ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

FOR THE PROPOSED FAECAL SLUDGE MANAGEMENT FACILITY LOCATED IN BUKOLWA LCI, BUKOLWA PARISH, WOBULENZI TOWN COUNCIL, LUWERO DISTRICT

Procurement Reference Number: MOWE/CONS/18-19/00046/1

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August 2021

DECLARATION STATEMENT

I……. commissioned the Environmental and Social Impact study on behalf of Studio Galli Ingegneria (SGI) and do acknowledge that I have read this Environmental and Social Impact (ESIS) and understood its content and do hereby commit myself and our organization to comply with the suggested mitigation / enhancement measures stated in the Environmental and Social Management and Monitoring Plan (ESMMP) to address the potential impacts associated with the development phases and actual implementation of the project.

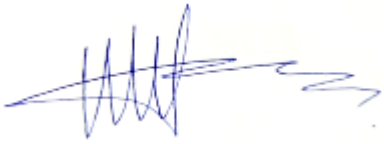
Designation: …….

Signature: …….

Date: …….

THE ESIA TEAM

M/s SGI, Studio Galli Ingegneria contracted a Team of NEMA Certified Environmental Practitioners to undertake the Environmental and Social Impact Assessment for the proposed Faecal Sludge Treatment Plant located in Bukolwa LCI, Bukolwa Parish, Wobulenzi Town Council, Luwero District, for presenting to NEMA as one of the requirements for similar projects under the National Environment Act No. 5, 2019, and prepare this Environmental Project Brief on their behalf.

Name and Expertise	Signature
Mr. DAVID Samuel Wafula (CEP) **ESIA Team Leader/ Infrastructure/Land use Specialist**	
Mr. RICHARD Bavakure (CEP) **Natural Resource Management / Waste Management Specialist**	
Ms. RASHEEDAH Agero (CEP) **Environment Management Specialist / Stakeholder Identification and Engagement**	

The above experts were assisted by the following experts:

Ms. Esther Nassonko Kavuma	Sociologist;
Mr. David Mukungu	Socio-Economist;
Ms. Jalia Kayemba	Biodiversity Specialist;
Mr. Solomon E Ojiambo	Environmentalist/Geographical Information System Expert;
Mr. Enock Nyende	Industrial Systems / Occupational Health and Safety Expert

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

CCS	Carbon Capture and Storage
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CO	Carbon Monoxide
CO_2	Carbon-dioxide
DWD	Directorate of Water Development
E&S	Environment and Safety
EA	Environmental Assessment
EH&S	Environmental Health and Safety
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
ESIS	Environmental and Social Impact Statement
ESMMP	Environmental Social Management and Monitoring Program
EU	European Union
EUETS	European Union Emission Trading Scheme
FS	Faecal Sludge
FS	Faecal Sludge
FSTP	Faecal Sludge Treatment Plant
GHG	Greenhouse Gases
GIPA	Greater involvement of people living with AIDS
IFC	International Finance Corporation
Km	Kilometres
KM^2	Square Kilometres
M	Metres
MoW&E	Ministry of Water and Environment
N_2O	Nitrogen Oxide
NEA	National Environment Act
NEMA	National Environment Management Authority
NWSC	National Water and Sewerage Corporation
O&M	Operation and Maintenance
PAI	Potential Area of Influence
PAPs	Potentially Affected Persons

PEAP	Poverty Eradication Action Plan
RAP	Resettlement Action Plan
RSPM	Respirable Suspended Particulate Matter
SO_2	Sulphur Dioxide
SPM	Suspended Particulate Matter
**STI ` **	Sexually transmitted infections
TC	Town council
ToR	Terms of Reference
VOC	Volatile Organic Carbon
WID	Wetlands Inspection Division

ACKNOWLEDGEMENTS

The Environmental Assessment Team is thankful to people who provided information for the preparation of this ESIA. The team is grateful for the support from the community of Wobulenzi Town council, and Luwero District Local Government Administration and Technical Staff. For the local community members, we are not only grateful to your open discussion but also for being hospitable. We are hopeful that the project will meet your expectations. Lastly, we highly appreciate the great support of the technical staff in the various government departments and agencies, who provided enriching information necessary for the quality output of this report

EXECUTIVE SUMMARY

ES I.1. Introduction and Background

The Government of Uganda (GoU) has adopted the Uganda Vision 2040; and has committed to improve the socio-economic status of Ugandans through key interventions like improved delivery of water and sanitation services. Recent Government efforts to promote delivery of household and public sanitation facilities, coupled with behaviour change campaigns has resulted in increased access to sanitation (about 86%) in urban areas. Over 90 percent of the existing sanitation facilities are on-site, and lack safe means of faecal sludge chain management (emptying, transportation, and disposal or re-use). The situation is exacerbated by the steady population growth due to increasing rate of urbanization (approximately 5.3%).

A nationwide sector assessment supported by World Bank Water and Sanitation Program (WSP) in 2014, identified fifty (50) potential clusters of small towns to be provided with shared FS treatment/disposal infrastructure to help improve faecal sludge (FS) service chain management across Uganda. To date, less than 40% of the number of clustered towns has been provided with the needed treatment facilities but without improved collection capacity. The Ministry is therefore directing its efforts towards improving the situation by providing additional treatment facilities and improving collection capacity to ensure universal access to all small towns' dwellers by 2030, in line with Government development aspirations and the Sustainable Development Goals (SDGs).

In addition, the existing potential for reuse is not adequately explored to maximize the related economic benefits. Several initiatives on FS reuse exist, but are not coordinated to derive synergies and draw lessons to improve performance. Reuse benefits can contribute to part recovery of operation and maintenance costs, and creation of job opportunities to improve livelihoods, particularly for the urban poor. A systematic and coordinated assessment of FS reuse market potential, together with development of strategies for promotion, marketing and sales would provide the opportunity to maximize related economic benefits.

To ensure sustainable delivery of infrastructure and services along the entire sanitation value chain (containment, collection, treatment and reuse), it is necessary that each link along the chain be developed based on appropriate business models, supported by relevant and effective regulation and institutions. Given a supportive environment, and based on experience in Kampala, this is likely to attract private sector participation and financing to accelerate delivery along the chain, once the business models are demonstrable and can result in achieving some margin of profit.

At the request of the Government of Uganda, the African Water Facility has provided funding support for consultancy services to undertake stakeholder consultations and prepare feasibility studies, detailed designs and investment plans for faecal sludge management in un-sewered urban centres in Uganda. The results of the studies and designs will inform stakeholders and development partners on the investments required, and will help mobilize resources to finance related infrastructure and services.

In bid to fulfil the above-mentioned assignment, The Ministry of Water and Environment contracted M/s SGI, Studio Galli Ingegneria to provide consultancy services for the Feasibility Studies and Detailed Design for Faecal Sludge Service Chain Management in Selected Un-Sewered Urban Centres in Uganda Covering Central and South-Western Towns of Kigumba, Wobulenzi, Kiira, Kanungu and Kyazanga under assignment 1.

It is against this background that the Ministry of Water and Environment (MoWE) intends to develop faecal sludge management facilities in Central and South-Western Uganda Towns of Kigumba, Wobulenzi, Kiira, Kanungu and Kyazanga

The proposed faecal sludge treatment plant will be located mainly in the towns under the Wobulenzi cluster are located in the districts of Luwero and Nakaseke.

Luwero District is located in Central Uganda, approximately 62km from Kampala City. The district is accessed via a tarmac road on Kampala – Gulu highway. The district is bordered by the districts of Kayunga and Mukono to the East, Wakiso to the South, Nakaseke to the West, and Nakasongola to the North.

Nakaseke District is located in Central Uganda, approximately 120km from Kampala City. The district is accessed via a tarmac road on Kampala – Gulu highway and gravel road from Luwero Town Council. The district is bordered by the districts of Nakasongola and Luwero to the East, Wakiso to the South, Mityana to the South West, Kiboga and Kyankwanzi to the West, and Masindi to the North.

The proposed towns under Wobulenzi cluster are Luwero Town Council, Wobulenzi Town Council, Bombo Town Council, Zirobwe Town Council, Busiika and Kiwoko. All the towns are located in Luwero District apart from Kiwoko located in Nakaseke

ES 1.1.1. Project Proponent and Contact

Name of the applicant	Ministry of Water and Environment
Contact Person	Eng. Felix Twinomucunguzi
Designation	Assistant Commissioner- Urban Water and Sanitation Department
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ES 1.2. Methodology

The ESIA study process followed the EIA process as outlined in the National Environment management Authority (NEMA) Guidelines for Environmental Impact Assessment in Uganda, 1997. As such, a scoping exercise was carried out as an initial step of the ESIA study. The scoping exercise was aimed at determining the scope of work to be undertaken in assessing the likely environmental and social impacts of the proposed project. The scoping exercise involved field reconnaissance visits, literature review and comprehensive consultations with relevant stakeholders. The scoping exercise led to the development of the Terms of Reference (ToR) for the ESIA study that were submitted to NEMA for review. Based on the ToR, a detailed ESIA study was carried out. The ESIA Study was concluded by preparation of this Environmental and Social Impact Statement under which the findings of the study are presented.

The surveys were carried out, not only to provide an understanding of prevailing socio and environmental situations, but also to provide a basis for future monitoring of the environmental and social implications of the faecal sludge treatment project. Baseline study of the Project was undertaken by means of:

Field visits and detailed studies of the site. The site visits took place in **2nd and 16th February 2021**. During the site visits, the different biodiversity features, habitat, vegetation and landscape units in the project area were identified and recorded.

For the baseline surveys; emphasis was laid on the social-economic environment, flora, birds, mammals, amphibians, butterflies, reptiles, occupational health and safety studies, hydro geological survey and hydrology. The Biophysical surveys were conducted only within the ecologically sensitive habitats such as wetlands.

Review of literature on appropriates the project area including environmental management in Uganda and project background documents from Ministry of Water and Environment and Luwero District;

Consultations as a means of getting additional information regarding to the possible impacts/concerns and suggested mitigation measures of the proposed faecal sludge treatment plant were extensive carried out;

Expert judgment was also used to identify some of the likely issues to occur as a result of the proposed development; and

The team took into account the existing legislation and regulations dealing with Uganda's natural resources management. The EU legislations and regulations were also consulted.

ES 1.3. Public Consultations

As required by the Guidelines for EIA, 1997 in Uganda, consultation meetings were held with relevant lead Agencies, Luwero district, Wobulenzi T.C, NGOs and the locals of Bukolwa LC1 in order to obtain their comments and views on the proposed Faecal sludge project. Consultative meetings were very important in identifying the potential impacts of the development on biodiversity.

ES 1.4. Project Description

This chapter explains in the details the location of the project, the proposed project components, and the cost estimates for the faecal Sludge Treatment plant project for Wobulenzi cluster. The project area for the proposed faecal treatment plant is in Bukolwa LCI, Bukolwa Parish, Wobulenzi Town Council, Luwero District

The proposed site for the faecal sludge treatment plant is located at GPS coordinates below,

Pt 1	443720.00 mE	80088.00 mN	1070 metres above sea level
Pt .2	443703.00mE	80154.00mN	1109metre above sea level
Pt. 3	443694.00 mE	80167.00 mN	1109 metres above sea level
Pt. 4	443648.00 mE	80245.00 mN	1105 metres above sea level
Pt. 5	443666.00 mE	80202.00 mN	1107 metres above sea level
Pt. 6	443571.00 mE	80058.00 mN	1109 metres above sea level

Pt. 7 443520.59 m E 80205.00 m N 1109 metres above sea level

ES 1.5 Detailed design of faecal sludge treatment facility

Design FS Volume

The design assumed base year to be 2022. The design life of 15 years would make the ultimate year to be 2037. Since this close to the year for Uganda Vision 2040. The Ultimate year was set to 2040, hence making the considered design life to be 18 years.

Design faecal volumes were predicted from categories of household and institutions. The household category had three approaches and the considered value was the average of the three approaches.

The total FS produced was the sum of household and institutional FS, which was 121.38 m^3/day. However, not all the potentially produced FS will be delivered to the FS treatment plant for the following reasons:

Some will remain unemptied due to very deep unlined pits observed in the project area and the owner digs another sanitation facility.

- Many institutions in the area were still depending on unlined latrines.
- Sanitation technologies may be poorly designed and do not allow emptying
- Some people will lack finances to support emptying
- Others practice illegally dump in a freshly dug pit next a full facility
- Some emptiers do not reach treatment plant and dump in the environment.
- Some of these illegal practices call for strengthening in implementations of regulations and bye-laws.

In a view of the mentioned challenges and the considered town councils being far from the selected area, it was therefore assumed that 30% of the produced faecal sludge would be delivered to the treatment plant. The total daily volume becomes **36.41 m^3/day**.

Screens

In order to prevent bulky material such as solid wastes from entering the treatment plant and to disturb the treatment process a screen shall be foreseen at the inlet of the plant. The dimensions of the screen at the FSTP include:

Chosen characteristics of the Screens	Units	Wobulenzi Cluster FSTP
Width of chamber	mm	1000
Depth of chamber	mm	350
Bar thickness	mm	10
Spacing between bars	mm	30
Slope in relation to the horizontal	Degree	30°
Number of bars	Nr	20
Bar spacing	mm	30
Bed slope	m	1 in 94
Drop after the screen	mm	150

Grit Chambers

The FS treatment plant shall be equipped with two parallel open channel grit chambers. FS contains high concentrations of suspended solids and large amounts of inorganic/sand particles. These require a grit chamber for their removal before joining settling-thickening tanks. The characteristics of the Grit channels at the FSTP include:

Chosen Characteristics of Grit Channels	Units	Wobulenzi Cluster FSTP
No. of Grit Channel Units	Nr	2
Depth of channel	m	1.2
Velocity in Channel	m/s	0.37
Width of each Grit Channel unit	mm	600
Length of each Grit Channel unit	m	3.0

Settling Tank

It is designed to remove suspended solids by sedimentation. The low flow velocity in a settler allows settleable particles to sink to the bottom, while constituents lighter than water float to the surface. The dimensions include:

Chosen Characteristics of Settling Tank	Units	Wobulenzi Cluster FSTP
No. of Tanks	Nr	2
Overall internal length	m	18
Internal width of each tank	m	2.0
Tank depth	m	1.8
Length of 1st compartment chamber	m	12
Length of 2nd Compartment chamber	m	6
Diameter of PVC pipe to facultative pond	mm	150
Desludging interval	Months	2

Sludge drying beds

4 No reinforced concrete sludge drying beds have been provided each measuring 18m x 18m and 1.1m deep. Each sludge drying bed shall have a ramp access for vehicular access or pedestrian access for moving sludge. Each bed shall be fed by DN 110mm UPVC pipe with gate valve to allow the choice of beds to fill. Dimensions of drying bed include:

Chosen Characteristics of Drying Beds	Units	Wobulenzi Cluster FSTP
No. of sludge drying beds	Nr	4
Length of each bed	m	19.2
Width of each bed	m	19.2
Bed depth	m	1.1
Feeding pipe diameter (UPVC)	mm	DN 110
Depth of sand layer	m	0.20
Depth of fine gravel	m	0.10
Depth of course gravel	m	0.15

Anaerobic Baffled Reactor

A baffle reactor with 4 up-flow chambers each of 1.0 m length, 3.1m wide and 2.0m depth has been sized in accordance with the design criteria in. Vents are provided to let out the methane produced in the reactor. Design calculations of the anaerobic baffled reactor are included in of this report. BOD removal rate is 84%. The effluent from the ABR will be conveyed to the facultative pond with 100mm diameter PVC pipes for further treatment.

Chosen Characteristics of ABR	Units	Wobulenzi Cluster FSTP
No. of up-flow chambers	Nr	4
Length of each chamber	m	1.0
Width of each chamber	m	3.1
Water depth at outlet	m	2.0
Free board	mm	300
Distance between pipes	mm	< or = 300

Facultative pond

Effluent from the settling-thickening tanks and sludge drying beds is collected for treatment in the facultative waste stabilization pond. One facultative pond measuring 22m x 11m x 1.5m depth has been provided. The BOD is reduced from 220.78 mg/L (ABR effluent) to 99.6 mg/l and the faecal coliforms reduced from 2.96 x 10^5 to 5495 Faecal Coliforms/100 ml.

Term	Unit	Wobulenzi Cluster FSTP
Total Volume of FS loaded per day	m^3/day	36.41
Freeboard	m	0.5
Slope of Embankment (1 : x)	-	2
Relation Length/Breadth	-	2:1
Depth of FS in pond	m	1.5
Mid-depth dimensions of pond; L X W	m	22.0 X 11.0
BOD Concentration at effluent from facultative pond	mg/l	99.6
Coliform Load after facultative pond	No/100ml	5495
Source: Project Estimates,		

For the FSTP, the effluent BOD_5 and faecal coliform concentration of the ponds system at 24.1°C, are slightly above the NEMA acceptable limits of 50mg/l and 5000 FC/100ml respectively for receiving streams. Therefore, there is a need for effluent polishing which will be done by the existing natural wetland.

ES 1.4.1. Project cost estimates

Project capital cost is estimated to be **Ugx 6,000,304,624 (Six Billion Three Hundred Four Thousand Six Hundred Twenty-Four Uganda Shillings) VAT inclusive**. However, this is an estimate which may be subject to changes during the course of construction works and operation.

ES 1.5. Baseline Conditions

The district's climate can be described as modified equatorial climate. Luwero District has two rainfall Seasons, with the main one from March to June and the second one from August to November. The

average rainfall is 1300mm and the mean annual rainfall is between 1450mm to1500mm. However, in some instances the rainfall pattern described may become irregular causing farmers' failure to plan accordingly. The variations in temperatures are not significant. The district recorded a mean annual maximum temperature of between 27.5^0C-30^{o}C and a minimum of 15^{o}C and 17.5^o C.

The topography is as a result of a number of ancient denudation processes on the rock systems leaving a series of old erosion levels throughout the district (Roadwaski, 1960 and Omoding 1994). Hilly uplands dominate the south ancient granitic rocks, with interlocking valleys that break up the low hills in the southern part of the district. The northern region is largely flat and low lying.

The relief of the largest part of Luwero District is generally low and flat characterized by shallow seasonal wetlands in North and flat-topped hills in South. Its altitude ranges fro1000-1250m above sea level (average of 1150m). In most cases the interfluves are broad flat or rounded and marram covered, and the valleys are wide.

The soils in the district are generally red sandy loams in the north and clay loams in the south. The clay loams are relatively fertile hence support growth/ cultivation of a variety of crops. The sandy loam soils in the north have relatively low nutrient/ fertility content.

The major wetland system within the project area is Mayanja-Wasswa Swamp which receives drainage from other smaller wetland systems such as Mayanja, wenkalwe and Danze. The Mayanja-Wasswa systems drains into the greater Kyoga Lake basin.

The vegetation in Wobulenzi Town Council is modified by landscaping and human activities which include: compound maintenance activities and office movements by several visitors to the site and there are no mature trees or threatened species and therefore have low ecological significance.

At the proposed site, Intercropping is the most common system of agriculture here with some of cabbages, Rice, tomatoes. Some trees species such as *Eucalyptus spp*

The total population of Nakaseke District was 230,451 according to 2014 census. The population was disaggregated as follows: 226,507 are males and 89,762 females.

As observed during the study, Wobulenzi Town Council's local economy revolves around commercial activities like sale of merchandise, hardware to the booming construction industry, petty trade, charcoal production, rearing of animals like cattle, goats, sheep, pigs and poultry, cultivation of crops like coffee, maize, rice, beans, matooke, cassava, sweat potatoes, Irish potatoes, tomatoes, green vegetables ground nuts, peas, soya beans, etc.

While in Bukolwa LCI, the local economy revolves around mainly subsistence agriculture (mainly sale of maize, beans, matooke and coffee) as well as petty trade and education service induced developments

ES 1.6. Legislation

Review and reference to EU standards, World Bank Policies, existing Laws, Regulations, Policies and working documents to verify how the proposed project conforms to them; the following relevant laws and regulations were reviewed;

1) National Environment Act 2019
2) Feasibility and Preliminary Design Report - Wobulenzi Cluster Towns September 2020
3) Physical Planning Act (2010)
4) Water Act Cap 152
5) Investment Act (2001)
6) Land Act (1998) and the revised version 2010

7) Local Governments Act (1997)
8) Electricity Act (1999)
9) Noise Pollution Regulations (2003)
10) Water Resources Regulations (1998)
11) The National Gender Policy (1997)
12) Worker's Compensation Act (2000)
13) Safety and Health Act (2006), among others

ES 1.7. Impact Identification and Mitigation Plan

This report has identified and discussed broad ranging impacts associated with the project and proposed mitigation measures for the same. These impacts are associated with flora and fauna, erosion and sediment transportation, environmental health and integrity, occupational health and safety, social welfare and equity among others.

Positive Impacts

The Project construction will have clear benefits with regard to local employment opportunities. Temporary employment opportunities (casual labour) will be provided to over 50 workers during the construction period and approximately 20 during operation stage of the FSTP. This is especially true for unskilled labour. It is planned to make use of local workers up to 60% of required employment with emphasis to gender balance (At least 30% women)

The project will help in empowering women in the management of sanitation issues and improved financial, managerial and administrative skills for the community at large due to training packages;

The project will also provide an opportunity for Wobulenzi T.C to widen its tax base especially from compost sludge bread sold to the farmers and sanitation local taxes;

Improved access especially the main road to Wobulenzi T.C where Faecal Sludge Treatment Plant is to be located. This road is currently very narrow and poor. This road is proposed to be well maintained an upgraded to accommodate heavy trucks transporting materials; and

While overall improved sanitation facilities will lead to improved standards of living in the Town Council in terms of reduction of diseases.

ES 1.8. Analysis of Alternatives

The construction of a faecal sludge treatment plant is an important project for the socio-economic development of Luwero as it is dealing with sanitation as a service for the people of Wobulenzi T.C and the surrounding areas. Consequently, the project is important and no alternative project can replace it in terms of the overall objective. The analysis of alternatives is therefore in the context of alternatives to the proposed project components. Some project components are so specific and have been carefully analysed in terms of their actions and intended location. For other project components, for example, the proposed locations of treatment plant and no project option, alternatives have been suggested as in **Chapter Seven** of this report.

However, because of the dire need to improve sanitation in Wobulenzi T.C, the "No Project option" was not considered as it would hinder development and accelerate the poor sanitation situation in the Wobulenzi T.C

ES 1.9. Environmental Social Management and Monitoring Plan

Environmental and Social Management Plan involves the implementation of measures to eliminate or reduce significant adverse environmental and social-economic impacts of a project to acceptable levels.

Monitoring is a long-term process, which should begin at the start of construction and should continue throughout the life of the project. The purpose of monitoring is to establish benchmarks so that the nature and magnitude of anticipated environmental and social impacts can be continually assessed. The overall objective of environmental and socio-economic monitoring is to ensure that recommended mitigation measures are actually implemented during road construction and operation. Monitoring is also conducted to determine the effectiveness of proposed mitigation measures, to check if the magnitude of anticipated impacts is in line with predicted and to establish if there are any project unforeseen impacts that would require addressing. Monitoring hence enables corrective actions to be undertaken in good time.

The key environmental aspects that will require monitoring include the following;

1) Effluent Quality
2) Air quality,
3) Water quality,
4) Noise levels,
5) Flora and Fauna
6) Soil quality.

In conclusion, if the mitigation measures for adverse impacts identified in this ESIA are implemented, as presented in the Environmental and Social Management and Monitoring Plan (ESMMP), the project will meet its intended objective of improving sanitation and health in Luwero District/Wobulenzi T.C. It is recommended that the project Developer/ Contractor engages all stakeholders during project implementation to create a sense of ownership, transparency and accountability.

ES 1.10. Conclusion

The anticipated benefits of the construction and operation and maintenance of the faecal sludge treatment plant are immense. The project will result into an improvement of public health conditions, spur social economic development, provide employment to local residents.

However, just like most developments, the immense benefits of the project do not necessarily insulate it from negative impacts. In order to evaluate the project so that its undesirable impacts on the environment and social economic set up are minimised, an evaluation of the possible project alternatives was also conducted. The planning and design of the treatment plant was found to be so specific that no alternative sites were proposed. In that case, the impacts of those project components were carefully analysed in terms of their actions and intended location.

Based on the immense project benefits of the sanitation Project to the people of Wobulenzi cluster, which have been stated above, and the fact that the identified negative impacts can be mitigated following the proposed EMP, we strongly recommend to NEMA to review and approve this ESIA to enable further development of the project.

The developer (Ministry of Water and Environment) and beneficiary (Luwero district) have all expressed willingness and commitment to carry out development in an environmentally sustainable manner and implement all the suggested mitigation measures to minimise the negative impacts from the proposed Faecal sludge treatment plant.

1. INTRODUCTION, OBJECTIVES AND SCOPE OF THE ESIA

1.1. Background

The Government of Uganda (GoU) has adopted the Uganda Vision 2040; and has committed to improve the socio-economic status of Ugandans through key interventions like improved delivery of water and sanitation services. Recent Government efforts to promote delivery of household and public sanitation facilities, coupled with behaviour change campaigns has resulted in increased access to sanitation (about 86%) in urban areas. Over 90 percent of the existing sanitation facilities are on-site, and lack safe means of faecal sludge chain management (emptying, transportation, and disposal or re-use). The situation is exacerbated by the steady population growth due to increasing rate of urbanization (approximately 5.3%).

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At the request of the Government of Uganda, the African Water Facility has provided funding support for consultancy services to undertake stakeholder consultations and prepare feasibility studies, detailed designs and investment plans for faecal sludge management in un-sewered urban centres in Uganda. The results of the studies and designs will inform stakeholders and development partners on the investments required, and will help mobilize resources to finance related infrastructure and services.

In bid to fulfil the above-mentioned assignment, The Ministry of Water and Environment contracted M/s SGI, Studio Galli Ingegneria to provide consultancy services for the Feasibility Studies and

Detailed Design for Faecal Sludge Service Chain Management in Selected Un-Sewered Urban Centres in Uganda Covering Central and South-Western Towns of Kigumba, Wobulenzi, Kiira, Kanungu and Kyazanga under assignment 1.

It is against this background that the Ministry of Water and Environment (MoWE) intends to develop faecal sludge management facilities in Central and South-Western Uganda Towns of Kigumba, Wobulenzi, Kiira, Kanungu and Kyazanga.

SGI has prepared the Environmental and Social Assessment report for submission to NEMA for review and approval in line with Schedule 5 (1) of the National Environment Act, No 5 of 2019.

1.2. Scope of Services

The ESIA team undertook investigations on social aspects, economic activities, and biophysical aspects, conservation of natural resources, historical and anthropological heritage, public consultations and disclosures

Task 1. Detailed Desk-top Review

The ESIA team had to review all existing documentation, and any previous ESIA proposed faecal sludge treatment planttaking into account of the critical study of the aquatic environment including and not limited to migratory species, semi-aquatic, Ecological flow and therefore has recommended mitigation measures.

Task 2. Description of the Baseline Environment

The ESIA team was required to collect, collate and present baseline information on the environmental characteristics of the Faecal sludge treatment plantin Bukolwa LCI, Bukolwa Parish, Wobulenzi Town Council, Luwero District**.** This description involved but not limited to:

- Physical environment (topography, land cover, geology, climate and meteorology air quality, hydrology, etc.)
- Biological environment (i.e., flora and fauna types and diversity, endangered species, sensitive habitats etc.)
- Social and cultural environment, including present and projected. Where appropriate (i.e., population, land use, planned development activities, community social structure, employment and labour market, sources and distribution of income, cultural/religious sites and properties, vulnerable groups and indigenous populations etc.)
- Economic activities, agriculture, livestock, small-scale industries etc.

Task 3. Legislative and Regulatory Framework

The ESIA team had to identify and describe the pertinent regulations and standards - both local and international, governing the environmental quality, health and safety, protection of sensitive areas, land use control at the national and local levels and ecological and socio-economic issues. Thereafter, the ESIA team had to identify the project activities that should comply with the identified regulations

Task 4. Determination of Impacts of Project Facilities and Activities

From the detailed field study, the ESIA team had to analyse and describe all significant changes brought about by the proposed Faecal sludge treatment plantproject. These would encompass environmental, ecological and social impacts, both positive and negative. The ESIA team had to make a prioritization of all concerns identified and differentiate between short, medium, long-term and cumulative impacts during construction, operation and decommissioning. The ESIA team also had to identify both temporary and permanent impacts.

The ESIA team had to analyse and describe all occupational health and safety concerns brought about by the proposed Faecal sludge treatment plant activities during all the phases of the project. The ESIA team also had to make recommendations on corrective and remedial measures to be implemented under the environmental management plan.

Task 5: Development of Management Plan to Mitigate Negative Impacts

The ESIA team had to develop a comprehensive Environmental, Social Management Plan. The plan would recommend a set of mitigation, monitoring and institutional measures to eliminate, minimize or reduce to acceptable levels of adverse environmental impacts and/or maximize socio-economic benefits.

Task 6: Development of Monitoring Plan

The ESIA team gave a specific description, and technical details, of monitoring measures for both ESMP, including the parameters to be measured, methods to be used, sampling locations, frequency of measurements, and the definition of thresholds that will signal the need for corrective actions as well as deliver a monitoring and reporting procedure. The ESIA team had to provide cost outlays for monitoring as well as their institutional and financial support, timeframe and responsibility.

1.3. The Environmental Impact Assessment Process

The International Association for Impact Assessment (1999) defines an Environmental Impact Assessment (EIA) as, "the process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals before major decisions being taken and commitments made."

Under Section 3 (1) of the NEA, no 5 of 2019 that is the principal law on Environmental protection in Uganda, “Every person in Uganda has a right to a clean and healthy environment per the Constitution and the principles of sustainable development”.

Schedule 5 (1) of the National Environment Act, 2019 makes it mandatory for a developer planning to upgrade or work on infrastructure projects to carry out an Environmental Social Impact Assessment. This is also in line with the Environmental Impact Assessment (EIA) Guidelines (1997) and NEMA Regulations (1998) for Uganda, projects listed under Schedule 5 subsection 22 (Hazardous waste storage and treatment facilities) require Environmental Assessment.

Under Part X (13), the National Environment Act categorizes projects for ESIA in three levels

a) Conduct an environmental and social impact assessment by way of scoping;
b) Prepare terms of reference for an environmental and social impact study; and
c) Undertake an environmental and social impact study as prescribed by regulations.

The requirement for ESIA is in line with the World Bank Environmental Assessment (EA) (OP/BP 4.01) safeguard policy, (one of the Environmental and Social Safeguard Policies and Procedures used to achieve the Banks objectives). This policy requires that projects that fall under Category A and B, an environmental assessment (EA) to be undertaken to ensure that development projects are undertaken in an environmentally sustainable manner.

1.4. Objectives of the ESIA

The general objective of the Environmental and Social Impact Assessment (ESIA) is to identify, assess and mitigate the potential environmental and social impacts that might result from the proposed Faecal Sludge Treatment Plant in Bukolwa LCI, Bukolwa Parish, Wobulenzi Town Council.

Specific Objectives of the ESIA are;

- ✓ To identify and assess potential adverse environmental and social effects of the planned infrastructure projects.
- ✓ To make recommendations that can be used for mitigating adverse effects resulting from project implementation.
- ✓ To identify stakeholders and undertake stakeholder mapping including their information needs throughout the project cycle.
- ✓ To prepare Environmental and Social Management Plans (ESMP) for each sub-project that can assist in implementing mitigation measures recommended.

1.4.1. Scoping Stage and Preparation of Terms of Reference

According to the Uganda ESIA Guidelines (1997), the Environmental Impact Study process starts with the scoping exercise (See Figure 1-1 below). In addition, the ESIA Guidelines (1997) and Regulations (1998) specify that the issues in the scoping process should be developed into Terms of Reference (ToR) that are submitted to NEMA and other stakeholders (Lead Agencies) for review. Environmental scoping is a critical, early step in the preparation of the ESIA. Environmental scoping identifies issues that are likely to be of most importance during the ESIA. The key objectives of the scoping exercise were:

- ✓ Inform the public about the proposed Faecal Sludge Treatment Plant;
- ✓ Identify the main stakeholders and their concerns and values;
- ✓ Define the reasonable and practical alternatives to the proposed Faecal Sludge Treatment Plant in Bukolwa LCI, Bukolwa Parish, Wobulenzi Town Council.
- ✓ Focus the important issues and significant impacts to be addressed by this ESIA;
- ✓ Define the boundaries for an ESIA in time, space and subject matter;
- ✓ Set requirements for the collection of baseline and other information; and
- ✓ Establish the Terms of Reference for an ESIA study

Subsequently, the Environmental and Social Scoping report and TORs were prepared and submitted to NEMA for review and approval. Approval for the Terms of Reference is attached under **Appendix 1**.

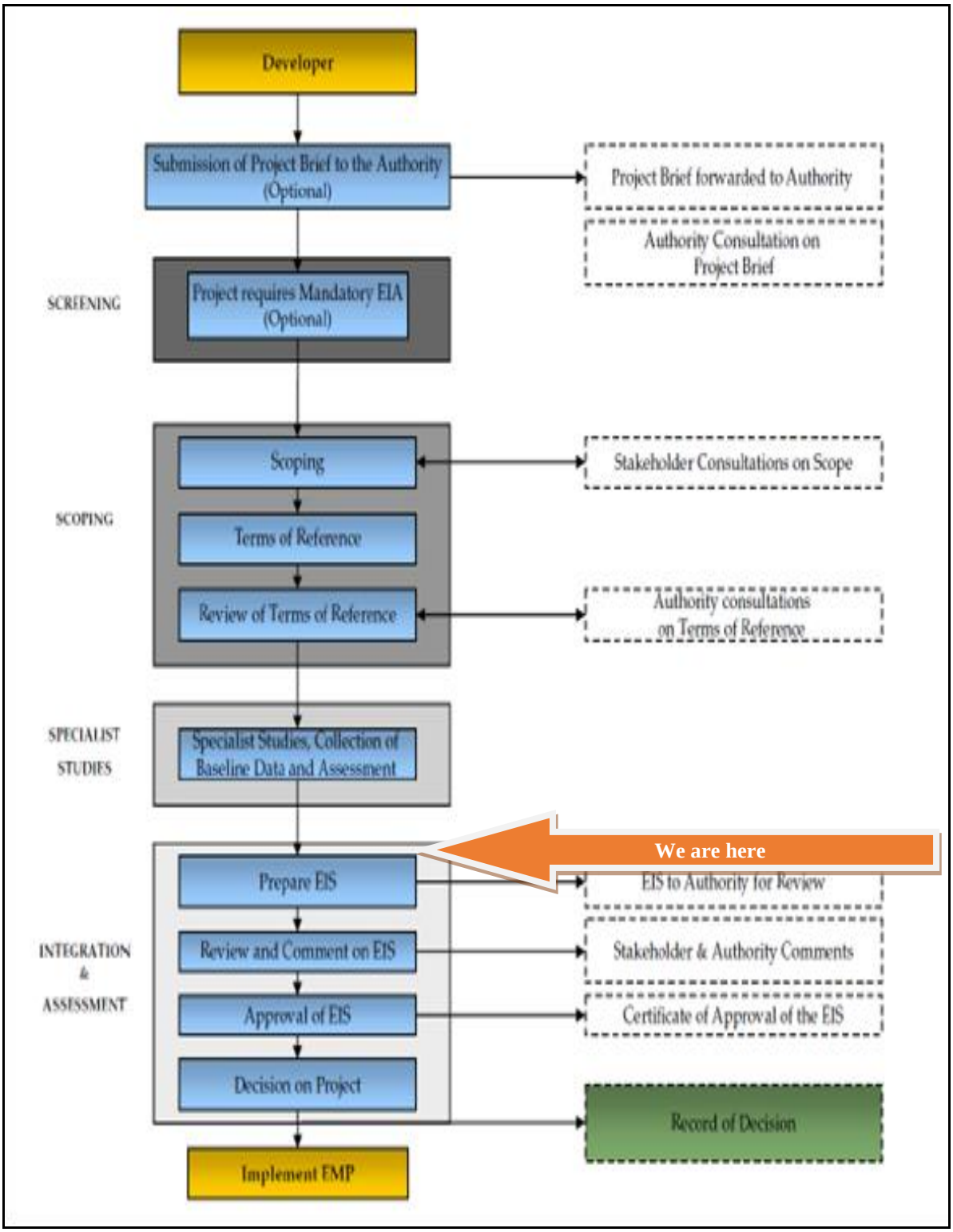

Figure 1-1: ESIA process in Uganda

1.5. Project Cost

Project capital cost is estimated to be **UgX 6,000,304,624** (Six Billion Three Hundred Four Thousand Six Hundred Twenty-Four Uganda Shillings) VAT inclusive. However, this is an estimate which may be subject to changes during the course of construction works and operation. Details are provided under section 3.3 and **appendix 6**.

1.6. Contact Information

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1.7. Structure of the ESIA report

Following this introduction, **Chapter 2** provides the project methodology and approach while **Chapter 3** provides the project description; **Chapter 4** gives the environmental bench mark information of the project site and the surrounding area. **Chapter 5** the legal framework; **Chapter 6** provides stakeholder consultation and comments**, Chapter 7** identifies potential negative environmental impacts and proposes preventive/mitigation measures against potential adverse ones. **Chapter 8** analyses any possible alternatives regarding the project while **Chapter 9** proposes environmental monitoring and management plans of the project by the developer. **Chapter 10** summarises and concludes the ESIA. References and Appendices

2. APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

2.1. Introduction

This chapter of the Environmental and Social Impact Statement details the approach to the ESIS phase of the proposed Faecal Sludge Treatment Plant in Bukolwa LCI, Bukolwa Parish, Wobulenzi Town Council, Luwero District with particular focus on the main aspects of the methodology such as impact significance evaluation

2.2. General Approach

The study was based on literature reviews, stakeholder consultations, site visits/physical inspections, and the integration and assessment of this information.

2.2.1. Literature Reviews

A number of key documents were reviewed in order to address the various aspects of the assignment. Some of these documents included; Feasibility and Preliminary Design Report Wobulenzi Cluster towns, September 2020, National Environment Act 2019, the National Environment Management Policy for Uganda; World Bank Safeguard Policies and Procedures; Environmental Assessment (OP/BP 4.01), Physical Cultural Resources (OP 4.11), Involuntary Resettlement (OP 4.12), Forests (OP 4.36), Natural Habitats (OP/BP 4.04), Disclosure Policy (BP 17.50), The National Water Policy; and the related IFC Environmental Health and Safety Guidelines & performance standards; National Environment Management Authority (NEMA), 2003, Environmental Legislation for Uganda Handbook; Environmental Impact Assessment Regulations for Uganda; Occupational Safety and Health Act 2006, Public Health Act Cap 281; Public Health (Drainage and Sanitation) Rules., S.I. 281-4. Public Health (Grade II Building) Rules, S.I. 281-3. Public Health (Plague Control) Rules, S.I. 281-27, Town and Country Planning Act, Cap. 246.; and other documents that the client deemed as being of fundamental importance to the assignment.

2.2.2. Field surveys

Field surveys included transect walks around the proposed roads to undergo rehabilitation, to assess availability and spatial location of utilities, topography, site geophysical environment, geomorphology, air quality aspects, drainage challenges as well as making an inventory of activities in the neighbourhoods that are likely to be affected. The surveys also included public consultations with the local leaders within the jurisdiction of the proposed Faecal Sludge Treatment Plant in Bukolwa LCI, Bukolwa Parish, Wobulenzi Town Council for further insight.

2.2.3. Stakeholder Consultations

A number of stakeholders were consulted as part of a ‘Stakeholder Identification and Engagement Plan’. The details of these are described in ***Chapter 6***.

2.2.4. Site Visits and Physical Inspections

Site visits and physical inspections were key aspects of the study. The proposed Faecal Sludge Treatment Plant in Bukolwa LCI, Bukolwa Parish, Wobulenzi Town Council was visited as part of the ESIA process and the relevant baseline surveys conducted and data collection undertaken. Specific details on this aspect of the methodology have been provided under this chapter of this report based on each of the specialist studies. It is worth noting that although the specialists were given free reign on how they conducted their research and obtained their information, they were required to provide the reports in a specific layout and structure, so that a uniform report could be produced. Considerable time was spent ensuring that the reports are of the highest standard possible.

In addition to the above, in order to ensure that a direct comparison could be made between the various specialist studies, a set methodology was used by all the specialists when evaluating the significance of impacts as outlined in Section 2.9

2.3. Flora Assessment

The above ground vegetation was assessed using a combined methodology comprising literature review, GIS and remote sensing techniques, alongside field observations. A GPS unit was used to take coordinates of plots and individual plants sampled at the different road sites. Inventories of demarcated plots have been widely used in floristic sampling and ecological studies (Poulsen 1997). The use of one size plot is usually not adequate to collect frequency data on all the important species within a community. A plot size appropriate for one species may not be appropriate for another. The nested plot concept is a simple approach to collecting data on two or more different sized plots at one time. Several different sized plots are placed inside each other in a smallest to largest sequence (Bill Coulloudon et al. 1997). Such plots were placed randomly in the different habitats along the existing road. Herbs were identified independently and sampled in a 2m-by-2m quadrant; shrubs and liana in a 15m-by-15m quadrant; and trees in 20 by 20m quadrants.

2.4. Visual Impact Study (VIS)

In order to map the visual basin of given Target Points in a site, a specific application has been developed, based on the following procedure: "beams of light" were spread from the target point towards the surrounding terrain. When a direct beam of light meets a point on a given topography this point is included by definition in the Visual Basin. The visual impact study methodological tool was used in this Environmental Impact Study:

a) A geometrical phase which identified the area from which the Faecal sludge treatment plant area project site could be observed. From an optical point of view the proposed Faecal sludge treatment plant site was the "Target Site", composed from many "Target Points";
b) A simulation phase, which was responsible of presenting the appearance of the proposed Faecal sludge treatment plantarea project within the target site, was undertaken; and
c) An experiential phase, which evaluated the impact of the planned proposed Faecal sludge treatment plantarea project on people's visual experience, while staying or moving in the visual basin was also conducted.

2.5. Air quality Assessment

The earth's atmosphere contains a number of gases such as Oxygen (21%), Nitrogen (78%), Water vapour (1-3%), Carbon dioxide (0.03%), Hydrogen, Nitrogen, Ozone, etc. in a relatively fixed ratio. The balance in distribution of the above gases may change due to man induced activities and the concentration of different gases may change accordingly. Dust and vehicular emissions may change the concentration of suspended solid particles in the air and may cause drastic changes in the levels of Suspended Particulate Matter (SPM) and Respirable Suspended Particulate Matter (RSPM), which is hazardous to human being and plants. Sulphur dioxide (SO_2), Oxides of Nitrogen (NOx) Greenhouse gases like carbon dioxide (CO_2), Methane CH_4) and RSPM are the four major air pollutants, which cause concern to environment and other living beings. The size of particles is directly linked to their potential for causing health problems. Fine particles ($PM_{2.5}$) pose the greatest health risk. These fine particles can get deep into lungs and some may even get into the bloodstream. Exposure to these particles can affect a person's lungs and heart. Coarse particles ($PM_{10-2.5}$) are of less concern, although they can irritate a person's eyes, nose, and throat.
The main emissions at the proposed establishment of Faecal Sludge management facility will includes particulate matter, Hydrogen Sulphide, Methane, Oxygen, Sulphuredoioxide, VOCs mainly carbon monoxide and those which may lead to offensive odour beyond the human inhalation. The assessment was carried out using Scientific laboratory equipment's such the Altair 4x and Temtop Airing-1000 detector respectively were used in the exercise.

2.5.1. Noise Emission Assessment

National Environment (Noise Standards and Control) Regulations, 2003 define noise as "any unwanted and annoying sound that is intrinsically objectionable to human beings or which can have or is likely to have an adverse effect on human health or the environment". High Noise is a form of energy which affects humans and animals and is referred to as noise pollution. The most studied effects have been on humans where it can lead to hearing damage, which may be partial or complete. The potential damage in humans does not only depend on its level but also on exposure duration.

Noise is a pollutant, which affects the environment and poses health and communication hazards. The intensity of noise is measured in decibel (dB). The intensity of more than 85 dB becomes alarming from pollution point of view. Ear protection/safeguard measures must be adopted so that the noise pollution effect can be minimized or mitigated.

Noise assessment was carried out at various project potential receptors to assess the existing noise levels of emissions at the proposed faecal sludge management facilities. This measurement was done through instantaneous spot measurements using a CEM DT-8852 Sound Level Meter with Data Logger Sound Level Meter set at 114 dB (A) range for forty-five minutes (45minutes) each sampling points. Details of the background noise measurements in form of LAeq, LAF max, LAF Min, within the vicinity of the project components.

Table 2-1: Equipment's used during the Air quality and Noise pollution assessment.

No	Type of Equipment	Activity	Photo
1.	Altair 4x Multi gas detector	Real Time gas monitor for Carbon Monoxide, Volatile Organic Compounds, LEL (combustible gases), Oxygen and Hydrogen Sulphide. Sulphur dioxide, Nitrogen Dioxide	
2.	Temtop Airing-1000 detector.	Temtop Airing-1000 Professional Laser Air Quality Monitor for Humidity, temperature and PM2.5/PM10 Detector Particle Counter Dust Meter Real Time Display High Accuracy.	
3	CEM DT-8852 Sound Level Meter with Data Logger.	This is a brand new CEM DT-8852 CE certified digital sound / noise level meter. This meter has a built-in USB port which connects to a PC for downloading the sound level data recorded over a period of time. This is an ideal instrument for noise monitoring in factories, schools, business and traffic areas. This meter conforms to the IEC61672-1 Class 2 and ANSI S1.4 Type 2 standards. With its internal memory and battery, this unit can record sound levels over a period of time as a standalone device. This device operates on	

No	Type of Equipment	Activity	Photo
		a 9V battery (about 30 hours) or an AC adapter (included). It is very accurate (+/- 1.4 dB) and durable, an ideal companion for your field projects. A heavy-duty carrying case is also included for the protection of the device and for your convenience. The difference between the DT-8852 and DT-8851 is that the DT-8852 has internal memory, so the sound level can be recorded without a computer. The recorded data stored in the DT-8852 can be uploaded to a PC at a later time.	

In addition, Table 2-2 shows the air quality parameters analysed, selection rationale and data source:

Table 2-2: Air Quality Parameters Analyzed, Selection Rationale and data Source

Parameter	Basis for Selection	Relation to Regulatory Drivers	Baseline Data for EIA
Particulate Matter, Inhalable Particulate Matter, SO_2, N_2O	Indicators of potential project effects from diesel engines and fugitive dust emissions Parameters of concern with respect to human and environmental health.	Criteria Air Contaminants under National Ambient Air Quality Objectives	Project-specific data for emission rates National data for ambient air quality Quantitative data

Below are pictorials of the air quality assessments

Figure 2-1: Air quality assessments field activities

2.6. Geotechnical Investigation studies

Two (02) disturbed and one (01) undisturbed sample were picked from each test pit, one disturbed sample was collected from 1.0m and the other at 3.0m together with the undisturbed soil sample being picked from the extreme bottom of each test pit. This kind of sampling applied to all the test pits including those excavated at the Solid Waste Landfill site. In addition, two bulk disturbed samples were picked from the Treatment Plant site at 0.5-1.0m from TP1 and TP2 in order to determine the subgrade properties required for the design of access roads. Samples were properly packed and safely transported to the laboratory for carrying out classification, CBR, compaction and soil chemical tests on disturbed samples, and direct shear box & Permeability tests on Undisturbed samples.

The Dynamic Light Penetrometer (DPL) test was carried out starting from the ground surface. The test involved dropping a hammer of 10kg from a height of 50 cm causing the rod with probe to penetrate into the ground. The number of strokes or blows was calculated after every 10.0 cm of penetration depth. The penetration per blow "penetration rate" was recorded as the cone was being driven into the soil and then used to calculate the strength of the soil through which it was passing.

A change in penetration rate indicated a change in strength between the soil layers, thus allowing strength of the soil to be determined.


Figure 2-2: Conducting of the DPL test at site

2.7. Faecal Sludge Sampling Methodology

Faecal sludge (FS) samples were collected from institutions such as schools (primary and secondary), apartments, health centres, taxi parks, markets and Fuel stations. Samples were obtained from selected lined pit latrines and/or septic tanks (water-borne systems) from these places in the town councils of Bombo, Wobulenzi, Luwero, Kiwoko, Zirobwe and Busiika. Faecal sludge samples were collected from Lined pits and septic tanks because they are usually emptiable when they are full, as opposed to unlined pit latrines from which the leachate infiltrates into the surrounding soils. If unlined pit latrines are to be emptied, lots of water is added to fluidize the FS and the pits are susceptible to collapse due to lack of support lining. The sampled sanitation facilities and their locations are presented in **Table 2-3**

Table 2-3: Sampled sanitation facilities in the town councils of Bombo, Wobulenzi, Luwero, Kiwoko, Zirobwe and Busiika

Town council	Sample ID.	Facility type	Source ID	Remarks
Bombo TC	1	Lined pit latrine	Household Apartments	There is low solids concentration observed. Last emptied one year ago and presents evidence of using pit additives. The sample is light brown in colour. Size: 4 by 2 m and 3 m deep.
	2	Septic Tank	Don Bosco Institution – Priests houses	Used by 70 to 200 people. Last emptied two years ago. The sample is black in colour, and sludge looks stable. Size: 4 by 2 m and 1.5 m deep.
Wobulenzi TC	3	Septic Tank	Shell fuel station - Wobulenzi	High solids concentration. Emptied twice in a year. Used by about 500 people a day. Sample is black in colour. Size: 3.5 by 1.5 m and 1.0 m deep.
	4	Septic	Wobulenzi	Used by about 150 people per day and

Town council	Sample ID.	Facility type	Source ID	Remarks
		Tank	Taxi park	emptied once in a year (about 8000 litres per year). Sample is dark-grey in colour. Size: 8 by 1.5 m and 1.2 m deep.
	5	Lined pit latrine	Mulusa Academy Sec. School	Latrine is poorly constructed. It is emptied 3 times in a year. Sample is brown in colour.
Luwero TC	6	Septic Tank	Luwero-Kasana Market	Toilet used by 50 to 70 users per day. The sample is yellowish in colour. Size: 7 by 1.5 m and 1.2 m deep.
	7	Septic Tank	Don Fuel Station	There is presence of thick scum layer. Sample is light grey in colour. Size: 3.2 by 1.3 m and 1.5 m deep.
Kiwoko TC	8	Septic Tank	Kiwoko Hospital	Presence of medical wastes. Tank is emptied annually. The sample is black in colour. Size: 4 by 2.5 m and 2 m deep.
Zirobwe TC	9	Lined pit latrine	St. Mathew Primary School	Latrine used by about 300 students in day section. It has been emptied once in 4 years. The sample is black with high levels of suspended solids.
Busiika TC	10	Lined pit latrine	Busiika Taxi park	Last emptied 2 years ago. The sample is dark brown in colour. Size: 6 by 1.0 m and 3 m deep.

Several grab samples were obtained through the access hole (s) which were included for emptying purposes. Samples were taken at the surface, in the middle and close to the bottom of the sanitation facilities by use of a sampler, which had a capacity of picking samples up to 4.5m depth (**Figure 2-3**). Samples were collected from 15th to 18th June 2020.

The grab samples were thoroughly mixed by use of a soup ladle to make a composite sample for each sanitation facility. Following this, the parameters of temperature, pH, electroconductivity (EC) and oxygen reduction potential (ORP) of the extracted composite FS samples were measured onsite using a potable meter (Hach HQ30d flexi model). Thereafter, a sample of about 1000 mL was put in the plastic-bottle container, placed in a cool box and transported to the Public Health and Environmental Engineering Laboratory, at Makerere University for analysis.

Figure 2-3: Faecal sludge sampling from (a) Pour flush toilet connected to a Cesspit, and (b) Lined pit latrine using a sampler

2.7.1. Sample preparation

Preparation of FS samples before analysis involved passing them through a 5 mm sieve in order to remove the extraneous materials. This is synonymous to screening, a pre-treatment action subjected to FS during treatment. FS to be used for analysis of all the parameters was homogenized by use of an electric blender (NIMA, model no. BL 888A, 1.5L, 350 watts, Japan), operated for one minute at its maximum speed. **Error! Reference source not found.** are the samples after homogenization. The measured parameters are not affected by FS physical structure and homogenization limit disparities in analysis since FS is highly variable, both within and between samples (Semiyaga *et al.*, 2017).

Figure 2-4: Homogenized faecal sludge samples from Wobulenzi cluster towns (from 1 to 10, in order)

2.7.2. Faecal sludge sample analysis

Potential contaminants in FS were grouped into solids, organics, nutrients and pathogens and some selected parameters under these categories were determined. The solids parameters measured included total solids (TS), total volatile solids (TVS), total suspended solids (TSS) and sludge volume index (SVI); organics parameters included chemical oxygen demand (COD) and biochemical oxygen demand (BOD_5); nutrients parameters included total nitrogen (TN) and total phosphorus (TP); and pathogens indicator included Faecal coliform. Other important general characterization parameters determined included pH, temperature, electroconductivity (EC) and oxygen reduction potential (ORP).

TS, TSS, COD, BOD_5, TN and TP were determined according to standard methods as applied to examination of water and wastewater (APHA/AWWA/WEF, 2012). TS concentration was determined gravimetrically by taking the weight of oven dried sample at 105^{o}C till a constant weight (for 24 hours) as a fraction of wet sample volume. TSS was determined photometrically by using Spectrophotometer DR 2800. SVI was determined through diving volume of FS settled in Imhoff cone by the TSS concentration. Settled volume was estimated by settling one litre of faecal sludge in Imhoff cones for 60 minutes. COD was determined using the closed reflux colorimetric method (APHA/AWWA/WEF, 2012). Concentrations of total nitrogen were determined with standard vial tests of Dr. Lange: LCK 238 (5-40 mg/l TN) for total nitrogen. Biochemical oxygen demand (BOD_5) was determined using the CAMLAB BOD track (serial no. 26197-01; Loveland, Co 80539, USA). The concentration of total coliforms was determined with Chromocult Coliform Agar media using the spread plate method (APHA/AWWA/WEF, 2012).

2.8. Cultural Heritage Methodology

It is common knowledge that understanding the origins and development of human societies is of fundamental importance to humanity in identifying its cultural and social roots. It is therefore important to protect our cultural/ archaeological heritage. This study captures issues concerning the cultural / archaeological heritage existing close and within the proposed site for the Faecal Sludge treatment facility. Several methods were used to detect the presence of any archaeological heritage. These included;

2.8.1. Literature Review

In the field of archaeology, past records are very important, so in an area like Wobulenzi Town Council which has some archaeological work on record, it was very important to have a look at the available data for information.

2.8.2. Selective Survey Sampling

Brief foot surveys were conducted mostly in areas to be impacted directly by the proposed Faecal Sludge treatment facility, areas mentioned by the local people during consultations which yielded built heritage, shrines, burials and pottery for analysis. The method of data collection included observations, recordings, informant interviews and consultations, photographic documentation of cultural resources and other environmental features likely to be both negatively or positively impacted on by the project. Surface inspection along exposed gullies, on newly cut roads, trails, riverbanks and at the basement of some the hill near the project.

2.8.3. Interviews and Focus Group Discussions

Meeting and interviews with community leaders and the local people were a major source of information about the current socio-cultural lives of the people living in and around the project area. In such discussions members were made to have a better understanding of different heritage properties, with the hope that they will in turn inform the working team of such properties in the area

2.8.4. Legal Frame Work

The umbrella of legislation that exists in the protection of cultural heritage in Uganda is both national and international. The national legal regime stems from the Constitutional provision that specifically provides for the protection of cultural heritage. According to the constitution of the Republic of Uganda, under Article 37 every person has a right to belong to, enjoy, practice and profess, maintain and promote any culture, cultural institution or tradition in community with others. Under the National Objectives and Directive Principles of State Policy, the State is obliged under objective XXIV and XXVII to promote protect and preserve cultural values and practices which enhance the dignity and wellbeing of Ugandans. Other laws reviewed included;

a) The Historical Monument Act of 1967
b) The National Environment Act 2019, Schedule 7
c) The Historic Monuments Act is the principal legislation that provides for the conservation and protection of historical monuments or objects archaeological, paleontological, ethnographical and traditional interest.
d) National Environment (Environment Impact Assessment) Regulations, 1998.
e) UNESCO World Heritage Convention, 1972) the convention concerning the protection of the world cultural and natural heritage.

2.9. Methodology/Criteria for Assessing Significance of Impacts

Potential and apparent impacts have been identified based on proposed activities to be undertaken, through specialist studies on site and through a consultative process with key stakeholders as discussed extensively in **Chapter 6**.

The initial impact identification presented in Table 2-4 specifically targets issues identified within the First schedule of the EIA regulations for Uganda of 1998.

Within this Impact identification phase, the project in general is evaluated against the possibility of resulting into a stated impact on Ecology, Social considerations, landscape or Land use.

The anticipated probability of causation of impact is rated as:

- ✓ Not possible (No)
- ✓ May impact
- ✓ Likely to impact
- ✓ Will Impact

Table 2-4: Impact Screening based on anticipated activities from the proposed Faecal sludge treatment plant in Wobulenzi Town Council

Recommended Considerations	Will the Project Directly or indirectly impact on?	No	May	Is likely	Will impact	Activities/ stage of Project implementation
Ecological						
Biological diversity	Number, diversity, breeding habits, etc. of wild animals and vegetation				X	Site preparation Existing vegetation to be removed.
	Gene pool of domesticated Plants and animals e.g., monoculture as opposed to wild types.	X				
Sustainable use	Soil fertility				X	Soil to be moved, and replaced during site restoration
	Breeding populations of fish and game or wild animals.	X				No breeding site observed.
	Natural regeneration of woodland and sustainable yield				X	
	Wetland resource degradation or wise use of wetlands	X				
Ecosystem maintenance	Food chains.	X				
	Nutrient cycles.				X	Removal of vegetation likely to cause changes in soil nutrient recharges e.g., less nitrogen. limited to construction phase
	Aquifer recharge, water run-off rates etc.	X				Site clearance for siting the Faecal sludge treatment plant and the related infrastructure, more paving and less greenery will lead to increased run-off.
	Areal extent of habitats.				X	
	Fragile ecosystems				X	
Social considerations	Generation or reduction of employment in the area				X	Employment opportunities during construction
	Social cohesion or disruption				X	Cohesion possible with a higher concentration of people in one area, noise
	Effect on human health.				X	Non-direct impact from the

Recommended Considerations	Will the Project Directly or indirectly impact on?	No	May	Is likely	Will impact	Activities/ stage of Project implementation
						project. Crowding does have an impact in exacerbating communicable disease spread, impacts on Occupational and public safety possible during construction
	Immigration or emigration.				X	Very likely that people will migrate to live here.
	Communication roads opened up, closed, re-routed.				X	
	Local economy				X	Increased revenue and increased reliable energy supply.
	Culture and objects of cultural value.	X				No elements of cultural value observed in this area.

3. LOCATION AND DESCRIPTION OF ACTIVITIES AT THE PROPOSED FAECAL SLUDGE MANAGEMENT FACILITIES

This chapter explains in the details the location of the project, the proposed project components, and the cost estimates for the faecal sludge treatment plant project in Wobulenzi Town Council. It is aimed at providing an insight into the extent of the proposed project and set a stage for analysis of the likely impacts.

3.1. Location of the Target Area

The towns under the Wobulenzi cluster are located in the districts of Luwero and Nakaseke.

Luwero District is located in Central Uganda, approximately 62km from Kampala City. The district is accessed via a tarmac road on Kampala – Gulu highway. The district is bordered by the districts of Kayunga and Mukono to the East, Wakiso to the South, Nakaseke to the West, and Nakasongola to the North.

Nakaseke District is located in Central Uganda, approximately 120km from Kampala City. The district is accessed via a tarmac road on Kampala – Gulu highway and gravel road from Luwero Town Council. The district is bordered by the districts of Nakasongola and Luwero to the East, Wakiso to the South, Mityana to the South West, Kiboga and Kyankwanzi to the West, and Masindi to the North.

The proposed towns under Wobulenzi cluster are Luwero Town Council, Wobulenzi Town Council, Bombo Town Council, Zirobwe Town Council, Busiika and Kiwoko. All the towns are located in Luwero District apart from Kiwoko located in Nakaseke District as shown in Figure 3.1 below.

The Proposed Wobulenzi cluster Faecal sludge treatment facility is to be location in Bukolwa LCI, Bukolwa Parish, Wobulenzi Town Council, Luwero District as shown in Figure 3.2 and 3.3 below.

The following was noted about the proposed project site.

- The land is privately owned, and the landowner is willing to sell (See the **appendix 7** for consent)
- The access road to the site is a gravel road
- The site is surrounded by farmland and the nearest settlements are at least 200m away
- The acreage of the site is approximately 2.52 acres. There is more acreage available
- The ground profile is sloping towards the stream
- There is a stream and sizeable swamp on the western boundary
- The site has access to electricity and piped water supply system; the utilities are located along the major access road approximately 1km away.

The GPS Coordinates of the proposed site are located in the table below.

Table 3-1: GPS coordinates of the proposed Faecal sludge site

Wobulenzi	Bukolwa LCI, Bukolwa Parish, Wobulenzi Town Council, Luwero District	Pt 1	443720.00 mE	80088.00 mN	1070 metres above sea level
		Pt 2	443703.00mE	80154.00mN	1109 metres above sea level
		Pt 3	443694.00 mE	80167.00 mN	1109 metres above sea level
		Pt 4	443648.00 mE	80245.00 mN	1105 metres above sea level
		Pt 5	443666.00 mE	80202.00 mN	1107 metres above sea level
		Pt 6	443571.00 mE	80058.00 mN	1109 metres above sea level
		Pt 7	443520.59 m E	80205.00 m N	1109 metres above sea level

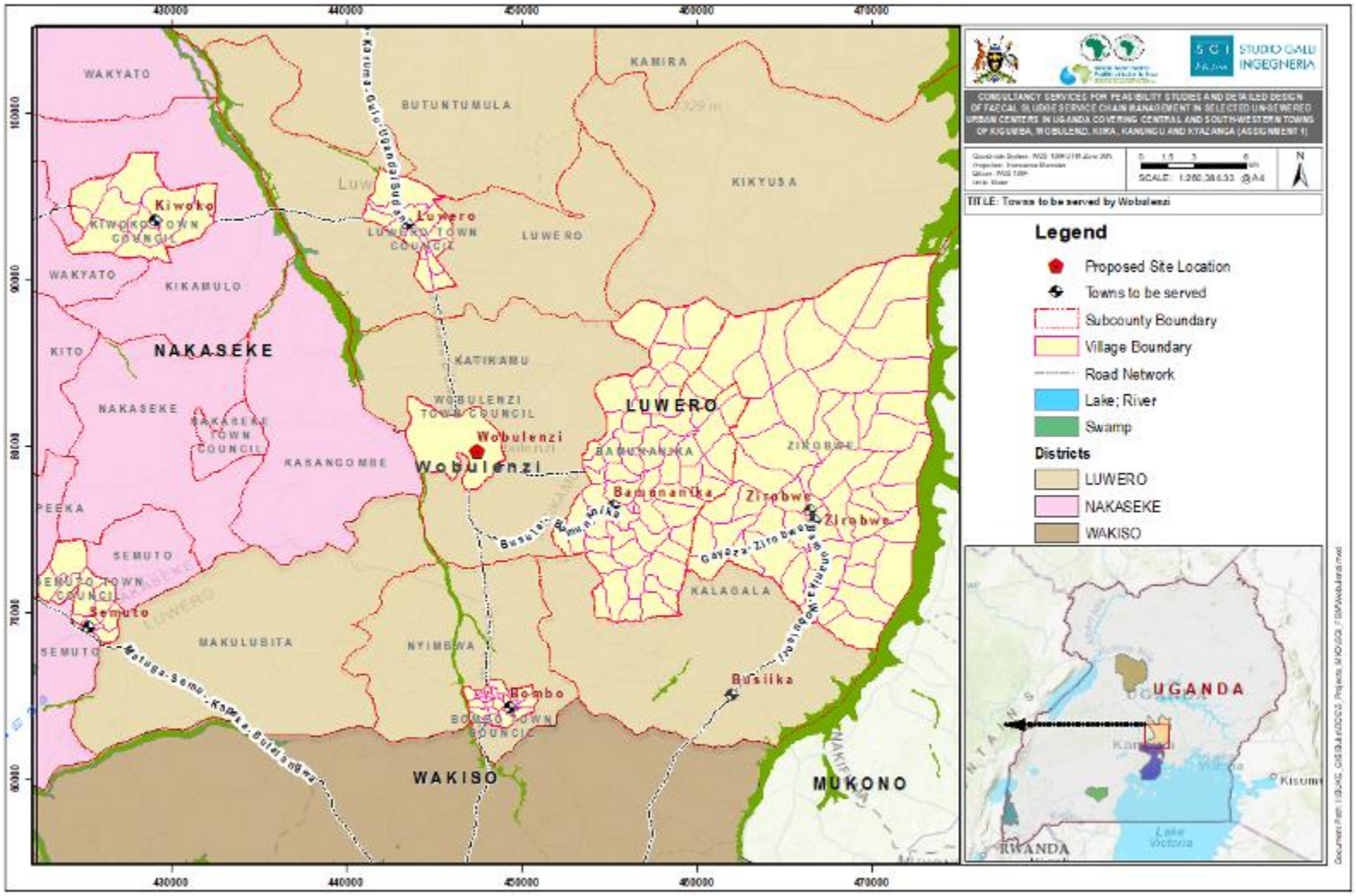


Figure 3-1: Map showing Wobulenzi Cluster Towns

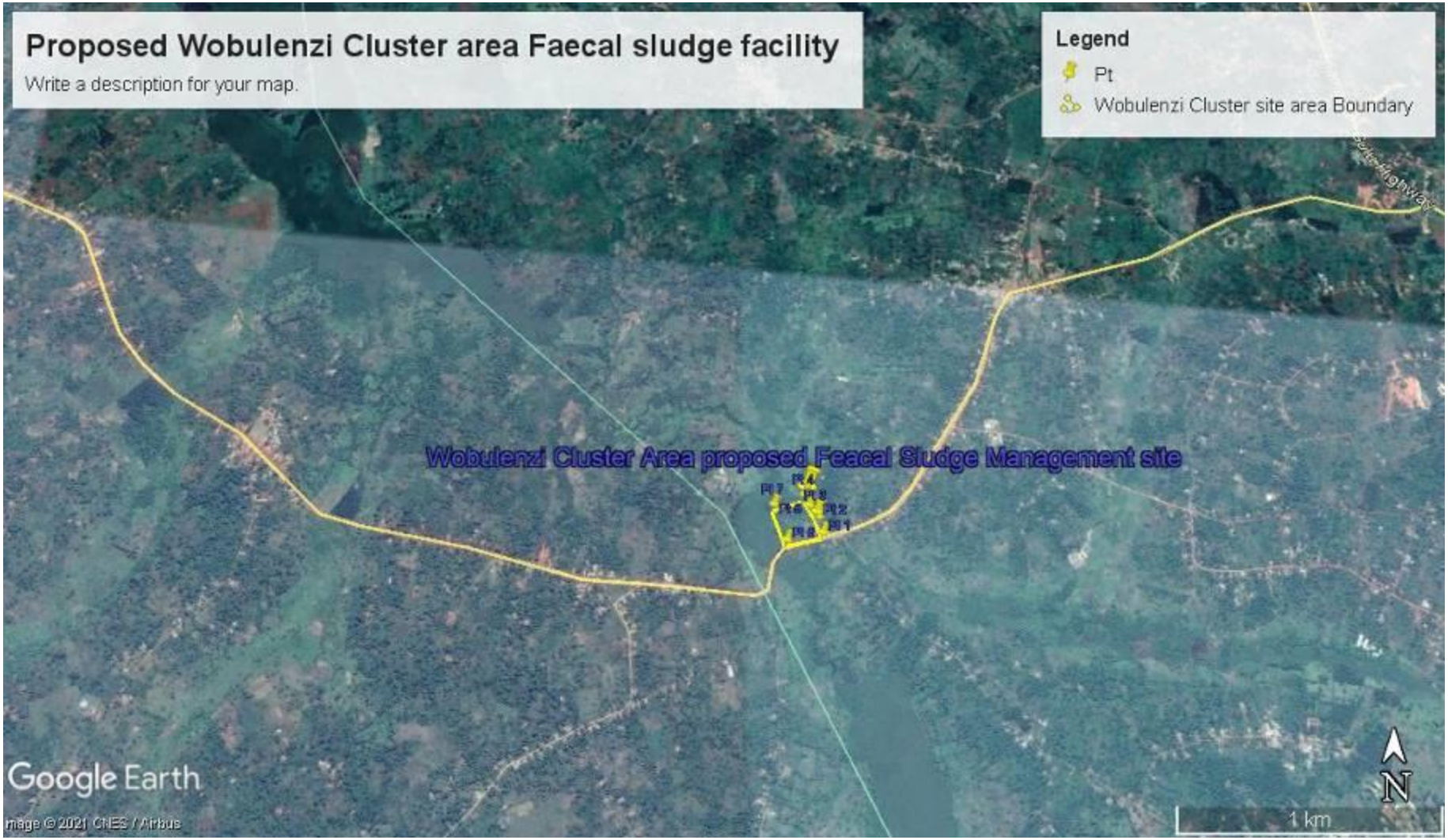


Figure 3-2: Map showing the general location of the proposed Wobulenzi Cluster area Faecal sludge facility

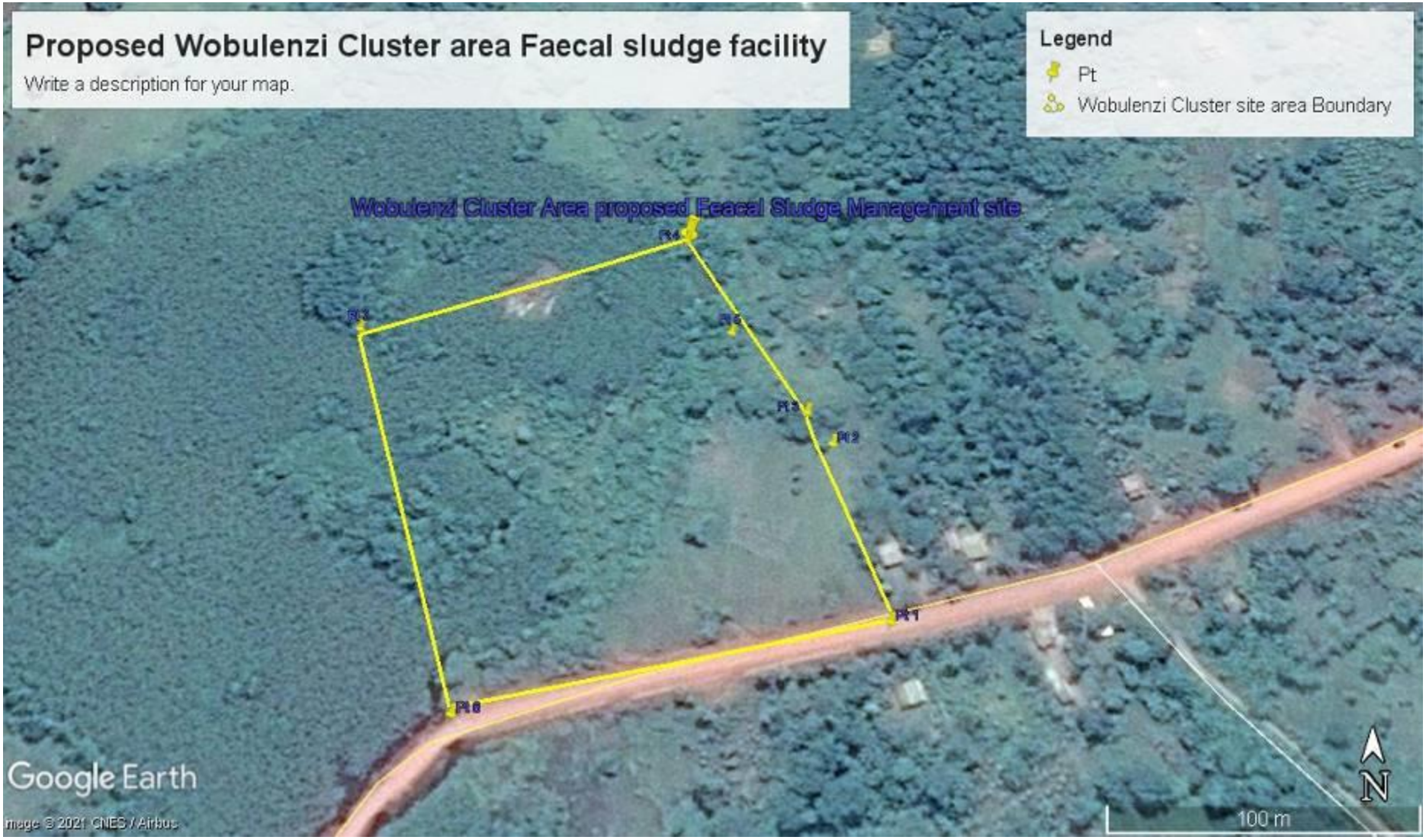


Figure 3-3: Map showing the exact location and boundaries of the proposed Wobulenzi Cluster area Faecal sludge facility

Figure 3-4: Cardinal view of the Proposed Site

3.2. Detailed Design of the Faecal Sludge Treatment Facility

3.2.1. Design Faecal Sludge Volume

The methods for quantification of faecal sludge varied according to sources. Faecal sludge sources in Wobulenzi cluster towns were categorized into residential households and institutions (educational, commercial and public).

3.2.1.1. Households' faecal sludge estimation

Three approaches were used to determine the faecal sludge volume at the design horizon:

1) Estimation of the FS Volume for Households Based on Water Connection

In the residential households, those connected to the piped water supply system were considered because they are the likely ones to have septic tanks. However, majority of households with piped water supply, with yard connections in such town councils use unlined pit latrines, indicating a small percentage of septic tanks in the households. After having water connections in the towns and construction of faecal sludge treatment plant, many town councils enforced new household construction plans to have a septic tank before approval. This gave an indication of the likely

increase of septic tanks in the town councils. Therefore, the following assumptions were considered in volume computations:

- ✓ Household populations were adopted from UBOS (2014) census reports for the respective town councils.
- ✓ The number of households connected to the piped water supply and the connection types were obtained from the water supply operator (National Water and Sewerage Corporation - NWSC) in the respective town councils.
- ✓ The annual growth rates in water connections of 2% for house connections and yard taps were adopted from the Final Report for the National Faecal Sludge Assessment for Small Towns in Uganda, 2013.
- ✓ The connections per category and population served were projected for the next 15 years, using 2022 as the base/initial year. The initial year was set to two (2) years ahead of detailed design year (2020) to allow for implementation lead time (procurement and construction of the faecal sludge treatment plant). The detailed design year is 2020. This makes the ultimate year to be 2037. However, since this is close to 2040, the ultimate year was made to correspond with Uganda vision 2040, hence increasing design life to 18 years.
- ✓ Lined pits and septic tanks are the only easily emptiable facilities, hence the only ones considered to contribute the required FS to the treatment plants.
- ✓ The projected number of households with septic tanks was estimated by adding the current number to the assumed future number based on water connections. The assumption was 50% of the new connections will construct a waterborne facility since the Town councils are ready to enforce every household to have a septic tank after construction of the treatment plant. This is because it is very difficult to have 100% because of the following reasons:

    - Most of the water connections are not household. It is household connection that favor the use of septic tanks.
    - Lined pits and septic tanks are expensive facilities, hence affordable to a few people.
    - Policy implementation/enforcement has always been a challenge, hence not easy to enforce 100% of new connections.

- ✓ Sludge and scum accumulation rate of 200l/P/year was be adopted (Morel & Diener, 2006). The same value was recommended for septic tanks in the Kampala Sanitation master plan, where 120 l/P/year was used for lined pit Latrines.
- ✓ A treatment facility is expected to be working 6 days per week (Monday to Saturday), 52 weeks per year and 10 hours per day (8 am to 6 pm).
- ✓ Using this approach, the FS volume to be treated at the treatment facility will be 15.6 m^3/day (Table 3-2).

Table 3-2: Design FS Volume for Households Based on Water Connection

Town Council/ Sub-County	Projected connections in Year 2040	Current HH with septic Tanks/lined pits - 2020	HH Using Septic Tanks - 2040 (Assum:50 % of new connections)	Population per Household	Population, P	Sludge and scum accumulation rate, S (N<5)	Volume of Sludge and scum in 1 year, B=PxS	Daily Sludge generated
						m^3/P/year	m^3/year	m^3/day
Bombo TC	2801	879	1062	3.8	4037	0.2	807.3	2.59
Bamunanika	74	881	886	4.3	3808	0.2	761.6	2.44
Zirobwe	1051	1376	1445	4.3	6213	0.2	1242.6	3.98
Luwero TC	4589	1496	1796	3.6	6465	0.2	1292.9	4.14
Wobulenzi TC	1646	914	1022	3.8	3884	0.2	776.9	2.49
Sub-Total					24406		4881.3	15.6

Source: Project estimates

2) Estimation of the FS Volume for Households using the Baseline survey Data

This approach used the responses from the baseline survey data, in which the percentage of respondents with septic tanks and lined pit latrines was used in computation of the faecal sludge volumes. To arrive at the faecal sludge volume, the following was considered:

- ✓ Household populations was adopted from the UBOS (2014)) census reports for the respective town councils.
- ✓ Current (2020) household number determined by projecting using growth rate in UBOS (2015) Census report.
- ✓ Percentage of households with septic tanks and lined pit latrines was obtained from the survey data. This was used to estimate the current household number with septic tanks.
- ✓ The projected households with septic tanks in the design horizons was calculated using household growth rate for the Town councils.

Where:

: is the projected number of households after n years

: initial number of households

: household growth rate

: design life

- ✓ Population growth rate adopted for Luwero district was 2.45% (UBOS, 2014).
- ✓ Sludge and scum accumulation rate of 200l/p/year was adopted (Morel & Diener, 2006).
- ✓ A treatment facility is expected to be working 6 days per week (Monday to Saturday), 52 weeks per year and 10 hours per day (8 am to 6 pm).
- ✓ With this approach, the FS volume produced will be **18.5 m^3/day** (Table 3-3)

Table 3-3: Design FS Volume for Households using the Baseline survey Data

Town Council	% of HH with septic tanks/lined pits using baseline data	Current No. of HH with Septic Tanks/Lined pit latrines - 2020	Projected HH with Septic tanks - 2040	Population per HH	Total population	Sludge and scum accumulation rate, S (N<5)	FS Volume, B=PxS	Daily Sludge generated
							m^3/year	m^3/day
Bombo TC	25	1949	3193	3.2	10217	0.2	2043.50	6.55
Bamunanika	4	289	469	4	1876	0.2	375.10	1.20
Zirobwe	4	525	851	4.4	3746	0.2	749.26	2.40
Luwero TC	9	1207	1958	4.3	8420	0.2	1684.06	5.40
Wobulenzi TC	8	649	1053	4.4	4632	0.2	926.31	2.97
Total					28891		5778.23	18.5

Source: Project estimates

3) Estimation of FS Volume for households using baseline survey data – With Unlined pits considered

From practices on the existing FS treatment plants, it has been observed that a fraction of FS from unlined pit latrines is emptied using semi-mechanized means or manually and transported to the treatment plant. This is usually thick sludge which is emptied into drums and transported using trucks or tricycles to the treatment plants. Therefore, some assumptions are made to consider this fraction of FS to be delivered to the treatment facility:

- ✓ Household population based on census report (UBOS, 2015),
- ✓ Current (2020) household number determined by projecting using growth rate in UBOS (2015) Census report.
- ✓ Fraction of households with lined pit latrines, septic tanks and unlined pit latrines was obtained from the baseline survey data. The following percentages of population relying on different facilities was obtained (Table 3-4).

Table 3-4:Fraction of population using different sanitation facilities

Town Council	Septic Tanks	Lined pit latrines	Unlined pit latrines
	%	%	%
Bombo TC	12.5	12.5	75.0
Bamunanika	3.7	0	96.3
Zirobwe	2	4.3	93.6
Luwero TC	1.8	7.3	89.7
Wobulenzi TC	15.2	4.3	78.3

- ✓ Sludge accumulation rates for septic tanks, lined pit latrines and unlined pit latrines were based on those in Kampala Mater plan and WHO guidelines. Values adopted include: 0.2, 0.12 and 0.06 for septic tanks, lined pit latrines and unlined pit latrines, respectively. Using these values, FS volume of 40.15 m^3/day is obtained

- ✓ However, it is not possible to have all the pit latrines emptiable since the most common available option is to cover a full one and construct a new unlined pit latrine.
- ✓ Projected number of households in 2040 was given by the equation below:

Where:

projected number of households in 2040

initial number of households in 2020

household growth rate

design life

- ✓ Assume, 50% of the owners of unlined pit latrines are located in urban areas where is it difficult to construct new facilities, hence need of emptying. The FS volume from unlined pit latrines which will reach treatment plants in 2040 will be 23.3 m^3/day.
- ✓ Total FS volume to be received at the treatment plant was 40.15 m^3/day (Table 3-5)

Table 3-5: Design FS Volume for Households considering unlined pit latrines

Household Facility	Households (potential demand) - 2020	Households Demand - 2040	Average Household size	Total Population	Sludge per capita per annum	Daily Sludge generated
					m^3/P/year	m^3/day
Septic Tanks	2978	4833.2	4.06	19623	0.2	10.75
Lined pit latrines	2816	4569.1	4.06	18550	0.12	6.10
Unlined pits	43032	69827.7	4.06	283501	0.06	23.30
Total	48826	79230		321674		40.15

Source: Project estimates

In considering the three approaches, the FS volume based on baseline data, with no consideration of unlined pit latrines was taken as the minimum variant and that based on the baseline line survey data, with consideration of unlined pita latrines as the maximum variant. In order not to over design or under design the system, the average of the three volumes (FS volume = 24.77 m^3/day) was taken as the design FS volume for the households in the project areas.

3.2.1.2. Faecal Sludge Volume from Educational, Commercial and Public Institutions

The current number of institutions in each town council were determined through stakeholder consultations. The different institutions considered included: schools, health Centre's, churches/mosques, hotels, restaurants/guesthouses/lodges, fuel stations, markets, vehicle parks, factories and civil institutions (police, prisons, banks, town council/sub-county offices, NWSC offices, etc.). The average number of people per institution category in each town council was determined, through baseline surveys and stakeholder consultations.

The total current population was determined by multiplying the average population by the number of institutions and summed up for different intuitions. Projections for the ultimate year 2040 were made using the population growth rate based on census report (UBOS, 2014).

Using sludge and scum accumulation rate of 200l/p/year, the FS volume produced per year was computed and this was used to estimate the daily production rate.

The assumption here is all the institutions are connected on emptiable facilities by the design life of the project. For example, the findings from the baseline survey data show that schools in a number of town councils were relying on emptiable sanitation facilities (lined pit latrines and septic tanks). Also, the presence of a faecal sludge treatment plant in the vicinity will lead to enforcement of the regulations to have the non-compliant institutions constructing emptiable facilities.

Using this approach, the FS volume produced from the institutions in Wobulenzi cluster towns was **96.6 m^3/day**

3.2.1.3. Design FS Volume delivered to Treatment Plant

The total FS produced was the sum of household and institutional FS, which was **121.38** m^3/day. However, not all the potentially produced FS will be delivered to the FS treatment plant for the following reasons:

- Some will remain unemptied and the owner digs another sanitation facility
- Sanitation technologies may be poorly designed and do not allow emptying
- Some people will lack finances to support emptying
- Others practice illegally dump in a freshly dug pit next a full facility
- Some emptiers do not reach treatment plant and dump in the environment.

Some of these illegal practices call for strengthening in implementations of regulations and bye-laws.

It is therefore assumed that 30% of the produced faecal sludge will be delivered to the treatment plant. This is because various towns under consideration are located at a distance far from the proposed location, hence increasing chances of some places using other plants that could be in their vicinity. Therefore, the total daily design volume becomes **36.41 m^3/day (Table 3-6)**.

Table 3-6: Average FS to be delivered to FS treatment facility

Category	**FS produced**	
Household FS	24.77	m^3/d
Institutional FS	96.60	m^3/d
Total	**121.38**	m^3/d
Assume 30% reaches the treatment plant	**36.41**	m^3/d

Source: *Project estimates*

3.2.2. Design of FS treatment process units

3.2.2.1. Choice of treatment technologies

The concentration in the outflow effluent of the FS treatment plant will be, according to the standards of the National Environmental Management Authority (NEMA), as follows:

BOD - 50 mg/l,

Faecal coliforms - 5000 FC/100ml

In order to fulfil the requirements concerning the quality of the effluent of the FS treatment plant and the percentage of clarification, different treatment technologies were investigated. However, taking into consideration the prevailing temperatures in Wobulenzi cluster as well as the economical and the operational aspects of the project, it was concluded that the use of below listed processes is the most appropriate system for the treatment of the FS. This treatment process requires little maintenance and has a considerable advantage with respect to the initial capital investment and maintenance costs. The proposed faecal sludge treatment process will involve the following units:

1) Inlet works
    - Bar screens
    - Grit chamber
2) Settling tank
3) Anaerobic Baffled Reactor
4) Unplanted drying beds
5) Facultative ponds
6) Ancillary works
    - Administration Building with a laboratory
    - Storage bunker for dried faecal sludge
    - Fencing

3.2.2.2. Inlet works

The inlet works will be comprised of a galvanized bar screen and grit chamber. The screen will be sized to the maximum peak flow from a vacuum truck discharging. The screens comprise of manually raked 20mm bar screens inclined at 30^{o} to the vertical. Sanitation technologies were found to have high volumes of solid wastes, which will form the screenings at the FS treatment facility. The screens will be raked manually onto the perforated steel troughs where the screenings will be allowed to dewater. Screenings/solid wastes will be placed in a storage skip and then disposed at landfill or space for drying will be provided to aid disposal through incineration.

The screened liquid FS will then be led to the grit chamber to remove suspended inorganic particles such as sand and grit. A twin grit chamber will be provided to allow easy maintenance of one chamber while the other chamber remains in operation. The FS after grit removal will be led to the settling-thickening tank for separation of solid from the liquid FS.

3.2.2.3. Screens

In order to prevent bulky material such as solid wastes from entering the treatment plant and to disturb the treatment process a screen shall be foreseen at the inlet of the plant. The dimensions of the screen at the FSTP is given in Table 3-7 below.

Table 3-7: FSTP Screens Characteristics

Chosen characteristics of the Screens	Units	Wobulenzi Cluster FSTP
Width of chamber	mm	1000
Depth of chamber	mm	350
Bar thickness	mm	10
Spacing between bars	mm	30
Slope in relation to the vertical	Degree	30°
Number of bars	Nr	20
Bar spacing	mm	30
Bed slope	m	1 in 94
Drop after the screen	mm	150

The FSTP middle fine screen will have 10mm thick bars made of galvanized steel spaced 30mm space apart and inclined at 30° to the vertical.

The screened material shall be removed using hand rakes. Perforated steel troughs for the screenings shall be used for placing the screenings on. The screenings are first raked manually onto the perforated steel troughs where the screenings are allowed to dewater. From there, the screenings can be placed in a nearby storage area and then removed. Screenings should be burnt or buried with 40 cm of soil cover.

The screen chamber will be equipped with an upstream and downstream sliding gate (penstock) for isolating and controlling the flows into the anaerobic ponds in the event that maintenance needs to be done and also if a need for the bypass to be used arises. The cleaning of the chamber and the removal of sand shall be carried out during the periods of low volumes delivered to the treatment plant.

3.2.2.4. Grit Chambers

The FS treatment plant shall be equipped with two parallel open channel grit chambers. FS contains high concentrations of suspended solids and large amounts of inorganic/sand particles. These require a grit chamber for their removal before joining settling-thickening tanks. One chamber shall be used, with the second closed. For large flows at the same time, both channels shall be in use.

Each channel will be equipped with an upstream and downstream sliding gate (penstock) for isolating the channels in the non-working phase. The grit shall be removed manually once the grit channel is filled with sand. **A grit deposit area** shall be constructed near the grit chamber where the grit can be washed and wash wastewater continues to settling-thickening tank. The characteristics of the Grit channels at the FSTP are given in **Table 3-8** below.

Table 3-8: FSTP Grit Chambers Characteristics

Chosen Characteristics of Grit Channels	Units	Wobulenzi Cluster FSTP
No. of Grit Channel Units	Nr	2
Depth of channel	m	1.2
Velocity in Channel	m/s	0.37
Width of each Grit Channel unit	mm	600
Length of each Grit Channel unit	m	3.0

The cleaning of the channels and the removal of sand shall be carried out during the low flow periods.

3.2.2.5. Settling Tank

The settling-thickening tanks have been designed to remove suspended solids by sedimentation. The low flow velocity in a settler allows settleable particles to sink to the bottom, while constituents lighter than water float to the surface.

A two-compartment settler will be provided of 18m total length, 2.0m width and 1.8m depth (Table 3-9). A desludging interval of 2 months has been considered. Desludging will be by vacuum tank through the inspection manholes and the sludge will be placed on the sludge drying beds. The FS is retained in the settling tank for 3 hours at the design horizon, the retention period will be longer in the first years of operation. The effluent from the settler will be conveyed to anaerobic baffled reactor (ABR) and later joins the facultative pond with 150mm diameter PVC pipes for further treatment. The bottom, top slabs and the side walls will be constructed with reinforced concrete.

Table 3-9: FSTP Settling-Thickening Tank Dimensions

Chosen Characteristics of Settling-Thickening Tank	Units	Wobulenzi Cluster FSTP
No. of Tanks	Nr	2
Overall internal length	m	18
Internal width of each tank	m	2.0
Tank depth	m	1.8
Length of 1st compartment chamber	m	12
Length of 2nd Compartment chamber	m	6
Diameter of PVC pipe to facultative pond	mm	150
Desludging interval	Months	2

3.2.2.6. Sludge Drying Beds

4 No reinforced concrete sludge drying beds have been provided each measuring 19.2m x 19.2m and 1.1m deep. Each sludge drying bed shall have a ramp access for vehicular access or pedestrian access for moving sludge. Each bed shall be fed by DN 110mm UPVC pipe with gate valve to allow the choice of beds to fill (Table 3-10).

The sludge drying beds are covered with a roof to avoid rainfall from rehydrating the drying sludge. The sides to the roof are elevated to allow for optimum drying conditions and vehicular access. The base shall consist of slightly inclined reinforced concrete slab. The area shall be surrounded by a

protection wall. One drainage pipe shall connect the drying area to the facultative pond so that if sludge drain water still exists it will flow back to the ponds. The dried sludge shall be removed periodically from the sludge drying area and shall be taken to tip, burnt or be given to interested farmers.

Table 3-10: FSTP Drying Bed Dimensions

Chosen Characteristics of Drying Beds	Units	Wobulenzi Cluster FSTP
No. of sludge drying beds	Nr	4
Length of each bed	m	19.2
Width of each bed	m	19.2
Bed depth	m	1.1
Feeding pipe diameter (UPVC)	mm	DN 110
Depth of sand layer	m	0.20
Depth of fine gravel	m	0.10
Depth of course gravel	m	0.15

3.2.2.7. Anaerobic Baffled Reactor (ABR)

A baffle reactor with 4 up-flow chambers each of 1.0 m length, 3.1m wide and 2.0m depth has been sized. Vents are provided to let out the methane produced in the reactor. BOD removal rate is 84%. The effluent from the ABR will be conveyed to the facultative pond with 100mm diameter PVC pipes for further treatment.

Table 3-11: FSTP Anaerobic Baffled Reactor Dimensions

Chosen Characteristics of ABR	Units	Wobulenzi Cluster FSTP
No. of up-flow chambers	Nr	4
Length of each chamber	m	1.0
Width of each chamber	m	3.1
Water depth at outlet	m	2.0
Free board	mm	300
Distance between pipes	mm	< or = 300

3.2.2.8. Facultative Pond

Effluent from the settling-thickening tanks and sludge drying beds is collected for treatment in the facultative waste stabilization pond. One facultative pond measuring 22m x 11m x 1.5m depth has been provided. The BOD is reduced from 220.78 mg/L (ABR effluent) to 99.6 mg/l and the faecal coliforms reduced from 2.96 x 105 to 5495 Faecal Coliforms/100 ml, all these figures are above the NEMA acceptable limits of 50mg/l and 5000 FC/100ml respectively for receiving streams, hence a need for further treatment of the wastewater using maturation ponds. A geosynthetic clay liner has been allowed for on the slopes and bottoms of the pond to prevent seepage of the leachate and contamination of the insitu soil and underground water. The pond embankments will be protected from

wave action erosion with concrete slabs, laid on a concrete ring beam. The FSTP for Wobulenzi cluster shall contain one Facultative Pond. The dimensions of the pond are given in Table 3-12 below.

Table 3-12: Dimensions of Facultative Ponds

Term	Unit	Wobulenzi Cluster FSTP
Total Volume of FS loaded per day	m^3/day	36.41
Freeboard	m	0.5
Slope of Embankment (1: x)	-	2
Relation Length/Breadth	-	2:1
Depth of FS in pond	m	1.5
Mid-depth dimensions of pond; L X W	m	22.0 X 11.0
BOD Concentration at effluent from facultative pond	mg/l	99.6
Coliform Load after facultative pond	No/100ml	5495
Source: Project Estimates,		

For the FSTP, the effluent BOD_5 concentration of the ponds system is, at 24.1°C, is 99.6 mg/l and the Faecal Coliform load of the effluent is 5495 No/100ml, both of which are slightly above NEMA standards of 50 mg/l and 5000 No/100 ml, respectively. Further polishing of the effluent will be done by the existing natural wetland.

3.2.2.8.1. Connections

The interconnections between the various ponds shall be with DN 200 pipes fitted with sluice valves. The sluice valves shall be of the socket ended type to fit uPVC spigots.

3.2.2.8.2. Erosion Protection

As erosion protection, the embankments will be provided with concrete slabs to be cast in-situ and to be anchored in the slope. The slab shall be of reinforced concrete and at least 10 cm thick. The width of the protection slab shall be 1.50 m fixed at the water level.

3.2.2.9. Water supply, Electrical Installations and Sanitary Facilities

The treatment plant shall be provided with a water connection. Sanitary facilities shall be provided as well as electrical installations. The operation building, the roads and lanes of the treatment plant and the corners of the ponds are to be supplied with electrical installations for illumination purposes

3.2.2.10. Ancillary works

An administration building containing an operational staff office, store, and a laboratory will be provided at the FS treatment facility. The operations building shall be constructed of reinforced concrete and hollow core concrete blocks for the walls. A generator structure will be constructed near the pump house to accommodate a standby generator.

Fencing, security lighting and site water supply system is to be installed together with drainage ditching and 2-coat bitumen and chip surface dressing of access road to and within the site. Other

facilities shall include roads, walkways and parking areas. Open areas shall be covered with lawns and flowers. Trees, ornamental plants and bushes shall be selected from those species, which do not shed too many leaves nor require too much maintenance. Tall trees, which would cut down wind access to the ponds, shall be avoided.

3.2.2.11. Laboratory Facilities

In order to ascertain the performance of the faecal sludge treatment plant, it is prudent that there is a laboratory facility at the site. Considering the proposed treatment unit processes and unit operations, routine monitoring will be required for the following parameters: pH, TS, TSS, COD, BOD5, Nutrients (Total Nitrogen and Total Phosphorus) and Total nitrogen of the faecal sludge.

In addition, ascertaining the quality of the dried faecal sludge will necessitate determination of pH, Moisture content, Nutrients (N & P), Calorific value (possibility for use as an energy source), Ascaris eggs (for safety) and heavy metals (Cd, Pb and Cr). It suffices to point out that except for calorific value, heavy metals and ascaris eggs, it is proposed that the rest of the parameters be undertaken at the site laboratory facility using the proposed equipment and consumables.

In order to avoid cross contamination, it is necessary that the laboratory facility is constructed in such a way that it is with separate sections for physical/chemical and microbiological analyses. There should be provision for appropriate storage of chemicals/reagents and consumables, sterilization of used glassware/containers and pertinent accessories and safe disposal of materials.

The operators at the plant and also within the laboratory will wear appropriate personal protective equipment at all times with hygiene safety given priority

Table 3-13: Proposed Equipment for laboratory facility at the faecal sludge treatment plant

S/N	Equipment/ Consumables	Description	Purpose
1	pH/EC meter	Hach HQ30d flexi model with pH and EC probe. Calibrations solutions for pH and EC	For in-situ determination of pH, EC, ORP and temperature
2	Incubator	LEEC C157 incubator, with internal dimensions (HxWxDmm) = 573x550x500, chamber capacity 157litres, 4 shelves, power rating (Max 280), Temperature range at least more than 5ºC above ambient to +60ºC. Temperature control typically ±0.1ºC at 37ºC.	For determination of Faecal coliforms
3	Dry Oven	Memmert Universal oven Model UFB 500; Interior Heating Concept (with English manual) Size: w x h x d = 560 x 480 x 400 mm, 108 l easy-to-clean interior, made of stainless steel, reinforced by deep drawn ribbing with integrated and protected large-area heating on four sides 2 stainless steel grids Temperature Range: from +30 °C (however, at least 10 °C above ambient) up to +220 °C	For determination of total solids and total dissolved solids

S/N	Equipment/ Consumables	Description	Purpose
		Voltage / Power Rating: 230 V (+/- 10%), 50/60 Hz ca. 2.000 W (during heating)	
4	BOD measurement system (3 sets)	BD 600 BOD measurement system 6 place -Product No.1200199 or 2444460. Each set includes; BD 600, complete unit with 6 sensor heads and control unit with batteries Power supply unit incl. Y-cable for common power supply of BD 600 and stirring unit 1 x USB-cable 1 x remote control Inductive stirring unit 6 sample bottles 6 rubber gaskets 6 magnetic stirring rods 1 overflow flask, 157 ml 1 overflow flask, 428 ml 1 bottle, 50 ml potassium hydroxide solution 1 bottle, 50 ml nitrification inhibitor solution 1 instruction Manual (in English) Include the BOD system test set calibrations tablets for testing the manometric measurement BOD system above (Product No. 1151979 or 418328)	For determination of BOD_5
5	Incubator	ET637-6 with 6 sockets Net capacity: 280 Ltr. Power consumption: 240 VA; 2,05 kWh / 24h (ambient temperature 25 °C, target temperature 20 °C with interior lighting switched on (15 W)) Weight: 82.0 kg Order Code: 2 42 82 35 Overall dimensions: 1590 H x 600 W x 600 D mm Inside dimensions : 1450 H x 515 W x 415 D mm (with 5 retractable grids and 1 bottom grid) Door with double glazed insulated in ABS frame	For determination of BOD_5

S/N	Equipment/ Consumables	Description	Purpose
		Order code: 2 43 82 35	
6	Spectrophotometer	DR 6000™ UV VIS Spectrophotometer without RFID; Product no. LPV441.99.00002 Includes Cuvette compatibility 2: 1 inch rectangular and round cell Cuvette compatibility 3: optional 100 mm rectangular cell with additional adapter Data Logger: 5000 data points (result, date, time, sample-ID, user-ID) Dimensions (H x W x D): 215 mm x 500 mm x 460 mm Display: TFT 7" WVGA color touch Enclosure Rating: IP20 with closed lid Includes: 1 x Power Cord (US, EU) with English manual	For readings of nutrients (N & P), Ammonium nitrogen and COD
7	Analytical and precision balances, 2 No. (200g capacity and 4500g capacity)	Analytical balance with a capacity of 200g, readability 0.1mg, pan size 3.5inch platform, 3 door draft shields, with dimensions 8.5"Wx1.3"Hx13.5"D (Product no. 1759 M 76). Precision balance, capacity 4500g, readability 0.01g, platform size mm (192Wx192L) with 18 weighing units including 2 user programmable custom units, automatic temperature compensation function, below pan weighing facility and with external calibration (Product no. B043-633), supplied with weigh below hook (Product no. B043-683), in-use cover (Product no. B043-689) and dust cover (Product no. B043-687).	For dependable mass measurement for solution preparation and quantitative analysis
8	Still, water, Automatic	Barnstead/Thermolyne FI-Streem II 2S Glass still with vapour trap. May be wall or bench mounted, with fully automatic controls, a level sensor, and dual feed capability, pressure 10-80psi. Dimensions 79x26x32.5cm, shipping weight 15kg, Electric supply 220Vac, 50/60Hz (Product no. 2615902)	For providing high quality distilled water for various laboratory applications
9	Autoclave, Electrical model	Autoclave complete self-contained unit with an immersion heating element, automatic thermostatic control, automatic release valve and pilot light. Model 75X (A774-356) with 1650Watt element for fast start-up times, more accurate TPI thermocouple, snaps switch and pilot light, 60-minute mechanical bell timer, with gross capacity of 39litres, internal diameter 356mm, Internal useable height 260mm, power rating 240,50/60Hz, standard working temperature 120ºC, supplied with support stand (Product no. A774-365)	For laboratory sterilizing applications
10	COD reactor	Model 45600 COD Reactor, a 25-well, dry-bath incubator that provides the 150 °C temperature environment required for chemical oxygen demand (COD) determinations. Supplied with a dial gauge thermometer, power cord and safety shield (15inch high, 3/16-inch-thick polycarbonate attached to a heavy steel base). Is with a 2-hour timer.	For digestion of samples for COD determination

S/N	Equipment/ Consumables	Description	Purpose
11	Refrigerator	Lab cold Refrigerator with digital display with re-circulated air cooling, lockable door, spark free interior, automatic defrost, CFC and HCFC free, temperature set point range 0 to 8ºC, capacity 490L, with internal air circulation powered by external motor for much improved temperature uniformity, dimensions mm (760wx720dx1775h), white enamel exterior and interior, supplied with 6 plastic coated wire mesh, electric supply 230V, 50/60Hz. Supply with power surge protectors.	For laboratory storage of samples, chemicals and reagents
12	Freezer	Liebherr freezer, upright with capacity of 520L, temperature range -9 to 26ºC, 7 fixed shelves with 14 baskets, Dimension external mm (753wx720dx1705h), Electric supply 230V, 50Hz single phase. Supply with power surge protectors.	For storage of samples.
13	Stirrer, Magnetic Hotplate, Digital	For preparation of solutions/reagents for various analyses. Magnetic stirrer with heating, alarm, time and set point indicators, temperature and time control options (variable 0-999minutes), chemically resistant splash proof, wipe clean panel, aluminium hot plate material, hot plate dimension: 140mm diameter, overall dimensions mm (200wx295dx135h), heater: 400watts, voltage: 230V and digital LED display, speed: 100-1500rpm, supplied with PTFE stirring rods (1x20mm and 1x40mm) (S519-125). Supply with star bar magnetic retriever (polyethylene pick up rod with powerful magnet sealed in one end and hand up grip on other, 31cm long) (Product No. 1523200)	For preparation of solutions/reagents for various analyses
14	Blender, Electric	Household (Kitchen) blender (not exceeding 2litres).	For faecal sludge sample preparation (homogenization) prior to analysis

3.3. Capital Costs

The capital investment costs are shown in the table below. All the costs are entirely in Uganda Shillings. The details are provided under **Appendix 6**-Bills of quantities

Table 3-14: Summary of Capital Costs

Bill No.	Description	Amount Ugx
	GENERAL	
WOB-G-1	General Items	941,100,800
	WORK ITEMS	
WOB-FS-1	Receiving Chamber Containment Tank	97,415,790
WOB-FS-2	Screen and Grit Chamber	53,761,225
WOB-FS-3	Settling - Thickening tank	162,749,600
WOB-FS-4	Anaerobic Reactor	8,770,790
WOB-FS-5	Sludge Drying Beds	729,096,610
WOB-FS-6	Composting building	365,973,090
WOB-FS-7	Facultative & Maturation Ponds	371,298,910
WOB-FS-8	Administration Building	232,066,020
WOB-FS-9	Ancillary Site works	1,367,898,000
WOB-FS-10	Mechanical Installation	165,000,000
WOB-FS-11	Electrical Installation	47,600,000

Bill No.	Description	Amount Ugx
	Sub-Total "A"	4,622,730,835
	Allow for Contingency (10% of Subtotal A)	462,273,084
	Sub-Total "B"	5,085,003,919
	Add VAT (18% of subtotal B)	915,300,705
	GRAND TOTAL	**6,000,304,624**

3.3.1. Operating Costs

The operating costs consist of the following:

- Staffing costs,
- Running costs,
- Chemical costs
- Energy costs
- Maintenance costs

The operating costs for the Town considering a Government Utility like NWSC or Umbrella Organization of Water and Sanitation managing the system are discussed below.

3.3.2. Staffing Costs

Staffing is required in the Town to operate the Faecal sludge Plant by:

- Operating the system in accordance with the service standards.
- Maintaining the system.
- Developing the system.
- Billing the consumers.
- Collecting revenue.
- Receiving applications for and making new connections.
- Making extensions to the system or assets.
- Attending to all customers.
- Keeping records of the operations of the system.
- Writing status reports for the operations of the system.

The level of staffing and the staffing costs are presented in the table 3-15 below. These are derived from the actual operation costs of National Water and Sewerage Corporation (NWSC).

Table 3-15: Staffing Schedule and Costs

Position	Total Salary	Staff Required	Total Staff Costs
	('000 Ugx/month)	(No.)	(Mio. Ugx /year)
Plant Manager	1,500	1	18.0
Plant Engineer	1,000	1	12.0
Technician	600	1	7.2

Position	**Total Salary**	**Staff Required**	**Total Staff Costs**
	('000 Ugx/month)	(No.)	(Mio. Ugx /year)
Plumber	800	1	9.6
Security Guards	400	1	4.8
Total		**5**	**52**
Source: *Project Estimates*			

3.3.3. Running Costs

The office running costs include stationary, utilities, cleaning and general office costs. They are summarised in the table 3-16 below**.** These are derived from the levels and costs in similar NWSC offices.

Table 3-16: Office Running Costs

Item	**Amount**	**Amount**
	(Ugx '000/month)	(Ugx '000/year)
Stationary	1200	14,400
Office Supplies	1200	14,400
Transport Costs	2400	28,800
Office and Utilities	1200	14,400
Cleaning Services	1000	12,000
Total		**84,000**
Source: *Project Estimates.*		

3.3.4. Energy and Chemical Costs

The power for the waste water pumps will be obtained from the national electricity grid. No Chemical costs are envisaged in the treatment of the Faecal Sludge, all treatment will be physical. The annual chemical and energy costs are shown in the table 3-17 below.

Table 3-17: Annual Energy & Chemical Costs

Item	**2020**	**2022**	**2025**	**2030**	**2035**	**2040**
FS Produced (in '000 m^3 / year)	13.9	14.3	15.1	16.4	17.9	19.4
UnDumped FS (in '000 m^3 / year)	5.5	5.7	6.0	6.6	7.1	7.8
FS Dumped at Treatment Plant (in '000 m^3 / year)	8.3	8.6	9.1	9.8	10.7	11.7
Energy Costs (USh mio. / year)	0.7	0.7	0.7	0.8	0.8	0.9
Chemical Costs (USh mio. / year)	0.0	0.0	0.0	0.0	0.0	0.0
Total Daily FS Produced (in m^3/day)	38.0	39.3	41.3	45.0	48.9	53.2
Supply hours per day	7.6	7.9	8.3	9.0	9.8	10.6
Cost of FS Produced (in USh/m^3)	0	14,651	13,930	12,808	11,777	10,829
Source: *Project Estimates*						

3.3.5. Maintenance Costs

The annual maintenance costs are taken as a percentage of the investment costs as follows:

- Civil works -1%
- Pipe work - 1%
- Mechanical & Electrical works - 5%

The annual maintenance costs of the UETCL Power grid are contained in the electricity tariff and are borne by UMEME, so no maintenance costs for these items have been considered. The cost estimates for the above categories are given in the table 3-18 below.

Table 3-18: Investment Cost Categories

Item	**As-New Value year 2022** (million USh)
Civil Works	
Structures and Siteworks	3,469.03
Pipelines	0.00
Subtotal	**3,469.03**
Mechanical and Electrical Works	
Mechanical and Electrical Works	212.60
Subtotal	**212.60**
Preliminaries and Contingencies	2,318.67
Total	**6,000.30**
Notes:	
Preliminaries and Contingencies have been distributed *pro rata* across all items.	
Source: Project Estimates	

The annual maintenance costs would therefore be as given in the table 3-19 below.

Table 3-19: Maintenance Costs

Item	**Maintenance Cost** (% of Capital Cost)	**Annual Maintenance Costs** (Million Ugx)
Structures and Siteworks	1.0%	56.54
Pipe work	1.0%	0.00
Mechanical and Electrical Works	5.0%	17.32
Total		**73.86**
Source: *Project Estimates*		

4. BASELINE CONDITIONS OF PROJECT AREA

4.1. Bio-Physical Environment

4.1.1. Climatic Conditions

The climate of Wobulenzi/ Luwero District where the site is located is that of a tropical rainforest climate. The area has got two annual wet seasons. There is a long rainy season from August to December and a short rainy season from February to June. However, the shorter rainy season sees substantially heavier rainfall per month, with April typically seeing the heaviest amount of precipitation at an average of around 1264 mm. The average annual temperature in Wobulenzi/Luwero is 21.8 °C. The district recorded a mean annual maximum temperature of between 27.5^0C-30^{o}C and a minimum of 15^{o}C and 17.5^o C.

4.1.2. Topography and Drainage

The topography is as a result of a number of ancient denudation processes on the rock systems leaving a series of old erosion levels throughout the district (Roadwaski, 1960 and Omoding 1994). Hilly uplands dominate the south ancient granitic rocks, with interlocking valleys that break up the low hills in the southern part of the district. The northern region is largely flat and low lying.

The relief of the largest part of Luwero District is generally low and flat characterized by shallow seasonal wetlands in North and flat-topped hills in South. Its altitude ranges fro1000-1250m above sea level (average of 1150m). In most cases the interfluves are broad flat or rounded and marram covered, and the valleys are wide.

Wobulenzi is situated in an area generally made up of elevated and dissected plateau consisting of a series of flat-topped hills and intervening valleys. The low-lying areas have comparatively little flat ground but consist of the lower pediment and valley bottoms that are relatively swampy and seasonally flooded.

4.1.3. Geology and Soils

According to the geological map of Luwero District, the site which is situated in Wobulenzi town council is underlain by Kampala granitoids, Orthogneiss (A3KAgr) as shown in the Figure 4-1 and 4-2 below.

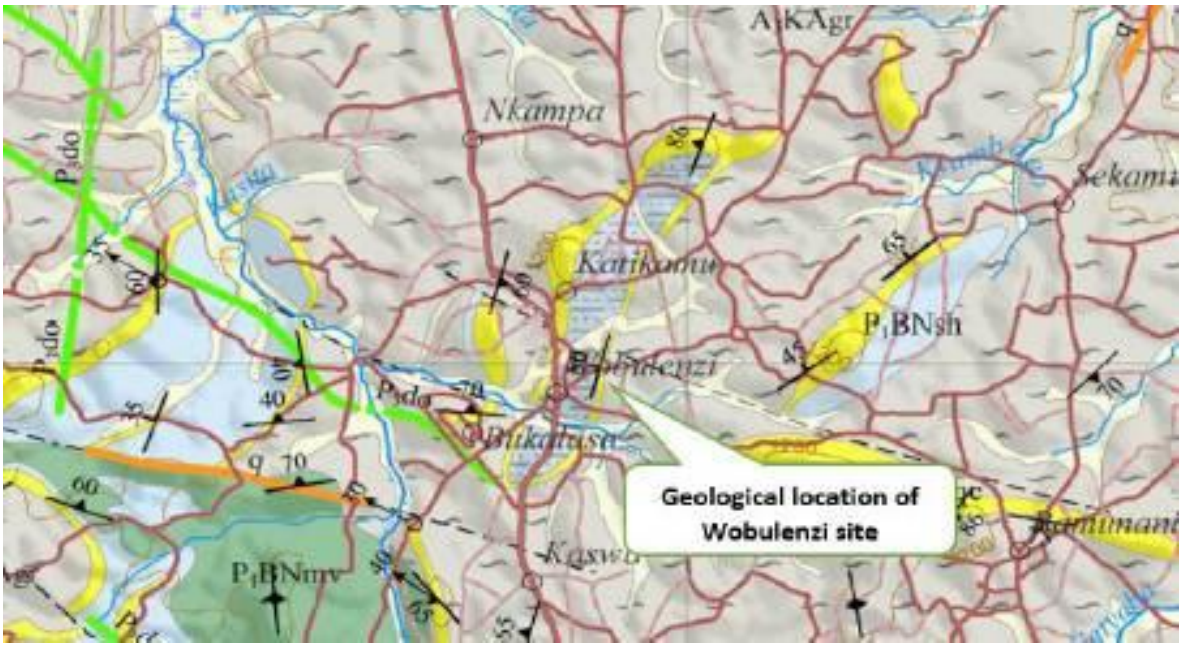


Figure 4-1: Geological Map of Luwero District

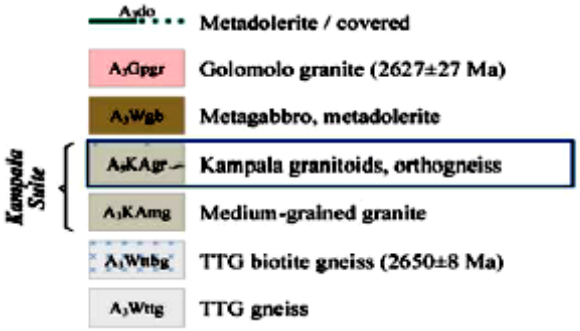


Figure 4-2: Key from Map extract

The soils in the district are generally red sandy loams in the north and clay loams in the south. The clay loams are relatively fertile hence support growth/ cultivation of a variety of crops. The sandy loam soils in the north have relatively low nutrient/ fertility content.

The soil stratigraphy at the site is presented in Table 4-1 below. the stratigraphy consists of two (02) major predominant layers i.e., FILL material comprising of murram underlain by saturated clayey sand and clayey gravel. The details are provided under **Appendix 5** of this ESIA report.

Table 4-1: Stratigraphy at the site

Profile at TP 1	Profile at TP 2	Profile at TP 3
0.0 ~0.4m: Organic silty Clay	0.0 ~0.3m: Organic silty Clay	0.0 ~0.5m: Organic Silty Clay
0.4~2.8m: clayey SAND	0.3~1.5m: clayey GRAVEL	0.5~1.5m: clayey SAND

4.1.4. Regional seismicity

According to the Seismic code of practice for structural designs, 2003 (US 319: 2003) from the Uganda National Bureau of Standards (UNBS), the site lies in zone 3 on the seismic zoning map. This is the least seismically active zone in Uganda with a zoning factor of Zmax=0.7. The project area is considered to be less prone to earthquake risk as shown in Figure 4-3 below.

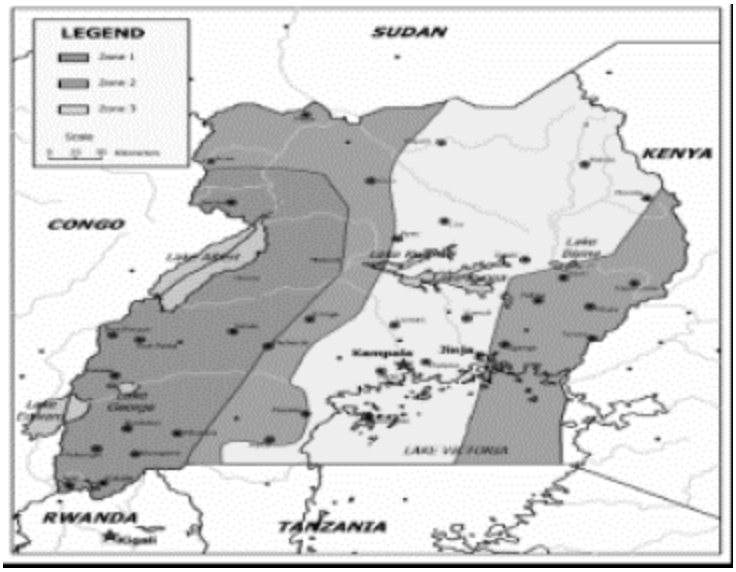


Figure 4-3: Seismic zoning map of Uganda (US319, 2003)

The seismic zoning map above indicates contours of ground acceleration, used for seismic action calculations. The seismic zoning factor, Z for the appropriate regions or locations and for the purposes of design may be applied as follows;

- Zmax = 1.0 for zone 1 (high risk area),
- Z = 0.8 for zone 2 (medium risk area) and;
- Z = 0.7 for zone 3 (low risk area).

4.1.5. Swamps/Wetlands

The major wetland system within the project area is Mayanja-Wasswa Swamp which receives drainage from other smaller wetland systems such as Mayanja, Wenkalwe and Danze. The Mayanja-Wasswa systems drains into the greater Kyoga Lake basin.

4.1.6. Vegetation

The vegetation in Wobulenzi Town Council is modified by landscaping and human activities which include: compound maintenance activities and office movements by several visitors to the site and there are no mature trees or threatened species and therefore have low ecological significance.

At the proposed site, Intercropping is the most common system of agriculture here with some of cabbages, Rice, tomatoes. Some trees species such as *Eucalyptus spp.*

Figure 4-4: Vegetation seen on site

4.1.7. Wobulenzi T.C CO_2 Emissions

Carbon Dioxide (CO_2) Emissions Per Capita in Tonnes Per Year for Wobulenzi stands at 0.31t as represented in the table below. This is high compared to Luwero and Katikamu.

Table 4-2: Emission Levels in the project areas

Location	CO2 Emissions	CO2 Emissions Per Capita	CO2 Emissions Intensity
Wobulenzi	9,545 t	0.31 t	486.9 t/km²
Katikamu	82,845 t	0.27 t	79.8 t/km²
Luwero	134,681 t	0.26 t	60.7 t/km²

Source: *Moran, D., Kanemoto K; Jiborn, M., Wood, R., Többen, J., and Seto, K.C. (2018) Carbon footprints of 13,000 cities. Environmental Research Letters DOI: 10.1088/1748-9326/aac72a*

4.1.8. Onsite Air quality Analysis

Site assessment findings for Air quality and Noise assessment Environmental findings at various project areas and its support facilities were conducted and the following findings were recorded.

4.1.8.1. Particulate Matter

Below are the findings of Particulate matter concentrations levels for specific areas. The findings are influenced by various sources like the existing activities in the place at the time of sampling and daily weather conditions.

Table 4-3: Particulate Matter of Wobulenzi site

Dust Sampling Location and coordinates. Real time reading.	$PM_{2.5/}$ 25 Average Recording	PM $_{10}$ 50 µg/m^3 Average Recording	Temperature	Humidity	Impact rating	Current Weather conditions	Potential Sources/Activity
IFC 2007 and WHO Air Quality Guidelines (AQG), 2005							
Bukolwa LCI, Bukolwa Parish, Wobulenzi Town Council, Luwero District (Wobulenzi Site).							
North the site 443720.00mE,80088.00mN,1070 metres above sea level.	4.1	5.6	32.0	48.5	Low	Sunny day	General fine particulate matter in atmosphere.
East of the Site 443703.00mE,80154.00mN,1109metre above sea level	8.6	11.3	35.4	39.3	Low	Sunny day	General fine particulate matter in atmosphere.
South of the Site 443694.00, mE80167.00mN,1109 metres above sea level	5.4	7.5	25.7	57.0	Low	Sunny day	General fine particulate matter in atmosphere.
West of the Site 443648.00mE,80245.00mN,1105 metres above sea level	5.4	7.4	26.7	60.9	Low	Sunny day	General fine particulate matter in atmosphere.
Center of the site 443666.00m, E80202.00mN,1107 metres above sea level	3.9	5.4	28.8	58.8	Low	Sunny day	General fine particulate matter in atmosphere.
IFC general EHS guidelines recommend that emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and standards by applying national legislated standards, or in their absence, the current WHO Air Quality Guidelines (2007).							

(Source: Field data source: Air quality (particulate matter) assessment March- 2021).

Analysis from the particulate matter data findings at different project potential receptor and sources:

- ✓ Various sampling points were taken along the proposed project facility with considerations of project potential receptors and sources. The Particulate matter concentrations ranged from (**3.9-8.6)** μg/m3 at all project areas sampled for PM2.5.
- ✓ The PM10 concentrations ranged from (**5.4-11.3**) μg/m3 with most of the areas having **Low** concentration below the permissible levels of Suspended particulate matter in the atmospheres due to the on-going activities in the area for PM10.
- ✓ There exiting particulate matter is Low with much sources it from the pollen grains from the plants in the area s sampled.

4.1.8.2. Gas emissions

Below are the findings of Gas emissions concentrations levels for specific areas in the table with the potential exiting sources. In conclusions from the findings showed all areas with readings below detectable levels (BDL) since the potential sources of Air emissions were aren't existing at the time of Sampling.

Table 4-4: Readings for Gas Emissions Monitoring

Name of Section / GPS Coordinates	Oxygen (O_2) %	Carbon Monoxide CO (PPM)	Hydrogen Sulphide (µg/m^3)	LEL Methane CH_4	VOC (mgNm-3)	Impact rating	Potential Sources
National Environment. (Draft Air Quality Standard for Ambient Air)	19.5-23.5	9.0	15	*	6	Low/medium/High BDL (Below Detection levels)	
Bukolwa LCI, Bukolwa Parish, Wobulenzi Town Council, Luwero District (Wobulenzi Site).							
North the site 443720.00mE,80088.00mN,1070 metres above sea level.	20.8	0	0	0	0	BDL	Combustible process from Motor vehicle and Equipment
East of the Site 443703.00mE,80154.00mN,1109metre above sea level	20.8	0	0	0	0	BDL	Combustible process from Motor vehicle and Equipment
South of the Site 443694.00, mE80167.00mN,1109 metres above sea level	20.8	0	0	0	0	BDL	Combustible process from Motor vehicle and Equipment
West of the Site 443648.00mE,80245.00mN,1105 metres above sea level	20.8	0	0	0	0	BDL	Combustible process from Motor vehicle and Equipment
Center of the site 443666.00m, E80202.00mN,1107 metres above sea level	20.8	0	0	0	0	BDL	Combustible process from Motor vehicle and Equipment

Source: field data source March 2021. BDL (Below detectable Levels)

Analysis of results from the Gas emission findings from the project point Sources;

The gas emissions was carried out at various project components to check the point source emissions level from various combustible process and below are the findings.

- ✓ Ambient average oxygen concentrations at all sampled points was ranging from 20.8 percentage volume.
- ✓ There were no concentrations identified for compounds of Carbon monoxide, Hydrogen and Sulphide, LEL (Methane) and VOCs during the time of sampling.

4.1.8.3. Noise Assessment

Noise emission sampling was carried out at project potential sources and receptors at the proposed faecal sludge management facilities to establish the existing baseline Noise levels. Below are the findings of Noise emissions levels for specific areas in the table with the potential exiting potential Natural and Anthropogenic sources.

Table 4-5: Details of the background Nosie measurements in form of LAeq, LAF max, LAF Min, within the vicinity of the project components

Location description and coordinates	Noise limit (dB(A) LEQ)	Recorded noise level			Existing noise sources		
		LAeq	LAF Max	LAF Min	Natural	Impact rating	Anthropogenic
Bukolwa LCI, Bukolwa Parish, Wobulenzi Town Council, Luwero District (Wobulenzi Site).							
North the site 443720.00mE,80088.00mN,1070 metres above sea level.	75	57.7	58.5	46.5	People	Low	Motor traffic
East of the Site 443703.00mE,80154.00mN,1109metre above sea level	75	45.6	56.7	46.8	People	Low	Motor traffic
South of the Site 443694.00, mE80167.00mN,1109 metres above sea level	75	42.6	52.9	44.8	People	Low	Motor traffic
West of the Site 443648.00mE,80245.00mN,1105 metres above sea level	75	47.4	48.1	43.7	People	Low	Motor traffic
Center of the site 443666.00m, E80202.00mN,1107 metres above sea level	75	55.7	61.0	54.9	People	Low	Motor traffic

Analysis of Noise emissions finding from various project sampled areas with considerations of the potential receptor's:

- ✓ The average (LAeq) noise level assessment at all the sampled areas ranged from (42.6-57.5) dBA. With all areas having Low Noise level within the permissible levels. However, this Noise level emissions is likely to change in this area when construction activities commence as a results of construction equipment's and material haulage to site.

4.1.8.4. Physical Agents

Exposure to occupational heat can result in disease, injuries, reduced productivity, and death. There is evidence that heat stress is an increasing problem for many workers, particularly those located in densely populated areas closer to the equator where temperatures are expected to rise in relation to the changing climate [Lucas et al. 2014]. Workers involved in industrial activities are often exposed to extreme heat or work or strenuous physical activities in hot environments which increases their risk for heat stress. This may subsequently result in occupational accidents and occupational illnesses such as heat stroke, heat exhaustion, heat syncope, heat cramps, heat rashes, or death. Exposure to heat can also result in sweaty palms, fogged-up safety glasses, dizziness, and may reduce brain function responsible for reasoning ability, creating additional hazards.

Using the assessment, the Wet Bulb-Globe Temperature Index (WBGT) was used to establish environmental factors of heat stress namely temperature and relative humidity. Readings were taken at Air (dry) bulb temperature (DB), Natural Wet Bulb temperature (WB) and Dew/Globe thermometer temperature (GT).

According to ISO 7243: Hot Environments—Estimation of Heat Stress on Working Man, based on the WBGT-Index (Wet Bulb Globe Temperature) [ISO 1989], WBGT exposure limits for acclimatized workers is set at 33°C Resting, 30°C Light activity, 28 °C Moderate activity, 25 °C Heavy activity and 23 °C Very heavy activity.

4.2. Socio-economic Environment

4.2.1. Demographics

According to the UBOS statistics of 2014, the population of Luwero district was estimated to be 106,235 persons with an average household size of 4.2. While the population of Wobulezi T.C was estimated to be 27,048 persons living in 6974 households.

Table 4-6: UBOS 2014 Population estimates for Wobulezi Town Council

Place	Males	Females	Total	Households
Wobulenzi Town Council	12,337	14,711	27,048	6,974
Bukalasa	374	330	704	151
Bukolwa	1,078	1,225	2,303	518
Katikamu	1,726	2,037	3,763	891
Wobulenzi Central	2,265	2,586	4,851	1,222
Wobulenzi East	4,696	5,714	10,410	2,718
Wobulenzi West	2,198	2,819	5,017	1,474

The 2020 population of Wobulezi is projected to be 30,519 persons as in the table below. The current town population density stands at 1,556 persons/ km² as indicated in the figure 4-5 below.

Table 4-7: 2020 project population for Wobulenzi Town council

Population	30,519
Male Population	13,888 (45.5%)
Female Population	16,631 (54.5%)

Source: *JRC (European Commission's Joint Research Centre) work on the GHS built-up grid*

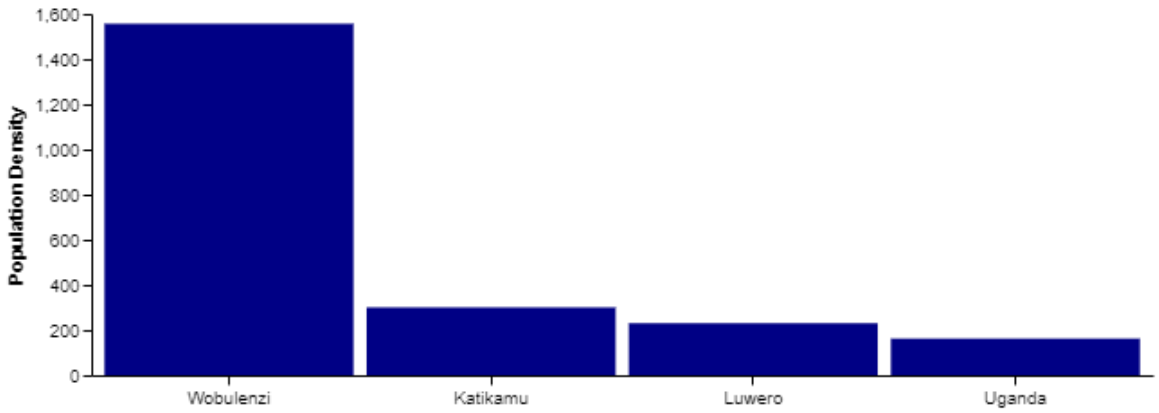


Figure 4-5:Population Density in the project areas

4.2.2. Local Economy

As observed during the study, Wobulenzi Town Council's local economy revolves around commercial activities like sale of merchandise, hardware to the booming construction industry, petty trade, charcoal production, rearing of animals like cattle, goats, sheep, pigs and poultry, cultivation of crops like coffee, maize, rice, beans, matooke, cassava, sweat potatoes, Irish potatoes, tomatoes, green vegetables ground nuts, peas, soya beans, etc.

While in Bukolwa LCI, the local economy revolves around mainly subsistence agriculture (mainly sale of maize, beans, matooke and coffee) as well as petty trade and education service induced developments.

4.2.3. Settlement Patterns in Wobulenzi Cluster Towns

The settlements patterns of the cluster towns are summarized in the table 4-5 below.

Table 4-8: Settlement Patterns in Wobulenzi Cluster Towns

TOWN	NOTES
LUWERO T/C	The core of the Town is characteristed by permanent and semi-permanent structures. The settlements are nucleated within the core of the Town and are located along well-planned tarmac and gravel access roads The fringe areas of the Town has

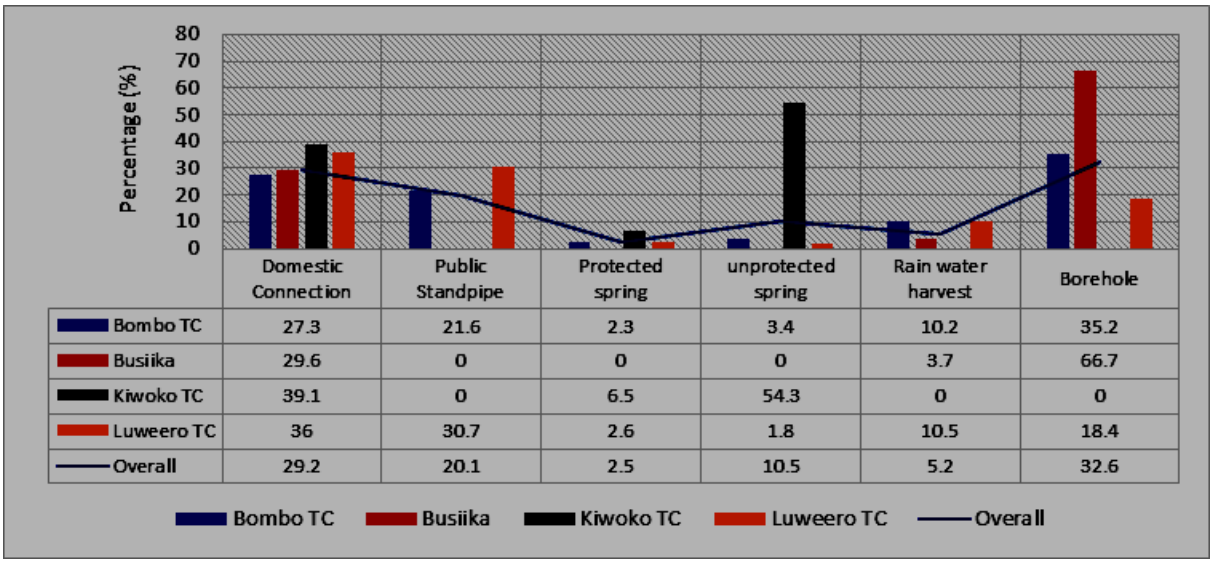
TOWN	NOTES
	dispersed settlements characterised by permanent and semi-permanent structures
WOBULENZI T/C 	The core of the Town is characteristed by permanent and semi-permanent structures. The settlements are nucleated within the core of the Town and are located along well-planned tarmac and gravel access roads The fringe areas of the Town have dispersed settlements characterised by permanent and semi-permanent structures
BOMBO T/C 	The core of the Town is characteristed by permanent and semi-permanent structures. The settlements are nucleated within the core of the Town and are located along the tarmac and gravel access roads The fringe areas of the Town has dispersed settlements characterised by permanent and semi-permanent structures
KIWOKO	The core of the Town is characteristed by permanent and semi-permanent structures. The settlements are nucleated within the core of the Town and are located along the gravel access roads. The fringe areas of the Town has dispersed settlements characterised by

TOWN	NOTES
	semi-permanent structures
ZIROBWE 	The core of the Town is characteristed by permanent and semi-permanent structures. The settlements are nucleated within the core of the Town and are located along the gravel access roads. Sections of the town have crowded semi-permanent structures that can only be accessed on foot. The fringe areas of the Town has dispersed settlements characterised by semi-permanent structures

4.2.4. Water Supply and Use

The majority of households visited get water from safe water sources that include boreholes (32.6%), domestic connections (29.2%) followed by public standpipes (20.1%). The above notwithstanding, there is a significant section of the households (10.5%) that still relied on getting water from un-safe water sources (un-protected springs), these households were mainly found in Kiwoko TC (54.3%). In comparison with the rest of the Country, the proposed towns are faring better than the greater part of the Country in using improved sources of drinking water – National average stands at 78%.

The description of improved sources of drinking water in Uganda include water from the following water sources: piped water, tube wells, boreholes, protected dug wells, protected springs, and rainwater.



	Domestic Connection	Public Standpipe	Protected spring	unprotected spring	Rain water harvest	Borehole
Bombo TC	27.3	21.6	2.3	3.4	10.2	35.2
Busiika	29.6	0	0	0	3.7	66.7
Kiwoko TC	39.1	0	6.5	54.3	0	0
Luweero TC	36	30.7	2.6	1.8	10.5	18.4
Overall	29.2	20.1	2.5	10.5	5.2	32.6

Figure 4-6: Main Water Sources for Households

The majority of the households (72%) pay for water for their home use. This was more pronounced in Busiika where 92.6% of the respondents reported to pay for water while the least number of households paying for water was observed in Bombo TC (60.2%) (***Figure 4-7*****).**

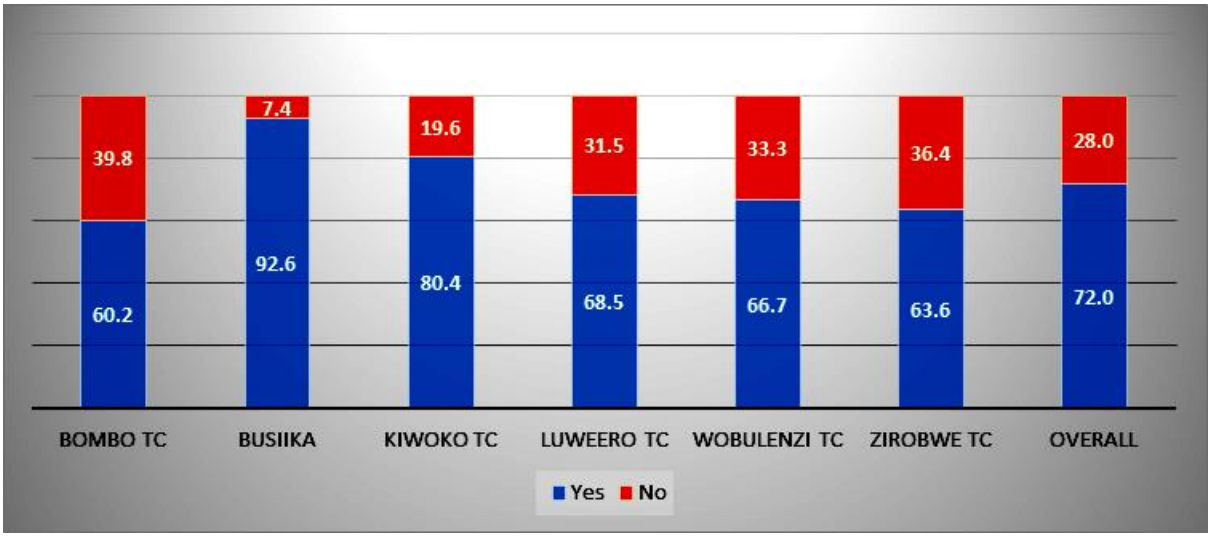


Figure 4-7: Payment for Water

4.2.5. Disposal of Human Excreta

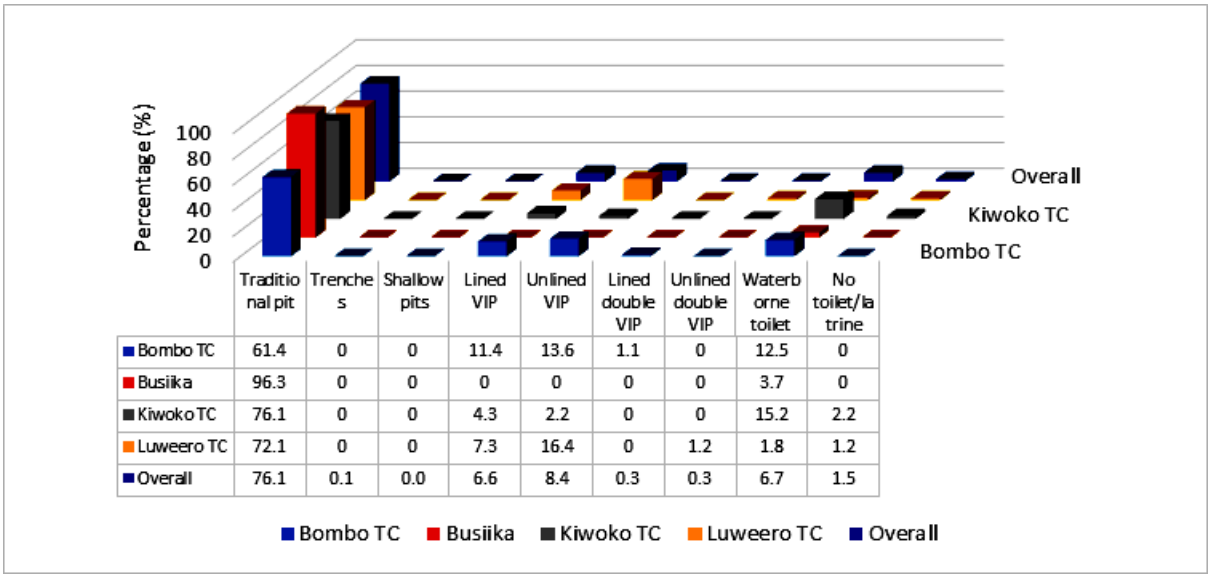
An overwhelming majority of respondents (98.5%) had sanitation facilities; in Bombo TC and Busiika all the households visited owned a sanitation facility. The most dominant type of sanitation facilities were the traditional pits that were found in 76.1% of households and the majority of these were in Busiika (96.3%) followed by Zirobwe TC (83.4%). The traditional pits were followed by unlined VIPs, which were found in 8.4% of the households. The dominant use of traditional pits and unlined pits implied that majority of the households visited did not have adequate sanitation. Refer to **figure 4-8**.

The definition of adequate sanitation at home by WHO/UNICEF refers to:

- Using an improved sanitation facility at home
- Sharing this facility between 5 or less households.

In comparison with the findings in the 2016 Uganda Demographic Health Survey (UDHS[1]), the sampled households fared lower than the national average in terms of usage of improved sanitation facilities whereby only 13.6% of the sampled households used improved sanitation facilities compared to the national average of 19%.

The dominant use of traditional and unlined pit latrines greatly affects pit emptying because the walls of unlined and traditional pit latrines are susceptible to collapsing in and hence do not support pit emptying services.

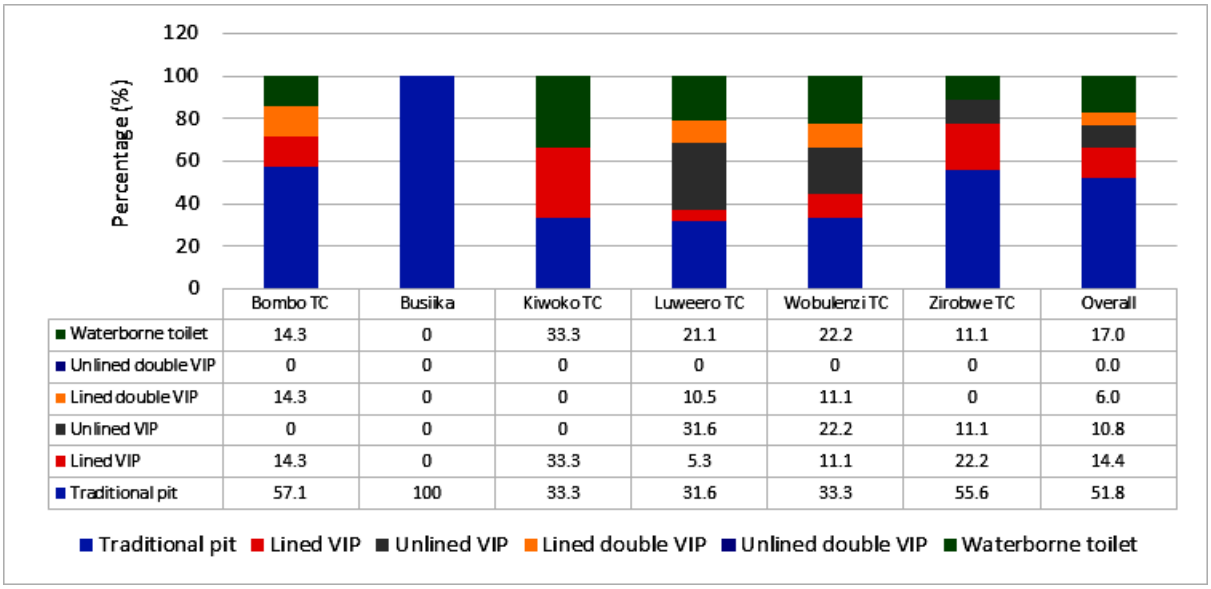


	Traditional pit	Trenches	Shallow pits	Lined VIP	Unlined VIP	Lined double VIP	Unlined double VIP	Waterborne toilet	No toilet/latrine
Bombo TC	61.4	0	0	11.4	13.6	1.1	0	12.5	0
Busiika	96.3	0	0	0	0	0	0	3.7	0
Kiwoko TC	76.1	0	0	4.3	2.2	0	0	15.2	2.2
Luweero TC	72.1	0	0	7.3	16.4	0	1.2	1.8	1.2
Overall	76.1	0.1	0.0	6.6	8.4	0.3	0.3	6.7	1.5

Figure 4-8: Ownership and Type of Sanitation Facility

All institutions visited owned sanitation facilities. The dominant type of sanitation facility were the traditional pits (51.8%) followed by the waterborne toilets (17%). Similar to the findings in the household survey, the dominant use of traditional pits greatly impedes pit emptying. Only 31.4% of the institution had sanitation facilities that support pit emptying as shown in **figure 4-9.**

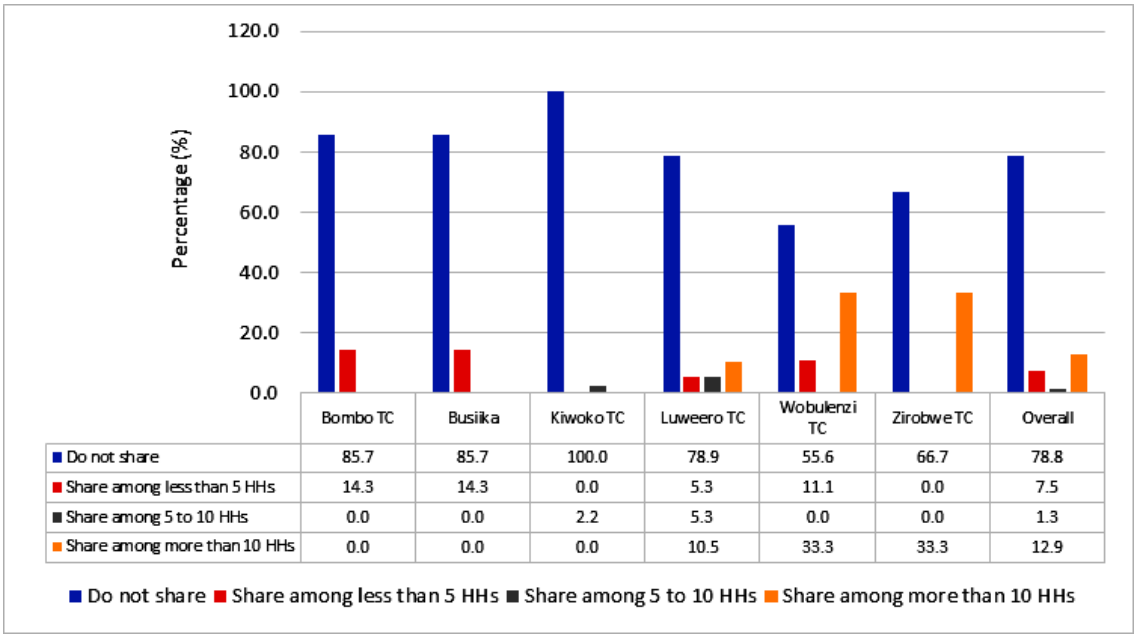
[1] Uganda Demographic Health Survey 2016.



	Bombo TC	Busiika	Kiwoko TC	Luweero TC	Wobulenzi TC	Zirobwe TC	Overall
Waterborne toilet	14.3	0	33.3	21.1	22.2	11.1	17.0
Unlined double VIP	0	0	0	0	0	0	0.0
Lined double VIP	14.3	0	0	10.5	11.1	0	6.0
Unlined VIP	0	0	0	31.6	22.2	11.1	10.8
Lined VIP	14.3	0	33.3	5.3	11.1	22.2	14.4
Traditional pit	57.1	100	33.3	31.6	33.3	55.6	51.8

Figure 4-9: Types of Sanitation Facilities

Although all the institutions visited owned sanitation facilities, the study found out that a substantial number of these institutions (21.2%) reported sharing sanitation facilities with households (members not part of the institutions) and these were mostly found in Wobulenzi TC (44.4%). Many of the institutions (12.9%) reported sharing their sanitation facilities with more than 10 households (members not part of the institutions) as shown in **figure 4-10 below.**



	Bombo TC	Busiika	Kiwoko TC	Luweero TC	Wobulenzi TC	Zirobwe TC	Overall
Do not share	85.7	85.7	100.0	78.9	55.6	66.7	78.8
Share among less than 5 HHs	14.3	14.3	0.0	5.3	11.1	0.0	7.5
Share among 5 to 10 HHs	0.0	0.0	2.2	5.3	0.0	0.0	1.3
Share among more than 10 HHs	0.0	0.0	0.0	10.5	33.3	33.3	12.9

Figure 4-10: Sharing of Sanitation Facilities

4.2.6. Faecal Sludge Management (FSM)

Faecal sludge management **(**FSM) is one of the key aspects of sanitation. At national level, the sanitation responsibility is shared between the Ministry of Health (MOH) and Ministry of Water and

Environment (MWE). MoH focuses on household sanitation while MWE concentrates on sanitation in urban areas and Rural Growth Centres (RGCs).

FSM like other key service delivery functions was decentralized. Part three of the Second Schedule of the LG Act Cap 243, provides functions and services that are a responsibility of the Urban LG Councils. FSM follows under the function of providing sanitary services for removal and disposal of night soil (human excreta), rubbish, carcasses of dead animals and all kinds of refuse and effluent. Qualitative inquiries with the key informants in the project area revealed that local authorities had not been involved in managing or regulating FSM. This has been left to the users and the communities. Local authorities reported that they do not approve architectural plans of new facilities without adequate sanitation plan (focusing on improved sanitation facility). The study however found out that these local authorities have not been ensured compliance to the approved plans and standards thus many new establishments are constructed without adequate sanitation.

The majority of the respondents (94.5%) reported that their sanitation facilities had never filled up in the last 5 years, 5.1% reported that their sanitation facilities had filled up once in the last 5 years while only 0.5% reported that their facilities had filled up twice or more in the last 5 years.

There were a number of reasons for the sanitation facilities not getting filled up more often. One of the main reasons was that the soils in the project areas supported digging of deep pits that take many years to get filled up and many of the households were not sharing their sanitation facilities as such they take long to get filled up.

Figure 4-11 and **Figure 4-12** presents the status of sanitation facilities filling up in the last 5 years.

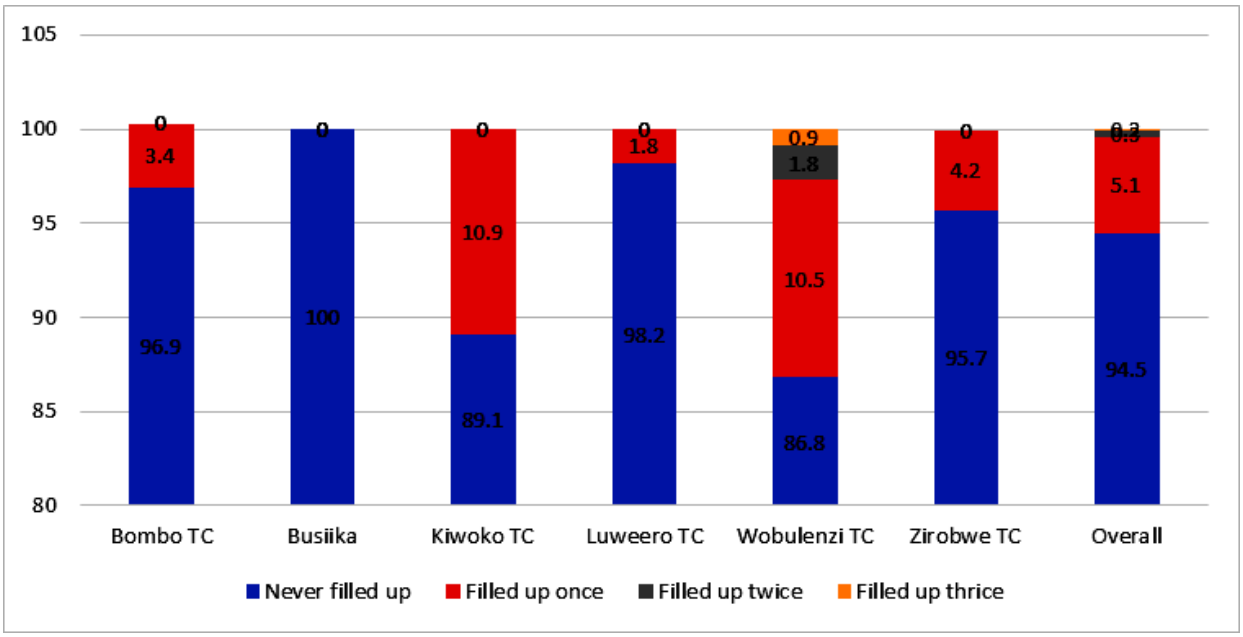
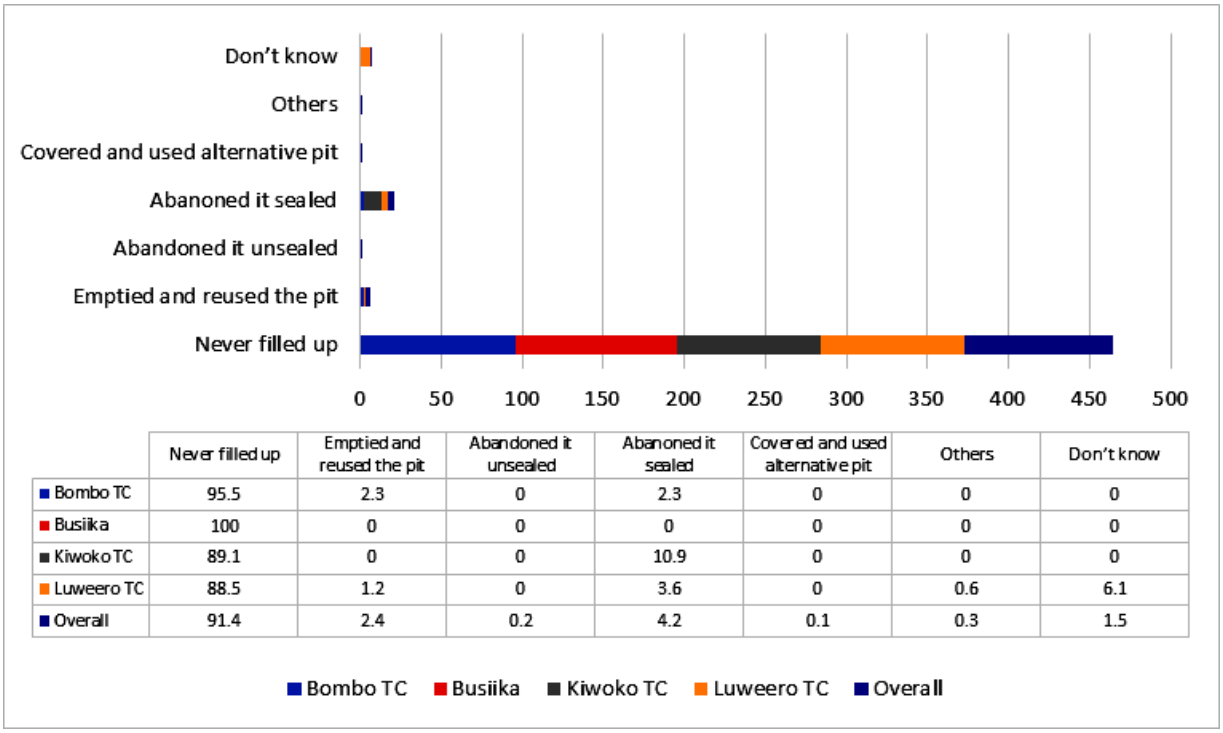


Figure 4-11: Status of Filling up of Sanitation Facilities in the last 5 Years

The study found out that in a few households that had their sanitation facilities filling up in the last five years; some of them just abandoned the pits (4.4%) and a few of them (2.4%) reported emptying and

re-using the pits or used alternative pits. Pit emptying was more pronounced in Wobulenzi TC where 10% of the respondents reported to have emptied their pits before.



	Never filled up	Emptied and reused the pit	Abandoned it unsealed	Abanoned it sealed	Covered and used alternative pit	Others	Don't know
Bombo TC	95.5	2.3	0	2.3	0	0	0
Busiika	100	0	0	0	0	0	0
Kiwoko TC	89.1	0	0	10.9	0	0	0
Luweero TC	88.5	1.2	0	3.6	0	0.6	6.1
Overall	91.4	2.4	0.2	4.2	0.1	0.3	1.5

Figure 4-12: Reported Household Practices when Sanitation Facilities filled up

The study investigated further on pit emptying – whether households had ever emptied their sanitation facilities or not. The study findings revealed that only 3.9% of the households had emptied their sanitation facilities, which further confirmed the previous findings. A perturbing observation was in Kiwoko TC where it was found out that none of the households reported to have emptied their sanitation facilities yet 10.5% of the households had reported that their sanitation facilities had filled up at least once in the previous 5 years (Refer to **Figure 4-13**).

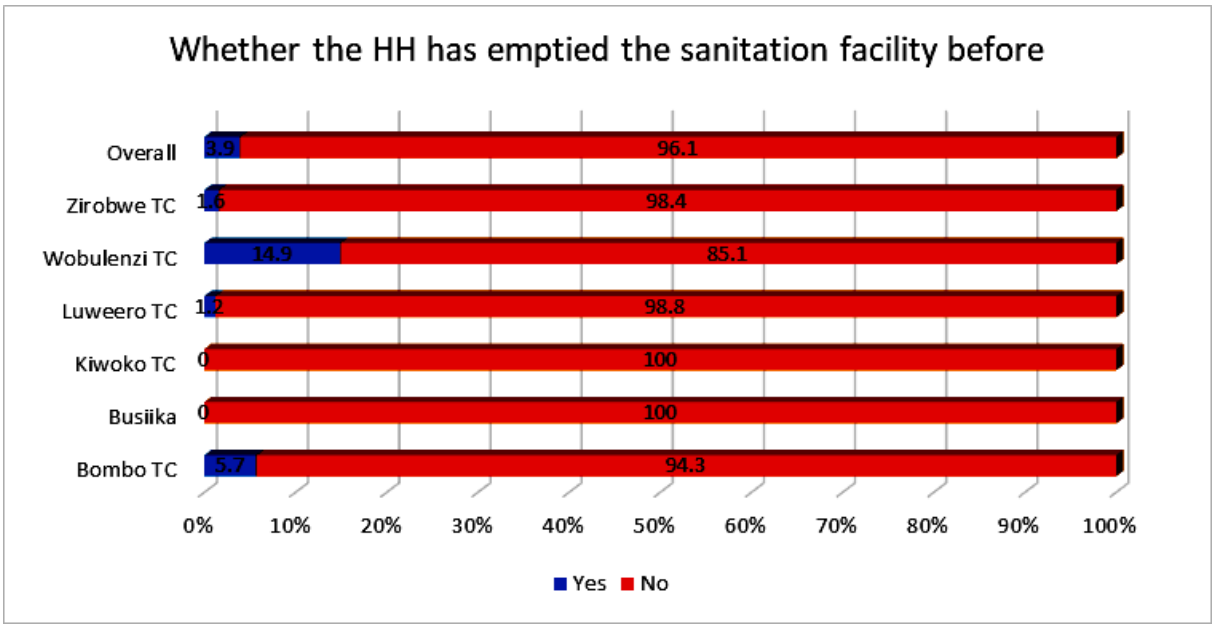


Figure 4-13: Frequency of Emptying Sanitation Facilities by Households

4.2.7. Solid Waste Management

Many of the households (37.9%) reported dumping solid waste in the gardens, followed by 30.4% that reported dumping waste in open dumps. The open dumping methods possess great environment and health hazards worse still even the waste that is stored in the private bins eventually end up in the open dumps (Error! Reference source not found.4-14).

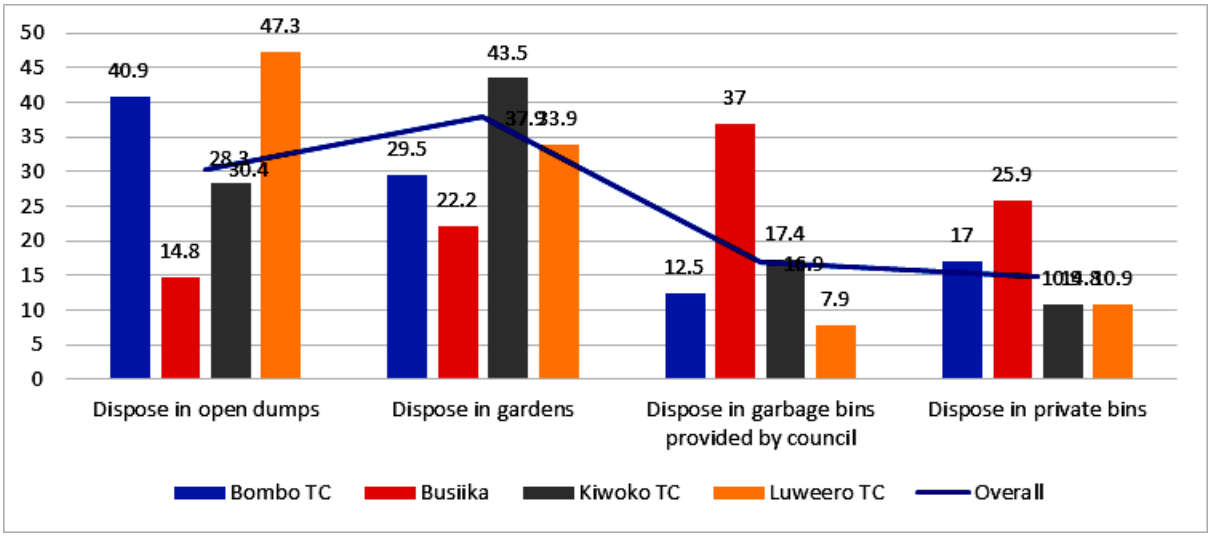


Figure 4-14: Dumping of Solid Waste

4.2.8. Faecal Sludge Management

The study found out that 87% of the institution's sanitation facilities had never filled up in the last 5 years. Among the few institutions that reported having had their sanitation facility filled up, many of them (6.6%) reported that their facilities had filled up only once, followed by 4.6% that reported that their sanitation facilities had filled up twice while only 1.9% reported that their facilities had filled up more than three times (**Figure 4-15**).

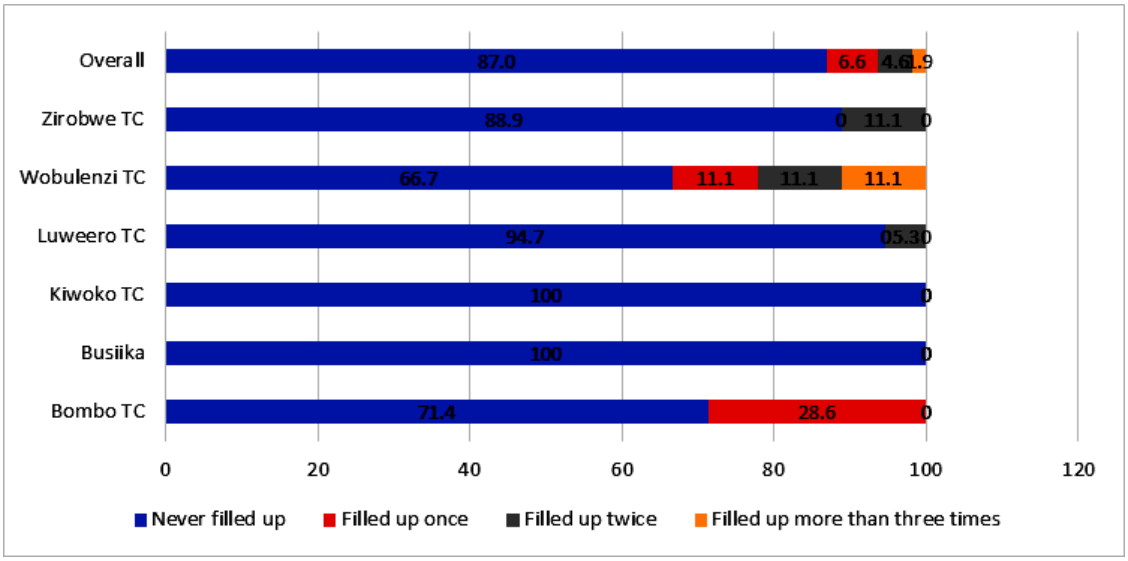
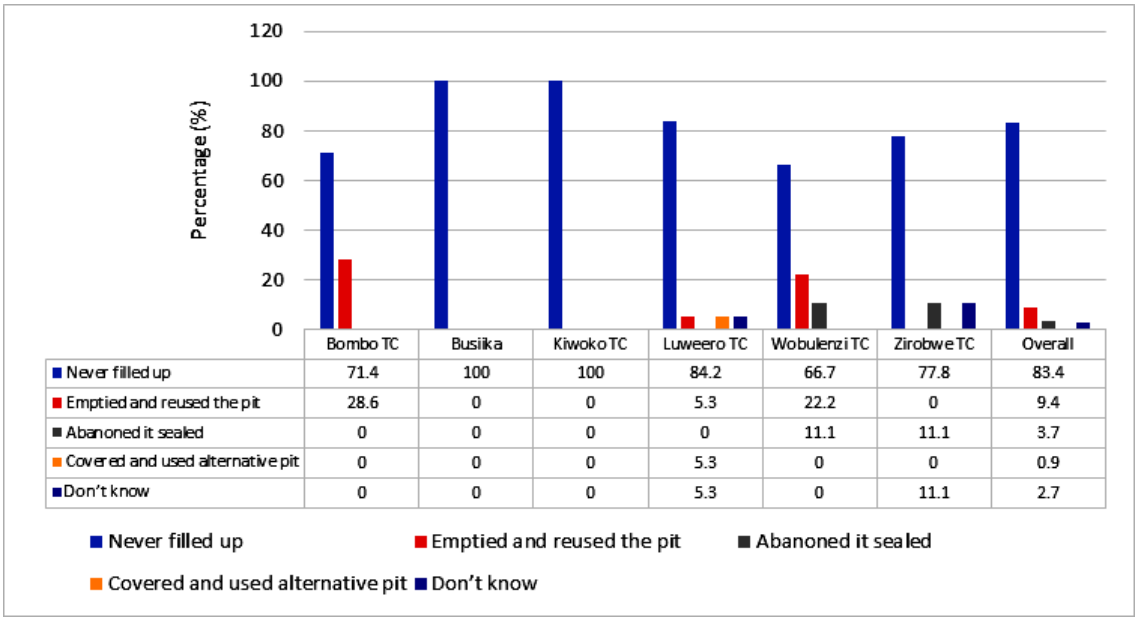


Figure 4-15: Status of Latrine / Septic Tank filling up in the last 5 years

When the septic tanks / latrines got filled up, it was reported that they had been emptied and re-used in many of the institutions (9.4%), however, there was a substantial number of institutions (4.6%) that abandoned the filled-up sanitation facilities. Refer to Error! Reference source not found. 4-16.



	Bombo TC	Busiika	Kiwoko TC	Luweero TC	Wobulenzi TC	Zirobwe TC	Overall
Never filled up	71.4	100	100	84.2	66.7	77.8	83.4
Emptied and reused the pit	28.6	0	0	5.3	22.2	0	9.4
Abanoned it sealed	0	0	0	0	11.1	11.1	3.7
Covered and used alternative pit	0	0	0	5.3	0	0	0.9
Don't know	0	0	0	5.3	0	11.1	2.7

Figure 4-16: Institutional Practices when Sanitation Facilities got filled up

5. INSTITUTIONAL, POLICY, LEGAL FRAMEWORKS AND INTERNATIONAL OBLIGATIONS

5.1. Introduction

In this chapter, the policy, legal and institutional framework within which this Environmental and Social Impact Assessment was conducted is discussed. National laws are discussed along with relevant multilateral environmental agreements to which Uganda is a party.

The proposed faecal sludge treatment plant development may have serious impacts on the environment from three perspectives: first, effects of construction and the resulting disturbance on ecological and social systems especially impacts on property rights; and secondly, the operational phase impacts of the faecal sludge treatment plant as well as socio-economic activities it creates may have both have negative and positive impacts on the environment and social setting of the resident area and finally the decommissioning phase impacts. These environmental and social effects/impacts must be managed within a legal framework.

Uganda has various laws, policies and institutional set up governing the management of its natural environment as discussed in the following sub-sections. These shall be strictly adhered to during the course of all activities relating to the faecal sludge treatment plant located in Wobulenzi T.C.

5.2. Institutional Framework

Table 5-1: Relevant Institutional Framework

Institutional Framework	Description	Relevance to the faecal sludge treatment plant
The Ministry of Water and Environment	The Ministry of Water and Environment is responsible for the management of water resource development project in Uganda. The ministry also has the overall responsibility for initiating national policies and for setting national standards and priorities for water resources management and environmental regulation. A multidisciplinary team representing stakeholders and constituting the Water Policy advises the Minister on the above functions and is mandated to initiate revisions to legislation and regulations. The key functions of the MWE are to promote the rational and sustainable utilization and/or development of the water resources while conserving relevant surrounding watershed environment in Uganda. They are several divisions within the MWE and these are: a) The Directorate of Water Development (DWD) which is in charge of the promoting the rational management and use of water resources of Uganda by coordinating and regulating activities that may impact water quality and quantity. b) Quality and quantity of water in water courses is monitored and regulated by the Directorate of Water Resources Management (DWRM), which also issues permit for water abstraction and effluent disposal.	During preparation of the ESIA, consultations were made with the Ministry of water and environment.

Institutional Framework	Description	Relevance to the faecal sludge treatment plant
	c) The Wetland Department (WD) is another technical unit in the Ministry which advises government on technical matters and policies related to sustainable wetland conservation and management. d) The Department of Meteorology is responsible for providing climate and weather information to any stakeholders engaged in national development activities in Uganda.	
National Environment Management Authority (NEMA)	NEMA was created following the enactment of the National Environment Statute (NES) later Act in 1995. It is responsible for overseeing, coordinating and supervising environmental management in Uganda. Since its formation in 1996, NEMA has put a strong emphasis on developing environmental policies, laws and guidelines as evidenced by the large number of environmental regulations that have been enacted over the last few years. NEMA's overall goal is to promote sound environmental management and prudent use of natural resources in Uganda through its objectives including: a) To develop environmental policies, laws and guidelines for regulating the environment; b) To enforce environmental standards and regulations; c) To build capacity for environmental planning	Role in the project: NEMA will: • Review and approve the ESIA report

Institutional Framework	Description	Relevance to the faecal sludge treatment plant
	management and monitoring within partner institutions and districts; d) To monitor the environment and disseminate accurate and up-to-date environmental information; e) To ensure integration of environmental concerns into planning at the centre, the district and local levels; and f) To promote awareness programs and increase public knowledge about environmental issues.	
The Ministry of Gender, Labour & Social Development (MoGLSD)	This ministry handles the Social Development issues. In collaboration with other stakeholders, MoGLSD is responsible for community empowerment, protection and promotion of the rights and obligations of the specified vulnerable groups for social protection and gender responsive development.	This Ministry handles the Social Development issues. In collaboration with other stakeholders, MGLSD is responsible for community empowerment, protection and promotion of the rights and obligations of the specified vulnerable groups for social protection and gender responsive development. The faecal sludge treatment plant has a number of socio-economic issues. The ministry in collaboration with the Contractor and other stakeholders will work towards the implementation of the labour, employment and occupational safety and health provisions as provided for under the regulatory instruments within this Ministry. This Ministry will be consulted during the ESIA process.

Institutional Framework	Description	Relevance to the faecal sludge treatment plant
Wetlands Management Department (WMD)	The WMD falls under the Ministry of Water and Environment (MW&E). It takes the lead on all the day-to-day management issues of Wetland resources in Uganda. It implements the Wetlands Policy in collaboration with other lead agencies notably NEMA. At district level, the Department of Environment is headed by the District Environment Officer and Director respectively. The Environmental Officer coordinates wetland work and an attempt has been made in various districts to have a Wetland Officer appointed. Even at village level, one of the members of the village council takes care of the environment and wetland related issues.	Since some of the project components of the Faecal Sludge Treatment Plant for Wobulenzi T.C is to be located in the wetland areas, the WMD will be consulted during the ESIA as one of the key stakeholders.
The Ministry of Lands, Housing & Urban Development (MLHUD)	This ministry is also very important to the proposed Faecal Sludge Treatment Plant in Wobulenzi T.C. The mandate of the Ministry of Lands, Housing & Urban Development (MLHUD) is to ensure rational and sustainable use, effective management of land and orderly development to urban and rural areas as well as safe, planned and health housing for socio-economic development. MLHUD is responsible for providing policy direction, national standards and coordination of all matters concerning lands, housing and urban development. MLHUD is also responsible for putting in place policies and initiating laws that ensure sustainable land management, promote sustainable	The Ministry shall be consulted during the ESIA process to ensure that the planned water and sanitation infrastructure is in line with the Luwero District Development plan and other national plans.

Institutional Framework	Description	Relevance to the faecal sludge treatment plant
	housing for all and foster orderly urban development in the country including zoning sites for Faecal Sludge Treatment Plant	
District Local Governments	The devolution of power to the local governments through the central government's Decentralization Policy has empowered local governments to enact by-laws that deal with the local situations among which environment matters are also addressed.	All sub-components of the proposed faecal sludge treatment plant fall within the jurisdiction of Luwero District (Wobulenzi T.C). Key offices in these administrative areas that are relevant for the project include; the Water officer, Environment/Natural Resources directorate/department, Directorate/ department of Physical Planning/Lands, Community Development Office Health Directorate/department and Agricultural Office. Equally important are village level local council administration (LCIs) within Luwero and particularly the host Town Council Leaders at these levels of local administration are closer to residents and therefore important in effective community mobilization, sensitization and dispute resolution.
Private Faecal Sludge Emptying Service Providers	The emptying of faecal sludge from pit latrines and septic tanks in Uganda is dominated by the private sector. The private entrepreneurs who engage in the service of emptying are organized in the Uganda Emptiers Association. The need for FS emptying in various towns is rapidly evolving, but no institutions, such as schools, and some urban councils own/operate vacuum trucks to empty faecal sludge from sanitation	The business of sludge emptying and transportation in Uganda is over 90% done by the private sector. Business owners usually buy vacuum trucks imported from overseas. The crew for each truck normally consists of two employees, a driver and a turn man, who assists during the emptying operation. The owner of the truck is responsible for all major

Institutional Framework	Description	Relevance to the faecal sludge treatment plant
	facilities within Wobulenzi Town council.	costs and services (e.g., tires, vacuum pumps, hosepipes, etc.). The sanitation facilities which are not reachable by vacuum trucks are emptied using gulpers. The gulping entrepreneurs are organized into the Gulpers Association of Uganda and their business is also growing country-wide.

5.3. Policy Framework

Table 5-2: Relevant Policy Framework

Policy Framework	Description	Relevance to the faecal sludge treatment plant
National Environment Policy, 1994	The overall goal is the promotion of sustainable economic and social development that enhances environmental quality without compromising the ability of future generations to meet their own needs. The policy states that an Environmental Impact Assessment should be conducted for a project that is likely to have impacts on the environment.	The provisions of this policy instrument are critical in guiding the ESIA process and ensuring that critical aspects of the proposed faecal sludge treatment plant construction activities do not adversely impact on the environment and where this occurs measures of mitigation are advanced.
Second National Development Plan (NDP II) 2015/16 – 2019/20	The National Development Plan (NDP) 2016-2020 plan vision is to achieve a transformed Ugandan society from a peasant to a modern and prosperous country within 30 years	Development of the proposed faecal sludge treatment plant in Wobulenzi T.C will enable in transforming Uganda since it will improve the sanitation and hygiene of Luwero district
Vision 2040	The Uganda National Vision 2040 while encouraging improved water resources management and utilization provides that efforts will be undertaken to attain a green	Government of Uganda actively takes all requisite measures to protect the environment and natural resources and ensure their future

Policy Framework	Description	Relevance to the faecal sludge treatment plant
	and clean environment with no water and air pollution while conserving the flora and fauna and restoring and adding value to the ecosystems. Sustainable utilization of the environment will be addressed in line with Uganda's commitment to the principles of the Rio Declaration on Environment and Development, the Programme for the Further Implementation of Agenda 21 and the Plan of Implementation of the World Summit on Sustainable Development (Johannesburg Declaration on Sustainable Development) among others.	sustainability as part of the international obligations, treaties and agreements. Therefore, the ESIA practice continues to be one of the ways in which environmental and social impacts are minimised thus ensuring environmental sustainability.
National Wetlands Policy, 1995	Government adopted the National Policy for the Conservation and Management of Wetland Resources to promote their conservation in order to sustain their values for the present and future well-being of the people. In support of this aim, the National Wetlands Policy sets five goals: a) To establish the principles by which wetland resources can be optimally used now and in the future; b) To end practices which reduce wetland productivity; c) To maintain the biological diversity of natural or semi-natural wetlands; d) To maintain wetland functions and values; e) To integrate wetland concerns into the planning	The proposed faecal sludge treatment plant for Wobulenzi is located close to a wetland which are functioning areas for ecosystem and biodiversity.

Policy Framework	Description	Relevance to the faecal sludge treatment plant
	and decision making of other sectors. In particular, the policy aims at: a) Ensuring that only non-destructive uses are carried out in and around; b) Ensuring, no drainage occurs unless more important environment management requirements supersede; c) Ensuring that wetland developments are subject to environmental impact assessment and audit; d) Maintaining an optimum diversity of uses and users and consideration for other stakeholders when using a wetland.	
The National Gender Policy, 1997	The Policy aims to guide and direct at all levels, the planning, resource allocation and implementation of development programmes with a gender perspective. The National Gender Policy forms a legal framework and mandate for every stakeholder to address the gender imbalances within their respective sectors. Its overall goal is to mainstream gender concerns in the national development process to improve the social, legal/civic, political, economic and cultural conditions of the people in Uganda in particular, the women.	In the context of the water and sanitation sector (for which the faecal sludge treatment plant falls), it aims to redress the imbalances which arise from the existing gender inequalities and promotes the participation of both women and men in all stages of the faecal sludge treatment plant's project cycle, thus promoting equal access to and control over water resources.
National Policy on Disability in Uganda, 2006	Government through the Ministry of Gender, Labour and Social Development has the mandate to promote and	PWDs shall also be allowed to be hired in sections where they can ably perform as

Policy Framework	Description	Relevance to the faecal sludge treatment plant
	protect the rights of persons with disabilities (PWDs). The Government is mandated to promote and protect the rights of persons with disabilities and the Constitution of the Republic of Uganda stipulates the need to empower and provide equal opportunities to PWDs. Government has focused on the provision of health services, community-based rehabilitation, vocational training etc.	these opportunities arise during project implementation.
The Land use Policy, 2004	In support of the national objectives on poverty eradication and economic growth, while at the same time ensuring sustainable utilisation of natural resources including land and water, the National Land Use Policy's main goal is 'to achieve sustainable and equitable social and economic development through land utilisation in Uganda'. The specific objective of the policy is to promote land use activities that ensure sustainable utilization of natural resources for national socio-economic development; the policy emphases among others, environmentally friendly practices, community based participatory planning, gender and land ownership.	The environmental and social Impact assessments is aimed at ensuring sustainable implementation of the proposed faecal sludge treatment plant in conformity to the land use policy.
The National Water Policy, 1999	The objective of the policy is to guide the development of the water resources of Uganda in an integrated and sustainable manner, to secure and maintain water of adequate quantity and quality for all social needs, with the full participation of all stakeholders and mindful of the needs of future generations.	The management of the proposed faecal sludge treatment plant should be in line with this policy especially in ensuring that the community is involved in management right from the design of the project. This will promote sustainability and a sense of

Policy Framework	Description	Relevance to the faecal sludge treatment plant
		responsibility.
Occupational Health and Safety Policy,2006	The policy seeks to: • Provide and maintain a healthy working environment; • Institutionalize OHS in the project programs/activities; and • Contribute towards safeguarding the physical environment. The OHS Policy Statement is guided by the Constitution of the Republic of Uganda and other global, national and sectoral regulations and policies. The Statement also takes into recognition of the PEAP, the Transport Sector Policy and Strategy Paper, and the Health Sector Strategic Plan, all of which aim to improve the quality of life for all Ugandans in their living and work settings.	All works shall integrate the health and safety of the workers and community members along with the project priority projects.
HIV / AIDS Policy	The current effort to combat HIV/AIDS is characterized by the policy of openness on the side of government. This has spread to the wider civil society, lower political and social institutions, and to an extent, the family. HIV/AIDS in the context of national development planning is attended to, through PEAP and Vision 2040.The multi-sectoral approach is also considered to be part of the integral part of PEAP. Main streaming HIV/AIDS in all programs including water and sanitation is an important aspect of a national overarching policy.	There is need for the developer/contractor to educate his work force (i.e., both migrant and local) and the general community on HIV/AIDs especially during construction of the faecal sludge treatment plant and it's associated infrastructure.

5.4. Legal Framework

Table 5-3: Relevant Legal Framework

Legal Framework	Description	Relevance to the Faecal sludge management facility
The Constitution of the Republic of Uganda, 1995	The Constitution is the supreme law of Uganda and it provides for protection of the environment. It provides for: Promote sustainable development and public awareness on the need to manage land, air, water resources in a balanced and sustainable manner for the present and future generations. Take possible measures to prevent or minimize damage and destruction to land, air and water resources resulting from pollution or other causes. Promote the rational use of natural resources so as to safeguard and project bio-diversity of Uganda. Article 39 of the Constitution provides that "Every person living in Uganda has a right to a clean and healthy environment". National Environment Act also requires certain projects to undergo environment impact assessments (EIA's). EIA's for projects with significant environmental impacts are subjected to public hearings. Utilization of natural resources like water and wetlands shall be managed in such a way as to meet the development and environmental needs of the present and future generations of Uganda.	Chapter 15, Article 237, Clauses (1) (2) (a) & (b) gives the Government the powers as guided by the Parliament to acquire land anywhere within the country and place it to the best use to benefit the citizens of the country, where deemed necessary. The development of the development of the Faecal Sludge Treatment Plant in Wobulenzi T.C is all aimed at sustainable development for the benefit of the locals and will be done following mitigation measures that will be suggested in the ESIA report. All land acquisitions will adhere to provisions of the 1995 National Constitution.
The National Environment Act No.5,	This Act spells out principles of environmental management and the rights to a decent environment, institutional arrangements, environmental planning, environmental regulations, environmental	This Act prescribes projects for which EIA is mandatory, particularly waste management facilities and specifically

Legal Framework	Description	Relevance to the Faecal sludge management facility
2019	standards, environmental restoration orders and environmental easements, records, inspection and analysis, financial provisions, environmental offences, judicial proceedings and international obligations. The National Environment Act, No.5, 2019; is the most important legal instrument in Uganda with respect to environmental management, providing for an institutional framework through establishment of the National Environment Management Authority (NEMA). It also specifies management measures, addresses pollution control and stipulates mechanisms for enforcement of the law. The process is further elaborated in Environmental Impact Assessment Guidelines of Uganda (July 1997). The projects listed in the include transportation projects such as all major roads, which applies to this road project. The Act provides for environmental audits and inspections by NEMA's environmental inspectors and Lead Agencies. This Act requires operator of projects or facilities to maintain records and make annual reports to NEMA to demonstrate environmental compliance.	the proposed Faecal Sludge Treatment Plant is one of these (in Seventh Schedule of the Act).
Local Governments Act, Cap 243	This Act provides for decentralized governance and devolution of central government functions, powers and services to local governments that have own political and administrative set-ups. According to Section 9 of the Act, a local government is the highest political and administrative authority in its area of jurisdiction and shall exercise both legislative and executive powers in accordance with the constitution.	Wobulenzi Town Council, where the proposed faecal sludge facility will be responsible for ensuring the faecal sludge treatment plant project is developed in an environmentally sustainable manner

Legal Framework	Description	Relevance to the Faecal sludge management facility
Land Act, Cap 227	It provides for the ownership and management of land. It gives power for the compulsory acquisition of land for public purposes that are taken to include land required for public water and wastewater facilities. Sections 43, 44 and 45 (1) and (2) of the Land Act (1998), Government or local government may acquire land in accordance with the provisions of Article 26 and clause (2) of Article 237 of the Constitution of the Republic of Uganda. The Act creates a series of land administration institutions consisting of Uganda Land Commission (ULC), District and Land Boards (DLB) Section 78 of the Act gives valuation principles for compensation i.e., compensation rates to be yearly approved by DLBs. Value for customary land is the open market value. Under Section IV, the Land Act describes the different tenure systems as follows: Mailo, Freehold, Leasehold and Customary. Section 70 of the Act provides that all rights in the water of any natural spring, river, stream, water course, pond, or lake on or under land shall be reserved to the Government and no such water shall be obstructed, dammed, diverted, polluted or interfered with except in pursuance of permission in writing granted by the Minister responsible for water and natural resources in accordance with the Water Act. These watercourses should not be used except without requisite permission.	MWE and the appointed contractor should seek to enter into mutual agreement with the occupier or owner of the land upon payment of compensation.
The Physical Planning Act, 2010	This is the principal Act that regulates physical development in Uganda. It provides for the making and approval of physical development plans, applying for development permission and other	The proponent will ensure that the development complies with the Luwero District Development Plan of Wobulenzi

Legal Framework	Description	Relevance to the Faecal sludge management facility
	related matters. Section 37 of the Act states that the approving authority may grant preliminary approval of a development application for which an EIA is required, subject to an applicant obtaining an EIA certificate, in accordance with the National Environmental Act. Pursuant to the provisions of this Act.	T.C and that the proposed site is restored to the original condition after construction of the water and sanitation infrastructure. The MWE and or their appointed contractor will be required to ensure the development does not in away have injurious impact on the environment. MWE or its appointed contractor are also supposed to submit his plans to for approval.
Road Act, Cap 358	This law is important because the water component of the project will involve trenching all and across access roads which lead to disruption and in rear cases temporary closure of access roads.	This Act provides for the maintenance of the access road by empowering the respective local governments hosting the Faecal Sludge Treatment Plant.
The Occupational Safety and Health Act, 2006	The Act provides for administration and enforcement of the Act, general duties, obligations and responsibilities of employers, general duties of manufacturers, suppliers and transporters, duties, rights and responsibilities of workers, registration of workplaces, general safety requirements, fire preparedness, machinery, plant and equipment, hazardous materials, chemical safety and special provisions and offences, penalties and legal proceedings. Section 13 (1) a stipulates that it's the responsibility of the employer to take, as far as is reasonably practical all measures for the protection of his or her workers and the general public from the dangerous aspects of the employer's undertaking at his or her own cost.	The contractor of the proposed Faecal Sludge Treatment Plant will be required to adhere to this provision of the labour laws.

Legal Framework	Description	Relevance to the Faecal sludge management facility
	'It shall be the duty of the employer to set up a safety committee for a workplace with at least 20 workers. The committee will review the measures taken to ensure the safety and health of employees' (Section 16). Section 19 requires an employer to provide adequate and suitable protective clothing and protective equipment to the workers of his or her undertaking.	
Petroleum Supply Act, 2003	This Act provides for the supervision and monitoring of transportation, supply, storage and distribution of petroleum products. The Act regulates licensing and control of activities and petroleum installations for protection of public health and safety and control of environmental pollution. Section 3, Part (d) ensures public safety and protection of public health and the environment in all petroleum supply operations and installations. According to this Act, "petroleum products" includes asphalts and bitumen, oils as well as conventional petroleum fuel. Section 17(1) prohibits constructing a petroleum products installation without having obtained a petroleum construction permit. Section 18 provides guidance on process leading to securing this permit. Section 32(1) requires owners of fuel facilities to comply with local and international public health and safety and environmental obligations prescribed by Uganda National Bureau of Standards (UNBS) and NEMA. In this regard, provision of impervious bunds around tank farms would be a standard obligation at fuel storage areas. Such bunds should have capacity enough to hold 100% volume of the largest tank in case of spill emergency. The bunds should be constructed such as to prevent soil contamination. By interpretation of this clause, fire safety at storage areas would also be a regulatory requirement. Of equal importance would be remediation of any contaminated areas on site, in interest of public health and contravention of all foregoing constitutes	In relation to this proposed Faecal Sludge Treatment Plant, this Act will apply to management (construction, operation and decommissioning) of fuel handling facilities during the implementation of the water and sanitation improvement infrastructure project including fuel transportation, constructing and operation of storage tanks and consumption of petroleum products. All foregoing provisions will be important for construction and operation of onsite fuel storage facilities during the construction of the Faecal Sludge Treatment Plant.

Legal Framework	Description	Relevance to the Faecal sludge management facility
	offences according to Sections 37 and 39 of the Act. Part IV Chapter 17(a) prohibits any person from carrying out the construction or major modifications of an installation or facility without having obtained a petroleum construction permit under this Act.	
Water Act, Cap 152	The objective of the Act is to enable equitable and sustainable management, use, and protection of water resources of Uganda through supervision and coordination of public and private activities that may impact water quantity and quality. Section 18 requires that before constructing or operation of any water works, a person should obtain a permit from Water Resources Management Directorate (WRMD). Construction is herein defined to include working in the wetlands / water courses. The Act also aims to control pollution of water resources (Sections 20 and 31). The foregoing notwithstanding, Section 19 provides that subject to guidelines established by the Minister from time to time, the Director (of water resources management) *may* exempt a public authority or a class of persons or works from requirements in Section 18 on such conditions as he or she may deem fit. Since this decision is reached upon evaluation of an application submitted to the Directorate, Section 19 does not automatically preclude works by public agencies from applying for permits prescribed by this Act. This Act will specifically be applicable to two aspects of the proposed Faecal Sludge Treatment Plant: Water abstraction for the proposed Faecal Sludge Treatment Plant construction and camp use. Activities associated with construction of ponds in the wetlands.	The Act provides for the management of water in Uganda and is under the mandate of Directorate of Water Development (DWD) in the Ministry of Water, Lands and Environment
Historical Monuments	Assented to on 21st October, 1967 and came into force on 15th May	Chance finds objects that may be found

Legal Framework	Description	Relevance to the Faecal sludge management facility
Act, Cap 46	1968, this Act provides for the preservation and protection of historical monuments and objects of archaeological, paleontological, ethnographical and traditional interest. The historical monuments act, Cap 46 gives mandate to the Department of Museums and Monuments to collect document and preserve cultural relics that have values to the community, the nation and the international community.	during the construction works for the Faecal Sludge Treatment Plant will therefore, be reported to the Department of Museums and Monuments for advice and where necessary undergo a forensic assessment.
Employment Act No 6, 2006	Employment Act, 2006 repeals Employment Act, Cap 219 enacted in 2000. This Act is the principal legislation that seeks to harmonise relationships between employees and employers, protect workers' interests and welfare and safeguard their occupational health and safety through: Prohibiting forced labour, discrimination and sexual harassment at workplaces (Part II; Part IV) Providing for labour inspection by the relevant ministry (Part III) Stipulating rights and duties in employment (weekly rest, working hours, annual leave, maternity and paternity leaves, sick pay, etc. (Part VI) Continuity of employment such as continuous service, seasonal employment, etc. (Part VIII). This law revises and consolidates laws governing individual employment relations and matters related to it. Similar to the Constitution, as earlier mentioned, it makes it an unlawful to discriminate people in employment. It defines discrimination as any distinction, exclusion or making preference on the basis of race,	Ugandan labour laws address matters below which will be important for employee management during the Faecal Sludge Treatment Plant construction: Contracts of Service; Employment of children/ child labour; Termination of Contracts; Illness of employees; Sexual harassment; Occupational diseases; First-Aid; Dust and fumes; Meals in certain dangerous trades; Protective clothing and appliances; Protection of eyes in certain processes;

Legal Framework	Description	Relevance to the Faecal sludge management facility
	colour, sex, and HIV status or disability amongst other which has the effect of nullifying or impairing the treatment of a person in employment or occupation or prevents an employee from obtaining any benefit under a contract of service. Some of the stakeholders consulted reported that contractors are found of under paying Uganda workers for a similar job as other employed foreigners. This should be discouraged and monitoring mechanisms be put in place by MWE and the contractor to make sure that such discrimination is not happening. The Employment Act also states that HIV status does not constitute fair reasons for dismissal or for the imposition of a disciplinary penalty. The Employment Act therefore requires to be made known to the contactor or their representatives and adhered to, to promote a health working environment for all those employed. Workers' welfare is one of the issues that require to be regularly monitored by the lead agency (MWE) or any other assigned agency. The Employment Act (2006) gives a provision for a Labour Advisory Board that advises on matters affecting employment and industrial relations.	Treatment of injuries and sickness; Drugs and medical equipment; Examination of employees; and, Failure to provide for the sick.
Regulations and Standards		
The Environment Impact Assessment regulations, 1998	Environmental Impact Assessment Regulations, 1998 provide for implementation of the National Environment Act, No.5, 2019. Under the Regulations, the rules governing EIA are stated. National Environment Management Authority (NEMA) has the major responsibility of managing all environmental related issues in Uganda. NEMA works with lead agencies to ensure a proper	The Environmental Impact Assessment Regulations, 1998 (Statutory Instruments No. 13/1998), provides for environmental Audits in Part VIII, section 31, 32 and 33. The Audits can be initiated by the Authority, a petition from

Legal Framework	Description	Relevance to the Faecal sludge management facility
	environmental management. The Environmental Impact Assessment Regulations includes clauses covering provisions, definitions, environmental impacts studies review processes, schedule, approval requirements and fees.	a member of the public, or an environmental inspector. The project implementers and owners will keep relevant authorities informed of the status of implementation of this project, and prepare regular environmental audit reports where need be.
National Environment (Noise Standards and Control) Regulations, 2003	This law is important to the project because the construction or operation of sanitation facilities such as; Faecal Sludge Treatment Plant will involve some noise generation. The regulation provides standards for: a) The maximum permissible noise levels to which a person may be exposed from a facility, activity or construction site; b) Control of noise and for mitigating measures for the reduction of noise levels; and c) Giving effect to the provisions of section 29 of the Act. Regulation 6 (1) provides that the maximum noise levels to which a person may be exposed from any area and shall not exceed the level specified in Column 2 of Part 1 of the First Schedule. Regulation 7 (1) No person shall emit or engage in any activity that emits or is likely to emit noise in excess of the permissible noise level specified in regulation 6, unless permitted by a license under these Regulations.	These regulations are relevant to the projects if construction activities and operation generate noise above permitted levels.

Legal Framework	Description	Relevance to the Faecal sludge management facility
	Regulation 7 (2) any person who emits or engages in any activity that emits or likely to emit noise above a maximum permissible level specified in sub-regulation (1) commits an offence. Regulation Section 8 (1) - Duty to control noise. It shall be the duty of the owner or occupier of a facility or premise or machinery, to use the best practicable means of ensuring that the emission of noise from that machinery, facility or premises does not exceed the permissible noise levels. Sub-regulation (3) states that a person or occupier of a premise or facility or machinery or plant generating noise who fails to comply with this regulation commits an offence. Part III Section 8 (1) requires machinery operators, to use the best practicable means to ensure that the emission of noise does not exceed the permissible noise levels. The regulations require that persons to be exposed to occupational noise exceeding 85 dBA for 8 hours should be provided with requisite ear protection. The regulatory noise limits at construction activity work sites are presented in Table 5-4. At construction sites corresponding limits are 75 dBA and 65 dBA for day and night time levels respectively. **Table 5-4:Regulatory noise limits** **Facility** / **Noise limits dB (A) (Leq)** — **Day*** / **Night***	

Legal Framework	Description	Relevance to the Faecal sludge management facility
	<table><tr><td>Construction sites</td><td>75</td><td>65</td></tr><tr><td>Residential areas</td><td>55</td><td>45</td></tr><tr><td colspan="3">*Time frame: Day 6.00 a.m -10.00 p.m; Night 10.00 p.m. - 6.00 a.m.</td></tr></table> *Source: The National Environment (Noise Standards and Control) Regulations, 2003.*	
National Environment (Waste Management) Regulations, 1999	These regulations require waste disposal in a way that would not contaminate water, soil and air or impact public health. This is in relation to onsite waste storage, haulage and final disposal. According to the regulations, waste haulage and disposal should be done by licensed entities. Regulation 5 (1) requires a person who owns or controls a facility or premises which generate waste shall minimize the waste generated by adopting the following cleaner production methods- • Improvement of production processes through- • Conserving raw materials and energy • Eliminating the use of toxic raw materials • Reducing toxic emissions and wastes • Monitoring the product cycle from beginning to by- • Identifying and eliminating potential negative impacts of the product; • Enabling the recovery and reuse of the product where possible; • Reclamation and recycling;	Therefore, if the proposed project contractors intend to store the project generated waste at their premises or to transport the project waste or to treat waste at the sites especially the sewage at the campsites, they must apply to NEMA for licenses to do so. Otherwise, they must use already licensed companies to transport waste, treat the waste and the waste must be stored in places designated by the authority for that purpose. The project contractors will therefore be required to adopt these methods to minimize the waste anticipated be generated by the project and its facilities such as waste waters and domestic wastes.

Legal Framework	Description	Relevance to the Faecal sludge management facility
	• Incorporating environmental concerns in the design and disposal of a product Regulation 6 (1) requires a person intending to transport or store waste on his or her premises to apply to the authority (NEMA) for a license. Regulation 6 (2) also requires a person intending to store waste on his or her premises to apply to the authority (NEMA) for a license. Regulation 13 (1) also requires a person intending to operate a waste treatment plant or disposal site to apply to the authority (NEMA) for a license. The company transporting waste must abide by all the regulations such as sub regulations 2, 3 and 5 of Regulation 7 and sub regulation 3 of regulation 11, set out in the regulations. Waste must also be stored according to the regulations such as sub regulation 3 of regulation 10 and regulation 11, set out in the regulations. A person operating waste treatment plant must abide by all the relevant regulations such as sub regulation 3 of regulation 14 and sub regulation 2 of regulation 15, set out in the regulations.	
Guidelines for Environmental Impact Assessment in Uganda, 1997	Environment Management Authority (NEMA) issued Guidelines for Environmental Impact Assessment, on July 1997. The Guidelines list the projects, which are subject to a detailed EIA study. The projects are classified into projects that in the proposed location have negligible environmental impacts, and projects that likely to have significant environmental impacts.	The proposed Faecal Sludge Treatment Plant by virtue of their locations are listed among projects that likely to have significant environmental impacts
The Water Resources Regulations, 1998	Sub-regulation (1) of this regulation applies to any person who occupies land on or adjacent to which there is motorised water	The project implementers are as well charged with ensuring that this

<table>
<tr><th>Legal Framework</th><th>Description</th><th>Relevance to the Faecal sludge management facility</th></tr>
<tr><td></td><td>pump, which whether temporarily or permanently pumps water from a bore hole or water way. Section 2 (b), of the regulation provides that a person who at the commencement of these regulations, owns, occupies, operates, controls any works on land referred to in sub-regulation (1), shall register the works and the use of water with the director. In case of any water abstraction at the site, the developer will ensure that the provisions of these regulations are enacted before operation.</td><td>regulation is adhered to during the construction and operation of faecal sludge activities.</td></tr>
<tr><td>The National Air Quality Standards, 2006</td><td>Pollutants such as carbon dioxide, Nitrogen oxides, Sulphur oxides, Volatile Organic Compounds and particulates are expected to be emitted especially by construction vehicles. The national air quality standards provide regulatory limits for these emissions and should be adhered too during the construction of the water and sanitation project.

Construction operations will generate dust and exhaust emissions, mainly from motorized equipment. The draft national air quality standards provide the following regulatory limits for various emissions as presented in Table 5.5 below.

Table 5-5: Draft regulatory air quality limits
<table>
<tr><th>Pollutant</th><th>Averaging time for ambient air</th><th>Standard for a</th></tr>
<tr><td>Carbon dioxide (CO2)</td><td>8 hrs</td><td>9.0ppm</td></tr>
<tr><td>Carbon monoxide (CO)</td><td>8 hrs</td><td>9.0ppm</td></tr>
<tr><td>Hydrocarbons</td><td>24 hrs</td><td>5mgm-3</td></tr>
</table></td><td>These standards are relevant considering that project construction will require motorised machinery powered by diesel engines hence generating pollutants such as CO_2, NOx, SOx and particulates are expected to be emitted. Dust will also be generated during excavation, construction and material/ equipment transport.</td></tr>
</table>

<table>
<tr><th>Legal Framework</th><th>Description</th><th>Relevance to the Faecal sludge management facility</th></tr>
<tr><td></td><td>
<table>
<tr><td>Nitrogen oxides (NOx)</td><td>24 hrs
1 year arithmetic</td><td>0.10 ppm</td></tr>
<tr><td>Smoke</td><td>Not to exceed 5 minutes in any one</td><td>Ringlemann Scale No.2 or 40% observed at 6m or more</td></tr>
<tr><td>Soot</td><td>24 hrs</td><td>500 µg/Nm-3</td></tr>
<tr><td>Sulphur dioxide (SO_2)</td><td>24 hrs</td><td>0.15 ppm</td></tr>
<tr><td>Sulphur trioxide (SO_3)</td><td>24 hrs</td><td>200 µg/Nm-3</td></tr>
</table>
Source: Draft National air quality standards, 2006. Note: ppm=parts per million, “N’ in µg/Nm-3 connotes normal atmospheric conditions of pressure and temperature (25^0C and 1 atmosphere).</td><td></td></tr>
<tr><td><u>National Environment (Minimum Standards for Management of Soil Quality) Regulations, 2001</u></td><td>Regulation 3 specifies the purpose of the regulations which is;
To establish and prescribe minimum soil quality standards to maintain, restore and enhance the inherent productivity of the soil in the long term;
To establish minimum standards for the management of the quality of soil for specified agricultural practices;
To establish criteria and procedures for the measurement and determination of soil.
Regulation 12 (1) specifies that every responsible person shall comply with the measures and guidelines for soil conservation for the particular topography, drainage and farming systems prescribed in the Fourth Schedule.</td><td>The construction works for the faecal sludge management facilities will involve significant movement of soils from one place to another and probably with the wetlands. Furthermore, the waste soil and offcuts should be tested for chemical contents, treated adequately and make sure it does not have significant impact on the resident environment especially the wetlands. The regulations will also be relevant in regard to prevention of contamination of land covered by the project infrastructure. The regulations will apply</td></tr>
</table>

<table>
<tr><th>Legal Framework</th><th>Description</th><th>Relevance to the Faecal sludge management facility</th></tr>
<tr><td></td><td></td><td>to waste disposal practices of contractors during construction, operation and decommissioning.</td></tr>
<tr><td><u>The Water (Waste Discharge) Regulations, 1998</u></td><td>Regulation 4 (1) of these regulations prohibits any person to discharge effluent or waste on land or into the aquatic environment contrary to the standards established under Regulation 3 unless he or she has a permit issued the Director of Water Resources. According to Regulation 4 (2) (a), a person granted a permit under Regulation 4 (1) shall ensure that the effluent or waste discharged conforms to the maximum permissible limits established under Regulation 3 (1).</td><td>Since the proposed project will generate waste water especially during the construction phase of the faecal sludge facilities, at construction sites and project camp(s), the contractors for the project would have to abide by the said regulations.</td></tr>
<tr><td><u>The National Environment (Standards for Discharge of Effluent into Water or on Land) Regulations, 1999</u></td><td>Section 6 (2) details maximum permissible discharge limits for 54 contaminants, that must not be exceeded before effluent is discharged into water or on land. Through limits on over 54 pollutants, these regulations control discharges in surface watercourses. Examples of some of the regulated pollutants are listed below in Table 5-6 below.
Table 5-6: National Discharge Standards for Selected Pollutant Parameters Associated with the Construction activities
<table>
<tr><th>S/N</th><th>Parameter</th><th>Maximum Permissible Limits</th><th>S/N</th><th>Parameter</th><th>Maximum Permissible Limits</th></tr>
<tr><td>1</td><td>1,1,1-Trichloroethane</td><td>3.0 mg/l</td><td>30</td><td>Magnesium</td><td>100.0 mg/l</td></tr>
<tr><td>2</td><td>1,1,2-</td><td>0.2 mg/l</td><td>31</td><td>Mangane</td><td>1.0</td></tr>
</table></td><td>The regulations promote cleaner production methods that enable the recovery and reuse of wastes, reclamation and recycling. Further the regulations require hazardous waste to be stored in facilities specially designed for that purpose and that such facilities obtain licenses from NEMA.</td></tr>
</table>

Legal Framework	Description						Relevance to the Faecal sludge management facility
		Dichloroethyelene			se	mg/l	
	3	1,1,2-Trichloroethane	1.06 mg/l	32	Mercury	0.01 mg/l	
	4	1,2-Dichloroethane	0.04 mg/l	33	Nickel	1.0 mg/l	
	5	1,3-Dichloropropene	0.2 mg/l	34	Natrite-N	20.0 mg/l	
	6	Aluminium	0.5 mg/l	35	Nitrite-N	2.0 mg/l	
	7	Ammonia Nitrogen	10.0 mg/l	36	Nitrogen (Total)	10.0 mg/l	
	8	Arsenic	0.2 mg/l	37	Oil and Grease	10.0 mg/l	
	9	Barium	10.0 mg/l	38	pH	6.0 - 8.0 mg/l	
	10	Benzene	0.2 mg/l	39	Phenols	0.2 mg/l	
	11	BOD5	50 mg/l	40	Phosphate (Total)	10.0 mg/l	
	12	Boron	5.0 mg/l	41	Phosphate (Soluble)	5.0 mg/l	
	13	Cadmium	0.1 mg/l	42	Selenium	1.0 mg/l	
	1	Calcium	100.0 mg/l	43	Silver	0.5	

Legal Framework	Description						Relevance to the Faecal sludge management facility
	4					mg/l	
	15	Chloride	500.0 mg/l	44	Sulfate	500.0 mg/l	
	16	Chlorine	1.0 mg/l	45	Sulfide	1.0 mg/l	
	17	Chromium (Total)	1.0 mg/l	46	TDS	1200 mg/l	
	18	Chromium (VI)	0.05 mg/l	47	Temperature	20 - 35 oC	
	19	Cirrus-1,2-Dichloroethylene	1.0 mg/l	48	Tetra-Chloroethylene	0.1 mg/l	
	20	Cobalt	1.0 mg/l	49	Tetra-Chloromethane	0.02 mg/l	
	21	COD	100 mg/l	50	Tin	5.0 mg/l	
	22	Clifford Organisms	10,000 counts/100 ml	51	Total Suspended Solids	100.0 mg/l	
	23	Color	300 TCU	52	Trichloroethylene	0.3 mg/l	
	24	Copper	1.0 mg/l	53	Turbidity	300 NTU	
	25	Cyanide	0.1 mg/l	54	Zinc	5.0 mg/l	
	2	Detergents	10.0 mg/l	38	pH	6.0 -	

Legal Framework	Description	Relevance to the Faecal sludge management facility
	6 | | | | | 8.0 mg/l 27 | Dichloromethane | 0.2 mg/l | | | | 28 | Iron | 10.0 mg/l | | | | 29 | Lead | 0.1 mg/l | | | | *Source: The National Environment (Standards for Discharge of Effluent into Water or on Land) Regulations, S.I. No 5/1999 and NEMA 2003, Environmental Legislation Handbook.*	
The National Environment (River Banks, Lake Shores and Wetlands Management) Regulations, 2001	The Regulation provides a list of regulated activities whose implementation in wetlands, riverbanks and lakeshores is subject to issuance of a Permit granted by NEMA in consultation with the Lead Agencies. These includes brick making, recreation activities such as spot fishing, maintenance of green spaces, cultivation, drainage, commercial exploitation, ***sewerage filtration,*** fishing using fish gear and weirs, fish farming, and other aquaculture, power dam construction, construction of transport and communication facilities such as roads, railways, telephone lines, burning and any other exploitative activity which is of a commercial or trade nature, such as harvesting of papyrus for commercial purposes. The regulations in section 34 provides that a developer desiring to conduct a project which may have a significant impact on a wetland, river bank or lake shore, will be required to carry out an Environmental Impact Assessment in accordance with sections 20,	The proposed project site for faecal sludge management facility in Wobulenzi T.C is close to the wetlands and most activities will be close to them. According to the National Environment (Riverbanks, Lakeshore and Wetlands) Regulations, the Government of Uganda or Local Governments shall hold in trust for the people and protect wetlands, riverbanks and lakeshores for the common good of the citizens of Uganda. Government or local government shall not lease out or otherwise alienate any wetlands, riverbank or lakeshore.

<table>
<tr><th>Legal Framework</th><th>Description</th><th>Relevance to the Faecal sludge management facility</th></tr>
<tr><td></td><td>21 and 22 of the National Environment Act. Environmental impact is mandatory for all activities in the wetlands, riverbanks and lakeshores and special measures are essential for protection of riverbanks, lakeshores and wetlands of international, national, and local importance as ecological systems and habitat for fauna and flora species, and for cultural and aesthetic purposes, as well as for their hydrological functions and values for preventing soil erosion, siltation and water pollution.

Table 5-7: Relevant Environmental Quality Standards
<table><tr><th>Particular</th><th>National Standard</th></tr><tr><td>Ambient air quality</td><td>The National Air Quality Standards, 2006</td></tr><tr><td>Noise</td><td>National Environment (Noise Standards and Control) Regulations, 2003</td></tr><tr><td>Drinking water quality</td><td>National Drinking Water Quality Standards, 2006</td></tr><tr><td>Discharge of Effluent</td><td>The National Environment (Discharge of Effluent into water or on Land) Regulations, S.I.No 5/1999</td></tr></table></td><td></td></tr>
</table>

5.5. International Policies, Agreements, and Institutional Requirements

5.5.1. The European Union (EU)

The EU has passed legislation aimed at improving the quality of water, tackling air and noise pollution, assuring the safety of chemicals, setting standards for waste disposal and protecting native wildlife and plants. The current EU Environment Action Plan identifies four environmental areas for priority action: climate change; nature and biodiversity; environment, health and quality of life, and natural resources and waste.

5.5.2. The EU Environment Policy

The Directive 97/11/EC, known as the "EIA"(environmental impact assessment), requires an assessment to be carried out by the competent national authority for certain projects which have a physical effect on the environment. The EU Directives on Environmental Assessment aim to provide a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation of projects, plans and programmes with a view to reducing their environmental impact. The directives ensure public participation in decision-making and thereby strengthen the quality of decisions. Within the EU Directive's objectives and requirements, scoping is recognized as an important feature of an adequate EIA regime mainly because it improves the quality of the EIA.

The environmental impact assessment must identify the direct and indirect effects of a project on the following factors: man, the fauna, the flora, the soil, water, air, the climate, the landscape, the material assets and cultural heritage, and the interaction between these various elements. The EU established a comprehensive system of environmental protection covering emissions into air and water, noise, waste disposal, conservation of natural habitats, chemicals and industrial accidents. An example of such domestic actions is the EU Emission Trading Scheme (EU ETS), on CO2 emissions from industrial installations. The EU also supports reducing CO2 emissions through Carbon Capture and Storage (CCS) to bury emissions so they don't enter the atmosphere. Also, in 2008, the EU reasserted a commitment to reduce the amount of CO2 emitted from new cars and to fine manufacturers for each gram of CO2 they produce over the target (€20 in 2012, €95 in 2015).

The consultation covers issues, such as the screening of projects for EIA, the quality of the EIA process, the harmonization of assessment requirements among member States, cross-border difficulties when projects affect more than one Member State, the role of the environmental authorities, and development of synergies with other EU policies, such as climate change and biodiversity. The consultation seeks views on the following issues:

- Screening of projects for EIA (in view of considerable differences among Member States)
- The quality of the EIA process e.g., data used in the EIA, assessment of alternatives)
- The role played by the environmental authorities, and
- Development of synergies with other EU environmental legislation and policies, such as climate change, resource efficiency and biodiversity, which are not sufficiently covered by the Directive in its current form.

In general, the EU's environmental policy is underpinned by the "precautionary principle." It is based on the "polluter pays" concept and the management and control of pollution at source. This policy has been triggered since the project for the faecal treatment plant is funded by the EU and has to therefore fall within the requirements of the funding institution.

5.5.3. World Bank Environmental Social Safeguard Policy Frameworks

The World Bank as a funding agency has policies, procedures and guidelines that detail the way in which environmental assessment is to be carried out. Some of key triggers that may be invoked by the land offices are:

- Land acquisition that requires the involuntary resettlement of people;
- Projects in protected areas; it should be noted that this project is not in a protected area.
- Projects with impacts on the habitats of protected and threatened species;
- Projects that impact cultural heritage

The World Bank requires Environmental Assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable, so as to improve decision-making. This study is therefore in line with the Bank's requirements.

A number of activities will be out of the character of the surrounding and will include land clearing which will involve bush and tree cutting, socio- economic aspects, soil exposure and ecological disturbance during construction of the Faecal sludge treatment plant. It's for this reason that the World Bank environmental and Social Safe guard policies for environmental assessment have been adhered to.

5.5.4. Environmental Assessment OP/BP 4.01

The Bank policy requires environmental assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable, and thus to improve decision making. Safeguard's policy OP 4.01 has been triggered, given that the project will include civil works, primarily construction of the faecal sludge treatment plant and its associated infrastructure such as office block. This policy examines the potential environmental risks and benefits associated with Bank financed investments, supports integration of environmental and social aspects of investments into the decision-making process, specifies consultation of the affected people, involve NGOs, and provide opportunities for their participation in the environmental assessment aspects.

The World Bank favours preventive measures over mitigation or compensatory measures, whenever feasible. This policy aims at identifying ways of improving project selection, siting, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts.

The EISA has taken all measures to prevent, avoid or mitigate any likely impacts as a result of constructing and operating the faecal sludge plant.

5.5.5. Policy Involuntary Resettlement (OP/BP) 4.12

The World Bank Involuntary Resettlement Operation Policy Framework 4.12 has been taken into account as there is a possibility of displacement of some properties. The World Bank's requirements regarding involuntary resettlement are detailed in Operation Policy Framework 4.12. The Directive outlines the following principles:

Acquisition of land and other assets, and resettlement of people should be minimized as much as possible by identifying possible alternative project designs, and appropriate economic, operational and engineering solutions that have the least impact on people in the project area.

The populations affected by the project are defined as those who may stand to the consequences of the project, all or part of their physical and non-physical assets, homes, homesteads, productive lands, commercial properties, tenancy, income opportunities, social and cultural activities and relationships, and other losses that are identified during the process of resettlement planning.

5.6. International Agreements

Uganda is party to several global and regional environment and conventions and agreements as described below:

The Convention on Biological Diversity (CBD)

A major objective of which is in-situ and ex-situ conservation of biological diversity. Parties to this convention are required to undertake EIA for projects likely to have significant adverse effects on biodiversity and are required to develop national plans and programmes for the conservation and sustainable use of biodiversity.

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

This convention seeks to ensure that international trade in species of wild fauna and flora does not threaten their survival in wilderness. Species on the CITES lists are considered of conservation concern.

The Ramsar Convention on Wetlands, 1971:

This convention on wetlands of international importance especially as waterfowl habitat (or Ramsar Convention 1971) as amended in 1982 and 1987 was ratified by Uganda in 1988.

Stockholm Convention on Persistent Organic Pollutants (POPS):

The Stockholm Convention on Persistent Organic Pollutants (POPs) is a global treaty adopted on 22 May 2001 and entered into force on 17 May 2004. It seeks to protect human health and the environment from POPs: organic (carbon-based) compounds that resist degradation in environment, have low water but high fat solubility and bioaccumulate in fatty tissues. Examples include dioxins and furans, PCBs and are toxic to humans and wildlife. This Convention requires Parties to take measures to eliminate or reduce the release of POPs into the environment. The Convention has 5 major aims: (i) to eliminate dangerous POPs starting with the 12 worst (the dirt dozens) among them DDT, PCBs, dioxins and other POPs pesticides); (ii) support the transition to safer alternatives; (iii) target

additional POPs for action; (iv) clean-up stockpiles of POP's and equipment containing PCBs; and (v) to cooperate with other Parties for a POPs free future. Uganda acceded to the Convention on the 20th July 2004 and was obligated to develop a National Implementation Plan (NIP) for managing the POPs. In fulfilment of Article 7 of the Stockholm Convention, Uganda developed and transmitted her NIP to the Conference of parties in January 2009. Today, various implementation activities are going on in the country in line with priority areas identifies in the NIP

5.7. International /development partners' Requirements and Guidelines

5.7.1. Equator Principles and the International Finance Corporation (IFC)

The Equator Principles are a financial industry benchmark for determining, assessing and managing social and environmental risks to projects. They represent a voluntary set of environmental and social guidelines for project finance lending. Since their launch in June 2003, the principles have become the new market standard, transforming project finance on a global scale.

There is close alignment between the Equator Principles and the International Finance Corporate (IFC) social and environmental sustainability performance standards and guidelines. The IFC performance standards and guidelines are prescriptive in nature and provide specific expectations with regards to scope and methodologies. Key issues within the IFC/Equator Principles version 2 frameworks are:

- Labour and working conditions;
- biodiversity;
- pollution prevention and abatement;
- indigenous peoples;
- land acquisition and involuntary resettlement;
- community health, safety and security; and
- Cultural heritage.

In addition, the International Finance Corporation (IFC) applies Performance Standards to projects it finances. Performance Standard 1, Social and Environmental Assessment and Management Systems (April 30, 2006) addresses standards for managing social and environmental risk and impacts through:

Community engagement in which the proponent demonstrates that it has built and maintained a constructive relationship with affected communities;

Disclosure in which the proponent provides project related information such as the Environmental Assessment (EA) that helps communities understand the risks, impacts and opportunities of the project

Consultation in which affected communities have an opportunity to express their views on and have constructive input into project risks, impact and mitigation measures;

Consultation on projects with significant adverse impacts on affected communities which must be done in a manner that ensures informed participation and that the communities' views on mitigation measures, benefits and opportunities and implementation measures are incorporated; and

Grievance procedure which is established to receive and facilitate resolution of affected communities' concerns and grievances in a prompt and efficient manner that is also culturally appropriate, readily

accessible to all segments of the affected communities, without cost or retribution and without prejudicing judicial or administrative actions.

In addition, The Principles state that the EA should address "participation of affected parties in the design, review and implementation of the project".

6. STAKEHOLDER ENGAGEMENT AND PUBLIC DISCLOSURE

6.1. Introduction

Consultation with relevant stakeholders and regulatory institutions was carried out by the ESIA team to ensure participation of relevant stakeholders, as recommended by the National Environment Act, 2019, EIA Regulations (1998), and conduct of Environmental Practitioners (2001) and guidelines for EIAs/Project Brief in Uganda.

The aim of these consultations was to identify and take note of environmental concerns and views of all the stakeholders at an early stage so that appropriate mitigations are incorporated in the final implementation plan for the proposed faecal sludge treatment facility.

Informal conversational interviews and observations were the key data collection methods applied. The consultation process ensured that their concerns were captured and will be addressed.

As such, Stakeholder Consultation and Engagement for the proposed faecal sludge treatment plant at in **Bukolwa LCI, Bukolwa Parish, Wobulenzi Town Council, Luwero District was** undertaken in accordance with the NEMA guidelines so as to gather opinions and views on the environmental aspects of the proposed project.

Some of the key steps taken in the consultation and engagement process included:

- Stakeholder consultative meetings; and
- Site Visits

6.2. Notifying Stakeholders of the ESIA

Consultations with various lead agencies, institutions and key personnel were conducted prior to the commencement and during the ESIA assignment as part of building support and gathering views for guidance on the designs and Environmental aspects to critically examine during the initial studies for the proposed faecal sludge treatment plant at in Bukolwa LCI, Bukolwa Parish, Wobulenzi Town Council, Luwero District.

A one-hour generic programme was drawn up for the public consultative meetings which was split into five short sessions. Session one; covered opening ceremonies (about the consultants, their specific tasks and their physical location), session two; provided a brief background and detailed information about the proposed faecal sludge treatment plant, session three; focused more on capturing locals concerns and views related to the proposed faecal sludge treatment plant, session four focused more on providing responses to the issues raised by the participants and Session five covered the Closing ceremonies. List of Attendees (**see Appendix 2**) are included in this ESIA.

6.3. Stakeholder Engagement Plan

During the ESIStudy phase, formal and informal meetings were been held with some of the stakeholders who were available at the time of the study site visits (refer to table 6.1. below). Additional, formal stakeholder meetings were held within the project area. Minutes, attendance registers and photographs from this meeting will be included in the ESIA.

6.4. Methodology and Approach

The key stakeholders who include government entities with persons around proposed faecal sludge treatment plant and potential PAPs and local leader's (see Table 6.1 below engagement meetings and dialogues on issues that involved the construction and operation phases of the faecal sludge treatment facility), were consulted following different agreed upon methodologies between the local leaderships of the affected communities and the ESIA team depending on the different dynamics encountered in those communities. Participatory approaches and methodologies were used which enabled potential PAPs and their leaders to open up, raised their concerns and actively participated in the sensitization and dialogue activities. The delivery methods included question and answer sessions which generated consensus on all issues raised by the participants

6.4.1. Objectives of Stakeholder Engagement

The objectives of stakeholder participation include the following:

a. To provide sufficient, balanced, objective, accurate and consistent information to assist stakeholders to understand the project.
b. To obtain feedback from stakeholders on project related issues
c. To work directly with stakeholders throughout the process to ensure that their grievances, concerns and needs are consistently understood, addressed or considered.
d. To partner with the stakeholders in the implementation of resettlement activities or compensation matters.
e. To create an enabling environment through which the project will smoothly operate in friendly co-existence with other stakeholders

The SEP should be reviewed and updated on a regular basis during project implementation. This SEP largely considers the stakeholders who have either interest, impact, influence over the construction and implementation activities of the project, stakeholders are therefore categorized based on the impact and the influence of them to the project construction and implementation activities. The approach, the strategies of handling the stakeholders, communication frequencies will be differing from one to the other based on the categorization with respect to impact and influence

6.4.2. Stakeholder Engagement Strategy

Engagement of stakeholders is vital in the understanding of project environmental and social risks, impacts and opportunities. The project will involve stakeholders and to keep good communication practices during the lifetime of the project. According to this approach, the aim of information disclosure / communication will be:

a. To provide to local communities a schedule and information on activities that will be arranged, together with the mechanisms for their feedback.

b. To improve the knowledge of what a project for proposed faecal sludge treatment plant involves, in all stages of the project life cycle.

c. To make public the commitment of the company to ensure the best practices in terms of environment protection and health and safety for workers and contractors.

d. To make available to the public a grievance procedure, in order to collect the negative feedback and to act in correcting the causes that may lead to a negative opinion as a result of the development or operations of the faecal sludge treatment facility.

In order to ensure transparency and availability of information regarding the proposed faecal sludge treatment plant at all phases (planning, construction and operation stages), MoWE will undertake the following:

- Project boards (in English) – will be prepared and hoisted at the project site and key roads leading to the project area. The board will include the most important information about faecal sludge treatment plant project as well as indicate MoWE's telephone information lines for communication.
- Website information – MoWE will disclose the projects information on its website. Information will be available in English languages and, in case of any relevant project changes, they will be publicly disclosed as well as their impacts

6.4.3. Sharing of reports and Documents

The following documentation shall be made available to the public on the website and in hard copies, upon request;

a. Project's Non-Technical Summary (NTS);

b. Stakeholder Engagement Plan (SEP), including Grievance Mechanism; and

c. Environmental and Social Impact Statement (ESIS).

6.4.4. Grievance Mechanism

A Grievance Mechanism shall be set up respond to any concerns, complaints particularly from project neighbours and stakeholders. Special care will be focused on training of project staff involved in the grievance mechanism management regarding functioning of grievance mechanism, particularly the stakeholder's opinion and communication mechanism.

Grievances during project construction phase as result of the following

a. Accidents involving some community members;

b. Communities exposed to high dust levels & noise;

c. Security related grievances;

d. Conflicts between community members and the construction workers;

e. Dumping of overburden/spoil material in people's gardens during access road maintenance or site clearance and debris extending beyond the bounds of the site;

f. Slope failure and soil erosion causing property damage;

g. Water resource quality impairment;
h. Low employment opportunities for the local communities;
i. Poor working conditions and terms of employment;
j. Houses close to construction area developing cracks and likely damages due to construction works such as vibrations; and

Grievance during operation such as;

a. Injurious affection (unforeseen post project impacts);
b. Accidents from project traffic (trucks, lorries and cars),
c. Fire acidents/emergency;
d. Bad ordour
e. Fuel spills;
f. Noxious Fumes;
g. Noise;
h. Social disruption/influx issues;
i. Employee strikes or grievances/Poor working conditions and terms of employment;
j. Low employment opportunities for the local communities;
k. Reckless conduct of company truck drivers

A Project Grievance Committee (PGC) will be set up to resolve grievances during construction and operation phases and will consist of MoWE project manager and Community Liaison Officer, Employer's representative, the local authorities. The activities of this committee will cease upon project completion.

6.4.5. Grievance Register

A Grievance Register (GR) will be made available to record all the grievances, complaints and issues the stakeholders would wish to make for consideration by MoWE. It shall be kept at a place where all will have easy access, preferably project offices onsite or in Wobulenzi Town Council offices to enable complainants to lodge their complaints.

The register will contain the following details date of the entry, name and contact details of the complainant; nature of grievance, Signature (on one side of the Register) and actions taken to address or reasons the grievance was not acted on, the signature of the GC and Complainant as to how the grievance was closed and date

6.4.6. Grievance Handling Procedure

A two-stage procedure to carry out grievance redress is proposed

Stage 1

The grievances shall be first lodged verbally or in writing to the Project Grievance Committee or village LC office. When the Project Grievance Committee receives grievances, it will be reviewed and categorized. If complainant is not affected the case will be ignored but in case there are justifiable reasons, the case shall be reviewed and resolved within 3 working days.

While resolving the grievances, the Project Grievance Committee or LC will always consult the relevant Luwero District technocrats depending on the issue e.g., Community Development Office, Environment Office, DISO/RDC etc. MoWE's project manager will be consulted by the local leaders from time to time on these matters.

Stage 2

Lodging compliant to Courts of Law

The constitution of Uganda gives a right to all persons if they are aggrieved and their issues are not resolved amicably or to their satisfaction to go to courts of law for proper redress. Just like aggrieved external parties, MoWE also has a right to lodge a complaint against any persons or community members that cause trouble to the implementation of the project. For example, the community vandalizing sign posts, conniving with their workers to steal project materials but have not been arrested, community members harassing the workers or use of derogative and abusive language, etc.

Table 6-1:Detailed Stakeholder Plan that was implemented

S. No	Stakeholder		Consultation/Engagement Date	Remarks/ Status
1.	Government Agencies/ Parastatals	Ministry of Water and Environment	**February 2021**	Completed
		Department of Occupational Health and Safety, Ministry of Labour, Gender and Social Development.		Nil
		Luwero District Offices	**February 2021**	Nil
		Wobulenzi T.C offices	**February 2021**	Completed
2.	Local Government Leadership and Potentially affected local residents	Communities	**February 2021**	Completed

6.5. Stakeholder Analysis Matrix

A Stakeholder analysis matrix for the proposed faecal sludge treatment plant in **Bukolwa LCI, Bukolwa Parish, Wobulenzi Town Council, Luwero District** was prepared in accordance with the NEMA guidelines to seek opinions and views on the environmental aspects of the project and the related impacts. This included the local legal framework of consultation activities and project disclosure requirements, particularly in respect of public consultation activities that are directly required, were also consulted. In this regard, the key steps within the overall stakeholder consultation and engagement process include: -

a. Identifying and notifying stakeholders of the ESIA;
b. Holding meetings (formal and informal);
c. Making provision for stakeholders to review and comment on all reports; and
d. Making a record of responses to comments and concerns available to stakeholders.

A stakeholder analysis exercise was conducted to identify the potential interests of different stakeholders (excluding the project proponent) as well as opportunities and threats and possible linkages they may have with regards to the proposed project.

The stakeholder analysis matrix is provided in Table 6.2.

Table 6-2:Stakeholder analysis matrix of the proposed faecal sludge treatment plant

Stakeholder	Activities	Impact/ Importance/ Interest	Influence	Management Strategy	Timing/Frequency	Responsibility and communication method
National Environment Management Authority (NEMA)	-Provide information for planning of wetland and water resource management. -Inspection of proposed faecal sludge treatment plant works to ensure compliance with water and environment laws, policies and regulations.	**Medium**	**Medium**	Consultations Monitoring; Inspection	Continuous throughout implementation phase and operation phase	Ministry of Water and Environment
Ministry of Water and Environment	Monitor and regulate the faecal sludge treatment plant in Uganda	**High**	**High**	Consultations Monitoring; Inspection	Continuous throughout implementation phase and operation phase	Ministry of Water and Environment
Project Area local communities, Project Affected Persons.	-Construction activities; -Increase traffic and road safety related issues; -Increase dust and air quality issues; -Potential incidents of property damage or loss, injuries or fatalities; - Issues related to influx of people for employment	**High**	**High**	If the concern is from a PAP immediate action through the Grievance Committee according to the grievance handling procedure prescribed. - If it is not from a PAP immediate action as per the grievance handling procedure	Throughout the implementation process	Ministry of Water and Environment, Wobulenzi T.C, LC's

Stakeholder	Activities	Impact/ Importance/ Interest	Influence	Management Strategy	Timing/Frequency	Responsibility and communication method
				prescribed		
Local Area Administration and Leadership. at District, sub-county, Parish and Village levels	Even if GC is set up complains may be received by local administration and leadership Grievances of people other than PAPs (Accidents, disturbances due to construction related issues, Contractor's workforce) Participate in sensitization of communities about market opportunities Dealing with cases of indiscipline and insecurity.	Medium	Medium	Educate them to direct complaints to MoWE and Luwero District Community meetings Directing to required offices like Police, Hospital in liaison with responsible/line project officers Physical follow up of cases	As and when necessary, before and during, Construction and Operation Continuous surveillance especially during construction but not full time	Ministry of Water and Environment, Wobulenzi T.C, LCs
Contract Labor Suppliers	To manage unhindered labour supply throughout the project implementation period	High	High	Legally enforceable labour supply contracts to be entered prior to commencement of work Use more than one labour supplier	Throughout implementation period	Ministry of Water and Environment, Wobulenzi Town council, Labour to be hired from the PAPs and project area

Stakeholder	Activities	Impact/ Importance/ Interest	Influence	Management Strategy	Timing/Frequency	Responsibility and communication method
Ministry of Labour and Gender and Social Development	Monitor work place as required by Occupational Health and Safety act, 2006	High	High	Field Inspections Inspection and review of documents	Continuous throughout project implementation	Ministry of Water and Environment
Waste transporters	To manage waste transportation from the proposed faecal sludge treatment plant throughout the project operation phase	High	High	Ensure that all waste transporters are licensed; Ensure all waste transportation trucks are covered; Clean up waste spills on approach roads; -Record waste transportation incidents.	Throughout operation phase	Ministry of Water and Environment

KEY:

Central government entities: Ministry of Water and Environment, Occupational Health and Safety Department (OHSD), National Environment Management Authority (NEMA), Wetlands Management Department (WMD),

Local government entities: Luwero District Directorate of Public Health and Environment and District Environment Offices, Health and sanitation officer Wobulenzi T.C, Environmental Officer Wobulenzi T.C

Local Communities: Communities in **Bukolwa LCI** – especially those near the proposed faecal sludge treatment plant

6.6. Site Visits

Site visits through proposed faecal sludge treatment plant and the proposed area to host the development were conducted between **2nd and 16th February 2021**. Area local area residents were sensitized on the proposed faecal sludge treatment plant and there after a discussion was held.

Figure 6-1: Meeting held at Bukolwa-Lusita Zone, Bukolwa Parish, Wobulenzi Town Council

6.7. Comments Register

A record of all comments and observations made during the scoping exercise for EIA has been maintained and Table 6.3 below provides a summary of the key issues and concerns raised during the consultation and engagement by some of the key stakeholders. Figure 6.1 also portrays some of the consultative meetings held with the locals in Bukolwa-Lusita Zone

Table 6-3:Stakeholder Consultations for the Proposed Faecal Sludge Treatment Facility Located in Bukolwa-Lusita Zone, Bukolwa Parish, Wobulenzi Town Council

Designation	When And Where	Concerns	Remarks
Madam Resty Nyesigire **Ministry of Water and Environment** **+256-782860256**	6th /07/2021-on phone discussion	The Town Councils are in dire need for these faecal facilities and the ministry is responding to need The Ministry has ensured that the sites are not directly in the wetlands but near so that treated effluents from our planted wetlands can then be sent to the natural water bodies once treated As the ministry we are securing memorandums of understanding for the sites through the respective local governments who are mandated to provide the land spaces.	Noted and advanced as a benefit of the project
Madam Patience Nssereko **National Environment Management Authority** **+256-772656218**	25th /06/2021 Phone call	The site should not be located in the wetland but can be adjacent to a wetland system The site should not be located close to settlements. Any settlement within a radius of 200metres should be compensated.	Noted and incorporated in the ESIA
Mr David Mugisa **Commissioner-Occupational Health and Safety** **MGLSD** **+256-772498767**	25th / 06/ 2021 Meeting held on phone and zoom	**Wastewater and treatment** Many systems, receive infiltration, which can carry pesticides and herbicides from soil applications. For many years, work in the wastewater treatment field was regarded as the most hazardous to workers, particularly because of deaths involving confined space entry. The wastewater treatment area is seen as slightly less hazardous today, but treatment plant workers still experience health problems and death. Specifically, these experiences involve chemicals in the sewer system and in regular work exposures	Noted and incorporated in the impacts and mitigations

Designation	When And Where	Concerns	Remarks
		throughout the facility's operations. Mixing equipment, sludge rakes, pumps and mechanical devices used for a variety of operations in sewage treatment plants can maim, and even kill, if they are inadvertently activated when a worker is servicing them. Wet surfaces, often encountered in sewage treatment plants, contribute to slipping and falling hazards. Sewage and wastewater contain bacteria, funguses, parasites, and viruses that can cause intestinal, lung, and other infections. If equipment, work practices, and personal protective equipment (PPE) don't protect you from swallowing these agents, you can get sick. **Health effects** Some chemical-related health complaints are acute in nature and involve short-term exposures and complaints such as irritations of the eyes, nose or throat. Other problems are chronic and result from repeated exposures, sometimes over several years, that negatively affect internal organs or cause allergic reactions. Surveys indicate that wastewater treatment may generate aerosols containing microbiological and chemical factors. The primary path of exposure for aerosols is probably inhalation. The physical layouts of many sewage treatment plants involve open tanks and drainage areas; plants typically are not designed to prevent aerial dispersion of effluent during the treatment process. Volatile organics in wastewater may be vaporized or air-	

Designation	When And Where	Concerns	Remarks
		stripped during treatment. Many of the compounds are carcinogens and/or mutagens, so sewage workers may be at increased risk of cancer or adverse birth defects. **Exposure** Effluent treatment plant workers may be exposed to chemicals or organisms by direct contact with sewage, water and sludges, or by inhalation of gases, particles, aerosols, vapours or droplets. These hazards may come into the plant in soluble form or bound to suspended solids. Compounds reported from sludge analyses include chlorinated organic solvents, polychlorinated biphenyls (PCBs) and pesticides, petroleum hydrocarbons, flame retardants, heavy metals, asbestos, dioxins and radioactive materials. The concentration of organics and metals in sludge is indicative of the region's industries. In one case, high concentration of PCBs and sludge were caused by the fabrication of electrical equipment upstream from the treatment plant. Chemical derivatives formed by microbiological or other operations during the sewage treatment process may be more or less toxic than the original compound. Disease-causing organisms have been found in sewage sludge, so sewage workers may be at increased risk of infection or diseases. **Conclusion** To keep workers safe, operators	

Designation	When And Where	Concerns	Remarks
Ssebalamu Moses **Major Wobulenzi Town Council** **Tel: +256772969197**	4th /Feb/2021 Meeting held in Bukolwa-Lusia village	We welcome the project People have nowhere to dig their toilets so the project will benefit it, areas such as Kiwoko, Nakaseke, Semuto and Ziribwe Town Councils will all use this facility	Noted
Jenifer Fachram **Health Assistant Wobulenzi Town Council** **Tel: +256772594083**	4th /Feb/2021 Meeting held at Wobulenzi Town Council	We welcome the project because it will improve on the sanitation of the communities We are proposing to construct lined up latrines in Wobulenzi which is appropriate for the proposed project Costs of transportation of these wastes will decrease We shall have to do sensitization of the cesspool emptiers to the communities	Noted
Bagambe David **Senior Enforcement Officer** **Tel: +256782514209**	4th /Feb/2021 Meeting held at Wobulenzi Town Council	The project will benefit Wobulenzi as a town council since the CBD is congested	Noted
Luwagga Edward **LC1 Bukolwa-Lusita village** **Tel: +256753261536**	4th /Feb/2021 Meeting held in Bukolwa-Lusia village	Will be the fees be lowered by those neighbouring the facility?	Noted
Kibugwe Edward **Secretary Bukolwa-Lusita Resident** **Tel: +256704015228**	4th /Feb/2021 Meeting held at Bukolwa-Lusia village	What is the acreage of the site?	Noted

Designation	When And Where	Concerns	Remarks
Nalumansi Florence **Bukolwa-Lusita Resident**	4th /Feb/2021 Meeting held at Bukolwa-Lusia village	Am one of the people who uses the well located in the site, we request a production well for the people	Noted

7. ANALYSIS OF PROJECT ALTERNATIVES

One of the objectives of an EIA is to investigate alternatives to the proposed development. There are two types of alternatives - Fundamental Alternatives and Incremental Alternatives. Alternatives are "*different means of meeting the general purpose and requirements of the activity"* which includes alternatives to:

1. The property on which or location where it is proposed to undertake the activity;
2. The type of activity to be undertaken;
3. The design or layout of the activity;
4. The technology to be used in the activity; and
5. The operational aspects of the activity.

There are two types of alternatives - Fundamental Alternatives and Incremental Alternatives.

7.1. Fundamental Alternative

Fundamental alternatives are developments that are totally different from the proposed project and usually involve a different type of development on the proposed faecal sludge treatment plant in Wobulenzi Cluster, Luwero District.

7.1.1. A Different Type of Development

Since the main interest of the project proponent, Ministry of Water and Environment-Northern Uganda Water and Sanitation Development Facility intends to Promote and develop appropriate sanitation facilities in Wobulenzi Town Council.The fundamental alternative of a development other than to undertake a project that would allow the developers to construct the faecal sludge treatment plant and operate the facility is therefore not viable in this case, and will not be considered further in the Environmental Impact Statement.

7.1.2. A Different Location

The proposed project location was selected by the Ministry of Water and Environment-Central Uganda Water and Sanitation Development Facility after in-depth needs assessment, as a result, alternative locations/sites are not technically feasible to meet the needs of Wobulenzi T.C for the proposed development.

7.2. Incremental Alternatives

Incremental alternatives are modifications or variations to the design of the faecal sludge treatment project that provide different options to reduce or minimise environmental impacts. There are several incremental alternatives that can be considered. These include.

- The design or layout of the activity.
- The technology to be used in the activity, and;
- The operational aspects of the activity.

These alternatives will be considered as part of the design process for the proposed faecal sludge treatment facility in Bukolwa LCI, Bukolwa Parish, Wobulenzi Town Council, Luwero District.

7.2.1. Option 1: Operational Footprint

The proposed faecal sludge treatment facility is expected to cover a large land area, situated on relatively flat terrain. Options on how to further minimise the ecological footprint of the development have been explored in the EIStatement.

7.2.2. Option 2: Timing and Duration of the Construction Works

It should be noted that the proposed faecal sludge treatment facility for Wobulenzi Town Council, Luwero District-will not take a long time and the construction schedule will follow a logical building order. The timing and duration of the construction work are likely to have a number of implications especially on the relatively flat project areas which are prone to flooding during the rainy season. Options on how to minimize the construction duration have been examined in the ESIStatement.

7.2.3. Option 3: Method of Construction Works to Employed

The type of construction method that is to be used can have an impact on the stability of the faecal sludge treatment facility for Wobulenzi Town Council. Therefore, a whole range of options have been considered especially those that will have little effect on the stability of the site, especially given the gentle terrain of the site.

7.2.4. Option 4: Source of construction Supplies and Raw Materials

The way supplies and materials (including labour) are sourced, can have implications especially for the local economy. Various options have been considered and assessed for the beneficiation effects on the local economy.

7.2.5. Option 5: Waste Management

The various phases of the project life cycle will generate wastes and the wastes will depend on the input materials that will be required for construction activities. The best waste prevention/minimisation and management practices will be considered as part of an effective waste management plan for the project in the ESMP.

7.3. Technical Site Assessment

Four sites were surveyed as follows;

7.3.1.1. Site 1

The proposed site is located in Wobulenzi Town Council. The approximate acreage of Site 1 is 2.52 acres.

Figure 7-1: Showing Site 1 located in Wobulenzi T/C

The access road to the site is a gravel road.

The approximate distance to the cluster towns is shown in Error! Reference source not found..

Table 7-1: Distance from Site 1 – Wobulenzi T/C to Cluster Towns

Town	Distance (km)
Luweero T/C	17.92
Wobulenzi T/C	4.52
Bombo T/C	23.02
Kiwoko T/C	34.32
Busiika T/C	30.42
Zirobwe T/C	27.82
Bamunanika	15.22
Semuto	46.22
Average	**24.9**

The following was noted from the field visit:

- ✓ The land is privately owned and the land owner is willing to sell.
- ✓ The site is surrounded by farmland and the nearest settlements are at least 200m away
- ✓ The acreage of the site is approximately 2.52 acres. There is more acreage available
- ✓ The ground profile is sloping towards the stream
- ✓ There is a stream and sizeable swamp on the western boundary
- ✓ The site has access to electricity and piped water supply system; the utilities are located along the major access road approximately 1km away.

7.3.1.2. Site 2

The proposed site is located in Wobulenzi Town Council. The approximate acreage of Wobulenzi Site 2 is 2.51 acres.

Figure 7-2: Site 2

The access road to the cluster towns is primarily Kampala – Gulu highway and a series of gravel access roads. The access road to the site is a gravel road.

The approximate distance to the cluster towns is shown in Error! Reference source not found..

Table 7-2: Distance from Site 2 to Cluster Towns

Town	**Distance (km)**
Luweero T/C	18.00
Wobulenzi T/C	4.60
Bombo T/C	23.10
Kiwoko T/C	34.40
Busiika T/C	30.50
Zirobwe T/C	27.90
Bamunanika	15.30
Semuto	46.30
Average	**25.0**

The following was noted from the field visit:

- ✓ The land is privately owned and there is uncertainty if the land owners are willing to sell.
- ✓ The site is surrounded by farmland and the nearest settlements are at least 200m away
- ✓ The acreage of the site is approximately 2.51 acres. The land is fragmented and there is uncertainty as to whether more acreage can be obtained
- ✓ The ground profile is sloping towards the stream
- ✓ There is a stream and swamp on the north western boundary
- ✓ The site has access to electricity and piped water supply system; the utilities are located along the major access road approximately 1km away.

7.3.1.3. Site 3

The proposed site is located in Kiyiiya village, Nakigoza Parish in Zirobwe Sub County. The approximate acreage of the Site 3 is 34 acres.

Figure 7-3: Showing Site 3 – Zirobwe

The access road to the cluster towns is primarily Kampala – Gulu highway and a series of gravel access roads. The access road to the site is a gravel road. The approximate distance to the cluster towns is shown in **Table 7-3 below**.

Table 7-3: Distance from Site 3 to Cluster Towns

Town	Distance (km)
Luweero T/C	42.48
Wobulenzi T/C	29.08
Bombo T/C	44.9
Kiwoko T/C	58.8
Busiika T/C	19.08
Zirobwe T/C	5.78
Bamunanika	18.38
Semuto	68.1
Average	35.8

The following was noted from the field visit:

- ✓ The land is owned by the Town Council (public land).
- ✓ The site is surrounded by farmland and the nearest settlements are at least 200m away
- ✓ The acreage of the site is approximately 34 acres.
- ✓ The ground profile is flat
- ✓ There is no stream. The plot is majorly water logged during the rainy season
- ✓ The site has access to electricity and piped water supply system; the utilities are located along the major access road approximately 5km away.

7.3.1.4. Site 4

The proposed site is located in Namuganja village, Busiika Parish in Kalagala Sub County.

Figure 7-4: Busiika Site

The access road to the cluster towns is primarily Kampala – Gulu highway and a series of gravel access roads. The access road to the site is a gravel road.

The approximate distance to the cluster towns is shown in **Error! Reference source not found.**.

Table 7-4:Distance from Site 4 to Cluster Towns

Town	Distance (km)
Luweero T/C	43.23
Wobulenzi T/C	29.83
Bombo T/C	29.75
Kiwoko T/C	59.63
Busiika T/C	3.93
Zirobwe T/C	17.23
Bamunanika	30.19
Semuto	52.94
Average	33.3

The following was noted from the field visit:

- ✓ The land is privately owned and there is uncertainty if the land owner is willing to sell.
- ✓ The site is surrounded by farmland and the nearest settlements are at least 200m away
- ✓ The acreage of the site is approximately 7.6 acres.
- ✓ The ground profile is sloping toward the wetland / swamp
- ✓ There is a sizeable swamp / wetland on the south eastern boundary
- ✓ The site has access to electricity and piped water supply system; the utilities are located along the major access road approximately 1km away.

7.3.1.5. Summary Assessment of Wobulenzi Sites

The location of the proposed sites in relation to the cluster sites is summarized in Table 7-5.

Table 7-5: Distance of Sites from Cluster Towns

Town	Distance (km)			
	Site 1	**Site 2**	**Site 3**	**Site 4**
Luweero T/C	17.92	18.00	42.48	43.23
Wobulenzi T/C	4.52	4.60	29.08	29.83
Bombo T/C	23.02	23.10	44.9	29.75
Kiwoko T/C	34.32	34.40	58.8	59.63
Busiika T/C	30.42	30.50	19.08	3.93
Zirobwe T/C	27.82	27.90	5.78	17.23
Bamunanika	15.22	15.30	18.38	30.19
Semuto	46.22	46.30	68.1	52.94
Average	**24.9**	**25.0**	**35.8**	**33.3**

The various parameters used in assessing the site suitability were assigned a criterion, with a score for each parameter ranging from 1 to 5, where 1 is the worst and 5 is the best. The various parameters and their score are shown in **Error! Reference source not found.**.

Table 7-6: Parameters for Site Assessment, with their scores

No.	Parameter	Score Criteria (1-5)
1	Access road	1 - No access road / Access Road doesn't reach site; 2 - Existing gravel access road in poor condition; 3 - Existing gravel road in good condition; 4 - Existing tarmac road in poor condition; 5 - Existing tarmac road in good condition
2	Acreage	1 - Acreage unknown; 2 - Acreage between 1 - 2a; 3 - Acreage between 2 - 4a; 4 - Acreage ~ 4a; 5 - Larger acreage available
3	Ownership of the land	1 - Privately owned with uncertainty of willingness to sell; 2 - Privately owned with willingness to sell (with restrictions on acreage); 3 - Privately owned with willingness to sell; 4 - Privately Owned, agreements with T/C in place; 5 - Owned by T/C
5	Topography	1 - Over 90% Flat, Need for fill material; 2 - Over 50% of land is Flat, Need for fill; 3 - 60 - 30% Flat, Need for fill; 4 - Steep Topography, need for cut; 5 - Gentle slope, minimal earth works
4	Ground Water	1 - Water logged or partially floods; 2 - Water logged seasonally; 3 - GW table estimated within 1m below GL; 4 - GW table estimated >1m below GL; 5 - GW table estimated >> 1m below GL

No.	Parameter	Score Criteria (1-5)
6	Effluent Disposal / Proximity to Swamp / Wetland	1 - Stream, limited acreage for constructed wetland; 2 - Seasonal wetland / swamp; 3 - Stream, available acreage for constructed wetland; 4 - Limited wetland / swamp with acreage for constructed wetland; 5 - Sizeable wetland / swamp
7	Access to Utilities (Piped Water)	1 - The T/C doesn't have piped water; 2 - T/C has piped water but with limited coverage / production; 3 - Site has piped water > 10km away; 4 - Site has piped water 5 - 10km away; 5 - T/C has piped water < 5km away
8	Proximity to settlements / Urbanization	1 - HHs / Settlements within 200m ra; 2 - HHs / Settlements within 200 - 500m ra; 3 - HHs / Settlements within 500 -1000m ra; 4 - HHs / Settlements > 1000m ra; 5 - No HHs / Settlements in sight
9	Proximity to Project Area	1 - Site > 80km ra of PA; 2 - Site within 60 - 80km of PA; 3 - Site within 40 - 60km of PA; 4 - Site within 20 - 40km of PA; 5 - Site within 20km of PA
10	Access to electricity	1 - The T/C doesn't have electricity; 2 - T/C has electricity but with limited coverage; 3 - Site has electricity > 10km away; 4 - Site has electricity 5 - 10km away; 5 - T/C has electricity < 5km away
11	Reuse potential of sludge	1- No gardens in the vicinity, No UDDTs 2- Farming ove 5 km 3- Farming 2 -5km 4- Farming 500m - 2km 5- Farming <500m, UDDTs in TC
12	Demand (Presence of emptiable facilities)	1- No emptiable facility 2- <10% emptiable 3- 10 - 30% emptiable 4- 30 - 50% emptiable 5- Over 50% emptiable facilities
13	Organization and coordination of Town leadership / Enabling environment for CWIS	1- Mode CSDA Score <5 points 2- Mode CSDA Score 5-10 points 3- Mode CSDA Score 10-15 points 4- Mode CSDA Score 15-20 points 5- Mode CSDA Score >20 points

In order to evaluate the sites, weight was attached to each of the parameters owing to its level of relevance to site selection. The score for each parameter was multiplied with the weighting factor,

which are summed to give a final score for the site. From the assessment, the most suitable site which was selected was Site 1 located in Wobulenzi Town Council (**Error! Reference source not found.**). The site score is 68%, against other sites. The summary of Assessment is provided in table 7-8 below.

Table 7-7: Site scores

Site	Score value (%)
Site 1	68
Site 2	50
Site 3	54
Site 4	61

Table 7-8: Summary of Site Assessment Criteria for Wobulenzi Sites

No.	Parameter	Score Criteria (1-5)	Weight	Site 1 - Wobulenzi T/C (1)			Site 2 - Wobulenzi T/C (2)			Site 3 - Zirobwe			Site 4 - Busiika		
				Comment / Notes	Score	Value	Comment / Notes	Score	Value	Comment / Notes	Score	Value	Comment / Notes	Score	Value
1	Access road	1 - No access road / Access Road doesn't reach site; 2 - Existing gravel access road in poor condition; 3 - Existing gravel road in good condition; 4 - Existing tarmac road in poor condition; 5 - Existing tarmac road in good condition	0.05	Access road existing; Gravel Road; Requires routine maintenance	2	0.10	Access road existing; Gravel Road; Requires routine maintenance	2	0.10	Access road existing; Gravel Road; in poor condition	2	0.10	Access road existing; Gravel Road; in poor condition	2	0.10
2	Acreage	1 - Acreage unknown; 2 - Acreage between 1 - 2a; 3 - Acreage between 2 - 4a; 4 - Acreage ~ 4a; 5 - Larger acreage available	0.10	2.52 acres mapped out, reportedly more acreage available	3	0.30	2.51 acres mapped out, reportedly more acreage available	3	0.30	Land is available (34 acres mapped)	5	0.50	Land is available (7.6 acres mapped)	5	0.50
3	Ownership of the land	1 - Privately owned with uncertainty of willingness to sell; 2 - Privately owned with willingness to sell (with restrictions on acreage); 3 - Privately owned with willingness to sell; 4 - Privately Owned, agreements with T/C in place; 5 - Owned by T/C	0.10	Land is privately owned; Willingness of owner to sell	2	0.20	Land is privately owned; Unsure of willingness of owner to sell; Land fragmented	1	0.10	Land owned by T/C (Public land)	5	0.50	Land is privately owned; Unsure of willingness of owner to sell	1	0.10

No.	Parameter	Score Criteria (1-5)	Weight	Site 1 - Wobulenzi T/C (1)			Site 2 - Wobulenzi T/C (2)			Site 3 - Zirobwe			Site 4 - Busiika		
				Comment / Notes	Score	Value	Comment / Notes	Score	Value	Comment / Notes	Score	Value	Comment / Notes	Score	Value
5	Topography	1 - Over 90% Flat, Need for fill material; 2 - Over 50% of land is Flat, Need for fill; 3 - 60 - 30% Flat, Need for fill; 4 - Steep Topography, Need for cut; 5 - Gentle slope, minimal earth works	0.10	The site has sloping topography	5	0.50	The site has sloping topography	3	0.30	The site is flat	1	0.10	The site has sloping topography	2	0.20
4	Ground Water	1 - Water logged or partially floods; 2 - Water logged seasonally; 3 - GW table estimated within 1m below GL; 4 - GW table estimated >1m below GL; 5 - GW table estimated >> 1m below GL	0.05	GW table is probably low	5	0.25	GW table is probably low	5	0.25	GW table is high, flooding reported during rainy season	2	0.10	GW table is probably low further from swamp	5	0.25
6	Effluent Disposal / Proximity to Swamp / Wetland	1 - Stream, limited acreage for constructed wetland; 2 - Seasonal wetland / swamp; 3 - Stream, available acreage for constructed wetland; 4 - Limited wetland / swamp with acreage for constructed wetland; 5 - Sizeable wetland / swamp	0.15	A stream and swamp on the western boundary	5	0.75	A stream on north western boundary	1	0.15	Seasonal wetland	2	0.30	Wetland on eastern boundary	5	0.75
7	Access to Utilities (Piped Water)	1 - The T/C doesn't have piped water; 2 - T/C has piped water but with limited coverage / production; 3 - Site has piped water > 10km away; 4 - Site has	0.05	Extension of Wobulenzi T/C piped	5	0.25	Extension of Wobulenzi T/C piped water	5	0.25	Existing Zirobwe T/C water system; extension	5	0.25	Extension of Busiika T/C piped water system	5	0.25

No.	Parameter	Score Criteria (1-5)	Weight	Site 1 - Wobulenzi T/C (1)			Site 2 - Wobulenzi T/C (2)			Site 3 - Zirobwe			Site 4 - Busiika		
				Comment / Notes	Score	Value	Comment / Notes	Score	Value	Comment / Notes	Score	Value	Comment / Notes	Score	Value
		piped water 5 - 10km away; 5 - T/C has piped water < 5km away		water system approx 1km away			system approx 1km away			nearby			approx 1km away		
8	Proximity to settlements / Urbanization	1 - HHs / Settlements within 200m ra; 2 - HHs / Settlements within 200 - 500m ra; 3 - HHs / Settlements within 500 -1000m ra; 4 - HHs / Settlements > 1000m ra; 5 - No HHs / Settlements in sight	0.15	Site has a few HHs nearby	1	0.15	Site has a few HHs nearby	1	0.15	Site surrounded by farmland, few settlements	1	0.15	Site surrounded by farmland and settlements	1	0.15
9	Proximity to Project Area	1 - Site > 80km ra of PA; 2 - Site within 60 - 80km of PA; 3 - Site within 40 - 60km of PA; 4 - Site within 20 - 40km of PA; 5 - Site within 20km of PA	0.10	Site within 47km of furthest T/C	3	0.30	Site within 47km of furthest T/C	3	0.30	Site within 68km of furthest T/C	2	0.20	Site within 60km of furthest T/C	2	0.20
10	Access to electricity	1 - The T/C doesn't have electricity; 2 - T/C has electricity but with limited coverage; 3 - Site has electricity > 10km away; 4 - Site has electricity 5 - 10km away; 5 - T/C has electricity < 5km away	0.05	National electricity grid lines about 1km away	5	0.25	National electricity grid lines about 1km away	5	0.25	National electricity grid lines about 5km away	4	0.20	National electricity grid lines about 1km away	5	0.25

No.	Parameter	Score Criteria (1-5)	Weight	Site 1 - Wobulenzi T/C (1)			Site 2 - Wobulenzi T/C (2)			Site 3 - Zirobwe			Site 4 - Busiika		
				Comment / Notes	Score	Value	Comment / Notes	Score	Value	Comment / Notes	Score	Value	Comment / Notes	Score	Value
11	Reuse potential of sludge	1- No gardens in the vicinity, No UDDTs 2- Farming ove 5 km 3- Farming 2 -5km 4- Farming 500m - 2km 5- Farming <500m, UDDTs in TC	0.025	Site surrounded by farmland	5	0.13	Site surrounded by farmland	5	0.13	Site surrounded by farmland	5	0.13	Site surrounded by farmland	5	0.13
12	Demand (Presence of emptiable facilities)	1- No emptiable facility 2- <10% emptiable 3- 10 - 30% emptiable 4- 30 - 50% emptiable 5- Over 50% emptiable facilties	0.025	12.5 % at household level	3	0.08	12.5 % at household level	3	0.08	15.2% at household level	3	0.08	3.7% at household level	2	0.05
13	Organisation and coordination of Town leadership / Enabling environment for CWIS	1- Mode CSDA Score <5 points 2- Mode CSDA Score 5-10 points 3- Mode CSDA Score 10-15 points 4- Mode CSDA Score 15-20 points 5- Mode CSDA Score >20 points	0.05	Mode CSDA Score is 13	3	0.15	Mode CSDA Score is 13	3	0.15	Mode CSDA Score is 9	2	0.10	Mode CSDA Score is 9	2	0.10
			1.00			3.40			2.50			2.70			3.03
						68 %			50 %			54 %			61 %

7.4. Treatment Options

Considering the characteristics of FS from the town councils with regard to meeting the recommended NEMA effluent discharge standards, the parameters that do not comply with the standards include; total solids, suspended solids, total nitrogen, total phosphorus, COD, BOD_5, EC and faecal coliforms. This FS if subjected to treatment to reduce the specified parameters to required concentration so that the effluent can be safely discharged with less damage to the receiving environment. Given the parameters that need to be improved from sampled FS in the town councils, a careful consideration of different possible treatment options was done based on criteria such as:

- suitability of the unit for FS quality improvement,
- cost of construction,
- operation and maintenance,
- need for highly skilled personnel and
- requirement for sophisticated equipment.

This led to the selection of treatment units presented in (**Figure 7-5**).

FS from the Wobulenzi cluster towns could be collected and transported by use of vacuum emptying trucks to the same treatment facility (proposed to be located in Wobulenzi). The solids concentration in a number of sampled septic tanks and lined pit latrines depict that vacuum emptying trucks can easily be used to empty these sanitation facilities without addition of excess amounts of water. However, the observed solid wastes deposited in these facilities require raking out solid wastes prior to emptying, since these can clog and damage the emptying trucks. The emptied FS will be transported to a treatment facility for adequate treatment, so that the effluent meets the discharge standards. In this case the proposed treatment will focus on removal of the identified non-compliant FS parameters which were categorized into; solids, organics, nutrients and pathogens. To realize effluent that meets the required discharge standards, the FS from these cluster towns should be treated through a combination of several unit processes and operations, namely; screening, grit removal, settling-thickening, drying beds and waste stabilization ponds as indicated in **Figure 7-5**. Considering the proposed site for location of the treatment facility, there is existence of a natural wetland and river through which the effluent will undergo tertiary treatment.

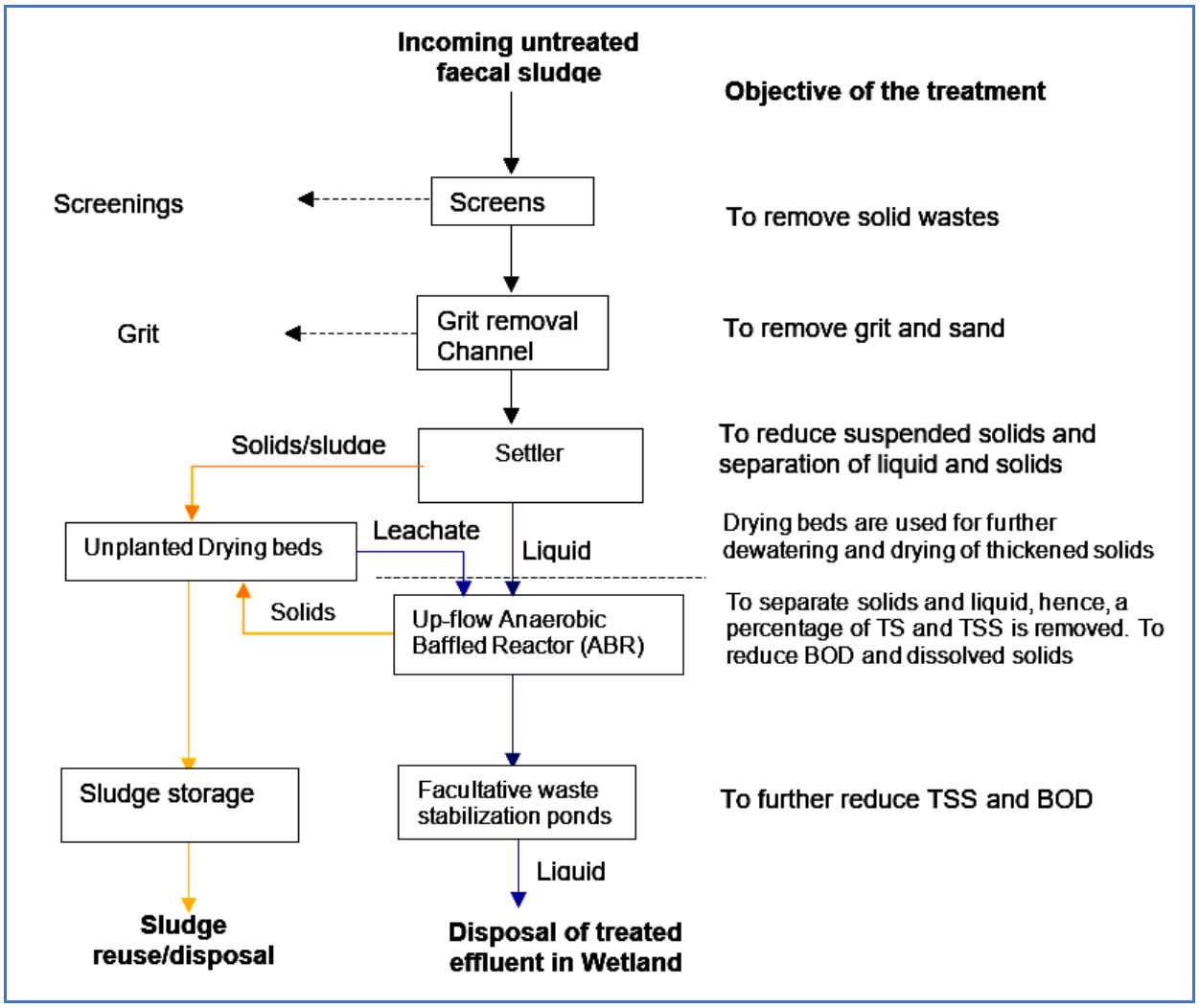


Figure 7-5: Proposed treatment processes for the FS sampled from the Wobulenzi Cluster towns

Faecal sludge from septic tanks and lined pit latrines is highly variable, both in characteristics and composition (Still & Foxon, 2012). FS from sampled septic tanks and lined pits contained solid wastes such as wood, textile, stones, polythene bags, condoms and plastics (Error! Reference source not found.**2-3 above in chapter 2**). This necessitates consideration of screening as the first pre-treatment unit of the proposed FS treatment facility. Additionally, FS from a number of sampled facilities, mainly septic tanks contained sand, which would imply provision of sand/grit removal channel at the pre-treatment section of the facility. After the grit removal, FS is proposed to be treated in an Anaerobic Baffled Reactor (ABR). Considering the high concentration of total suspended solids (TSS) in the FS from the sampled sanitation facilities, settling-thickening tanks act to reduce the TSS from the effluent through sedimentation. Therefore, the settling-thickening tanks separate the solids in FS from the effluent (Dodane & Bassan, 2014). Since a fraction of the settled solids are organic, settling-thickening tanks also greatly reduce the BOD_5 or COD concentration from the effluent. Qualitatively, the most observed FS colour of brown to black from the sampled facilities and the long retention times of FS in these facilities (FS age of more than ranges of 1 to 3 years).

Additionally, the COD/BOD_5 ratios of the sampled FS quantitatively confirmed the partial biodegradability of FS, hence can further be treated using Anaerobic Baffled Reactor (ABR). The flow of FS under and over the vertical baffles greatly improves settlement of TSS (solid-liquid separation) and anaerobic degradation of BOD and dissolved solids. Dissolved solids formed a significant fraction of total solids and this can be reduced in an ABR. Since a fraction of the settled solids are organic, ABR greatly reduce the BOD_5 or COD concentration from the effluent by 80-90% (Morel & Diener, 2006; Tilley *et al.*, 2014). Additionally, the ABR technology can be efficiently designed for a daily FS inflow of up to 200 m^3/day (Tilley *et al.*, 2014), which is not likely to be surpassed, owing to low coverage of lined pits and septic tanks in the town councils under consideration. The BOD_5/COD ratios of the sampled FS depicted partial biodegradability of FS in the sanitation facilities. Additionally, the ABR removes part of the BOD_5 or COD, but significant amounts still remain, rendering the effluent not fit for safe disposal. Therefore, further degradation/stabilization of the FS organics can be achieved by use of waste stabilization ponds (WSPs). Waste stabilization ponds are simple to build and require relatively low operation & maintenance. They are more appropriate in tropical climates and achieve a relatively high pathogen reduction from the effluent. They can be a good alternative in places where land is available. The partially stabilized effluent of the ABR with reduced organic solids concentrations can then be treated in facultative ponds to further stabilize it through reduction in BOD_5. Additionally, high nutrient concentration (nitrogen and phosphorus) can be reduced from the FS effluent by the WSPs through uptake by the algae, which will sediment at the pond bottoms or be harvested during pond maintenance.

The settled solids in settling-thickening tank and ABR still contain high proportion of water after separation. Therefore, further dewatering and drying will be achieved through use of roofed unplanted drying beds. The leachate from the unplanted drying beds is low in solids and organic matter and can thus be directly loaded to the facultative ponds (Ronteltap *et al.*, 2014). Similarly, the sludge from the ponds can be loaded to the drying beds for dewatering and drying. The dried FS can be put to use, depending on the feasible reuse options in the area vicinity. Additionally, a roofed shade may be included to act as storage area for dried FS from the drying beds. The dried FS will then be stored for a minimum of 6 months to reduce the pathogen concentration, making it fit for agricultural purposes.

7.4.1. Comparison of Treatment Processes

In the following paragraphs the most appropriate technologies for small scale treatment plants were compared.

7.4.1.1. Planted Drying Beds

A planted drying bed (PDB) consists of a filter body (sand and gravel) with plants (e.g., cat tails). Operation of the PDB is described as follows:

a) Faecal sludge is repeatedly loaded onto the beds where it accumulates for several years (about 5 years);

b) Long-term bed permeability is maintained by the plants' root systems;

c) The sludge' liquid part (percolate) drains vertically through the filter body, is collected by perforated drainage pipes and needs further treatment;

d) Accumulated dried sludge (bio solids) needs to be stored in dry condition for a few months in order to hygienise it.

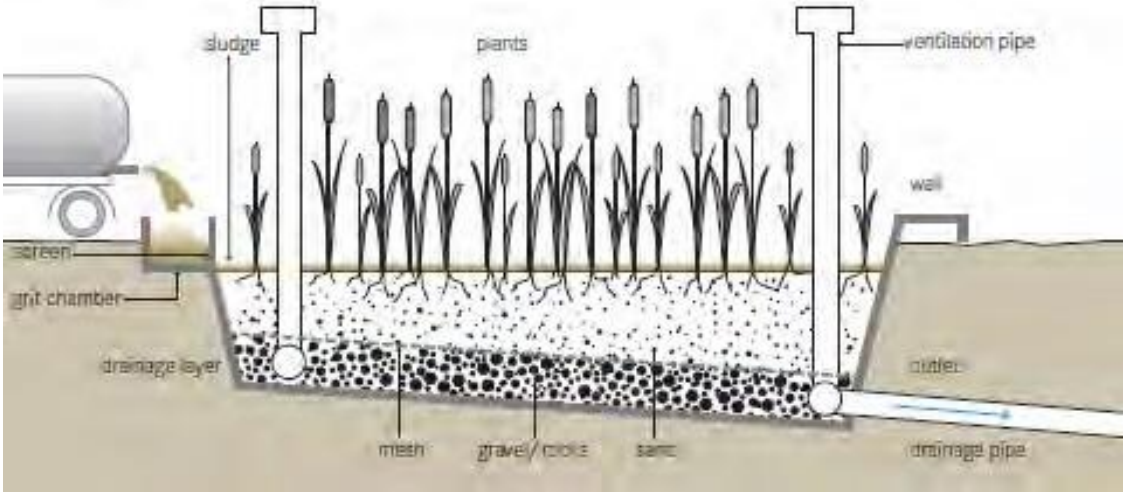


Figure 7-6: Schematic section view of planted drying beds

*(**Source:** EAWAG, Compendium of sanitation systems and technologies, 2nd edition, 2014)*

7.4.1.2. Unplanted Drying beds

Unplanted drying beds comprise a filter body and a drainage system at the bottom. As for the PDB, the percolate needs further treatment.

Before each new FS application, the dried sludge must be removed. If beds are covered, the drying period in and around Kampala is about 4 weeks, resulting in extensive land requirements.

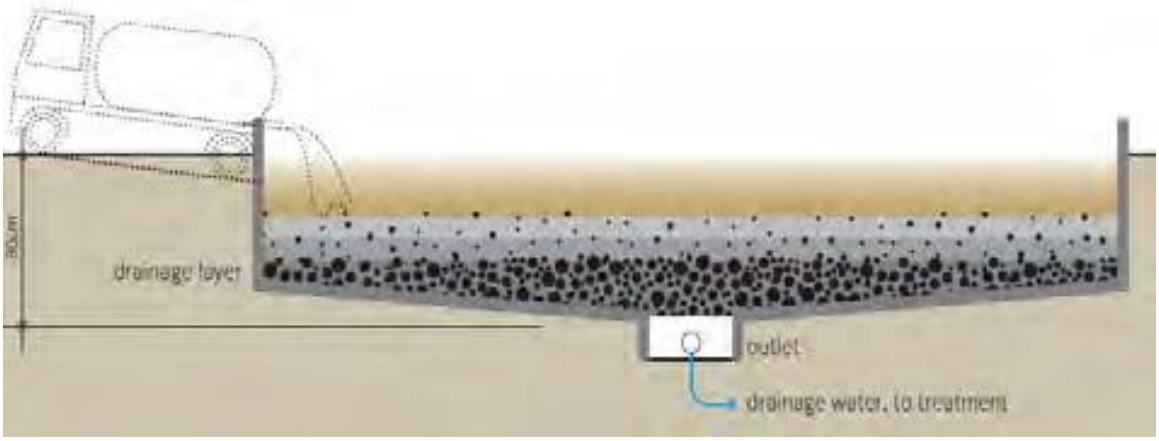


Figure 7-7: Illustration of possible treatment processes (Unplanted Drying Beds)

*(**Source:** EAWAG, Compendium of sanitation systems and technologies, 2nd edition, 2014)*

7.4.1.3. Thickening Tanks and Unplanted drying beds

To reduce the land requirements, unplanted drying beds can be combined with a preliminary thickening facility. It allows to reduce the volume of sludge to be dried and thus the land requirement for the unplanted drying beds.

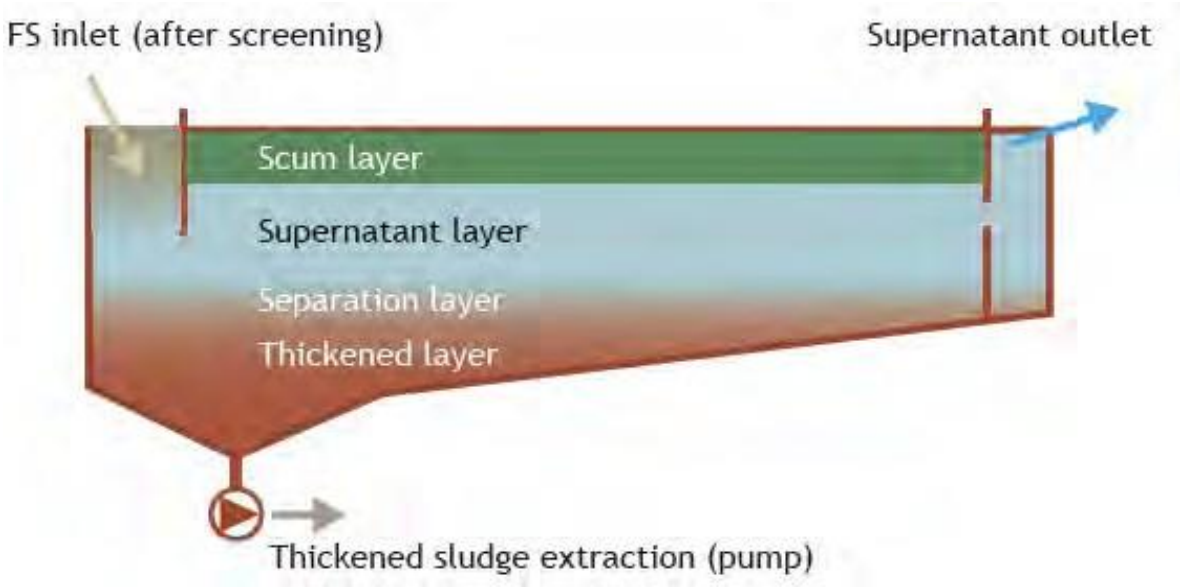


Figure 7-8: Illustration of possible treatment processes (Thickening + Unplanted Drying Beds)

*(**Source:** EAWAG, Compendium of sanitation systems and technologies, 2nd edition, 2014)*

7.4.2. Comparison and selection of most appropriate treatment processes

The following table 7-9 summarises the comparison and assessment of the three treatment processes:

Table 7-9:Comparison of Possible Treatment Processes

Criterion	Planted drying beds		Unplanted drying beds		Thickening tank + Unplanted drying beds	
	Assessment	Description	Assessment	Description	Assessment	Description
Sludge stabilization method	1	Dry storage period	1	Dry storage period	1	Dry storage period
Sludge stabilization duration	1	6-12 months	0	12-18 months	0	12-18 months
Sludge	1	5 years	0	Monthly	0	Weekly to
Sludge removal	1	Manual or excavator	0	Manual	0	Manual
Liquid	1	Not	1	Not required	0	Required (ThT)
Operation	1	Low	1	Low	0	Medium

Criterion	Planted drying beds		Unplanted drying beds		Thickening tank + Unplanted drying beds	
	Assessment	**Description**	**Assessment**	**Description**	**Assessment**	**Description**
Day to day staff skill	2	Unskilled	1	Unskilled	1	Skilled
Liquid	1	Medium	1	Medium	0	High (ThT
Energy	1	≈ 0 kwh/m³	1	≈ 0 kwh/m³	0	≈ 5 kwh/m³
	-	-	-	-		1,500 €/a
Operation	1	Low	1	Low	0	Medium
Investment costs	2	Low (≈ 150,000 €)	0	High	1	Medium
Land	1	Medium	0	High (4,000	1	Medium (1,500
Accumulated treatment process experience	1	Good	1	Good	1	Good
Overall	**15**		**8**		**5**	

The large land requirements and capital costs of unplanted drying beds exclude this technology from favourable options in this project. In conclusion, it is recommended to select the planted drying bed (PDB) technology, which is in addition less expensive (capital as well as O&M costs).

7.5. The Action Option

If the faecal sludge treatment project is implemented then the benefits that would arise from its implementation would be realised. Its implementation would cause some adverse impacts on the environment, however measures to mitigate/ eliminate these impacts have been proposed.

7.6. The "No-Action Option"/Do-Nothing

If the project is not implemented, then any benefits, presented in the preceding chapter including improved public health, employment opportunities (over 50 workers), investment attraction among others that would otherwise result from the construction of the Faecal sludge drying beds/ treatment plant would not be realised. However, the adverse impacts of the proposed project on the environment such as loss of vegetation, noise pollution, odour among others presented under the preceding chapter would be eliminated. However, because of the dire need to improve sanitation in Wobulenzi T.C, this option was not considered as it would hinder development and accelerate the poor sanitation situation in Wobulenzi Town council.

8. EVALUATION OF ENVIRONMENTAL AND SOCIAL IMPACTS AND MITIGATION MEASURES

8.1. Introduction

In line with the above legislative requirements, this chapter of the ESIStatement presents the identified impacts that may result from the proposed Faecal Sludge Management facility in Bukolwa LCI, Bukolwa Parish, Wobulenzi Town Council, Luwero District Town Council and provides mitigation measures to minimise the negative impacts as well as enhancing/optimising the positive impacts.

8.2. Assumption, Uncertainties and Gaps in Knowledge

The following assumptions, uncertainties and gaps in knowledge are implicit in the study which information formed the basis of part of the impact assessment:

Social Impacts

Assumptions

- No great social changes will take place in the proposed project area between data collection and the submission of this report; and
- Information about all important stakeholders has been included in the study.

Limitations

- Secondary data sources, including statistical data, are limited;

In addition to the assumptions and limitations listed above, it is important to note that identification of socio-economic impacts differs from identifying environmental impacts in the following ways:

Social impacts are not always objectively measurable and often need to be inferred rather than measured. A combination of insight into social processes in general and a thorough knowledge of the communities under study are important to draw valid inferences.

Social impacts are often clustered and interdependent rather than clearly separable.

- ✓ Communities are dynamic and in a continual process of change, which is not easily predictable. The proposed faecal sludge management facility at in Bukolwa LCI, Bukolwa Parish, Wobulenzi Town Council, Luwero District Town Council, Luwero District is but one factor contributing to this change. It is often difficult to identify if an impact is attributable to the development, to factors beyond, or a combination of both.
- ✓ The positive or negative nature of an impact is often value-based – some might view a particular impact as positive and others as negative.
- ✓ Social impacts are often unavoidable and difficult to mitigate and as such, mitigation strategies should be regarded as strategies to manage change, rather than as means to avoid an impact.

Successful management of a potentially negative impact may change the impact into a positive impact.

Designing of sanitation components for Wobulenzi Cluster Towns is one of the major issues in the pre-construction phase. Careful planning helps to avoid the occurrence of particular impacts and the design measures help to minimize ecological and socio-economic impacts as much as possible.

8.3. Pre-construction Phase (Physical Impacts)

8.3.1. Impact 1: Alteration of the Landscape and visual amenity

Cause of Impact

When surveying the proposed area for the project components for the faecal sludge plant, manual cutting of some trees and crops might be necessary in order to get a wide view when surveying. This impact may be more pronounced at the faecal sludge treatment plant. This will cause minimal visual changes in the landscape.

Significance Rating without Mitigation: Negative and Low

Impact classification:

Nature	Probability	Geographic Extent	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Probable	1	1	1	Low	Insignificant

Mitigation Measures:

- ✓ During site clearance vegetation clearance shall be minimised in as much as possible by considering the use of existing cleared areas or areas without crops and trees;
- ✓ The clearance of both tree branches, crops and shrubs at the proposed site for the faecal sludge management facility shall be done manually; and
- ✓ Prior to site clearance, an inventory of all the destroyed vegetation (crops and trees) shall be documented / recorded so that they can be included in the project valuation.

Significance Rating with Mitigation: Negative and Insignificant

8.3.2. Impact 2: Contamination of Soil and the Wetland

Cause of Impact

During surveying the proposed faecal sludge site at Bukolwa LCI, samples of the sub-soil will be taken for the soil profile survey. If the sample holes are left open, they may be contaminated by upper substrate waste. The soil cleared for purposes of soil surveys may get into the wetland causing contamination of the wetland which may lead to loss of ecosystems especially in the Mayanja-Wasswa wetland of the proposed Wobulenzi Cluster Town faecal Sludge Treatment Plant (FSTP).

Significance Rating without Mitigation: Negative and Low

Impact classification:

Nature	Probability	Geographic Extend	Duration	Magnitude	Significance mitigation	Significance with mitigation
Negative	Probable	1	1	1	Low	Insignificant

Mitigation Measures:

- ✓ During site surveying particularly excavation of trial pits on the proposed site for the faecal sludge plant, cconsideration shall be made to prevent soil contamination;
- ✓ After each exploration hole for the site, the hole shall be capped after surveying; and
- ✓ During surveying, soils excavated from the exploration holes shall be left besides the holes to ensure that the soils don't erode into the neighbouring water stream /wetland.

Significance Rating with Mitigation: Negative and Insignificant

8.4. Pre-construction Phase (Biological Impacts)

8.4.1. Impact 1: Loss of Vegetation cover and Crops

Cause of Impact

During the topographic and geological surveys of the project areas especially the faecal sludge plant, cutting of trees and clearance of vegetation and crops will be necessary. The proposed site for Wobulenzi Faecal sludge treatment plant because the proposed site has grasslands, a few trees and crops such as cabbages, sweet potatoes, beans, maize and eucalyptus trees which are planted by the locals. If this impact is not well managed, it may result into conflicts with the locals.

Significance Rating without Mitigation: Negative and Low

Impact classification:

Nature	Probability	Geographic Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	1	2	1	Low	Insignificant

Mitigation Measures:

- ✓ During site clearance, vegetation removal shall only be restricted to only necessary areas for carrying out studies;
- ✓ Manual cutting of branches shall be encouraged especially when carrying out surveying;
- ✓ All the destroyed economic trees and crops shall be recorded and included in the valuation report for purposes of compensation; and

- ✓ Vegetation clearance shall be carried out in the presence of the property owners and the local leadership.

Significance Rating with Mitigation: Negative and Insignificant

8.4.2. Impact 2: Disturbance of Terrestrial Fauna

Cause of Impact

This impact will be caused by human presence and activity when carrying out the topographic and geological surveys on the proposed Wobulenzi faecal sludge plant. While surveying, the survey team will likely remove vegetation, cross the Mayanja-Wasswa wetland and use of vehicles and/or machinery may affect the fauna resident at the proposed project site.

Significance Rating without Mitigation: Negative and Low

Impact classification:

Nature	Probability	Geographic Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Probable	1	1	1	Low	Insignificant

Mitigation Measures:

- ✓ During site clearance, vegetation removal shall be restricted to only necessary areas;
- ✓ Manual clearance of vegetation shall be encouraged to ensure that terrestrial fauna is largely protected; and
- ✓ The use of machinery in areas which harbour fauna like wetlands shall be encouraged.

Significance Rating with Mitigation: Negative and Insignificant

8.5. Pre-construction Phase (Socio-Economic Impacts)

8.5.1. Impact 1: High Expectations of the Local Communities in relation to Jobs

Cause of Impact

There is within the local population, expectations about jobs creation. Indeed, during the design and survey process, the project will create employment opportunities especially areas neighbouring the proposed faecal sludge treatment plant. The jobs will be limited due to the short-term nature of the survey and design period.

Significance Rating without Enhancement: Positive and Low

Impact classification:

Nature	Probability	Extension	Duration	Intensity	Significance without Enhancement	Significance with enhancement
Positive	Certain	1	1	1	Low	Insignificant

Enhancement Measures:

- ✓ The hiring requirements must be clear, properly publicized before the start of the recruitment process and respected by the design team. For a better impact on the communities this process shall be conducted with the involvement of local leaders;
- ✓ In the event there are local expectations for employment that cannot be met by the project, the limited availability of places shall be made known to the interested parties through local authorities; and
- ✓ The principles and procedures for hiring shall, as far as possible, give priority to the hiring of skilled local workers.

Significance Rating with enhancement: Positive and Insignificant

8.6. Construction Phase (Biological Impacts)

8.6.1. Impact 1: Temporary loss of habitat within the construction site

Cause of Impact

The construction phase of the faecal sludge plant will involve the use of heavy machines and vehicles and increase of circulation of people. Stock pile areas for storage of construction materials, storage of sewer pipes, parking of trucks and construction machines etc. and work camps have to be installed.

Vegetation will be cleared for opening or upgrading local access route to the proposed site. This will disturb the fauna and flora and cause temporary loss of habitat and component species within the construction site as highlighted under baseline section 4.1.4. There is likely to be temporary fragmentation of the habitat and damage to adjacent habitat and species due to incursion of machinery/personnel into nearby site not directly required for construction purposes.

Significance Rating without Mitigation: Negative and Moderate

Impact classification:

	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	1	1	1	Moderate	Insignificant

Mitigation Measures:

- ✓ The project access road especially in relation to Wobulenzi site shall be selected limiting passage through the wetland section, avoiding sensitive areas and minimizing erosion;
- ✓ Unless of benefit to local communities, temporary access roads leading to the faecal sludge management site shall be removed when no longer needed and shall be reinstated;
- ✓ Selection of a temporary site for the workers camp and materials stockpiles shall ensure that avoidance of natural areas is observed to minimise the impact on fauna and flora. The selected sites (workers camp and materials stockpile sites) shall be approved by NEMA;
- ✓ All personnel shall be briefed on environmental sensitivities in the surrounding area especially the wetland;
- ✓ After construction and use of materials stock piles, reinstatement of the disturbed sites shall be enforced to maintain habitat continuity as far as is practicable;
- ✓ At the commencement of works, the working width shall be clearly delineated where it passes through environmental sensitive areas; and
- ✓ Fishing and the hunting of animals and birds by the construction personnel in areas around Mayanja-Wasswa wetland shall be strictly prohibited.

Significance Rating with Mitigation: Negative and Insignificant

8.6.2. Impact 2: Disturbance of fauna by noise and vibration

Cause of Impact

The construction phase will involve the use of heavy machines and vehicles. Noise and vibration are generated by excavators, bulldozers, concrete mixers and transport vehicles. Increase in noise levels is and vibration is likely to mainly affect the fauna at the proposed Wobulenzi Faecal sludge treatment plant because of the presence of Mayanja-Wasswa wetland which is an active wetland. The site is reported to have some ecosystems, habitat and birds. Small animals, soil micro-organisms and birds are very sensitive to noise and vibration and often get killed or relocate to other areas.

Furthermore, impacts related to noise are more evident during the night disturbing animals which have a nocturnal living habit for feeding and roaming. However, construction activities will be restricted to day time what could affect e.g., birds that have their breeding habitats along the mains corridor.

Significance Rating without Mitigation: Negative and Low

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	1	1	1	Low	Insignificant

Mitigation Measures:

- ✓ Restrict construction activities and operation of heavy machines to daylight, when most wildlife is active and can react to noise;
- ✓ Ensure that heavy machinery is limited to only necessary activities; and
- ✓ Construction machinery should be properly maintained to ensure that noise and vibration levels are limited.

Significance Rating with Mitigation: Negative and Insignificant

8.6.3. Impact 3: Disturbance of plant processes and fauna by dust generated

Cause of Impact

The construction activities will cause some dust emissions. These emissions will create short-term adverse impacts to the immediate environment. The dust can interfere with the plant photosynthesis, evapotranspiration and other processes and will disturb the fauna temporarily, causing respiratory and visual disruption as well. Dust emission will also decrease the quality of forage quality of herbivorous animal species in the area.

Significance Rating without Mitigation: Negative and Low

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	2	1	1	Low	Insignificant

Mitigation Measures:

- ✓ Water the soil surface and any unpaved access roads during construction at least once a day during the dry season;
- ✓ If the soil removed from the sites is going to be left out for some days, cover the soil to prevent dust emission by wind.

Significance Rating with Mitigation: Negative and Insignificant

8.6.4. Impact 4: Loss of vegetation cover and plant diversity

Cause of Impact

Levelling activities, excavations and grading of the Wobulenzi faecal sludge site will require the removal of vegetation. This activity will lead to a loss of native vegetation and open access to the site with intact vegetation. Moreover, once established the access road and the faecal sludge site will be regularly cleared to control the growth of vegetation.

Significance Rating without Mitigation: Negative and High

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	1	2	3	High	Moderate

Mitigation Measures:

- ✓ All the access roads leading to the site shall be aligned during excavation, grading and levelling to follow existing access roads and already disturbed surfaces which are currently modified/ previously cleared;
- ✓ Vegetation removal shall be restricted to the minimum necessary width; and
- ✓ In the case of slow growing large trees, these shall be unburied and replanted to restore the vegetation cover / beautify the landscape.

Significance Rating with Mitigation: Negative and Moderate

8.6.5. Impact 5: Disturbance and mortality of terrestrial fauna

Cause of Impact

By clearance of vegetation, breeding, feeding and hiding habitats for animals will be affected especially in the Lumansi swamp. In addition, terrestrial fauna may also be killed. Sound and vibration during the construction phase is also likely to disturb the terrestrial fauna. Any use of light, if construction takes place during the night will attract fauna to the construction site and increase the chances of being hurt.

Significance Rating without Mitigation: Negative and Low

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Probable	1	1	2	Low	Insignificant

Mitigation Measures:

- ✓ Construction activities shall be restricted to day time hours (8:00 am – 5:00pm);
- ✓ Prior to site clearance and digging, inspections for any terrestrial fauna shall be carried out;
- ✓ Any trench left overnight shall be protected with a net fence to block fauna from being trapped inside;
- ✓ Capture and release fauna away from the direct influence zone (including species trapped in the trenches); and

- ✓ During site clearance and bush burning, this shall be carried out in the dry season to avoid interfering with nesting and breeding.

Significance Rating with Mitigation: Negative and Insignificant

8.6.6. Impact 6: Loss of habitat and disturbance of fauna using the wetland

Cause of Impact

The proposed Wobulenzi faecal sludge site is located in Mayanja-Wasswa wetland which drains into Lake Kyoga. Therefore, the construction of the faecal sludge treatment plant will require the removal of wetland vegetation where most faunal species seek refuge during the daylight. The aquatic vegetation in the wetland will also be affected by vegetation clearance, siltation, noise and other related impacts.

Significance Rating without Mitigation: Negative and Moderate

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	1	1	2	Moderate	Low

Mitigation Measures:

- ✓ Construction works shall be carried out during periods of lowest water flow in the wetland, so that aquatic wildlife will be less abundant on the papyrus vegetation to the cleared;
- ✓ Vegetation clearance shall be limited to only those areas required for construction of the faecal sludge plant;
- ✓ The workers' camp shall establish at a secure distance from the wetland to avoid unusual presence of workers near the water course; and
- ✓ Education program shall be carried out for the workers on importance of the water bodies and wetland environments.

Significance Rating with Mitigation: Negative and Low

8.6.7. Impact 7: Pollution by solid wastes

Cause of Impact

Solid waste from construction activities and worker's domestic waste can also have negative impacts on the environment, especially if it gets into in the vital natural habitats for wildlife and aquatic life in Mayanja-Wasswa wetland.

Significance Rating without Mitigation: Negative and Moderate

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Probable	1	1	1	Moderate	Insignificant

Mitigation Measures:

- ✓ Environmental awareness shall be provided to the employees on solid wastes;
- ✓ The contractor shall prepare and implement the Solid Waste Management Plan (SWMP);
- ✓ The contractor shall provide the proper containers for disposal of solid wastes; and
- ✓ The contractor shall contract a licensed waste handler to collect regularly and dispose properly the solid wastes.

Significance Rating with Mitigation: Negative and Insignificant

8.7. Construction Phase (Socio-Economic Impacts)

8.7.1. Impact 1: Loss of crops and livelihood

Cause of Impact

As part of site preparation activities, the vegetation within the footprint of the site which mainly comprises of rice, tomatoes, sweet potatoes, cabbages belonging to a number of local residents. It was observed at the proposed site, eucalyptus is also common here and the most common system of agriculture here is visibly with some intercropping among others.

Significance Rating without Mitigation: Negative and Moderate

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	1	3	2	Moderate	Low

Mitigation Measures

- ✓ Ensuring that the land take for the existing access road widening is kept to a minimum so as not to destroy a large section of the gardens and any crops planted therein;
- ✓ Most of the garden owners shall be allowed to harvest any standing crops before clearing for site preparation;
- ✓ In the event that some crops will have to be cleared, for purposes of compensation, an inventory of the crops in the gardens (annual crops and trees) shall be recorded and where possible agreed with the farmers;

- ✓ Linked to the above, the farmers shall be compensated according to the acceptable compensation rates commensurate with the evaluation rates at the District or the Chief Government valuer; and
- ✓ A strategy for engagement with the farmers during preparation and execution of the compensation plan, including a grievance mechanism shall be put in place.

Significance Rating with Mitigation: Negative and Low

8.7.2. Impact 2: Land take for the faecal sludge management facility and access road

Cause of Impact

The construction of both the faecal sludge management facility about 2.52 acres and the 200m long, site access road extension will lead to a certain degree of land take manifesting itself in project affected persons.

Significance Rating without Mitigation: Negative and High

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	2	3	2	High	Low

Mitigation Measures

- ✓ The width of the access road extension should be kept to a minimum and shall not exceed that of the largest service vehicle that is to be used during the construction phase; and
- ✓ Adequate compensation shall be paid to project affected persons in line with approved District compensation rates prior to commencement of the project.

Significance Rating with Mitigation: Negative and Low

8.7.3. Impact 3: Employment opportunities

Cause of Impact

The construction activities at the proposed faecal sludge treatment facility and associated infrastructure project site will create temporary employment opportunities to some of the local residents of Bukolwa LCI, Bukolwa Parish, Wobulenzi Town Council and the wider Luwero District. These will be mainly casual labourers and a few technical personnel to participate in the construction activities.

Significance Rating without Enhancement: Positive and Low

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without Enhancement	Significance with Enhancement
Positive	Certain	3	3	2	Low	Low

Enhancement Measures

- ✓ Ministry of Water and Environment / their appointed contractor shall work hand in hand with the local leaders when recruiting labour from the local community. The policy for employment, working conditions and recruitment can then be communicated to prospective employees by the local leaders.

Significance Rating with Enhancement: The impact will remain Positive and Low because of the limited number of employees recruited and the short duration of the construction phase

8.7.4. Impact 4: Market for construction materials

Cause of Impact

Some of the construction materials will be procured locally within Luwero District – the project area and this will provide revenue to the local economy and these will include: sand, bricks and aggregate stones. The proceeds from the sale of the raw materials to the construction activities at the proposed project will boost the local economy in form of increased earnings.

Significance Rating without Enhancement: Positive and Low

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without Enhancement	Significance with Enhancement
Positive	Certain	1	3	2	Low	Moderate

Enhancement Measures

- ✓ Ministry of Water and Environment and their appointed contractor shall work closely with the local leadership to ensure that local communities or businesses that are capable of supplying some of the construction materials benefit from the procurement process.

Significance Rating without Enhancement: Positive and Moderate

8.7.5. Impact 5: Theft of construction materials

Cause of Impact

With construction activities ongoing at the proposed faecal sludge management facility coupled with the location of the site, a huge volume of construction materials will be required for the construction activities which if not properly handled could attract wrong elements who might steal some of these items among which include cement, iron bars and timber among others. If this is not adequately addressed, it could sabotage the smooth implementation of the construction activities.

Significance Rating without Mitigation: Negative and High

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	3	3	2	High	Low

Mitigation Measures

- ✓ A containerized storage facility for some of the construction materials (cement, iron bars and timber) shall be set up at the construction site with secure locking and manned with armed store keepers;
- ✓ The casual labourers hired at the construction site shall be screened with the help of the local leaders so as to screen out the wrong elements;
- ✓ Security guards shall be contracted to watch over the activities at the construction site; and
- ✓ Clarke Farm Limited and or their appointed contractor in collaboration with the local leadership of Bukolwa LCI and Wobulenzi Town Council shall hire people from the project area so as to benefit from a neighborhood watch scheme.

Significance Rating without Mitigation: Negative and Low

8.7.6. Impact 6: Pressure on Social Services

Cause of Impact

The construction workforce at the proposed faecal sludge management facility and associated infrastructure at Bukolwa LCI, Bukolwa Parish, Wobulenzi Town Council, Luwero District Town Council, Luwero district will in a way exert extra pressure on the existing health facilities in the area which are largely under equipped, located at distant locations from the site and under staffed. Tropical diseases like malaria which is rampant in the area and will likely be referred to health facilities in the area and not only the clinical facilities at the construction campsite. Sexually transmitted diseases such as HIV/AIDS are also likely to be a concern as well given the high prevalence of such diseases in remote areas; and.

Construction vehicles will equally exert extra pressure on the community roads in the area leading to the site in Bukolwa LCI, with most of roads being loose surface murram and are affected by both vagaries of weather which will also be damaged by the heavy trucks that will be plying along the community roads.

Significance Rating without Mitigation: Negative and High

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	3	3	2	High	Low

Mitigation Measures

- ✓ In collaboration with both Wobulenzi Town Council and Luwero District Local Government, the upgrading and maintenance of access roads will have to be a priority especially during the project activities. It has to be ascertained with District and Wobulenzi Town Council officials of their willingness to work with the Ministry of Water and Environment and the appointed contractor in order to improve the road infrastructure;
- ✓ The project's clinical support services will have to be adequately stocked to avoid relying on those within the local community/ project area;
- ✓ All members of the workforce will be provided with mosquito nets and encourage their use as means of preventing malaria which can have a negative impact on the project activities. None Ugandan / expatriate staff on the project will also be prescribed an anti-malarial dose;
- ✓ An HIV/AIDS in the work place policy will be put in place and a voluntary counselling and testing (VCT) programme rolled out and peer educators trained as way of guarding against this and other sexually transmitted diseases (STDs); and
- ✓ Liaisons between project employees and local people that might lead to uncalled for sexual liaisons will have to be discouraged.

Significance Rating without Mitigation: Negative and Low

8.7.7. Impact 7: Spread of Sexually Transmitted Infections (STIs)

Cause of Impact

With construction work ongoing at the proposed coffee processing mill and associated infrastructure, casual workers at the project site are likely to interact with the local community of both Wobulenzi Town Council and particularly Bukolwa LCI and beyond which could potentially lead into the spread of Sexually Transmitted Infections (STIs) including AIDS. With the booming petty trade, increased number of truck drivers stopping in Wobulenzi Town and construction business, sexual workers are likely to flock the area in search of casual sex to benefit from the construction workers earnings from the project. Additionally, with the young population and decaying moral fibre in rural areas, the young vulnerable girls are likely to be lured into sex with the construction workers leading to the spread of STIs and unwanted pregnancies among others.

Significance Rating without Mitigation: Negative and High

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	3	3	2	High	Low

Mitigation Measures

- ✓ The contractor shall endeavor to hire local labour from the project area to minimise on the influx of immigrants in search of work who could also exacerbate the spread of STIs;
- ✓ HIV/AIDS awareness trainings shall be conducted among the work force and the local communities on a regular basis;
- ✓ The contractor shall develop and endeavor to implement an HIV/AIDS policy for the project;
- ✓ The contractor shall endeavor to sensitise workers on the use of appropriate preventive measures such as abstinence and the use of condoms by workers among others; and
- ✓ The contractor shall provide appropriate contraceptives (condoms) to the workers as a preventive measure for STIs.

Significance Rating with Mitigation: Negative and Low

8.8. Construction Phase (Physical Impacts)

8.8.1. Impact 1: Soil Compaction

Cause of Impact

Since the proposed site is situated in a swampy area, the dumping of marram and hardcore coupled with the stripping of the site of vegetation cover for the construction of the faecal sludge management facility and associated infrastructure, the frequent vehicular movements of construction trucks delivering construction materials, equipment and workers to the project site might result into soil compaction and trampling at the site if no designated access tracks and parking area are demarcated at the site.

Significance Rating without Mitigation: Negative and High

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	2	3	3	High	Low

Mitigation Measures

- ✓ Wide tyred construction vehicles shall be used in the construction activities at the site to minimise the impact of soil compaction and trampling at the site; and
- ✓ A designated parking area shall be established at the construction site to avoid construction vehicles indiscriminately parking around the site.

Significance Rating with Mitigation: Negative and Low

8.8.2. Impact 2: Siltation and Sedimentation of the wetland

Cause of Impact

The stripping of vegetation from the site coupled with compaction (for purposes of stability) of the site will result in accelerated runoff rates from the site. Given the gentle elevation of the site, the runoff is likely to carry soil and rocks along with it as it makes its way from the site into Mayanja-Wasswa wetland

Significance Rating without Mitigation: Negative and High

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	3	3	2	High	Low

Mitigation measures

- ✓ Vegetation cover shall be maintained around and in some sections of the proposed project site to act as buffer against the effect of runoff; and
- ✓ The access road leading to the project site shall have proper drainage channels that will convey runoff to the main storm water drains.

Significance Rating with Mitigation: Negative and Low

8.8.3. Impact 3: Poor sanitation around the construction site

Cause of Impact

During the site visit, it was observed that there was no toilet facility at the proposed project site for faecal sludge management facility for which the construction workers could use during the short construction phase. There is a likelihood that the workers might indiscriminately dispose-off human waste in the Mayanja-Wasswa wetland and in the neighbourhood which would potentially contaminate the water source used by some of the area residents or pollute the area and also result into disease outbreaks like cholera and dysentery among others.

Significance Rating without Mitigation: Negative and High

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	3	3	2	High	Low

Mitigation Measures

- ✓ Since the construction phase will last for a short duration, the contractor shall liaise with Ministry of Water and Environment to construct a pit latrine at the site prior to construction – this can then be used by the necessary personnel e.g., guards at the site, construction work force during the construction and could also be used in the operational phase.

Significance Rating with Mitigation: Negative and Low

8.8.4. Impact 4: Poor air quality due to dust emissions

Cause of Impact

The clearance of vegetation around the proposed site for the faecal sludge management facility will expose the soils to wind erosion. Increased vehicular movement to and from the construction site could potentially generate fugitive dust in and around the vicinity of the site. Construction materials like cement might also be a source of dust that could cause nuisance.

Also, likely to have a negative impact on air quality, are the greenhouse gases generated by the construction vehicles, equipment and machinery.

Significance Rating without Mitigation: Negative and Moderate

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	1	3	2	Moderate	Low

Mitigation measures

- ✓ To avoid the generation of unnecessary dust, material drop height shall be kept to a minimum;
- ✓ Dust at the site and along the access road shall be kept to a minimum through occasional wetting. The same shall be applied to any banked soil stockpiles. Wetting shall be increased during high wind days and during dry spells or seasons; and
- ✓ Greenhouse gas (GHG) generating equipment shall undergo routine preventive maintenance.

Significance Rating with Mitigation: Negative and Low

8.8.5. Impact 5: Construction debris and wastes

Cause of Impact

During the construction phase, some waste from the packaging and in form of packaging, construction debris – off cuts, and domestic waste from the food remains brought to the site by the construction workers. Once not well handled this waste could become a sanitation hazard and also be an eyesore at the construction site and in the neighbourhood.

Significance Rating without Mitigation: Negative and High

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	3	3	2	High	Low

Mitigation Measures

- ✓ Ministry of Water and Environment / appointed contractor shall obtain a permit for the disposal of construction debris from the excavation, earth and civil works of some of the components at the proposed coffee processing mill and associated infrastructure;
- ✓ Pollution prevention and waste minimisation shall be made key aspects of a wider construction waste management plan. These shall be supplemented by having waste management facilities e.g., waste containers on site during construction that take waste segregation into account; and
- ✓ Appropriate waste management practices that include: Separation of wastes according to their hazardous and non-hazardous nature and their proper treatment and disposal shall be considered with special attention paid to any hazardous wastes.

Significance Rating with Mitigation: Negative and Low

8.8.6. Impact 8: Visual and Landscape Impacts

Cause of Impact

There is likely to be a high degree of visibility attributed to the construction activities for the proposed faecal sludge management facility and associated infrastructure at the project site.

Significance Rating without Mitigation: Negative and Moderate

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation

Negative	Certain	1	3	2	Moderate	Low

Mitigation measures

- ✓ The fence around the proposed faecal sludge management facility and associated infrastructure will be screened off with iron sheets painted in inconspicuous colours that blend with the surrounding so as to not affect the visual amenity of the community adjacent the project site; and
- ✓ The degree of lighting at the construction site at night will have to be kept to a minimum that is required for security vision.

Significance Rating with Mitigation: Negative and Low

8.9. Construction Phase (Health and Safety Impacts)

8.9.1. Impact 1: Construction related traffic

Cause of Impact

Given the location at the site for hosting the proposed faecal sludge management facility in Wobulenzi Town council, there will be an increase in vehicular traffic due to the transportation of the required construction equipment and materials to the proposed project site. The increased volume of traffic to the site may increase the potential for accidents especially along the community access road leading to the proposed project site.

Significance Rating without Mitigation: Negative and High

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	3	3	2	High	Low

Mitigation Measures

- ✓ Traffic calming measures, in particular speed bumps, shall be put in place along the community access road leading to the project site and inside the construction site;
- ✓ Traffic wardens shall be deployed to guide traffic along the access road leading to the project site;
- ✓ Traffic signage shall be put up along the access road and in the site premises to warn other road users on the access road of movements attributed to heavy construction vehicles;
- ✓ Environment Health and Safety toolbox talks shall be conducted for drivers of construction vehicles. The speed limit close to the construction site shall not exceed 5KPH; and
- ✓ Construction vehicles shall undergo regular preventive maintenance so as to guard against the effects of mechanical failure.

Significance Rating with Mitigation: Negative and Low

8.9.2. Impact 2: Construction Noise

Cause of Impact

Construction activities at the project site for the proposed faecal sludge management facility and associated infrastructure that involve operation of construction machinery, construction works and material delivery by trucks will generate noise at the project site and inconvenience the construction workers.

Significance Rating without Mitigation: Negative and High

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	3	3	2	High	Low

Mitigation Measures

- ✓ If possible, a temporary storage for construction materials shall be constructed onsite to avoid multiple deliveries of materials;
- ✓ Noisy construction machinery shall be directed away from the direction of sensitive receptor(s) and its use restricted where possible;
- ✓ Construction workforce especially machine operators shall be provided with appropriate Personal Protective Equipment (PPE) in form of earplugs, / earmuffs; and

Construction activities shall conform to National Environment (Noise standards and Control) Regulations, 2003. Key emphasis should conform to standards governing construction sites as indicated in Table 8.1 below.

Significance Rating without Mitigation: Negative and Low

Table 8-1: Maximum Permissible Noise Levels for construction sites

Time Frame:

Day	6:00 am.	10:00 pm
Night	10:00pm	6:00 am

**The time frame takes into consideration human activities*

Facility	Maximum Noise Level Permitted (Leq) in dB (A)

Hospitals, Schools, Institutions of Higher learning, homes for the disabled etc	60	50
Buildings other than those prescribed in paragraph (i) above	75	65

Source: Environmental Legislation of Uganda Handbook (2003)

8.9.3. Impact 3: Construction accidents

Cause of Impact

- Construction accidents at the proposed faecal sludge management facility and associated infrastructure may be caused by some of the following activities:
- Poor handling of machinery and equipment has the potential of causing accidents to the workers at the site. Incidents and near misses should also be taken into account; and
- Elevated and overhead work at the proposed faecal sludge management facility and associated infrastructure attributed to working at heights especially assembling metallic components, roofing, and building at elevated heights poses some level of risk to workers safety – fall from overhead.

Significance Rating without Mitigation: Negative and High

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	3	3	2	High	Low

Mitigation Measures

- ✓ Basic Environment, Health and Safety induction training shall be carried out for all employees and contractors (where applicable) prior to commencement of work at the site;
- ✓ Regular Environment, Health and Safety (EHS) training toolbox talks shall be conducted for the construction workforce;
- ✓ Appropriate hazard warning signs shall be displayed around the construction site;
- ✓ Emergency preparedness and response measures such as first aid kits shall be in place;
- ✓ Adequate Personal Protective Equipment (PPE) shall be provided to all workers that are commensurate with construction site activities, e.g., helmets, overalls, safety shoes and harnesses for those working at height. It is important that PPE is used at all times whilst on duty and penalties for lack of its use/improper use should be clearly spelt out.; and
- ✓ Hoisting and lifting equipment shall be rated and maintained and operators trained in their use.

Significance Rating without Mitigation: Negative and Low

8.10. Operational Phase (Physical Impacts)

8.10.1. Impact 1: Decline in Air Quality

Cause of Impact

There is likely to be a potential of pollution at the proposed Wobulenzi Faecal sludge management facility during operation if there is poor management. Air pollution may result from improper treatment of the faecal matter or often taking long to collect faecal sludge thus accumulating and rooting before it is collected. Indeed, during transportation of faecal matter, pollution may be an issue to the areas along the access roads.

There is likely to be odour nuisance from Inlet works and anaerobic ponds if not well managed during operation. The concern is mainly on the neighbouring homesteads. If the nuisance is not well handled it may make the area inhabitable. Smell is one of the major issues why most people don't prefer staying close to a faecal sludge treatment plant.

Significance Rating without Mitigation: Negative and High

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Probable	1	3	2	High	Low

Mitigation Measures:

- ✓ Proper process design and operation shall be essential in minimizing potential odour production;
- ✓ Trees shall be planted along the faecal sludge treatment plant boundary;
- ✓ Periodic maintenance and monitoring of the air quality shall be conducted along the proposed faecal sludge treatment plant/sewers;
- ✓ There shall be timely and adequate transportation of faecal sludge to the FSDP;
- ✓ Appropriate and adequate handling of the faecal sludge shall be ensured during transportation to avoid polluting the environment; and
- ✓ Proper waste treatment measures shall be used at the FSDP areas to avoid bad odours which may become a constant menace to the neighbouring areas.

Significance Rating with Mitigation: Negative and Low

8.10.2. Impact 2: Noise and Dust Emissions

Cause of Impact

The waste trucks bringing faecal matter to and from the treatment plants and project vehicles may be a source of noise along the access routes and project neighbours. Noise may also come as a result of dumping activities within the treatment plant.

On the other hand, dust may only accrue as a result of increased traffic along the un- paved access roads.

Significance Rating without Mitigation: Negative and Low

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	1	1	2	Low	Insignificant

Mitigation Measures:

- ✓ Noise emissions shall be kept within the National Noise standards of Uganda;
- ✓ Local communities shall be informed on the activities schedule at the faecal treatment plant;
- ✓ Noise levels shall be monitored biannually to ensure that the surrounding communities and fauna are not being disturbed; and
- ✓ The client shall endeavor where possible to improve and tarmac the access roads to the treatment plants. Where this is not economically possible, NWSC Wobulenzi branch can continuously water the community access roads especially where the traffic is high in the dry spells.

Significance Rating with Mitigation: Negative and Insignificant

8.10.3. Impact 3: Solid wastes from the Screens

Cause of Impact

There is likely to be solid waste generated from the screening process. If these solid wastes get into the environment especially the neighbouring Mayanja-Wasswa wetland, they may be a source of pollution.

Significance Rating without Mitigation: Negative and Moderate

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	1	3	2	Moderate	Low

Mitigation Measure:

- ✓ Washing and disposal shall be done at controlled solid waste disposal site

Significance Rating with Mitigation: Negative and Low

8.11. Operational Phase (Biological Impacts)

8.11.1. Impact 1: Loss of vegetation cover during maintenance activities

Cause of Impact

There might be a need to conduct some repairs or maintenance. In principle, the impacts caused by such maintenance activities will likely cause loss of some vegetation along the access the roads. These maintenance activities during operation will take place very seldom.

Significance Rating without Mitigation: Negative and Low

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Probable	1	1	1	Low	Insignificant

Mitigation Measures:

- ✓ If needed, during the pipeline maintenance, vegetation shall be removed manually; and
- ✓ All temporary access roads (not in use) shall be rehabilitated to promote recovery of vegetation.

Significance Rating with Mitigation: Negative and Insignificant

8.11.2. Impact 2: Contamination of Ground water, wetland and Soils

Cause of Impact

Improper faecal sludge treatment or management may generate a substantial amount of leachate (residual liquids in solid waste containing among other components, organic matter, nutrients, salts, pathogens, and hazardous chemicals) that may end up in surface drainage structures or wetlands/natural waterways. The high biochemical oxygen demand of faecal sludge/leachate would severely pollute any nearby environmental receptor. Likewise, ground infiltration of leachate will present a considerable risk of soil and aquifer contamination, potentially resulting in the acidification of ground water. Storm water runoff from surface drainage structures at the site may also degrade the quality of receiving waters in nearby steam beds and banks. This may contain suspended sediments, coliform and other potential pathogens. Improper design of the sludge storage site could result in ground water contamination.

Significance Rating without Mitigation: Negative and Very High

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Probable	2	3	3	Very High	Low

Mitigation Measures:

- ✓ Soil contamination prevention measures shall be considered while designing the sludge storage site;
- ✓ Use of a geomembrane (UV resistant) shall be employed to prevent soil from contamination;
- ✓ All the facilities, especially the storage, receiving, and disposal areas shall be paved with an impermeable floor structure (10-7 cm/sec) and covered. Furthermore, an effective drainage system shall be established for leachate and storm water collection and management. Storm water and runoff shall be diverted to avoid any contact with the faecal sludge waste;
- ✓ A drainage layer shall be installed underneath the Faecal Sludge plant to provide adequate drainage of leachate from faecal sludge. This may consist of a bed of coarse material such as wood chippings, or the processing area may permanently incorporate a drainage layer designed to withstand loading, working and removal of material; and
- ✓ Underground water investigations shall be undertaken by NWSC / Faecal sludge plant operator to determine subsurface water strikes and establish inclination of aquifers. This will be vital in determining the direction of faecal discharge in relation to the existing water sources and ground water flow.

Significance Rating with Mitigation: Negative and Low

8.11.3. Impact 3: Generation of Anaerobic Conditions

Cause of Impact

During operation of the sewerage/ faecal sludge treatment plants, there is likelihood of generation of anaerobic conditions in sewer pipes and storm water flooding of basements and leakage of sewer pipes.

Significance Rating without Mitigation: Negative and Low

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Probable	1	1	1	Low	Insignificant

Mitigation Measure:

- ✓ Proper maintenance of sewer system shall be ensured during operation

Significance Rating with Mitigation: Negative and Insignificant

8.11.4. Impact 4: Aquatic Weeds and Deterioration of Effluent Quality

Cause of Impact

During operation, there is likely to be proliferation of aquatic weeds in ponds and deterioration of effluent quality by decaying aquatic weeds.

Significance Rating without Mitigation: Negative and Moderate

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Probable	1	2	1	Moderate	Low

Mitigation Measure:

- ✓ Manual clearance of ponds for aquatic weeds shall be undertaken periodically, if necessary.

Significance Rating with Mitigation: Negative and Low

8.11.5. Impact 5: Foul Odour

Cause of Impact

There is likely to be foul odour coming from the dumping of faecal matter in the dumping points at the Faecal sludge management plant, when transporting faecal wastes and poor maintenance of disposal sites and public toilets. The concern is mainly on the neighbourhoods of the faecal disposal sites and public toilets. But there is also the issue of odour when transporting wastes along the access roads. If the nuisance is not well handled it may make the area inhabitable. Smell is one of the major issues because most people don't prefer staying close to a faecal treatment plant.

Significance Rating without Mitigation: Negative and High

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Certain	1	2	2	High	Low

Mitigation Measures:

- ✓ Proper in-house management shall be employed especially when dumping the wastes. This shall be achieved with proper aeration in the dumping units;
- ✓ Trees shall be planted along the faecal sludge dumping points; and
- ✓ Periodic maintenance and monitoring of the air quality shall be carried out along the access roads to ensure that the sewer transportation vehicles are properly maintained.

Significance Rating with Mitigation: Negative and Low

8.12. Operational Phase (Health and Safety Impacts)

8.12.1. Impact 1: Occupational Health and Public Health concerns

Cause of Impact

Health and safety at the proposed Faecal sludge treatment plants sites are considered primarily in terms of potential exposure to pathogens and accident occurrence to workers and members of the local population during operation.

There is likely to be health and risk of pathogens for potential users of the Mayanja-Wasswa wetland by liquid effluent discharge from the faecal sludge plant. This may lead to transmission of water borne diseases and vector transmitted diseases if the faecal sludge treatment/sewer is not well handled. FSTP are potentially dangerous work environments unless proper precautionary measures are implemented.

Significance Rating without Mitigation: Negative and High

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Probable	1	3	2	High	Low

Mitigation Measures:

- ✓ Health and safety regulations shall be imposed on all the workers. Safety regulations include; first aid kits, protective clothing such as uniforms, gloves and helmets, in addition to regulations concerning the storage and use of hazardous material. Furthermore, the FSTP site shall be kept clean to prevent sanitation failures and workers should not be allowed to exceed working hours;
- ✓ To prevent accidents, members of the public shall not be allowed to access the faecal treatment plant at any time, especially after working hours. This is ensured by proper site closure, fencing, and securing the site using a night guard;
- ✓ No cattle grazing or irrigation shall be allowed to use water from the ponds/ wetlands created for purification;
- ✓ Fencing of 100m from the wetland from discharge point and provision of disinfecting facility shall be considered, if found necessary;

- ✓ Vector control program, i.e., fish & frogs feeding on insect larvae shall be instituted at the plant; and
- ✓ For use of insecticides, environmentally best practice shall be used, e.g., *bacillus thuringiensis* (bacterial toxin)

Significance Rating with Mitigation: Negative and Low

8.12.2. Impact 2: Effect on farm yield and soils by poorly treated faecal sludge cake

Cause of Impact

If the faecal sludge is not properly treated, it may harm the farm production of those farmers who apply the cake to their farm yields. It may also affect the soil fertility of the gardens. Additionally, the farmers handling the faecal sludge cake may get health effect because of handling sludge which is not well treated.

Significance Rating without Mitigation: Negative and Moderate

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Unlikely	3	2	1	Moderate	Low

Mitigation Measures:

- ✓ Proper treatment of the faecal sludge shall be ensured before selling it as manure to the farmers; and
- ✓ Farmers shall be advised to use protective gears when applying manure to their farms / gardens.

Significance Rating with Mitigation: Negative and Low

8.13. Operational Phase (Social Impacts)

8.13.1. Impact 1: Improvement of farm yields and income source

Cause of Impact

The production of the faecal sludge cake will be important to the farmers who require fertilizers/manure for their farms. The sale of the cake will be a source of income to the client. But will also help improve the farm yields of the farmers and hence enhance food security of the country-Uganda.

Significance Rating without Enhancement: Positive and High

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without Enhancement	Significance with Enhancement
Positive	Certain	3	3	2	High	High

Enhancement Measures:

- ✓ Ensure proper treatment of the faecal sludge before selling it as manure to the farmers; and
- ✓ Train the farmers on the importance and best methods of using the fertilizer cake from the treated faecal matter.

Significance Rating with Enhancement: Positive and High

8.13.2. Impact 2: Effects on Accessibility

Cause of Impact

Cesspool vehicles bringing in faecal matter for dumping may cause traffic inconveniences to other road users especially along the Wobulenzi-Luwero road and the community access roads within Bukolwa village leading to the faecal sludge management plant. This may cause delays along these busy roads especially during peak hours.

Significance Rating without Mitigation: Negative and Moderate

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without mitigation	Significance with mitigation
Negative	Probable	1	1	1	Moderate	Low

Mitigation Measures:

- ✓ Vehicles bringing faecal matter for dumping shall be restricted to particular times of the day and not certainly during peak hours; and
- ✓ The client (MWE or NWSC) shall ensure that the drivers realise the need of continuous flow of traffic and dumping shall be done as fast as possible.

Significance Rating with Mitigation: Negative and Low

8.13.3. Impact 3: Improved sanitation and standards of living

Cause of Impact

While overall improved sanitation facilities will lead to improved standards of living in since the cost of buying water and accessing good sanitation facilities like public toilets will be reduced.

Significance Rating without Enhancement: Positive and Low

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without Enhancement	Significance with Enhancement
Positive	Certain	3	3	2	Low	High

Enhancement Measures:

- ✓ The prices levied on sewer management and faecal sludge disposal should be rational and realistic based on the economy of Wobulenzi Cluster Towns. This will enable people access these services at a reasonable price which they can afford.

Significance Rating with Enhancement: Positive and High

8.13.4. Impact 4: Elimination of open dumping of faecal matter

Cause of Impact

Elimination of open dumping of faecal matter which often enters the open drains causing bad sanitary conditions and foul smell in the project areas especially during the rainy spells. Provision of the faecal sludge treatment facilities and ventilated improved and water borne toilet facilities will help solve this problem.

Significance Rating without Enhancement: Positive and Low

Impact classification:

Nature	Probability	Geographical Extend	Duration	Magnitude	Significance without Enhancement	Significance with Enhancement
Positive	Certain	3	3	2	Low	High

Enhancement Measures:

- ✓ The community shall be educated and sensitized on the dangers of open dumping of faecal matter and encouraged to use the provided toilets and pit latrines by the project.

Significance Rating with Enhancement: Positive and High

Table 8-2:Impact Matrix summary of the impacts for the proposed Wobulenzi Cluster Faecal sludge management facility and their influence on the environment

The positive impacts have not been colour coded

SN.	Impact/Issue of concern	Nature	Duration	Extent	Magnitude	Probability of occurrence	Overall Significance	
							Without Mitigation / Enhancement	With Mitigation / Enhancement
PRE-CONSTRUCTION PHASE								
Physical Impacts								
1.	Alteration of landscape and visual amenity	Negative	Short term	Local	Low	Probable	LOW-	INSIGNIFICANT-
2.	Contamination of the soil and the wetland	Negative	Short term	Local	Low	Probable	LOW-	INSIGNIFICANT-
Biological Impacts								
1.	Loss of vegetation and crops	Negative	Short term	Local	Low	Probable	LOW-	INSIGNIFICANT-
2.	Disturbance of Terrestrial fauna	Negative	Short term	Local	Low	Probable	LOW-	INSIGNIFICANT-
Socio-Economic Impacts								
1.	High Expectations of local communities in relation to jobs	Negative	Short term	Local	Low	Probable	LOW+	INSIGNIFICANT+
CONSTRUCTION PHASE								
Biological Impacts								
1.	Temporary loss of habitat in construction site	Negative	Medium Term	Local	Moderate	Very Probable	MODERATE-	INSIGNIFICANT-
2.	Disturbance of fauna by noise and vibration	Negative	Short term	Local	Moderate	Certain	LOW-	INSIGNIFICANT-
3.	Disturbance of plant process and fauna by dust generated	Negative	Medium Term	Local	Moderate	Probable	LOW-	INSIGNIFICANT-
4.	Loss of vegetation cover and plant diversity	Negative	Medium Term	Local	High	Certain	HIGH-	MODERATE-
5.	Disturbance and mortality of terrestrial fauna	Negative	Medium Term	Local	Moderate	Probable	LOW-	INSIGNIFICANT-
6.	Loss of habitat and disturbance of fauna using the wetland	Negative	Short term	Local	Moderate	Certain	MODERATE-	LOW-

SN.	Impact/Issue of concern	Nature	Duration	Extent	Magnitude	Probability of occurrence	Overall Significance	
							Without Mitigation / Enhancement	With Mitigation / Enhancement
7.	Pollution by solid wastes	Negative	Short term	Local	Moderate	Certain	MODERATE-	LOW-
Socio-Economic Impacts								
1.	Loss of crops and livelihood	Negative	Long term	Local	Moderate	Certain	MODERATE-	LOW-
2.	Land take for the faecal sludge management facility and access road	Negative	Long term	Local	Moderate	Certain	HIGH-	LOW-
3.	Employment opportunities	Positive	Short term	Regional	Low	Certain	LOW +	LOW+
4.	Market for construction materials	Positive	Short term	Regional	Low	Certain	LOW+	MODERATE +
5.	Theft of construction materials	Negative	Short term	Local	High	Probable	HIGH-	LOW-
6.	Pressure on social services	Negative	Short term	Regional	High	Certain	HIGH-	LOW-
7.	Spread of Sexually Transmitted Infections (STIs)	Negative	Short term	Local	High	Certain	HIGH-	LOW-
Physical Impacts								
1.	Soil compaction	Negative	Short term	Local	High	Certain	HIGH-	LOW-
2.	Siltation and sedimentation of the wetland	Negative	Short term	Local	High	Certain	HIGH-	LOW-
3.	Poor sanitation around the construction site	Negative	Short term	Local	Moderate	Certain	MODERATE-	LOW-
4.	Construction debris and wastes	Negative	Short term	Local	High	Certain	HIGH-	LOW-
5.	Visual and landscape impact	Negative	Short term	Local	Moderate	Certain	MODERATE-	LOW-
Health and Safety Impacts								
1.	Construction related traffic	Negative	Short term	Local	High	Certain	HIGH-	LOW-
2.	Construction noise	Negative	Short term	Local	High	Certain	HIGH-	LOW-
3.	Construction accidents	Negative	Short term	Local	High	Certain	HIGH-	LOW-
OPERATIONAL PHASE								
Physical Impacts								
1.	Decline in air quality	Negative	Long term	Regional	High	Certain	HIGH-	LOW-
2.	Noise and dust emissions	Negative	Short term	Local	Moderate	Probable	LOW-	INSIGNIFICANT-

SN.	Impact/Issue of concern	Nature	Duration	Extent	Magnitude	Probability of occurrence	Overall Significance	
							Without Mitigation / Enhancement	With Mitigation / Enhancement
3.	Solid wastes from the screens	Negative	Long term	Local	Moderate	Certain	MODERATE-	LOW-
Biological Impacts								
1.	Loss of vegetation during maintenance activities	Negative	Short term	Local	Low	Probable	MODERATE-	LOW-
2.	Contamination of ground water, wetland and soils	Negative	Long term	Regional	High	Probable	VERY HIGH -	LOW-
3.	Generation of anaerobic conditions	Negative	Short term	Local	Low	Probable	LOW -	INSIGNIFICANT-
4.	Aquatic weeds, deterioration of effluent quality	Negative	Medium term	Local	Low	Probable	MODERATE-	LOW-
5.	Foul odor	Negative	Long term	Regional	High	Probable	HIGH -	LOW-
Health and Safety Impacts								
1.	Occupational Health and Public Health concerns	Negative	Long term	Local	Moderate	Probable	HIGH-	LOW-
2.	Effect on farm yield and soils by poorly treated faecal sludge cake	Negative	Long term	Regional	Moderate	Certain	MODERATE-	LOW-
Socio-Economic Impacts								
1.	Improved farm yields and income source	Positive	Long term	Regional	High	Certain	HIGH+	HIGH+
2.	Effects on accessibility	Negative	Long term	Local	Moderate	Certain	MODERATE-	LOW-
3.	Improved sanitation and standard of living	Positive	Long term	Regional	Moderate	Certain	LOW +	HIGH+
4.	Elimination of open dumping of faecal matter	Positive	Long term	Regional	Moderate	Certain	LOW +	HIGH+

8.14. Decommissioning Phase Impacts

Decommissioning of the proposed project will become necessary when the project completes its life cycle or when there is change of use. In a situation where the Sanitation system facilities complete their lifecycle, decommissioning process will typically involve demolition of the buildings, clearing of the site and reclaiming or restoring the affected land into a natural condition. Table .3 below, outlines the basic measures that will be required to be undertaken once all operation activities have ceased.

8.14.1. Impact 1: Change of use situation

In a situation where there is a change of use, decommissioning process may entail structure alterations and/or relocation of Sanitation system facilities. Upon demolition of some of the sanitation structures, the affected land will need to be reclaimed or restored into a natural condition through landscaping and planting of vegetation.

8.14.2. Impact 2: End of life situation

In a situation where the faecal sludge structures have completed their useful life, the decommissioning process will entail removal of the Sanitation system facility buildings/structures. Site clearing of the site and reclaiming or restoring the affected land into a natural condition will then follow.

Restoration of the affected land may involve the filling in of the open pits and grading the land to its natural contours, then planting appropriate tree species and under cover vegetation to hold the soil in place and to prevent flooding. Planting of trees however, may not be necessary if the site is immediately taken over for another development.

During decommissioning, the debris resulting from the demolition will either be transported by a licensed waste transporter for dumping at an approved site or used as base material for new construction work. The demolition process will entail removal of permanent materials using crowbars and hammers, breaking of walling and reinforced slabs using sledge hammers and/or jack hammers, which utilize compressed air and lowering of materials from high to low levels. Some of the exercise may entail working at high level and all the necessary health and safety measures will need to be implemented including provision of personal protective equipment such as, safety harnesses, helmets, gloves, respirators, safety shoes, coveralls, goggles and ear protectors.

Generally, the developer will need to follow the necessary safety guidelines and precautions during the demolition process as shown in the decommissioning plan in Table 8.3 below.

Table 8-3: Decommissioning Plan for Wobulenzi Faecal Sludge Management facility

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Monitoring Means	Time Frame	Cost (UGX)
Demolition waste management					
Demolition waste	Use of an integrated solid waste management system i.e., through a hierarchy of options: Source reduction; Recycling; Reuse; Sanitary land filling.	Project Manager and Contractor	Inspection and Observation	One-off	To be determined
	All structures and partitions that will not be used for other purposes must be removed and recycled/reused as far as possible.	Project Manager and Contractor	Inspection and Observation	One-off	-
	All foundations must be removed and recycled, reused or disposed of at a licensed disposal site.	Project Manager and Contractor	Inspection and Observation	One-off	-
	Where recycling/reuse is not possible, the materials should be taken to a licensed waste disposal site.	Project Manager and Contractor	Inspection and Observation	One-off	-
Rehabilitation of project site					
Vegetation disturbance	Implement an appropriate re-vegetation programme to restore the site to its original status.	Project Manager and Contractor	Observation	One-off	-
	Consider use of indigenous plant species in re-vegetation.	Project Manager and Contractor	Observation	One-off	-
Minimization of occupational health and safety impacts					
Occupational Health and Safety	Adherence to the Occupational Health and Safety Rules and Regulations stipulated in the Occupational Health and Safety Act, 2006.	Health and Safety Manager	Inspection, Meeting and Observation	Throughout decommissioning period	To be determined
	Provision of appropriate personal protective equipment as well as ensuring a safe and healthy environment for demolition workers	Proponent	Inspection and Observation	Throughout decommissioning period	To be determined
	Mitigate demolition workers' accidents by enforcing adherence to safety procedures and preparing contingency plan for accident response.	Health and Safety Manager	Meeting and Observation	Throughout decommissioning period	To be determined
Minimization of demolition noise and vibration					
Noise and	Sensitize demolition vehicle drivers and	Project Manager and	Meeting	Throughout	No added cost

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Monitoring Means	Time Frame	Cost (UGX)
vibration	machinery operators to switch off engines of vehicles or machinery not being used.	Contractor		demolition period	

9. SCOPE OF THE ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN FOR THE PROPOSED FAECAL SLUDGE MANAGEMENT FACILITY AT BUKOLWA LCI

The purpose of this ESMMP is to ensure "good environmental practice" by taking a holistic approach to the management of environmental and social impacts during the construction and operational phases of the proposed wet coffee processing mill and associated infrastructure. This ESMMP therefore sets out the methods by which proper environmental controls are to be implemented by Ministry of Water and Environment (MWE) and any nominated contractor (if applicable) based largely on the mitigation measures recommended in the ESIStatment. However, where necessary, these methods have been expanded upon and additional issues addressed in order to ensure that all environmental and social aspects are appropriately considered and monitored. The duration over which contractors (if any) management controls shall be in place cover the construction and operation period of the faecal sludge management facility construction, operation as well as the project specifications and, as the defects notification period.

It is important to note that this ESMMP is focused primarily on the construction and operational phases of the proposed faecal sludge management facility and associated infrastructure. Design specifications from an environmental and social point of view were taken into consideration throughout the ESIA during which the Consultant provided input with regards to possible mitigation measures to reduce environmental and social impacts.

The provisions of this ESMMP are binding on Ministry of Water and Environment (MWE) and any nominated contractor and any contractors. They are to be read in conjunction with all the documents that comprise the suite of documents for this contract (as highlighted in Section 9.3 below). In the event that any conflict occurs between the terms of this ESMMP and the project specifications or Certificate of EIA Approval once / if issued by NEMA, the terms herein shall be subordinate.

EIA follow up and effective monitoring has become a matter of concern among EIA practitioners (IAIA, 2005) and in the EIA policies of many countries. Mitigation options and enhancement measures are meaningless without effective and consistent follow up i.e. monitoring.

Monitoring refers to the systematic collection of data through a series of repetitive measurements over a long period of time to provide information on characteristics and functioning of environmental and social variables in specific areas over time. There are four types of monitoring that are also relevant to this EIA.

Monitoring will be required in order to check on the effectiveness of the enhancement measures and mitigation options as well as generating information that would be used in future developments and planning processes. An Environmental Management and Social Monitoring Plan (ESMMP) is a detailed plan and schedule of measures necessary to minimize, mitigate, etc. any potential environmental and social impacts identified by the ESIA (World Bank 1999). In this EIA, the significant impacts have been identified, thus the preparation of this ESMMP.

This ESMMP consists of a set of mitigation, monitoring and institutional measures to be taken during the implementation and operation of the proposed pharmaceutical plant establishment so as to eliminate adverse environmental impacts, offset them or reduce them to acceptable levels. The ESMMP also includes the actions needed to implement these measures, including the following features:

Mitigation based on the environmental and social impacts reported in the ESIA, the ESMMP describes the technical details of each mitigation measure.

The EMMP also includes monitoring objectives that specifies the type of monitoring activities linked to the mitigation measures.

Specifically, the monitoring section of the ESMMP provides:

1. A specific description, and technical details, of monitoring measures that includes the parameters to be measured, the methods to be used, sampling locations, frequency of measurements, detection limits (where appropriate), and definition of thresholds that will signal the need for corrective actions;
2. Monitoring and reporting procedures to ensure early detection of conditions that necessitate particular mitigation measures and to furnish information on the progress and results of mitigation;
3. The ESMMP also provides a specific description of institutional arrangements i.e. who is responsible for carrying out the mitigating and monitoring measures (for operation, supervision, enforcement, monitoring of implementation, remedial action, financing, reporting, and staff training);
4. Additionally, the ESMMP includes an estimate of the costs of the measures and activities recommended;
5. The ESMMP also considers compensatory measures if mitigation measures are not feasible or cost effective;

It is worth noting that this ESMMP is operative throughout the whole Project Cycle.

9.1. Assumptions and Limitations to the ESMMP

This ESMMP has been prepared based on the following assumptions and limitations:

- ✓ It is assumed that the consultant was provided with all relevant project description information by Ministry of Water and Environment;
- ✓ There will be no significant changes to the project description or surrounding environment between the completion of the report and implementation of the proposed project that could substantially influence findings, recommendations with respect to mitigation, etc.;

9.2. Applicable Documentation

All the environmental documentation/reports that form the suite of documents for the proposed project's ESIA are applicable to this project, and should therefore be read in conjunction with this ESMMP. In addition, cognisance of the Certificate of Approval must be taken once/if it is issued by NEMA. Where necessary, this ESMMP must be amended to comply with the Certificate of Approval, and submitted to NEMA for approval.

Other documentation which should be considered includes: -

- All contract documentation applicable.
- All applicable environmental legislation.

9.3. Administration and Regulation of the Environmental and Social Obligations

Ministry of Water and Environment – the operators / owner of the faecal sludge management facility and the associated infrastructure must in line with this ESMMP prepare a document clearly outlining and demonstrating the environmental and social responsibilities, accountability and liability of the Contractors' employees. Ministry of Water and Environment shall assign responsibilities for the following:

- Reporting structures.
- Actions to be taken to ensure compliance.
- Overall design, development and implementation of the ESMMP.
- Documenting the environmental policy and strategy.
- Implementing the ESMMP in all stages/phases of the project.

All the aspects which require action under the other core elements and sub-elements of the ESMMP.

All official communication and reporting lines including instructions, directives and information shall be channeled according to the contractor's organization structure.

9.3.1. Roles and Responsibilities

9.3.1.1. Ministry of Water and Environment (MWE)

Ministry of Water and Environment (MWE) is the project proponent and shall therefore be the entity monitoring the implementation of the ESMMP and compliance with the Certificate of Approval. MWE's appointed contractor is not required to appoint a separate management staff for the implementation and monitoring of this management plan. Clarke Farm Limited's appointed contractor to implement some of the measures during the construction phase of the project on behalf of the client (Ministry of Water and Environment) and hence implement the proposed mitigation measures documented in this ESMMP on behalf of MWE, then the successful contractors' responsibilities are outlined in Section 9.4.1.2 that follows.

9.3.1.2. The Appointed Contractor

The appointed Contractor shall:

- Be responsible for the finalization of the ESMMP in terms of methodologies which are required to be implemented to achieve the environmental specifications contained herein and the relevant requirements contained in the Certificate of Approval, once/if issued by NEMA;
- Be responsible for the overall implementation of the ESMMP in accordance with the requirements of Ministry of Water and Environment (MWE) and the Certificate of Approval, once/if issued by NEMA;
- Ensure that all third parties who carry out all or part of the Contractor's obligations under the Contract comply with the requirements of this ESMMP; and
- Ensure that the appointments of the Environmental Control Officer (ECO) and Environmental Site Officer (ESO) are subject to the approval of Ministry of Water and Environment (MWE).

9.3.1.3. Environmental Officer and Health and Safety Officer

Ministry of Water and Environment shall appoint an Environmental Officer (EO) as well as a Health and Safety Officer (HSO) who shall be based on site and shall be the responsible persons for implementing the environmental and social provisions as outlined in this document.

One of the tasks of the EO will be to ensure that the proposed impact mitigation actions as outlined in this report in respect of the faecal sludge management facility and associated infrastructure will be properly implemented as required during the construction phase, demobilization phase and during the operational phase. Where necessary, more than one EO may be required on the site as the scope of the work dictates.

9.3.1.4. Independent and External Environment and Social Auditor

An independent external environmental auditor shall be appointed by Ministry of Water and Environment to ensure compliance with the ESMMP. The audit shall at least be carried out halfway through the general operations phase of the faecal sludge management and associated infrastructure.

9.3.1.5. Liaison Committee

A liaison committee consisting of a representative from the Client – Ministry of Water and Environment, the contractor, National Environment Authority (NEMA), National Water and Sewage Corporation (NWSC), Luwero District Local Government, Wobulenzi Town Council and any other role-player deemed necessary by the members of the committee (the "Liaison Committee") will meet regularly to review the progress of both the Contractor and Operator in implementing and complying with their obligations as set out in this ESMMP.

9.4. Environmental Monitoring

Environmental monitoring is the systematic measurement of key environmental indicators over time within a particular geographic area (World Bank, 1999). Monitoring should focus on the most significant impacts identified in the ESIA. Various types of monitoring activity are currently in practice. The main types are briefly described below:

1. **Baseline Monitoring:** A survey should be conducted on basic environmental parameters in the area surrounding the proposed project before implementation of project activities. Subsequent monitoring can assess the changes in those parameters over time against the baseline.
2. **Impact Monitoring**: The biophysical and socio-economical (including public health) parameters within the project area, shall be measured during the project construction, operational and decommissioning phases in order to detect environmental changes, which may have occurred as a result of project implementation e.g. air emission, dust, noise, water pollution etc. (European Commission, 1999).
3. **Compliance Monitoring:** This form of monitoring shall employ a periodic sampling method, or continuous recording of specific environmental quality indicators or pollution levels to ensure project compliance with recommended environmental protection standards.

Monitoring shall be regular and performed over a long period of time. Interruptions in monitoring might result in generating insufficient data to draw accurate conclusion concerning project impact.

The main aim of ESIA monitoring is to provide the information required to ensure that project implementation has the least possible negative environmental impacts on the people and environment.

9.5. Key Environmental and Social Monitoring Parameters

9.5.1. Geology and Soils

9.5.1.1. Construction phase

- **Hazardous material**

Spills of fuel, oil and other liquids have the potential to cause contamination of soil and groundwater. The Contractor shall implement measures to contain such spills and avoid contamination as much as possible. However, it is possible that some contamination may occur and the Contractor will be required to implement remediation measures in accordance with project and national requirements.

- **Soil Erosion**

The project area is susceptible to surface erosion, especially after heavy rain, therefore efforts will be made to reduce the potential for soil erosion during construction activities. Temporary berms will be constructed where necessary to control any run-off to prevents rills or gulley's forming or soil wash out to surface water features. Correct ground works and compaction should be specified in the contract documentation to prevent soil erosion.

- **Air Quality**

It will be the responsibility of the construction management to schedule construction activities and to apply best practices for dust control, to minimize occurrences of excessive dust concentrations in sensitive neighbouring areas and at the worksite. It will be the responsibility of the construction management to apply best practices for reducing fuel consumption and exhaust emissions, wherever feasible. Aspects such as a reduction of idle driving, selection of new equipment where possible and maintenance of all machinery and engines should be encouraged.

- **Noise**

The nature and extent of the works, particularly those involving rehabilitation and expansion of the water supply system and sanitation services will result in noise and disturbance to local residents. NWSC will ensure that the contractor minimizes disruption and noise, by inter alia, liaising with residents. It must also be noted that the residents are supportive of the project, as it will result in provision of a reliable, constant water supply and will therefore generally be tolerant of disruption to some extent.

According to the National Environment (Noise standards and Control regulations) allowable noise level should be 60 dBA in daytime; and 50 dBA at night-time, which is close to the international.

- **Flora and Fauna**

The main potential effects on the flora and fauna will be related to the construction of the faecal sludge treatment plants in areas which are largely wetlands with marsh vegetation. The most likely to be affected is the Mayanja-Wasswa wetland which is presently cultivated. The widening of the access road(s) leading to the proposed faecal sludge site may affect the associated habitats. The work will need to be undertaken carefully, with good planning to conserve topsoil; reduce encroachment and damage to features such as tree roots; avoid pollution of the wetland; ensure continuous flow of water

in the wetland; and ensure good reinstatement as well as storage and handling of fuels and oils to avoid contamination.

- **Storage and Use of Chemicals**

All chemicals will be stored in designated, locked storage areas, taking care to ensure segregation of potentially reactive substance (e.g. flammables should not be stored with toxic substances). These areas will have an enclosed drainage system/bund to avoid contamination. Material Safety Data Sheets (MSDS) will be provided for all substances and used in project health and safety assessments. Efforts will be made to avoid and minimize the use of hazardous chemicals during construction where possible.

- **Waste Management**

Inert, solid waste (metals, rocks, concrete, gravel, sand and etc.) will be generated during site excavation for the faecal sludge management facility. Construction of paved access roads and asphalt surfaces (where necessary) will also be carried out.

Solid wastes generated at the construction site and during the construction of the faecal sludge plant will be transported by the client (MWE) or his appointed construction contractor. Transportation and disposal of such waste will require in accordance with the National Environment (Waste Management) Regulations, 2020) a license from NEMA as waste handlers in Uganda or sub-contract the activity to a licensed company/person as necessary. The construction works will generate hazardous waste, such as used oils, solvents and other construction waste, which will be required to be disposed of and therefore it will be necessary to arrange an appropriate containment and/or disposal place in in accordance with the National Environment (Waste Management) Regulations, 2020). Measures compliant to good health and safety practice will need to be employed, including appropriate PPE for workers, dampening down of any material that may be generate potentially inhalable dust particles and appropriate containment prior to its storage at an approved/agreed secure facility.

A construction yard shall be created, for laydown of plant and material, maintenance of machinery and prefabrication of infrastructure components. The construction site will be managed as follows:

- Boundaries of the construction site will be marked beforehand and signs will be erected warning people not to enter or dump garbage;
- Metal wastes will be collected and taken to metal processing companies;
- Construction debris (sand, soil, rocks) will be re-used as an additional material for filling deep trenches when needed and where suitable. If not needed, they will be taken to a gazetted dumping site, as agreed with local environmental/planning authorities;
- Speed limits will be set for all trucks operating within the project area; this will be important for those transporting faecal matter for dumping and processing as well.

9.5.2. Waste Management Protocols

Waste and by-products are expected to be generated during the construction and operational phases of the project and therefore, measures to be put in place for the management of this waste have been discussed under the relevant headings in Mitigation Measures above. For ease of reference, waste management protocols for the construction and operational phases of the project are summarized in full in the table 9.1 below.

Table 9-1: Waste Management Protocols during Construction and Operational Phase

Ref. No.	Type of waste/By-product	Waste Management Measures
Construction Phase		
WM1.	Vegetative Material	All woody species shall be harvested and cleared from the submergence area to be inundated prior to damming.
WM2.	Topsoil	Topsoil generated by scarifying of work areas shall be stockpiled in designated areas and will be re-used on the site for re-vegetation of the quarry area and landscaping of other green areas.
WM3.	Overburden	Overburden material from the construction works, depending on the quality, shall be used as gravel for construction purposes like access roads connecting the project site.
WM4.	Construction Rubble	Material such as concrete spoil/broken blocks and excess sub-soil from trench excavations shall be stockpiled in a designated area on site and recycled as: Aggregate for other construction and/or maintenance/erosion control.
WM5.	Other Solid Waste	Skips shall be provided on site for the disposal of construction waste and refuse such as rejected off-cuts and packaging, worker's garbage, etc. Waste from the skips shall be collected on a regular basis by for disposal in accordance with NEMA Waste Management Regulations. Provision shall be made for the separation and composting of organic waste. Materials such as scrap timber and cement bags shall be recycled as far as possible on the site.
WM6.	Hazardous Waste	All hazardous wastes including material soiled with hazardous wastes and empty containers of hazardous materials shall be stored in a designated area on site for regular removal and disposal by a registered contractor in accordance with the Hazardous Waste Management Regulations. Immediate soil remediation shall be carried out for any major oil or fuel spillages that may occur by mopping up with an appropriate material and disposal off site by a registered contractor in an approved manner. Used oil and lubricants shall be stored in approved containers on a concrete hard standing surface with retention bund as per UNBS standards and disposed of in accordance with the Hazardous Waste Management Regulations. Drip pans shall be available on hand for the capture of any substance leaking from machinery
WM7.	Sanitary Waste	All workers (including casuals) shall use the toilets and ablutions provided on site

Ref. No.	Type of waste/By-product	Waste Management Measures
WM8.	Dust	All exposed work surfaces on the site shall be watered down on a regular (daily) basis
WM9.	Exhaust Emissions /Oil & Fuel Leaks (Construction Machinery)	Badly maintained construction equipment shall not be allowed to operate on the construction site to avoid smoke emissions and oil leaks.
Operational Phase		
WM10.	General	Proper housekeeping shall ensure that all the parts of the faecal sludge management facility are at all times clean and tidy.
WM11.	Hazardous Waste	As per WM6.
WM13.	Solid Waste	Un-recyclable waste from refuse skips shall be collected on a regular basis for disposal in accordance with NEMA Waste Management Regulations.

9.5.2.1. Operational phase

- **Air Quality**

Adverse air quality effects are not predicted during operation, due to the nature of the project. All machinery shall either be new and/or shall be maintained according to the manufacturer's service program. Furthermore, significant noxious odours are only typically generated from a WTP in the vicinity of pumping operations, where an aerosol effect is produced or when faecal waste has gone septic due to operational problems. All the main potential locations where noxious odour could be generated shall be housed and ventilated. In addition, there are no sensitive receptors nearby to the operating facility, which is located some distance away from residential areas.

- **Noise**

Negligible operational noise is anticipated, as the faecal sludge plant shall be fenced off and trees planted around the site. Additionally, there is no major noise associated with faecal sludge plant with the exception of the cesspool trucks which bring in the faecal matter for treatment.

- **Flora and Fauna**

The receiving watercourse /wetland and ground water may adversely be affected by waste/waste water from the faecal sludge plant if not properly treated, however with sound management it's expected to improve considerably and can be expected to see improvements as nutrient and bacteria levels will significantly reduce.

9.6. Environmental and Social Monitoring and Management Plan (ESMMP)

This ESMMP has been designed to suit the particular activities and needs of Ministry of Water and Environment, and incorporates the following:

1. General environmental mitigation measures; and
2. Project specific mitigation measures.

The EMMP therefore identifies the following:

1. Activities that will impact on the environment;
2. Specifications with which the contractor shall comply in order to protect the environment from the identified impacts and
3. Actions that shall be taken in the event of non-compliance.

It is important to note that the ESMMP is a dynamic document subject to similar influences and changes as are brought by variations to the provisions of the project specification. Any substantial changes shall be submitted to Ministry of Water and Environment - the proprietor / operator and the relevant environmental authorities in writing for approval. It must be emphasized that some changes may have budget and timeframe implications.

Table 9-2: Environmental and Social Management Plan for the Proposed Faecal Sludge Management Facility for Wobulenzi Cluster Towns

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
Pre-Construction Phase					
Physical Environment					
Changes in the Landscape – Visual Impact	Negative	Vegetation clearance shall be restricted to existing cleared areas or areas without crops and trees whenever possible; The cutting of branches, crops and shrubs shall be done manually. All the destroyed trees and crops shall be recorded so that they can be included in the project valuation.	Not Applicable	Design team MWE	**MWE** **Local leadership**
Contamination of Soil and Wetland	Negative	Soil contamination prevention measures shall be considered while carrying out trial pits survey on the proposed site for the faecal sludge plant. Each exploration hole shall be closed with a cap after surveying. The removal and clearance of all the soils shall be left on side of the excavated soil exploration holes to ensure that the soils don't erode into the neighbouring water streams/wetlands	Not applicable	Design Team MWE	**MWE**
Biological Environment					
Loss of Plant Cover/ Vegetation	Negative	Vegetation removal shall be restricted to only necessary areas for carrying out studies; The cutting of branches shall be done manually	No cost because the identified measures are		

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
and Crops		especially when carrying out surveying; All the destroyed economic trees and crops shall be recorded and included in the valuation report for purposes of compensation; and Vegetation clearance shall be carried out in the presence of the property owners and the local leadership.	adequate, provided they are integrated into normal construction procedures.		
Disturbance of Terrestrial Fauna	Negative	Vegetation removal shall be restricted to only necessary areas; Manual clearance of vegetation shall be encouraged to ensure that terrestrial fauna is largely protected; and Use of machinery in areas which harbour fauna like wetland shall be avoided.	No cost because the identified measures are adequate, provided they are integrated into normal construction procedures.	Contractor/MWE	**MWE** **Luwero Environmental officer and Wobulenzi Town Council Environmental Officer (if any)** **NEMA**
Socioeconomic Environment					
High Expectations of the Local Communities in relation to Jobs	Positive	The hiring requirements shall be clear and properly publicized before the start of the recruitment process and respected by the design team. For a better impact on the communities this process should be conducted with the involvement of local leaders; In the event there are local expectations for employment that cannot be met by the project, the limited availability of places shall be made known to the interested parties through local authorities; and The principles and procedures for hiring shall, as far as possible, give priority to the hiring of	No cost because the identified measures are adequate, provided they are integrated into normal construction procedures.		

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
		skilled local workers.			
Construction Stage Impacts					
Physical Environment					
Changes of Landscape - Visual Impact	Negative	The use of paint with colours that match the environment shall be considered to minimize visual impact of the faecal sludge plant structures; and The retention of a belt of trees/bush shall be encouraged around the faecal sludge facilities built to minimize visual impact.	No cost because the identified measures are adequate, provided they are integrated into normal construction procedures.	Contractor/MWE	**MWE** **Luwero District Environmental officer / Wobulenzi Town Council (if any)** **NEMA**
Soils Contamination	Negative	The contractor shall acquire, use and maintain mobile toilets during construction of the faecal sludge plant; Regular maintenance of construction vehicles and machinery shall be considered to ensure that they are spill free; Refueling activities shall be restricted to areas with concrete or impermeable and bunded surface. These areas shall be far from the wetland sections of the FSP site; Adequate supplies of absorbent material shall be available at all fuel storage and handling area; All members of the workforce shall be trained in their use and safe disposal; The contractor shall prepare and reinforce	Management of Human wastes and machine maintenance UGX 15,000,000	Contractor/MWE	**MWE** **Luwero District Environmental officer / Wobulenzi Town Council (if any)** **NEMA**

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
		awareness on waste management and refueling procedure; Leaking or empty oil drums shall be removed from the construction site immediately with measures in place to prevent contamination; and The contractor shall prepare and implement a Waste Management Plan.			
Soils Erosion and Compaction	Negative	The contractor shall restrict the activities to the minimum possible site for the construction of the faecal sludge plant; The contractor shall use appropriate machinery and/or protective boarding during soil stripping; All parent material (top soil and subsoil) shall be removed and stockpiled separately; and The contractor shall use the stockpiled material in the origin area to reinstate after construction of the faecal sludge plant;	Erosion control measures UGX 17,000,000	Contractor/MWE	**MWE** **Luwero District Environmental officer / Wobulenzi Town Council (if any)** **NEMA**
Noise and Vibration Emissions	Negative	Noise and vibration awareness training shall be conducted for all site staff as part of general site induction; The construction and operation of heavy machinery and vehicles shall be restricted to daytime; Noise emissions shall be kept within the National Permissible Standards of 75db(A) during day and 65db(A) during night for	No cost for identified measures provided they are integrated into normal construction procedures	Contractor/NWSC	**NWSC** **NEMA**

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
		Construction sites as highlighted under the National Environment (Noise Standards & Control) Regulations, 2003 ; Information shall be shared with the local communities on the activities schedule; Truck movements shall be restricted by careful planning of needs of construction material; Vehicles shall not be left turned on or idling at the site for longer than minimum amount of time required; All vehicles and construction machinery shall have an efficient muffler design in accordance with the manufacturer's specifications; Regular and effective equipment maintenance shall be conducted; and The use heavy vibration related machinery shall be restricted at night times.			
Dust and Gaseous Emissions	Negative	The soil surface and any non-asphalted roads shall be periodically watered, especially in the dry season; The storage and handling of spoil, subsoil, topsoil and materials shall be carefully managed to minimise the risk of wind-blown material and dust; The burning of any waste on site shall be prohibited; Vehicle engines shall not be left running	Periodic watering of dusty areas estimated at UGX 11,000,000	Contractor/MWE	**MWE** **Luwero District Environmental officer / Wobulenzi Town Council (if any)** **NEMA**

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
		unnecessarily; and Regular and proper maintenance of vehicles and machinery shall be emphasised.			
Alteration of hydrology of the wetland	Negative	Ambient downstream flow rates shall be maintained and measures shall be taken to minimise raised sediment loadings in the wetland.	No cost because the identified measures are adequate provided, they are integrated into normal construction procedures.	Contractor/MWE	**MWE** **Luwero District Environmental officer / Wobulenzi Town Council (if any)** **NEMA**
Contamination of the wetland and groundwater	Negative	The Supervising Engineer shall ensure that strict and acceptable storage practices are upheld; The disposal of such oils shall be restricted to particular areas like the service bays and the used oil cans should be disposed at approved sites by the Luwero environmental office and NEMA; The contractor shall have spill response equipment available on site; The contractor shall ensure there is regular maintenance of vehicles and machinery; The Refueling activities shall be restricted to areas with concrete or impermeable and bunded surface; Adequate supplies of absorbent material shall be available at all fuel storage and handling	Proper storage of toxic materials/effluents: UGX 13,000,000	Contractor/MWE	**MWE** **Luwero District Environmental officer / Wobulenzi Town Council (if any)** **NEMA**

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
		areas; The workforce shall be trained in their use and safe disposal; The contractor shall prepare and reinforce awareness on waste management and refueling procedure; Leaking or empty oil drums shall be removed from the site immediately with measures in place to prevent contamination; and Monitoring the status of the wetland shall be undertaken to ensure that any slight contamination is dealt with immediately.			
Biological Environment					
Temporary loss of habitat within the construction sites	Negative	The project access road especially in relation to Bukolwa LCI shall be selected limiting passage through the wetland, avoiding sensitive areas and minimizing erosion; Unless of benefit to local communities, temporary access roads will be removed when no longer needed and shall be reinstated; Selection of the temporary site for the workers camp and material stockpiles shall ensure that avoidance of natural areas is observed to minimise the impact on fauna and flora. The selected sites shall be approved by NEMA; All personnel shall be briefed on environmental sensitivities in the surrounding areas especially	No cost because the identified measures are adequate, provided they are integrated into normal construction procedures.	Contractor/MWE	**MWE** **Luwero District Environmental officer / Wobulenzi Town Council (if any)** **NEMA**

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
		the wetland; The contractor shall maintain habitat continuity as far as is practicable after construction during site restoration; and Fishing and the hunting of animals and birds by the construction personnel in the wetland shall be strictly prohibited.			
Disturbance of fauna by noise and vibration	Negative	Construction activities and operation of heavy machines shall be restricted to daylight, when most fauna is active and can react to noise; The use of heavy machinery shall be limited to only necessary activities; and Construction machinery shall be properly maintained to ensure that both noise and vibration levels are limited.	No cost because the identified measures are adequate, provided they are integrated into normal construction procedures.	Contractor/MWE	**MWE** **Luwero District Environmental officer / Wobulenzi Town Council (if any)** **NEMA**
Loss of vegetation cover and plant diversity	Negative	Water the soil surface and any unpaved access roads during construction roads at least once a day during the dry season; Soil excavated from the site shall be covered to prevent dust emission by wind.	Restoration/planting of greenery: UGX 28,000,000	Contractor/MWE	**MWE** **Luwero District Environmental officer / Wobulenzi Town Council (if any)** **NEMA**
Disturbance and mortality of terrestrial fauna	Negative	Construction activities shall be restricted to the day time; The area to be cleared shall be inspected for any terrestrial fauna before bush clearing and digging; and	No cost because the identified measures are adequate, provided they are integrated into normal	Contractor/MWE	**MWE** **Luwero District Environmental officer / Wobulenzi Town Council (if any)**

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
		Large scale bush clearing activities shall be carried out during the dry season, to avoid interfering with nesting and breeding.	construction procedures.		**NEMA**
Loss of habitat and disturbance of fauna using the wetland	Negative	Construction activities shall be carried out during periods of lowest water flow in the wetland, so that aquatic fauna will be less abundant in the papyrus vegetation to the cleared; Clearance of vegetation shall be limited to only those areas required for construction of the faecal sludge plant; The workers' camp shall be located at a secure distance from the wetland, to avoid unusual presence of workers near the water course; and Education awareness programs shall be carried out for workers on importance of the wetland environment	No cost because the identified measures are adequate, provided they are integrated into normal construction procedures.	Contractor/MWE	**MWE** **Luwero District Environmental officer / Wobulenzi Town Council (if any)** **NEMA**
Pollution by solid wastes	Negative	Environmental awareness shall be provided to the employees on solid wastes; A Solid Waste Management Plan shall be prepared and implemented; Proper containers shall be provided for the disposal of solid wastes; and Solid wastes shall be collected regularly and disposed off properly.	Waste management equipment's and collection UGX 15,000,000	Contractor/MWE	**MWE** **Luwero District Environmental officer / Wobulenzi Town Council (if any)** **NEMA**
Socioeconomic					

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
Land take for the faecal sludge facility	Negative	In case of compensation, adequate, prompt, timely compensation in line with the current market price shall be effected by the benefiting communities. The compensation shall be fair to ensure that the land owner does not feel cheated and is able to acquire land somewhere else. Most of this land will be acquired through voluntary good will surrender or full payment compensation.	Valuation Report will highlight the amount required for compensation	MWE Chief government Valuer	**MWE** **Local leadership**
Social Conflicts among workers and the local population in the project area	Negative	In the dialogues of health and safety, MWE and the contractor shall explain to workers about the importance of keeping a good relationship with local communities; Amongst the local workers shall be a group of community liaison, responsible for establishing communication between project staff and community, which shall be particularly important in cases of complaint; and MWE and the contractor should establish and implement a set of rules (or a Code of Conduct) for the workplace. The standards shall include, inter alia, the entry of persons outside the service and the prohibition of prostitution in the construction camp.	Conflict resolution Budget required UGX 11,000,000	MWE Grievance management officer	**Local leadership** **Contractor**
Creation of Jobs and improvement of living conditions of	Positive	Clear formal hiring requirements established shall be observed by the client MWE and the contractor; The hiring requirements shall be clear, properly publicized before the start of the recruitment	No cost because the identified measures are adequate, provided they are integrated	MWE/ Contractor Local leadership	**Labour officers of Luwero District** **Local leadership**

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
the population		process and respected by the designated contractor. For a better impact on the communities this process shall be conducted with the involvement of local leaders; The required skills for the positions shall be provided or, in cases where it is not applicable, shall be clearly indicated that no special qualifications are required; The client and contractor shall disclose for each position, the exact number of jobs available, the applicable period and the remuneration to be allocated for each type of work; The principles and procedures for hiring shall, as far as possible, give priority to the hiring of skilled local workers; In as much as possible, training shall be given to local people to perform semi-specialized tasks, so as to reduce the number of workers from outside for this purpose; Employment measures shall ensure that gender considerations are taken into consideration aimed at ensuring that at least 20% are women; and In the event where are local expectations for employment that cannot be met by the project, the limited availability of places shall be made known to the interested parties through local authorities.	into normal construction procedures.		
Health and Safety Impacts					

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
Injuries or fatalities	Negative	A traffic management plan shall be developed for the construction site; All visiting drivers shall report to site management before entering the faecal sludge construction site; The H&S Management Plan shall include procedures to avoid repetitive motion and wrong manual handling; Manual work shall be carried out by workers having the physical conditions to undertake the tasks without any risks to their health (consider experience and familiarity with the job, age and historical of injuries); Sufficient breaks shall be implemented and organized to ensure the possibility for having a rest from repetitive tasks or heavy manual handling, especially under hot ambient conditions. The arrangements for breaks shall be communicated to all concerned workers; Suitable and proved PPE shall be provided to each worker without any cost; and Ensure that there are suitable pedestrian crossing points on vehicle routes bringing in construction materials and taking away waste soils.	Trainings of workers UGX 6,500,000 Provision of PPE's to the workers estimated at UGX 32,000,000 Provision of First Aid Kits on site 4,000,000	Contractor/MWE Workers Drivers of project vehicles Community members	**Medical officers-Luwero District** **Local leadership** **Occupational Health and Safety Department-MoGLSD**
Exposure to Chemicals, Hazardous or	Negative	Fuel stores shall be as low in volume as practicable; any leaks of the stores must be avoided and prevented. The outlet of the stores,	Storage facilities for chemicals and hazardous wastes	Contractor/MWE	**Luwero District Health Department** **Occupational Health and**

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
Flammable Materials		drums, tanks etc. must be secured and locked. Bunds shall be empty at any time; any spills must be removed immediately. The storage areas must be secured against damage because of vehicle collision; The number of employees exposed shall be kept to a minimum; Adequate ventilation shall be provided in case of enclosed spaces; and Emergency numbers and MSDS shall be available and displayed.	UGX 8,500,000	Workers in contact with chemicals	**Safety Department-MoGLSD** **NEMA**
Health related issues due to noise	Negative	Warnings shall be posted to warn of the health effects and training and education of personnel on avoiding unnecessary noise generation; Noisy works shall be scheduled to times when the least workers are present; Surveillance and job rotation where exposure to noise is significant; If engineering and administrative controls do not reduce the noise levels sufficiently, approved hearing protection devices (HPD) shall be provided, worn and maintained; and. A reasonable mitigation measure, of more importance than wearing hearing protection devices, is the reduction of noise levels to an as low as possible level. Noise levels shall be kept below the recommended 75 dB (A) during day time wherever possible.	No cost for identified measures provided they are integrated into normal construction procedures	Contractor/MWE Drivers of project vehicles	**Local leadership/community members** **NEMA**

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
Increased incidence of diseases, including the spread of HIV/AIDS	Negative	Awareness campaigns shall be carried out for workers on ways of transmission of STIs and HIV/AIDS, including risk behaviours; MWE shall recruit a specialist organization to implement activities to raise awareness about STIs and HIV/AIDS among the workers. Special attention should be given to sex workers, women and local girls; Free condoms shall be provided in the project area for the faecal sludge site; Awareness-raising shall be expected to encourage employees to undergo HIV testing (outside the scope of the employment contract); and The client (MWE) or the contractor shall forward workers to clinics for early treatment and monitoring of secondary infections/opportunistic such as coughs, flu and pneumonia.	AIDs awareness campaigns in the project areas UGX 3,500,000	Contractor/MWE Project Workers Community members	**Ministry of Health** **Luwero District health department** **MWE** **Local leadership**
Operational Impacts					
Physical Environment					
Decline in Air Quality	Negative	Proper process design and operation are essential in minimizing potential odour production; Trees shall be planted along the faecal sludge treatment plant boundary; Periodic maintenance and monitoring of the air	Monitoring of sludge quality: UGX 10,000,000/year Transportation of sludge	MWE /NWSC	**MWE /NWSC** **NEMA** **Neighbouring Communities** **Luwero District Local Government**

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
		quality shall be conducted along the proposed faecal sludge treatment plant; There shall be timely and adequate transportation of faecal sludge to the FSDP; During the transportation, appropriate and adequate handling of the faecal sludge shall be ensured to avoid polluting the environment; and Proper waste treatment measures shall be used at the FSDP area to avoid bad odours which may become a constant menace to the neighbourhood.	UGX 10,000,000/year		
Noise and Dust Emissions	Negative	Noise emissions shall be kept within the National Noise standards of Uganda; Local communities shall be informed on the activities schedule; Noise levels shall be monitored biannually to ensure that the surrounding communities and fauna are not being disturbed; and The client shall endeavour where possible to improve and tarmac the access roads to the treatment plant. Where this is not economically possible, MWE shall continuously water the community access roads especially where the traffic is high in the dry spells.	No cost because the identified measures are adequate, provided they are integrated into normal operating procedures.	MWE /NWSC	NEMA Local community/Leadership Luwero District Local Government
Solid Wastes from Screens	Negative	Washing and disposal shall be done at controlled solid waste disposal site	No cost because the identified measures are adequate, provided	MWE /NWSC	**NEMA** **Luwero District Local Government**

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
			they are integrated into normal operating procedures.		
Biological Impacts					
Contamination of Ground Water, Wetlands and Soil	Negative	Soil contamination measures shall be considered while designing the sludge storage site; Geomembrane (UV resistant) shall be used to prevent soil from contamination; All the facilities, especially the storage, receiving, and disposal areas shall be paved with an impermeable floor structure (10-7 cm/sec) and covered. Furthermore, an effective drainage system shall be established for leachate and storm water collection and management. Storm water and runoff shall be diverted to avoid any contact with the faecal sludge waste; A drainage layer shall be installed underneath the FSTP to provide adequate drainage of leachate from faecal sludge. This may consist of a bed of coarse material such as wood chips, or the processing area may permanently incorporate a drainage layer designed to withstand loading, working and removal of material; and. Underground water investigations shall be undertaken by MWE to determine subsurface water strikes and establish inclination of	Cleaning up the contamination estimated at UGX 18,000,000	MWE /NWSC	**NEMA** **Wetlands Management Department**

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
		aquifers. This will be vital in determining the direction of faecal discharge in relation to the existing water sources and ground water flow.			
Anaerobic Conditions	Negative	Proper maintenance of sewer system in operation	No cost because the identified measures are adequate, provided they are integrated into normal operating procedures.	MWE /NWSC	NEMA
Aquatic Weeds and Deterioration of Effluent Quality	Negative	Manual clearance of ponds for aquatic weeds to be undertaken periodically if necessary.	No cost because the identified measures are adequate, provided they are integrated into normal operating procedures.	MWE /NWSC	**NEMA**
Health and Safety					
Occupational Health and Public Health Concerns	Negative	Health and safety regulations shall be imposed on all the workers. Safety regulations include; first aid kits, protective clothing such as uniforms, gloves and helmets, in addition to regulations concerning the storage and use of hazardous material. Furthermore, the FSTP site shall be kept clean to prevent sanitation failures and workers shall not be allowed to exceed working hours;	No cost because the identified measures are adequate, provided they are integrated into normal operating procedures.	MWE /NWSC	**NEMA** **Occupational Health and Safety Department-MoGLSD**

Impact/Issue of concern	Nature	Mitigation Measures	Estimated Cost of Impact Mitigation Measures	Responsibility	Monitoring
		To prevent accidents, members of the public shall not be allowed to access the faecal sludge site at any time, especially after working hours. This is ensured by proper site closure, fencing, and securing the site using a night guard; No cattle grazing or irrigation shall be allowed to use water from the ponds/ wetland created for purification; Fencing of 100m from the wetland from discharge point, provision of disinfecting facility, if found necessary; Vector control program shall be implemented, i.e. fish & frogs feeding on insect larvae; and For use of insecticides, environmentally best practice shall be used, e.g., *bacillus thuringiensis* (bacterial toxin)			
Note: All mitigation measures identified in this Table should be specified in all bidding documents (Bill of Quantities) and contracts for construction and operation of the project, and should also be including in all manuals or operating procedures that are developed.					

In total around UGX 202,500,000 needs to be allocated to implement main mitigation measures.

The Contractor shall be contractually required to conform to the requirements specified in the ESIA and ESMMP and will be accountable to the Ministry of Water and Environment (MWE) as the client. It is recommended that Ministry of Water and Environment support the contractor in achieving project environmental and social safeguard objectives where necessary recruit an environmental consultant to be included in the staff of construction Supervisory Body, the consultant will advise and support MWE in implementation of the ESIA standards during construction and into operation.

There are several mechanisms of ensuring delivery during construction of both general and site-specific mitigation developed in ESIAs. One mechanism favoured for the project involves requiring the Contractor to further develop the outline requirements in an ESMMP by designing individual Management Plans, such as oil and fuel storage, waste management, traffic management and pollution prevention.

This approach for each individual scheme will benefit from oversight by the Ministry of Water and Environment to form a set of environmental and social requirements applicable to the project as a whole, which will ensure compliance of the work to national and best international practices/standards. Such measures will be mandated in the bidding and contract documents, so that an overall good standard of work is achieved. This approach also has benefits of institutional capacity training, as the knowledge and capability of Ministry of Water and Environment will be extended to effective environmental management and as each scheme comes on stream the operator or National Water and Sewerage Corporation will benefit from knowledge gained on previous schemes. Main elements of the Specific Management Plans are given in Table 9.3 below.

Table 9-3: List of Specific Management Plans for the Proposed Faecal sludge management facility in Wobulenzi Town

Specific Management Plan	Outline of Content
Waste Management	Measures to reduce, handle, separate, store and dispose waste from operations and work sites. Requirements for monitoring, recording, inspection and reporting. Instructions for the storage and handling of various types of hazardous materials.
Waste Water Management	Measures to control, collect, treat or reuse Waste water/ effluents from various sources to avoid pollution.
Air Quality Control	Measures to reduce and control air emission from various sources. Requirements for monitoring, recording, inspection and reporting.
Dust Control	Measures to reduce and control dust emissions from roads, work sites and construction activities. Requirements for monitoring, recording, inspection and reporting.
Noise and Vibration Control	Measures to reduce and control noise and vibrations generated by plant at all work sites and from transport activities. Requirements for monitoring, recording, inspection and reporting.
Traffic Management	Procedures for minimizing disruption to traffic and access, especially for public buildings such as hospitals and schools.
Emergency Response	Procedures for response to a range of incidents and emergencies. Requirements for monitoring, recording, inspection and reporting.

Specific Management Plan	Outline of Content
Archaeology and Cultural Heritage	Measures to reduce adverse impacts on cultural heritage during construction. If any late finds are made measures must be taken to ensure 'conservation' in accordance with legislation.
Oil and fuel storage and refueling	Specification for storage of all oils and fuels (secondary containment etc.) and procedures for refueling vehicles, plant and equipment so as to ensure environmental protection.
Site Inspection	Procedures for site inspection and reporting including notification of non-compliance
Handling of Complaints and Grievances	Procedures for handling of complaints including response to complainer and reporting.
Environmental Training	Project Induction Toolbox talks Training requirements and procedures including target groups, contents of training sessions and verification.
Storage and use of hazardous products & substances	Registration, logging of material safety data sheets and risk assessment of materials and chemicals being used in the project. Documentation requirements.
Reinstatement Plan	Plan for topsoil management and removal of all equipment and materials from temporary work sites and reinstatement of areas to a standard at least as good as the pre-construction condition.

9.7. Performance Monitoring for Environmental parameters

Conducting monitoring is the major strategic tool in environmental management and the extent of project monitoring will be dependent on the nature, scale and potential impact of the project activities. Monitoring may require the services of environmental specialists or a company with laboratory and analytical facilities (for complex environmental problems) or inspection by the local government environmental officers.

Main elements of the environmental monitoring plan are the following:

a) During the construction phase:

- Dust monitoring;
- Noise monitoring;
- Solid wastes monitoring;
- Waste waters monitoring;
- Soil monitoring.

The Contractor/client will prepare Specific Management Plans (Refer to Table 9.3 above) addressing all aspects of the ESMMP, and will establish a team for the monitoring activities (as shown in Table 9.4 below).

b) During the Operation phase:

a) Monitoring of water volume at water points distributed to informal settlements;

b) Monitoring of microbiological and chemical composition of waste water discharged, comparison to water standards;

c) Monitoring of waste waters after purification;

d) Monitoring of odour and air quality especially around the faecal sludge treatment plant;

e) Monitoring of on-site septic tanks, its desludging, sludge disposal;

f) Monitoring of soil where depositions generated in water cleaning plant will be used as fertilizers.

g) Monitoring of all activities during construction period will be under the responsibility of MWE.

The Client (MWE)/appointed contractor will be responsible for the compliance of the constructions with the national norms and standards. Monitoring of construction activities will have to ensure that mitigation measures of construction impacts are being implemented properly. Contractor's Environmental and Social Safeguards Team will be subject to the government inspections (National Environment Management Authority (NEMA), Wetland Management Department, Ministry of Gender, Labour and Social Development (MoGLSD), Luwero District Local Government (KDLG) and Ministry of Health among others) from time to time. An individual auditing company may also inspect the Contractor on a long-term basis, such as every 3 months or 6 months. Regular reports on implementation of monitoring plan will be submitted to the Client (MWE) by the Contractor. The Environmental and Social Monitoring Plan (see Table 9.4) is as presented below.

Table 9-4: Environmental and Social Monitoring Plan for the proposed Faecal Sludge Management facility in Wobulenzi Town, Luwero District

Item	Element	Location	Type of monitoring	Frequency of monitoring	Purpose of monitoring	Cost
Construction works of the faecal sludge plant	Dust	In the construction sites	Visual monitoring	During periodic site visits to be carried on daily basis by contractor and by environmentalist appointed in the contract	To ensure adherence to environmental protection requirements	UGX 2,000,000
			Project site and surrounding area	Each month	Relevance to standards and rules	UGX 2,000,000
	Waste water/ effluents flows generated in the construction site	In the construction sites	Visual monitoring	During monthly site visits	To ensure adherence to environmental protection requirements	UGX 2,000,000
	Collection of solid wastes	In the construction sites	Visual monitoring	During periodic site visits	To ensure adherence to environmental protection requirements	UGX 2,000,000
	Utilization of solid wastes	Abandoned areas	Visual monitoring	During periodic site visits	To ensure adherence to environmental protection requirements	UGX 2,000,000
	Use of dangerous materials h (paints with heavy metals, lead compositions, asbestos-cement	In the construction sites with right documentation	Visual monitoring and study of documentation	Each month	To ensure adherence to environmental protection requirements	UGX 2,000,000

Item	Element	Location	Type of monitoring	Frequency of monitoring	Purpose of monitoring	Cost
	slabs, pipes, inflammable and toxic substances etc.)					
	Protective measures in the construction site	In the construction sites with right documentation	Visual monitoring	Each month	To ensure adherence to environmental protection and safety requirements	UGX 2,000,000
Construction works of the faecal sludge plants, dumping sites and water distribution	Protection of nature	In the construction sites	Visual monitoring	Each month	To ensure adherence to environmental protection requirements	UGX 2,000,000
	Earth restoration after excavation works	In the construction sites	Visual monitoring	At completion of construction works	To ensure adherence to environmental protection requirements	UGX 2,000,000
	Noise & vibrations resulting from equipment work	Project area/close to settlements	Portative noise metering device	During periodic site visits, on daily basis	To ensure adherence to environmental protection requirements	UGX 2,000,000
	Traffic operation /movement	In the construction sites	visual monitoring of machinery and trucks carrying construction materials	During periodic site visits	To ensure adherence to environmental protection requirements	UGX 2,000,000
Construction works of the	Obstructed access	In the construction sites	visual monitoring	During periodic site visits on daily basis	To ensure adherence to requirements	UGX 1,000,000

Item	Element	Location	Type of monitoring	Frequency of monitoring	Purpose of monitoring	Cost
faecal sludge plant	Vehicle and pedestrian safety when there is no construction activity	In the construction sites	visual monitoring by supervisor	On daily basis during nonworking hours	To ensure adherence to requirements	UGX 2,000,000
Operation of the faecal sludge plant	Utilization of solid wastes	Abandoned areas	Visual	Periodic visits	To ensure adherence to environmental protection requirements	UGX 2,000,000
	Quality of treated potable water	Inlet to treatment structure	Measuring (pH, turbidity, suspended solids, bacteria)	In accordance with the schedule	Relevance to standards and norms	UGX 4,000,000 Each year
	Adequacy of treated potable water to standards	Outlet to treatment structure	Measuring (physical-chemical and bacteriological, including heavy metals and pesticides on permanent basis)	In accordance with the schedule	Relevance to potable water standards	UGX 4,000,000
	Quality of treated faecal effluents	Outlet to treatment structure	Measuring (physical-chemical and bacteriological analyses)	In accordance with the schedule	Relevance to standards and norms	UGX 4,000,000 each year
		Water quality (visual, water smell, bacteriological, chemical)	At up and downstream points of water discharge and water discharge areas (basins)	Each month	To ensure adherence to environmental protection requirements	UGX 4,000,000

Item	Element	Location	Type of monitoring	Frequency of monitoring	Purpose of monitoring	Cost
	Quality of sludge (sediments)	Monitoring of nematodes, coliforms and heavy metals of sludge composition	Physical, chemical and bacteriological analyses	After sludge processing	Relevance to FAO requirements for neutralization or reuse for agricultural purposes	UGX 4,000,000
Total						**UGX 47,000,000**

10. CONCLUSIONS AND RECOMMENDATIONS

10.1. Introduction

This report presents a comprehensive (full) environmental and social impact assessment for the proposed construction of the faecal sludge treatment plant located in Bukolwa LC1, I Wobulenzi T.C, and proposed measures for mitigating the adverse impacts while enhancing the positive ones during the phases of construction, operation and maintenance. An evaluation of the possible alternatives for the project activities was also performed.

10.2. Conclusion

The anticipated benefits of the construction and operation and maintenance of the proposed faecal sludge drying bed are immense. The project will result into an improvement of public health conditions, spur social economic development, and provide employment to local residents.

However, just like most developments, the immense benefits of the project do not necessarily insulate it from negative impacts. In order to evaluate the project so that its undesirable impacts on the environment and social economic set up are minimised, an evaluation of the possible project alternatives was also conducted. The planning and design of the treatment plant found to be so specific that no alternative was proposed. In that case, the impacts of those project components were carefully analysed in terms of their actions and intended location. Alternatives were suggested for the proposed treatment site location which reflects future wastewater treatment plant that would allow wastewater flow by gravity without the need for pumping.

For both the project components, which are suggested to be maintained and proposed alternatives, an evaluation of the positive and negative impacts was performed, and an Environmental Social Management and Monitoring Plan (ESMMP) drawn. All negative impacts can be mitigated following the ESMMP. Suggestions were also proposed on the enhancement of the positive impacts. The project should be developed in conformity with all legal requirements. The developer should ensure that the wastes are handled and disposed off in accordance with the ESMMP, and must comply with the protection measures for the safety of all persons interfacing with the project and the environment. If the project is developed following the suggestions given in the ESMMP of this ESIA, it is our contention that there will be no negative impacts to deter the implementation of the project.

The developer (Ministry of Water and Environment) and beneficiary (Luwero District) have all expressed willingness and commitment to carry out development in an environmentally sustainable manner and implement all the suggested mitigation measures to minimise the negative impacts from the proposed faecal sludge treatment plant.

10.3. Recommendations

Based on the immense project benefits of the sanitation Project to the people of Wobulenzi cluster, which have been stated above, and the fact that the identified negative impacts can be mitigated following the proposed ESMMP, we strongly recommend to NEMA to review and approve this ESIA to enable further development of the project.

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APPENDICES

Appendix 1: Reviewed Terms of Reference

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY (NEMA)

NEMA House
Plot 17,19 & 21, Jinja Road.
P.O.Box 22255, Kampala, UGANDA.

Tel: 256-414- 251064, 251065, 251068
342758, 342759, 342717
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NEMA/4.5

6th July 2021

The Permanent Secretary,
Ministry of Water and Environment,
P. O. Box 200226,
KAMPALA.

Tel: +256 414 505942
Email: ps@mwe.go.ug

RE: APPROVAL OF THE SCOPING REPORT AND TERMS OF REFERENCE FOR UNDERTAKING THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE FEACAL SLUDGE MANAGEMENT FACILITIES IN SELECTED TOWNS IN CENTRAL AND SOUTH WESTERN UGANDA

This is in reference to the Terms of Reference (TOR) for carrying out an Environmental and Social Impact Assessment (ESIA) for the Feacal Sludge Management Facilities in selected Towns in Central and South Western Uganda which was submitted to this Authority for consideration for approval. Specifically, for the facilities to be developed in the following locations:

(i) Luteete Menvu Cell, Lugo Ward, Busukuma Division, Nansana Municipality, Wakiso District;

(ii) Bukolwa LCI, Bukolwa Parish, Wobulenzi Town Council, Luwero District;

(iii) Kihura LCI, Ward C, Kigumba Town Council, Kiryandongo District;

(iv) Luyembe Village, Kitoro Parish, Kyanzanga Town Council, Lwengo District; and,

(v) Kiiga Village, Bushura Parish, Kirima Sub County, Kanungu District.

This Authority has finalized the review and grants formal **APPROVAL** of the said TOR. However, separate ESIA reports shall be prepared for the respective Facilities and submitted to the Authority for further consideration.

Please note that the approval of the TORs does not constitute permission to start implementing any of the proposed project activities, as this is not a Certificate of approval.

Page 1 of 3

In addition to the scope of work detailed in the TOR, the ESIA team should consider the key aspects below during the conduct of the Environmental Impact Study and the preparation of the report.

(i) Make reference to the updated regulatory frameworks for environmental management. In particular, the National Environment (Waste Management) Regulations, 2020, the National Environment (Standards for Discharge of Effluent into Water or Land), Regulations, 2020, the National Environment (Environment and Social Assessment) Regulations, 2020 and the National Environment (Audit) Regulations, 2020. Uganda has not yet developed standards for air quality, however, reference can be made to the East African Standard: Air Quality Specification (EAS 751:2010). The project should be designed and planned to meet the standards and requirements set out in the respective pieces of legislation.

(ii) The sites are located within or close to wetland systems. Comprehensive hydrological studies of the respective catchment areas, should therefore be undertaken as part of the ESIA process. The report should provide details of the respective wetland systems and identify issues that may need to be addressed to minimize potential impacts on surface and ground water resources. Efforts should be made to avoid disturbing the critical areas or core of the wetland systems, and areas with a relatively high water table or undisturbed wetland.

(iii) Identify and map (including providing GPS coordinates) community water sources within the project sites or their surroundings. Assess potential impacts on such water sources and mitigation measures in this regard.

(iv) The scoping report makes mention of the potential use of treated feacal slugde as soil conditioner. The ESIS should clearly detail the quality assurance and quality control measures that will be implemented to ensure health and safety for the proposed disposal options.

(v) Provide site specific baseline information on the soils, water, air quality and existing activities at the respective sites and their surroundings, including maps and images where appropriate. In particular, provide baseline characteristics of water quality within the respective project sites and their surroundings.

(vi) Ensure that the project alternatives are clearly be documented and appropriate justification provided for the selected options. This shall include options for the safe disposal of treated sludge and effluent from the respective Plants.

6/7/21

Page 2 of 3

Appendix 2: Consultative Meetings

Appendix 2 (a): Community Consultative Meetings

msitu consults

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Office Tel: +256-200905847
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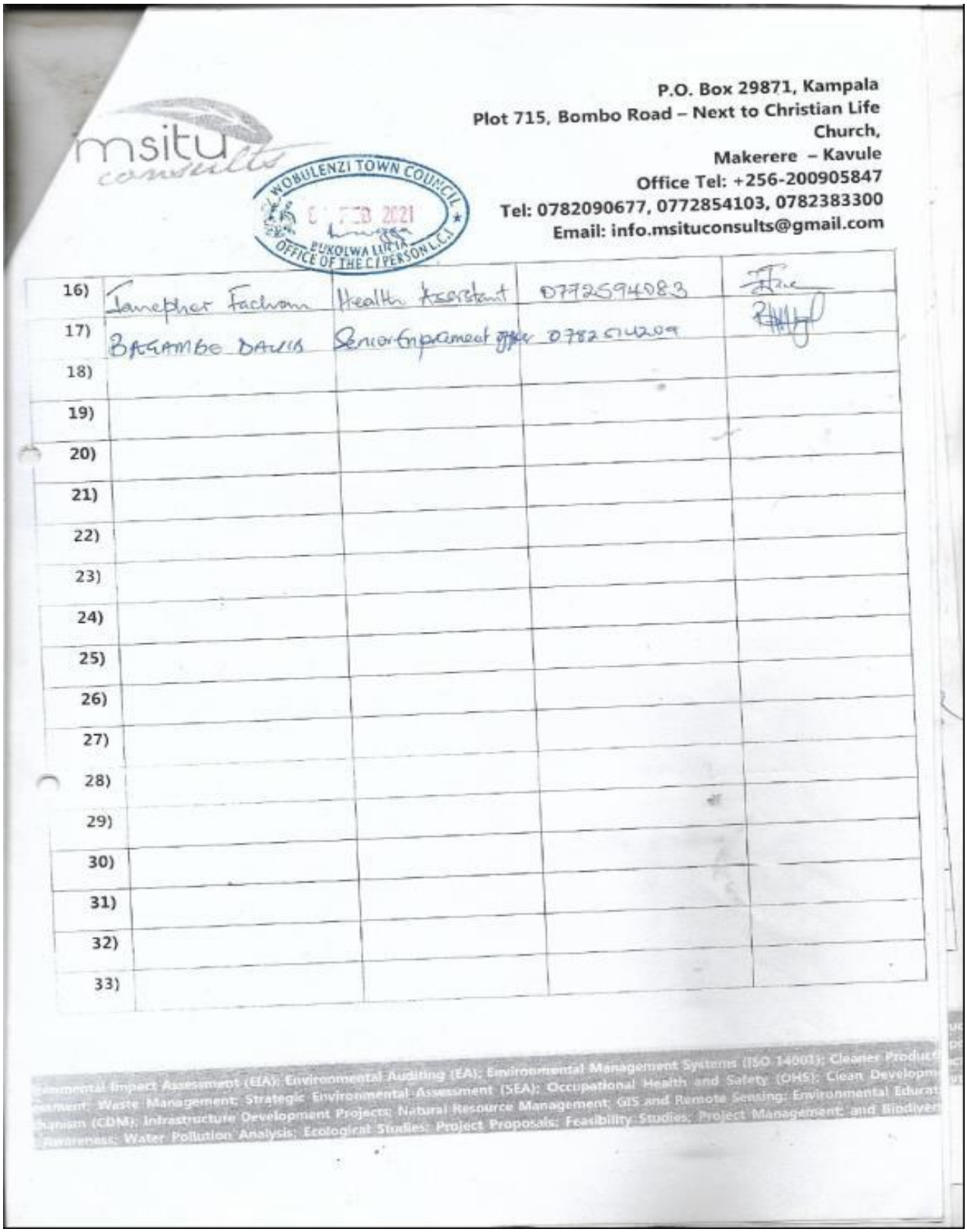
NOBULENZI TOWN COUNCIL
FEB 2021
BUKOLWA LUCIA
OFFICE OF THE CHAIRPERSON L.C.I

Date: 4/FEB/2020

Environmental Stakeholder Consultation List For the proposed Faecal Sludge Treatment Facility Located in BUKOLWA - LUSIYA ZONE, BUKOLWA PARISH IN NOBULENZI TOWN COUNCIL.

NO	Name	Village Name	Contact	Signature
1)	Luwaggu Edward	Lusiya	0753261536	Luwaggu
2)	Kalibbala Edward		078243457?	KE
3)	Muteegama Dan	Kikusa	0774-095611	Muteegama
4)	Nabiranda	costa	077940966?	
5)	Tumwebaze Fred	Lusiya	0788?64969	Fred
6)	NalumansiFro	Lusiya		NalumansiFro
7)	Nakitanda Agnes	Lusia	0775?752?0	Nakitanda A
8)	Ntege Ronald	"	0753457780	Ntege
9)	Kawuma	GodFrey	0782123092	Kawuma
10)	Ssebalamu	Kolulenzi	0772969197	
11)	Jello	gems	0709808148	
12)	kamonga		0783[illegible]1619	
13)	Kimbugwe Edward	Lusiya	0704015228	
14)	Mukasa Ronald	"	0784297602	
15)	Malirdua	Yusufu	0753085121	malirdua

Environmental Impact Assessment (EIA); Environmental Auditing (EA); Environmental Management Systems (ISO 14001); Cleaner Production; Waste Management; Strategic Environmental Assessment (SEA); Occupational Health and Safety (OHS); Clean Development; Infrastructure Development; Natural Resource Management; GIS and Remote Sensing; Environmental Education; Ecological Studies; Project Proposals; Feasibility Studies; Project Management and Biodiversity



msitu consults

P.O. Box 29871, Kampala
Plot 715, Bombo Road – Next to Christian Life Church,
Makerere – Kavule
Office Tel: +256-200905847
Tel: 0782090677, 0772854103, 0782383300
Email: info.msituconsults@gmail.com

WOBULENZI TOWN COUNCIL
FEB 2021
BUKOLWA LCI/IA
OFFICE OF THE CHAIRPERSON L.C.I

16)	Janepher Fachwan	Health Assistant	0772594083	
17)	BAGAMBE DAVIS	Senior Enpowerment	0782514209	
18)				
19)				
20)				
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Environmental Impact Assessment (EIA); Environmental Auditing (EA); Environmental Management Systems (ISO 14001); Cleaner Product... Assessment; Waste Management; Strategic Environmental Assessment (SEA); Occupational Health and Safety (OHS); Clean Developm... Mechanism (CDM); Infrastructure Development Projects; Natural Resource Management; GIS and Remote Sensing; Environmental Educat... and Awareness; Water Pollution Analysis; Ecological Studies; Project Proposals; Feasibility Studies; Project Management; and Biodiver...

Appendix 2 (b): Luwero and Wobulenzi Town Council Consultative Meetings

Feasibility Studies and Detailed Designs for Faecal Sludge Service Chain Management in Un-Sewered Urban Centers in Uganda

INCEPTION VISIT

PROJECT AREA: LUWERO **DATE:** 28/11/19

No.	NAME	COMPANY/ ORGANIZATION	DESIGNATION	TEL No.	SIGNATURE
1	MUSISI HENRY	LUWERO LGVT	[illegible]	0772326072	[signature]
2	Nansikombi Winfred	Luwero Town Council	SAE	0772846211	[signature]
3	Luke Obonyo	Luwero T/C	Town Eng	0701699513	[signature]
4	Mugabi Betty	Luwero T/C.	Health inspector	0772520178	[signature]
5	NABWAJA LYDIA	WOBULENZI T.C	Town clerk	0781571629	[signature]
6	Nakato Prossy	Wobulenzi T.C	physical plan	0772859277	[signature]
7	Sebalamu moses	"	chairperson LCII	0772969197	[signature]
8	[illegible] M	Bbaale T/C	T/clerk	0782338782	[signature]
9	OSMAN KASSIM R	BOMBO T/C	MAYOR	0701774112724	[signature]
10	NAMUBIRU MOUREEN	Bombo T/C	Health/Ass	0736-693=77	[signature]

SGI STUDIO GALLI INGEGNERIA
life, first

Appendix 3: LC1 Letter

THE REPUBLIC OF UGANDA

BUKOLWA LUSIA ZONE LCI

WOBULENZI TOWN COUNCIL – LUWERO DISTRICT

Date: 04th February, 2021

Our Ref: .....
Your Ref: .....

The Executive Director
National Environment Management Authority
P.O Box 22255,
Kampala - Uganda

WOBULENZI TOWN COUNCIL 01 FEB 2021 OFFICE OF THE C/PERSON L.C.I BUKOLWA LUCIA

RE: PROPOSED FEACAL SLUDGE TRETMENT FACILITY AT BUKOLWA LUSIA BUKOLWA PARISH – WOBULENZI TOWN COUNCIL

We, the undersigned residents of Bukolwa Lucia in Wobulenzi Town Council take this opportunity to appreciate the proposed project referenced above.

However, we would like to take this opportunity to raise the following concerns before you so that we can move together for the success of this project:

1. We request to continue using the available cross cutting road located within the proposed project site since it's the only way to access our gardens (farms).
2. The project residues are anticipated to generate bad smell (cause pollution) which scares the residents especially the neighbors to the facility. So, how will that smell be managed so that it doesn't affect the residents?
3. There is also the available water source (well), we request for its protection to benefit the community.
4. We request that the project offer employment opportunities to residents especially the youth.

We shall be grateful if the above concerns are addressed before the construction of the above mentioned facility commences.

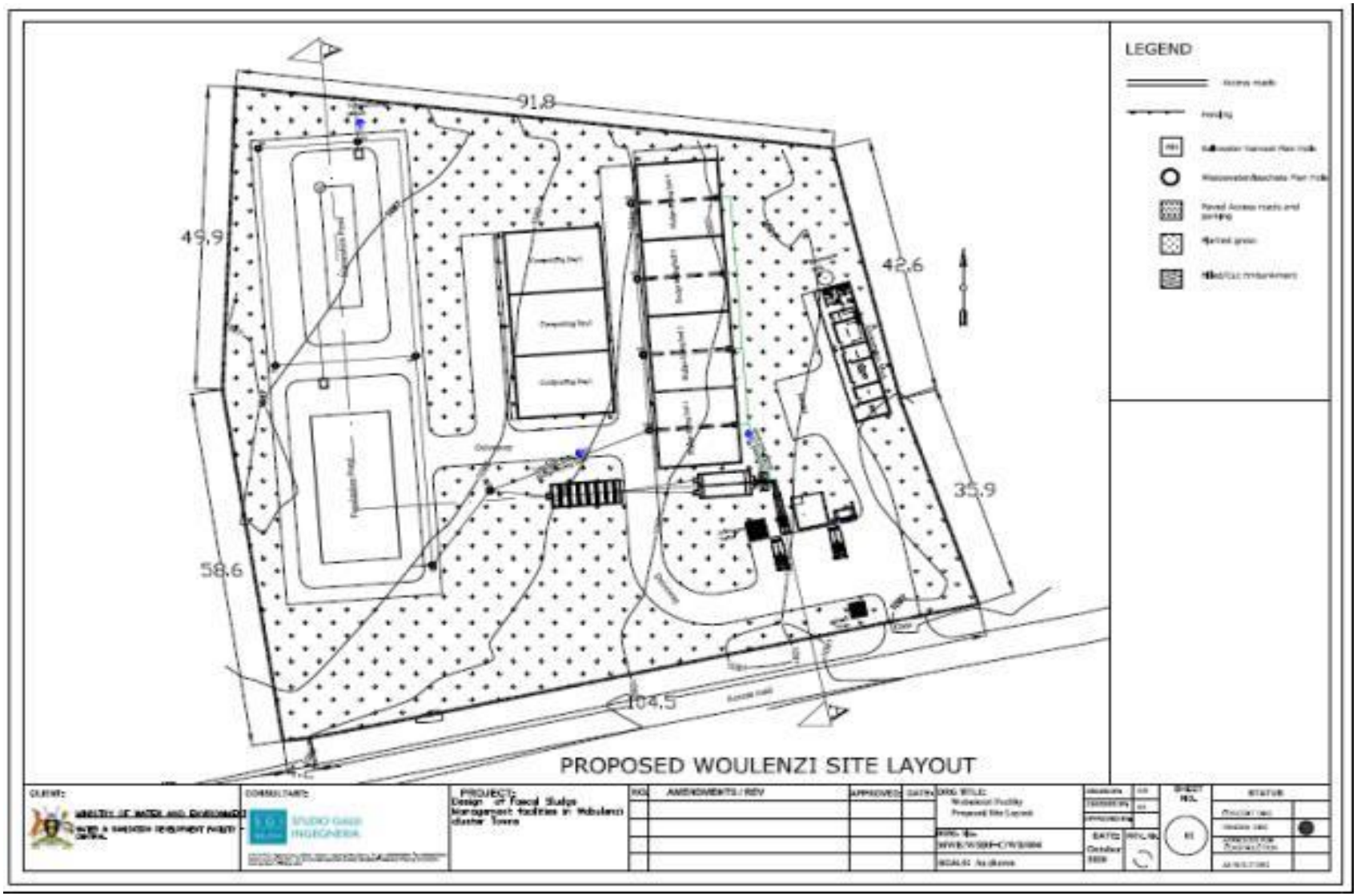
Yours faithfully,

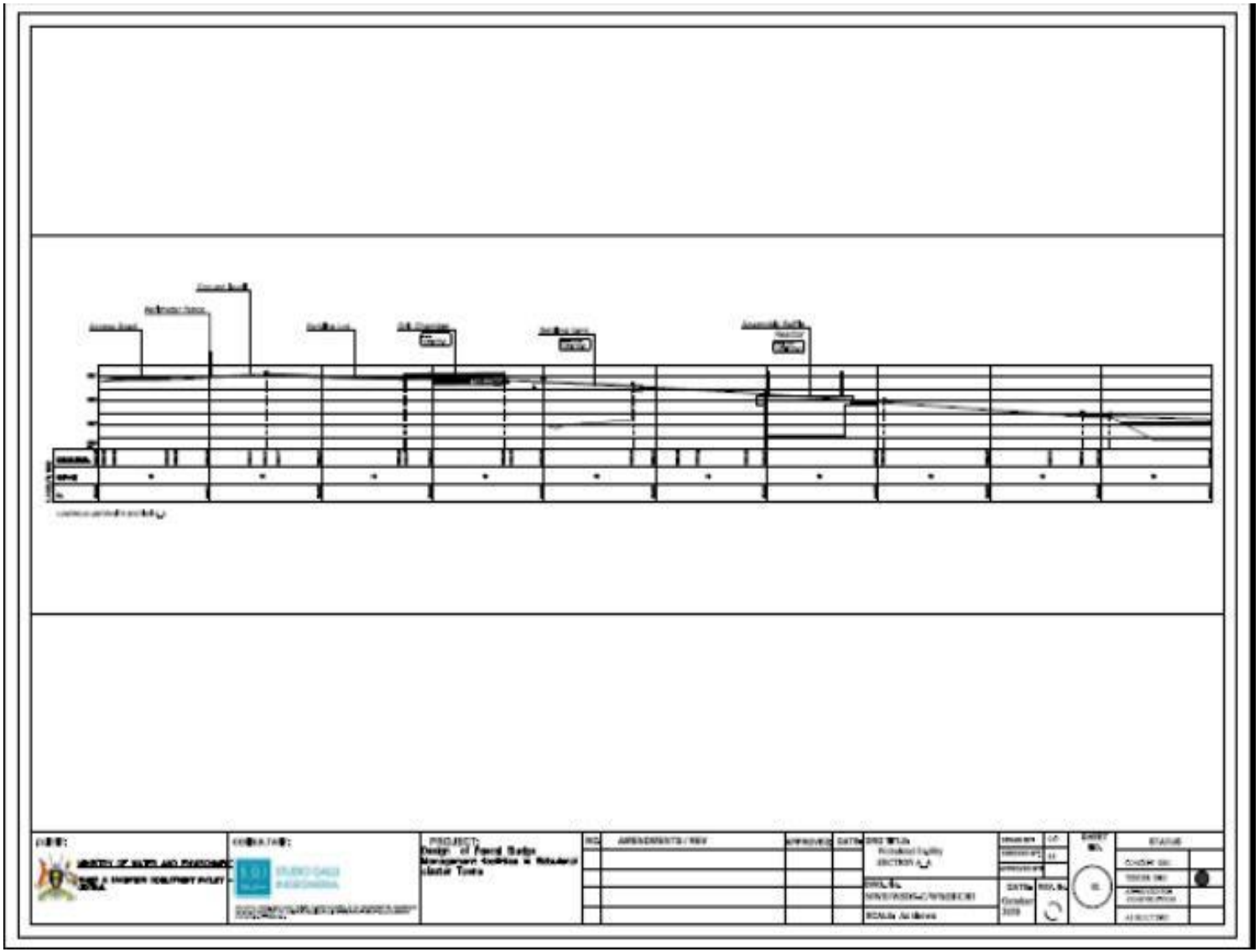
.....
Luwagga Edward (0753261536)
Chairperson LCI
Bukolwa Lusia

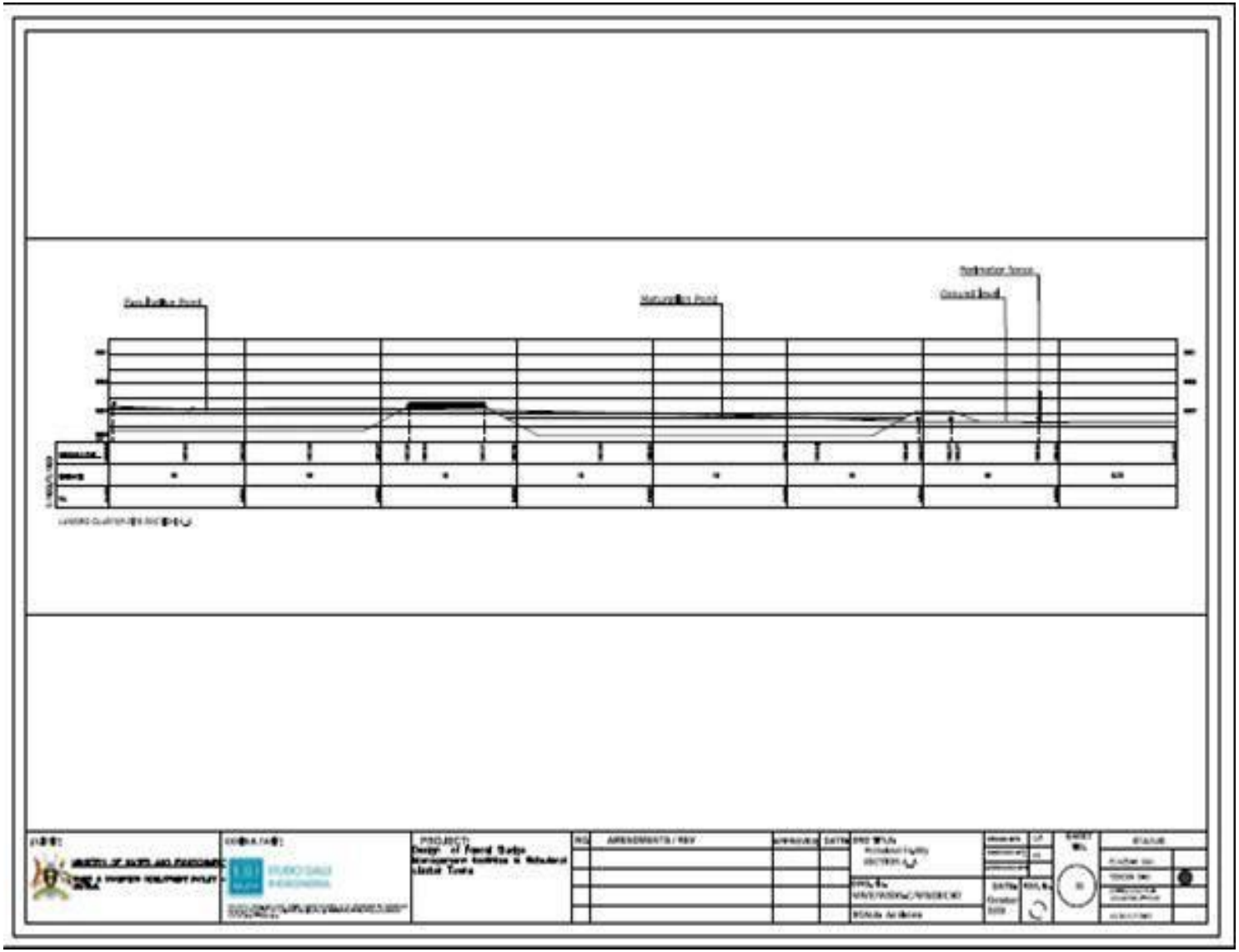
.....
Kimbuggwe Edward (0704015228)
Secretary
Bukolwa Lusia

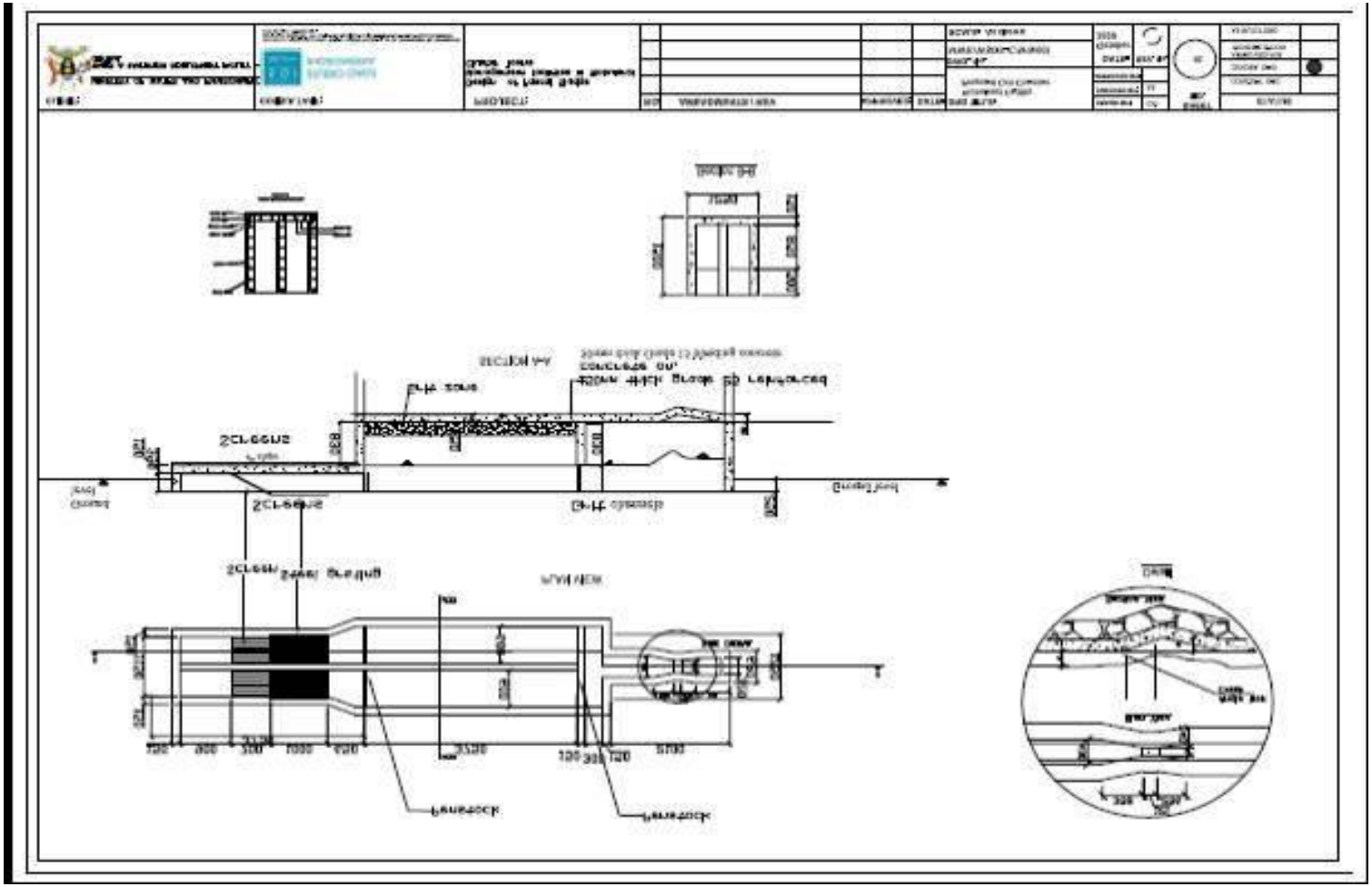
WOBULENZI TOWN COUNCIL 01 FEB 2021 OFFICE OF THE C/PERSON L.C.I BUKOLWA LUCIA

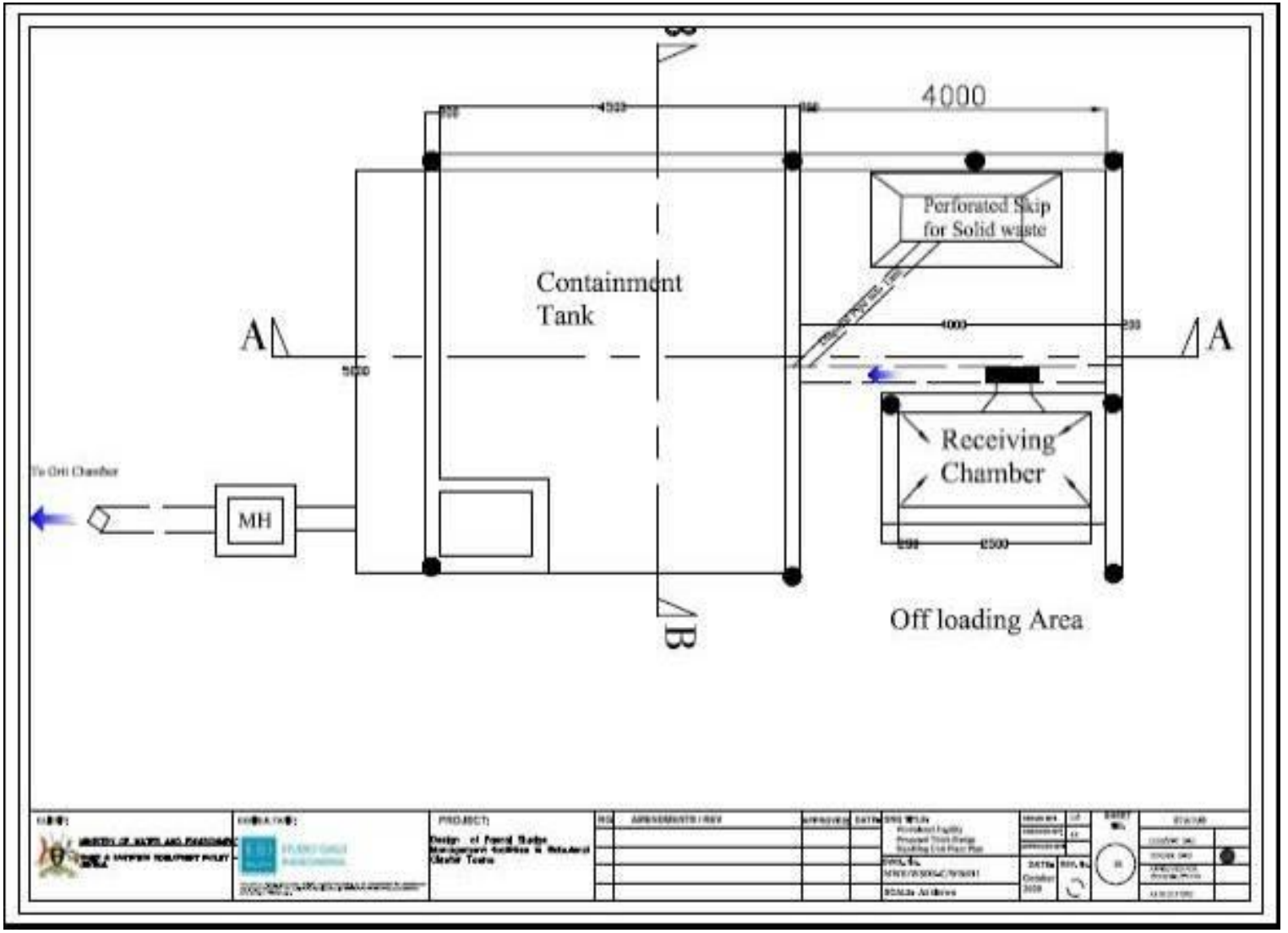
Appendix 4: Project Site layout and Design

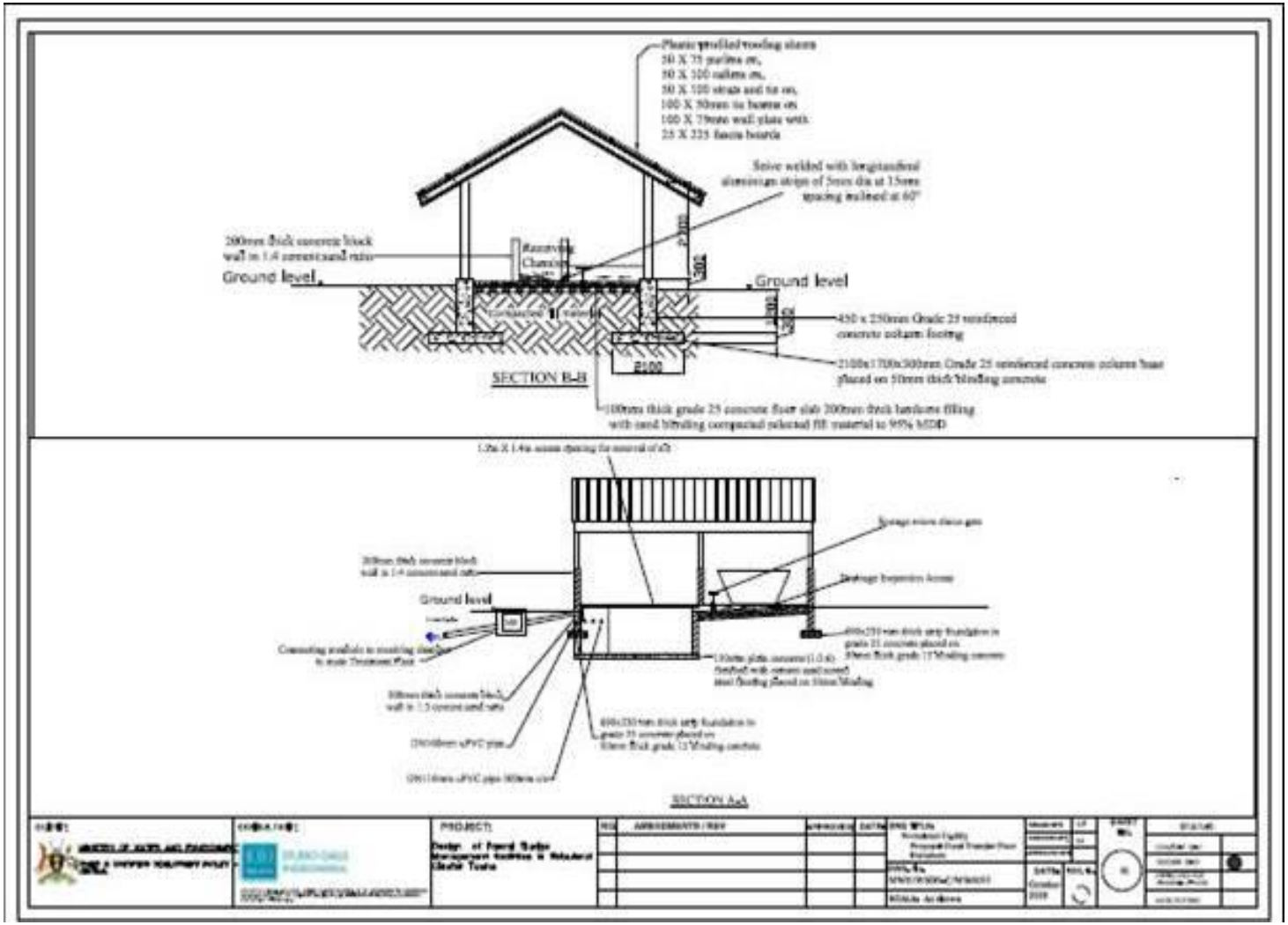


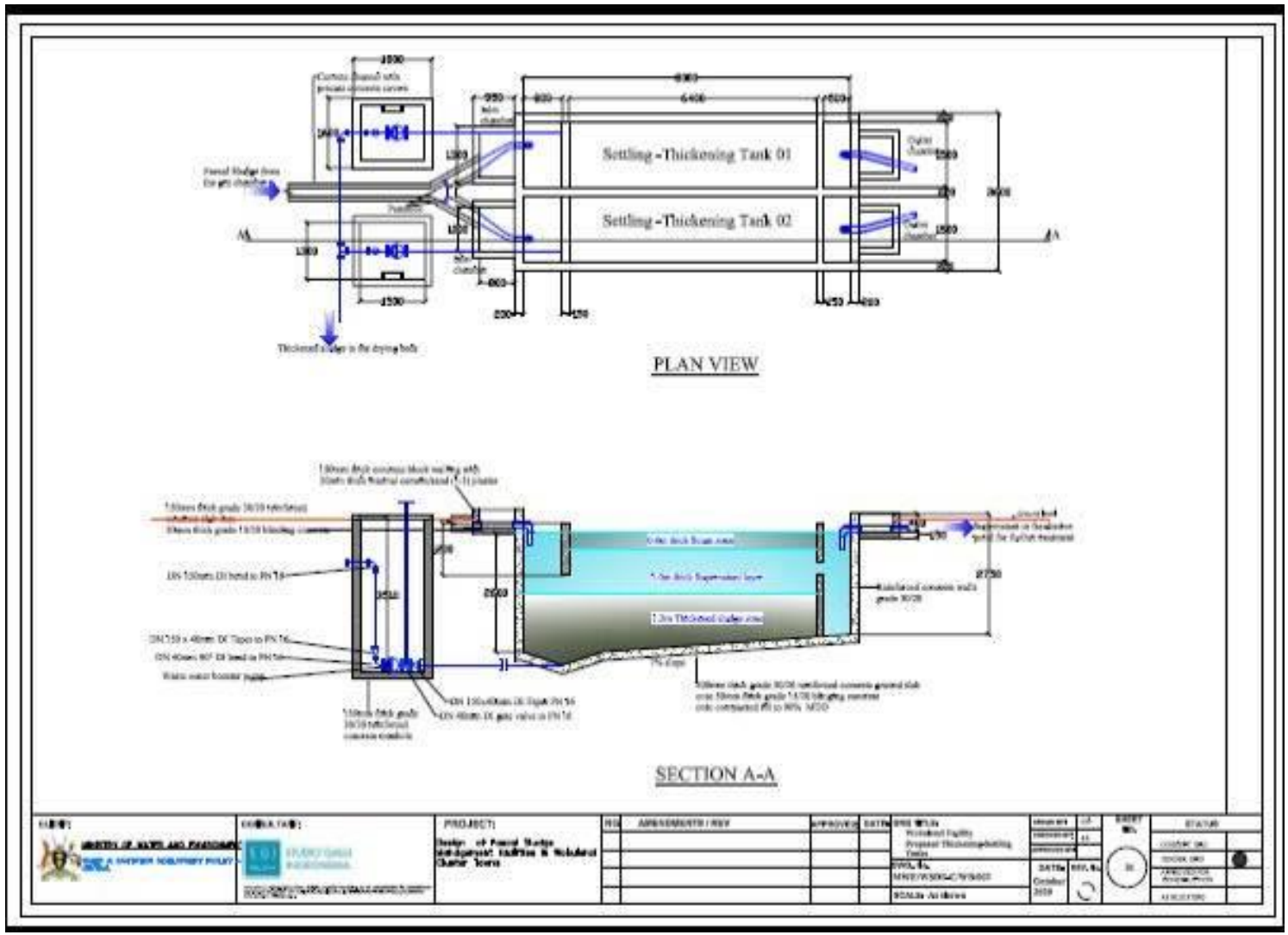


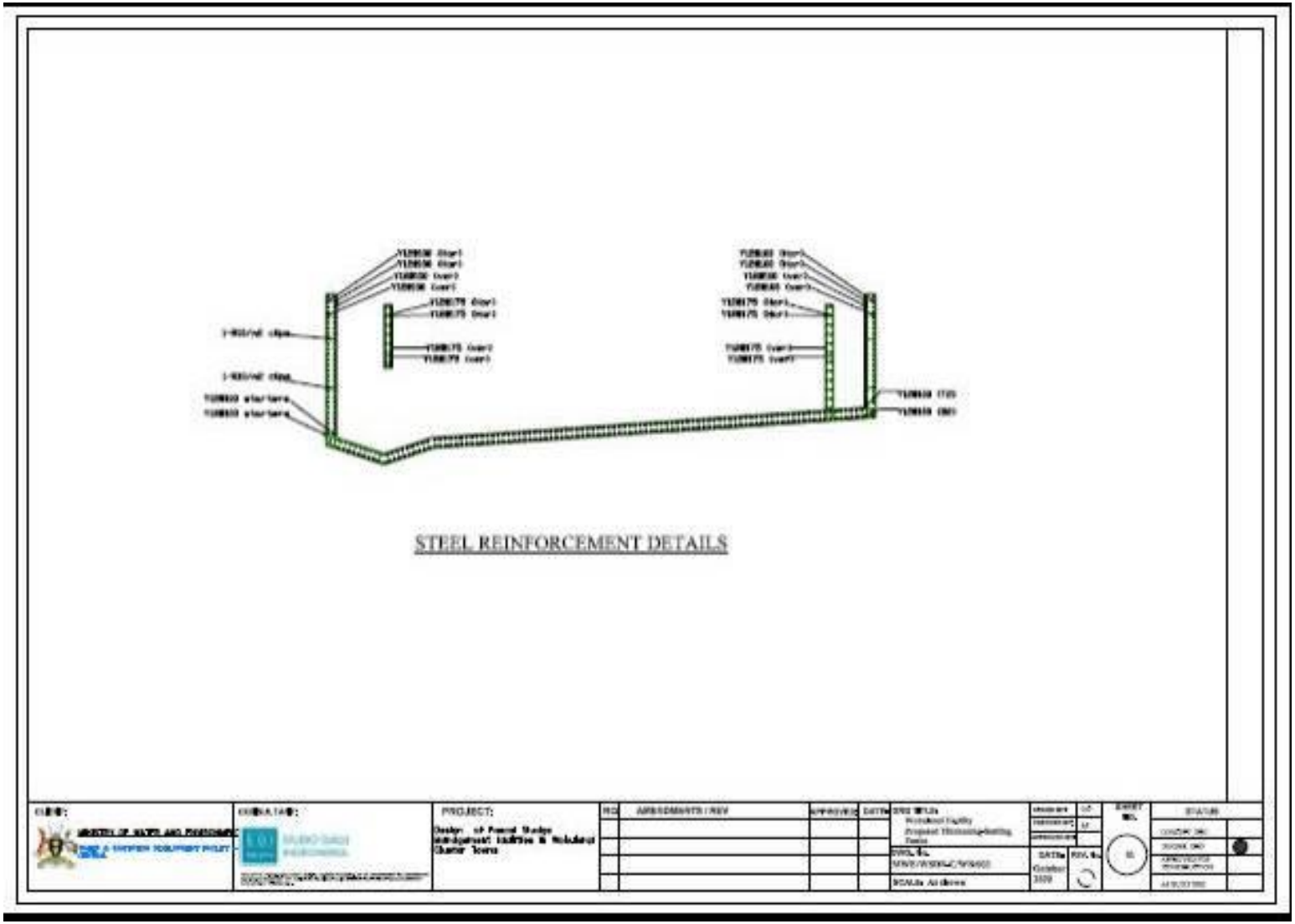


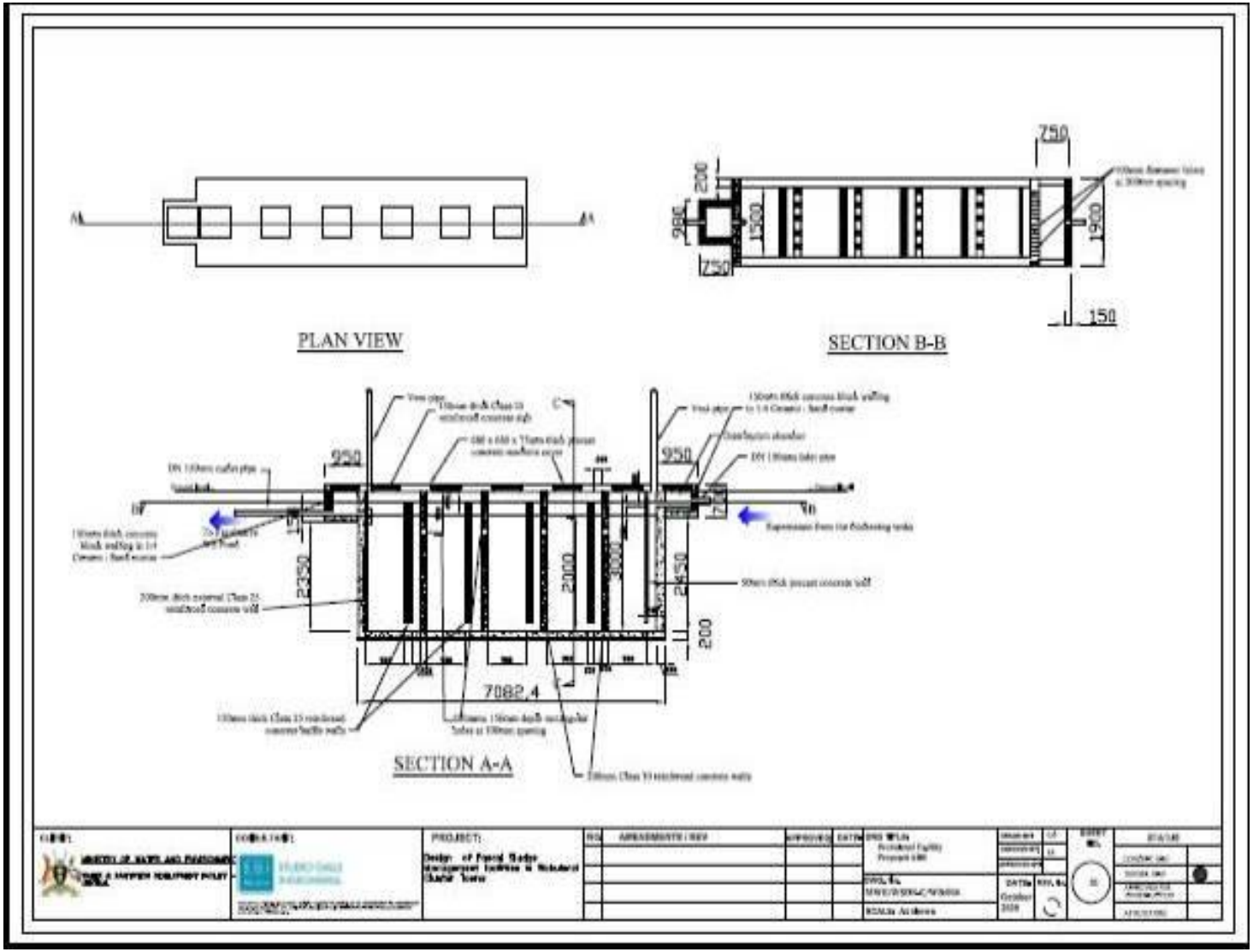


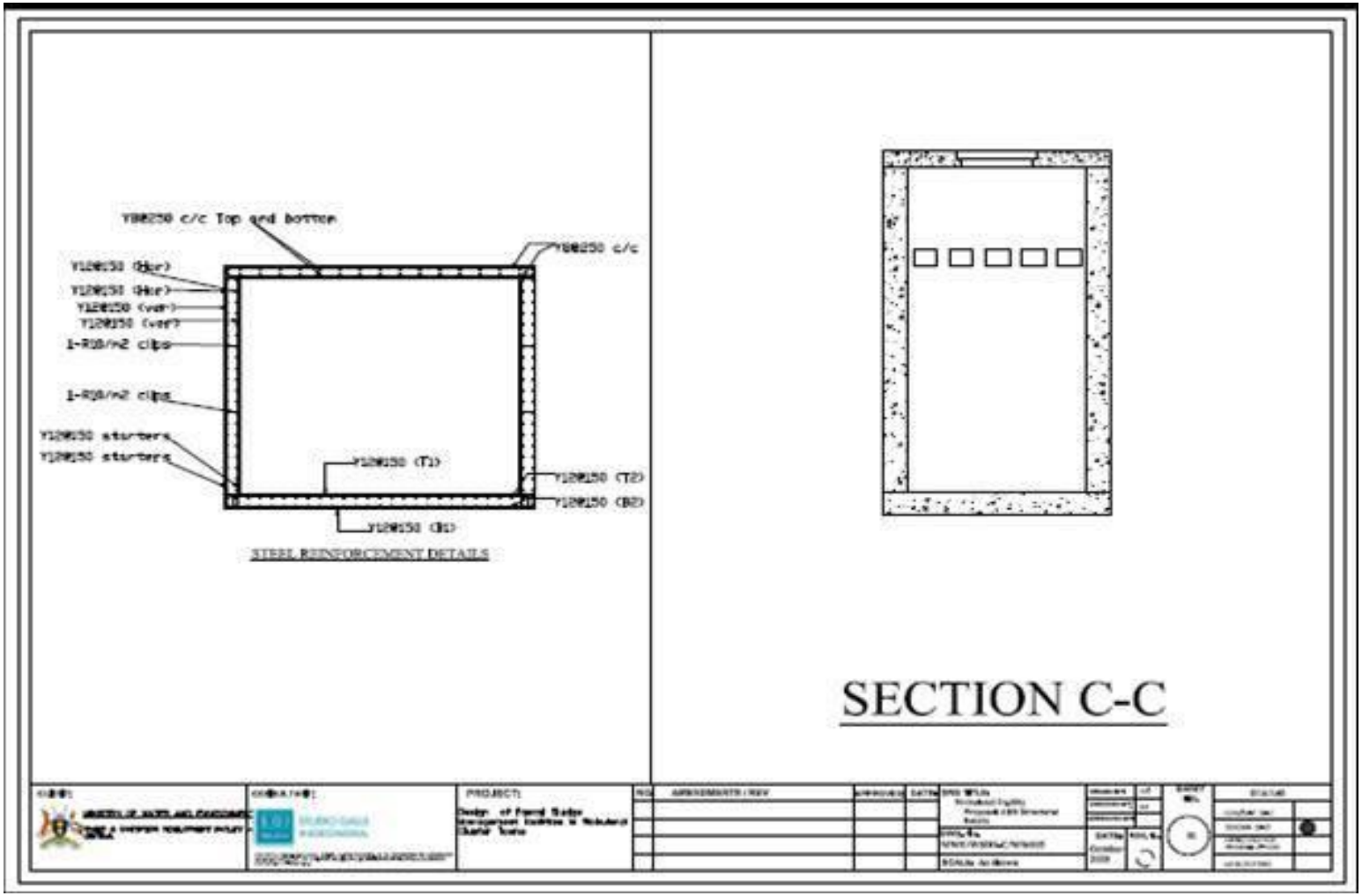

B
4000
Perforated Skip
for Solid waste
Containment
Tank
A
A
MH
Receiving
Chamber
Off loading Area
B

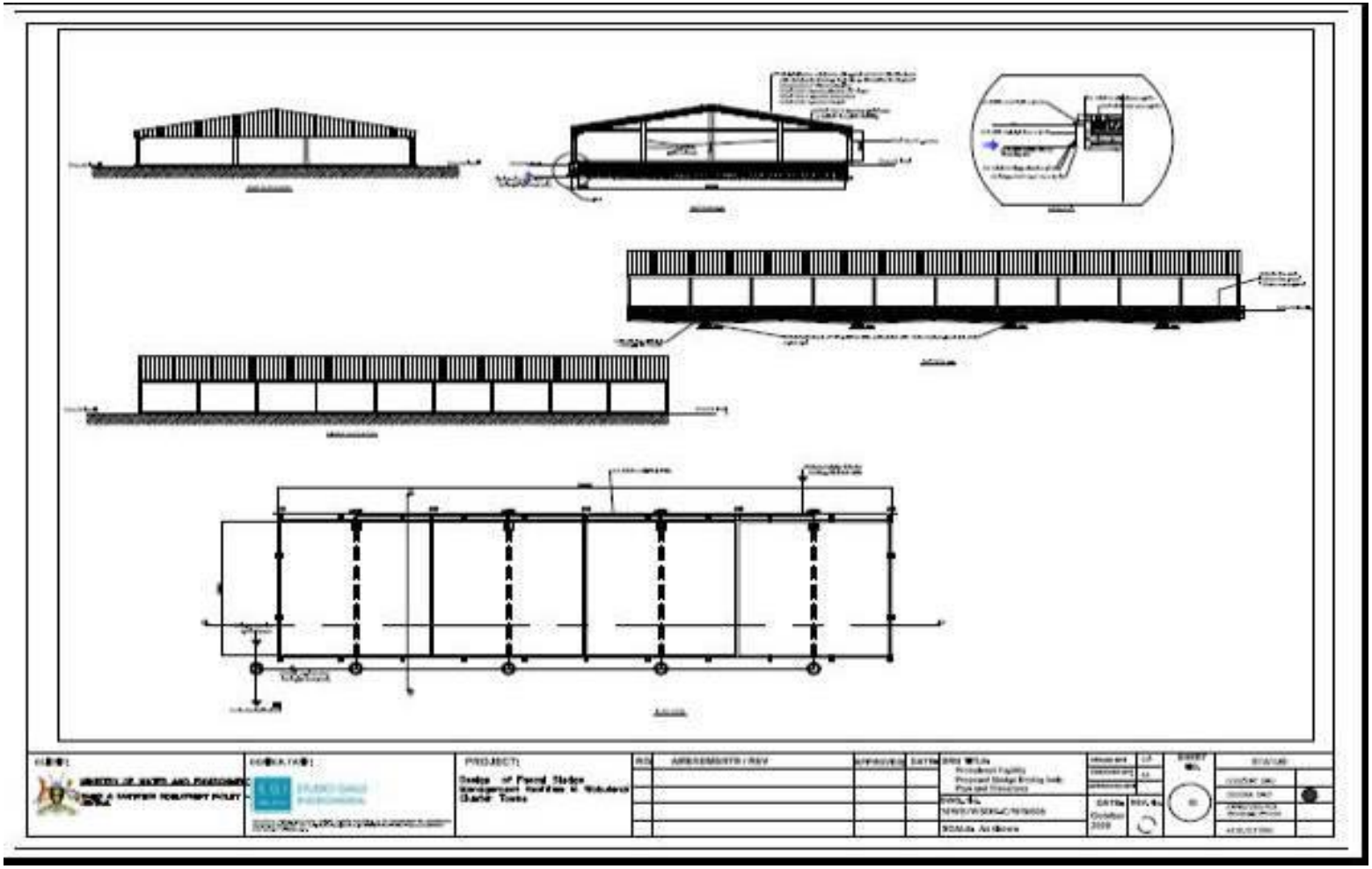

Ground level
Ground level
SECTION B-B
SECTION A-A

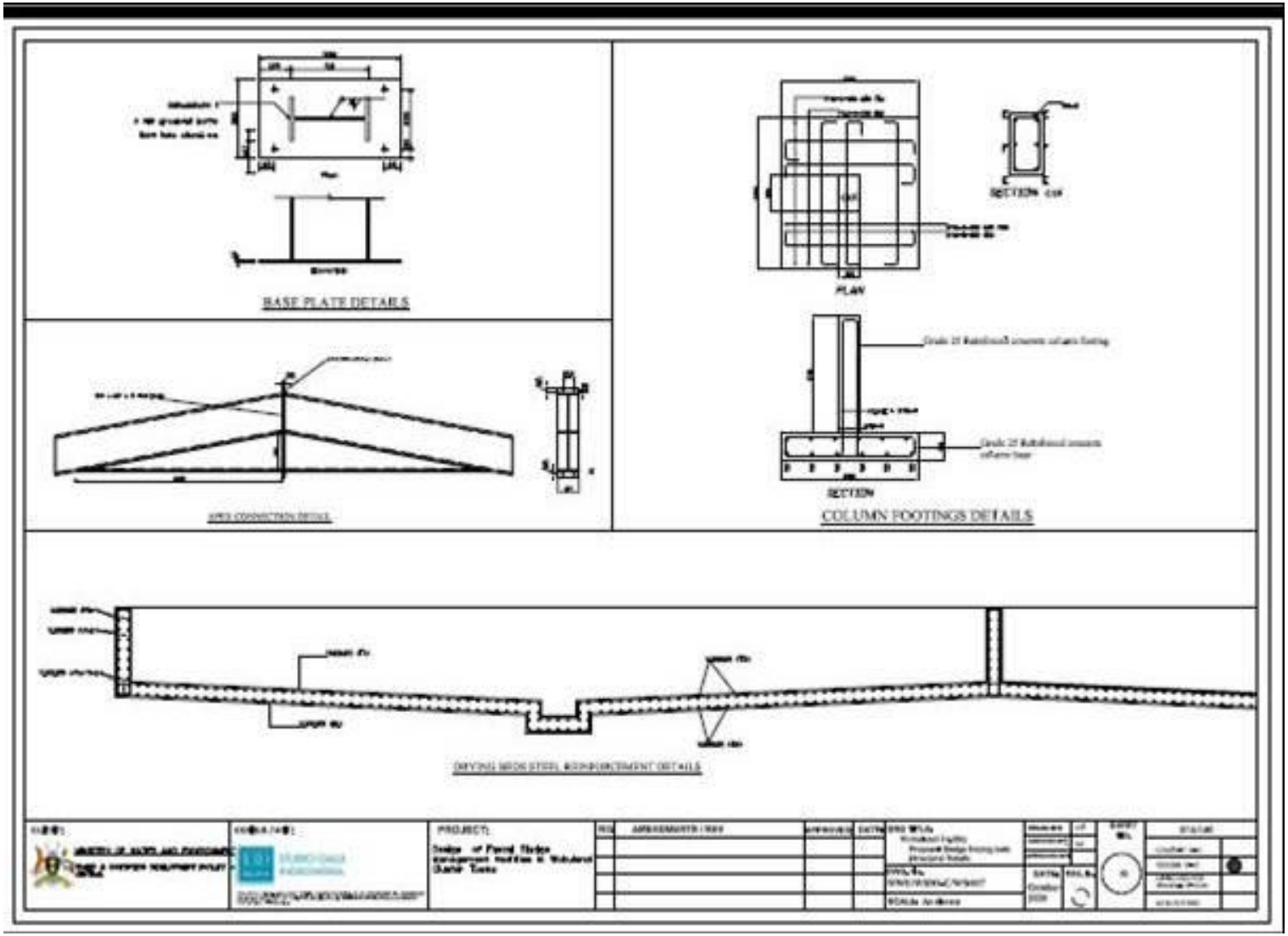

Settling - Thickening Tank 01
Settling - Thickening Tank 02
PLAN VIEW
SECTION A-A

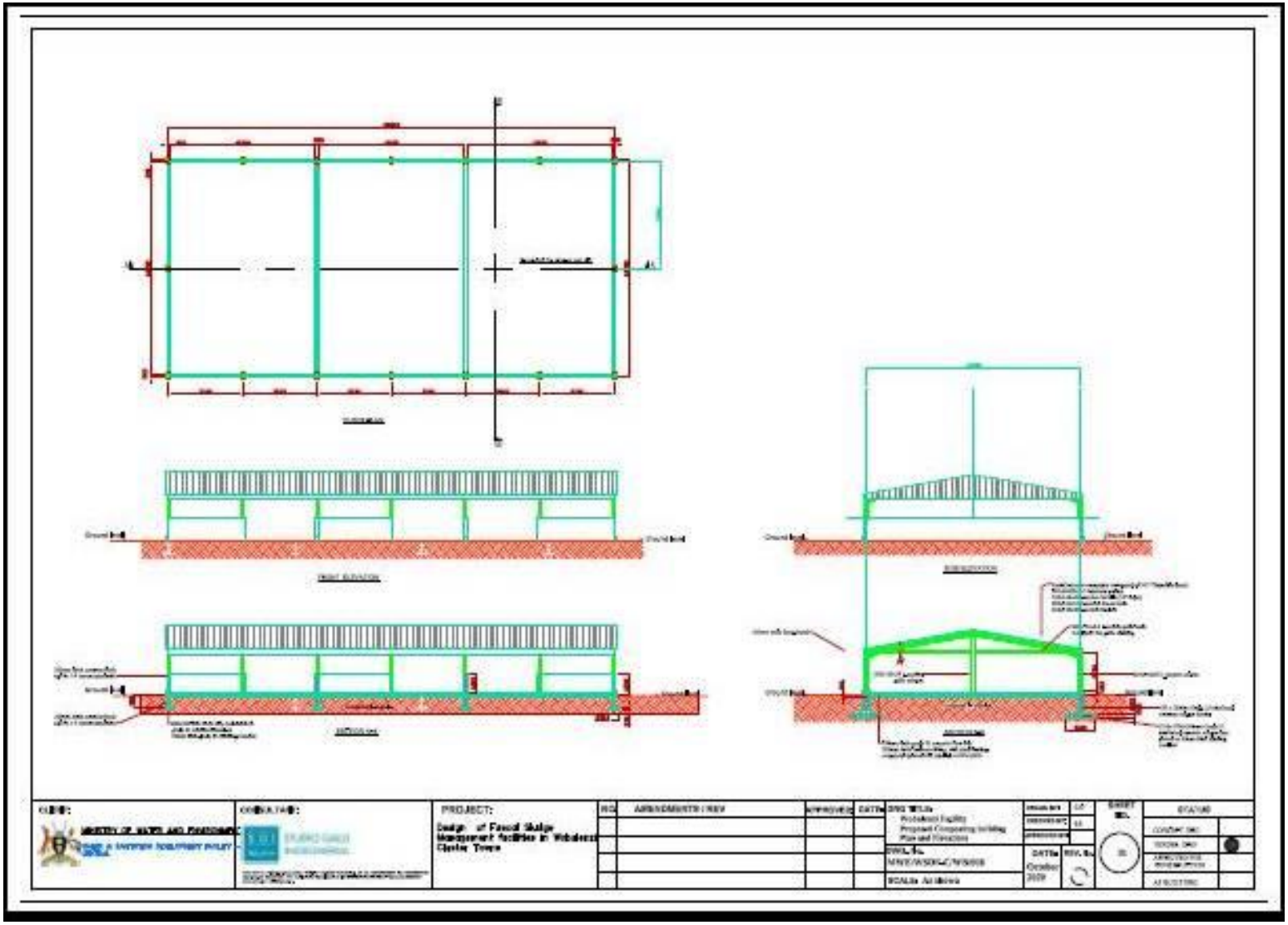

STEEL REINFORCEMENT DETAILS


PLAN VIEW
SECTION B-B
SECTION A-A
750
200
1500
1900
150
950
2350
2000
3000
2450
7082.4


Y8@250 c/c Top and Bottom
Y8@250 c/c
Y12@150 (Hor)
Y12@150 (Hor)
Y12@150 (ver)
Y12@150 (ver)
1-R8/m2 clips
1-R8/m2 clips
Y12@150 starters
Y12@150 starters
Y12@150 (T1)
Y12@150 (T2)
Y12@150 (B2)
Y12@150 (B1)
STEEL REINFORCEMENT DETAILS
SECTION C-C




BASE PLATE DETAILS
PLAN
SECTION
COLUMN FOOTINGS DETAILS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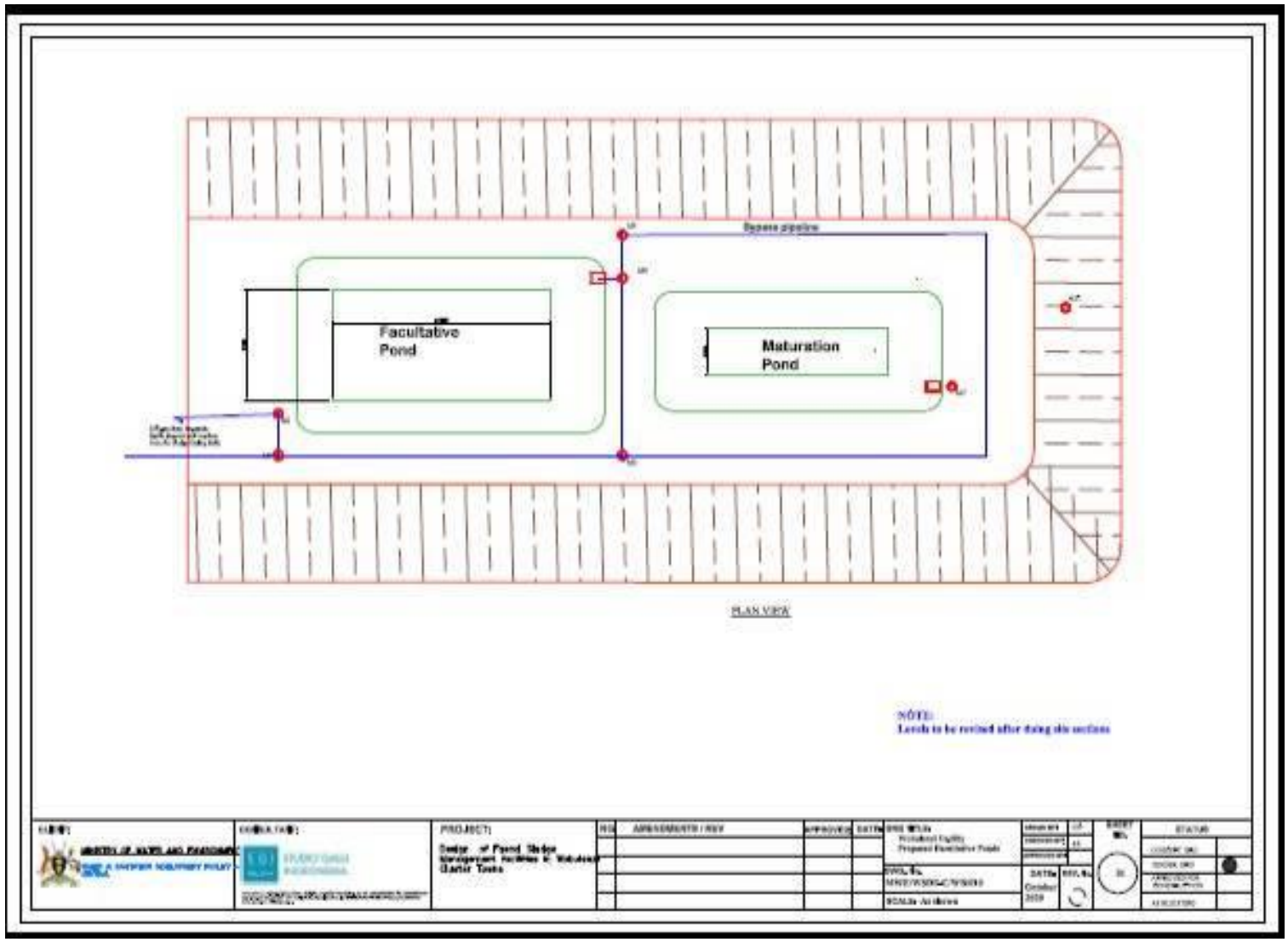
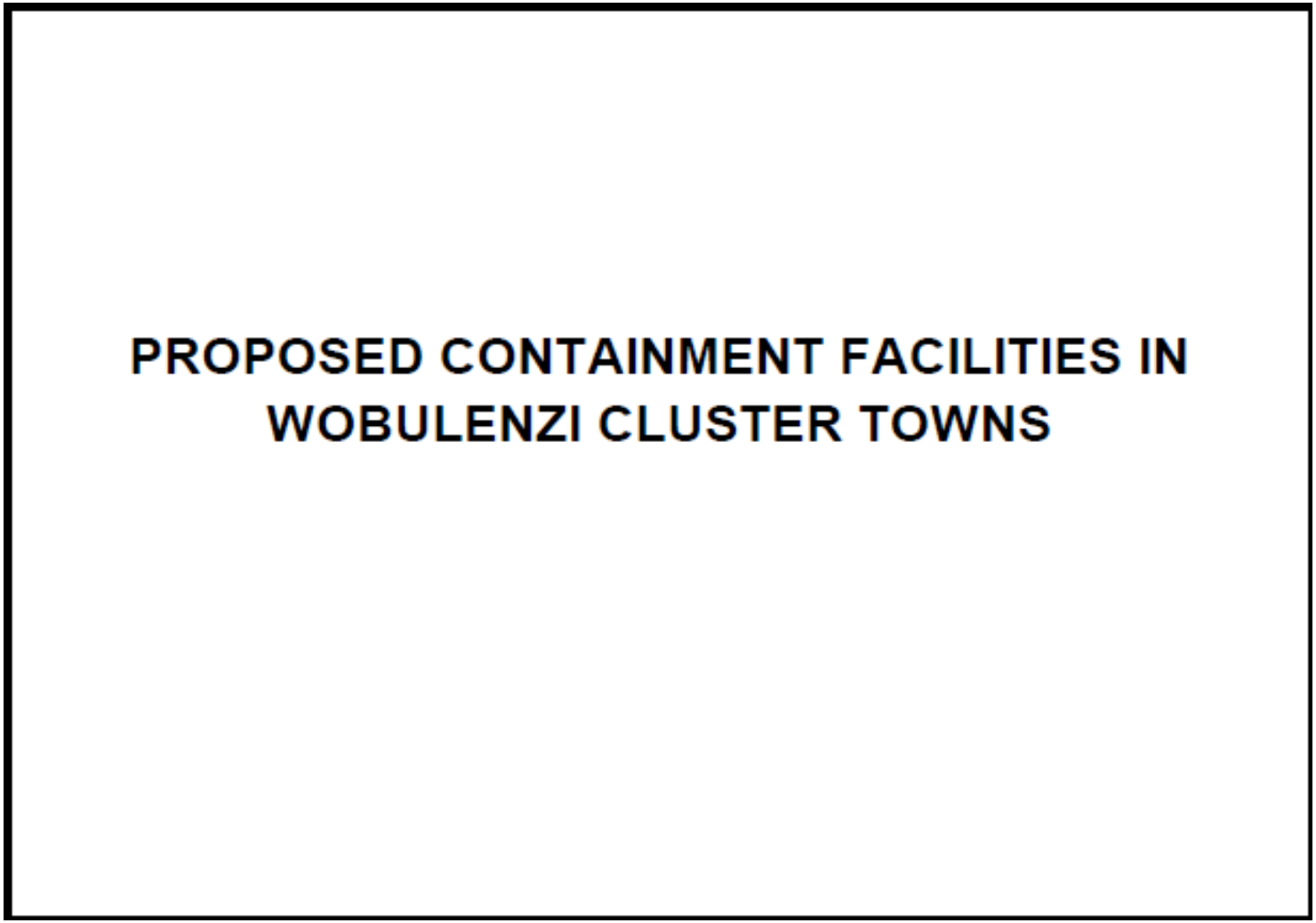
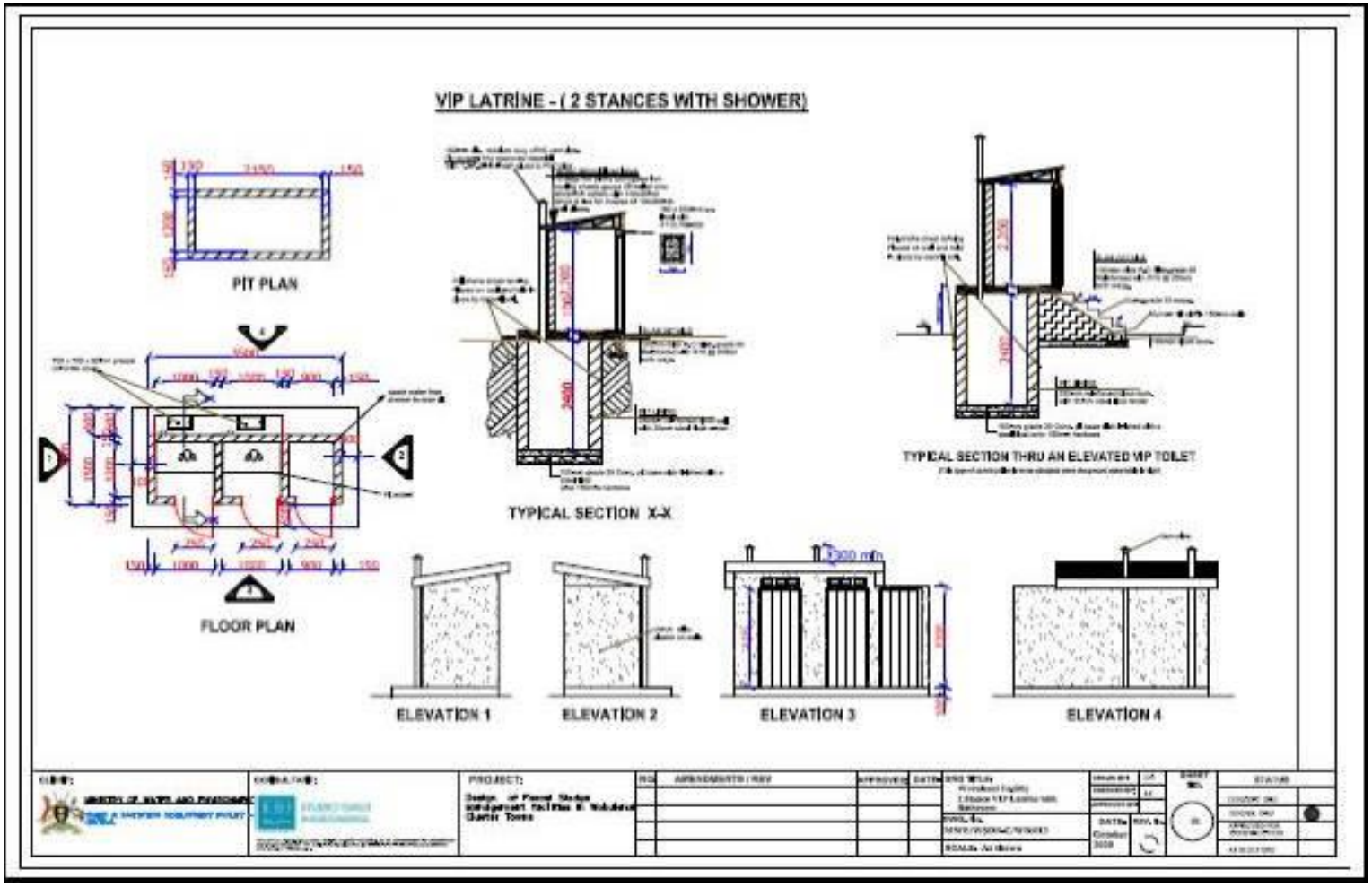
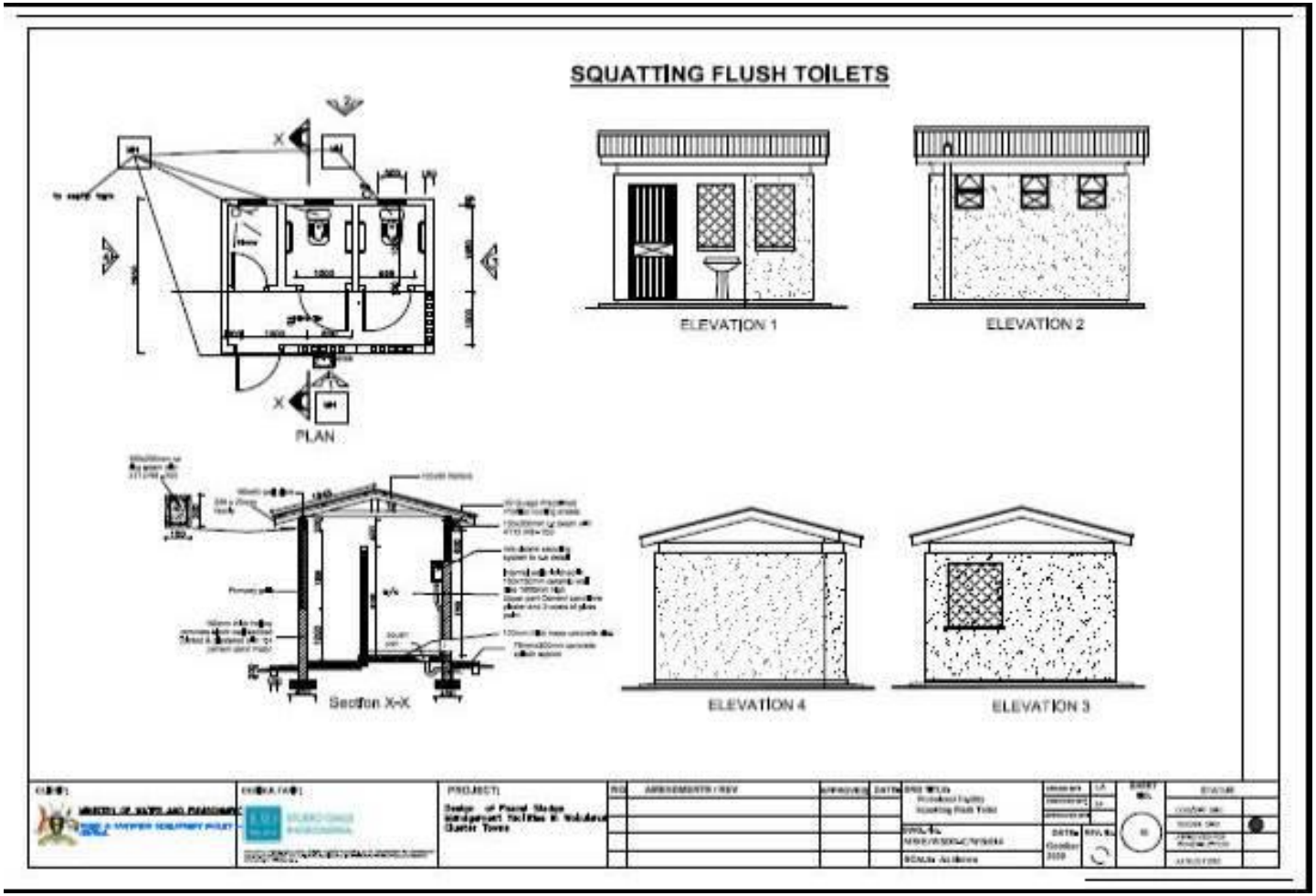
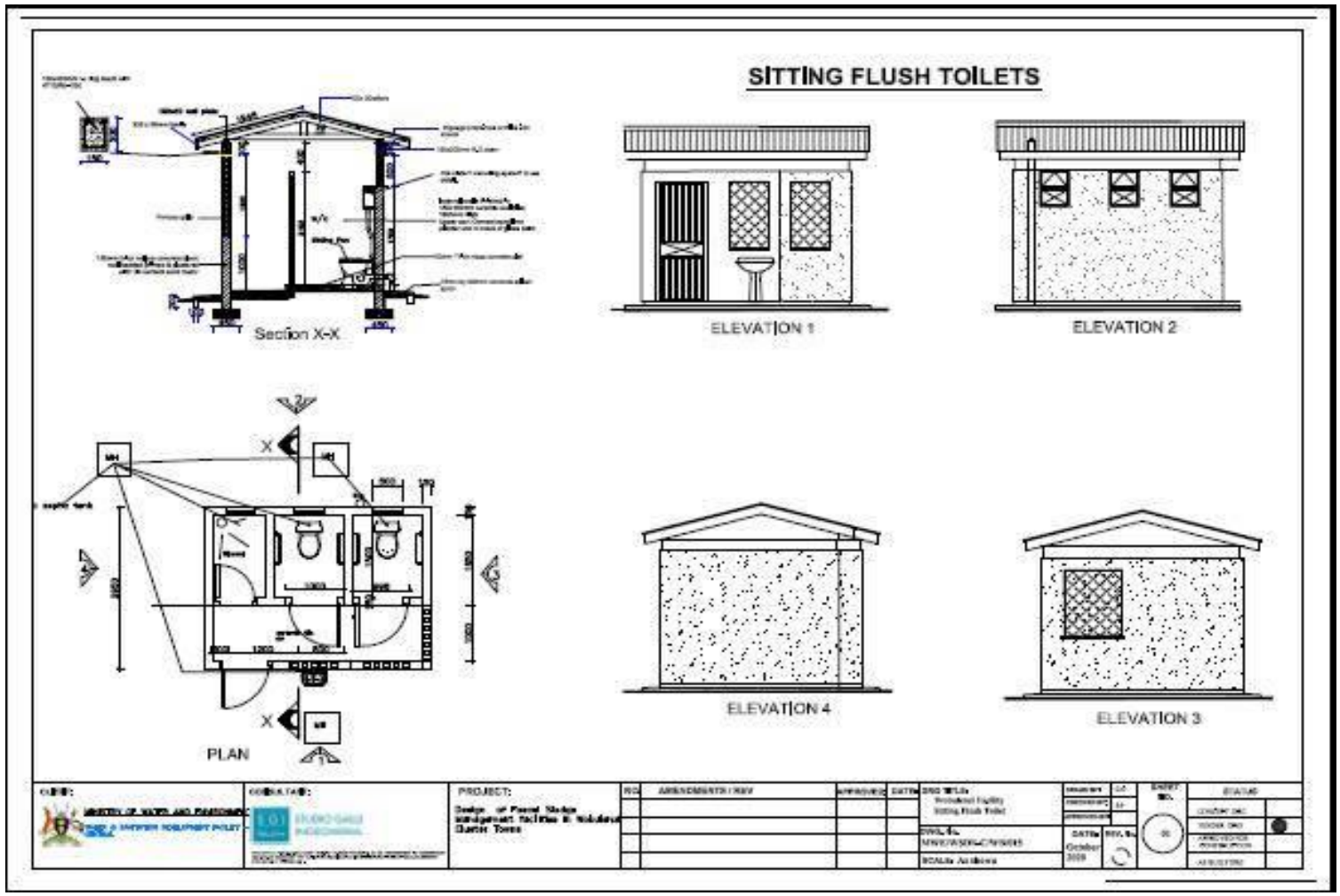

Facultative Pond
Maturation Pond
PLAN VIEW
NOTE:

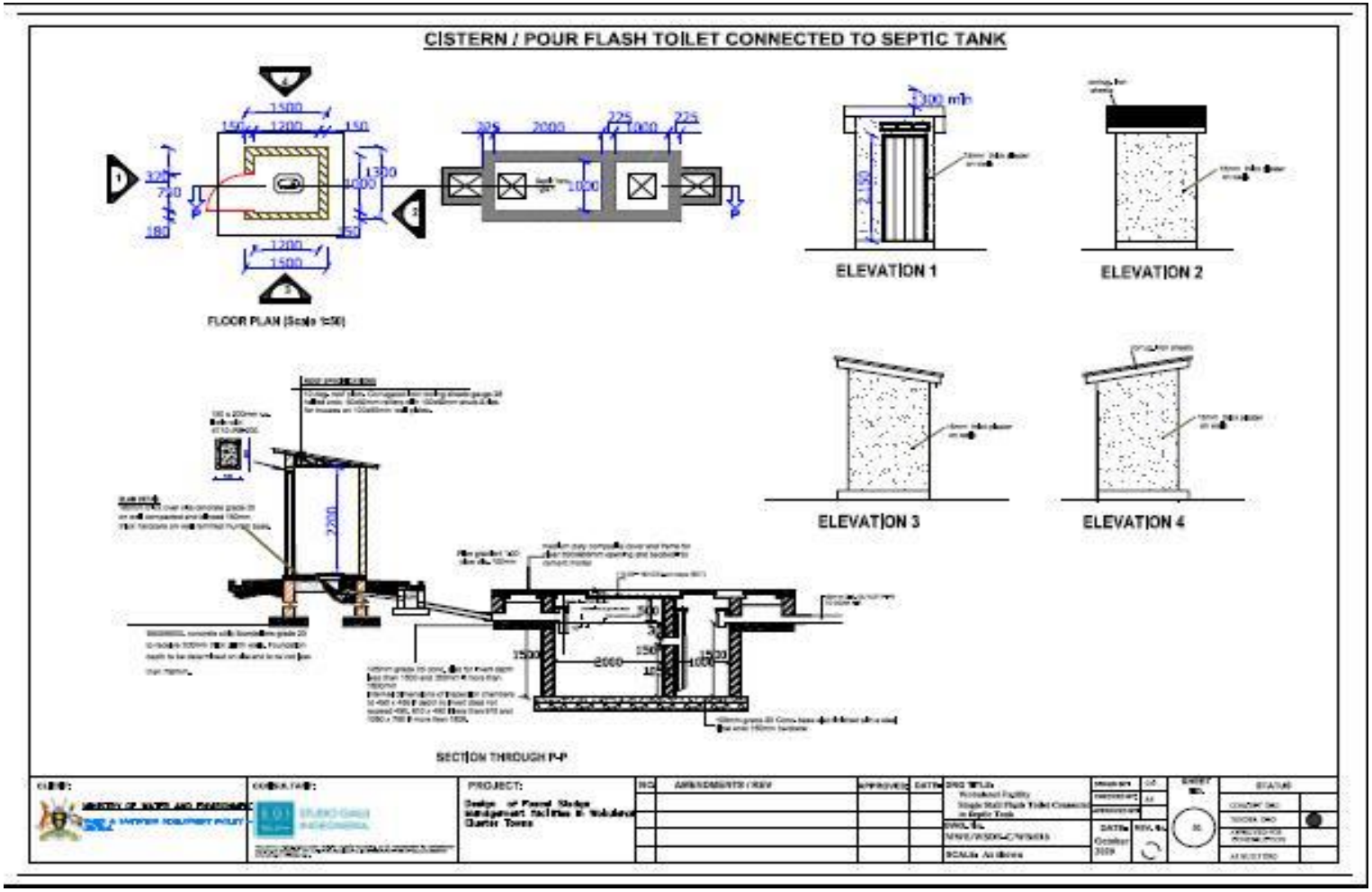

PROPOSED CONTAINMENT FACILITIES IN
WOBULENZI CLUSTER TOWNS

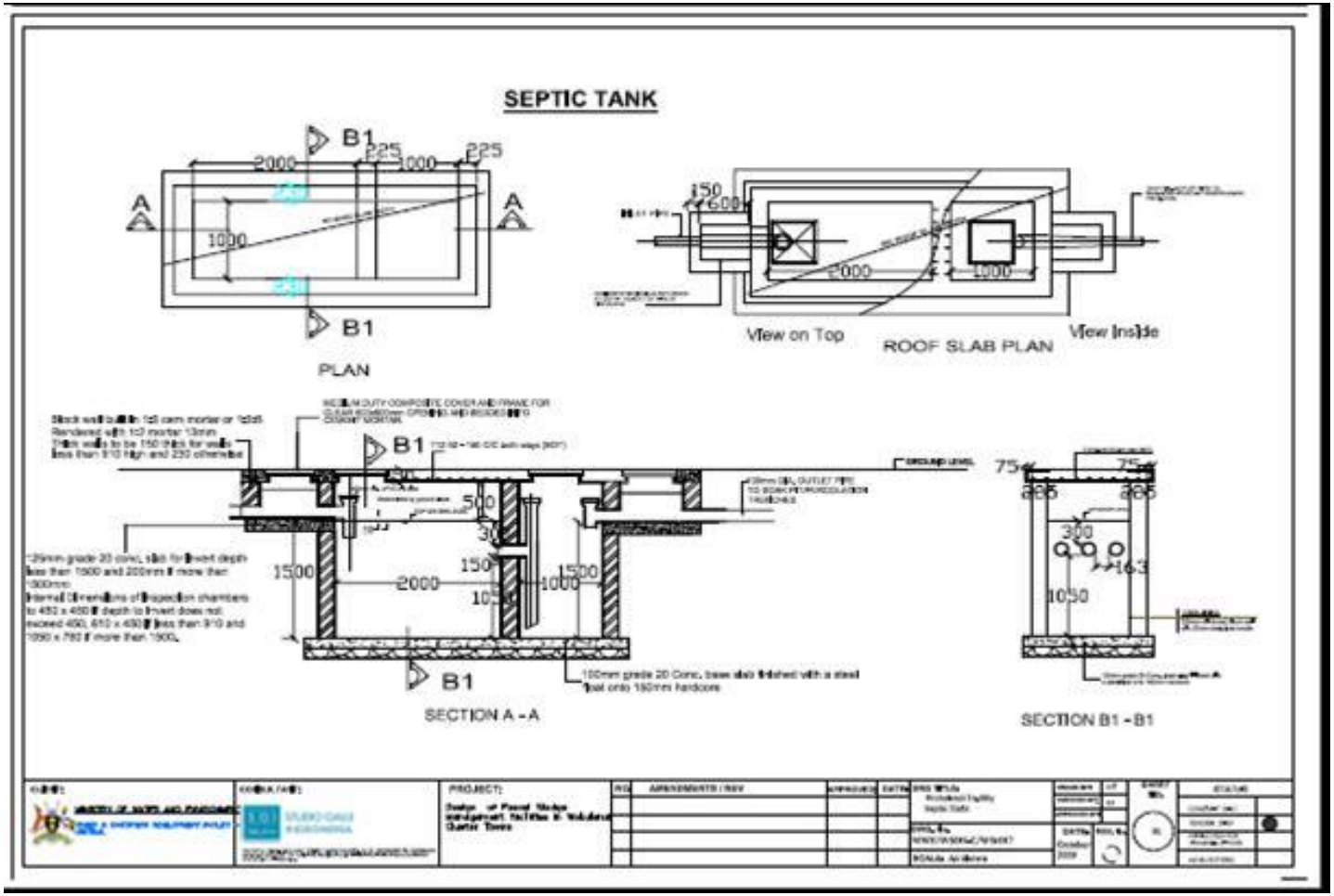
HOUSE HOLDS

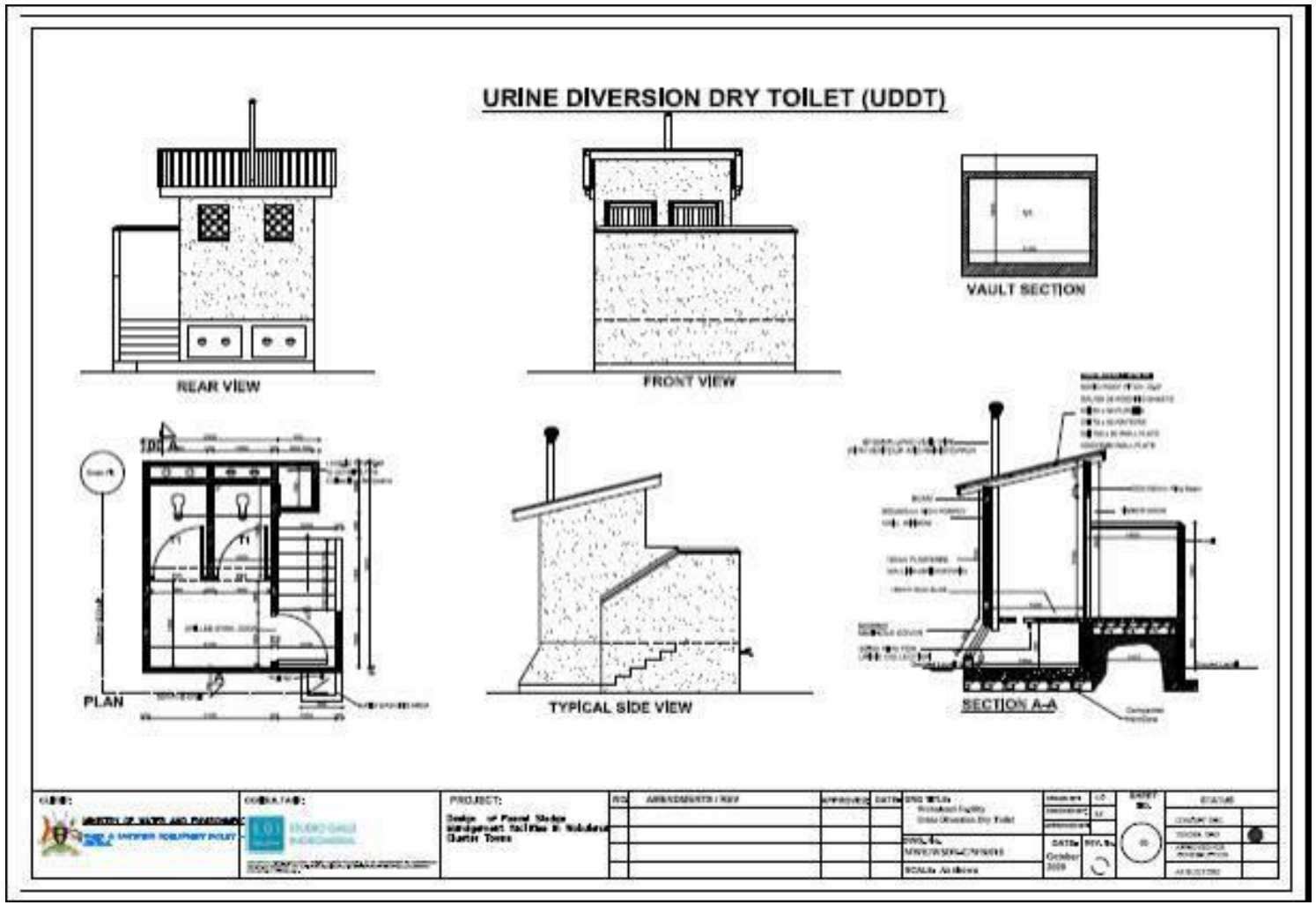

VIP LATRINE - (2 STANCES WITH SHOWER)
PIT PLAN
FLOOR PLAN
TYPICAL SECTION X-X
TYPICAL SECTION THRU AN ELEVATED VIP TOILET
ELEVATION 1
ELEVATION 2
ELEVATION 3
ELEVATION 4


SQUATTING FLUSH TOILETS
PLAN
ELEVATION 1
ELEVATION 2
Section X-X
ELEVATION 4
ELEVATION 3

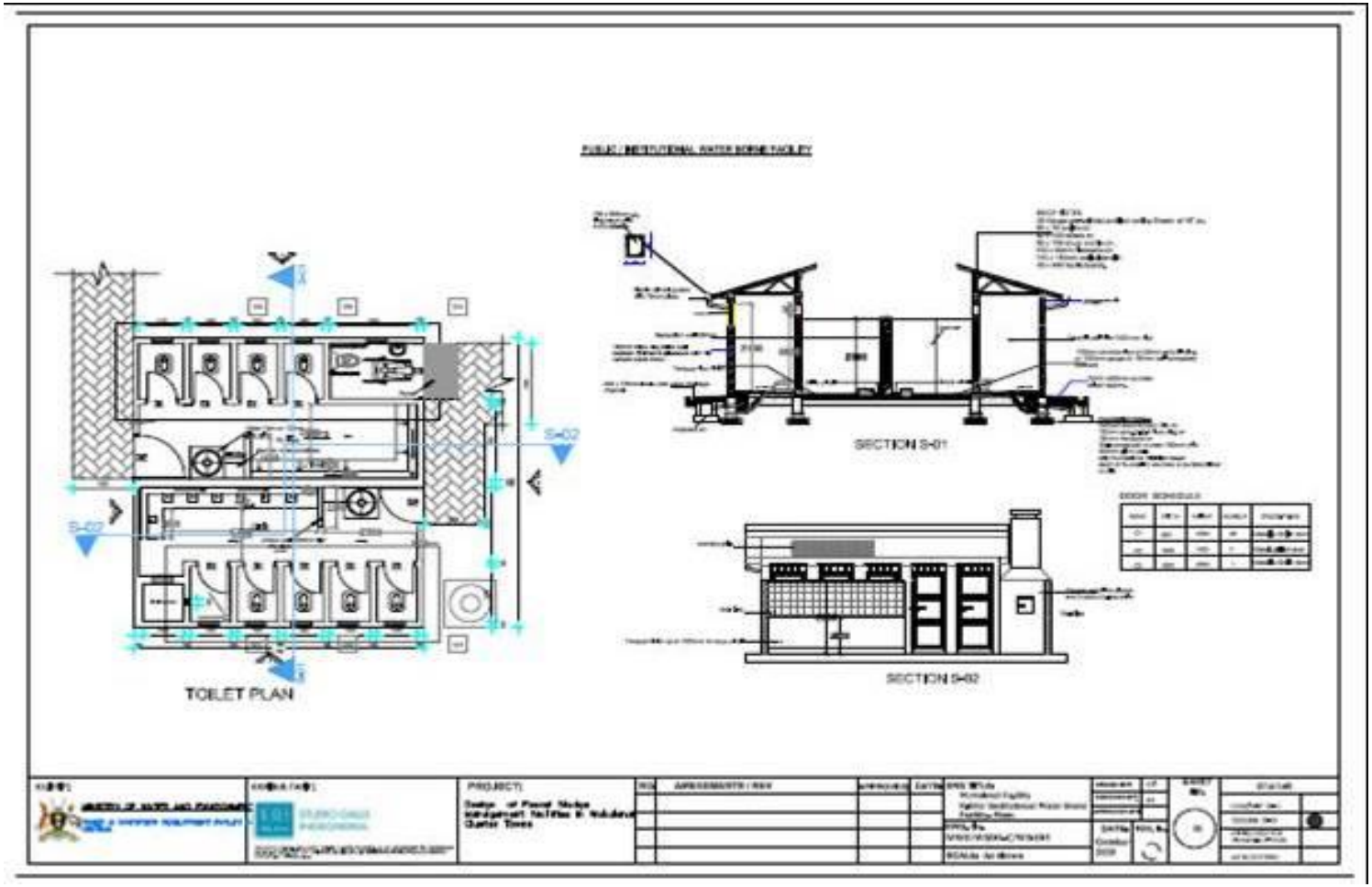

SITTING FLUSH TOILETS
Section X-X
ELEVATION 1
ELEVATION 2
PLAN
ELEVATION 4
ELEVATION 3

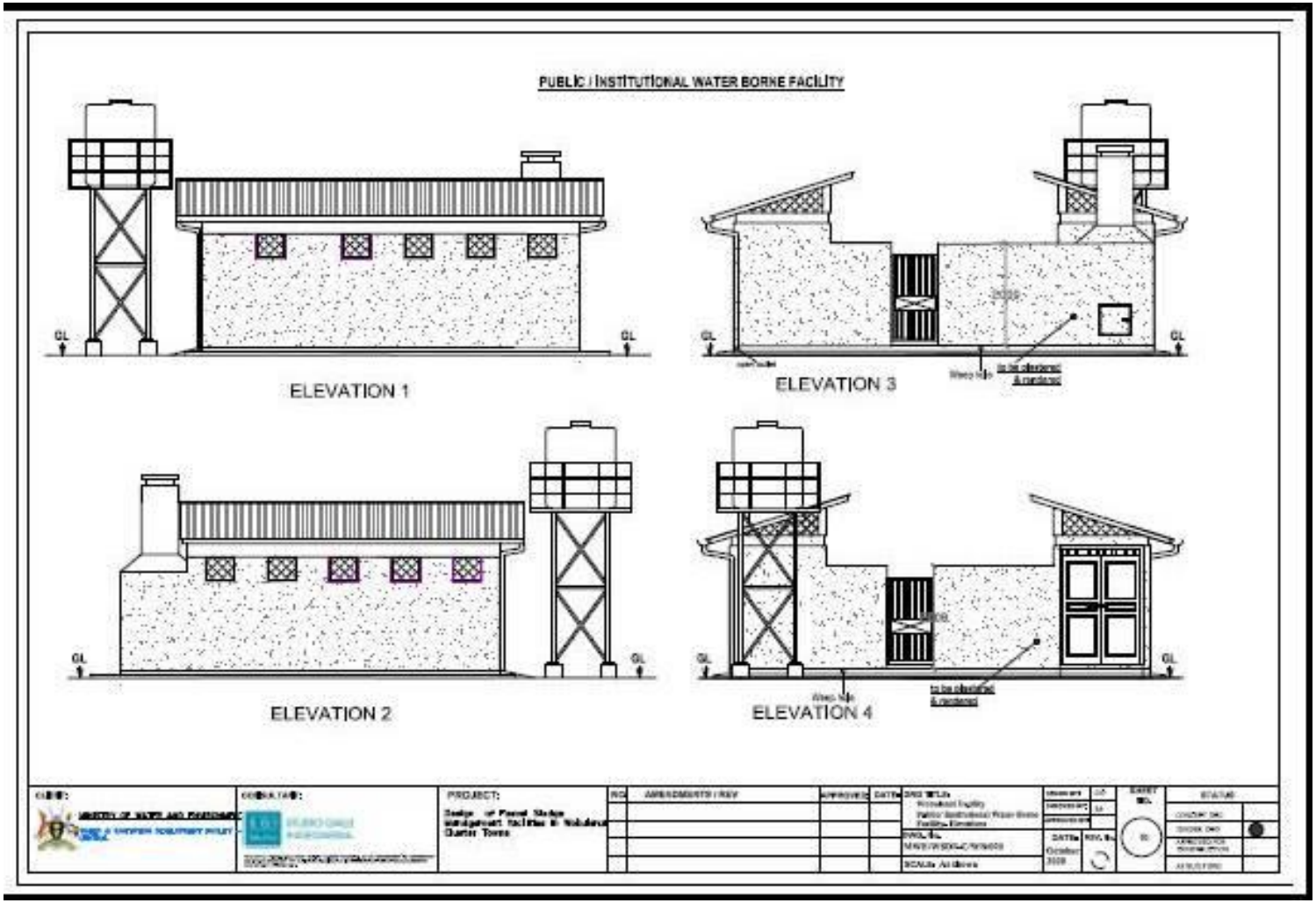

CISTERN / POUR FLASH TOILET CONNECTED TO SEPTIC TANK
FLOOR PLAN (Scale 1:50)
ELEVATION 1
ELEVATION 2
ELEVATION 3
ELEVATION 4
SECTION THROUGH P-P

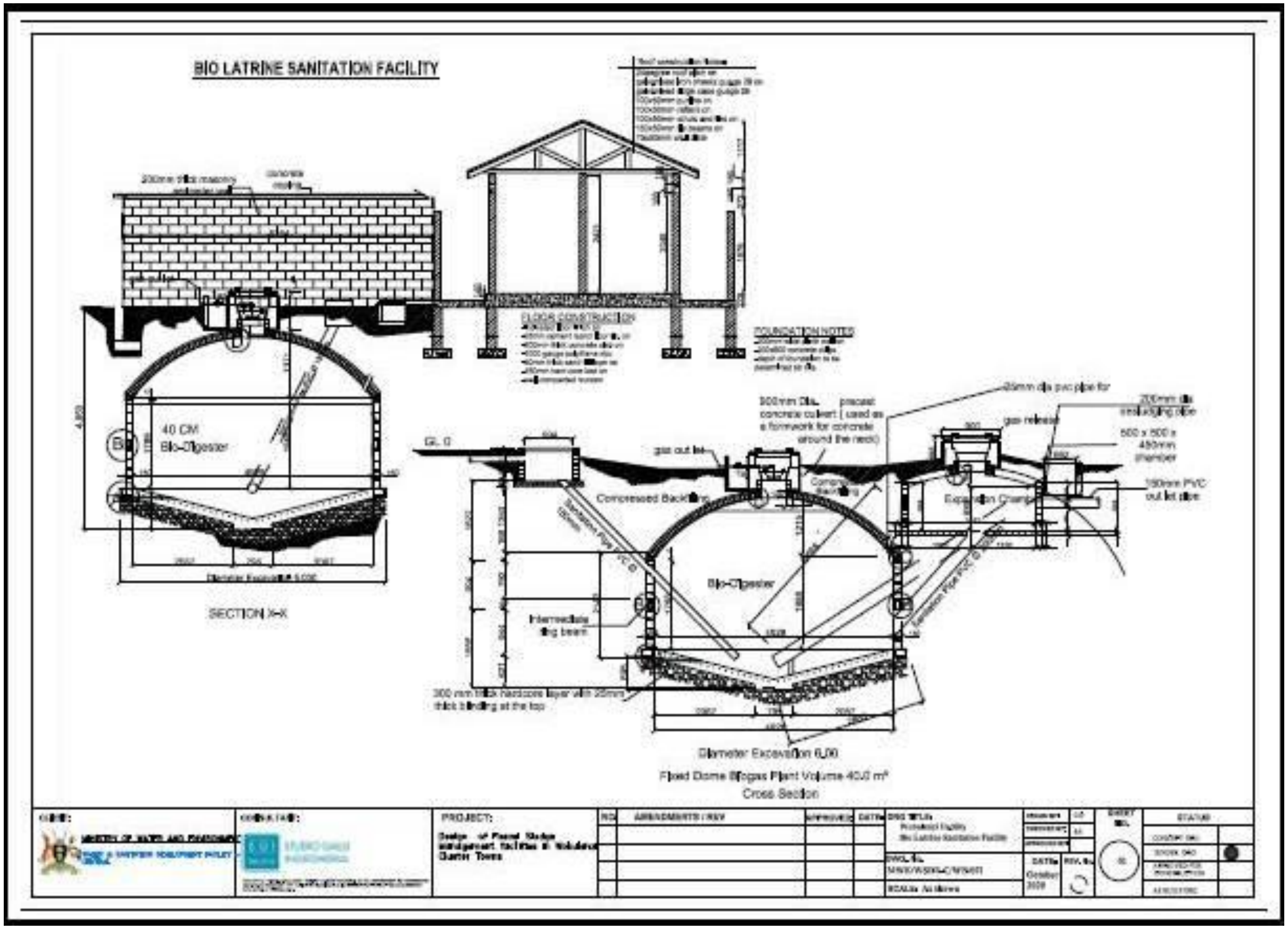

SEPTIC TANK
B1
2000
225
1000
225
A
A
1000
B1
PLAN
150
600
2000
1000
View on Top
ROOF SLAB PLAN
View Inside
B1
500
1500
150
2000
1500
1000
B1
SECTION A - A
75
225
225
300
163
1050
SECTION B1 - B1

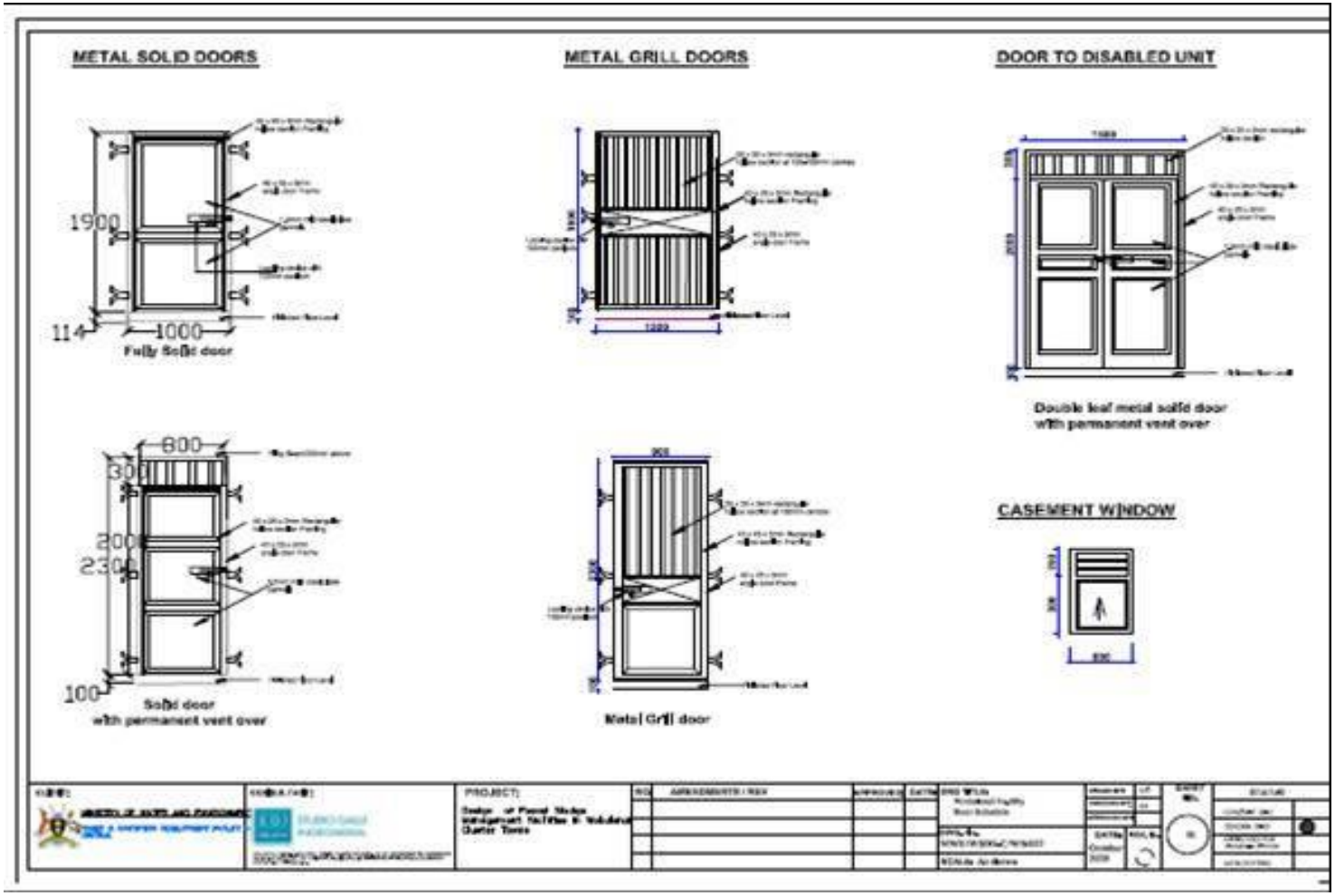

URINE DIVERSION DRY TOILET (UDDT)
REAR VIEW
FRONT VIEW
VAULT SECTION
PLAN
TYPICAL SIDE VIEW
SECTION A-A

PUBLIC/ INSTITUTIONAL


TOILET PLAN
SECTION S-01
SECTION S-02


PUBLIC / INSTITUTIONAL WATER BORNE FACILITY
ELEVATION 1
ELEVATION 3
ELEVATION 2
ELEVATION 4
GL
PROJECT:


BIO LATRINE SANITATION FACILITY
FLOOR CONSTRUCTION
FOUNDATION NOTES
40 CM
Bio-Digester
SECTION X-X
GL 0
gas out let
Compressed Backfilling
Bio-Digester
Intermediate ring beam
300 mm thick hardcore layer with 25mm thick blinding at the top
Expansion Chamber
gas release
150mm PVC out let pipe
Diameter Excavation 6,00
Fixed Dome Biogas Plant Volume 40,0 m³
Cross Section
PROJECT:


METAL SOLID DOORS
METAL GRILL DOORS
DOOR TO DISABLED UNIT
1900
114
1000
Fully Solid door
Double leaf metal solid door
with permanent vent over
800
300
200
2300
100
Solid door
with permanent vent over
Metal Grill door
CASEMENT WINDOW

Appendix 5: Geotechnical Survey

R S V
ENGINEERING GROUP
(Civil Consulting, Structural and Construction, Geophysical, Laboratory Testing and Geotechnical Engineering)

Geotechnical Investigation Report

Soil Investigation for the Proposed Faecal Sludge Treatment Plant in Wobulenzi Town Council, Luwero District

Date: February 12th, 2021

To: Ministry of Water and Environment

Website: www.rsvgroup.com

DOCUMENT/REPORT CONTROL FORM

Client's Name:	Ministry of Water and Water
Project Name:	Geotechnical Investigation for the Proposed Faecal Sludge Treatment Plant in Wobulenzi Town Council, Luwero District
Project Number:	005-130221
Revision Number:	Rev #00

Revision History

Revision #	Date	Prepared	Reviewed	Approved for Issue
00	12-02-2021	Kazooba Dorothy	Katusabe Rogers	Eng. Robert Tumwesige

Issue Register

Distribution List	Date Issued	Number of Copies
Ministry of Water and Environment	12-Feb-2021	1 hard copy
RSV Engineering Group Ltd Project File	12-Feb-2021	1 electronic copy

RSV Engineering Group Ltd | Uganda

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P.O. Box 10704, Kampala, Uganda
Tel: +256 782943463
rsv@rsvegroup.com | rtumwesige@gmail.com

IMPORTANT NOTICE

This report is confidential and is provided solely for the purposes of determining the Geotechnical properties for the Proposed Faecal Sludge Treatment Plant at Wobulenzi Town Council in Luwero District. The report is provided pursuant to a Consultancy Agreement between RSV Engineering Group Ltd and Ministry of Water and Environment under which RSV Engineering Group Ltd undertook to perform a specific and limited task for [Ministry of Water and Environment]. The report is strictly limited to the matters stated in it and subject to the various assumptions, qualifications and limitations in it and does not apply by implication to other matters. RSV Engineering Group Ltd makes no representation that the scope, assumptions, qualifications and exclusions set out in this report will be suitable or sufficient for other purposes nor that the content of the report covers all matters which you may regard as material for your purposes.

This report must be read as a whole. Any subsequent reports must be read in conjunction with this report.

The report supersedes all previous draft or interim reports, whether written or presented orally, before the date of this report. This report has not and will not be updated for events or transactions occurring after the date of the report or any other matters which might have a material effect on its contents or which come to light after the date of the report. RSV Engineering Group Ltd is not obliged to inform you of any such event, transaction or matter nor to update the report for anything that occurs, or of which RSV Engineering Group Ltd becomes aware, after the date of this report.

Unless expressly agreed otherwise in writing, RSV Engineering Group Ltd does not accept a duty of care or any other legal responsibility whatsoever in relation to this report, or any related enquiries, advice or other work, nor does RSV Engineering Group Ltd make any representation in connection with this report, to any person other than [Ministry of Water and Environment]. Any other person who receives a draft or a copy of this report (or any part of it) or discusses it (or any part of it) or any related matter with RSV Engineering Group Ltd, does so on the basis that he or she acknowledges and accepts that he or she may not rely on this report nor on any related information or advice given by RSV Engineering Group Ltd for any purpose whatsoever.

TABLE OF CONTENTS

1. INTRODUCTION

On 5th January, 2021, Ministry of Water and Environment hereinafter called the Client through its Engineers contracted RSV Engineering Group Ltd hereinafter called the Consultant to carry out a ground investigation for Proposed Faecal Sludge Treatment Plant at Wobulenzi Town council in Luwero District. Field work involved intrusive site works and in-situ testing and sampling. The field work was followed by geotechnical laboratory testing of the sampled materials and reporting of the investigation results. This report provides the relevant geotechnical information including the geotechnical design results for the proposed development.

The investigation was carried out in accordance with BS 5930: 2015, the Client's instructions, and other relevant standards as cited in the remaining parts of the report. The report considers the Client's particular instructions and requirements and so it should not be used for purposes other than the design of the proposed development.

1.1. Key Objective of the Investigation

The primary purpose of this study was to determine the stratigraphic characteristics or geotechnical design parameters of the site based on field and laboratory tests.

1.2. General Scope of Works

The following activities which were agreed with the client were undertaken;

i. Excavation and logging of three (03) test pits to a maximum depth of 3.0m below ground surface level at the proposed site,

ii. Conducting the Dynamic Lightweight Penetrometer (DPL) tests to a maximum depth of 8.0m below ground level or till refusal at three points of Faecal Sludge Treatment Plant site,

iii. Collection of representative disturbed and undisturbed samples for laboratory testing accordingly,

iv. Compilation of results and report writing.

2. SITE DESCRIPTION

The site is located at Bukolwa-Lusiga, Wobulenzi Town Council in Luwero District. At the time of investigation, the site was covered with bushes and crops. The site is gently sloping from the eastern direction towards the west and drainage is primarily in the same direction. **Figure 1** below shows the site view. A layout showing the location of exploration points is attached as **Appendix 1.**

Figure 1: View of the investigated site

2.1. Climate

The climate of Wobulenzi/ Luwero District where the site is located is that of a tropical rainforest climate. The area has got two annual wet seasons. There is a long rainy season from August to December and a short rainy season from February to June. However, the shorter rainy season sees substantially heavier rainfall per month, with April typically seeing the heaviest amount of precipitation at an average of around 1264 mm. The average annual temperature in Wobulenzi/Luwero is 21.8 °C.

2.2. Topography

Wobulenzi is situated in an area generally made up of elevated and dissected plateau consisting of a series of flat-topped hills and intervening valleys. The low-lying areas have comparatively little flat ground but consist of the lower pediment and valley bottoms that are relatively swampy and seasonally flooded.

2.3. Geology

According to the geological map of Luwero District, the site which is situated in Wobulenzi town council is underlain by Kampala granitoids, Orthogneiss (A3KAgr) as shown in the **Figures 2** & **3** below.

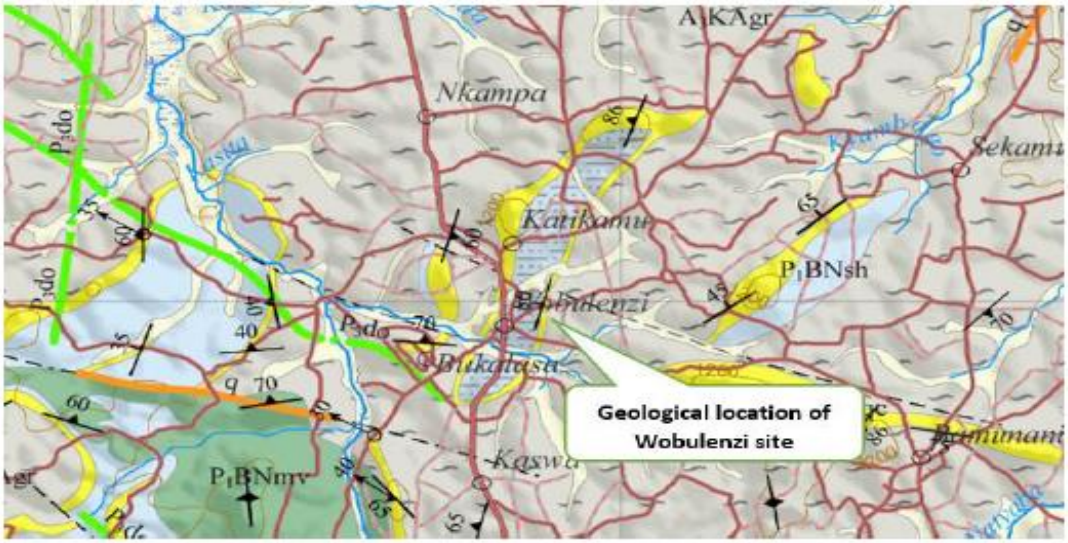


Figure 2: Geological Map of Luwero District

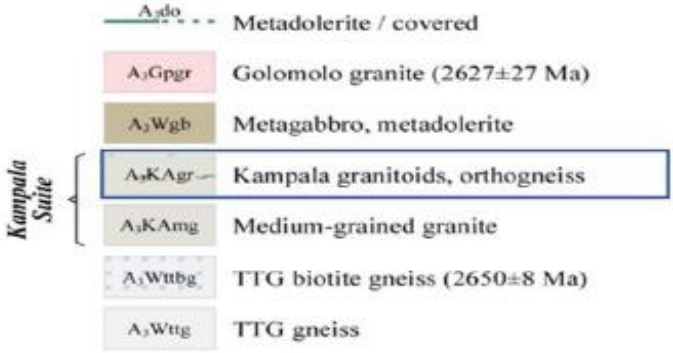


Figure 3: Key from Map extract

2.4. Regional seismicity

According to the Seismic code of practice for structural designs, 2003 (US 319: 2003) from the Uganda National Bureau of Standards (UNBS), the site lies in zone 3 on the seismic zoning map. This is the least seismically active zone in Uganda with a zoning factor of Zmax=0.7. The project area is considered to be less prone to earthquake risk as shown in **Figure 4**.

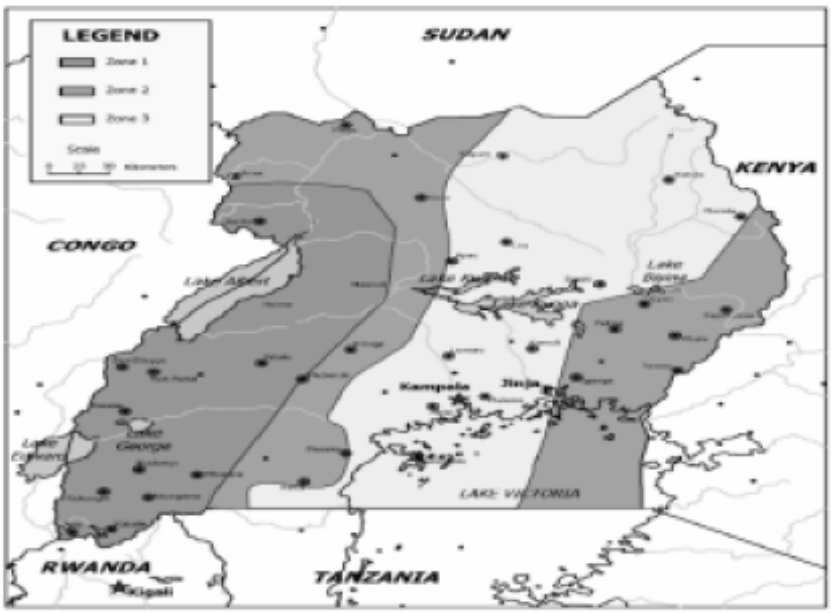


Figure 4: Seismic zoning map of Uganda (US319, 2003)

The seismic zoning map above indicates contours of ground acceleration, used for seismic action calculations. The seismic zoning factor, Z for the appropriate regions or locations and for the purposes of design may be applied as follows;

- Z_{max} = 1.0 for zone 1 (high risk area),
- Z = 0.8 for zone 2 (medium risk area) and;
- Z = 0.7 for zone 3 (low risk area).

3. FIELD EXPLORATORY & LABORATORY TESTING

The field investigation covered logging of soil profile within the excavated trial pits, sampling and conducting of the DPL tests from the surface till refusal. Samples were transported to the laboratory and tests carried out accordingly.

3.1. Test Pit Excavation

Test pits excavation was generally carried out in accordance with the procedure described in BS5930:2015. The excavation was undertaken with the use of hand tools as shown in **Figure 5** up to a maximum depth of 2.8m based on the soil consistencies and densities. Within the excavated test pits, logging was done to show the various subsoil strata as observed on site.

During the process of excavation, layers having different soil types were heaped separately. The trial pits were backfilled after obtaining disturbed & undisturbed samples. Backfilling of the excavated trial pits followed the same sequence with the last layer to be excavated being buried first. Test pit logs showing the site stratigraphy and sampling depth are attached as **Appendix 2**.

A. Excavation of TP1 B. Excavation of TP2

Figure 5: Excavation of trial pits

A sketch showing the location of the different trial pits is attached as **Appendix 1. Table 1** shows the coordinates and depth of the exploration points. All coordinates are given in UTM 36N, WGS 84 system.

3.2. Soil sampling

Four (04) disturbed samples and one (1) undisturbed sample were picked at bottom of the excavated test pits. In addition, two bulk disturbed samples were picked at 0.5-1.0m from TP1 and TP2 in order to determine the subgrade properties required for the design of access roads. The samples were properly packed and safely transported to the laboratory for carrying out classification, chemical and shear box tests.

Table 1: Showing location of exploration points and sampling criteria

Test pit/exploration point	Sample type/Depth (m)	Depth (m)	Coordinates	
TP 01	Disturbed	1.0	36N 0443683	UTM 0080129
	Disturbed	2.8		
TP 02	Disturbed	1.5	36N 0443668	UTM 0080172
TP 03	Disturbed & Undisturbed	1.5	36N 0448660	UTM 0080224

3.3. Dynamic Light Penetrometer (DPL) Test

The Dynamic Light Penetrometer (DPL) test was carried out starting from the ground surface. The test involved dropping a hammer of 10kg from a height of 50 cm causing the rod with probe to penetrate into the ground. The number of strokes or blows was calculated after every 10.0 cm of penetration depth. The penetration per blow "penetration rate" was recorded as the cone was being driven into the soil and then used to calculate the strength of the soil through which it was passing. A change in penetration rate indicated a change in strength between the soil layers, thus allowing strength of the soil to be determined. **Figure 6** shows technicians conducting the DPL test at some of the exploratory points. The DPL test was conducted next to the test pit locations i.e., DLP01, DLP02 & DLP 03 for TP1, TP2 and TP3 respectively. DPL bearing capacity test results are attached in **Appendix 3**. It should be noted that due to the differing depth of encountering refusal levels, the DPL was carried out not exceeding 5.0m at all the test pit locations.

Figure 6: Conducting of the DPL test at site

3.4. Laboratory Testing

Laboratory tests to determine classification, subgrade strength, shear strength and chemical composition of soil samples obtained were carried out on disturbed samples. Classification tests carried out included wet sieving (grain size distribution) and Atterberg limits. On the other hand, chemical tests included PH, Chloride and Sulphate. CBR and compaction tests were conducted on subgrade samples to determine the properties of the subgrade required for the design of access roads. Direct shear box test was carried out on the undisturbed sample from TP3 at 1.5m and remoulded samples from TP1 and TP2. **Table 2** shows a summary of the geotechnical tests which were carried out on the samples with the procedures used.

Table 2: Standards used in testing the samples

Test Description	International Standard
Disturbed samples	
Liquid Limit	BS 1377: Part 2, Clause 4:1990
Plastic Limit & Plasticity Index	BS 1377: Part 2, Clause 5:1990
Linear Shrinkage	BS 1377: Part 2, Clause 6:1990
Particle Size Distribution	BS 1377: Part 2, Sub cl. 9.2: 1990
5 Point Modified Proctor Compaction	AASHTO T99
Soaked CBR Test - One Point Method	BS1377: Part 4:1990

Test Description	International Standard
Undisturbed Samples	
Direct Shear box test	BS 1377: Part 7: 1990

3.4.1 Particle Size Distribution

Gradation curves in **Figure 7** show that the soils from the test pits are coarse grained i.e., % passing the #200 sieve is less than 50%.

3.4.2 Atterberg Limit Test Results

Plasticity index (PI) values were plotted against Liquid (LL) values for the samples on the A-Line chart. All samples plotted above the A-line within the regions of clays of low plasticity as shown in **Figure 8**. This shows that the fine-grained portion of the soil is predominantly clay. A summary of classification test results is attached as **Appendix 4**. According to the classification test results, the soil underlying the site can be classified as clayey SAND. However, the sample from 1.5m depth at TP2 classifies as a clayey GRAVEL.

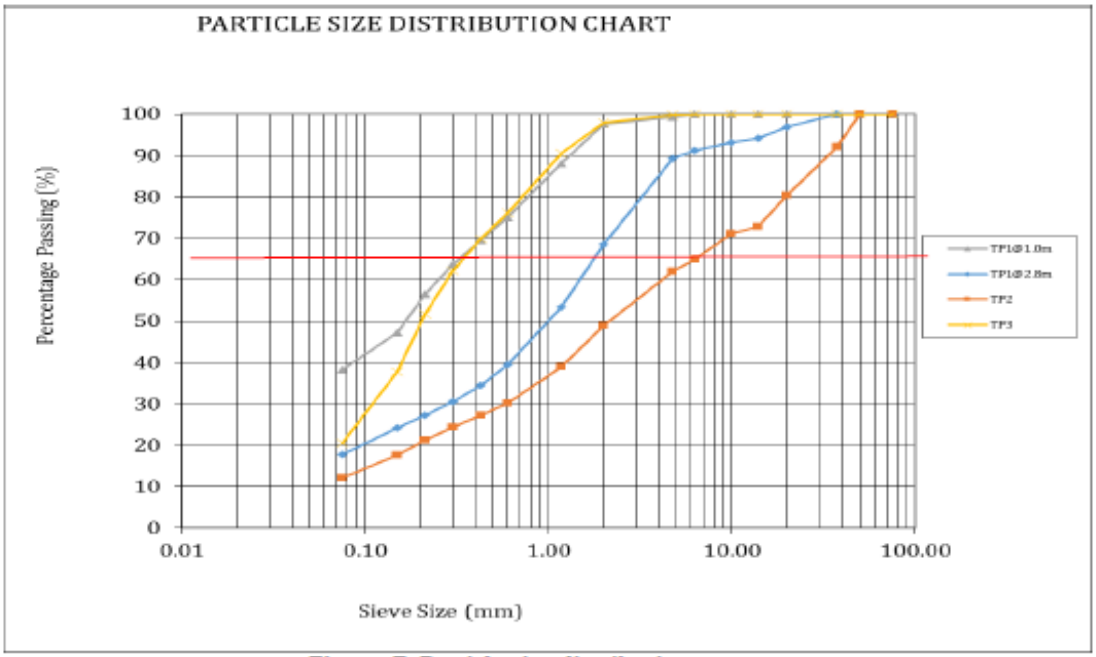


Figure 7: Particle size distribution curves

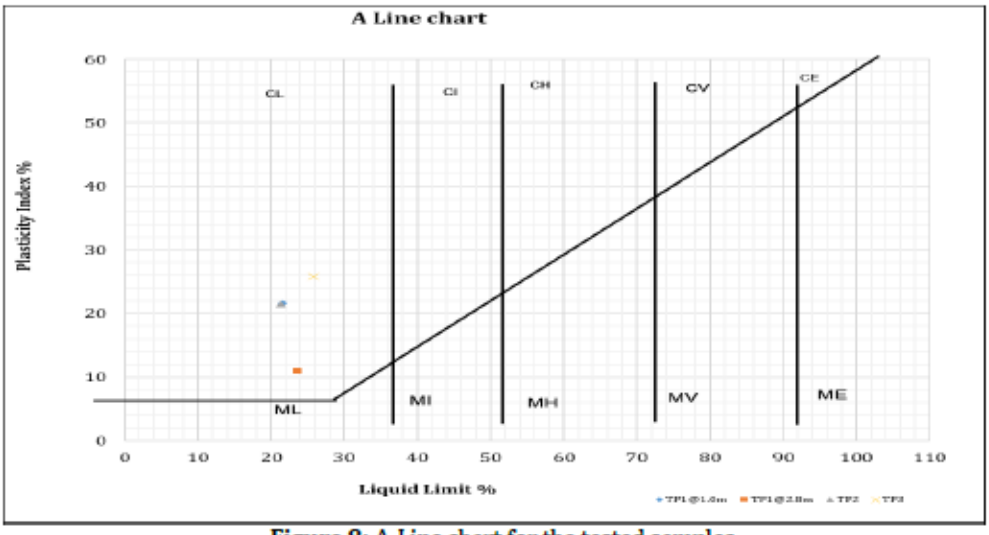


Figure 8: A-Line chart for the tested samples

3.4.3 Subgrade Test Results

Tests conducted on the subgrade materials from TP1 and TP2 included; moisture content, sieve analysis, Atterberg Limits, Compaction and CBR. Test Results are presented in **Table 3.**

Table 3: Subgrade Test Results

Test Pit	Depth (m)	Moisture Content	% pass 75µm	Plasticity Index	MDD (Mg/m^3)	OMC (%)	CBR (%)
TP1	0.5-1.0	11.7	45	0	2.060	9.00	76
TP2	0.5-1.0	7.2	32	0	2.170	6.30	118

A minimum subgrade CBR of 76% was obtained and according to the Ministry of Works and Transport Flexible Pavement Design Manual 2010, the subgrade can be classified as an S6.

3.4.3 Direct Shear Box Test Results

Direct shear box test was carried out on the undisturbed sample from TP4. Results are presented in **Table 4** below and detailed results are attached as **Appendix 5** and these are typical of a clayey sand material. Detailed test results are attached in **Appendix 6.** The angles of internal friction are low due to the fact that the samples were remoulded.

Table 4: Direct shear box test results

TP No; & Depth	Bulk density (Mg/m^3)	Cohesion (kPa)	Angle of Internal Friction (Degrees)
TP1 (2.8)	1.841	26.3	7.12
TP2 (1.5)	1.834	26.26	5.95
TP3 (1.5)	1.948	18.06	11.16

3.4.4. Chemical Aggressiveness to Concrete

The chemical test results for tests conducted on the samples are presented in **Table 5** below. The following assessment of the chemical environment to concrete is in accordance with BRE Special Digest 1 'Concrete in Aggressive Ground' SD1, published 2005 and Bureau of Reclamation (1981). The following criteria will be used to determine need for corrosion protection:

- A pH less than 5.5 is considered to be strongly acidic, while values of 8.5 or greater are considered to be strongly alkaline. If the pH >6.5, enhanced concrete protection will not be required unless an electric resistivity test is carried out and the resulting resistivities are found to be below 1500 ohm-cm.
- For grounds with sulphate or chloride concentrations <0.1% or 1000 parts per million, ordinary concrete will be considered sufficient to withstand these chemical concentrations in the ground. For higher concentrations of sulphates, higher strength concrete, concrete with lower amounts of calcium aluminate (under 5%) or special coatings may be necessary.

Results from chemical test for the samples tested show that the pH was greater than 5.5 but less than 6.5 and sulphate & chloride contents are less than 1000ppm. This implies that the ground might be slightly acidic.

Table 5: Summary of chemical test results

Trial Pit No & Depth	pH	Chlorides (ppm)	Sulphates (ppm)
TP 01 (2.8)	6.0	98	22
TP 02 (1.5)	5.9	41	0
TP 03 (1.5)	5.9	100	12

3.5. Soil Profile

The soil stratigraphy at the site is presented in **Table 6** below and as it can be observed on the logs, the stratigraphy consists of two (02) major predominant layers i.e., FILL material comprising of murram underlain by saturated clayey sand and clayey gravel.

Table 6: Stratigraphy at the site

Profile at TP 1	Profile at TP 2	Profile at TP 3
0.0 ~0.4m: Organic silty Clay	0.0 ~0.3m: Organic silty Clay	0.0 ~0.5m: Organic Silty Clay
0.4~2.8m: clayey SAND	0.3~1.5m: clayey GRAVEL	0.5~1.5m: clayey SAND

4. GEOTECHNICAL MODEL

The geotechnical design parameters for this soil are presented in **Table 7** below. The site is underlain by top soil which comprises of mainly organic silty clay which is turn underlain by either clayey sand or clayey gravel.

4.1. Geotechnical Model Parameters

With the objective of obtaining a representative geotechnical model of the site under study, laboratory and field tests were executed with the aim of studying the behavior of the site subsoil. The laboratory test results obtained were compared with the Dynamic Light Penetrometer (DPL) test results obtained during the field campaign as shown in **Appendix 3**. The geotechnical design parameters which were considered are presented in **Table 7**.

Table 7: Geotechnical design parameters

Fi = 5 degrees C=26.26 kN/m^2 Unit Weight = 18.41 kN/m^2	E = 9000 kN/m^2 Poisson's ratio = 0.3

4.2. Load Bearing Capacity for Square & Mat Footing

For the calculation of the ultimate load bearing capacity of a square footing, Terzaghi's theory was used by employing the following expression:

$$q_u = 1.3\ c\ N_c + \gamma\ D_f\ N_q + 0.4\ \gamma\ B\ N_\gamma \quad \ldots\ldots \quad \text{Square footing}$$

Where:

q_c	Ultimate load capacity, t/m^2
N_c, N_q& N_γ	Non-dimensional load capacity factors
γ	Unit weight, t/m^3
D_f	Foundation depth, m
B	Foundation width, m
C	Soil cohesion, t/m^2

A Safety Factor of 3 was used to obtain the admissible load capacity. The load capacity factors Nc, Nq and Ng, are a function of the soil friction angle and are obtained through the graph shown in **Figure 9.**

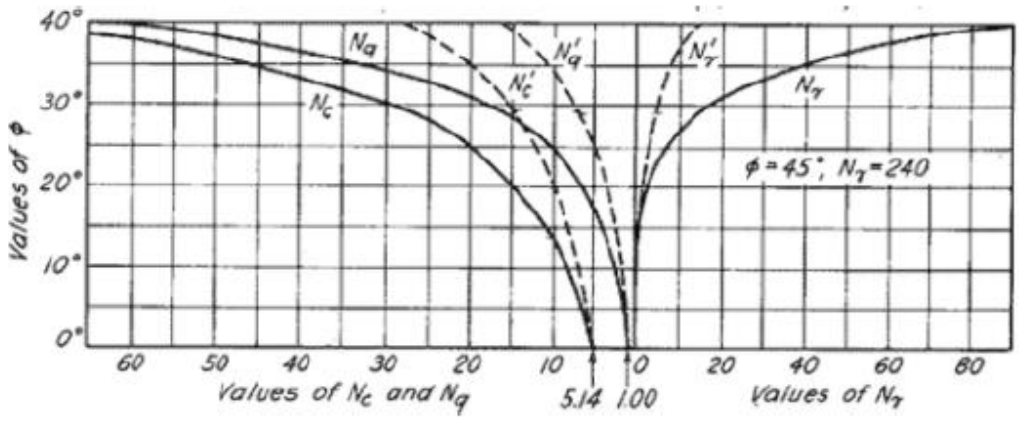


Figure 9: Terzaghi load bearing capacity factors.

4.3. Analysis of Settlements

Based on the physical characteristics of the soil (i.e. granular soil) found during the exploration stage, it is a fact that the settlements generated by the loads from the structure to the foundation system will be mainly immediate in nature, that is to say, the deformations will take place during and or shortly after the construction stage.

The elastic/short term settlements were therefore analyzed using the theory of elasticity by employing following equation.

$$S_e = \frac{Bq_o}{E_s}(1-\mu_s^2)\left[(1-\mu_s^2)F_1 + (1-\mu_s-2\mu_s^2)F_2\right]$$

Where:

Se Elastic Settlement, cm

q Contact pressure, kg/cm²

B Foundation width, cm

Es Modulus of elasticity of the soil, kg/cm²

μ Poisson's ratio of the soil, dimensionless

H Depth of the incompressible stratum, m

B Footing width

L Footing length, m (L=B)

F1 & F2 Shape and depth factors (Steinbrenner, 1934)

Figures 10 and **11** show the graphs used to obtain the values of F1 and F2 with respect to the relation to shape (L / B) and depth (H / B) factors.

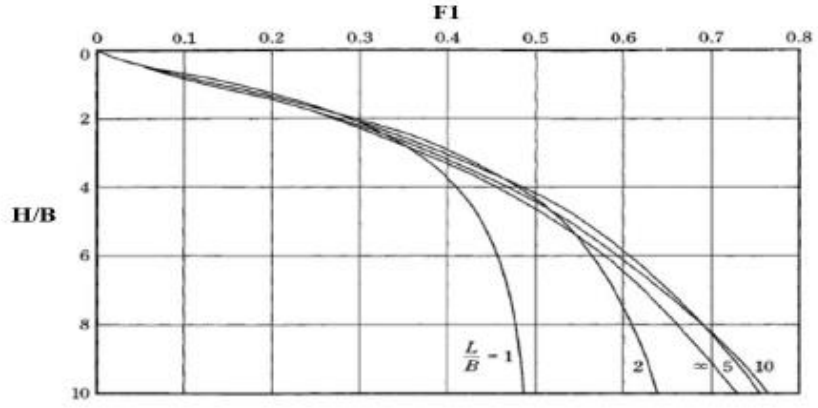


Figure 10: Variation of F1 with respect to H / B (Steinbrenner, 1934)

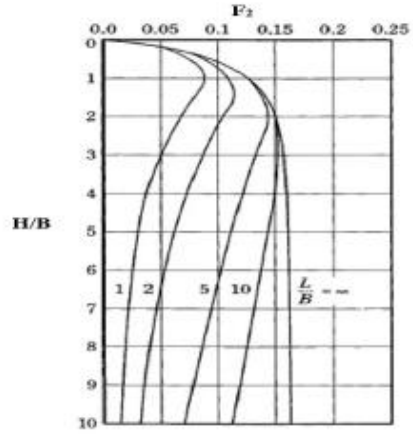


Figure 11: Variation of F2 with respect to H / B (Steinbrenner, 1934)

4.4. Modulus of Subgrade Reaction

This parameter is associated with the load transmitted to the ground and is measured by the relationship between the applied load and the settlement it generates, it is usually identified as follows:

$$K_{sv} = \frac{q}{\delta}$$

Where:

K_{sv} Modulus of subgrade reaction.

q Applied load, t/m^2.

δ Measured deformation, m.

4.5. Results of the Geotechnical Analysis

It is worth mentioning that as of the date of preparation of this report, there was not any detailed information to evaluate the settlements as well as the design of foundations for each structure in a particular way, however, the range of loads provided was taken to provide various foundation solutions. The specialist in charge of detailed engineering will be responsible for defining the specific foundation sizes that will be adapted to the needs and specific requirements of the project based on the load bearing capacity information presented in the following tables and graphs.

As an outcome of the geotechnical analysis of the classified zones, the values of admissible load capacity, elastic settlements and modulus of subgrade reaction of the soil were obtained and the results are presented as follows:

RESULTS FOR SQUARE FOOTING

Table 8: Load bearing capacity results.

ALLOWABLE SOIL BEARING CAPACITY FOR SQUARE FOOTINGS (kN/m^2 or kPa)				
FOOTING WIDTH (m)	FOUNDING DEPTH (m)			
	Df = 2.00 m	Df = 2.50 m	Df = 3.00 m	Df = 3.50 m
1.00	107.27	112.69	118.12	123.55
1.50	107.43	112.86	118.29	123.72
2.00	107.60	113.03	118.46	123.89
2.50	107.77	113.20	118.63	124.06
3.00	107.94	113.37	118.80	124.23

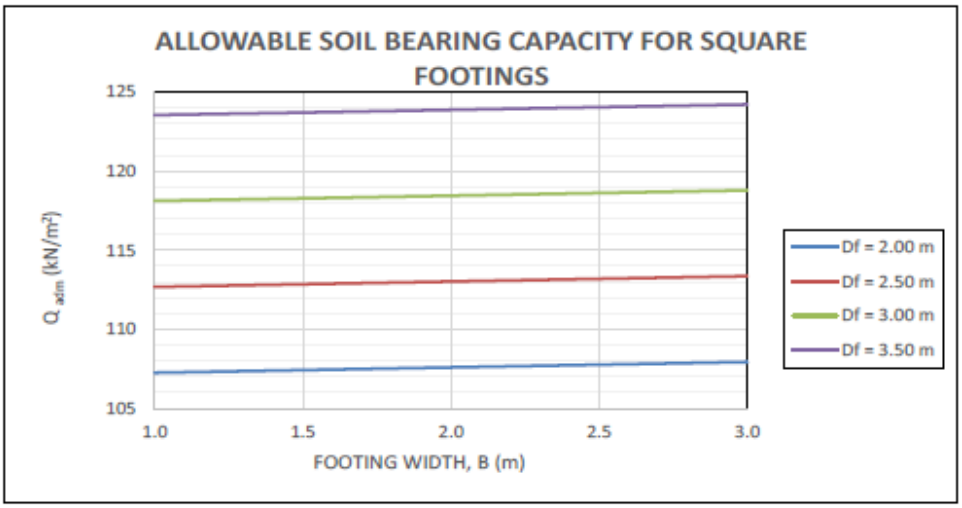


Figure 12: Results of load bearing capacity vs. foundation width

Table 9: Results of short-term settlement analysis.

SETTLEMENTS FOR SQUARE FOOTINGS - SHORT TERM (cm)				
FOOTING WIDTH (m)	FOUNDING DEPTH (m)			
	Df = 2.0	Df = 2.5	Df = 3.0	Df = 3.5
1.00	0.63	0.64	0.65	0.67
1.50	0.97	0.98	0.99	1.01
2.00	1.32	1.31	1.32	1.34
2.50	1.65	1.64	1.65	1.67
3.00	1.97	1.96	1.96	1.97

Table 10: Modulus of Subgrade Reaction

MODULUS OF SUBGRADE REACTION (k=q/δ) SQUARE FOOTINGS (t/m^3)				
FOOTING WIDTH (m)	FOUNDING DEPTH (m)			
	Df = 2.0	Df = 2.5	Df = 3.0	Df = 3.5
1.00	1734.00	1797.60	1843.65	1878.45
1.50	1123.87	1177.37	1217.78	1249.23
2.00	831.37	876.46	911.93	940.34
2.50	664.17	702.39	733.60	759.29
3.00	558.41	591.07	618.63	641.91

Raft Foundations, also called Mat Foundations, are recommended as a second option. In this type of foundation, the entire floor slab acts as the foundation; the weight of the building or structure is spread evenly over the entire footprint of the building.

Mat Foundations are used where the soil is weak, and therefore building or structural loads have to be spread over a large area, or where columns are closely spaced, which means that if individual footings were used, they would touch each other, however, in this current project the above-mentioned problem does not arise.

RESULTS FOR RAFT FOOTING

Table 11: Load bearing capacity results.

ALLOWABLE SOIL BEARING CAPACITY FOR MAT/COMBINED FOOTING (kN/m^2 or kPa)				
FOOTING WIDTH (m)	FOUNDING DEPTH (m)			
	Df = 0.20 m	Df = 0.30 m	Df = 0.40 m	Df = 0.50 m
4.00	69.41	70.49	71.58	72.66
6.00	70.25	71.33	72.42	73.51
8.00	71.09	72.18	73.26	74.35
10.00	71.93	73.02	74.11	75.19
12.00	72.78	73.86	74.95	76.03

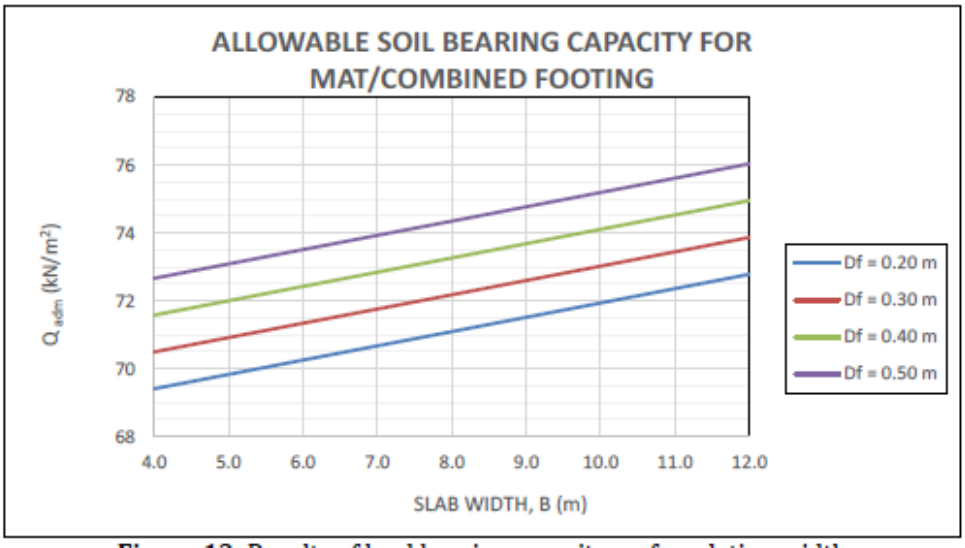


Figure 13: Results of load bearing capacity vs. foundation width

Table 12: Results of short-term settlement analysis.

SETTLEMENTS FOR MAT/COMBINED FOUNDATIONS - SHORT TERM (cm)				
FOOTING WIDTH (m)	FOUNDING DEPTH (m)			
	Df = 0.2	Df = 0.3	Df = 0.4	Df = 0.5
4.00	2.02	2.03	2.03	2.04
6.00	2.29	2.30	2.32	2.33
8.00	2.49	2.51	2.53	2.54
10.00	2.64	2.66	2.68	2.70
12.00	2.75	2.77	2.80	2.82

Table 13: Modulus of Subgrade Reaction

MODULUS OF SUBGRADE REACTION (k=q/δ) MAT/COMBINED FOUNDATIONS (t/m^3)				
FOOTING WIDTH (m)	FOUNDING DEPTH (m)			
	Df = 0.2	Df = 0.3	Df = 0.4	Df = 0.5
4.00	349.65	354.04	358.73	363.66
6.00	312.57	315.60	318.83	322.22
8.00	290.99	293.27	295.70	298.24
10.00	277.97	279.80	281.73	283.76
12.00	270.10	271.62	273.23	274.91

5. CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

This investigation was carried out to determine the soil type underlying the proposed site, determine its bearing capacity and determine the founding depth. From the investigation results, the following conclusions are drawn:

i. Generally, the site is predominantly underlain by saturated clayey sand and clayey gravel

ii. The subgrade has a minimum CBR of 76% and this is classified as an S6 subgrade,

iii. Groundwater table was encountered at a depth of 1.1m in TP2 and at 0.8m in TP3,

iv. The allowable bearing capacities for square footings from the geotechnical model vary from 107.27 to 124.23kpa at depths varying from 2.0m to 3.0m for foundation widths between 1.0 and 3.0m respectively,

v. The allowable bearing capacities for mat footings from the geotechnical model vary from 69.41 to 76.03kpa at depths varying from 0.2m to 0.5m for foundation widths between 4.0and 12.0m respectively.

5.2 Recommendations

Based on the results of the investigation, the following recommendations have been made;

i. Two foundation types have been proposed i.e., square footings slab and mat foundation,

ii. Once excavations to accommodate the foundations have been completed, the bottom of the excavation shall be protected in all cases with a thin layer of lean concrete (f'c=100 kg/cm^2), with a thickness of at least 50mm before proceeding to place concrete for foundation construction.

iii. The foundation should be cured for 14 days (minimum) and thereafter left undisturbed for a period not less than 30 days,

iv. This soil mechanics report provides geotechnical recommendations for the **explored area** and the information provided should never be employed to provide geotechnical solutions to a different location.

Appendix 6: Bills of Quantities

MINISTRY OF WATER AND ENVIRONMENT			
CONSTRUCTION OF WOBULENZI FAECAL SLUDGE TREATMENT PLANT			
Bill No.	**Description**	**Amount Ugx**	**Amount Ugx**
	GENERAL SUMMARY		
	GENERAL		
WOB-G-1	General Items	941,100,800	
	WORK ITEMS		
WOB-FS-1	Receiving Chamber Containment Tank	97,415,790	
WOB-FS-2	Screen and Grit Chamber	53,761,225	
WOB-FS-3	Settling - Thickening tank	162,749,600	
WOB-FS-4	Anaerobic Reactor	88,770,790	
WOB-FS-5	Sludge Drying Beds	729,096,610	
WOB-FS-6	Composting building	365,973,090	
WOB-FS-7	Facultative & Maturation Ponds	371,298,910	
WOB-FS-8	Administration Building	232,066,020	
WOB-FS-9	Ancillary Site works	1,367,898,000	
WOB-FS-10	Mechanical Installation	165,000,000	165,000,000
WOB-FS-11	Electrical Installation	47,600,000	47,600,000
	Sub-Total "A"	4,622,730,835	212,600,000
	Allow for Contingency (10% of Subtotal A)	462,273,084	21,260,000
	Sub-Total "B"	5,085,003,919	233,860,000
	Add VAT (18% of subtotal B)	915,300,705	42,094,800
	GRAND TOTAL	**6,000,304,624**	**275,954,800**

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB G-1					
DESCRIPTION: GENERAL ITEMS					
ITEM NO.	**DESCRIPTION**	**UNIT**	**QTY**	**UNIT RATE (Ushs)**	**AMOUNT (Ushs)**
	General Obligations				
	Preliminary and General Items relating to Contractor's establishment, provision and maintenance of key staff and equipment are subject to the conditions stipulated in the Conditions of Contract				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB G-1					
DESCRIPTION: GENERAL ITEMS					
ITEM NO.	**DESCRIPTION**	**UNIT**	**QTY**	**UNIT RATE (Ushs)**	**AMOUNT (Ushs)**
1.1.1	Provision of Performance Bank Guarantee in accordance with Clause 4.15 of the Conditions of Contract.	LS	1	50,000,000	50,000,000
1.1.2	Provision of Insurance of Works in accordance with Clause 1.21 of the Conditions of Contract.	LS	1	20,000,000	20,000,000
1.1.3	Provision of Third-Party Insurance in accordance with Clause 1.21 of the Conditions of Contract.	LS	1	10,000,000	10,000,000
1.1.4	Provision of Insurance for Contractor's Equipment in accordance with Clause 1.21 of the Conditions of Contract.	LS	1	20,000,000	20,000,000
1.1.5	Provision of Workmans Compensation in accordance with Clause 1.21 of the Conditions of Contract.	LS	1	20,000,000	20,000,000
1.1.6	Establishment and maintenance of Contractor's camps, offices, facilities, etc. and provision of all equipment that will be required during the entire contract period 80% and removal and demobilisation after completion of the project 20%	LS	1	50,000,000	50,000,000
1.1.9	Provide, erect and maintain project sign boards at a location shown by the Engineer and in accordance with the Drawings and Specifications.	No	2	1,500,000	3,000,000
1.1.10	Provide and construct a project commemorative plaque at a conspicuous location to be shown by the Engineer at completion of the project.	LS	1	5,000,000	5,000,000
1.2	**Office for the Resident Engineer (R.E.)**				-
1.2.1	Rent office for RE for duration of project	month	12	1,000,000	12,000,000
1.2.2	Maintenance of RE's office in accordance with the Specifications.	month	12	500,000	6,000,000
1.2.9	Provide and maintain 1No. 16megapixels digital camera with 8GB memory card of approved make for the entire contract period.	No	1	2,500,000	2,500,000
1.3	**General Items**				-
1.3.1	The Contractor is referred to the Conditions of Contract and the Specifications and is to include in this item amounts necessary to ensure compliance therewith except for the foregoing items shown elsewhere in the Bills of Quantities. If no sum is inserted here it will be understood to have been included in the rates inserted against items elsewhere. The sum inserted here shall cover items which may be considered to have been omitted from the bills of Quantities. The Contractor is required to describe the item(s), sum(s) inserted here. (Health and safety)	LS	1	5,000,000	5,000,000
1.4	**Provisional Sums-01**				-

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB G-1					
DESCRIPTION: GENERAL ITEMS					
ITEM NO.	**DESCRIPTION**	**UNIT**	**QTY**	**UNIT RATE (Ushs)**	**AMOUNT (Ushs)**
1.4.1	Client's administration, Supervision expenses and witness testing	PC Sum	1	50,000,000	50,000,000
Carried to Collection					**203,500,000**
1.4.2	Prepare and submit As-built drawings as per Specifications and to the Engineer's approval	PC Sum	1	10,000,000	10,000,000
1.4.3	Prepare and submit Operation and Maintenance Manuals as per Specifications and to the Engineer's approval	PC Sum	1	5,000,000	5,000,000
1.4.4	Consumer advocacy and surveys by others	PC Sum	1	70,000,000	70,000,000
1.4.5	Allow sum for consumer sensitisation on HIV by others	PC Sum	1	20,000,000	20,000,000
1.5	**R.E.'s Accommodation**				-
1.5.1	Payment of alternative accommodation for the Resident Engineer and his staff for maximum of one month before rental houses are available	PC Sum	1	6,000,000	6,000,000
1.5.2	Rental charges for 1No. Senior Resident Engineer's staff residential accommodation of area not less than 150m^2 in an approved location.	PC Sum	1	7,200,000	7,200,000
1.5.3	Rental charges for 1No. Junior Resident Engineer's staff residential accommodation of area not less than 150m^2 in an approved location.	PC Sum	1	4,800,000	4,800,000
1.5.4	Allow PC Provision of Double Cabin Pick-up transport vehicle	nr	1	200,000,000	200,000,000
1.5.5	Allow PC Double Cabin Pick-up transport vehicle (2No.)-running cost	km	25000	4,000	100,000,000
1.5.6	Allow a P.C Sum for the RE's miscellaneous account	PC sum	1	10,000,000	10,000,000
1.5.7	Allow a PC sum for furnishing to the 1No. Resident Engineer's Senior Staff Houses	PC Sum	1	10,000,000	10,000,000
1.5.8	Allow a PC sum for furnishing to the 1No. Resident Engineer's Junior Staff Houses	PC Sum	1	10,000,000	10,000,000
	Equipment for use by the R.E.'s Staff				-
1.6.1	Provision of office equipment as specified in the Specifications including furnishings.	PC sum	1	10,000,000	10,000,000
1.6.2	Provision of rental survey equipment as specified in the Specifications	PC sum	1	15,000,000	15,000,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB G-1					
DESCRIPTION: GENERAL ITEMS					
ITEM NO.	**DESCRIPTION**	**UNIT**	**QTY**	**UNIT RATE (Ushs)**	**AMOUNT (Ushs)**
A420.2	Emergency compensation payments to land, crops, removal of structures or property owners made on behalf of the employer	P. Sum	1	50,000,000	50,000,000
A420.5	Environmental protection of water sources by Others	P. Sum	1	70,000,000	70,000,000
A420.6	All profits and overheads on Item No.1.5.1 to A420.5 as inserted for Prime cost Item in Appendix to Tender	%	20%	548,004,000	109,600,800
	Testing works				
	Testing of Materials				-
A270.3	Additional Testing of materials ordered by the Engineer to be carried out by Material Laboratories approved by the Ministry of Works	sum	1	10,000,000	10,000,000
	Temporary Works				-
A289.3	Provision for work in water affected areas, including dewatering of sites and work areas, all temporary works, protection, access, etc to ensure the works are completed as specified; include removal of facilities.	sum	1	20,000,000	20,000,000
Carried to Collection					**737,600,800**
	COLLECTION				
	Collection, Page 1/1				203,500,000
	Collection, Page 1/2				737,600,800

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-1					
DESCRIPTION: RECEIVING CHAMBER AND CONTAINMENT TANK					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	ANEAROBIC BAFFLED REACTOR				
	PREAMBLE				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-1					
DESCRIPTION: RECEIVING CHAMBER AND CONTAINMENT TANK					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
Note 1	The works measured in this bill are covered under the Specifications. The relevant drawings are the DRAWING **MWE/WSDF-C/WB/004**. (Including references made there-in to other drawings)	item			
	CLIMATIC CONDITIONS				
Note 3	Refer to Specification Clause 1.1.02 - Climatic Conditions - detailing wet/dry seasons; The Tenderer is to provide in his price for all temporary works required to complete this work under these conditions.	Item			
	CLASS E: EARTHWORKS				
	EXCAVATION FOR FOUNDATIONS				
	Material other than topsoil, rock or artificial hard material, commencing surface is the underside of artificial hard material removal				
E323	Maximum Depth: not exceeding 0.25 m	m^3	6.5	10,000	64,700
E323	Maximum Depth 0.25 - 0.5m	m^3	6.5	10,000	65,000
E323	Maximum Depth 0.5 - 1m	m^3	12.8	12,000	153,960
E324	Maximum Depth 1 - 2m	m^3	25.7	14,500	372,070
E325	Maximum Depth 2 - 5m	m^3	48.8	18,500	902,060
	In rock, commencing surface is the exposed surface of the rock				
E334	Maximum Depth 1 - 2m	m^3	10.0	50,000	500,000
	EXCAVATION ANCILLARIES				
	Preparation of excavated surfaces				
E522	Material other than topsoil, rock or artificial hard material	m^2	25.6	5,000	128,000
E523	Rock surfaces	m^2	25.6	50,000	1,280,000
Carried to Collection					**3,465,790**
	CLASS E: EARTHWORKS (Cont'd)				
	EXCAVATION ANCILLARIES (Cont'd)				
	Disposal of excavated material				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-1					
DESCRIPTION: RECEIVING CHAMBER AND CONTAINMENT TANK					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
E532	Material other than topsoil, rock or artificial hard material	m3	87.3	20,000	1,745,400
	FILLING				
	To Embankments				
E624	Selected excavated material other than topsoil or rock	m3	31.0	5,000	155,000
E626	Excavated Rock	m3	10.0	20,000	200,000
	FILLING ANCILLARIES				
	Trimming of Filled Surfaces				
E712.1	Material other than topsoil, rock or artificial hard material.	m2	31.0	3,000	93,000
E712.2	Material other than topsoil, rock or artificial hard material, inclined at an angle of 10 deg to 45 deg to the horizontal.	m2	31.0	3,000	93,000
E713.1	Excavated Rock:	m2	10.0	20,000	200,000
E713.2	Excavated Rock: inclined at an angle of 10 deg to 45 deg to the horizontal.	m2	10.0	20,000	200,000
	CLASS F: IN-SITU CONCRETE				
	PROVISION OF CONCRETE				
	Ordinary Designed Mix Concrete				
	Grade 15/20				
	Designed mix, grade 15/20 concrete, to BS 5328, with ordinary Portland cement to BS 12, aggregate to BS882, for the following aggregate sizes				
F233	20mm aggregate	m3	6.0	450,000	2,700,000
	Grade 30/20				
	Designed mix, grade 30/20 concrete, to BS 5328, with ordinary portland cement to BS 12, aggregate to BS882, for the following aggregate sizes				
F253	20mm aggregate	m3	34.2	550,000	18,810,000
Carried to Collection					**24,196,400**
	CLASS F: IN-SITU CONCRETE (Cont'd)				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-1					
DESCRIPTION: RECEIVING CHAMBER AND CONTAINMENT TANK					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	PLACING MASS CONCRETE				
	Blinding				
	Placing blinding concrete, for ground slab, grade 15/20				
F511	Thickness not exceeding 150mm	m3	6.0	180,000	1,080,000
	PLACING REINFORCED CONCRETE				
	Bases, Footings, Pile Caps & Ground Slabs				
	Placing reinforced concrete 30/20,				
F623	Thickness 150 - 300mm	m^3	18.0	180,000	3,240,000
	Walls				
	Placing reinforced concrete, grade 30/20				
F644	Thickness 150 - 300mm	m3	34.2	180,000	6,156,000
	CLASS G: CONCRETE ANCILLARIES				
	FORMWORK: FAIR FINISH				
	Plane Vertical				
G243.1	Width: 0.10 - 0.2m - ground and suspended slab	m2	7.2	35,000	252,000
G243.1	Width: 0.2 - 0.4m internal walls	m2	10.4	35,000	365,400
G243.2	Width: 0.2 - 0.4m external walls	m2	7.2	35,000	252,000
G244.1	Width: 0.40m - 1.22m internal walls	m2	42.8	35,000	1,498,000
G244.2	Width: 0.40m - 1.22m external walls	m2	14.8	35,000	516,600
G245.1	Width: exceeding 1.22m - internal walls	m2	92.9	35,000	3,252,200
G245.2	Width: exceeding 1.22m - external walls	m2	32.0	35,000	1,121,400
	Plane horizontal				
G215	Width: exceeding 1.22m - suspended slab	m2	14.0	35,000	490,000
Carried to Collection					**18,223,600**
	CLASS G: CONCRETE ANCILLARIES (Cont'd)				
	REINFORCEMENT				
	Deformed High Yield Steel				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-1					
DESCRIPTION: RECEIVING CHAMBER AND CONTAINMENT TANK					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	Hot rolled high yield ribbed bars of yield strength of 460N/mm2 to BS 4449 and of the following sizes				
G524	Nominal size, 6-16mm	t	5.3	5,000,000	26,500,000
	JOINTS				
	Formed Surface for water stop				
G644	Average width: not exceeding 0.5m	m^2	120.0	15,000	1,800,000
	Plastic or Rubber waterstops				
G652	Horizontal - Average width 150 - 200mm, Specification Reference 2.2.20 - between slab and walls and in midway for the external walls	m	66.4	150,000	9,960,000
	FINISHING OF TOP SURFACES				
G812.1	Steel Trowel to top of suspended slabs	m2	27.0	15,000	405,000
G812.2	Steel Trowel finish to top surfaces of base slab	m2	27.0	15,000	405,000
	INSERTS				
G832.1	Other Inserts - vent pipes to suspended slab; project from two surfaces of the concrete	nr	2.0	25,000	50,000
G832.2	Other Inserts - 100mm - inlet & outlet pipes through walls; project from two surfaces of the concrete	nr	20.0	25,000	500,000
	CLASS H: PRECAST CONCRETE				
	PROVISION OF CONCRETE				
	Precast concrete slabs, Area not exceeding $1m^2$				
H511	Mass: not exceeding 250kg - 680 x 680 x 75mm - Precast concrete heavy-duty manhole covers with frame and lifting lugs: 680mm x 680mm complete.	nr	9.0	150,000	1,350,000
Carried to Collection					**40,970,000**
	CLASS I: PIPEWORK - PIPES				
	UNPLASTICISED POLYVINAL CHLORIDE (uPVC) PIPES TO BS EN 1401-1: 2009				
	Nominal bore: 150 mm				
I512	In trenches, depth: not exceeding 1.5 m	m	15.0	85,000	1,275,000
	CLASS J: PIPEWORK - FITTINGS AND				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-1					
DESCRIPTION: RECEIVING CHAMBER AND CONTAINMENT TANK					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	VALVES				
	UNPLASTICISED POLYVINAL CHLORIDE (uPVC) PIPES TO BS EN 1401-1: 2009				
	Junctions and branches				
J421	Nominal bore 150mm - Tee	nr	2.0	80,000	160,000
	VENT PIPES				
J481	100mm diameter uPVC soil and vent pipe 2400mm high including wire balloon grating with concrete sorrounding to 1.0m height of 300mm diameter.	nr	2.0	240,000	480,000
	CLASS U; BRICKWORK, BLOCKWORK AND MASONRY				
	Concrete Blockwork				
	Dense concrete blockwork to BS 7263, jointed with ordinary 1:4 cement mortar, hoop irons every three courses,				
U511	150mm thick inlet and outlet chamber walls	m²	5.0	55,000	275,000
	Rendering				
U511	1:4 cement sand screed to walls of the inlet and outlet chambers	m²	10.0	12,000	120,000
	Roofing				
ODR W-1.1	Construct roofing, complete as in the drawings and as specified; include tie beams, purlins, rafters, struts, wall plate, facia board and all roofing timber, eave closing, gauge 26 prepainted GCI resin sheeting and ridges	m²	55.0	150,000	8,250,000
Carried to Collection					**10,560,000**
	Bill Summary				
	Collection, Page 1/5				3,465,790
	Collection, Page 2/5				24,196,400
	Collection, Page 3/5				18,223,600
	Collection, Page 4/5				40,970,000
	Collection, Page 5/5				10,560,000
Carried to Grand Summary					**97,415,790**

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-2					
DESCRIPTION: SCREEN AND GRIT CHAMBER					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	SCREEN AND GRIT CHAMBERS				
	PREAMBLE				
Note 1	The works measured in this bill are covered under the Specifications. The relevant drawings are the DRAWING **MWE/WSDF_C/WB/001** (including references made there-in to other drawings)	item			
Note 2	**CLIMATIC CONDITIONS**				
	-				
	Refer to Specification Clause 1.1.02 - Climatic Conditions - detailing wet/dry seasons; The Tenderer is to provide in his price for all temporary works required to complete this work under these conditions.	Item			
	CLASS E: EARTHWORKS				
	EXCAVATION FOR FOUNDATIONS				
	Material other than topsoil, rock or artificial hard material, commencing surface is the underside of topsoil strip				
E422	Maximum Depth 0.25 - 0.5m	m^3	9.2	10,000	91,500
E423	Maximum Depth 0.5 - 1 m	m^3	18.3	12,000	219,600
E423	Maximum Depth 1 - 2 m	m^3	27.5	14,500	398,025
	EXCAVATION ANCILLARIES				
	Preparation of excavated surfaces for whole structure in the following materials				
E522	Material other than topsoil, rock or artificial hard material	m^2	18.0	3,000	54,000
E523	Rock surfaces	m^2	18.0	20,000	360,000
	Disposal of excavated material				
E532	Material other than topsoil, rock or artificial hard material	m^3	49.9	20,000	998,000
E533	Rock	m^3	5.0	50,000	250,000
	FILLING				
	To stated depth or thickness				
E647.1	Imported rock - 300mm thick	m^2	18.0	75,000	1,350,000
E647.2	Imported Soil	m^2	20.0	35,000	700,000
Carried to Collection					**4,421,125**
	CLASS F: IN-SITU CONCRETE				
	PROVISION OF CONCRETE				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-2					
DESCRIPTION: SCREEN AND GRIT CHAMBER					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	Ordinary Designed Mix Concrete				
	Grade 15/20				
	Designed mix, grade 15/20 concrete, to BS 5328, with ordinary portland cement to BS 12 , aggregate to BS882 , for the following aggregate sizes				
F233	20mm aggregate	m^3	2.4	450,000	1,080,000
	Grade 25/20				
	Designed mix, grade 25/20 concrete, to BS 5328, with ordinary portland cement to BS 12, aggregate to BS882 , for the following aggregate sizes				
F253	20mm aggregate - Concrete channel coveying FS to the thickening tank	m^3	7.2	500,000	3,600,000
	Grade 30/20				
	Designed mix, grade 35/20 concrete, to BS 5328, with ordinary portland cement to BS 12 , aggregate to BS882 , for the following aggregate sizes				
F253	20mm aggregate- walls	m3	9.0	550,000	4,950,000
	PLACING MASS CONCRETE				
	Blinding				
	Placing blinding concrete, for ground slab, grade 15/20				
F511	Thickness not exceeding 150mm	m3	2.4	180,000	432,000
	PLACING REINFORCED CONCRETE				
	Bases, Footings, Pile Caps & Ground Slabs				
	Placing reinforced concrete 30/20,				
F621	Thickness: not exceeding 150mm - channel connecting to the thickening tanks	m^3	7.2	180,000	1,296,000
	Walls				
	Placing reinforced concrete, grade 30/20				
F641	Thickness: not exceeding 150mm - Screen channel and grit chamber	m^3	9.0	180,000	1,620,000
Carried to Collection					**12,978,000**
	CLASS G: CONCRETE ANCILLARIES				
	FORMWORK: FAIR FINISH				
	Plane Vertical				
G242	Width: 0.1 - 0.2 m (Edges of slab)	m	31.6	12,000	378,600
G243	Width: 0.2 - 0.4 m	m^2	12.6	35,000	441,700
G244	Width: 0.4 - 1.22 m	m^2	36.3	35,000	1,269,800
G245	Width: exceeding 1.22 m	m^2	36.3	35,000	1,270,500

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-2					
DESCRIPTION: SCREEN AND GRIT CHAMBER					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	CONCRETE ACCESSORIES				
	Finishing of top surface				
G811	Steel trowel finish to top surface of surface of Slab in screen and grit channels and top surfaces of the walls	m2	12.0	12,000	144,000
	REINFORCEMENT				
	Deformed High Yield Steel				
	Hot rolled high yield ribbed bars of yield strength of 460N/mm2 to BS 4449 and of the following sizes				
G524	Nominal size, 6-16mm	t	1.6	5,000,000	8,100,000
	Steel Fabric				
	Steel fabric to BS4483				
G522	Nominal mass: 2 - 3 kg/m^2 - A142	m^2	20.0	15,000	300,000
	JOINTS				
	Plastic or Rubber waterstops				
G652.1	Horizontal - Average width: not exceeding 150mm	m	31.6	150,000	4,732,500
G652.2	Vertical - Average width 150 - 200mm, Specification Reference 2.2.20	m	10.0	150,000	1,500,000
	CONCRETE ACCESSORIES - CONT'D				
	INSERTS				
G831	Linear Inserts - Build-in 150mm diameter inlet and outlet	nr	1.0	800,000	800,000
	CLASS H: PRECAST CONCRETE				
	PROVISION OF CONCRETE				
	Precast concrete slabs, Area not exceeding 1m^2				
H511	Mass: not exceeding 250kg - 260 x 500 x 60mm	nr	13.0	25,000	325,000
Carried to Collection					**19,262,100**
	CLASS I: PIPEWORK - PIPES				
	DUCTILE SPUN IRON PIPES TO BS EN 598				
	OUTLET PIPE				
	Nominal bore : 150 mm				
I312	In Trenches: depth not exceeding 1.5m	m	10.0	150,000	1,500,000
	CLASS J: PIPEWORK - FITTINGS AND VALVES				
	Valves and Penstocks				
	Sluice Gate: Manual Operated				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-2					
DESCRIPTION: SCREEN AND GRIT CHAMBER					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	Stainless Steel penstock complete with channels, spindle; manually operated, complete with floor pillar, handwheel and gearbox				
J812	300 - 600mm nominal bore; fixed to channel in reinforced concrete walls	nr	4.0	2,800,000	11,200,000.00
	CLASS N: MISCELLANEOUS METAL WORK				
	BAR SCREEN				
	Stainless Steel - 16mm Bar Screen, complete.: Drg MWE/WSDF-C/KN/001				
N190.1	Fixed to a reinforced concrete structure; 1000mm long x 600mm wide	nr	2.0	1,200,000	2,400,000
	CLASS N: MISCELLANEOUS METAL WORK CONT'D				
	GALVANISED STEEL PLATFORM				
	Provide and Fix Galvanised metal open grid access platform over Sludge Channel.				
N190.3	Fixed to reinforced concrete structure; 1000mm long x 560mm wide	nr	2.0	1,000,000	2,000,000
Carried to Collection					**17,100,000**
	COLLECTION				
	Collection, Page 1/4				4,421,125
	Collection, Page 2/4				12,978,000
	Collection, Page 3/4				19,262,100
	Collection, Page 4/4				17,100,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-3					
DESCRIPTION: SETTLING- THICKENING TANK					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	SETTLING - THICKENING TANK				
	PREAMBLE				
Note 1	The works measured in this bill are covered under the Specifications. The relevant drawings are the DRAWING **MWE/WSDF-C/WB/002.** (Including references made there-in to other drawings)	item			

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-3					
DESCRIPTION: SETTLING- THICKENING TANK					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	CLIMATIC CONDITIONS				
Note 3	Refer to Specification Clause 1.1.02 - Climatic Conditions - detailing wet/dry seasons; The Tenderer is to provide in his price for all temporary works required to complete this work under these conditions.	Item			
	CLASS E: EARTHWORKS				
	EXCAVATION FOR FOUNDATIONS				
	Material other than topsoil, rock or artificial hard material, commencing surface is the underside of artificial hard material removal				
E323	Maximum Depth: not exceeding 0.25 m	m3	15.0	10,000	150,000
E323	Maximum Depth 0.25 - 0.5 m	m3	15.0	10,000	150,000
E323	Maximum Depth 0.5 - 1m	m3	30.0	12,000	360,000
E324	Maximum Depth 1 - 2m	m3	60.0	14,500	870,000
E325	Maximum Depth 2 - 5m	m3	120.0	18,500	2,220,000
	EXCAVATION ANCILLARIES				
	Preparation of excavated surfaces				
E522	Material other than topsoil, rock or artificial hard material	m2	32.4	5,000	162,000
E523	Rock surfaces	m2	10.0	20,000	200,000
	Disposal of excavated material				
E532	Material other than topsoil, rock or artificial hard material	m3	187.7	20,000	3,754,000
Carried to Collection					7,866,000
	CLASS E: EARTHWORKS (Cont'd)				
	FILLING ANCILLARIES				
	Trimming of Filled Surfaces				
E712.1	Material other than topsoil, rock or artificial hard material.	m2	42.4	3,000	127,200
E712.2	Material other than topsoil, rock or artificial hard material, inclined at an angle of 10 deg to 45 deg to the horizontal.	m2	42.4	5,000	212,000
E713.1	Excavated Rock:	m2	42.4	5,000	212,000
E713.2	Excavated Rock: inclined at an angle of 10 deg to 45 deg to the horizontal.	m2	42.4	50,000	2,120,000
	CLASS F: IN-SITU CONCRETE				
	PROVISION OF CONCRETE				
	Ordinary Designed Mix Concrete				
	Grade 15/20				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-3					
DESCRIPTION: SETTLING- THICKENING TANK					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	Designed mix, grade 15/20 concrete, to BS 5328, with ordinary Portland cement to BS 12, aggregate to BS882, for the following aggregate sizes				
F233	20mm aggregate	m3	6.0	450,000	2,700,000
	Grade 30/20				
	Designed mix, grade 30/20 concrete, to BS 5328, with ordinary Portland cement to BS 12, aggregate to BS882, for the following aggregate sizes				
F253	20mm aggregate	m3	71.0	550,000	39,050,000
	PLACING MASS CONCRETE				
	Blinding				
	Placing blinding concrete, for ground slab, grade 15/20				
F511	Thickness not exceeding 150mm	m3	6.0	180,000	1,080,000
Carried to Collection					45,501,200
	CLASS F: IN-SITU CONCRETE (Cont'd)				
	PLACING REINFORCED CONCRETE				
	Bases, Footings, Pile Caps & Ground Slabs				
	Placing reinforced concrete 30/20,				
F623	Thickness 150 - 300mm	m³	18.0	180,000	3,240,000
	Walls				
	Placing reinforced concrete, grade 30/20				
F644	Thickness 150 - 300mm	m3	53.0	180,000	9,540,000
	CLASS G: CONCRETE ANCILLARIES				
	FORMWORK: FAIR FINISH				
	Plane Vertical				
G243.1	Width: 0.10 - 0.2m - ground slab	m2	7.2	35,000	252,000
G243.1	Width: 0.2 - 0.4m internal walls	m2	9.9	35,000	346,500
G243.2	Width: 0.2 - 0.4m external walls	m2	7.2	35,000	252,000
G244.1	Width: 0.40m - 1.22m internal walls	m2	40.7	35,000	1,423,450
G244.2	Width: 0.40m - 1.22m external walls	m2	29.9	35,000	1,044,750
G245.1	Width: exceeding 1.22m - internal walls	m2	108.1	35,000	3,784,200
G245.2	Width: exceeding 1.22m - external walls	m2	79.3	35,000	2,775,500
	For Voids				
G479.1	Large voids 1500 x 300 in 150mm thickening tank outlet partition wall	nr	2.0	35,000	70,000
	REINFORCEMENT				
	Deformed High Yield Steel				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-3					
DESCRIPTION: SETTLING- THICKENING TANK					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	Hot rolled high yield ribbed bars of yield strength of 460N/mm2 to BS 4449 and of the following sizes				
G524	Nominal size, 6-16mm	t	7.7	5,000,000	38,500,000
Carried to Collection					61,228,400
	JOINTS				
	Formed Surface for water stop				
G644	Average width: not exceeding 0.5m	m2	20.0	150,000	3,000,000
	Plastic or Rubber water stops				
G652	Horizontal - Average width 150 - 200mm, Specification Reference 2.2.20 - between slab and walls and in midway for the external walls	m	88.0	150,000	13,200,000
	FINISHING OF TOP SURFACES				
G812.1	Steel Trowel to top surface of walls	m2	10.0	15,000	150,000
G812.2	Steel Trowel finish to top surfaces of base slab	m2	40.0	15,000	600,000
	INSERTS				
G832.2	Other Inserts - DN 150mm - inlet & outlet pipes through walls;	nr	4.0	50,000	200,000
	CLASS I: PIPEWORK - PIPES				
	DUCTILE SPUN IRON PIPES TO BS EN 598				
	Nominal bore: 150 mm				
I322	In Trenches: depth not exceeding 1.5m - pumping main to the drying beds	m	40.0	200,000	8,000,000
	UNPLASTICISED POLYVINAL CHLORIDE (uPVC) PIPES TO BS EN 1401-1: 2009				
	Nominal bore; not exceeding 200mm				
I511	Not in Trenches	m	2.0	65,000	130,000
I511	In Trenches, depth not exceeding 1.5m	m	10.0	85,000	850,000
	CLASS J: PIPEWORK - FITTINGS AND VALVES				
	DUCTILE SPUN IRON PIPES TO BS EN 598				
	All Flanged 90-degree bends to PN 16				
J311.1	Nominal bore 40mm	nr	2.0	160,000	320,000
J311.2	Nominal bore 150mm	nr	3.0	380,000	1,140,000
Carried to Collection					27,590,000
	Junctions and Branches to PN 16				
J321	Nominal Bore 150 x 150mm flanged tee	nr	1.0	380,000	380,000
	Flanged Tapers to PN 16				
J331	DN 150 x 40mm reducer.	Nr.	2.0	450,000	900,000
	Adaptors to PN 16				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-3					
DESCRIPTION: SETTLING- THICKENING TANK					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
J351.1	DN 40 flange adaptor.	Nr.	2.0	150,000	300,000
J351.2	DN 150 flange adaptor.	Nr.	1.0	380,000	380,000
	Straight specials; flanged pipe with puddle flange from one end, 2000 mm long				
J381.1	Nominal bore: 150 mm	Nr.	4.0	600,000	2,400,000
	Straight specials; double flanged pipe, Nominal bore: 150 mm				
J381.2	2600 mm long	Nr.	1.0	600,000	600,000
J381.3	500 mm long, with puddle flange	Nr.	2.0	380,000	760,000
J381.4	2400 mm long	Nr.	1.0	600,000	600,000
	UNPLASTICISED POLYVINAL CHLORIDE (uPVC) PIPE FITTINGS TO BS EN 1401-1: 2009				
	Inlet and outlet bends				
J411	Nominal Bore; not exceeding 200mm	nr	4.0	200,000	800,000
	Valves and Penstocks				
	Gate Valve: Manual Operated				
	All flanged CI gate valves to BS 5163, flanges to BS 4505, complete with Spindle & Pillar as shown on Drg. MWE/WSDF-C/WB/002				
J811	150 mm Nominal Bore	nr	2.0	1,750,000	3,500,000
	Penstock:				
	Stainless Steel penstock complete with channels, spindle; manually operated, complete with floor pillar, handwheel and gearbox				
J812	200 - 300mm nominal bore; fixed to channel in reinforced concrete walls	nr	2.0	1,050,000	2,100,000
Carried to Collection					12,720,000
	CLASS K: PIPEWORK AND MANHOLE ANCILLARIES				
	OTHER STATED CHAMBERS				
	PUMP CHAMBER				
K137	Provide for the construction and finishing of the Manhole in Drawing **MWE/WSDF-C/KN/002** - 1.8m long, 1.6m wide and internal depth of 3.1m. Including all concrete, formwork, steel reinforcement, inserts, voids, finishing's, covers and step irons etc.	item	2.0	3,100,000	6,200,000
	CLASS N; MISCELLANEOUS METALWORK				
	Ladders				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-3					
DESCRIPTION: SETTLING- THICKENING TANK					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	Steel ladders to BS 4211, galvanised to BS 729, fixed to onto reinforced concrete wall	m	6.5	180,000	1,170,000
	CLASS U; BRICKWORK, BLOCKWORK AND MASONRY				
	Concrete Blockwork				
	Dense concrete blockwork to BS 7263, jointed with ordinary 1:4 cement mortar, hoop irons every three courses,				
U511	150mm thick inlet and outlet chamber walls	m²	6.0	55,000	330,000
	Rendering				
U511	1:4 cement sand screed to walls of the inlet and outlet chambers	m²	12.0	12,000	144,000
Carried to Collection					7,844,000
	Bill Summary				
	Collection, Page 1/6				7,866,000
	Collection, Page 2/6				45,501,200
	Collection, Page 3/6				61,228,400
	Collection, Page 4/6				27,590,000
	Collection, Page 5/6				12,720,000
	Collection, Page 6/6				7,844,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-4					
DESCRIPTION: RECEIVING CHAMBER AND CONTAINMENT TANK					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	ANEAROBIC BAFFLED REACTOR				
	PREAMBLE				
Note 1	The works measured in this bill are covered under the Specifications. The relevant drawings are the DRAWING **MWE/WSDF-C/KN/004**. (Including references made there-in to other drawings)	item			
	CLIMATIC CONDITIONS				
Note 3	Refer to Specification Clause 1.1.02 - Climatic Conditions - detailing wet/dry seasons; The Tenderer is to provide in his price for all temporary works required to complete this work	Item			

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-4					
DESCRIPTION: RECEIVING CHAMBER AND CONTAINMENT TANK					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	under these conditions.				
	CLASS E: EARTHWORKS				
	EXCAVATION FOR FOUNDATIONS				
	Material other than topsoil, rock or artificial hard material, commencing surface is the underside of artificial hard material removal				
E323	Maximum Depth: not exceeding 0.25 m	m^3	6.5	10,000	64,700
E323	Maximum Depth 0.25 - 0.5m	m^3	6.5	10,000	65,000
E323	Maximum Depth 0.5 - 1m	m^3	12.8	12,000	153,960
E324	Maximum Depth 1 - 2m	m^3	25.7	14,500	372,070
E325	Maximum Depth 2 - 5m	m^3	48.8	18,500	902,060
	In rock, commencing surface is the exposed surface of the rock				
E334	Maximum Depth 1 - 2m	m^3	10.0	50,000	500,000
	EXCAVATION ANCILLARIES				
	Preparation of excavated surfaces				
E522	Material other than topsoil, rock or artificial hard material	m^2	25.6	5,000	128,000
E523	Rock surfaces	m^2	25.6	50,000	1,280,000
Carried to Collection					**3,465,790**
	CLASS E: EARTHWORKS (Cont'd)				
	EXCAVATION ANCILLARIES (Cont'd)				
	Disposal of excavated material				
E532	Material other than topsoil, rock or artificial hard material	m3	87.3	20,000	1,745,400
	FILLING				
	To Embankments				
E624	Selected excavated material other than topsoil or rock	m3	31.0	5,000	155,000
E626	Excavated Rock	m3	10.0	20,000	200,000
	FILLING ANCILLARIES				
	Trimming of Filled Surfaces				
E712.1	Material other than topsoil, rock or artificial hard material.	m2	31.0	3,000	93,000
E712.2	Material other than topsoil, rock or artificial hard material, inclined at an angle of 10 deg to 45 deg to the horizontal.	m2	31.0	3,000	93,000
E713.1	Excavated Rock:	m2	10.0	20,000	200,000
E713.2	Excavated Rock: inclined at an angle of 10 deg to 45 deg to the horizontal.	m2	10.0	20,000	200,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-4					
DESCRIPTION: RECEIVING CHAMBER AND CONTAINMENT TANK					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	CLASS F: IN-SITU CONCRETE				
	PROVISION OF CONCRETE				
	Ordinary Designed Mix Concrete				
	Grade 15/20				
	Designed mix, grade 15/20 concrete, to BS 5328, with ordinary Portland cement to BS 12, aggregate to BS882, for the following aggregate sizes				
F233	20mm aggregate	m3	6.0	450,000	2,700,000
	Grade 30/20				
	Designed mix, grade 30/20 concrete, to BS 5328, with ordinary Portland cement to BS 12, aggregate to BS882, for the following aggregate sizes				
F253	20mm aggregate	m3	34.2	550,000	18,810,000
Carried to Collection					**24,196,400**
	CLASS F: IN-SITU CONCRETE (Cont'd)				
	PLACING MASS CONCRETE				
	Blinding				
	Placing blinding concrete, for ground slab, grade 15/20				
F511	Thickness not exceeding 150mm	m3	6.0	180,000	1,080,000
	PLACING REINFORCED CONCRETE				
	Bases, Footings, Pile Caps & Ground Slabs				
	Placing reinforced concrete 30/20,				
F623	Thickness 150 - 300mm	m^3	18.0	180,000	3,240,000
	Walls				
	Placing reinforced concrete, grade 30/20				
F644	Thickness 150 - 300mm	m3	34.2	180,000	6,156,000
	CLASS G: CONCRETE ANCILLARIES				
	FORMWORK: FAIR FINISH				
	Plane Vertical				
G243.1	Width: 0.10 - 0.2m - ground and suspended slab	m2	7.2	35,000	252,000
G243.1	Width: 0.2 - 0.4m internal walls	m2	10.4	35,000	365,400
G243.2	Width: 0.2 - 0.4m external walls	m2	7.2	35,000	252,000
G244.1	Width: 0.40m - 1.22m internal walls	m2	42.8	35,000	1,498,000
G244.2	Width: 0.40m - 1.22m external walls	m2	14.8	35,000	516,600
G245.1	Width: exceeding 1.22m - internal walls	m2	92.9	35,000	3,252,200
G245.2	Width: exceeding 1.22m - external walls	m2	32.0	35,000	1,121,400
	Plane horizontal				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-4					
DESCRIPTION: RECEIVING CHAMBER AND CONTAINMENT TANK					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
G215	Width: exceeding 1.22m - suspended slab	m2	14.0	35,000	490,000
Carried to Collection					**18,223,600**
	CLASS G: CONCRETE ANCILLARIES (Cont'd)				
	REINFORCEMENT				
	Deformed High Yield Steel				
	Hot rolled high yield ribbed bars of yield strength of 460N/mm2 to BS 4449 and of the following sizes				
G524	Nominal size, 6-16mm	t	5.3	5,000,000	26,500,000
	JOINTS				
	Formed Surface for water stop				
G644	Average width: not exceeding 0.5m	m^2	120.0	15,000	1,800,000
	Plastic or Rubber water stops				
G652	Horizontal - Average width 150 - 200mm, Specification Reference 2.2.20 - between slab and walls and in midway for the external walls	m	66.4	150,000	9,960,000
	FINISHING OF TOP SURFACES				
G812.1	Steel Trowel to top of suspended slabs	m2	27.0	15,000	405,000
G812.2	Steel Trowel finish to top surfaces of base slab	m2	27.0	15,000	405,000
	INSERTS				
G832.1	Other Inserts - vent pipes to suspended slab; project from two surfaces of the concrete	nr	2.0	25,000	50,000
G832.2	Other Inserts - 100mm - inlet & outlet pipes through walls; project from two surfaces of the concrete	nr	20.0	25,000	500,000
	CLASS H: PRECAST CONCRETE				
	PROVISION OF CONCRETE				
	Precast concrete slabs, Area not exceeding $1m^2$				
H511	Mass: not exceeding 250kg - 680 x 680 x 75mm - Precast concrete heavy-duty manhole covers with frame and lifting lugs: 680mm x 680mm complete.	nr	9.0	150,000	1,350,000
Carried to Collection					**40,970,000**
	CLASS I: PIPEWORK - PIPES				
	UNPLASTICISED POLYVINAL CHLORIDE (uPVC) PIPES TO BS EN 1401-1: 2009				
	Nominal bore: 150 mm				
I512	In trenches, depth: not exceeding 1.5 m	m	15.0	85,000	1,275,000
	CLASS J: PIPEWORK - FITTINGS AND VALVES				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-4					
DESCRIPTION: RECEIVING CHAMBER AND CONTAINMENT TANK					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	UNPLASTICISED POLYVINAL CHLORIDE (uPVC) PIPES TO BS EN 1401-1: 2009				
	Junctions and branches				
J421	Nominal bore 150mm - Tee	nr	2.0	80,000	160,000
	VENT PIPES				
J481	100mm diameter uPVC soil and vent pipe 2400mm high including wire balloon grating with concrete surrounding to 1.0m height of 300mm diameter.	nr	2.0	240,000	480,000
Carried to Collection					**1,915,000**
	Bill Summary				
	Collection, Page 1/5				3,465,790
	Collection, Page 2/5				24,196,400
	Collection, Page 3/5				18,223,600
	Collection, Page 4/5				40,970,000
	Collection, Page 5/5				1,915,000
Carried to Grand Summary					**88,770,790**

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-5					
DESCRIPTION: SLUDGE DRYING BEDS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	SLUDGE DRYING BEDS				
	PREAMBLE				
Note 1	The works measured in this bill are covered under the Particular Specifications. The relevant drawings are the DRAWINGS **MWE/WSDF_C/WB/006** (including references made there-in to other drawings)	item			
	CLIMATIC CONDITIONS				
Note 2	Refer to Specification Clause 1.1.02 - Climatic Conditions - detailing wet/dry seasons; The Tenderer is to provide in his price for all temporary works required to complete this work under these conditions.	Item			
	CLASS E: EARTHWORKS				
	EXCAVATION FOR FOUNDATIONS				
	Material other than topsoil, rock or artificial hard material, commencing surface is the underside of artificial hard material removal				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-5					
DESCRIPTION: SLUDGE DRYING BEDS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
E323	Maximum Depth: not exceeding 0.25 m	m3	168.2	10,000	1,682,000
E322	Maximum Depth: 0.25 - 0.5m	m3	168.2	10,000	1,682,000
E323	Maximum Depth: 0.5 - 1m	m3	336.3	12,000	4,036,080
E324	Maximum Depth: 1 - 2m	m3	336.3	14,500	4,876,350
	In rock, commencing surface is the exposed surface of the rock				
E333	Maximum Depth: 1 - 2m	m³	20.0	50,000	1,000,000
	EXCAVATION ANCILLARIES				
	Preparation of excavated surfaces for whole structure in the following materials				
E522	Material other than topsoil, rock or artificial hard material	m²	622.7	5,000	3,113,400
E523	Rock surfaces	m²	50.0	20,000	1,000,000
	Disposal of excavated material				
E532	Material other than topsoil, rock or artificial hard material	m3	971.0	20,000	19,420,320
E533	Rock	m3	20.0	20,000	400,000
	Double handling of excavated material				
E542	Material other than topsoil, rock or artificial hard material - Column footings	m3	38.0	20,000	760,480
Carried to Collection					**37,970,630**
	FILTER MEDIUM TO SLUDGE DRYING BEDS				
	Imported natural material other than topsoil or rock				
E645.1	Initial Filter Layer of corase gravel (20 - 40mm) as specified; to Sludge Drying Beds: Average 150mm thick	m3	269.1	160,000	43,056,000
E645.2	Second Filter Layer of fine to medium gravel as specified to sludge Drying Beds: 150 mm thick	m3	100.0	160,000	16,000,000
E645.3	Top Filter Layer fine to course sand as Specified to Sludge Drying Bed: 300 mm thick	m3	201.0	180,000	36,180,000
	Preparation of filled surface				
E722.1	Imported natural material; Filter layers	m2	294.0	10,000	2,940,000
	CLASS F: IN-SITU CONCRETE				
	PROVISION OF CONCRETE				
	Ordinary Designed Mix Concrete				
	Grade 15/20				
	Designed mix, grade 15/20 concrete, to BS 5328, with ordinary portland cement to BS 12, aggregate to BS882, for the following aggregate sizes				
F233	20mm aggregate	m3	35.9	450,000	16,159,500
	PROVISION OF CONCRETE (Cont'd)				
	Grade 30/20				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-5					
DESCRIPTION: SLUDGE DRYING BEDS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	Designed mix, grade 30/20 concrete, to BS 5328, with ordinary portland cement to BS 12, aggregate to BS882, for the following aggregate sizes				
F253	20mm aggregate	m3	143.6	550,000	79,002,000
	Grade 30/20 in Column footings and bases				
	Designed mix, grade 30/20 concrete, to BS 5328, with ordinary portland cement to BS 12, aggregate to BS882, for the following aggregate sizes				
F253	20mm aggregate	m3	45.9	550,000	25,239,500
Carried to Collection					**218,577,000**
	CLASS F: IN-SITU CONCRETE (Cont'd)				
	PLACING MASS CONCRETE				
	Blinding				
	Placing blinding concrete, for ground slab, grade 15/20				
F511	Thickness not exceeding 150mm	m3	35.9	180,000	6,463,800
	PLACING REINFORCED CONCRETE				
	Bases, Footings, Pile Caps & Ground Slabs				
	Placing reinforced concrete,				
F622	Thickness 150 - 300mm	m³	159.6	180,000	28,728,000
	Walls				
F642	Thickness 150 - 300mm	m³	56.3	180,000	10,134,000
	Columns				
F653	Cross sectional area 0.1 -0.55m2	m³	4.3	180,000	772,200
	CLASS G: CONCRETE ANCILLARIES				
	FORMWORK: ROUGH FINISH				
	Plane Vertical				
G142.1	Width: 0.20-0.40m - to edges of slab and leachate channel	m2	46.0	35,000	1,610,000
G142.2	Width: 0.20-0.40m - to edges of column bases	m2	83.2	35,000	2,912,000
Carried to Collection					**50,620,000**
	CLASS G: CONCRETE ANCILLARIES (Cont'd)				
	FORMWORK: FAIR FINISH				
	Plane Vertical				
G243.1	Width: 0.20-0.40m - to edges of external walls	m2	25.3	35,000	885,500
G243.2	Width: 0.20-0.40m - to edges of internal walls	m2	35.6	35,000	1,246,000
G244	Width: 0.40 - 1.22m to edges of external walls	m2	163.8	35,000	5,733,000
G243.2	Width: 0.40 - 1.22m to edges of internal walls	m2	231.4	35,000	8,099,000
	For concrete components of constant cross section				
G282	Columns: 350mm x 250mm	m	75.1	12,000	901,680
G283	Walls:	m	0.0	-	-

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-5					
DESCRIPTION: SLUDGE DRYING BEDS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	REINFORCEMENT				
	Deformed High Yield Steel				
	Hot rolled high yield ribbed bars of yield strength of 460N/mm2 to BS 4449 and of the following sizes				
G524	Nominal size, 6-16mm	t	32.0	5,000,000	160,000,000
	JOINTS				
	Plastic or Rubber waterstops				
G652.1	Horizontal - Average width 150 - 200mm, Specification Reference 2.2.20	m	165.4	95,000	15,713,000
G652.2	Vertical - Average width 150 - 200mm, Specification Reference 2.2.20	m	50.0	95,000	4,750,000
	FINISHING OF TOP SURFACES				
G812.1	Steel Trowel. Horizontal	m2	718.2	15,000	10,773,600
G812.2	Wood Trowel. Slope 1 in 20	m2	718.2	15,000	10,773,600
	CLASS I: PIPEWORK - PIPES				
	uPVC PIPES				
	Perforated uPVC Pipes: Nominal Bore 150mm				
I511	Not in Trenches	m	43.0	65,000	2,795,000
	uPVC Pipes: Nominal Bore 150mm				
I511	In trenches, depth: not exceeding 1.5m	m	5.0	85,000	425,000
Carried to Collection					**222,095,380**
	CLASS I: PIPEWORK - PIPES (Cont'd)				
	DUCTILE SPUN IRON PIPES TO BS EN 598				
	SPECIFICATION, FLANGED JOINTS				
	INLET PIPE				
	Nominal bore: 150 mm				
I312	In trenches: depth not exceeding 1.5m	m	10.0	150,000	1,500,000
	OUTLET PIPE				
	Nominal bore: 150 mm				
I312	In trenches: depth not exceeding 1.5m	m	20.0	170,000	3,400,000
	CLASS J: PIPEWORK - FITTINGS AND VALVES				
	DUCTILE SPUN IRON PIPE FITTINGS TO BS EN 598				
	SPECIFICATION; FLANGED JOINTS				
	90 DEGREE FLANGED BENDS TO PN 16				
J311	Nominal bore: 150 mm	nr	5.0	380,000	1,900,000
	JUNCTIONS AND BRANCHES TO PN 16				
J321	Nominal bore 150mm - Flanged Tee	nr	2.0	380,000	760,000
	ADAPTORS TO PN 16				
J351.2	DN 150 flange adaptor.	Nr.	13.0	380,000	4,940,000
	FLANGED STRAIGHT SPECIALS TO PN16				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-5					
DESCRIPTION: SLUDGE DRYING BEDS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
J312.1	Nominal bore: 150 mm: 750mm long with puddle flange	nr	3.0	380,000	1,140,000
J312.2	Nominal bore: 150 mm: 600mm long flanged one side with puddle flange	nr	3.0	380,000	1,140,000
J312.3	Nominal bore: 150 mm: 300 - 600mm long	nr	3.0	380,000	1,140,000
	OUTLET				
J312.4	Nominal bore: 150 mm: 400mm long with puddle flange	nr	3.0	380,000	1,140,000
	CLASS K: PIPEWORK - MANHOLES AND PIPEWORK				
	ANCILLARIES				
	MANHOLES				
	PRECAST CONCRETE WITH HEAVY DUTY CONCRETE COVER AND FRAME WITH LIFTING LUG: INCLUDING BUILDING IN PIPEWORK				
	OUTLET PIPE				
K151.1	Depth not exceeding 1.5m;	nr	4.0	1,800,000	7,200,000
K151.2	Depth 1.5 - 2 m	nr		2,000,000	-
Carried to Collection					**24,260,000**
	CLASS L: PIPEWORK - SUPPORTS AND PROTECTION, ANCILLARIES TO LAYING AND EXCAVATION (Cont'd)				
	VALVES AND PENSTOCKS				
	Gate Valve: Manual Operated				
	All flanged CI gate valves to BS 5163, flanges to BS 4505, complete with Spindle & Pillar				
J812	150 mm Nominal Bore	nr	3.0	1,750,000	5,250,000
	SUNDRIES				
	GRAVEL TO DRAIN PIPE CHANNEL				
J999	Gravel: Max 15mm grain size: surround to perforated uPVC pipe	m	43.0	25,000	1,075,000
	CLASS N: MISCELLANEOUS METAL WORK				
	GALVANISED STEEL PLATFORM				
	Provide and Install Galvanised raised metal open grid access platform between Sludge Tanks. Raised to provide assess to Gate Valves: fixed to reinforces concrete with supports: provide openings for Spindals				
N190.3	Fixed to reinforced concrete structure; 22.8m long x 1600mm wide	nr		60,000,000	-
	HAND RAILS				
	Mild steel handrails to BS 4211, galvanised to BS 729, complete, and fixed to the following structures				
N140	Fixed to a metal platform: 22.8m long	nr		280,000	-
Carried to Collection					**6,325,000**

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-5					
DESCRIPTION: SLUDGE DRYING BEDS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	CLASS M: STRUCTURAL METALWORK				
	SHELTER TO SLUDGE DRYING BEDS				
	FABRICATION FOR MEMBERS OF FRAMES				
	Portal Frames; Grade 48 Hot Rolled Sections; Galvanised: IPE 200; including cleats, plates, flanges and haunches.				
M333	Straight on plan	t	5.0	5,000,000	25,000,000
	Bracing, purlins & cladding rails; Grade 48 Hot rolled sections: Galvanised; including cleates, plates flanges and haunches				
M363	Straight on plan	t	2.0	5,000,000	10,000,000
	ERECTION OF MEMBERS OF FRAMES				
	Permanent Erection				
M520.1	Shelter to Sludge Drying Beds	t	7.0	5,000,000	35,000,000
	Anti-sag rods				
M520.2	Galvanised Steel; 12 dia rods: fixed to eaves beams; include for drilling, fixing, tensioning and making good.	m	260.0	10,000	2,600,000
	Site Bolts, galvanised; including washers and nuts.				
M631	Diameter; 10mm - 20mm	nr	250.0	18,000	4,500,000
	Anchor Bolts				
M682.1	16mm dia ASTM F1554, High Tensile: Grade 55 Galvanised Anchor Bolts; fixed to reinforced concrete stub column. As detailed	nr	104.0	20,000	2,080,000
	GROUTING				
	Grouting to underside of of base plates with 30MPa non-Shrinking grout.				
M682.2	350mm x 250mm base plate	nr	26.0	25,000	650,000
Carried to Collection					**79,830,000**
	CLASS Z: BUILDING WORKS				
	SURFACE FINISHES				
	Roofing Sheets				
	Roofing Sheets: Anti-Cossosive Composite Corrugated uPVC; IT5 profile; 200mm laps; screw fixed to Z-Purlins with proprietary screws complete with waterproof cap;				
W321	Roofs; sloping	m2	832.7	95,000	79,104,600
W327	Ridge Capping; fixed to roof apex	m	51.4	30,000	1,542,000
W327	Ridge cap fixing to gable ends	m	0.0	30,000	-
W326	360mm Fascia board	m	135.2	35,000	4,732,000
	RAINWATER DISPOSAL				
Z5.04	160mm uPVC rainwater gutters; fixed to eaves beam with and including brackets, outlets and ends.	m	46.0	50,000	2,300,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-5					
DESCRIPTION: SLUDGE DRYING BEDS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
Z505	110mm diameter uPVC Downpipes; fixed to steel columns, including hopper heads, bends and outlet shoes; overall length 3.5m	nr	6.0	40,000	240,000
Z506	110mm diameter uPVC pipes; including hopper heads, bends and outlet shoes; to convey rainwater to the wastewater pipeline	m	60.0	25,000	1,500,000
Carried to Collection					**89,418,600**
	Bill Summary				
	Collection, Page 1/8				37,970,630
	Collection, Page 2/8				218,577,000
	Collection, Page 3/8				50,620,000
	Collection, Page 4/8				222,095,380
	Collection, Page 5/8				24,260,000
	Collection, Page 6/8				6,325,000
	Collection, Page 7/8				79,830,000
	Collection, Page 8/8				89,418,600

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-6					
DESCRIPTION: DRIED FAECAL SLUDGE COMPOSTING BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE Ushs**	**AMOUNT Ushs**
	SLUDGE DRYING BEDS				
	PREAMBLE				
Note 1	The works measured in this bill are covered under the Particular Specifications. The relevant drawings are the DRAWINGS **MWE/WSDF-C/WB/008** (including references made there-in to other drawings)	item			
	CLIMATIC CONDITIONS				
Note 2	Refer to Specification Clause 1.1.02 - Climatic Conditions - detailing wet/dry seasons; The Tenderer is to provide in his price for all temporary works required to complete this work under these conditions.	Item			
	CLASS E: EARTHWORKS				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-6					
DESCRIPTION: DRIED FAECAL SLUDGE COMPOSTING BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE Ushs**	**AMOUNT Ushs**
	EXCAVATION FOR FOUNDATIONS				
	Material other than topsoil, rock or artificial hard material, commencing surface is the underside of artificial hard material removal				
E323	Maximum Depth: not exceeding 0.25 m	m3	119.4	10,000	1,193,500
E322	Maximum Depth: 0.25 - 0.5m	m3	119.4	10,000	1,194,000
E323	Maximum Depth: 0.5 - 1m	m3	238.7	12,000	2,864,400
E324	Maximum Depth: 1 - 2m	m3	238.7	14,500	3,461,150
	In rock, commencing surface is the exposed surface of the rock				
E333	Maximum Depth: 1 - 2m	m^3	20.0	50,000	1,000,000
	EXCAVATION ANCILLARIES				
	Preparation of excavated surfaces for whole structure in the following materials				
E522	Material other than topsoil, rock or artificial hard material	m^2	477.4	5,000	2,387,000
	Disposal of excavated material				
E532	Material other than topsoil, rock or artificial hard material	m3	695.0	20,000	13,900,000
E533	Rock	m3	20.0	20,000	400,000
	Double handling of excavated material				
E542	Material other than topsoil, rock or artificial hard material - Return fill and compact selected excavated material in foundations to 95% MDD	m3	97.0	10,000	970,000
Carried to Collection					**27,370,050**
	CLASS E: EARTHWORKS (Cont'd)				
	DISPOSAL				
	To Embankments				
E624	Disposal of excavated material other than topsoil, rock or artificial hard material to embankments on site	m3	598.0	5,000	2,990,000
E626	Excavated Rock to embankments on site	m3	5.0	20,000	100,000
	EXCAVATION ANCILLARIES				
	Trimming of Surfaces in Disposal Embankment				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-6					
DESCRIPTION: DRIED FAECAL SLUDGE COMPOSTING BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE Ushs**	**AMOUNT Ushs**
E722.1	Material other than topsoil, rock or artificial hard material.	m2	457.4	5,000	2,287,000
E722.2	Material other than topsoil, rock or artificial hard material, inclined at an angle of 10 deg to 45 deg to the horizontal.	m2	20.0	20,000	400,000
	FILLING				
	Imported rock				
	To Structures				
E617	Imported rock - 200mm thick compacted hardcore filling	m3	95.5	160,000	15,276,800
	FILLING ANCILLARIES				
	Preparation of filled surface				
E722.1	Imported natural material - sand blinding; 50mm thick	m3	23.9	150,000	3,580,500
	CLASS F: IN-SITU CONCRETE				
	PROVISION OF CONCRETE				
	Ordinary Designed Mix Concrete				
	Grade 15/20				
	Designed mix, grade 15/20 concrete, to BS 5328, with ordinary portland cement to BS 12 , aggregate to BS882 , for the following aggregate sizes				
F233	20mm aggregate	m3	20.8	450,000	9,351,000
	PROVISION OF CONCRETE (Cont'd)				
	Grade 30/20				
	Designed mix, grade 30/20 concrete, to BS 5328, with ordinary portland cement to BS 12, aggregate to BS882 , for the following aggregate sizes				
F253	20mm aggregate	m3	70.0	550,000	38,500,000
Carried to Collection					**72,485,300**
	CLASS F: IN-SITU CONCRETE (Cont'd)				
	PLACING MASS CONCRETE				
	Blinding				
	Placing blinding concrete, grade 15/20				
F511	Thickness not exceeding 150mm	m3	2.9	180,000	514,800
	Strip foundation				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-6					
DESCRIPTION: DRIED FAECAL SLUDGE COMPOSTING BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE Ushs**	**AMOUNT Ushs**
	Placing strip foundation concrete, grade 30/20				
F521	Thickness not exceeding 150mm	m3	17.9	180,000	3,225,600
	PLACING REINFORCED CONCRETE				
	Bases, Footings, Pile Caps & Ground Slabs				
	Placing reinforced concrete,				
F621	Thickness: not exceeding 150mm - floor slab	m^3	47.7	180,000	8,593,200
F622	Thickness 150 - 300mm - Column bases	m^3	17.1	180,000	3,085,200
	Columns				
F653	Cross sectional area 0.1 -0.25m2	m3	5.0	180,000	907,200
	CLASS G: CONCRETE ANCILLARIES				
	FORMWORK: ROUGH FINISH				
	Plane Vertical				
G142	Width: 0.10-0.20m - to edges of slab	m	92.6	35,000	3,241,000
G143	Width: 0.20-0.40m - to edges of bases	m2	36.5	35,000	1,276,800
G144	Width: 0.40-1.22m - to edges of column	m2	62.7	35,000	2,195,200
	CLASS G: CONCRETE ANCILLARIES (Cont'd)				
	REINFORCEMENT				
	Deformed High Yield Steel				
	Hot rolled high yield ribbed bars of yield strength of 460N/mm2 to BS 4449 and of the following sizes				
G524	Nominal size, 6-16mm	t	7.0	5,000,000	35,000,000
	Steel Fabric				-
	Steel fabric to BS4483				-
G522	Nominal mass: 2 - 3 kg/m^2 - A142	m2	477.4	15,000	7,161,000
Carried to Collection					**65,200,000**
	CLASS M: STRUCTURAL METALWORK				
	FABRICATION FOR MEMBERS OF FRAMES				
	Portal Frames; Grade 48 Hot Rolled Sections; Galvanised: IPE 200; including cleats, plates, flanges and haunches.				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-6					
DESCRIPTION: DRIED FAECAL SLUDGE COMPOSTING BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE Ushs**	**AMOUNT Ushs**
M333	Straight on plan	t	6.0	5,000,000	30,000,000
	Bracing, purlins & cladding rails; Grade 48 Hot rolled sections: Galvanised; including cleates, plates flanges and haunches				
M363	Straight on plan	t	3.0	5,000,000	15,000,000
	ERECTION OF MEMBERS OF FRAMES				
	Permanent Erection				
M620	Erection of members for frame	t	9.0	,000,000	45,000,000
	Anti-sag rods				
M520.2	Galvanised Steel; 12 dia rods: fixed to eaves beams; include for drilling, fixing, tensioning and making good.	m	227.0	15,000	3,405,000
	Site Bolts, galvanised; including washers and nuts.				
M631	Diameter; 10mm - 20mm	nr	250.0	18,000	4,500,000
	Anchor Bolts				
M682.1	10mm dia ASTM F1554, High Tensile: Grade 55 Galvanised Anchor Bolts; fixed to reinforced concrete stub column. As detailed	nr	64.0	20,000	1,280,000
	GROUTING				
	Grouting to underside of of base plates with 30MPa non-Shrinking grout.				
M682.2	350mm x 200mm base plate	nr	64.0	25,000	1,600,000
Carried to Collection					**100,785,000**
	CLASS U; BRICKWORK, BLOCKWORK AND MASONRY				-
	Dense Concrete Blockwork				-
	Dense concrete blockwork to BS 7263, jointed with ordinary 1:3 cement mortar, hoop irons every three courses				-
U521.1	200mm thick solid block wall	m²	179.3	80,000	14,340,000
	Dense concrete blockwork to BS 7263, jointed with ordinary 1:4 cement mortar, hoop irons every three courses				-
U521.2	200mm thick solid block wall	m²	115.7	70,000	8,099,000
	Damp proof course of bitumen impregnated fabric to BS 6398 for the				-

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-6					
DESCRIPTION: DRIED FAECAL SLUDGE COMPOSTING BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE Ushs**	**AMOUNT Ushs**
	following wall thickness				
U582	Width 150-200mm wide	m	89.0	5,000	445,000
	CLASS W: WATER PROOFING				-
	Protective Layers				-
	Flexible polyethylene sheeting, gauge 1000, or similar approved, laid to the surface of blinding concrete or sand blinded hardcore fill				-
W131	Surfaces inclined at an angle not exceeding 30 degrees to the horizontal	m²	477.4	9,000	4,296,600
	CLASS Z: BUILDING WORKS				
	SURFACE FINISHES				
	SURFACE FINISHINGS, LININGS AND PARTITIONS				-
	In situ finishes, beds and backings				
	Floors				
	Sand and Cement Screed				
	Sand and cement screed of 1:3 cement sand mortar, applied to concrete floors, 40 mm thick, prepared and applied as specified, and finished with a steel float				
W441	Surfaces of floors inclined at an angle not exceeding 30 degrees to the horizontal	m²	477.4	19,500	9,309,300
	Wall Finishes				
Z413.1	External: 25 mm thick plaster (1:4) in two coats to walls, trowelled hard and smooth	m²	85.1	19,500	1,659,840
Z413.2	Internal: 20 mm plaster in two coats, steel trowelled to hard and smooth finish to walls internally	m²	165.2	19,500	3,221,400
Carried to Collection					**41,371,140**
	Roofing Sheets				
	Roofing Sheets: Anti-Cossosive Composite Corrugated uPVC; IT5 profile; 200mm laps; screw fixed to Z-Purlins with proprietary screws complete with waterproof cap;				
W321	Upper surfaces inclined at an angle not exceeding 30° to the horzontal	m2	513.3	95,000	48,761,600

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-6					
DESCRIPTION: DRIED FAECAL SLUDGE COMPOSTING BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE Ushs**	**AMOUNT Ushs**
W323	Upper surfaces inclined at an angle exceeding 60º to the horzontal	m2	0.0	95,000	-
W327	Ridge Capping; fixed to roof apex	m	32.0	30,000	960,000
W327	Ridge cap fixing to gable ends	m	32.0	30,000	960,000
W326	460mm Fascia board	m	96.0	35,000	3,360,000
	RAINWATER DISPOSAL				
Z5.04	160mm uPVC rainwater gutters; fixed to eaves beam with and including brackets, outlets and ends.	m	64.0	50,000	3,200,000
Z505	110mm diameter uPVC Downpipes; fixed to steel columns, including hopperheads, bends and outlet shoes; overall length 3.5m	nr	6.0	45,000	270,000
Z506	110mm diameter uPVC pipes; including hopperheads, bends and outlet shoes; to convey rainwater to the wastewater pipeline	m	50.0	25,000	1,250,000
Carried to Collection					**58,761,600**
	Bill Summary				
	Collection, Page 1/7				27,370,050
	Collection, Page 2/7				72,485,300
	Collection, Page 3/7				65,200,000
	Collection, Page 4/7				100,785,000
	Collection, Page 5/7				41,371,140
	Collection, Page 6/7				58,761,600

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-7					
DESCRIPTION: FACULTATIVE AND MATURATION PONDS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	FACULTATIVE AND MATURATION PONDS				
	PREAMBLE				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-7					
DESCRIPTION: FACULTATIVE AND MATURATION PONDS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
Note 1	The works measured in this bill are covered under the Particular Specifications. The relevant drawings are the DRAWING **MWE/WSDF-C/WB/010** (including references made there-in to other drawings)	item			
	CLIMATIC CONDITIONS				
Note 3	Refer to Specification Clause 1.1.02 - Climatic Conditions - detailing wet/dry seasons; The Tenderer is to provide in his price for all temporary works required to complete this work under these conditions.	Item			
	CLASS E: EARTHWORKS				
	EXCAVATION FOR CUTTINGS				
	Material other than topsoil, rock or artificial hard material, commencing surface is the underside of topsoil strip				
E211	Maximum Depth: not exceeding 0.25m	m3	2050	12,000	24,600,000
E222	Maximum Depth: 0.25 - 0.5m	m3	293	12,000	3,516,000
E223	Maximum Depth: 0.5 - 1m	m3	238	14,500	3,451,000
	Maximum Depth: 1 - 2m	m3	98	18,500	1,813,000
	In rock, commencing surface is the exposed surface of the rock				
E333	Maximum Depth 0.5 - 1.0m	m³	75	50,000	3,750,000
	EXCAVATION ANCILLARIES				
	Preparation of excavated surfaces for whole structure in the following materials				
E522.1	Material other than topsoil, rock or artificial hard material	m²	810	10,000	8,100,000
E522.2	Material other than topsoil, rock or artificial hard material; inclined at an angle of 10-45deg to the horizontal	m²	379	15,000	5,685,000
E523	Rock surfaces	m²	100	15,000	1,500,000
	Disposal of excavated material				
E532	Material other than topsoil, rock or artificial hard material	m³	2125	7,000	14,875,000
Carried to Collection					**67,290,000**
	FILLING TO FORM SLOPES OF FACULTATIVE AND MATURATION PONDS				
	Filling Embankments by methods specified and to depths as shown in the drawing				
E614	Selected excavated material	m3	3,010	16,000	48,160,000
	Imported Fill				
E615	Imported natural material other than topsoil or	m3	1,000		40,000,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-7					
DESCRIPTION: FACULTATIVE AND MATURATION PONDS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	rock			40,000	
E645	Imported material: Impermeable clay layer (Puddle Clay) - to form base and sides of the Ponds - 300mm deep. Including finishing to a profiled smooth finish	m2	1500	40,000	60,000,000
	Filling Ancillaries				
E722.1	Preparation of filled surface to form profile - horizontal - Pond bases and accesses	m2	1,914	7,000	13,398,000
E722.2	Preparation of filled surface to form profile - inclined at an angle 10 - 45deg to the horizontal - Pond side slopes	m2	2,550	7,000	17,850,910
	DISPOSAL				
	To Embankments on site				
E624	Selected excavated material other than topsoil or rock	m3	1000	5,000	5,000,000
E626	Excavated Rock	m3	500	20,000	10,000,000
	FILLING ANCILLARIES				
	Trimming of Filled Surfaces				
E722	Material other than topsoil, rock or artificial hard material.	m2	500	5,000	2,500,000
E722	Material other than topsoil, rock or artificial hard material, inclined at an angle of 10 deg to 45 deg to the horizontal.	m2	500	10,000	5,000,000
E722	Excavated Rock:	m2	200	15,000	3,000,000
E722	Excavated Rock: inclined at an angle of 10 deg to 45 deg to the horizontal.	m2	100	15,000	1,500,000
	SLOPE PROTECTION SLABS				
	Supply and Install concrete slabs to form protection strip to embankment at water level. Slabs (600mm x 600mm) to be laid on prepared base to Engineers instruction.				
E911	1200mm wide	m2	270	100,000	27,000,000
	Construct reinforced concrete beam; include for all excavation, preparation, disposal, concrete Grade C25, formwork, reinforcement and finishes.				
E912	400mm deep x 150mm wide complete.	m	230	120,000	27,600,000
Carried to Collection					**261,008,910**
	CLASS I - PIPEWORK - PIPES				
	DUCTILE SPUN IRON PIPES TO BS EN 598;				
	FLANGED JOINTS				
	FACULTATIVE POND INLET PIPE				
	Nominal bore: 150 mm				-

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-7					
DESCRIPTION: FACULTATIVE AND MATURATION PONDS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
I312.1	Partly in trenches, include for excavation, backfilling and making good: depth not exceeding 1.5 m; passing through side slopes and supported at one end on concrete support: other end with puddle flange: Pipe 7m long	nr	1	2,500,000	2,500,000
	FACULTATIVE POND OUTLET PIPE				
	Nominal bore: 150 mm				-
I312.2	Partly in trenches, include for excavation, backfilling and making good: depth not exceeding 1.5 m; passing through side slopes one end built into Outlet Structure other end with puddle flange: Pipe 3m long	nr	1	1,200,000	1,200,000
	MATURATION POND 1 INLET PIPE				
	Nominal bore: 150 mm				-
I312.3	Partly in trenches, include for excavation, backfilling and making good: depth not exceeding 1.5 m; passing through side slopes and supported at one end on concrete support: other end with puddle flange: Pipe 7m long	nr	1	2,500,000	2,500,000
	MATURATION POND 2 INLET PIPE				
	-				
	Nominal bore : 150 mm				-
I312.4	Partly in trenches, include for excavation, backfilling and making good: depth not exceeding 1.5 m ; passing through side slopes and supported at one end on concrete support: other end with puddle flange: Pipe 7m long	nr	1	2,500,000	2,500,000
	MATURATION POND 1 OUTLET PIPE				
	Nominal bore : 150 mm				-
I312.5	Partly in trenches, include for excavation, backfilling and making good: depth not exceeding 1.5 m ; passing through side slopes one end built into Outlet Structure other end with puddle flange: Pipe 3m long	nr	1	1,200,000	1,200,000
	MATURATION POND 2 OUTLET PIPE				
	Nominal bore : 150 mm				-
I312.6	Partly in trenches, include for excavation, backfilling and making good: depth: 1.5 - 2.0m ; passing through side slopes one end built into Outlet Structure other end with puddle flange: Pipe 10m long	nr	1	2,000,000	2,000,000
Carried to Collection					**11,900,000**
	OTHER STATED CHAMBERS				
	In-situ concrete: Reinforced				
K231	Internal - 1000mm x 1375mm x 1350mm high: 250mm thick walls and base: including Scum board	nr	2	1,500,000	3,000,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-7					
DESCRIPTION: FACULTATIVE AND MATURATION PONDS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
K232	Internal - 1000mm x 1375mm x 1800mm high: 250mm thick walls and base: including Scum board	nr	1	2,000,000	2,000,000
	CLASS L: PIPEWORK - SUPPORTS AND PROTECTION, ANCILLARIES TO LAYING AND EXCAVATION				
	Other Isolated Pipe Supports				
L870.3	Concrete column/foundation 1.2 - 1.5m high, include for excavation and making good to existing surfaces in Facultative Pond	nr	4	1,500,000	6,000,000
Carried to Collection					**31,100,000**
	Bill Summary				
	Collection, Page 1/5				67,290,000
	Collection, Page 2/5				261,008,910
	Collection, Page 3/5				11,900,000
	Collection, Page 4/5				31,100,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-9					
DESCRIPTION: ADMINISTRATION BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	ADMINISTRATION BUILDING				
	PREAMBLE				
Note 1	The works measured in this bill are covered under the Particular Specifications. The relevant drawings are the DRAWING **MWE/WSDF-C/WB/0** (including references made there-in to other drawings)	item			
	CLASS E: EARTHWORKS				
	Excavation for foundations				
E323	Depth 0.5 - 1m	m³	70.0	12,000	840,000
E324	Depth 1 - 2m	m³	70.0	14,500	1,015,000
	Disposal of Excavated Material				
	Disposal of excavated material off site				
E532	Material other than topsoil, rock, or artificial hard material.	m³	54.0	10,000	540,000
	Double handling of excavated material				
E542	Material other than topsoil, rock or artificial hard material - Return fill and compact selected excavated material in foundations to 95% MDD	m3	16.0	10,000	160,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-9					
DESCRIPTION: ADMINISTRATION BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	Filling				
	Filling to Structures by methods specified and to depths as shown in the drawings				
E615	Imported granular material - 50mm sand blinding	m3	6	20,000	120,000
E647	Hardcore filling; 200mm deep	m2	115	65,000	7,475,000
Carried to Collection					10,150,000
	FILLING ANCILLARIES				
	Preparation of Filled Surfaces				
E712.1	hardcore materials	m2	115	5,000	575,000
	CLASS F: IN-SITU CONCRETE				
	Provision of Concrete				
	Ordinary Designed Mix Concrete				
	Grade 15/20				
	Designed mix, grade 15/20 concrete, to BS 5328, with ordinary portland cement to BS 12, aggregate to BS882, for the following aggregate sizes				
F231	20mm aggregate	m³	5.0	400,000	2,000,000
	Grade 30/20				
	Designed mix, grade 30/20 concrete, to BS 5328, with ordinary portland cement to BS 12, aggregate to BS882, for the following aggregate sizes				
F253	20mm aggregate	m³	36	500,000	18,000,000
	Placing Mass Concrete				
	Blinding				
	Placing blinding concrete, for ground slab, grade 15/20, of the following thickness				
F511	Thickness not exceeding 150mm	m³	5	108,000	540,000
	Strip foundation				
	Placing strip foundation concrete, grade 30/20				
F522	Nominal thickness 230mm	m3	19	108,000	2,052,000
	Placing Reinforced Concrete				
	Bases, Footings and Ground Slabs				
	Placing reinforced concrete, grade 30/20, for ground slab of the following thickness				
F623	Thickness not exceeding 150mm	m³	13	108,000	1,404,000
Carried to Collection					24,571,000
	CLASS F: IN-SITU CONCRETE (Cont'd)				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-9					
DESCRIPTION: ADMINISTRATION BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	Placing Reinforced Concrete (Cont'd)				
	Ring Beams				
	Placing reinforced concrete, grade 30/20, for ring beam				
F632	Thickness 200 x 200mm	m^3	4.0	108,000	432,000
	CONCRETE ANCILLARIES				
	Formwork; Rough Finish				
	Plane vertical				
	Width 0.20 to 0.40m	m2		35,000	
	Formwork-Fair Finish				
	Plane Vertical				
G242	Width 0.1m - 0.2m to edges of slab	m	56	12,000	674,400
	Plane Vertical				
G243	To ring beam 200mm x 200mm; Width 0.2m - 0.4m	m2	40.0	35,000	1,400,000
	Reinforcement				
	Deformed High Yield Steel				
	Hot rolled high yield ribbed bars of yield strength of 460N/mm2 to BS 4449 or BS EN 10080 and BS EN 1993 and of the following sizes				
G524	All sizes	kg	440	5,000	2,200,000
	Steel Fabric				
	Steel fabric to BS4483				
G522	Nominal mass: 2 - 3 kg/m^2 - A142	m2	126	15,000	1,890,000
	CLASS N: MISCELLANEOUS METAL WORK				
	Steel veranda supports: tubular section				
N164	100mm diameter x 4mm thick round hollow section: size 2700mm long including 500mm length bedded in concrete grade 20: top welded with 4mm thick mild steel plate to receive timber beam (m/s): bottom welded with fixing lugs: bottom 4mm base plate welded to the steel pipe: including Bolts and nuts, painted in accordance with engineer's specification. complete.	nr	8	1,500,000	12,000,000
Carried to Collection					18,596,400
	CLASS U; BRICKWORK, BLOCKWORK AND MASONRY				
	Dense Concrete Blockwork				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-9					
DESCRIPTION: ADMINISTRATION BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	Dense concrete blockwork to BS 7263, jointed with ordinary 1:3 cement mortar, hoop irons every three courses				
U521.1	200mm thick solid block wall in plinth wall	m²	200	80,000	16,020,800
	Dense concrete blockwork to BS 7263, jointed with ordinary 1:4 cement mortar, hoop irons every three courses				
U521.2	200mm thick solid block wall	m²	306	80,000	24,484,320
U511	100mm thick solid block wall	m²	13	40,000	520,000
	Damp proof course of bitumen impregnated fabric to BS 6398 for the following wall thickness				
U582	Width 150-200mm wide	m	116	5,000	580,000
	CLASS V: PAINTING				
	High Gloss				
	Timber Surfaces				
	External quality high gloss oil paint, two coats, to the following timber surfaces; include surface preparation and undercoat				
V321	Upper surfaces of facia board inclined at an angle not exceeding 30 degrees to the horizontal	m²	15	15,000	225,000
	Emulsion Paint				
	Masonry				
	External quality emulsion paint (weather guard), two coats, to the following smooth masonry surfaces, include surface preparation and undercoat as specified				
V553	Surfaces of walls inclined at an angle exceeding 60 degrees to the horizontal	m²	179	10,000	1,790,000
Carried to Collection					43,620,120
	CLASS V: PAINTING (Cont'd)				
	Emulsion Paint (Cont'd)				
	Masonry				
	Internal quality emulsion paint, two coats, to plastered blockwork; include surface preparation and undercoat as specified				
V553	Surfaces of walls; inclined at an angle exceeding 60 degrees to the horizontal	m²	350	12,000	4,200,000
	Approved Floor Paint				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-9					
DESCRIPTION: ADMINISTRATION BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	Horizontal Surfaces of steel trowelled concrete floor; applied strictly in accordance with suppliers recommendations.				
V639	Surfaces of floors; horizontal - Office, store, Labourer's rest area and veranda	m2	63	12,000	756,000
	CLASS W: WATER PROOFING				
	Protective Layers				
	Flexible polyethylene sheeting, gauge 1000, or similar approved, laid to the surface of blinding concrete or sand blinded hardcore fill				
W421	Surfaces inclined at an angle not exceeding 30 degrees to the horizontal	m²	115	6,500	747,500
	CLASS Z: SIMPLE BUILDING WORKS				
	WINDOWS DOORS & GLAZING				
	Timber Doors				
	Supply and install 45mm thick wrot hardwood timber doors as described to: 45 mm thick framed, ledged and battened size as shown below overall comprising 45 x 125 mm stile and top rail, 25 x 125 mm ledges, 20 x 100 mm battens with V joints, all glued and assembled, including painting general surfaces woodwork and all necessary iron mongery.				
Z313.1	Size 900mm x 2100mm high	nr	9	750,000	6,750,000
Z313.2	Size 800mm x 2100mm high	nr	3	600,000	1,800,000
Carried to Collection					14,253,500
	CLASS Z: SIMPLE BUILDING WORKS (Cont'd)				
	WINDOWS DOORS & GLAZING (Cont'd)				
	Metal Doors				
	Supply and install steel door fabricated from standard steel sections not less than 3mm thick and comprising 300mm high vent filled in with 4no 2mm thick x 75mm wide steel louvre blades, 2no 6mm thick clear glass and glazing panels complete with all iron mongery, steel burglar proof grilles, heavy-duty stainless-steel door lock to as union or equal approved and including painting to Engineer's satisfaction.				
Z323.1	Door size 1200mm x 2100mm high	nr	3	1,400,000	4,200,000
Z323.2	Door size 900mm x 2100mm high	nr	2	1,200,000	2,400,000
	Metal Windows				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-9					
DESCRIPTION: ADMINISTRATION BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	Supply and install steel casement window with frames and sashes in standard sections as described: timber including timber sub-frames; including glazing, complete with all ironmongery, burglar proof and including painting to Engineer's specification.				
Z321.1	Window Size 1500mm x 1200mm high, with 1500mm x 250mm vent on top; casement	nr	6	900,000	5,400,000
Z321.2	Window Size 1000mm x 1200mm high, with 1000mm x 250mm vent on top; casement	nr	5	700,000	3,500,000
Z321.3	Window Size 600mm x 600mm high, with 600mm x 250mm vent on top; top hung	nr	5	450,000	2,250,000
	Precast concrete				
	Window Cills				
	Supply and install 265 x 68mm weathered and throated window sill finished fair on exposed surfaces and bedded in cement mortar (1:4) including gloss oil painting applied in three coats				
Z350	Cross-sectional area not exceeding 0.1 m2	m	17	50,000	850,000
Carried to Collection					18,600,000
	CLASS Z: SIMPLE BUILDING WORKS (Cont'd)				
	SURFACE FINISHINGS, LININGS AND PARTITIONS				
	In situ finishes, beds and backings				
	Floors				
	Sand and Cement Screed				
	Sand and cement screed of 1:4 cement sand mortar, applied to concrete floors, 50 mm thick, prepared and applied as specified, and finished with a steel float				
W441	Surfaces of floors inclined at an angle not exceeding 30 degrees to the horizontal	m²	63	25,000	1,575,000
	Wall Finishes				
Z413.1	External: 20 mm thick plaster (1:5) in two coats to walls, trowelled hard and smooth	m²	179	15,000	2,685,000
Z413.2	Internal: 15 mm plaster in two coats, steel trowelled to hard and smooth finish to walls internally	m²	350	15,000	5,250,000
	Tiles				
Z421.1	300x 300 x 8mm thick approved non-slip ceramic floor tiles on 42mm thick screed - toilets, pantry and laboratory.	m²	39	90,000	3,510,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-9					
DESCRIPTION: ADMINISTRATION BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
Z421.2	8x100mm high skirting	m	52	15,000	780,000
Z423	300x 150 x 8mm thick approved ceramic wall tiles on 25mm thick cement and sand mortar backing - 1.8m high.	m²	94	90,000	8,460,000
	Ceiling Finishes				
	Soffits				
Z414	In situ finishes, beds and backings: plasterboard ceiling with applied finish to provide a smooth surface: complete with timber backing & expanded metal as required.	m²	90	70,000	6,300,000
Carried to Collection					28,560,000
	CLASS Z: SIMPLE BUILDING WORKS (Cont'd)				
	FIXTURES & FITTINGS				
	Laboratory fittings				
	Factory manufactured laboratory fittings				
Z371.1	Cupboard units and bench tops as specified; to make up units 7000mm x 550mm wide	nr	1	5,000,000	5,000,000
	Pantry fittings				
	Factory manufactured pantry fittings				
Z371.2	Cupboard units and bench tops as specified; to make up units 2050mm & 950mm long - width 550mm	nr	1	1,900,000	1,900,000
	Office Furniture				
Z371.3	Provisional sum for furniture in the Manager's, Laboratory and Secretary's offices including cupboards, and shelves in accordance to details to be provided by the project manager	sum	1	20,000,000	20,000,000
	Roof				
Z800	Construct roofing, complete as shown on drawing DET - WWTPN-006 and as specified; include tie beams, purlins, rafters, struts, wall plate, facia board and all roofing timber, gauge 24 pre-painted GCI resin sheeting and ridges; the GCI sheet should be resin bonded or with other protection against corrosion by Alum or Soda Ash or Chlorine	m^2	173	125,000	21,625,000
	Piped building services				
	Pipework				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-9					
DESCRIPTION: ADMINISTRATION BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	Supply and install complete cold water distribution system for the building from the main water supply line to laboratories, ladies & gents washrooms as shown in Drawing MWE/WSDF-C/Nak/17/012 in PE or PPR plastic pipes, including all bends, elbows, tees, tapers, ball valves and accessories				
Z511-1	Administration Building cold water distribution system	item	1	3,500,000	3,500,000
	Supply and install complete internal sewage collection system to laboratories, pantry, ladies & gents washrooms and as shown in MWE/WSDF-C/Nak/17/012 in PVC DN 40 mm to DN 110 mm pipes with flexible rubber joints, including all bends, elbows, tees, tapers and accessories				
Z511-3	Administration building internal sewage drainage system	item	1	3,000,000	3,000,000
Carried to Collection					55,025,000
	CLASS Z: SIMPLE BUILDING WORKS (Cont'd)				
	Piped building services (Cont'd)				
	Sanitary appliances and fittings				
Z701	Supply and Install Vitreous China WC as Twyford Classic bowl with P outlet 9 litre cistern with valve fittings and seat and cover, complete with valve cistern fittings, including outlet and inlet valves, internal overflow, connecting fitments from cistern to bowl and all accessories.	nr	3	750,000	2,250,000
Z702	Wash hand basin in Vitreous China approximately 560 x 405mm with one tap hole and chain-stay hole, complete with Amazon mixer pillar tap, Chrome plated chain waste, plastic bottle trap, pedestal and all accessories as TWYFORDS CLASSIC 560 or equal approve	nr	2	550,000	1,100,000
Z703	Stainless steel sink: Single bowl single as "ASL" or equal approved (2000 x 500mm): 615/041 40mm chain waste: Bricon 365/50 tap: 40mm S.P. bottle trap: 75mm seal: including fixing with necessary screws and brackets.	nr	2	1,800,000	3,600,000
	Concrete Splash Apron				
Z703	Concrete Grade 25/20 100mm thick laid on 150mm thick blinded hardcore sub-base; include for wood float surface finish to falls; formwork to external edge and movement/ construction joints as required.	m2	36	90,000	3,240,000
	RAINWATER DISPOSAL				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-9					
DESCRIPTION: ADMINISTRATION BUILDING					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
Z5.04	160mm uPVC rainwater gutters; fixed to eaves beam with and including brackets, outlets and ends.	m	60	65,000	3,900,000
Z505	110mm diameter uPVC pipes; including hopper heads, bends and outlet shoes; to convey rainwater to the water tank	m	10	10,000	100,000
Z505	5000 litre plastic water tank with all the necessary valves and outflow pipes including masonry base	nr	1	4,500,000	4,500,000
Carried to Collection					18,690,000
	Bill Summary				
	Collection, Page 1/10				10,150,000
	Collection, Page 2/10				24,571,000
	Collection, Page 3/10				18,596,400
	Collection, Page 4/10				43,620,120
	Collection, Page 5/10				14,253,500
	Collection, Page 6/10				18,600,000
	Collection, Page 7/10				28,560,000
	Collection, Page 8/10				55,025,000
	Collection, Page 9/10				18,690,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-10					
DESCRIPTION: ANCILLARY SITE WORKS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	ANCILLARY SITE WORKS				
	PREAMBLE				
Note 1	The works measured in this bill are covered under the Specifications. The relevant drawings are the DRAWING …….. (Including references made there-in to other drawings)	item			
Note 3	**CLIMATIC CONDITIONS**				
	Refer to Specification Clause 1.1.02 - Climatic Conditions - detailing wet/dry seasons; The Tenderer is to provide in his price for all temporary works required to complete this work under these conditions.	Item			
	CLASS D: DEMOLITION AND SITE				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-10					
DESCRIPTION: ANCILLARY SITE WORKS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	CLEARANCE				
	GENERAL CLEARANCE				
D100	Faecal Sludge Management Facility Site	ha	1.2	4,000,000	4,800,000
	TREES				
	Cut and dispose of trees of the following girth; include removal of stump and backfilling the hole left with top soil				
D210	Girth 500 mm - 1m	nr	15	150,000	2,250,000
D220	Girth 1-2 m	nr	10	300,000	3,000,000
	STUMPS				
	Remove and dispose of stumps of the following diameter; include for grabbing up the roots and backfilling the hole left with top soil				
D310	Diameter 150- 500 mm	nr	5	150,000	750,000
D320	Diameter 500mm - 1m	nr	3	300,000	900,000
	CLASS E: EARTHWORKS				
	GENERAL EXCAVATION				
	Top soil				
E411	Maximum depth: not exceeding 0.25m	m^3	1390.0	10,000	13,900,000
	EXCAVATION FOR CUTTINGS				
	Material other than topsoil, rock or artificial hard material, commencing surface is the underside of topsoil strip				
E222	Maximum Depth: 0.25 - 0.5m	m3	56	10,000	560,000
E223	Maximum Depth: 0.5 - 1m	m3	260	12,000	3,120,000
E224	Maximum Depth: 1 - 2m	m3	1100	14,500	15,950,000
E225	Maximum Depth: 2 - 5m	m3	2688	18,500	49,728,000
Carried to Collection					**94,958,000**
	In rock, commencing surface is the exposed surface of the rock				
E333	Maximum Depth 0.5 - 1.0m	m^3	50	50,000	2,500,000
E334	Maximum Depth: 1 - 2m	m3	50	100,000	5,000,000
E335	Maximum Depth: 2 - 5m	m3	50	150,000	7,500,000
	EXCAVATION ANCILLARIES				
	Preparation of excavated surfaces				
E522	Material other than topsoil, rock or artificial hard material	m^2	1200	5,000	6,000,000
	Disposal of excavated material				
E531	Top soil	m^3	18387	5,000	91,935,000
E532	Material other than topsoil, rock or artificial hard material	m^3	2000	5,000	10,000,000
E533	Rock	m^3	1500		

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-10					
DESCRIPTION: ANCILLARY SITE WORKS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
				20,000	30,000,000
	FILLING				
	General				
E634	Selected excavated material other than topsoil or rock	m^3	21500	16,000	344,000,000
	LANDSCAPING				
E820	Hydraulic mulch grass seeding to horizantal and inclined surfaces including importation of top soil and preparation of surface	m2	12790.0	5,000	63,950,000
	CLASS I: PIPEWORK-PIPES				
	PN 10 'UNPLASTICISED POLYVINAL CHLORIDE (uPVC) SEWER PIPES WITH FLEXIBLE RUBER RING JOINTS TO BS EN 1401-1: 2009				
	SECTION - ANAEROBIC BAFFLE REACTOR TO INLET MANHOLE OF FACULTATIVE POND				
	OD : 160mm Sewer pipe				
I243.1	In trenches, depth not exceeding 1.5 m	m	25	85,000	2,125,000
Carried to Collection					**563,010,000**
	CLASS I: PIPEWORK-PIPES (Cont'd)				
	UNPLASTICISED POLYVINAL CHLORIDE (uPVC) PIPES TO BS EN 1401-1: 2009				
	SECTION - SLUDGE DRYING BEDS TO MAIN SEWER LINE				
	OD: 160mm Sewer pipe				
I243.1	In trenches, depth not exceeding 1.5 m	m	49	85,000	4,165,000
	SECTION - WITHIN WWTP - BY-PASS LINE				
	OD: 160mm Sewer pipe				
I243.1	In trenches, depth not exceeding 1.5 m	m	190	85,000	16,150,000
	SECTION - OUTFALL WITHIN THE FSTP SITE				
	OD: 160mm Sewer pipe				
I512	In trenches, depth not exceeding 1.5 m	m	25	85,000	2,125,000
I512	In trenches, depth: 1.5 - 2 m	m		95,000	
	SECTION - OUTFALL OUTSIDE FSTP				
	OD: 160mm Sewer pipe				
I512	In trenches, depth not exceeding 1.5 m	m	20	85,000	1,700,000
	CLASS J: PIPEWORK - FITTINGS AND VALVES				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-10					
DESCRIPTION: ANCILLARY SITE WORKS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	UNPLASTICISED POLYVINAL CHLORIDE (uPVC) PIPES TO BS EN 1401-1: 2009				
	STRAIGHT SPECIALS				
J383.1	Nominal Bore: 150mm: 900mm long to manholes with puddle flange	nr	32	380,000	12,160,000
	CLASS L: PIPEWORK - SUPPORTS AND PROTECTION, ANCILLARIES TO LAYING AND EXCAVATION				
	EXTRAS TO EXCAVATION AND BACKFILLING				
	IN PIPE TRENCHES				
L111	Excavation of rock	m3	5	120,000	600,000
L118.1	Excavation of natural material below the Final Surface and backfilling with imported granular material	m3			
	IN MANHOLES AND OTHER CHAMBERS				
L118.2	Excavation of natural material below the Final Surface and backfilling with imported granular material	m3			
Carried to Collection					**36,900,000**
	SURROUNDS				
	Pipe surrounds, of imported granular material; Standard Detail for the following pipe sizes				
L532.1	Nominal bore 150 mm - Outfall pipe in swamp	m	20	20,000	400,000
	CLASS K: PIPEWORK - MANHOLES AND PIPEWORK				
	ANCILLARIES				
	PRECAST CONCRETE MANHOLES WITH HEAVY				
	DUTY PE COVER AND FRAME				
	Refer to Drawing No.				
K151.1	Depth not exceeding 1.5m	nr	14	1,500,000	21,000,000
K151.2	Depth 1.5 - 2 m	nr	2	1,500,000	3,000,000
	OTHER PIPEWORK ANCILLARIES				
	STONE PITCHING DRAINAGE CHANNEL				
K871	200mm thick grouted stone pitching (1:3 cement mortar) as detailed for open drains	m2	405	70,000	28,350,000
	ROAD CROSSINGS - Precast Concrete Pipe Culverts				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-10					
DESCRIPTION: ANCILLARY SITE WORKS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
H7	Diameter 600mm with bedding class B, including excavation not exceeding 1.5m depth, compacted backfilling to 93%BS heavy	m	25	200,000	5,000,000
	CONCRETE BLOCKWORK FOR HEADWALLS				
U521	230 mm thick jointed with 1:3 motar	m2	24	90,000	2,160,000
	CLASS R: ROADS AND PAVINGS				
	SUB BASE; FLEXIBLE ROAD BASE AND SURFACING				
	Granular Material				
R715	150mm natural gravel fill material for base well-watered and compacted to 98% BS Heavy laid to Engineer's approval - All access roads and parking	m3	512	85,000	43,520,000
	Kerbs				
	Construct Kerbs of pre-cast concrete to BS 7263 of cross section area 0.05-0.1 m² to the following alignment				
R611	Straight or curved to a radius exceeding 12 m - to parking area only	m	100	50,000	5,000,000
R612	To a radius not exceeding 12 m	m			
Carried to Collection					**108,430,000**
	CLASS R: ROADS AND PAVINGS (Cont'd)				
	PAVEMENTS				
	Double surface dressing				
R341	Bituminous surface dressing to part of access road and parking (450m2), include preparation of base course surface, heat & spray MC30 cutback bitumen as prime coat, at a rate of 0.7 L/m2, provision of blinding material on primed surface at 200m2 /m3, first seal of 80/100 pen at a rate of 1.2 L/m2, and 14/20 mm chippings at rate of 80m2 /m3, 2nd seal of 80/100 bitumen at a rate of 1.0 L/m2 , 6/10 mm chippings at rate of 135m2 /m3 to the satisfaction of the Engineer	m2	1,700	70,000	119,000,000
	CLASS U; BRICKWORK, BLOCKWORK AND MASONRY				
	STONE PITCHING				
U823	200mm thick stone pitching (1:3 cement mortar) to sides of filled material	m2	70	80,000	5,600,000
	CLASS X: MISCELLANEOUS				

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-10					
DESCRIPTION: ANCILLARY SITE WORKS					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE Ushs**	**AMOUNT Ushs**
	WORKS				
	FENCES				
	100x100mm Concrete post of grade 35/20 concrete and wire galvanised wire chain link fence of gauge 10 to BS 1722, with triple row of barbed wire on top, anchored into and including Concrete/blockwork dwarf wall complete with foundations as per drawing, height 2-2.5 m				
X135	Height 2.0 - 2.5m	m	450	160,000	72,000,000
	GATES AND STILES				
	Supply and complete installation of metal field gate to BS 3470 in grade 25/20 concrete pad foundations; complete. height 2-2.5 m				
X235	Width 4 - 5m, double leaf	nr	1	5,000,000	5,000,000
Carried to Collection					**201,600,000**
	MISCELLANEOUS STRUCTURES				
	Solid waste skip				
X901	Area 9 sq. m	nr	1	3,500,000	3,500,000
	Guard House				
X902	Area 10 sq. m	nr	1	15,000,000	15,000,000
	VIP Latrine (2stances with Shower)				
X903	Area 10 sq. m	nr	1	25,500,000	25,500,000
	Squatting Flush Toilets (2stances with Shower)				
X904	Area 10 sq. m	nr	1	28,500,000	28,500,000
	Sitting Flush Toilets (2stances with Shower)				
X905	Area 10 sq. m	nr	1	38,000,000	38,000,000
	Cistern/Pour Flash Toilet Connected to septic Tank				
X906	Area 4 sq. m	nr	1	30,000,000	30,000,000
	Urine Diversion Dry Toilet				
X907	Area 13 sq. m	nr	1	32,500,000	32,500,000
	Public/Institutional water borne Facility				
X908	Area 82 sq. m	nr	1	85,000,000	85,000,000
	BioLatrine Sanitation Facility				
X909	Area 82 sq. m	nr	1	105,000,000	105,000,000
Carried to Collection					**363,000,000**
	Bill Summary				
	Collection, Page 1/7				94,958,000
	Collection, Page 2/7				563,010,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-10					
DESCRIPTION: ANCILLARY SITE WORKS					
ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT RATE Ushs	AMOUNT Ushs
	Collection, Page 3/7				36,900,000
	Collection, Page 4/7				108,430,000
	Collection, Page 5/7				201,600,000
	Collection, Page 6/7				363,000,000

MINISTRY OF WATER AND ENVIRONMENT					
CONSTRUCTION OF WOBULENZI FAECAL SLUDGE TREATMENT PLANT					
BILL No. WOB FS-10					
DESCRIPTION: MECHANICAL INSTALLATIONS					
ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT RATE Ushs	AMOUNT Ushs
	MECHANICAL INSTALLATION				
	PUMP				
	Required waste water pump capacity: 5.0m3/hr at a head of 10m.				
	No Flow Switches, Thermistors and Soft starters and control panel to be included.				
M001	Pump, supplied and installed in accordance with manufactures instructions	nr	2	15,000,000	30,000,000
	WATER SUPPLY TO ADMINISTRATION BUILDING				
M002	Provide potable water supply to the Administration Building a distance of 2Km. (Provisional Sum)	Item	1	10,000,000	10,000,000
	FOUL/WASTE WATER				
M003	Provide foul/waste water drainage from Administration Building to treatment plant works inlet				
		Item	1	2,000,000	2,000,000
	FLOW MEASUREMENT METER				
M004	Provide for electronic flow measurement meter complete with chamber. Include for connections to piping etc.	item	1	3,000,000	3,000,000
	CESSPOOL EMPTIER				
M005	Supply a cesspool emptier of capacity 5000 litres	item	1	120,000,000	120,000,000
Carried to Grand Summary					**165,000,000**

Appendix 7: Land Documents

THE REPUBLIC OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

MWE – B **Form B – Consent Form**

Project Name: Feasibility Studies and detailed designs for inclusive Faecal Sludge Management in Un-Sewered urban centers

Project Code: P-UG-EBO-007

Contract Number: MWE/CONS/18-19/00046/1

I, ..Mumanura....David....Apolly............do accept to offer land equivalent to 4acres for the construction of the faecal sludge treatment plant for WobulenziTown council as we wait for the Chief Government to value the land . The Contractor is therefore free to use the land as we wait for the Government Compesation.

Signature...Date:....02.....Aug....2021..............

Witnesses

1. LC 1 Chair Person / Representative
   Name:..Lwanga....Edward....Sign.......................
   Date:..16 Aug 2021..........
   0753261536
   LC1 CHAIRPERSON LUSIYA CELL BUKOLWA WARD WOBULENZI TOWN COUNCIL LUWERO DISTRICT
2. District/Town Representative
   Name:.Ssebwalamu Moses..........Sign.......................
   0772969197 / 0759129030
   CHAIRPERSON L.C III 16 AUG 2021 WOBULENZI TOWN COUNCIL
3. Ministry of Water and Environment Representative
   Name:...Sign:...
   Kalibbala Edward 0782434572

Muteegana Dan - 0774-085611
Kimbugwe Edward 0704015228

UGANDA

REGISTRATION
OF TITLES
ACT

Certificate of Title

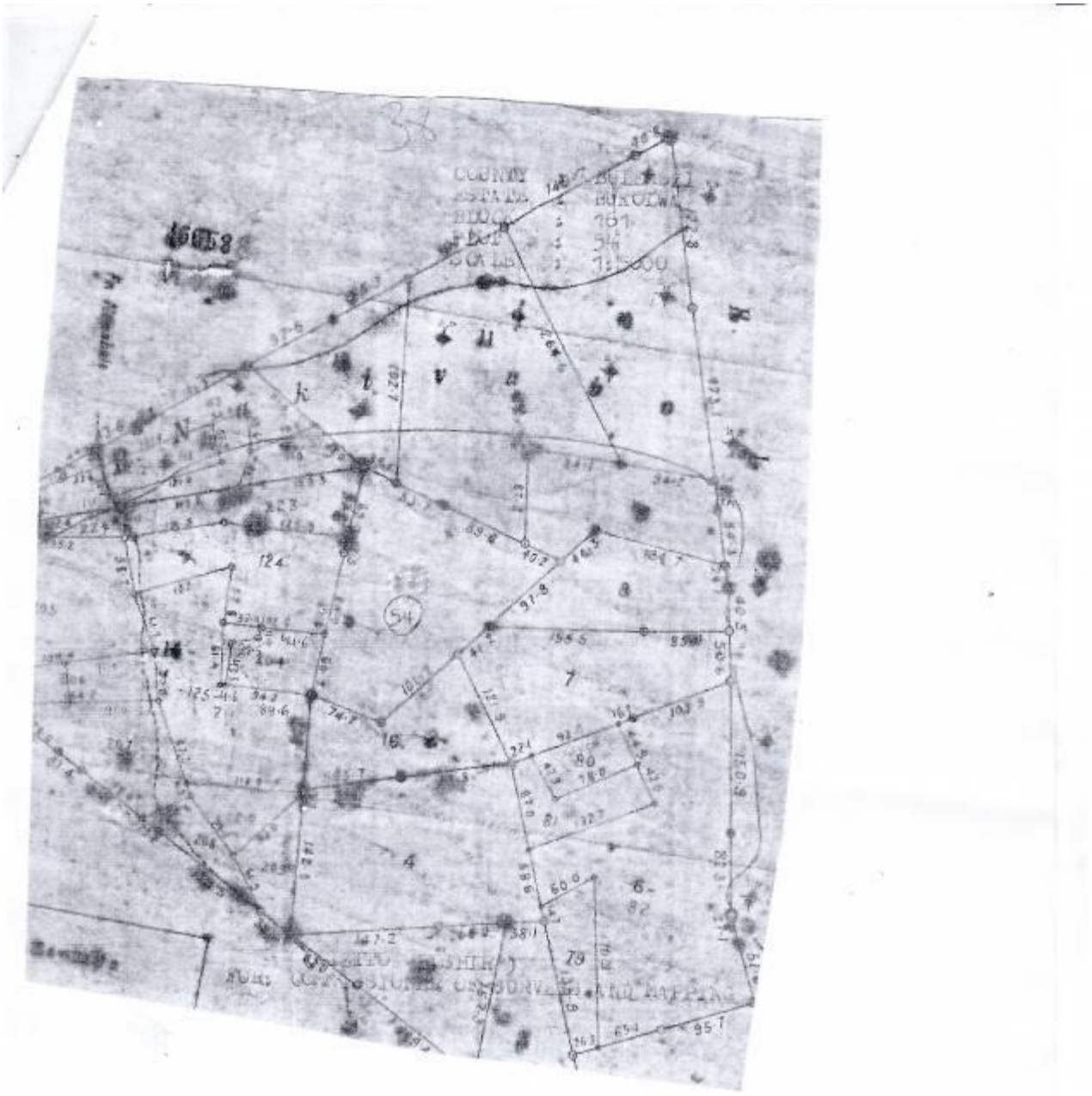
District .. EAST BUGANDA ..... County .. BULEMEZI .....

Block ..... 161 ..... Plot ..... 54 .....

Office of Titles

BUKALASA

.....



COUNTY: BULEMEZI
SUB-COUNTY: SSABAGABO

UGANDA
THE LAND REGISTER

DISTRICT	PLOT No.
EAST BUGANDA BLOCK No. 161	54

AREA IN HECTARES: 2.347 ARA

PART I-PROPERTY

NAME OR DESCRIPTION: LAND AT BUKOLWA

ALL THAT piece of PRIVATE MAILO land situate and described above which is indicated on the Registry Plan by the Block and Plot numbers written hereon

Easements, rights, etc. appurtenant to the land NIL

REGISTRAR OF TITLES

Proprietor's Signature or Mark

SEAL OF OFFICE

PART II-OWNERSHIP

Date and time of Registration	Instrument No.	Proprietor's Name and Address	Father's Name (if applicable)	Clan (if applicable)	Registrar's Signature
12.4.1990 at 2.30PM	BUK 10339	Ssepuuya Edward	Sendawula Peter	Nsenene	[signature]
25.6.1992 at 10.00AM	BUK.19015	YOKANA KALANZI	SENDAWULA	NSENENE	

MINISTRY OF LANDS, HOUSING AND URBAN DEVELOPMENT

General: 0414-230879 / 0414-342531/3
Hon. Minister: 0414-259420
Hon. Minister of State (Lands): 0414-231020
Hon. Minister of State (Housing): 0414-348265
Hon. Minister of State (Urban Devt): 0414-236364
Toll Free: 0800 100 004
Permanent Secretary: 0414-230879
Under Secretary: 0414-236359
Fax: 0414-230891
Email: mlhud@mlhud.go.ug

Uganda Vision 2040

Luwero Ministry Zonal Office, Plot 35, Bukalasa Estate, Luwero

In any correspondence on this subject please quote No. **BULEMEZI, BLOCK 161, PLOT 54**
9th day of February 2021

To: TOWN CLERK
PO BOX WOBULENZI

RE: STATEMENT OF SEARCH AS AT 9th day of February 2021

Reference is made to your request for a search. This is to inform you that the following entries appear on the Titles Register as follows:

Title:	LAND AT BUKOLWA BULEMEZI BLOCK 161 PLOT 54.
Area:	2.3500 HECTARES
Owner/s:	**KALANZI YOKANA** REGISTERED ON 29TH DAY OF AUGUST 1960 UNDER INSTRUMENT NO. BUK20500
Incumbrance/s:	CAVEAT BY **LUBOWA JOSEPH FRANCIS** CLAIMING AS PURCHASER OF PO BOX 72 WOBULENZI REGISTERED ON 23RD DAY OF JULY 2019 AT 10:42 AM UNDER INSTRUMENT NO. LUW-00000303

It is for you to satisfy yourself that this land is the property of the person in whom you are interested in and not of someone else of the same name.

As only personal searches are of the Register is provided for in the Registration of Titles Act, (Cap. 230), the above information is given on the understanding that its accuracy is not guaranteed and that no liability whatsoever can be accepted if loss or damage result from any error, omission or mis-statement therein.

Yours faithfully,

Sharon Christine Namambwe
Registrar of Titles
For: Commissioner Land Registration