mg/l**	**< 30**
Chemical Oxygen Demand COD	**mg/l**	**< 50**
Total Suspended Solids	**mg/l**	**< 30**
Total Dissolved Solids	**mg/l**	**< 1,200**
Ammonia (NH_4) + Nitrate (NO_3) + Nitrite $N0_2$	**mg/l**	**< 100**
Max E. Coli		**Nil/100**
Total Coliform		**1000/100**
pH		**6.5 - 8.5**

Appendix 2: List of PPE requirement (Personal Protective Equipment List)

This section list the standard PPE items required of the wastewater treatment plant and the pumping stations. The following items are to be kept and be available for use at all times:

- **Ear/hearing protection**
- **Life rings (around the treatment system)**
- **Sun screen**
- **Apron/disposal overalls**
- **Rubber Gloves**
- **Goggles**
- **Gumboots**
- **Steel capped Boots**

Sewerage response truck: The following items are to be kept on the sewerage reticulation response truck:

- **Goggles/eye protection**
- **Hearing protection**
- **Apron/disposable overalls**
- **Rubber gloves**
- **Gumboots**

Appendix 3: List of Emergency contact details applicable for the wastewater system

Title (and name in due course)	Contact details
Project Manager	
Senior Site Engineer	
Electrician	
Occupational Safety and Health Officer	
Environment and Social Officer	
First Aider	
Hospital	
Police Fire Brigade (Juba)	
Fire Brigade (Juba)	
Etc.	

Appendix 4: Glossary

Aerobic A biological decomposition process in the presence of oxygen
Anaerobic A biological decomposition process in the absence of oxygen
Anaerobic Digestion A series of biological processes in which microorganisms break down biodegradablematerial in the absence of oxygen
Biodegradable Organic material or waste that is degraded or chemically dissolved by bacteria or otherliving organisms.
Biogas Gas containing mostly methane generated when wastes decompose anaerobically
Baseline: A description of the biophysical and socio-economic state of the environment at a given time, prior to development of a particular project.
Biodiversity: The variety of life on earth.
Composting Controlled aerobic biological decomposition of organic matter, such as food scraps andplant matter, and other organic waste into humus, a soil-like material
Contamination: Pollution.
Environment: The combination of elements whose complex interrelationships make up the settings, surroundings and conditions of life of the individual and society as they are or are felt.
Environmental and Social Management Plan (ESMP): A comprehensive plan for the implementation of mitigation measures prescribed in the environmental and social impact assessment.
Faecal Sludge Management Comprises collection transportation, treatment and disposal of the liquid and solid material removed from septic tanks or pit latrines thus contributing significantly to breaking the chain of disease transmission and creation of a healthier environment
Fauna: The total animal population in a given area.
Flora: The total vegetation assemblage in a given area.
Habitat: Terrestrial, freshwater, or marine geographical unit or airway that supports assemblages of living organisms and their interactions with the nonliving environment.
Harm to the environment: harm to the environment is material if: • it involves actual or potential harm to the health or safety of human beings or to ecosystems that is not trivial, or • it results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding $15,000
Incident (in context of this PMP: An environmental or pollution related incident is an event that is a departure from standard operating conditions that can or does have an impact on human health or the environment
Impact: The consequence of an action or activity on the human or natural environment. Impacts may be positive, negative or neutral.

Loss: includes the reasonable costs and expenses that would be incurred in taking all reasonable and practicable measures to prevent, mitigate or make good harm to the environment.
Magnitude: The size or degree of a predicted impact.
Mitigation: Prescribed actions taken to prevent, avoid, reduce or minimize the impacts, or potential adverse effects, of a project
Onsite system Excreta removal facility where excreta is collected at the site
Offsite system Excreta removal facility where excreta is carried away through water to conventionalwastewater treatment system
Pollution incident: An incident or set of circumstances during or as a consequence of which there is or is likely to be a leak, spill or other escape or deposit of a substance, as a result of which pollution has occurred, is occurring or is likely to occur. It includes an incident or set of circumstances in which a substance has been placed or disposed of on premises, but it does not include an incident or set of circumstances involving only the emission of any noise
Reticulation: The system of works necessary to provide water supply to particular land, being works connecting headworks to the point at which water supply is provided
Sanitation Refers to the provision of facilities and services for the safe disposal of human urine and faeces.
Sewerage system A system for the collection, treatment, and final disposal of sewage/wastewater. It includesthe sewer lines with manholes and pumps that convey sewage to the treatment plant, the treatment plant for treating sewage and the final disposal system of the treated wastewater and sludge.
Sewage The off-site water-carried waste (human faeces, urine and sullage), in solution or suspension
Septage The liquid and solid material removed from septic tanks or pit latrines
Sullage the liquid waste form from household sinks, showers, and baths
Utility The organization that provides services that is consumed by the public. In this case it is the set of services provided by the utility to collect, treat and final disposal of sewage
Wastewater System Comprises storage, collection, transportation, treatment, and disposal of domestic humanwaste (human urine and faeces and sullage) to avoid environmental degradation and aesthetic nuisance