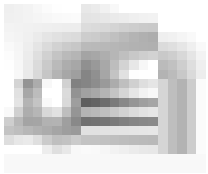
THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF WATER



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Comprehensive Project Brief for the Proposed Fecal Sludge Treatment Plant to be constructed at Kizani Mtaa, Somangira Ward, Kigamboni District, Dar es Salaam Region

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ABBREVIATIONS

AAQ Ambient Air Quality
AIDS Acquired Immuno-Deficiency Syndrome
DAWASA Dar es Salaam Water and Sanitation Authority
EIA Environmental Impact Assessment
EMP Environmental Management Plan
ESIA Environmental and Social Impact Assessment
ESMP Environmental and Social Monitoring Plan
FSTP Faecal Sludge Treatment Plant
GoT Government of Tanzania
HIVHuman Infection Virus
IDA International Development Association
LGA Local Government Authority
NEMC National Environment Management Council
NEP National Environment Policy
OGSP Off-Grid Sanitation Project
PPE Personal Protective Equipment
PVC Polyvinyl Chloride
RAP Resettlement Action Plan
SSS Simplified Sewerage System
STDS Sexual Transmitted Diseases
TANESCO Tanzania National Electric Supply Company
WSP Wastewater Stabilization Ponds

THE STUDY TEAM

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EXECUTIVE SUMMARY

Comprehensive Project Brief for the Proposed Fecal Sludge Treatment Plant to be constructed at Kizani Mtaa, Somangira ward, Kigamboni District, Dar es Salaam Region

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INTRODUCTION

The Government of the United Republic of Tanzania (GoT) through the Dar es Salaam Water and Sewerage Authority (DAWASA) under the Ministry of Water intends to implement an Off-Grid Sanitation Project (OGSP) in Dar es Salaam City to serve peri-urban areas not connected to the central sewerage system. DAWASA has received financing from the International Development Association (IDA) in the form of a credit to implement the project. Prior to implementing the project, the law in Tanzania requires an Environmental Impact Assessment to be conducted and approved by relevant authority. In order to comply with the law in Tanzania, the DAWASA intends to apply a portion of the proceeds of the credit to eligible payments for consulting services for Preparation of Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Report for construction of off grid sanitation projects.

Dar es Salaam is the largest and most important commercial and industrial centre in According to the Tanzania National Census of August 2022, the City of Dar es Salaam has a population of 5,383,728 (sense.nbs.go.tz, accessed December 24, 2022). About 10% of the population is served by sewers and the rest almost depend on on-site sanitation systems. The sewer coverage is only limited to the area within city centre with a total length of 67.8km and the system is based on a separate system and discharge their effluent into oxidation ponds, and into the sea through sea outfall of about 1.03km long. The onsite sanitation systems result into Faecal sludge of which handling and management throughout the sanitation chain (from domestic containment, transportation as well as disposal and treatment) is currently hygienically inadequate thus posing environmental and public health risks. The Off-Grid project is intended to address these challenges. The Off-Grid project in divided into several subprojects which will be implemented in the five municipalities of Dar es Salaam City. One of these is the Construction of Faecal sludge treatment plant at Kizani in Somangira ward, Kigamboni District.

The ESIA study was conducted in accordance with Regulation 6(1) of Environmental Management (Environmental Impact Assessment and Audit) (Amendment) Regulations, 2018. These Regulations provide legal procedures for implementing the requirements of the Environmental Management Act Cap.191 of 2004. The Regulations give mandate to NEMC to oversee the EIA process, which culminates with an award of the EIA Certificate by the Ministry responsible for Environment.

In accordance with the EIA Regulations, NEMC is mandated to screen projects and make decisions of level of EIA required as well as evaluating the adequacy of respective environmental statements. Considering the nature and size of the proposed “Faecal Sludge Project in Kigamboni District”, the project falls under Category “B2” (Non-Mandatory) in accordance with Reg.4 (1)(c) and First Schedule of the amended 2018 Regulations. The regulations require developers to prepare and submit to the National Management Council (NEMC) filled EIA

registration forms and “Project Briefs” for all B2 projects. The preparation and content of the “Project Briefs” is provided under Regulation 6(1) of Environmental Impact Assessment and Audit Regulations, 2005. The same has been followed in preparing this “Project Brief”. The project brief was conducted in July-August 2020.

This project brief for the Proposed Construction of Faecal Sludge Treatment Plant in Kigamboni District is being submitted to NEMC together with EIA Registration Forms for EIA Certificate decision.

PROJECT DESCRIPTION

The project site is located at Somangira ward, Kigamboni Municipal within Dar es Salaam Region. The site is 48.7 Kilometers and 41.3 Kilometers from Dar Es Salaam city centre via Kilwa road and Julius K. Nyerere road respectively. The proposed project site is not within the sensitive ecosystem or protected area and far from public utilities.

The project area is accessible via Julius K. Nyerere road as follows, starting from Samora Avenue 2 Kilometers; at the roundabout take the 4th exit onto Railway St. 0.2 Kilometers then turn right onto Gerezani St. 2.1 Kilometers then turn left onto Julius K. Nyerere road up to Somangira junction 20Kilometers. Then onto Somangira junction up to Somangira Bus stop 13 Kilometers then remains about 5Kilometers to the project site via rough road.

The proposed project site is characterized with both natural and artificial vegetation. There are short and tall grasses and some artificial trees (Palm trees) and Mango trees around the site area. The project site is located adjacent to the marches within which a river drains to Indian Ocean. Generally, the project site is rich in nutrients because some farming activities were observed to be conducted. The project is about 0.3km from the newly built ward office and play ground.

POLICIES, LEGISLATION AND INSTITUTIONAL ARRANGEMENTS

Sector policies that were reviewed when executing the proposed development are;

- National Environment Policy 2021
- National Land Policy of 1997
- Construction Industry Policy (2003)
- National Health Policy (2003)
- National Gender Policy of 2000
- National Human Settlements Development Policy (2000)

Principal Acts, regulations and guidance that support and provide guidelines to implement the intended project are;

- Environmental Management Act (2004)
- The Environmental Management (Fees and Charges) Regulations, 2021
- The Environmental Management (Control of hazardous Waste) regulations, 2021
- The Environmental Management (Control of Noise and vibration) regulations, 2015
- The Environmental Management (Prohibition of Plastic Carrier bags) regulations, 2019
- The Environmental Management (Solid Waste Management) regulations, 2007
- The Environmental Management (Water Quality) regulations, 2009
- The Environmental Management (Air Quality) regulations, 2009
- The Environmental Management (Soil Quality) regulations, 2009
- Occupational Health and Safety Act 2003
- The Water Supply and Sanitation Act No. 12 of 2009
- Engineers Registration Act and its Amendments 1997 and 2007
- The Contractors Registration (Amendment) Act, 2008

- The Architects and Quantity Surveyors Act (1997)
- The Urb World Bank guidelines for Environmental Managementan Planning Act (2007)
- Public Health Act (2009)

STAKEHOLDERS ISSUES AND CONCERNS

Different stakeholders were consulted. Among of the issues that arise during consultation at the Kigamboni District and community at Kizani Mtaa are:

Facilities to be developed

- Proper awareness to people on best ways to dispose pads and other waste in order to avoid system blockage
- The proposed facilities should be well protected

Awareness to the community

- Awareness to the people on the system operation, since it is a new technology
- Awareness to the community to avoid riots in the future
- Educate the community to avoid the use of detrimental disinfectants to the system so as to avoid system failure and contaminated manures.

PROJECT REQUIREMENTS AND WASTE GENERATION

Project requirements

The main materials for Faecal Sludge Treatment Plant include cement, aggregates (stones), water, steel, sand, timbers, blocks, uPVC pipes, IPS Pipes and gravels. All materials are available in the local sources in Tanzania. The estimated quantities of the materials to be included in the BoQ.

The proposed project development will employ various standard construction equipment and machinery. Equipment expected to be used during the construction works are Excavators, Tippers, Concrete Mixers, poker vibrators, Wheel barrow, Compactor, etc. All equipment and machineries for construction works needed by

the proposed project will be determined when the bill of quantities (BoQ) and selection of Contractor is finalized. These equipments shall be temporary and shall be demobilized once project is completed.

Wastes generation

The major wastes generation associated with the project are spoil soils resulting from earthworks during the foundation excavations, solid wastes and liquid waste. The spoil soil shall be stock piled around the public toilet for further use in landscaping the site at the end of the project.

A total of 120m^3 per day of liquid waste is estimated to be received at the receiving chamber of the proposed facility during the maximum operation phase. On the other hand, about 0.5-1 tons per month of domestic refuse and other solid wastes is estimated to be generated and trapped at the garbage screen during the project construction and operation phase respectively. A well-established solid waste collection system will be instituted. The system will involve among other things wastes segregation at source, recycling or reuse of some wastes and final disposal to the approved dumpsite / landfill.

POTENTIAL IMPACTS

The following impacts were identified to be likely to occur during mobilization phase:

- Employment opportunities
- Improved urban agriculture
- Increased socio-cultural interaction

The following impacts were identified to be likely to occur during the construction phase;

- Increased HIV/AIDS and other sexual related diseases
- Loss of biodiversity
- Land degradation and increased pollution

- Noise pollution
- Air pollution from dust emission
- High risk of Health associated with construction work
- Waste generation durig construction

The following impacts were identified to be likely to occur during the operational phase;

- Improved social-economic livelihood and dignity within the beneficiary society
- Increased Revenue to the nation through taxes, both direct and indirect
- Cost reduction for sewage management
- Biogas production potential
- Minimized forest harvesting
- Sewer leakage/overflow
- Improved urban agriculture

MITIGATION MEASURES AND ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

The options to minimize or prevent the identified adverse social and environmental impacts as well as a monitoring plan have been suggested in this report and are contained in the ESMP. Many of them are based on good engineering practices and the timely responsiveness of the responsible institution. The ESMP describes the implementation schedule of the proposed mitigation measures as well as planning for long-term monitoring activities. It defines the roles and responsibilities of different actors of the plan. The Approach environmental and social costs amount to Tshs 68,000,000.00. The estimated annual costs for carrying out the proposed environmental and social motoring program amounts to TSH 28,000,000.00.

DECOMMISSIONING PLAN

The decommissioning is not anticipated in the foreseeable future. However, if this will happen, may entail change of use (functional changes) or demolition triggered by change of land use. In view of this, specific mitigation measures pertaining to environmental impacts of decommissioning works cannot be proposed at the moment with a reasonable degree of certainty.

CONCLUSION

The proposed project is of greater profit to the community and the country at large as it promotes and improve sanitation in the streets. When there is good and improved sanition, then the outbreak of diseases like diarhoea and associated stomach and waterborne diseases are also reduced and prevented hence improved public health.

The impacts identified are preventable and of less negativity to the community, therefore the developer can be provided with the environmental clearance certifacte in order to commence the implimentation of the project.

It is, therefore, concluded that implementation of the proposed construction of the Faecal sludge treatment plant at Kizani Mtaa will entail no detrimental impacts provided that the recommended mitigation measures are adequately and timely put in place. The identified adverse impacts shall be managed through the proposed mitigation measures and implementation regime laid down in this EIS. DAWASA is committed to implementing all the recommendations given in the EIS and further carrying out the environmental auditing and monitoring schedules.

Comprehensive Project Brief for the Proposed Fecal Sludge Treatment Plant to be constructed at Kizani Mtaa, Somangira ward, Kigamboni District, Dar es Salaam Region

1.0 BACKGROUND AND JUSTIFICATION

The Government of the United Republic of Tanzania (GoT) through the Dar es Salaam Water and Sewerage Authority (DAWASA) under the Ministry of Water intends to implement an Off-Grid Sanitation Project (OGSP) in Dar es Salaam City to serve peri-urban areas not connected to the central sewerage system. DAWASA has received financing from the International Development Association (IDA) in the form of a credit to implement the project. Prior to implementing the project, the law in Tanzania requires an Environmental Impact Assessment to be conducted and approved by relevant authority. In order to comply with the law in Tanzania, the DAWASA intends to apply a portion of the proceeds of the credit to eligible payments for consulting services for Preparation of Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) Report for construction of off grid sanitation projects.

Dar es Salaam is the largest and most important commercial and industrial centre in Tanzania. The city has an estimated population of about 5.0 million and is projected to double at the end of the project horizon of 25 *years (National Census 2022)*. About 10% of the population is served by sewers and the rest almost depend on on-site sanitation systems. The sewer coverage is only limited to the area within city centre with a total length of 67.8km and the system is based on a separate system and discharge their effluent into oxidation ponds, and into the sea through sea outfall of about 1.03km long. The onsite sanitation systems result into Faecal sludge of which handling and management throughout the sanitation chain (from domestic containment, transportation as well as disposal and treatment) is currently hygienically inadequate thus posing environmental and public health risks. The Off Grid project is intended to address these challenges. The Off Grid project in divided into several subprojects which will be implemented in the five municipalities of Dar es

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This project brief for the Proposed Construction of Faecal Sludge Treatment Plant in Kigamboni District is being submitted to NEMC together with EIA Registration Forms for EIA Certificate decision.

1.1 NATURE OF THE PROJECT

The proposed project concerns construction of an engineered Faecal sludge treatment facility for public use at Ngobedi, Somangira ward, Kigamboni District. The nature of the project enhances environmental protection through proper handling and disposal of domestic sewage. According to First Schedule of the EIA and Audit Regulations (Amended) of 2018, the nature of the project is small and entails no significant impacts. The project can be categorised as Type B2, which according to the regulations are "small-scale activities and enterprises that require registration but shall not require Environmental Impact Assessment. Further, the projects shall not require screening and scoping, rather, the Project Brief shall be examined and issued with an Environmental Impact Assessment Certificate".

2.0 PROJECT DESCRIPTION

2.1 Project Location

The project site is located at Somangira ward, Kigamboni Municipal within Dar es Salaam Region. The project site is geographically located at 37S UTM zone with coordinates in Table 1. The site is 48.7 Kilometers and 41.3 Kilometers from Dar Es Salaam city centre via Kilwa road and Julius K. Nyerere road respectively. (Refer Figure 1, and Figure 2). The proposed project site is not within the sensitive ecosystem or protected area and far from public utilities.

Table 1: The coordinates of the project area

S/No.	Coordinates	
	Easting	Northing
1.	542717	9241398

Figure 1: A Map of Dar es salaam region showing the project Ward and District

Figure 2: An Extract Google view to show the Location of the project area

2.2 Accessibility

The project area is accessible through Kigamboni-Kongowe/Somangira road, about 15 km from Kigamboni Ferry and approximately 1.35 km from the road. It is in the right-left side location for Kigamboni to Somangira direction.

2.3 Specific Features

The proposed project site is characterized by both natural and artificial vegetation. There are tall grasses, shrubs with climbers, and some artificial trees (Palm trees) around the site area (Figure 3). The project site is located adjacent to the marches within which a river drains to the Indian Ocean. Generally, the project site is rich in nutrients because some farming activities were observed to be conducted.

Figure 3: Some of the natural vegetation species at the site

2.4Adjacent Land Use

The nutritious nature of the Marshes and water logging phenomenon adjacent to the site where the aforesaid project is located has dictated the farming activities being conducted. The main crops being cultivated in these farms are maize, cassava, yams and vegetables, figure 4. The proposed project site is located at Kizani Mtaa, the area is about 100m to the nearby seasonal water stream. The land in which the project is expected to be implemented is owned by the Kigamboni District, whereby the city Council provided land to DAWASA (Project implementer) and they have the letter which indicates that they acquired land from the City Director. The Memorandum of Understanding is attached in appendix II.

Figure 4: The Farming activities around the project site

2.5 PROJECT ACTIVITIES

2.5.1 Mobilization or pre-construction phase

This phase entails mobilization of labour force, and equipment as well as acquisition of various permits as required by the law.

Other activities during this phase include;

- Topographical Survey for setting out purposes,
- Geo-technical Investigation for the areas allocated with the balancing tank and Anaerobic Baffled Reactor (ABR)
- Construction Materials' source Investigation,
- Land acquisition,
- Material storage and material preparation,

2.5.2 Construction phase

This phase entails all the necessary installations, site grading and placement of the facility components. The major activities include;

- Vegetation clearance and earthworks (foundations excavation),
- Dewatering
- Site access road formation and drainages construction;
- Construction of parking lot and access ramp for tankers;
- Construction of Garbage screen, balancing tank, Biogas digester, Anaerobic Sludge Reactor (ABR) and sludge drying beds;
- Construction of Plant Office, guard house and storage room;
- Preparation of planted gravel filter;
- Plumbing work connecting all treatment units up to the effluent; and
- Installation of biogas collection system to the intended end user.

2.5.3 Demobilization phase

This phase will involve the dismantling of temporary structures such as scar fording and removing/spreading spoil materials for proper restoration of the site.

Other activities include;

- General cleanliness of the area, that is clearance of all sorts of solid wastes (plastics, wood, metal, papers, etc);

- Deposit all wastes to the authorized dumpsite;

2.5.4 Operation phase

The phase entails the actual usage of the Feacal sludge Plant.Faecal sludge will be desludged using vacuum takers and disposed of at the proposed facility for further treatment. DAWASA will decide on the mode of operation of the Faecal Sludge Treatment Facility.

2.5.5 Decommissioning Phase

Decommissioning is not anticipated in the foreseeable future as the completed facility will be serving a number of houses which at present incur many costs to dispose fecal sludge and if not so tend to discharge illegally. However, if this will happen, may entail change of use (functional changes) or demolition triggered by change of land use.

2.6 PROJECT DESIGN

2.6.1 Design criteria

The proposed technology and construction design follow the objective to execute an engineering design of fecal sludge management facility (one in number at the stated site) which will be simple, cost effective/efficient, easy to operate and maintain performance standards which conform to NEMC.

Technology selection was based on the following four main aspects;

- Land availability
- Context of the location of the treatment sites (existing infrastructures)
- Local operation and maintenance management capacity
- Revenue generation through by-products

2.6.2Technology description

2.6.2.1 Garbage screen

Domestic sludge is dispersed directly onto the screening inlet chamber to retain the incoming debris before it goes to the preliminary treatment process.

2.6.2.2 Balancing tank

The incoming wastewater is stored in the balancing tank to allow sludge stabilization and controlling flow when it goes to the next treatment units. This tank play key role to reduce shocking loads towards the system especially when the hydraulic loading surpasses plant designed holding capacity.

2.6.2.3 Biogas digester

This unit is designed to separate the incoming wastewater in liquid and solid form as well as the biologically digestion of organic solids. The digestion process takes place without oxygen input, under anaerobic conditions, and generates biogas useful for cooking, lighting and heating. Therefore, the project will produce biogas which will be harvested and used by the nearby facilities ie ward office and the nearby residents, but the number of users depends on the volume produced from the nature of the wastewater received in the facility.

2.6.2.4 Anaerobic Baffled Reactor (ABR)

The baffled reactor consists of series of chambers in which the wastewater flows up-stream. Here, the suspended and dissolved solids in the pre-settled waste water undergo anaerobic degradation. The activated sludge settles at the bottom of each chamber and the influent wastewater is forced to flow through this sludge blanket where anaerobic bacteria make use of the pollutants for their metabolism. Progressive decomposition occurs in the successive chambers. A part of the last chambers can optionally be filled up with coarse filter material like, stones, cinder or plastic rings. The filter materials act as carrier material for an attached bio-film, which consumes the organic water pollutants. In ABR plants the BOD removal efficiency is up to 90% and the pathogen removal ranges between 40-75%. The baffled reactor is resistant to shock load and variable inflow. It operates by gravity and maintenance is reduced to desludging of the chambers at intervals of 1-2 years. This unit is advantageous since its sub-soil construction saves space.

2.6.2.5 Planted Gravel filter

Planted Gravel Filter (PGF) is a constructed wetland suitable for wastewater with low percentage of suspended solids that have already been removed by pre-treatment. The main removal of treatment mechanisms are biological conversion, physical filtration and chemical absorption. The PGF is made of planted filter bodies consisting of graded gravel. The bottom slope is 1% and the flow direction is mainly horizontal. The main plants used in this filter bed are; *Canna indica, Reed juncus, Papyrus, Phragmites* and *Arundo donax*. The plant selection is mainly based on their ability to grow on waste water and have their roots go deep and spread wide. Plants transport oxygen via their roots into the ground. However, in the present DEWATS design the use of plants is only to act as catalysts rather than actually be a treatment medium. BOD removal ranges between 75-90% efficiency on the other hand pathogen removal efficiency is over 95%. The operation and maintenance of the system are simple and spatial requirements for construction are compensated through beautifying landscapes.

2.6.2.6 Sludge Drying Bed (SDB)

This unit is designed for storage and drying of dislodged sludge after 3-6 months from the Biogas Settler, the sludge drying is mainly by using solar energy which kills pathogens. Sludge can then be used as compost in agricultural fields to grow various crops especially bananas.

2.7 Sludge loading intensity

There is a wide range of sludge loadings and intervals of reed beds according to previous researches, when operated with septage and pit latrine sludge. Maximal sludge loading rate of 250kg DM per m^2 and per years are recommended for septage, meaning sludge from septic tanks have a fairly good degree of stabilization. For this project with a mixture of sludge coming from septic tanks and lined and un-lined pit latrines the receiving sludge is considered as partly anaerobic.

2.8 Proposed Processing steps

The treatment process of the proposed facility follows the cross-section flow diagram in figure 5 from the influents to the effluent.

Figure 5: The Fecal Sludge Treatment Facility cross-section diagram

3.0 POLICIES, LEGISLATION AND INSTITUTIONAL ASPECT

According to the fundamental principles of environment, any developmental activities of this nature such as construction of Faecal Sludge Treatment Plant would have socio-economic and somehow environmental impacts that must be addressed and governed in order to serve public interest and sustainable development. Given the many existing and developing environmental laws, regulations and standards in Tanzania, it is worth considering resorting to constitutional provisions to protect and manage the environment. With increasing environmental awareness in recent decades, the environment has become a higher political priority and many constitutions now expressly guarantee a 'right to a healthy environment', as well as the procedural rights necessary to implement and enforce the substantive rights granted.The public or national interest in this aspect is addressed through government Policies and regulated by Principal Acts and Regulations. The implementation of the proposed project shall touch various sectors; therefore, the developer has to comply with number of cross-sectorial policies and legislations relevant to this project. Also, the listed institutions involved in environmental management for the project is included in this chapter.

3.1 RELEVANT POLICIES

This section focuses on various policies which guide the development aspects for sustainable vision, apart from the national environmental policy, there are numbers of sector policies that are to be reviewed when executing the proposed development and these include;

3.1.1 National Environment Policy 2021

Environmental awareness in the country has significantly increased in recent years. The government has been developing and reviewing national policies to address environmental management in various sectors. Among others, the objective of these policies is to regulate the development undertaken within respective sectors so that they are not undertaken at the expense of the environment. The national policies that address environmental management as

far as this project is concerned and which form the cornerstone of the present study include the following:

3.4.1 National Environmental Policy (NEP, 2021)

The National Environmental Policy of 2021 has just been launched in February 2021. The new policy formulation is a revision of the National Environmental Policy of 1997. The Policy serves as a national framework for planning and sustainable management of the environment in a coordinated, holistic and adaptive approach taking into consideration the prevailing and emerging environmental challenges as well as national and international development issues. Effective implementation of this policy requires mainstreaming of environmental issues at all levels, strengthening institutional governance, and public participation in environmental management regimes. The long-term vision of this policy is geared towards the realization of environmental integrity, assurance of food security, poverty alleviation, and increased contribution of the environmental resources to the national economy. It also recommends strong institutional and governance measures to support the achievement of the desired objectives and goals.

The policy seeks to promote the economy and livelihoods of people while promoting sustainable utilization of natural resources in the country. The policy provides the framework for the formulation of plans, programs, and guidelines for the achievement of sustainable development.

The policy's overall objective is to provide a national framework for guiding harmonized and coordinated environmental management for the improvement of the welfare of present and future generations. The specific objectives are i) to strengthen coordination of environmental management in sectors at all levels; ii) to enhance environmentally sound management of land resources for socioeconomic development; iii) to promote environmental management of water sources; iv) to strengthen conservation of wildlife habitats and biodiversity; v) to enhance conservation of forest ecosystems for sustainable provision of environmental goods and services; vi) to manage pollution for the safe and healthy environment; vii) to strengthen the national capacity for

addressing climate change impacts; viii) to enhance conservation of aquatic system for the sustained natural ecosystem; ix) to ensure safety at all levels of application of modern biotechnology; x) to promote gender consideration in environmental management; xi) to promote good governance in environmental management at all levels; and xii) to ensure predictable, accessible, adequate and sustainable financial resources for environmental management.

3.1.2 National Land Policy of 1997

The National Land Policy states that "the overall aim of a National Land Policy is to promote and ensure a secure land tenure system, to encourage the optimal use of land resources, and to facilitate broad-based social and economic development without upsetting or endangering the ecological balance of the environment". This study partly responds to this requirement.

3.1.3 Construction Industry Policy (2003)

Among the major objectives of the policy, which supports a sustainable building development sector, include the promotion and application of cost effective and innovative technologies and practices to support socio-economic development activities such as sanitation, water supply, buildings, road-works, shelter delivery and income generating activities and to ensure application of practices, technologies and products which are not harmful to either the environment or human health. Proposed project is in-line with this policy as ultra-modern technology is used during construction and its operation.

3.1.4 National Health Policy (2003)

The health Policy is a vital guide towards health development of any country. It is particularly, important in a country like ours where resources and technology are more limited than in other countries, which are relatively better off in both technology and resources. This Policy is a revision of the 1990 Health Policy, which emphasized on the need for increasing community involvement in health development and improved access and equity in health and health services.

The Policy recognizes the challenges of consolidating the principles of the previous health policy in community involvement, improved health services provision, access and equity while addressing the different dimensions of reforms that are taking place in the Public Sector.

The proposed project will adhere to policy requirements to ensure no transmission of such communicable diseases between construction workers and the community, protect workers from all sorts of health risks and hazards; and provide adequate sanitation services within the project and ensure that its activities are not a source of health issues.

3.1.5 National Gender Policy of 2000

The overall objective of the Gender and Development Policy is to promote gender equality and equal participation of men and women through facilitation of access to education, child care, and employment and decision making. Also, this policy is to provide guidelines that will ensure that gender-sensitive plans and strategies are developed in all sectors and institutions. While the policy aims at establishing strategies to eradicate poverty, it emphasizes gender quality and equal opportunity of both men and women to participate in development undertakings and to value the role played by each member of society. The proposed project will adhere the requirements addressed under this policy.

3.1.6 National Human Settlements Development Policy (2000)

Among the objectives of this policy is to improve the level of the provision of infrastructure and social services for the development of sustainable human settlements and to make serviced land available for shelter to all sections of the community. Such infrastructure and services constitute the backbone of urban/rural economic activities. Feacal Sludge Treatment Plant (FSTP) is one among of the important infrastructure for the Somangira community and country at large

3.2 PRINCIPAL LEGISLATIONS AND REGULATIONS

The ESIA team reviewed several legislations relevant to the construction of Feacal Sludge Treatment Plant. These encompass Principal Acts that support and provide guidelines to implement the intended project as discussed below.

3.2.1 Environmental Management Act (2004)

Among the major purposes of the EMA are to provide the legal and institutional framework for sustainable management of the environment in Tanzania; to outline principles for management, impact and risk assessment, the prevention and control of pollution, waste management, environmental quality standards, public participation, compliance, and enforcement; to provide the basis for the implementation of international instruments on the environment; to provide for the implementation of the National Environmental Policy; to provide for the establishment of the National Environmental Fund and to provide for other related matters.

Part III, Section 15(a) states that "*in matters about the environment, the Director of Environment shall coordinate various environment management activities being undertaken by other agencies to promote the integration of environmental considerations into development policies, plans, programs, strategies projects and undertake strategic environmental assessments to ensure the proper management and rational utilization of environmental resources on a sustainable basis for the improvement of the quality of human life in Tanzania*".

Part X of the law deals with Environmental Quality Standards. Section 140 of this act states that "*The National Environmental Standards Committee of the Tanzania Bureau of Standards established under the Tanzania Bureau of Standards Act, 1975 shall develop, review and submit to the Minister proposal for environmental standards and criteria concerning; water quality; discharge of effluent into the water; air quality; control of noise and vibration pollution; sub-sonic vibrations; soil quality, control of noxious smells; light pollution; and any other environmental quality standard*" Some of these standards have already

been published in the government *gazette* while others are not in place. This project shall take into account all the standards specified by this act.

3.2.2 The Environmental Management (Fees and Charges) Regulations, 2021

These Regulations shall apply in relation to an act or service in respect of which fees and charges are payable under the Act and Regulations made thereunder. The regulations emphasize that "a person shall not, upon payment of fees and charges prescribed in the Schedule to these Regulations, carry on any of the following":

- Environmental Impact Assessment;
- Environmental Compliance Monitoring and Audit;
- Registration of Environmental Experts;
- Environmental Quality Standards;
- Noise and Vibrations; or
- other activities related to the environment

This project complies with the regulations since the proponent has already paid registration fees and review charges as directed by NEMC.

3.2.3 The Environmental Management (Control of hazardous Waste) regulations, 2021

The objective of these regulations is to protect the environment and human health by preventing or reducing the generation of Hazardous waste, the adverse impacts of the generation and management of hazardous waste and by reducing overall impacts of resource use and improving the efficiency of such use, which are crucial for the transition to a circular economy. The regulation requires that "any person generating, collecting, storing, transporting, treating, recycling, reusing, recovering and disposing of hazardous waste or any person exercising jurisdiction under these Regulations shall, assure that there are no adverse impacts to be generated or caused by the activity conducted. Project developer will comply with the requirements of this regulation by reducing the

construction materials which may generate hazardous impacts, as well as proper handling of such waste such as in use of fuels for various purposes etc.

3.2.4 The Environmental Management (Control of Noise and vibration) regulations, 2015

The regulations focus on the maintenance of a healthy environment for all the people in Mainland Tanzania, the tranquility of their surrounding and their psychological well-being by regulating noise and vibration levels to prescribe the maximum permissible noise and vibration levels from a facility or activity to which a person may be exposed. The project developer will make sure that all the guidelines under this policy will be considered to ensure the healthy environment to everyone.

3.2.5 The Environmental Management (Prohibition of Plastic Carrier bags) regulations, 2019

Regulations are meant to impose a total ban on the import, export, manufacturing, sale, and use of plastic carrier bags regardless of their thickness. Plastic carrier bags has a wide definition in the Regulations, as a bag made of plastic film, with or without handles, or gussets and to which its layer is in any thickness. The Regulations also categorically state that no person shall sell or offer for sale beverages or other commodities wrapped in plastics unless the nature of such commodities require wrappings by plastics, and restricts any licensing authority from issuing any licenses after the Regulations come into force. Project developer will make sure that there will be no use of plastic bags within the project site and the whole project life time, also in case of the need of carrier bags the proponent will make sure that there will be an alternative bags which are allowed by the regulations. For the commodities that are wrapped in plastic, then the proponent will make sure that such plastic will be handled properly.

3.2.6 The Environmental Management (Solid Waste Management) regulations, 2007

The solid waste management regulation of 2007, provides general directive on management of solid waste as follows: -

Regulation detail the requirements and responsibilities for managing solid waste in Tanzania

Highlight waste minimization and cleaner production principles alongside the duty to safeguard the public health and the environment from adverse effects of solid waste. Detail permitting requirements, notably that any person dealing with solid waste as collector, transporter, waste depositor or manager of a transfer station will apply to the LGA for a permit. The local authority will also issue licenses to individuals or companies qualified to operate solid waste disposal sites; permit is required to operate an LGA waste disposal site. The proposed project is expected to generate solid waste in construction phase. Therefore, to comply with this regulation the Project developer will engage the registered solid waste collection contractor.

3.2.7 The Environmental Management (Water Quality) regulations, 2009

Regulations provide for institutional and legal framework for sustainable management and development of water resources; to outline principles for water resources management; to provide for the prevention and control of water pollution; to provide for participation of stakeholders and the general public in implementation of the National Water Policy. These regulations require the sustainable management of water sources and proper use of the available sources without causing any damage towards such sources. Also, the regulations emphasize that it is every one's responsibility to conserve and preserve the available water sources in Tanzania. During all phases of the project there will be water demand, hence the project developer will make sure that there will be a sustainable use of water. Also during construction and maintenance phase the developer will make sure that the water supply pipes will not be damaged in either ways

3.2.8 The Environmental Management (Air Quality) regulations, 2009

The Regulations were formed in order to: -

- Prohibit emissions and releases of hazardous substances into the environment
- Prescribe permissible emission limits and quantities of emissions of sulphur oxide, carbon monoxide, black smoke and suspended particulate matters, nitrogen oxide, ozone, hydrocarbons, dust and lead
- Empower NEMC to issue air pollutant emission permits, enforce compliance, undertake emergency prevention and issue stop orders
- Set baseline parameters on air quality and emissions based on a number of practical considerations and acceptable limits and ensure protection of human health and the environment from various sources of pollution.

The proposed project will adhere the requirements of this Act, emission limits will be monitored to the permissible limits.

3.2.9 The Environmental Management (Soil Quality) regulations, 2009

These Regulations, made by the Minister of State under sections 143, 144 and 230 of the Environmental Management Act, concern soil pollution and soil quality standards and provide with respect to a soil protection permit and compliance system. They also concern measures of enforcement. The object of these Regulations is to

- Set limits for soil contaminants in agriculture and habitat;
- Enforce minimum soil quality standards prescribed by the National Environmental Standards Committee.

Also, the regulations require that, the contaminants of volatile organic compounds in habitat and agricultural soils shall comply with parameters and upper limits as prescribed and contaminants of heavy metals in habitat; agricultural soils shall comply with parameters and upper limits as prescribed and contaminants of pesticides in habitat and agricultural soils shall comply with parameters and upper limits as prescribed. Local government authority may prescribe special or specific measures and guidelines for soil conservation

applicable to their respective areas of jurisdictions which are not below standards prescribed under these Regulations. The Project developer will comply with the requirements made under these regulations.

3.2.10 Occupational Health and Safety Act 2003

The provisions of this law require employers to provide decent working environment to employees to guarantee their health and safety. Occupational health and safety services are important for sustainable development of a country, as they reduce occupational accidents and diseases which can have huge economic burden to individuals, enterprises and the nation as whole. Improving health and safety of workers will significantly increase productivity at the workplaces to encourage more investments, increase job creation, higher morale, and job satisfaction hence industrial harmony. The law also entails employers to fulfil obligations of ensuring safety of the equipment's used by workers and providing proper safety gears as required.

3.2.11 The Water Supply and Sanitation Act No. 12 of 2009

This is also a new legislation that provides for sustainable management and adequate operation and transparent regulation of water supply and sanitation services; provides for establishment of water supply and sanitation authorities as well as community owned water supply organizations; and provides for appointment for service providers. The main aim of this law is to ensure the right of every Tanzanian to have access to efficient, effective and sustainable water supply and sanitation services for all purposes by taking into account among others protection and conservation of water resources and development and promotion of public health and sanitation; and protection of the interest of customers. Under this law, the Minister responsible for water affairs shall establish water authority and cluster water authorities in order to achieve commercial viabilities.

3.12 Engineers Registration Act and its Amendments 1997 and 2007

The Acts regulate the engineering practice in Tanzania by registering engineers and monitoring their conduct. It establishes the Engineering Registration Board (ERB), the law requires any local or foreigner engineer to register with ERB before practicing in the country. Project developer will continue to comply as it has utilized the services of registered engineering firm for its structural designs which it will continue to use to supervise the construction process.

3.2.13 The Contractors Registration (Amendment) Act, 2008

The Contractors Registration Act requires contractors to be registered by the Contractors Board (CRB) before engaging in practice. It requires foreign contractors to be registered by the Board before gaining contracts in Tanzania. Project Developer shall comply with the law requirement during the recruitment of contractors for project implementation.

3.2.14 The Architects and Quantity Surveyors Act (1997)

The Act requires Architects and Quantity Surveyors to be involved in the project to be registered by the Architects and Quantity Surveyor Board (AQSB) before engaging in practice. It also requires foreign contractors to be registered by the Board before gaining contracts in Tanzania. Project Developer has complied with the law requirement during the recruitment of architects who have designed the project and will continue to utilize registered persons in the project implementation.

3.2.15 The Urban Planning Act (2007)

The law provides for the orderly and sustainable development of land in urban areas, to preserve and improve amenities; to provide for the grant of consent to develop land and powers of control over the use of land and to provide for other related matters. Under Section 3, among others the law seeks to improve level of the provision of infrastructure and social services for sustainable human settlement development. This act established planning authorities which

include the city, municipal, town and township councils in the country which have responsibilities including:

- Secure the orderly and environmentally sustainable development of area under its jurisdiction;
- Prepare general and detailed planning schemes;
- Control building densities and access to buildings;
- Recommending approval of building schemes and subdivision of plots by developers;
- Secure cooperation of all agencies, utility bodies, land owners and other bodies and institutions involved in the preparation and implementation of planning process;

3.2.16 Public Health Act (2009)

Provide for the promotion, preservation, maintenance of public health with a view to ensuring the provisions of comprehensive, functional and sustainable public health services to the general public. Part III (e) of the act requires premises owners to keep their premises free of mosquitoes and other disease vectors, vermin or causative agents; Section 54 prohibits causing or suffering from nuisance likely to be injurious or dangerous to health, land, premises, air or water; Part IV (c) assigns responsibility to City council to remove or appoint an agent to collect, transport and dispose solid and liquid waste and charge fees to beneficiaries of this service and responsibilities for prescribing types of wastes and guidelines for their collection and disposal; Section 101 it gives rights to any private sewer to connect it to any available public sewer to discharge foul or storm water therefore the project may connect to and discharge sewage or storm water into the available trunk main. However, the quality of the sewage should be as per agreed with the water authority.

The Contracting Authority will ensure that the project design, construction and operation does not constitute a nuisance; meets the requirements meets public health requirements

3.2.17 World Bank guidelines for Environmental Management

The main objective of this EMP is to establish a set of mitigation and monitoring measures to minimize the adverse social and environmental impacts that can take place during the implementation stage of the subproject. The measures especially focus on sensitive receptors or sensitive locations. The EMP also provides specific information about the monitoring program during construction stage including locations, frequency and reporting process. This project complies with these guidelines as it has ESMP which contains mitigation and monitoring plans of the identified impacts.

4.0 BASELINE INFORMATION

4.1 INTRODUCTION

This section provides baseline data on the relevant environmental characteristics of the project area. Much of the description of the environment is site specific. Other aspects such as that of climate and socio-economic issues are broad covering the whole Kigamboni District. The Consultant relied on primary data as collected from the site as well as secondary data and information gleaned from the literature for the project area.

4.2 PHYSICAL CHARACTERISTICS

4.2.1 Climate

The project area as compared to many other areas in Dar es Salaam city is influenced by coastal climatic conditions. The area experiences a modified type of equatorial climate.

- **Temperature, Sun hours and Radiation**

The region is generally hot and humid throughout the year with an average temperature of 29ºC. The hottest season is from October to March during which temperatures can raise up to 31ºC. It is relatively cool between July to September, with temperature around 20ºC. The maximum sun hours is 9 experienced from August to October, from November to January the sun hours is 8 while in February to March and May to July is 7 hours and the minimum is 5 hours in April. That means from October to March the operation in the project site will probably need more electricity for the purposes of culling at the office, while during coolest monthlies which is from July to September the consumption might go down see figure 4.1

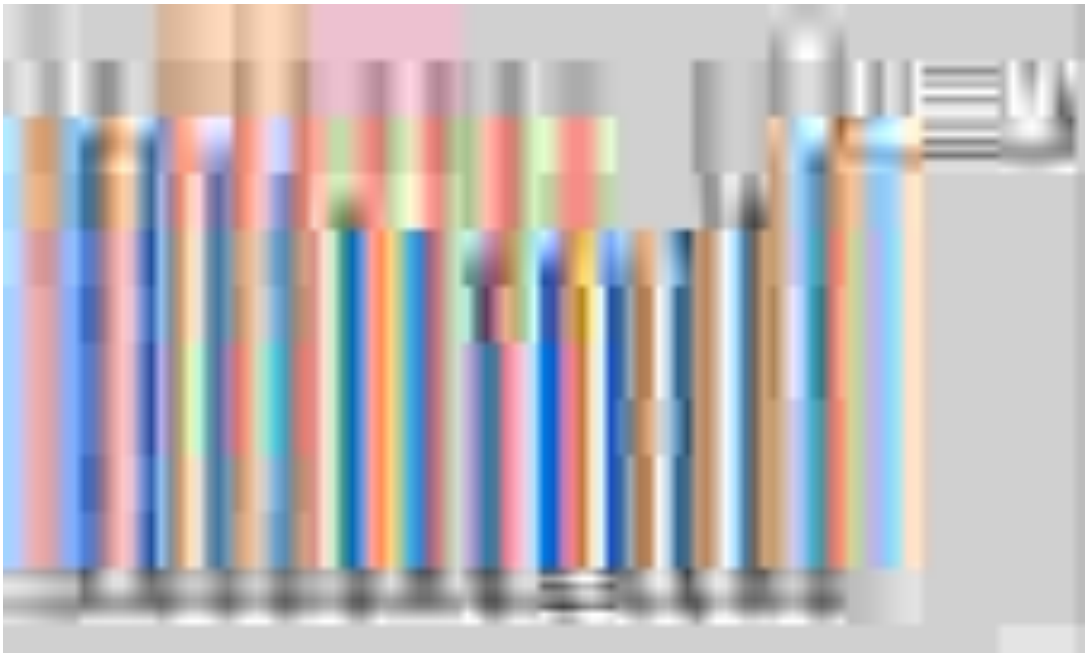

Figure 4.1: Annual temperature, sun hours and radiation of the site(*Source Socio-Economic profile 2019)*

The average radiation of an area is 20.3 MJ/m^2/day, with 16.3 MJ/m^2/day being the minimum in April and 23.7 MJ/m^2/day maximum in October.

- **Wind Speed**

The region experiences the average wind speed of 5.74 m/s. The maximum wind speed is 7.63 m/s experienced in June which blows from the South South East (SSE) direction which means if the project site will produce and air pollutant all activities downstream of SSE direction will be prone to that pollution. The wind is calm around December to March. The climate is also influenced by the south-westerly monsoon winds from April to October and north-westerly monsoon winds between November and March.

- **Rainfall**

There are two main rain seasons; a short rain season from October to December and a long rain season between March and May. Figure 3.4 shows the effective rainfall received at Dar es Salaam region.

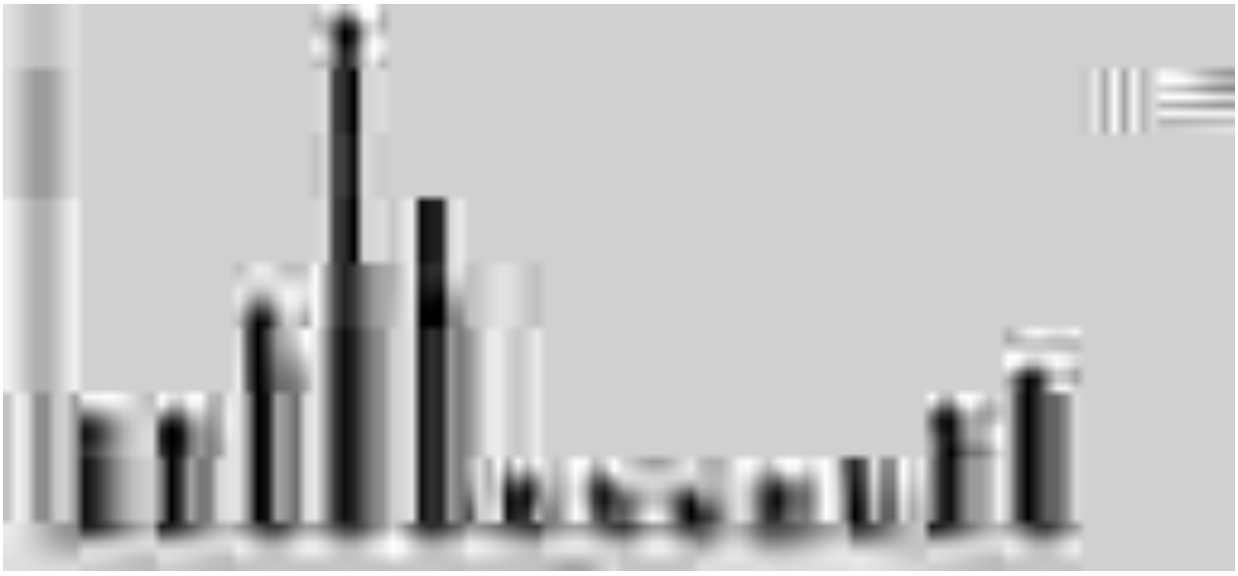

Figure 4.2: Average annual rainfall data for the site(*Source Socio-Economic profile 2019)*

4.2.2 Soils, Geology and Hydrogeology of the area

- **Hydrology**

As the area is already developed therefore it is covered by manmade drainage system along Pugu Road close to the project area. Rainwater simply flows to the public drainage system and some percolates through the soil as it easily permits percolation. No River or stream found close to the facility. However, there is potential for ground water in the project area as some surrounding buildings use borehole for their water demand.

- **Soils**

The soils at the project site are typical characterized with sandy and little clay with moderate humus at its upper layer.

4.2.3 Topography

The landscape of the project site is highly manipulated to make the topography flat and suitable for storage activities. The highest contour elevation at the project site is 96.5m Above Mean Sea Level (AMSL) on the western side while the lowest contour elevation is94m AMSL at eastern part of the project site, that

means the rainfall runoff at the project site are directed towards southern eastern side.

4.2.4 Air Quality and Noise Level

The ambient air quality at the project area was observed to be good because the area is for residential purposes only, just because of daily activities there will be particulate matter like dust.

4.2.5 Noise and Vibration

The noise and vibration levels at the project site are rated negligible as the only source of noise at the project site are motor vehicles using the street feeder road adjacent to the project area.

4.2.6 Water quality

4.2.6.1 Water Table and water quality analysis

Groundwater is abundant in almost the entire Dar es salaam City. This is because of the sea level rise. The major direct impacts of sea-level rise include inundation of low-lying areas, loss of coastal wetlands, increased rates of shoreline erosion, saltwater intrusion and increased salinity in estuaries and coastal aquifers, and higher water tables and higher extreme water levels leading to coastal flooding (Nicholls et al., 2007; Bicknell et al., 2009).

The expected water quality at the receiving chamber has been provided as appendix VI.

4.3 BIOLOGICAL CHARACTERISTICS

4.3.1 Flora and Fauna

Being in the municipal Centre, there are no flora species of conservation significances identified within the project site. Furthermore, there is no protected area or locations of ecological significance within the project site. The largest part of Apartment is covered with building and the remained small area is paved with concrete floor and pass ways therefore there is no any vegetation at the site. The presence of fuel station has no significant impacts to the biological features as the project area has already developed and modified

4.4 PROJECT REQUIREMENTS AND WASTE GENERATION

4.4.1 Project requirements

4.4.1.1 Construction materials and labour force

The main materials for Faecal Sludge Treatment Plant include cement, aggregates (stones), water, steel, sand, timbers, blocks, uPVC pipes, IPS Pipes and gravels. All materials are available in the local sources in Tanzania. The estimated quantities of the materials to be included in the BoQ.

In addition to that, material such as stone and gravels can be acquired from registered dealers such as M/S Even Enterprises Company Limited who has a license to mine at Lugoba area in Bagamoyo District, Appendix VIII.

4.4.1.2 Labour force

The labour force will be determined by the Contractor; nevertheless, it is projected that during the construction phase the project will require not less than 50 workers both skilled and non-skilled laborers for each phase of project construction.

4.4.1.3 Machinery and Equipment

The proposed project development will employ various standard construction equipment and machinery. Equipment expected to be used during the construction works are Excavators, Tippers, Concrete Mixers, poker vibrators, Wheel barrow, Compactor, etc. All equipment and machineries for construction works needed by the proposed project will be determined when the bill of quantities (BoQ) and selection of Contractor is finalized. These equipments shall be temporary and shall be demobilized once project is completed.

4.4.2 Wastes generation

The major wastes generation associated with the project are spoil soils resulting from earthworks during the foundation excavations, solid wastes and liquid waste. The spoil soil shall be stock piled around the public toilet for further usein landscaping the site at the end of the project.

4.4.2.1 Liquid waste management

A total of120m^3 per day of liquid waste is estimated to be received at the receiving chamber of the proposed facility during the maximum operation phase. The project operations will conform to the National Effluent Standard of Tanzania with regard to waste water produced by the plant. After the treatment process is done, the effluent which is rich in nutrients is expected to cater for irrigation taking the advantage of the ongoing agriculture fields adjacent to the project site. However, in case the nutritious effluent will not be used for irrigation, there is a possibility of discharging direct to the river within the marsh which drains to Indian Ocean.

4.4.2.2 Solid waste management

About 0.5-1 tonnes per month of domestic refuse and other solid wastes is estimated to be generated and trapped at the garbage screen during the project construction and operation phase respectively. A well-established solid waste collection system will be instituted. The system will involve among other things wastes segregation at source, recycling or reuse of some wastes and final disposal to the approved dumpsite / landfill.

The project management team will provide waste bins and recycling receptacles of different type to enable sorting. Compostable materials will be sent direct to the city dumpsite area. Table 2 below shows solid and liquid waste wastes to be generated by the project and the methods of their disposal.

Table 2: Management of construction and operation wastes

Type of waste	Sources	Disposal / Management procedure
Debris and Rubble (overburden)	Site clearance	Fill material for road potholes, etc.
Biodegradable materials mainly domestic waste (food, paper, wood etc.)	- Construction crew	Accessible litter bins within the camp site and later to the city waste disposal system (engage a private company)
Non- biodegradable materials (plastic, glass)	- Construction crew	Recycling/ reuse (Plastics to be sent to plastic recyclers and glass bottles to be sent to glass recyclers)

Type of waste	Sources	Disposal / Management procedure
- Excreta (domestic) human - Grey water /cleaners	- Toilets and floor cleaning	Use of septic tanks and when full will use the constructed facility (FSTP) to dispose the sludge

5.0 STAKEHOLDER VIEW ON THE PROPOSED PROJECT

During the conduction of this study, different stakeholders were consulted. Among these include the Kigamboni District and community at Kizani area (see Figure 6). Consultations were made through meetings.

Figure 6: Stakeholder's consultation meeting at Kigamboni District office and Kizani Mtaa Office

During the meeting, the consultant gave a brief explanation on the proposed Faecal sludge treatment Plant. The project description covered proposed location, type and design of the plant (a typical design was displayed). The stakeholders were given chance give their views on the project. Moreover, the consultant offered chance to clarify issues where stakeholders wanted to be given more explanations. The comments by stakeholders were analyzed and incorporated in the design of mitigation measures. Table 5 summarizes the issues raised. The names of the stakeholders consulted are given in Appendix I whereas the minutes of conducted meetings are given in appendix III.

Table 3: Stakeholders issues and concerns

Institution	Name	Position	Issues/ concerns	Response
KIGAMBONI DISTRICT	Arch. Ng'wilabuzu N. Lugigija	Municipal Director, MD	-The design and ESIA studies should complete a time to pave way for Construction activities -The Local community should be Sensitized to the benefits of the proposed facilities	Section 7.3.2.1 Table 3
KIGAMBONI DISTRICT	Bachi Shayo	Ag. DMO	-The implementation of the project will enhance the development -The technology is good since it occupies a small piece of land as compared to WSP	Section 5.1 Section 6.2.1
KIGAMBONI DISTRICT	Rajab Gundumu	Estate Manager	-The location of Municipal Director's office is expected to have several facilities like; Police station, Bus stand, Health Center. It is taken as the Centre of the Municipal	
KIGAMBONI DISTRICT	Veronica J Kiluvia	Ag. MCDO	-Wanted to know why the proposed sites and not other places?	Section 5.1
KIGAMBONI DISTRICT	Wenceslaus Lindi	MAHRO	-Due to the Centeredness of the Municipal Simplified Sewerage System should be put in place	Section 5.1
KIGAMBONI DISTRICT	Gozbert Ishengoma	MEO-Kizani	-Employment opportunities to the local people	Section 7.2.1.1

6.0 POTENTIAL IMPACTS

6.1 Positive impacts

6.1.1 Improved living conditions and economic growth

The project will improve the living conditions in Kigamboni Municipal whereby the project operation phase willdo away with illegal faecal sludge dislodging especially during rainy season or during the night. The charged fee for emptying septic tanks and pit latrines will be such as affordable by the intended customer. Thus, there will be increased money circulation that result into increased income consequently better standard of living of people in the project area.

6.1.2 Employment opportunities

Labour force for the project will be originated from Somangira ward and the surrounding communities in Kigamboni areas. Even though during construction the employment will be on short term basis, employees will have been benefiting from the project. Some will witness their incomes and livelihood improvement.

6.1.3 Improved urban agriculture

Farming activities in urbanised Kigamboni is vital to the economy of the local community. With the effluent rich in nutrients and manure from dried sludge the farming activities will have been moved to the high production level. That is to say, farming activities especially of bananas will be going on despite the driest months of June, July and August.

6.1.4 Increased socio-cultural interaction

Increased socio-cultural interaction is another anticipated positive impact. The implementation of the project will bring many people from different cultural backgrounds. The interactions may bring about social changes in the communities around the project areas. Interaction with technocrats as a result of new immigrants (customers) into the area will stimulate adoption of the new technologies.

6.1.5 Increased Revenue to the nation through taxes, both direct and indirect

DAWASA is expected to increase government revenue collection at Municipal Council and at National level. This will be enhanced by time to time payment of all charges to dislodge septic tanks and pit latrines of the respective household. The revenue collected will contribute towards economic development within the municipal and the country at large.

6.1.6 Biogas production potential

Among other positive impacts gas production for domestic uses is anticipated to serve the local communities and institutions. In this case, the Kigamboni Hospital which is in proximity to the project site will be the immediate beneficiary of the produced biogas.

6.1.7Minimized Forest products harvesting

Source of energy for cooking in most of the households originates from the forest products. Charcoal and firewood are the most commonly used for domestic purposes. The biogas production from the plant will minimize the use of forest products as to why the gas will be availed to the local community. However, the quantity of the biogas produced depends on the quality of influent to the facility.

6.1.8Cost reduction for sewage management

The proposed facility will make it easier for the Institutions and households which at present incur unbearable costs for proper dislodging the septic tanks when full. That simply means the households in the vicinity and the institutions will benefit through direct connection to the treatment facility depending on the nature of topography.

6.2 Negative impacts

6.2.1 Increased HIV/AIDS and other sexual related diseases:

Local communities surrounding the project area have to be aware of the fact that HIV/AIDS is present in their areas but accede to it not being at an alarming rate. The communities were worried that with an influx of people into the project area the pace of spread will accelerate especially during the construction phase.

Mitigation Measures

- Contractor shall enforce a code of conduct in the project area to encourage respect for the local community and to maintain self-cleanliness of the working area at all times.

- The contractor shall deploy locally available labour to reduce risk of spreading communicable diseases (especially STDs).

- In order to prevent more HIV/AIDS infection, during the implementation phase, the project should include information education and communication component (IEC) in its budget. This will help to raise more awareness on HIV/AIDS, and means to suppress its incidence.

- A safety, health and environment induction course shall be conducted to all workers, putting more emphasis on HIV/AIDS, which has become a national disaster.

6.2.2 Loss of biodiversity

Loss of biodiversity will be experienced during the site clearance for the construction activities to start. Huge biomass will be cleared that may include important and rare species.

Mitigation Measures

- Close supervision of earthworks shall be observed in order to confine land clearance within the area where the construction activities are to take place.

6.2.3 Land degradation and increased erosion

Establishment of new facility within the project areamight result into land degradation and promote soil erosion.

Mitigation Measures

- Unnecessary ground clearance and sensitive re-alignments shall be avoided.

- Lined drainage channels at sensitive terrains shall be provided to control speed and volumes of storm-water.

- The contractor should plant grass or any other vegetation cover to minimise exposed soil surface.

- Directing flow to properly designated channels within the facility site.

6.2.4 Noise pollution

Noise pollution is likely to occur due to the application of construction equipment and generators at the site.

Mitigation Measure

- The proponent shall maintain equipment in good running conditions to ensure that ambient noise level and vibrations pollution into the environment is veryminimum to comply with Tanzania standards

- The noisy construction activities will be scheduled at normal working hours. Regular inspection and maintenance of construction vehicles and equipment will be done to ensure that they have mufflers installed and worn parts are replaced

6.2.5 Air Pollution from dust emission

Air pollution is likely to occur due to the emission of suspended particulate matter (dust) to the atmosphere from the construction activities.

Mitigation Measure

- Mixing equipment shall be sealed properly and vibrating equipment will be equipped with dust removing devices.

- Also all vehicles that generate excessive black smoke will not be used.

- Adequate training and use of personal protective equipment (PPE) such as eye glasses and dust masks will be ensured in order to reduce risks associated with dust.

6.2.6 High Risk of Health associated with construction work

Construction activities exposes the workers to a lot of risks for example risk of falling into the excavated pits more than 3metres deep, riskof injuries from falling objects or sharp pointed objects e.t.c

Mitigation measure

- The project proponent shall ensure that all personnel are provided with appropriate protective gear.

- All works shall be planned and conducted in accordance with relevant OHS Guidelines. First Aid Kit as well as regular medical check-ups for the workers will be provided during the entire working hours.

- Adequate number of firefighting equipment/extinguishers will be provided in every few distance to help putting off fire in case of occurrence.

- Excavated pits should be protected by warning tape and guardrails to prevent workers from falling

6.2.7 Waste generation during construction

A lot of waste will be generated especially during construction stage. For example, excavation of foundations will generate a lot of spoil materials that will need to be disposed of. Construction of walls and roof will both generate wastes. Other wastes will be generated from cleaning of construction equipment and containers like mixers and paint buckets.

Mitigation measures:

- Stick to the design specifications
- Provide waste containers
- Provide training to workers and orient them towards environmental protection values

7.0 ACTION PLAN FOR PREVENTION AND MANAGEMENT OF ACCIDENTS DURING IMPLEMENTATION STAGE

The project shall be implemented in compliance to labour laws in Tanzania, in particular, the Occupational Health and Safety Act (2003). Clauses to protect the health and safety of workers shall be included in the contract documents for implementation stage.

7.1 Health and Safety

The proponent is committed to protect the health and safety of its employees and those of its contractors, to ensuring that activities are conducted in a manner that protects the environment and people. The Contractor shall provide and enforce the

use of appropriate personal protective equipment for all workers e.g. overalls, gloves, masks, etc. (wherever required). Tanzanian/international construction standards will be followed for quality and safety to workers. First aid facility will be installed at the construction site.

7.2 Security

The whole proposed project will take care of security matter of the site by fencing the whole project area and provide gates for entrance and exit purpose. The project proponent shall have a 24 hours security services from a private company to secure the whole project premise at the site. Also since the nature of investment involves fecal sludge management facility with the potential of biogas production. The project proponent will install the best firefighting system at site. The purpose of fire protection is to protect life, good and activities within the project site.

The following are some of the active and passive fire-fighting equipment that will be employed;

- Fire detection system
- Fire hydrant system
- Portable Fire Extinguishers

7.3 Monitoring, Maintenance and repair

The management of the facility will be upon both DAWASA and Kigamboni District to ensure the approved design or plan is implemented accordingly. Furthermore, provision of basic services is being executed at high quality as intended.

7.4 Project Alternatives

Hybrid Constructed Wetlands (CW)

Constructed Wetlands (CWs) are a natural, low-cost, Eco technological biological wastewater treatment technology designed to mimic processes found in natural wetland ecosystems, which is now standing as the potential alternative or supplementary systems for the treatment of wastewater *(Source Design Report 2021).*

8.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

8.1 Environmental and Social Management Plan

The Environmental and Social Management Plan (ESMP) presents the implementation schedule of the proposed mitigation measures for both environmental and social impacts. The ESMP for the proposed Construction of Faecal Sludge Treatment Plant at Ngobediis summarized in Table 3. The ESMP also indicates environmental costs needed to implement the recommended mitigation measures. The Faecal Sludge site selection process and engineering designs have already included some of the mitigation measures recommended in this report. Additional recommendations are provided in the ESMP to enable the Faecal Sludge Treatment Plant to be constructed and operated in environmentally friendly manner.

DAWASA in collaboration withKigamboni District shall be the main implementer of the ESMP through. The environmental measures incorporated in the detailed engineering design will be attached to the Bills of Quantities and Contract Documents. Moreover, there will be an Environmental, Social, Health and Safety (ESHS)Code of Conduct to be signed by the Contractor(s) to show their commitment in the implementation of the Environmental, Social, Health and Safety. The implementation of the Code will be supervised by DAWASA or his consultant.

The ESHS Code is a set of Guidelines attached to the Bidding Document and Contract to be adopted by Contractor during project implementation. It contains the commitment and obligations of the Contractor and its subsidiaries (i.e. Sub-Contractors and staff) to undertake construction activities in accordance with all applicable Laws, Rules, and Regulations. The Contractor and its subsidiaries shall comply with the Code of Conduct with high ethical standards. Failure to observe the Code, will subject the firm to disciplinary action, including Contract termination. Violation of the Code, is violation of Law which may result to civil and/or criminal penalties to Contractors, Supervisors or Firm.

Some of the issues to be included in the ESHS shall include;

- Site specific **ESMP, HSMP**,
- Traffic Management Plan **(TMP), where applicable**

- HIV/AIDS Awareness Program,
- Occupational Health and Safety Awareness Program.
- Sexual Harassment Prevention Policy
- Child Labour Prevention Policy

The environmental and social mitigation and enhancement measures incorporated in the detailed engineering design will be attached to the Contract Documents. The Contractor shall take stock of the contents of the Project Brief.

Table 4: Environmental and SocialManagement Plan for the Proposed Construction of Feacal Sludge Treatment Plant at Kizani area, Somangira ward, Kigamboni Municipal

Impact	Mitigation Measure	Responsible Institution	Estimated One Time Cost (TZS)	Estimated Annual cost (TZS)
Mobilization Phase				
Increased waste generation	o Stick to the design specifications o Provide waste containers o Provide training to workers and orient them towards environmental protection values	DAWASA	To be included in the BOQ	
Noise pollution during construction	o The proponent shall maintain equipment in good running conditions to ensure that ambient noise level and vibrations pollution into the environment is very minimum to comply with Tanzania standards o All construction works will be scheduled at normal working hours. o Proper inspection and maintenance of	DAWASA	500,000.00	

Impact	Mitigation Measure	Responsible Institution	Estimated One Time Cost (TZS)	Estimated Annual cost (TZS)
	construction vehicles and equipment will be done to ensure that they have mufflers installed and worn parts are replaced			
Construction Phase				
Increased waste generation	o Stick to the design specifications o Provide waste containers o Provide training to workers and orient them towards environmental protection values	DAWASA	To be included in the BOQ	
Increased HIV/AIDS and other STD	o The contractor shall enforce a code of conduct in the project area to encourage respect for the local community and to maintain self-cleanliness of the working area at all times. o The contractor shall deploy locally available labor to reduce the risk of spreading communicable	DAWASA	5,000,000.00	

Impact	Mitigation Measure	Responsible Institution	Estimated One Time Cost (TZS)	Estimated Annual cost (TZS)
	diseases (especially STDs). o To prevent more HIV/AIDS infections, during the implementation phase, the project should include an information education and communication component (IEC) in its budget. This will help to raise more awareness on HIV/AIDS and means to suppress its incidence. o A safety, health, and environment induction course shall be conducted for all workers, putting more emphasis on HIV/AIDS, which has become a national disaster.			
Land degradation and increased erosion	o The contractor should pave the walkways prone to erosion whose	DAWASA	25,000,000	

Impact	Mitigation Measure	Responsible Institution	Estimated One Time Cost (TZS)	Estimated Annual cost (TZS)
	quantities are shown in the BoQ o To obtain the construction materials official negotiations should be performed with wards leaders to avoid conflict.			
Noise pollution during construction	o The proponent shall maintain equipment in good running conditions to ensure that ambient noise level and vibrations pollution into the environment is very minimum to comply with Tanzania standards o All construction works will be scheduled at normal working hours. o Proper inspection and maintenance of construction vehicles and equipment will be done to ensure that they have	DAWASA	1,000,000.00	

Impact	Mitigation Measure	Responsible Institution	Estimated One Time Cost (TZS)	Estimated Annual cost (TZS)
	mufflers installed and worn parts are replaced			
Dust generation during construction	o Mixing equipment shall be sealed properly and vibrating equipment will be equipped with dust-removing devices. o Also, all vehicles that generate excessive black smoke will not be used. o Adequate training and use of personal protective equipment (PPE) such as eyeglasses and dust masks will be ensured to reduce risks associated with dust.	DAWASA	3,000,000.00	
Health Risks associated with construction works	o The project proponent shall ensure that all personnel is provided with appropriate protective gear. o All works shall be planned and conducted following relevant OHS	DAWASA	33000,000.00	

Impact	Mitigation Measure	Responsible Institution	Estimated One Time Cost (TZS)	Estimated Annual cost (TZS)
	Guidelines. First Aid Kit as well as regular medical check-ups for the workers will be provided during the entire working hours. o An adequate number of firefighting equipment/extinguishers will be provided every few distances to help to put off the fire in case of occurrence. o Excavated pits should be protected by warning tape and guardrails to prevent workers from falling Sensitization/Awareness of the beneficiary community on the importance of the Facility and the associated benefits			
Demobilization phase				
Noise pollution during construction	o The proponent shall maintain equipment in good running conditions to	DAWASA	500,000.00	

Impact	Mitigation Measure	Responsible Institution	Estimated One Time Cost (TZS)	Estimated Annual cost (TZS)
	ensure that ambient noise level and vibrations pollution into the environment is very minimum to comply with Tanzania standards o All construction works will be scheduled at normal working hours. o Proper inspection and maintenance of construction vehicles and equipment will be done to ensure that they have mufflers installed and worn parts are replaced			
Operational Phase				
Health Risks associated with Operation works	o The project proponent shall ensure that all visitors and personnel are provided with appropriate protective gear. o An adequate number of firefighting	DAWASA	Depend on the operational manual	

Impact	Mitigation Measure	Responsible Institution	Estimated One Time Cost (TZS)	Estimated Annual cost (TZS)
	equipment/extinguishers will be provided every few distances to help to put off the fire in case of occurrence. o Adhere to good maintenance o Sensitization/Awareness of the beneficiary community on the importance of the Facility and the associated benefits			
Total			**68,000,000.00**	**68,000,000.00**

9. 0 MONITORING PLAN

9.1 Environmental Monitoring

The national EIA guidelines require the developer to prepare and undertake monitoring plan of implemented development projects. Monitoring is needed to check if and to what extent the impacts are mitigated, benefits enhanced and new problems addressed. Recommendations for monitoring have been included in the Table 4. The monitoring plan also assigns responsibilities for different actors. Moreover, the wardand street environmental committees will shoulder the long-term monitoring of the project.

Table 5: Monitoring Plan for the Proposed Construction of Feacal Sludge Treatment Plant at Ngobediarea, Somangira ward, Kigamboni Municipal

Parameter	Monitoring Frequency	Sampling Area	Measurement Unit	Method	Target Level/Standard	Responsibility for monitoring	Estimated Annual (or once cost (TZS)
Mobilization Phase							
Dust	Daily	Immediate working area	ppm	Physical-visual	TBS	DAWASA	None
Air Quality	Daily	Around the Inspection chambers	µg/m^3	Smelling (nasal)	TBS	DAWASA	2,500,000.00
Waste Generation	Weekly	At the working area	Amount of waste	Physical measurement or estimation	All waste contained	DAWASA	In BOQ
Health risks	Daily	At working area	Accidents	Counting	NO accident	DAWASA	In BOQ
HIV/AIDS	Monthly	Workers	Training	Numbers	One per month during construction phase only	DAWASA	5,000,000.00
Biodiversity	Once (at commencement)	Working area	Destruction of habitat or removal of biodiversity	Area affected	Minimal disturbance to biodiversity	DAWASA	1,000,000.00
Construction phase							
Dust (PM 2.5, PM 10)	Weekly	Immediate working area	ppm	Physical-visual	tbs	DAWASA	None
Air Quality	Weekly	Around the Inspection chambers	µg/m^3	Smelling (nasal)	TBS	DAWASA	2,500,000.00
Waste Generation	Weekly	At the working area	Amount of waste	Physical measurement or estimation	All waste contained	DAWASA	In BOQ

Parameter	Monitoring Frequency	Sampling Area	Measurement Unit	Method	Target Level/Standard	Responsibility for monitoring	Estimated Annual (or once cost (TZS)
Health risks	Daily	At working area	Accidents	Counting	NO accident	DAWASA	In BOQ
HIV/AIDS	Monthly	Workers	Training	Numbers	One per month during construction phase only	DAWASA	5,000,000.00
Biodiversity	Once (at commencement)	Working area	Destruction of habitat or removal of biodiversity	Area affected	Minimal disturbance to biodiversity	DAWASA	1,000,000.00
Demobilization Phase							
Dust (PM 2.5, PM 10)	Weekly	Immediate working area	ppm	Physical-visual	TBS	DAWASA	None
Air Quality	Weekly	Around the Inspection chambers	$\mu g/m^3$	Smelling (nasal)	TBS	DAWASA	500,000.00
Waste Generation	Weekly	At the working area	Amount of waste	Physical measurement or estimation	All waste contained	DAWASA	In BOQ
Health risks	Daily	At working area	Accidents	Counting	NO accident	DAWASA	In BOQ
HIV/AIDS	Monthly	Workers	Training	Numbers	One per month during construction phase only	DAWASA	5,000,000.00
Biodiversity	Once (at commencement)	Working area	Destruction of habitat or removal of biodiversity	Area affected	Minimal disturbance to biodiversity	DAWASA	1,000,000.00
Operation phase							
Air Quality	Monthly	Around the Inspection chambers	$\mu g/m^3$	Smelling (nasal)	Absence of nuisance smells	DAWASA	500,000.00

Parameter	Monitoring Frequency	Sampling Area	Measurement Unit	Method	Target Level/Standard	Responsibility for monitoring	Estimated Annual (or once cost (TZS)
Waste Generation	Monthly	At the working area	Amount of waste	Physical measurement or estimation	All waste contained	DAWASA	In operation manual
Health risks	Monthly	At working area	Accidents	Counting	NO accident	DAWASA	In operation manual
HIV/AIDS	Annually	Workers	Training	Numbers	One per month during construction phase only	DAWASA	In operation manual
						Total	**28,000,000.00**

10.0 PROJECT BUDGET

The investment cost for the proposed Faecal Sludge Treatment Plant is estimated to be around Tshs.700 million that will be financed by The World Bank.

11.0 CONCLUSION

The proposed project is of greater profit to the community and the country at large as it promotes and improve sanitation in the streets. When there is good and improved sanition, then the outbreak of diseases like diarhoea and associated stomach and waterborne diseases are also reduced and prevented hence improved public health.

The impacts identified are preventable and of less negativity to the community, therefore the developer can be provided with the environmental clearance certifacte in order to commence the implimentation of the project.

It is, therefore, concluded that implementation of the proposed construction of the Faecal sludge treatment plant at Kizani Mtaa will entail no detrimental impacts provided that the recommended mitigation measures are adequately and timely put in place. The identified adverse impacts shall be managed through the proposed mitigation measures and implementation regime laid down in this EIS. DAWASA is committed to implementing all the recommendations given in the EIS and further carrying out the environmental auditing and monitoring schedules.

Appendix I: List of Stakeholders Consulted

Appendix II. Land ownership Letter

Appendix III: Minutes of Meetings with Locals

Appendix IV: Screening Decision from NEMC

Appendix V: Memorandum of Understanding between DAWASA and Dar es Salaam Municipal Councils

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ACRONYMS

BC	Beneficiary Community
CEO	Chief Executive Officer
CPM	Critical Path Method
CV	Curriculum Vitae
DAWASA	Dar es Salaam Water and Sewerage Authority
DDCA	Drilling and Dam Construction Agency
DEWATS	Decentralized Wastewater Treatment System
DSM	Dar es Salaam
EMP	Environmental Management Plan
ESA	Environmental and Social Assessment
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
EWURA	Energy and Water Utilities Regulatory Authority
FDR	Final Design Report
FSM	Feacal Sludge Management
GIS	Geographic Information System
GoT	Government of the United Republic of Tanzania
H&S	Health and Safety
ICB	International Competitive Bidding
IFRs	Interim Financial Report
LGAs	Local Government Authorities
m^3	Cubic meter = 1,000 litres
MD	Managing Director
MKUKUTA	National Strategy for Growth and Reduction of Poverty
MoEVT	Ministry of Education and Vocational Training
MoHCDEC	Ministry of Health, Community Development, Gender, Elderly and Children
MoU	Memorandum of Understanding
MoW	Ministry of Water
NCB	National Competitive Bidding
NEMC	National Environment Management Council

NGO	Non-Governmental Organization
NWSDS	National Water Sector Development Strategy
O&M	Operations and Maintenance
PAP	Projected Affected Person
PERT	Program Evaluation Review Technique
PIM	Project Implementation Manual
PIP	Program Implementation Plan
PO	Private Operators
PO-RALG	Presidents Office Regional Administration and Local Government
PPRA	Public Procurement Regulatory Authority
RAP	Resettlement Action Plan
RAS	Regional Administrative Secretary
RS	Regional Secretariat
RFP	Request for Proposals
SDG	Sustainable Development Goal
SPS	Small Piped Water Supply
TBS	Tanzania Bureau of Standards
ToR	Terms of Reference
UWSA	Urban Water and Sewerage Authority
WC	Water Committee
WSDP	Water Sector Development Program
WSS	Water Supply and Sanitation.
WSSP	Water Sector Development Program
WSSPII	Second Water Sector Support Project

A MEMORANDUM OF UNDERSTANDING
FOR THE IMPLEMENTATION OF THE OFF- GRID WATER SUPPLY AND SANITATION PROJECTS UNDER THE SECOND WATER SUPPLY AND SANITATION PROJECT USING EARMARKED FINANCING

Memorandum of Understanding ("MoU") between the Ministry of Water on one part and the Dar es Salaam Water Supply and Sewerage Authority ("DAWASA"),the Dar es Salaam Regional Secretariat(RS),and the five municipalities of Dar es Salaam(collectively referred to as "the MUNICIPALITIES ") on the other part.

WHEREAS in recognition of the importance and contribution of the water sector to the social and economic development of the United Republic of Tanzania, the Government has developed a water sector support framework set out in the following documentation: (a) the National Strategy for Growth and Reduction of Poverty ("MKUKUTA, as amended") ,(b) the National Water Sector Development Strategy ("NWSDS") and (c) the Water Sector Development Program ("WSSP").

WHEREAS after being satisfied with the objectives of the WSSP II, parties to this Memorandum have expressed their willingness to participate fully in its implementation;

WHEREAS The WSSPII project development objective is to strengthen the capacity for the integrated water resources planning and management in the united Republic of Tanzania and improve access to water supply and sanitation services in an operationally efficient manner in Dar es Salaam. The project has four components namely: Integrated Water Resources Management, Dar es Salaam Water Supply improvement, Dar es Salaam Sanitation Improvement, and Project Management and Implementation support.

WHEREAS the project is being financed by IDA Credit through Investment Project Financing, the recipient has declared its commitment to the objectives of the Project.

WHEREAS on the other part DAWASA has committed itself to the principle of harmonization and strive for the highest degree of alignment with the Government's budgetary and accountability systems and local financial framework so as to enhance effective implementation, reduce the administrative burden on the Government, and minimize transaction costs; and

NOW THEREFORE, the parties hereby agree to cooperate in coordinating the implementation of the off-grid water supply and sanitation part of WSSP II in accordance with the principles and procedures set forth in this MoU; provided, however, that in case of any conflict between the provisions of this MoU AND THE PROJECT Financing Agreement, the provisions of the Financing Agreement shall prevail.

1 DEFINITIONS

Unless the context otherwise requires, several terms defined in the Preamble of this MoU have the respective meanings set forth therein, and the additional terms referred to below have the following meanings:

1. **Off Grid water supply** means the activities which will provide water supply services to people of Dar es Salaam, who are not connected to the formal network. The proposed solutions include decentralized Interventions, which may be an interim measure to be integrated to the grid network as it expands in the future. Schemes to be implemented include mostly independent water supply distribution systems supplied from point sources (e.g boreholes) or a bulk water supply from the DAWASA distribution system. In areas where the existing grid network is not available, independent stand-alone Small Piped Water Supply (SPS) systems will be implemented. These projects, typically involve a source of water (for example, borehole), a community-based distribution system and water points at a community and/or household level. The operations and maintenance will be supported from the tariff collected from the users.

2. **Off-Grid Sanitation** means activities which will provide sanitation services in Dar es Salaam to areas without access to sewers. This activity will support installation of improved toilets; safe emptying and transportation of the waste to a treatment facility; and treatment and safe disposal of treated waste into the environment. This will include piloting decentralized systems and other new technology.

3. **Environmental and Social Management Framework or ESMF"** means the framework dated September 2006, prepared by the Government and cleared by the International Development Association, setting forth an environmental and social screening process that will enable WSSP II Implementing Agencies to identify and assess potential adverse environmental and social impacts, and offset and reduce them to acceptable levels, or enhance positive impacts, and in accordance with which environmental and social management plans will be prepared by WSSPII Implementing Agencies.

4. **MKUKUTA II** Means the Government's National Strategy for Growth and Reduction of Poverty dated July 2010, covering the period from 2011 – 12 to 2016 – 17 and subsequent versions that may be introduced by GOT.

5. **Resettlement Policy Framework** or RPF means the governing framework dated September 2006, prepared by the Government and approved by the International Development Association, for land acquisition, resettlement and compensation under the WSDP, and in accordance with which resettlement action plans will be prepared,

as necessary, as the same may be amended from time to time with the concurrence of the International Development Association;

6. **WSSP Implementation Manual** means the Project Implementation Manual (PIM) specifying implementation arrangements for the Second WSSP, including institutional arrangements; procedures for procurement, disbursement of funds, financial management, environmental and social management, and monitoring and evaluation; and progress reporting requirements, including annexes to the said manual.

7. **Project Management Team** means a team set up by DAWASA for day to day management of the off-grid water supply sub-project. Same for management of off-grid sanitation sub-project.

8. **Facilitation Team** A team appointed by the Municipal Director of the respective Municipal Council from Dar es Salaam region for the purpose of facilitating the implementation of the Off-Grid water supply projects and Off- Grid Sanitation projects. The scope of their responsibility are detailed in the PIM and summarized in this MoU.

2. UNDERLYING PRINCIPLES

2.1 The MoW, DAWASA, RS and Municipalities agree that the following are the underlying principles that govern this partnership:

(a.) Commitment to the fulfilment of the aspirations of the National Development Vision 2025;
(b.) Compliance with defined budgeting, procurement and public financial management rules and regulations;
(c.) Good governance and accountability of the Government to its citizens, including an active fight against corruption;
(d.) Coordinating the implementation of the off-grid water supply and sanitation sub-projects cost effectively; and
(e.) Each party executing its respective roles in a timely manner

3. GENERAL PROVISIONS

3.1 Purpose

This MoU outlines the responsibilities of the **MoW, DAWASA, RS and Municipalities** with respect to the implementation of off-grid water supply and sanitation sub-projects and sets forth common institutional, environmental and social measures, monitoring and evaluation, audit and reporting arrangements. The WSSP II Implementation Manual complements procedures and arrangements set out in this MoU.

3.2 Status of the MoU

This MoU is not intended to create any legally binding obligations and the parties take due cognizance of the separate sector laws and regulations between the Government Institutions, and this MoU is adopted pursuant to and subject to any such regulations. In case of any conflict between the provisions of this MoU and the project Financing Agreement, the provisions of the Financing Agreement shall prevail.

4. OFF GRID WATER SUPPLY

4.1 Commitment

The DAWASA declares its commitment to the objectives of the **Second Water Sector Support Project** and will act with due diligence and efficiency to facilitate the successful implementation of the projects. To this end, DAWASA, as an Implementing Agency will effectively carry out its roles and responsibilities in the implementation of the off-grid water supply and sanitation sub-projects as defined in the WSSP II Project Implementation Manual. The Ministry of Water, as the Responsible Agency for WSSP II will have overall responsibility for the coordination and implementation of the off-grid water supply and sanitation sub-projects.

4.2 Institutional Arrangements

The institutional framework for overseeing the implementation of the WSSP II comprises the following key bodies, as set out in the Sections below, and in greater detail in the WSSP Implementation Manual:

1. Ministry of Water;
2. Prime Minister's Office Regional Administration and Local Government;
3. Ministry of Health, Community Development, Gender, Elderly and Children
4. Municipal Councils
5. Beneficiary Communities ("BC");

4.2.1 Ministry of Water (MoW)

The MoW will be responsible for provision of overall coordination and oversight. The Ministry will also provide technical and administrative support in the implementation of WSSP II, including without limitation the following activities:

1. Coordinating and consolidating the quarterly WSSP II IFRs (Interim Financial Report); semi–annual and annual progress reports; and ensuring that funds earmarked for implementation of WSSP II activities are duly considered in the annual work plans

and budgets of the implementing agencies; and that the WSSP II procurement plans are consistent with WSSP II work plans and budgets;

2. Ensuring quality and consistency of the documents referred to in subparagraph (a) above prior to consolidation as indicated in the Programme Implementation Manual and submission to the Off-Grid WSS SC for discussion;

3. Monitoring the implementation of the Annual Work Plans and Budgets by the WSSP II Implementing Agencies, at least on quarterly basis;

4. Providing oversight on financial management, controls, audit and reports; and

5. Ensuring that management decisions made by the Off-Grid WSS Steering Committee are communicated to the Implementing Agencies, implemented and monitored.

4.2.2 DAWASA

DAWASA will be responsible for overall coordination and implementation of off grid water supply activities. The off-grid water supply shall be implemented under the Directorate of Infrastructure Development (for construction arrangements) in collaboration with the Communication Unit (for coordination arrangements). The Communication Unit will be generally responsible for:-

1. Coordinating inputs as required from other units within DAWASA such as Procurement, Technical Services, and Finance, etc.
2. Supervising and monitoring contracts / agreements
3. Setting up Sub-project Agreements with beneficiary communities
4. Monitoring and reporting overall progress of the off-grid water supply sub-component.
5. Reviewing and evaluating the operation and management of the water supply sub-projects.
6. The financial aspects for off- grid water supply sub-projects will be managed as per Project Implementation Manual VOLUME II, and
7. Overall supervision of off-grid water supply activities.

4.2.3 Municipal Councils (or DLGAs)

The five Dar es Salaam Municipal Councils, through their respective Urban Planning Department, Legal Unit, Municipal Health and Water Department, will be responsible for the following tasks:

1. Creating awareness and mobilization of the communities.

2. Each DLGA will form a Municipal Facilitation Team comprising different specialists from Water, Health, Education, Community Development departments that will be tasked to assist consultants/contractors/PO on implementation and operation of Off Grid Water Supply facilities in their respective areas.
3. DLGAs through Legal unit, Health and Water department will coordinate the formation of Water Supply by-laws and regulations and thereafter enforcing for sustainability of Off Grid Water Supply facilities.
4. DLGAs will be responsible for identification and facilitation of Land acquisition for construction of Off- Grid Water Supply facilities

4.2.4 WSS Steering Committee

Given the multiplicity of institutions with varying roles, a WSS Steering Committee (SC) will be set up under the project to ensure coordination, synergy, and dovetailing. This SC will be newly set up or be adopted from some of the other projects (for example, Dar es Salaam Metropolitan Development Program [DMDP]) which may have similar steering mechanisms. This steering committee will be chaired by the Head of the Water Sector from RS and DAWASA will provide the secretary to WSS SC.

The RS will chair the Off Grid WSS Steering Committee, which will be comprised of representatives from the DAWASA, RS, WRBO, MOW, DLGAs i.e Temeke, Ilala, Kinondoni, Kigamboni and Ubungo. The Steering Committee will be responsible for providing general oversight of the selection and approval of sub-projects for implementation by the Off-Grid Water Supply and Sanitation. The key responsibilities of the Off Grid WSS Steering Committee include:

1. Reviewing overall Off Grid Sanitation implementation arrangements
2. Reviewing and approving Off Grid Sanitation sub-project operational guidelines
3. Reviewing and approving Off Grid Sanitation sub-project proposals
4. Reviewing overall Off Grid Sanitation progress and performance and providing guidance for improvements if needed
5. Conflict Resolution as per PIM.

4.2.5 Beneficiary Community

At the project level, Beneficiary Community will be involved in the project appraisal, that includes identification of sources, selection of appropriate sites, kiosk locations, and

protection of water source and infrastructures. DAWASA will be responsible for the efficient operation and management of the water supply systems.

4.2.6 Private Operator

The Private Operator (PO) may be engaged if the expansion of DAWASA grid network is beyond five years away. The PO would primarily have as its members the households from the community, with an operating body selected by the members from among themselves, with additional membership from DAWASA/DLGA. The regulation of these systems, including the tariff, would be undertaken by EWURA, as part of the overall regulation of the sector in Dar es Salaam.

Private Operator will operate, maintain, and manage the scheme under contract with DAWASA.

The Private Operator shall be responsible for keeping and maintaining appropriate records of its business activities. These shall include:

1. Customer details
2. Operation and maintenance records including volume of water produced and sold
3. Asset register, work as executed records, manuals of plant and equipment
4. Condition and expected life of assets
5. The details of network expansions as up to standards.
6. The Private Operator shall prepare monthly and quarterly operation and maintenance
7. Reports for the completed off -grid water supply subproject
8. Billing and payment records
9. Business accounts and financial statement

In general, the Operation and Maintenance Reports will address such issues as:

1. Number of registered customers in the service area
2. Number of people in the service area and number of people served
3. Business plan and budget
4. Level of service; proposed and actual
5. Revenue and expenses, progress against budget
6. Customer satisfaction
7. Maintenance activities, breakdowns, failures
8. Availability of ground /reliable water sources
9. Availability for land resources for project activities
10. Manage non-revenue water in the business area

4.3 SELECTION CRITERIA

DAWASA, in consultation with the five municipalities Ilala, Temeke, Kinondoni, Kigamboni and Ubungo will identify communities which are eligible for the Off-Grid Water Supply sub-project under the WSSP II. The identification will follow the criteria below;

1. High population density
2. Low-income areas
3. Prevalence/risk of waterborne diseases
4. No wholesome water services
5. Near-trunk infrastructure
6. Availability of sufficient land for the interventions
7. Unplanned settlements
8. Community willingness

Each of these criteria will be allocated a score, and the communities prioritized according to their total score. Keeping in mind the decisions of other interventions (for example, The Dar es salaam Metropolitan Development Program - DMDP), WSSP-II will invest in those communities which have the highest need.

5.0 OFF-GRID SANITATION

5.1 Definition.

The Off-Grid Sanitation components will provide much needed improvements to wastewater management services in areas of Dar es Salaam that are not served by DAWASA network. These improvements will be realised as a result of construction of Off-Grid sanitation stand-alone projects such as Decentralized Waste Water Treatment Systems (DEWATSs), faecal sludge treatment facilities, and condominial/simplified sewerage. The Off-Grid Sanitation Services will address the lack of sanitation services in unserved areas.

5.2 Institutional Arrangements

A strategy to address the poor sanitation in Dar es Salaam requires clarity and coordination among the various institutions involved in the sector. However, institutional responsibility is fragmented and unclear, being divided between National Ministries, City Utilities, Municipal Organizations, Regulatory Authorities, Community-Based Organizations, the Informal Private Sector and sanitation users themselves.

Currently sanitation service delivery is undertaken by a mixture of Utilities, Municipalities and Regulators. DAWASA will be responsible for overall coordination and supervision of Off-Grid sanitation activities. Other institution as detailed in PIM are summarised below:

1. MoHCDGEC,
2. MoW,
3. RS,
4. DLGAs,
5. NGOs,
6. PO

5.2.1 Ministry of Water

Ministry of Water will be responsible with setting Policy and guidelines specific to FSM and overall project coordination and implementation support .

5.2.2 DAWASA

DAWASA will provide a foundation and resources for the overall implementation of Off-Grid Sanitation.

Directorate of Infrastructure Development will be the department within DAWASA responsible for overseeing the implementation of the WSSP II including Off-Grid Sanitation Sub component. The head of this department will report directly to the DAWASA Chief Executive Officer and will generally be responsible for:

1. Coordination of the Off-Grid Sanitation Steering Committee as well as establishing a general agenda and timetable for Steering Committee meetings with consultation with Steering Committee Chairperson and providing secretariat services.
2. Coordinating inputs as required from other Directorates within DAWASA such as Procurement, Infrastructure Development, and Finance, etc.
3. Signing, supervising and monitoring contracts / agreements
4. Setting up Sub-project Agreements with successful communities.
5. Monitoring and reporting overall progress of the Off-Grid Sanitation
6. Reviewing and evaluating the operation and management of the community sanitation schemes.

In support of Sub Component 3.2: a Sanitation coordination team led by PO-RALG - Regional Secretariat will be established to coordinate implementation of the Off- Grid sanitation services. The technical department in the municipalities in coordination with DAWASA will be responsible for implementation of the off-grid sanitation component. DLGAs through Health, Legal unit and Water departments will coordinate the formation or improvement of existing Sanitation by laws and regulations and thereafter enforcing them for the sustainability of Off Grid Sanitation facilities. Areas where these facilities will be built people will be required to connect. DLGAs will be responsible for identification and facilitation of Land acquisition for construction of Off- Grid Sanitation facilities, and management of Public toilets.

5.2.3 MoHCDGEC/MoW:

Policy and guidelines specific to FSM.

5.2.4 DLGAS under Regional Secretariat:

Roles and responsibilities of the DLGAs will include:

1. Creating awareness and mobilization of the community
2. Formulation of Municipal Facilitation Team comprised of specialists from Water, Health, Education, Community Development departments that will be tasked to assist consultants/Contractors/PO on implementation and operation of Off Grid Sanitation facilities
3. Coordination of the formation of Sanitation by-laws and regulations and thereafter enforcing them for sustainability of Off Grid Sanitation facilities through Legal unit, Health and Water Department
4. Identification and facilitation of land acquisition for construction of Off- Grid Sanitation facilities
5. Establish and capacitate the grievance redress mechanism (GRM) team
6. Monitor and evaluate project implementation, trouble shooting and responding to grievances raised by Grievance Redress Mechanisms (GRM) teams
7. Prepare and submit to WSS SC a monthly project implementation progress report

5.2.5 WSS Steering Committee

Given the multiplicity of institutions with varying roles, a WSS Steering Committee (SC) will be set up under the project to ensure coordination, synergy, and dovetailing. This SC will be newly set up or be adopted from some of the other projects (for example, Dar es Salaam Metropolitan Development Program [DMDP]) which may have similar steering mechanisms. This steering committee will be chaired by the Head of the Water Sector from RS and DAWASA will provide the secretary to WSS SC.

The RS will chair the Off Grid WSS Steering Committee, which will be comprised of representatives from the DAWASA, RS, WRBO, MOW, DLGAs i.e Temeke, Ilala, Kinondoni, Kigamboni and Ubungo. The Steering Committee will be responsible for providing general oversight of the selection and approval of sub-projects for implementation by the Off-Grid Water Supply and Sanitation. The key responsibilities of the Off Grid WSS Steering Committee include:

1. Reviewing overall Off Grid Sanitation implementation arrangements
2. Reviewing and approving Off Grid Sanitation sub-project operational guidelines
3. Reviewing and approving Off Grid Sanitation sub-project proposals

4 Reviewing overall Off Grid Sanitation progress and performance and providing guidance for improvements if needed

5 Conflict Resolution as per PIM.

5.2.6 Private Operator (PO):

The domestic private sector will be a major institution which will require to be involved for sanitation in low-income settlements. Their involvement will include approaches to empty faecal sludge from latrine pits and septic tanks. This could be through vacuum trucks, or in areas where access is difficult, small 'gulper' technologies.

Private Operator will form the basic unit for planning and eventually operating and managing the community-based sanitation schemes implemented under the off-grid sanitation. Off-grid sanitation POs, will be responsible for:

1. Possession of necessary registration as per requirements.
2. Undertaking training and development in operations and maintenance, financial management, monitoring and reporting.
3. Operating and maintaining the off-grid sanitation Scheme in a sustainable manner and providing equitable access to the service for everyone in the community
4. Maintaining adequate records and reporting on technical and financial performance to DLGAs and DAWASA.

5.2.7 NGOs/ Consultant:

NGO will be responsible for Capacity building, mobilization of community; media campaigns

DAWASA will contract with a reputable NGO active in the DAWASA service area as implementing agents for the off- grid Sanitation. The key roles of the off-grid sanitation NGO include:

1. Mobilising community groups to identify all sanitation needs and raising awareness within community groups about sanitation issues.
2. Assisting community members to obtain legal status if required and to set up the necessary bank accounts, for the community to qualify for funding from micro finance institution for toilet improvements.
3. Undertaking a needs analysis and preparing a subproject proposal design, budget, impact assessment, operational and maintenance of the sanitation facility
4. Preparing subproject proposals in association with the community members for consideration by the off-grid sanitation Steering Committee.
5. Sensitization and training of POs to operate, maintain, and manage off-grid sanitation systems.

6. Assisting DAWASA to develop suitable O&M guidelines/manuals and financial management guidelines for use by the POs in operating and managing the completed schemes.

5.3 SELECTION CRITERIA

DAWASA, in consultation with the five municipalities Ilala, Temeke, Kinondoni, Kigamboni and Ubungo will identify communities which are eligible for Off-Grid Sanitation sub-project under the WSSP II, in the eligible project area using the criteria mentioned in the PIM. The criteria will include the availability of land resources for the project activities as additional criteria.

Each of these criteria will be allocated a score, and the communities prioritized according to their total score. Keeping in mind the decisions of other interventions (for example, DMDP), WSSP-II will invest in those communities, which have the highest need.

The five municipalities will be the focal point for planning, prioritizing, and implementing the off-grid sanitation in their areas. A comprehensive master sanitation plan, based on empirical data and evidence, will form the basis for this planning and implementation.
The results of the ongoing efforts to map the city on the said indicators, will form the basis for the planning efforts by the stakeholders.

Summary of Institutional Roles for Sanitation Provision

MoH/MoW/PO-RALG	Policy and guidelines specific to FSM
MoW	Overall project coordination and implementation support
EWURA	Regulate performance of DAWASA
DAWASA	Facilitating the establishment and operation of treatment facilities (FSM and the like and facilitating the development of options for transportation and treatment of this waste, establishment and management of public toilets; regulating the services of transporters
Municipalities	Facilitating the upgrading of unimproved household toilets to improved ones and regulation of waste disposal; facilitating the availability of land for decentralized systems; provide licenses to private transport operators
Private sector	Development of infrastructure for transportation and treatment, operation
NGOs	Capacity building, mobilization of community; media campaigns

TBS	Setting up of standards for effluent disposal
NEMC	Regulation of disposal of effluent

6.0 EFFECTIVENESS AND DURATION OF MoU

6.1. This MoU will become effective on the date of signature by all parties.

6.2 This MoU shall remain in force until end Closure of the Second WSSP, or as shall be mutually agreed by the parties hereto.

7.0. AMENDMENTS

This MoU may be amended at any time with the written agreement of the parties hereto.

8.0 CONFLICT RESOLUTION

In the event of any differences arising with respect to the provisions of this MoU, the parties will endeavour to find a solution through dialogue and consultation.

9.0 INFORMATION AND NOTICES

9.1 The parties to this MoU will furnish to each other all such information in relation to the WSSP II as will be reasonably requested in a timely manner.

9.2 Any notices or documents given, made or sent by the parties in relation to this MoU will be in writing and will be deemed to have been duly given, made or sent to the organization or person to which it is addressed at the time of its delivery by hand, mail, or courier at its respective address, as listed in this MoU.

9.3. Any party hereto may, by written notice to the other parties, change the address to which any notice or request for the Participant so giving such notice will be addressed.

9.4 All communications and documents submitted to any party and by any part will be in the English language.

9.5 The following addresses are specified for purposes of Section 16.2.

9.6 FOR THE PARTIES

Permanent Secretary
Ministry of Water
Address
Tel:
E-mail:

Chief Executive Officer
DAWASA
Address
Tel:
E-mail:

Region Administrative Secretary
Dar es Salaam Region
Address:
Tel:
E–mail:

Municipal Director
Temeke Municipal Council
Address:
Tel:
E–mail:

Municipal Director
Ilala Municipal Council
Address:
Tel:
E–mail:

Municipal Director
Kinondoni Municipal Council
Address:
Tel:
E–mail:

Municipal Director
Ubungo Municipal Council
Address:
Tel:
E–mail:

Municipal Director
Kigamboni Municipal Council
Address:
Tel:
E–mail:

Signed by the duly authorized representatives of the parties as hereunder:

Permanent Secretary
Ministry of Water

Date 18/

Regional Administrative Secretary
Dar es Salaam

Date 12

CEO
DAWASA

Date 28.01.2019

Municipal Director
Temeke

Date

Municipal Director
Ilala

Date

Municipal Director
Ubungo

Date 0 2/2019

MD

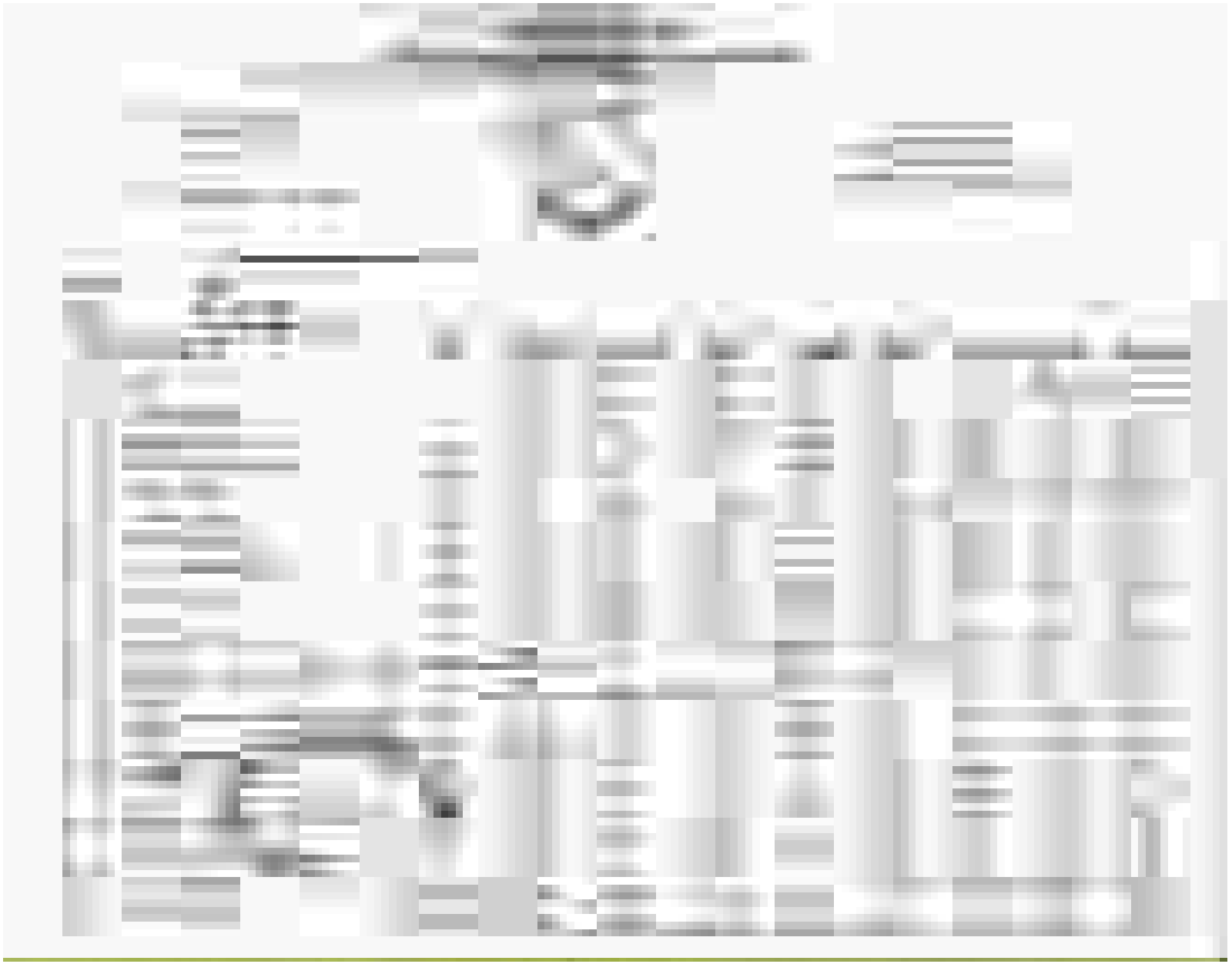
Kinondoni

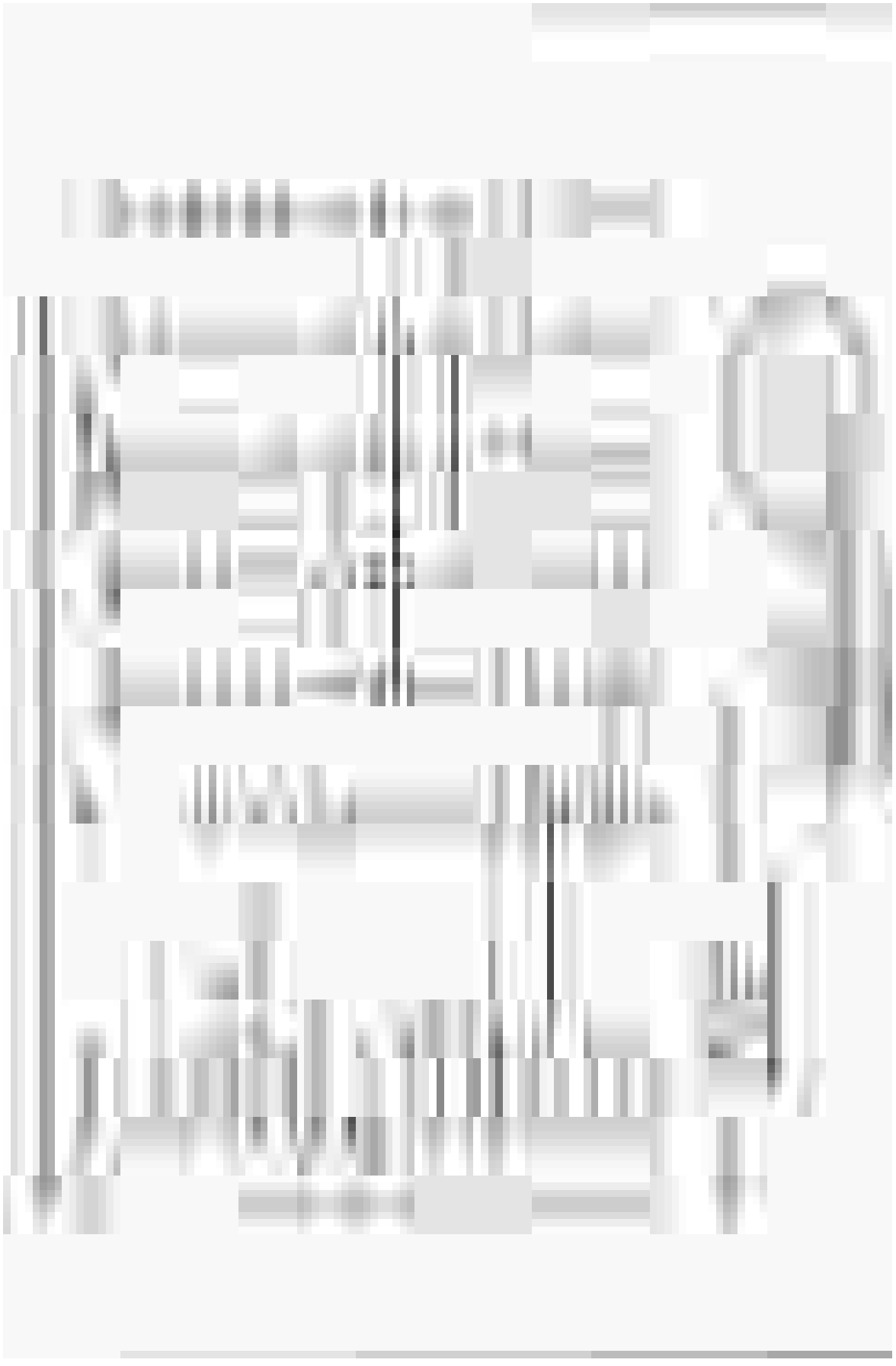
Municipal Director

Kigamboni

Date 02

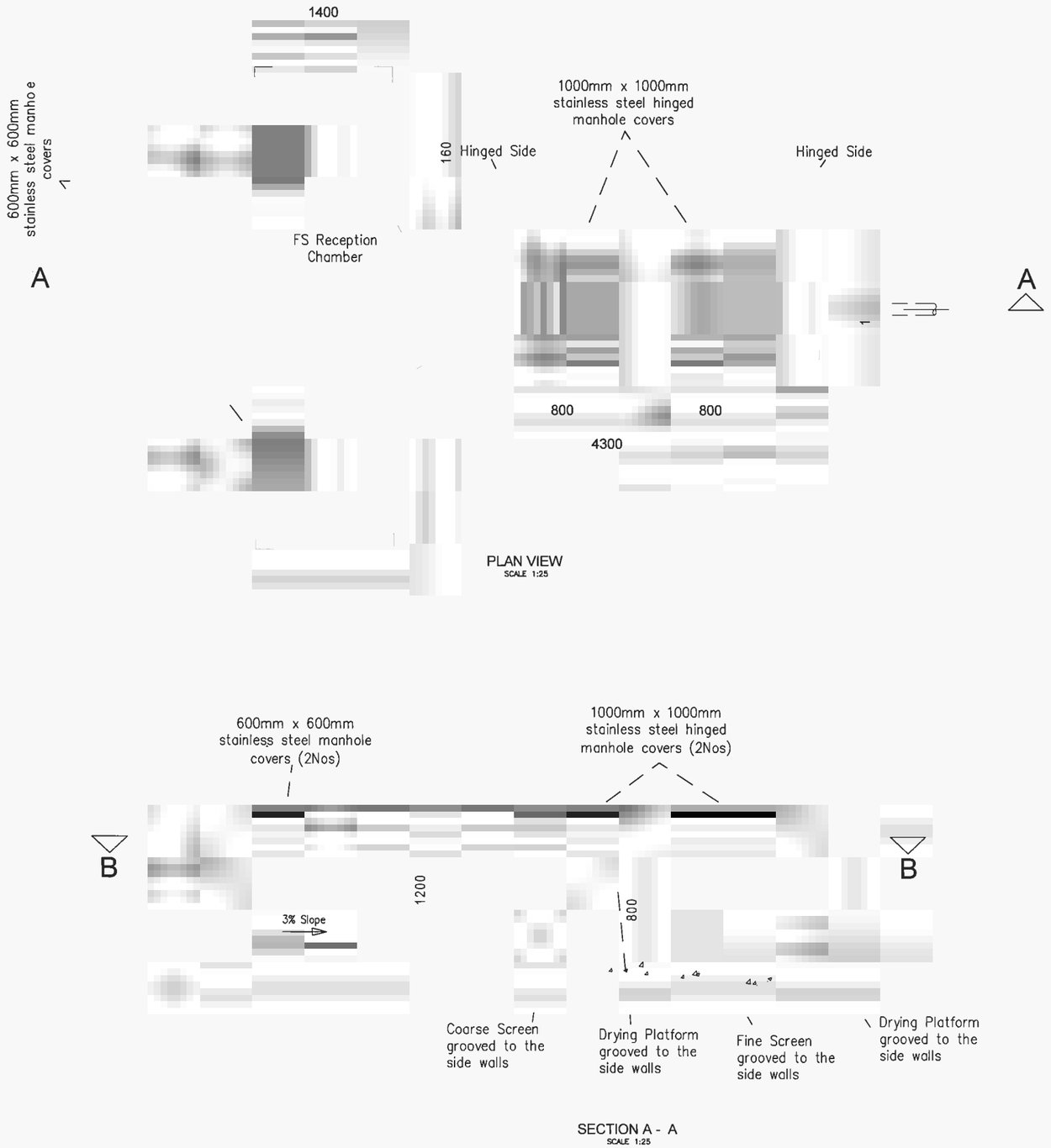
Appendix VI: Faecal Sludge and Septage Laboratory analysis results





Appendix VII: Approved Architectural Drawings

Appendix VIII: Approved source of construction materials

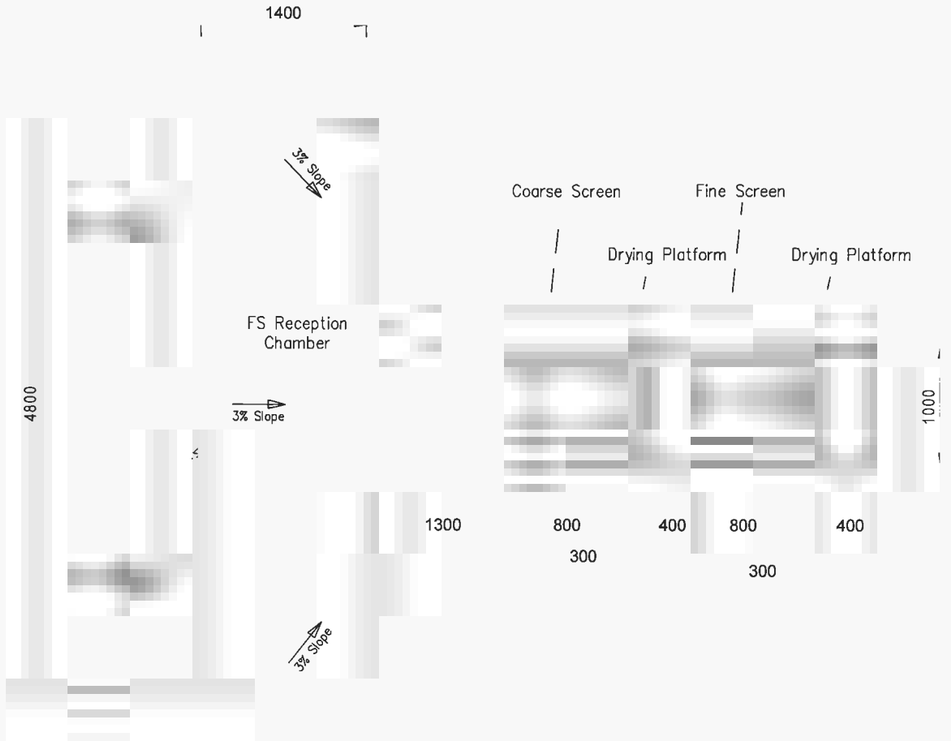


PLAN VIEW
SCALE 1:25

SECTION A - A
SCALE 1:25

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN
2. DO NOT SCALE FROM THIS DRAWING
3. THE SCALES GIVEN ON THIS DRAWING REFER TO THE A1 SIZE ORIGINAL DRAWING
4. THE SUBGRADE SHALL BE COMPACTED TO 99% MAXIMUM DRY DENSITY BEFORE THE PLACEMENT OF HARDCORE
5. CONCRETE SHALL BE CLASS C30/37 FOR STRUCTURAL MEMBERS AND CLASS C8/10 FOR BLINDING
6. THE MAXIMUM SIZE OF AGGREGATE SHALL BE 20mm UNLESS OTHERWISE SHOWN
7. REINFORCEMENT SHALL BE HIGH TENSILE DEFORMED TYPE WITH A CHARACTERISTIC YIELD STRESS OF AT LEAST 429N/mm²
8. COVER TO REINFORCEMENT SHALL BE:
   - FOUNDATIONS 50mm
   - SLABS 25mm
   - WALLS AND BEAMS 30mm
9. LAPS TO ALL REINFORCEMENT SHALL BE 50 * BAR DIAMETER UNLESS OTHERWISE SHOWN



SECTION B-B
SCALE 1:25

DESIGN BY		
DRAWN BY	SCALE	AS SHOWN
CHECKED BY		
APPROVED BY	DATE	JANUARY-2022
SHEET NO:	DRAWING NO	FSTP-103-01

PROJECT
CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM

TITLE
FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - FEEDING & SCREENING TANK - LAYOUT PLAN AND SECTION GENERAL ARRANGEMENTS

REVISION	
DATE	
NATURE OF REV	
CHECKED BY	
APPROVED BY	

CLIENT
DAR ES SALAAM WATER SUPPLY & SANITATION AUTHORITY (DAWASA)

CONSULTANT
DOHWA Engineering CO., LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS

NOTES:

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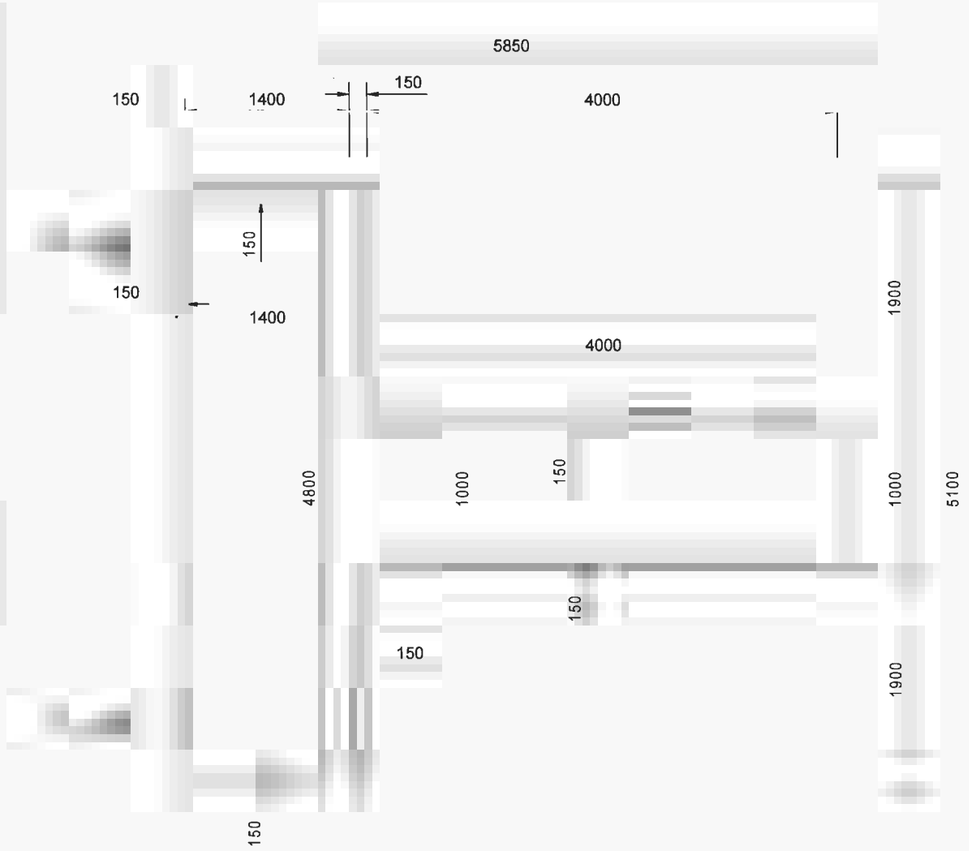
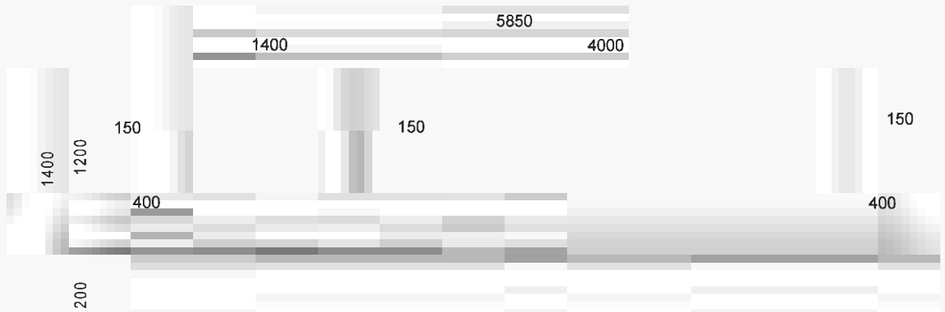
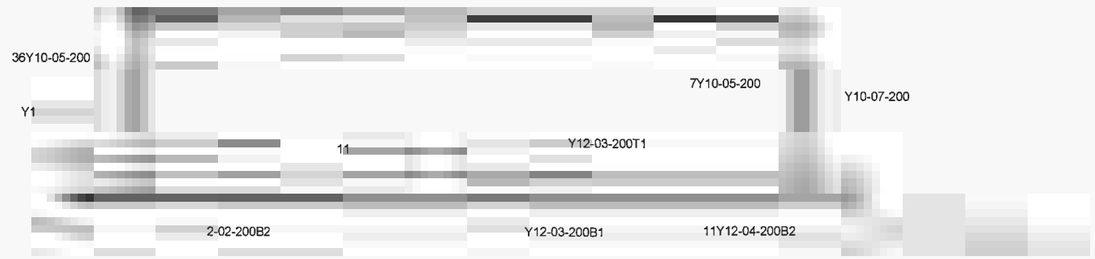


BOTTOM SLAB REINFORCEMENTS
SCALE 1:25





SECTION A - A
SCALE 1:25

DESIGN BY
DRAWN BY
CHECKED BY
APPROVED BY
SHEET NO:

SCALE AS SHOWN
DATE JANUARY-2022
DRAWING NO. FSTP-103-01

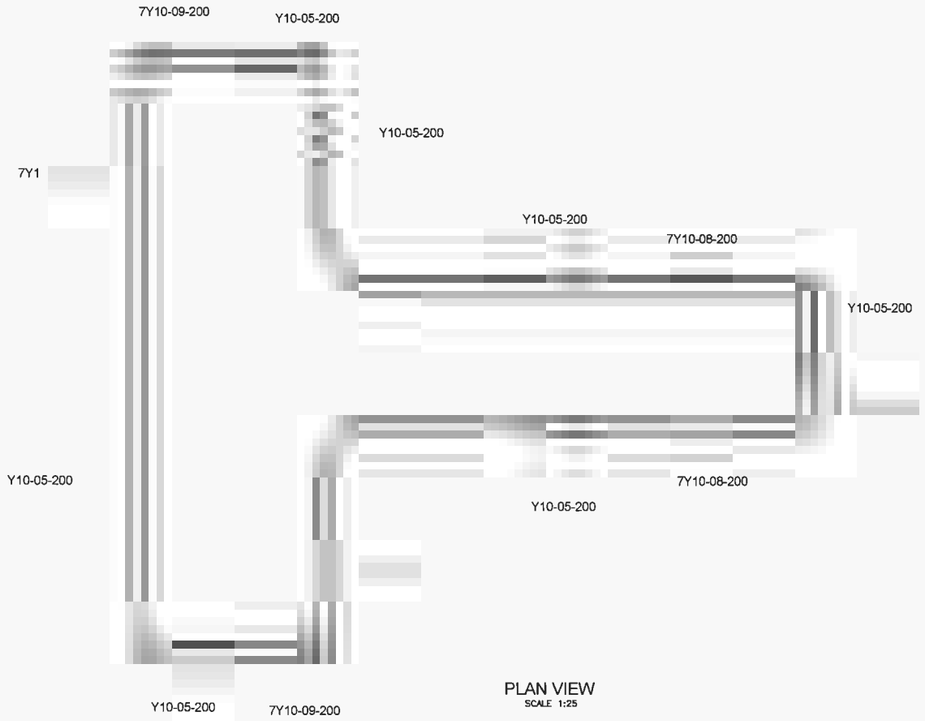
PROJECT
CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM

TITLE
FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - FEEDING & SCREENING TANK - LAYOUT PLAN, SECTION AND SECTIONS GENERAL ARRANGEMENTS

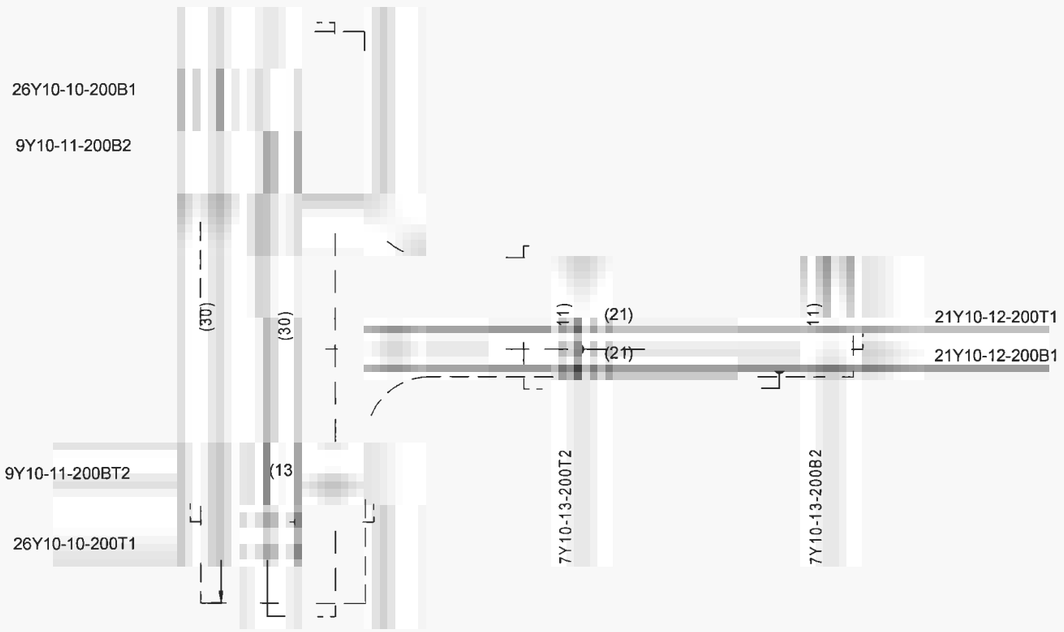
REVISION
DATE
NATURE OF REV
CHECKED BY
APPROVED BY

CLIENT
DAR ES SALAAM WATER SUPPLY & SANITATION AUTHORITY (DAWASA)

CONSULTANT
DOHWA Engineering CO., LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS



PLAN VIEW
SCALE 1:25



TOP SLAB REINFORCEMENTS
SCALE 1:25

NOTES:

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   - SLABS 25mm
   - WALLS AND BEAMS 30mm
9. LAPS TO ALL REINFORCEMENT SHALL BE 50 * BAR DIAMETER UNLESS OTHERWISE SHOWN

Mark	Diameter	Total Numbers	Length (mm)	Unit weight (kg/m)	Total weight (kg)	Bar bending shape
01	Y12	60	2700	0 888	144	
02	Y12	26	6100	0 888	141	
03	Y12	42	2300	0 888	86	
04	Y12	22	4700	0 888	92	
05	Y10	234	1700	0 616	245	
06	Y10	28	5350	0 616	93	
07	Y10	14	1450	0 616	13	
08	Y10	28	4300	0 616	75	
09	Y10	28	1850	0 616	32	
10	Y10	52	1850	0 616	60	
11	Y10	18	5350	0 616	60	
12	Y10	42	1450	0 616	38	
13	Y10	14	4300	0 616	37	
				Total	1,116	

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DRAWN BY
CHECKED BY
APPROVED BY
SHEET NO:

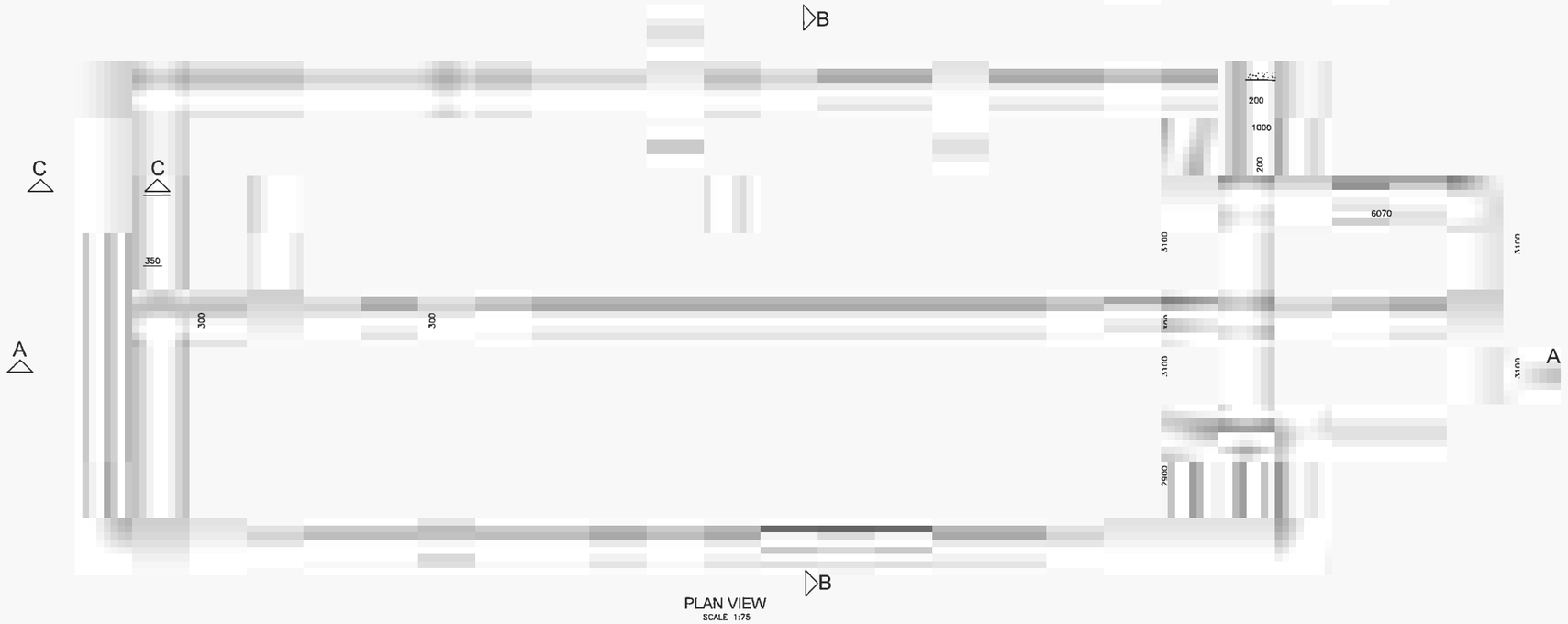
SCALE AS SHOWN
DATE JANUARY-2022
DRAWING NO FSTP-103-01-2

PROJECT
CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM

TITLE
FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - FEEDING & SCREENING TANK - WALLS REINFORCEMENT DETAILS & BAR BENDING SCHEDUL

REVISION
DATE
NATURE OF REV.
CHECKED BY
APPROVED BY

CLIENT
DAR ES SALAAM WATER SUPPLY & SANITATION AUTHORITY (DAWASA)
CONSULTANT
DOHWA Engineering CO., LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS



PLAN VIEW
SCALE 1:75

SECTION A - A
SCALE 1:75

SECTION B - B
SCALE 1:50

SECTION C - C
SCALE 1:25

NOTES:

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5 CONCRETE SHALL BE CLASS C30/37 FOR STRUCTURAL MEMBERS AND CLASS C8/10 FOR BLINDING
6. THE MAXIMUM SIZE OF AGGREGATE
7. REINFORCEMENT SHALL BE HIGH YIELD STRESS OF AT LEAST
8. COVER TO REINFORCEMENT SHALL BE:
   - FOUNDATIONS 50mm
   - SLABS 25mm
   - W BEAMS 30mm
9. LAPS TO ORCEMENT SHALL BE 50 * BAR DIAMETER UN SHOWN

DESIGN BY
DRAWN BY
CHECKED BY
APPROVED BY
SHEET NO:

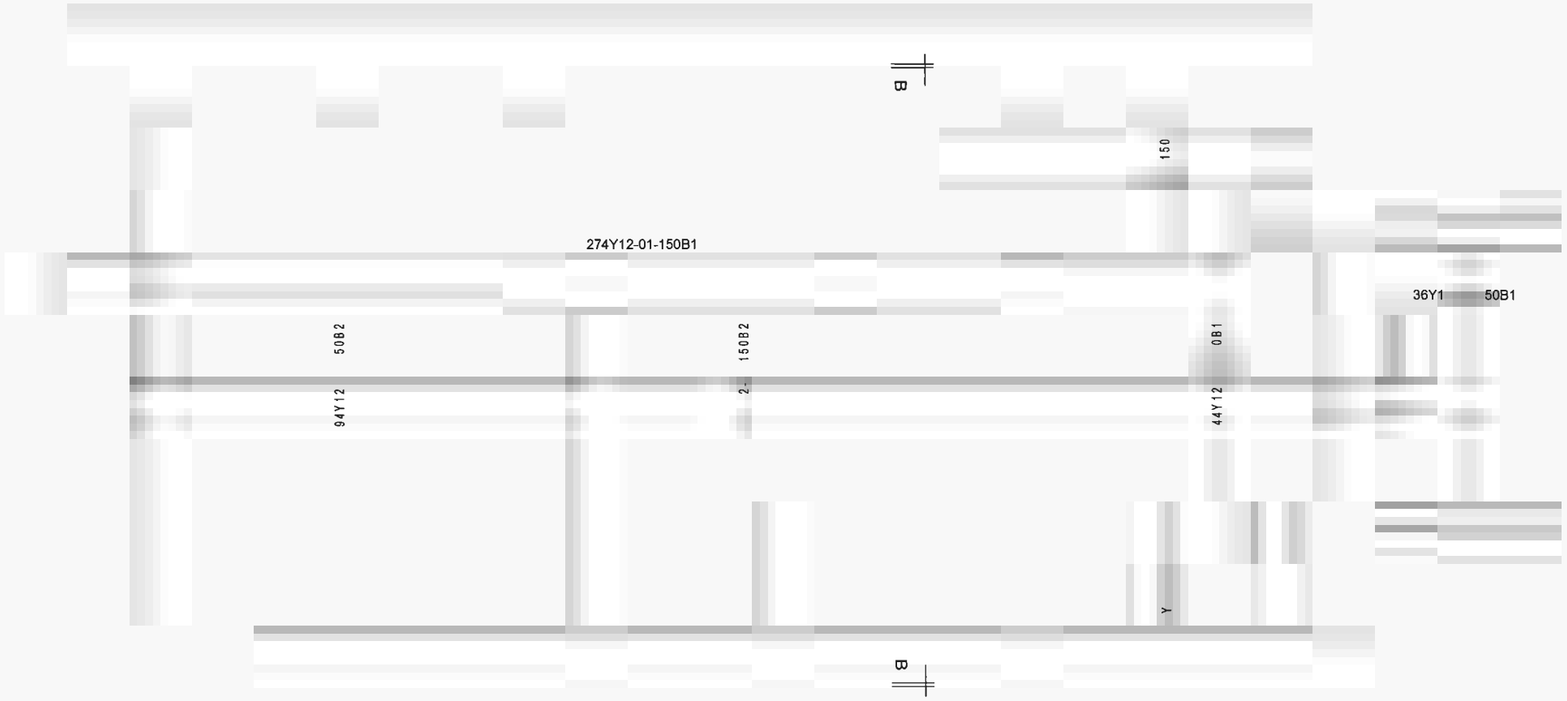
SCALE AS SHOWN
DATE JANUARY-2022
DRAWING NO FSTP-103-02

PROJECT
CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM

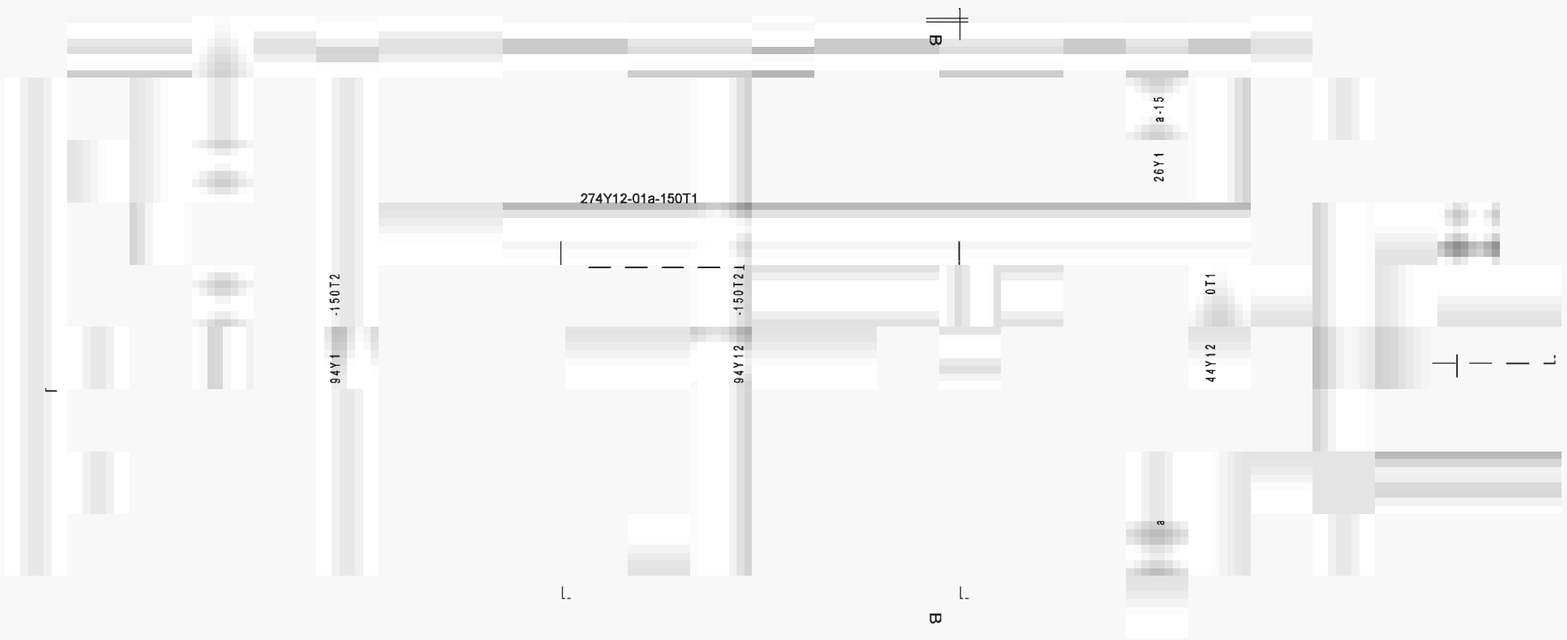
TITLE
FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - SLUDGE THICKENING TANK - LAYOUT PLAN AND SECTION GENERAL ARRANGEMENTS

REVISION
DATE
NATURE OF REV.
CHECKED BY
APPROVED BY

DAR ES SALAAM WATER SUPPLY & SANITATION AUTHORITY (DAWASA)
TANT
DOHWA Engineering CO., LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS



FOUNDATION BASE BOTTOM REINFORCEMENTS DETAILS



FOUNDATION BASE TOP REINFORCEMENTS DETAILS

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN
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3. THE SCALES GIVEN ON THIS DRAWING REFER TO THE A1 SIZE ORIGINAL DRAWING
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5. CONCRETE SHALL BE CLASS C30/37 FOR BERS AND C8/10 FOR BLINDING
6. THE MAXIMUM SIZE OF AGGREGATE
7. REINFORCEMENT SHALL BE HIGH YIELD STRESS OF AT LEAST 429N/mm²
8. COVER TO REINFORCEMENT SHALL BE
   FOUNDATIONS 50mm
   SLABS 25mm
   WALLS AND BEAMS 30mm
9. LAPS TO ALL REINFORCEMENT SHALL BE 50 * BAR DIAMETER UNLESS OTHERWISE SHOWN

DESIGN BY		
DRAWN BY	SCALE	1:75
CHECKED BY		
APPROVED BY	DATE	JANUARY-2022
SHEET NO:	DRAWING NO.	FSTP-103-02-1

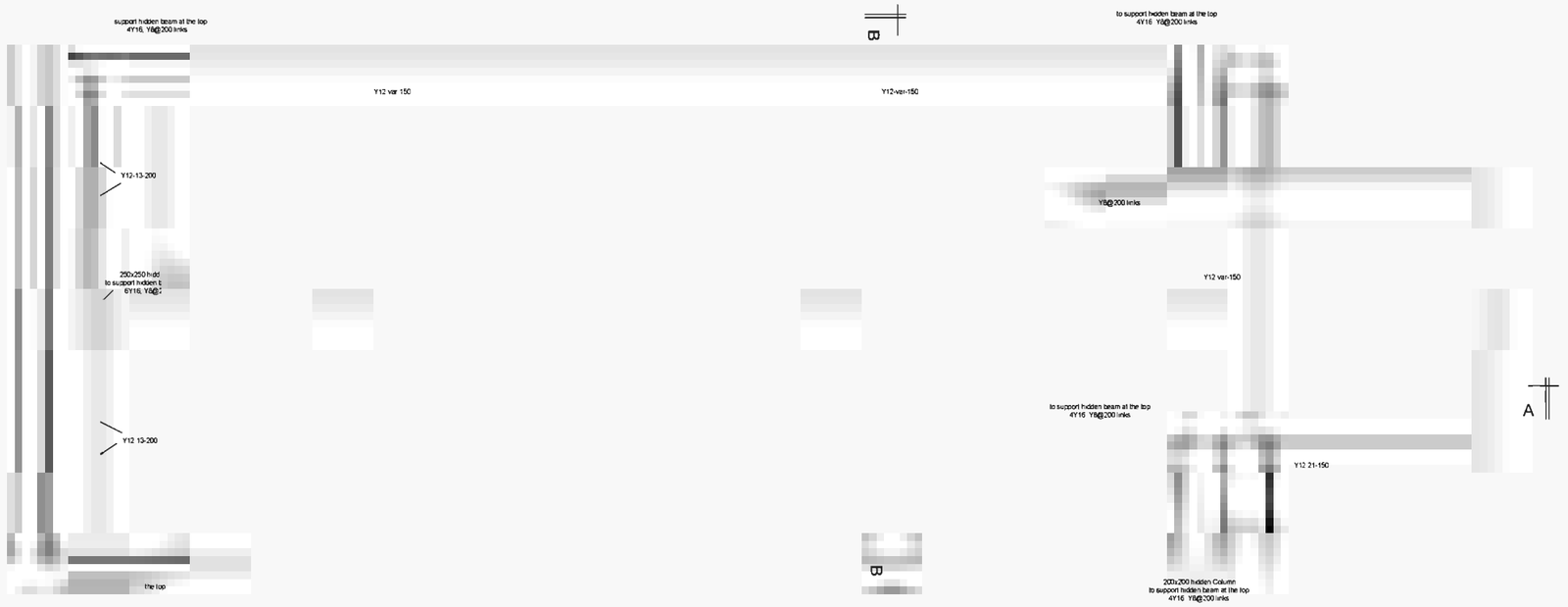
PROJECT
CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM

TITLE
FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - SLUDGE THICKENING TANK - BOTTOM SLAB REINFORCEMENTS DETAILS

REVISION	
DATE	
NATURE OF REV.	
CHECKED BY	
APPROVED BY	

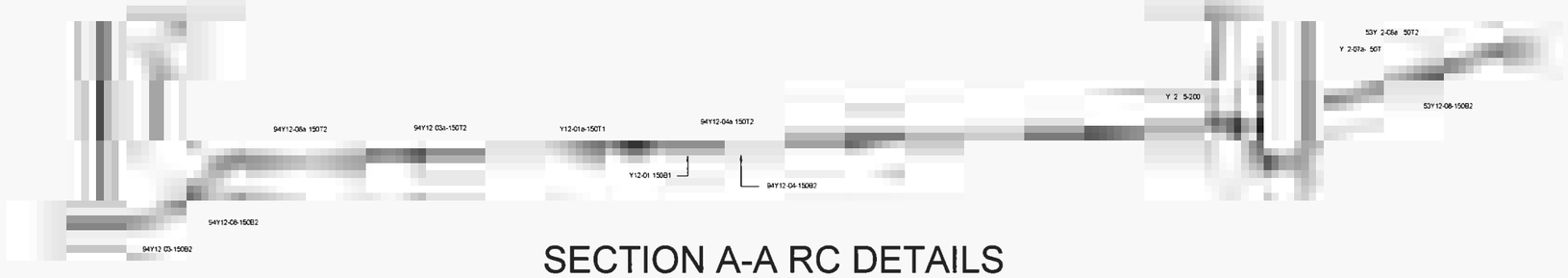
CLIENT
DAR ES SALAAM WATER SUPPLY & SANITATION AUTHORITY (DAWASA)

DOHWA Engineering CO., LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS



WALLS PLAN REINFORCEMENTS DETAILS

SCALE 1:75



SECTION A-A RC DETAILS

SCALE 1:75

SECTION B-B RC DETAILS

SCALE 1:50

SECTION C-C RC DETAILS

SCALE 1:25

BAR BENDING SCHEDULE FOR SLUDGE THICKENING TANK

Diameter	Unit weight (kg/m)	Total weight (kg)
Y08	0.312	576
Y10	0.616	256
Y12	0.888	24,928
Y16	1.578	554
	Total	26,314

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN
2. DO NOT SCALE FROM THIS DRAWING
3. THE SCALES GIVEN ON THIS DRAWING REFER TO THE A1 SIZE ORIGINAL DRAWING
4. THE SUBGRADE SHALL BE COMPACTED TO 99% MAXIMUM DRY DENSITY BEFORE THE PLACEMENT OF HARDCORE
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6. THE MAXIMUM SIZE OF AGGREGATE SHALL BE 20 UNL
7. REINFORCEMENT SHALL BE HIGH TENSILE DEFOR TYP YIELD STRESS OF AT LEAST 429N/mm²
8. COVER TO REINFORCEMENT SHALL BE:
   - FOUNDATIONS 50mm
   - SLABS 25mm
   - WALLS AND BEAMS 30mm
9. LAPS TO ALL REINFORCEMENT SHALL BE 50 * BAR DIAMETER UNLESS OTHERWISE SHOWN

DESIGN BY			
DRAWN BY	**SCALE**	**AS SHOWN**	
CHECKED BY			
APPROVED BY	**DATE**	**JANUARY-2022**	
SHEET NO:	**DRAWING NO**	**FSTP-103-02-2**	

PROJECT

CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM

TITLE

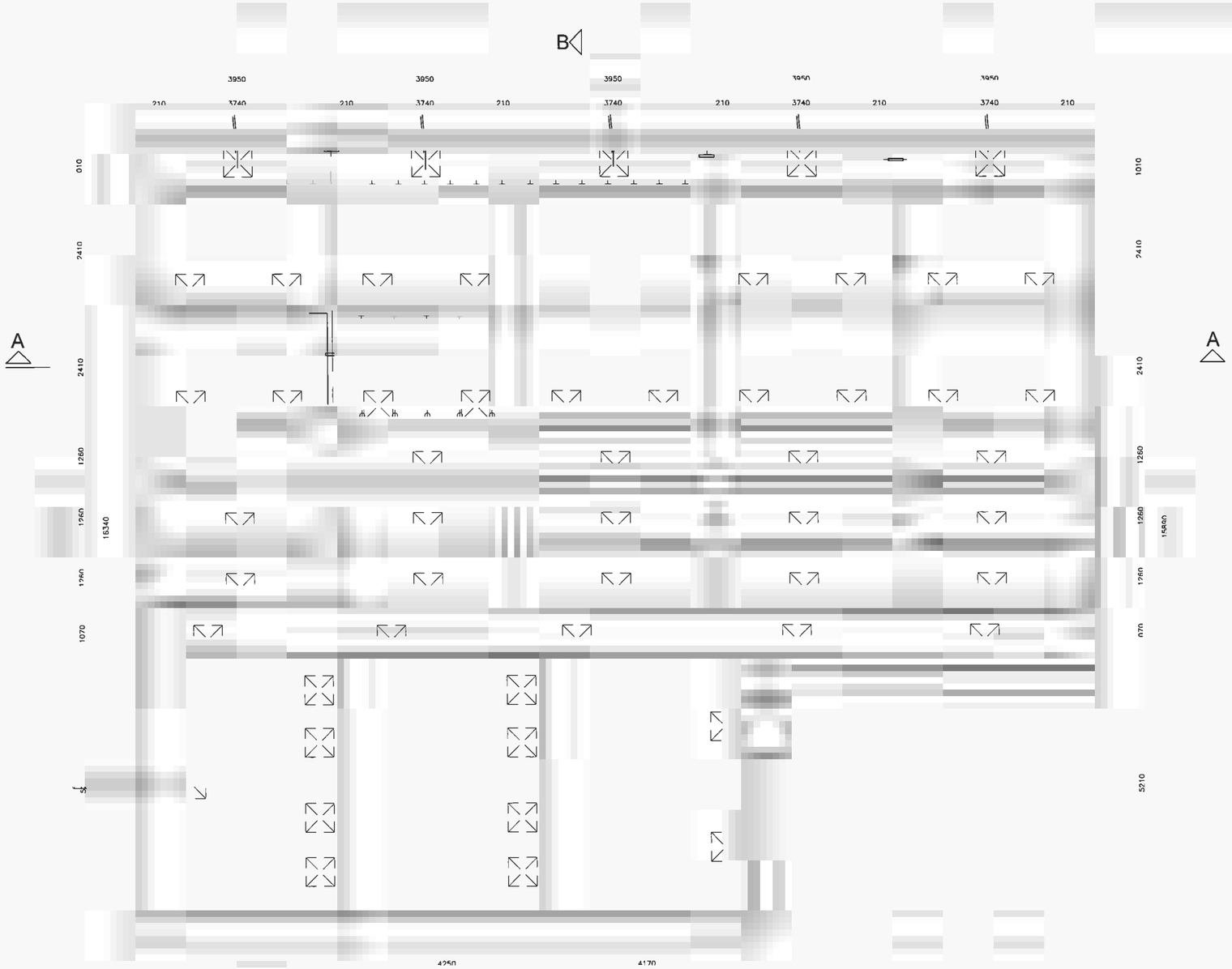
FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - SLUDGE THICKENING TANK - WALLS SECTIONS REINFORCEMENTS DETAILS

REVISION	
DATE	
NATURE OF REV.	
CHECKED BY	
APPROVED BY	

DAR ES SALAAM WATER SUPPLY & SANITATION AUTHORITY (DAWASA)

CONSULTANT

DOHWA Engineering CO., LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS



ABR PLAN VIEW
SCALE 1:50

NOTES:

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DESIGN BY
DRAWN BY
CHECKED BY
APPROVED BY
SHEET NO:

SCALE AS SHOWN
DATE JANUARY-2022
DRAWING NO. FSTP-103-03-A

PROJECT
CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM

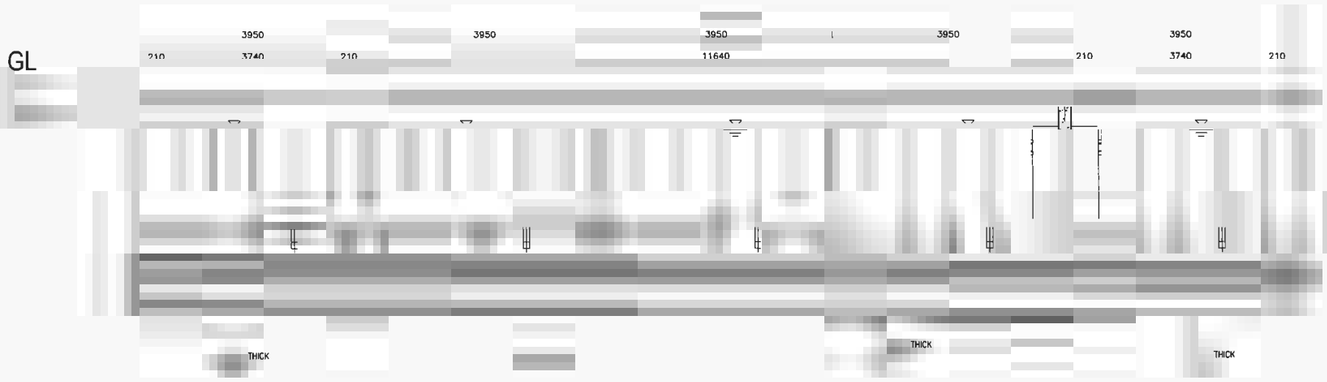
FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - INTEGRATED SETTLER, ABR & ANAEROBIC FILTER - PLAN VIEW GENERAL ARRANGEMENTS

REVISION
DATE
NATURE OF REV.
CHECKED BY
APPROVED BY

DAR ES SALAAM WATER SUPPLY & SANITATION AUTHORITY (DAWASA)
CONSULTANT
DOHWA Engineering CO., LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN
2. DO NOT SCALE FROM THIS DRAWING
3. THE SCALES GIVEN ON THIS DRAWING REFER TO THE A1 SIZE ORIGINAL DRAWING
4. THE SUBGRADE SHALL BE COMPACTED TO 99% MAXIMUM DRY DENSITY BEFORE THE PLACEMENT OF HARDCORE
5. CONCRETE SHALL BE CLASS C30/37 FOR STRUCTURAL MEMBERS AND CLASS C8/10 FOR BLINDING
6. THE MAXIMUM SIZE OF AGGREGATE SHALL BE 20mm UNLESS OTHERWISE SHOWN
7. REINFORCEMENT SHALL BE HIGH TENSILE DEFORMED TYPE WITH A CHARACTERISTIC YIELD STRESS OF AT LEAST 429N/mm²
8. COVER TO REINFORCEMENT SHALL BE:
   - FOUNDATIONS 50mm
   - SLABS 25mm
   - WALLS AND BEAMS 30mm
9. LAPS TO ALL REINFORCEMENT SHALL BE 50 * BAR DIAMETER UNLESS OTHERWISE SHOWN



SECTION A - A
SCALE 1:50

SECTION B - B
SCALE 1:50

DESIGN BY		PROJECT	REVISION
DRAWN BY	SCALE AS SHOWN	CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM	DATE
CHECKED BY			NATURE OF REV
APPROVED BY	DATE JANUARY-2022	FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - INTEGRATED SETTLER, ABR & ANAEROBIC FILTER - SECTIONS GENERAL ARRANGEMENTS	CHECKED BY
SHEET NO:	DRAWING NO. FSTP-103-03-B		APPROVED BY

DAR ES SALAAM WATER SUPPLY & SANITATION AUTHORITY (DAWASA)

CONSULTANT

DOHWA Engineering CO., LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS

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   - WALLS AND BEAMS 30mm
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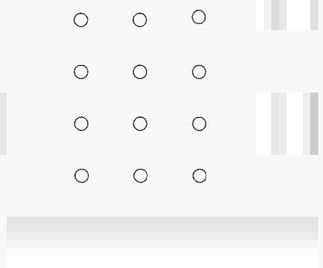
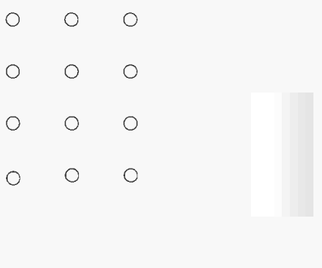
AF PARTIAL PLAN
SCALE 1:25



AF SLAB TYPE I
--- UNITS
SCALE 1:10



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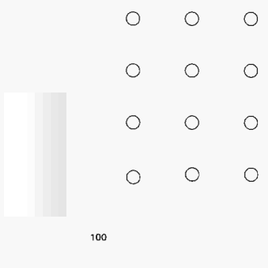
--- UNITS
SCALE 1:10



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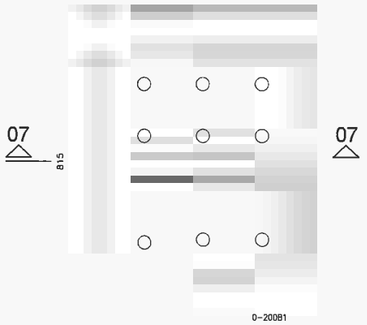
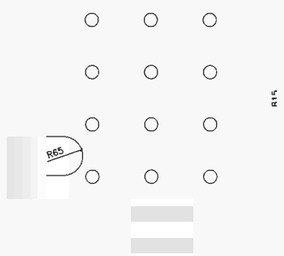
--- UNITS
SCALE 1:10



AF SLAB PLAN VIEW
SCALE 1:10



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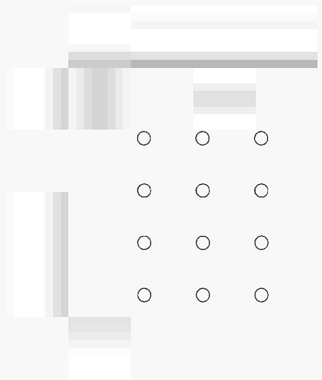
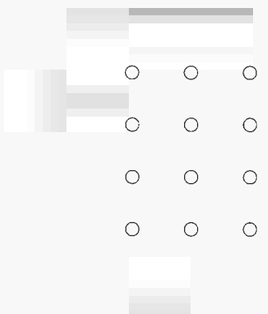
--- UNITS
SCALE 1:10



AF SLAB TYPE V
--- UNITS
SCALE 1:10



---AF SLAB TYPE VI
--- UNITS
SCALE 1:10

DESIGN BY		
DRAWN BY	SCALE	AS SHOWN
CHECKED BY		
APPROVED BY	DATE	JANUARY-2022
SHEET NO:	DRAWING NO.	FSTP-103-03-C

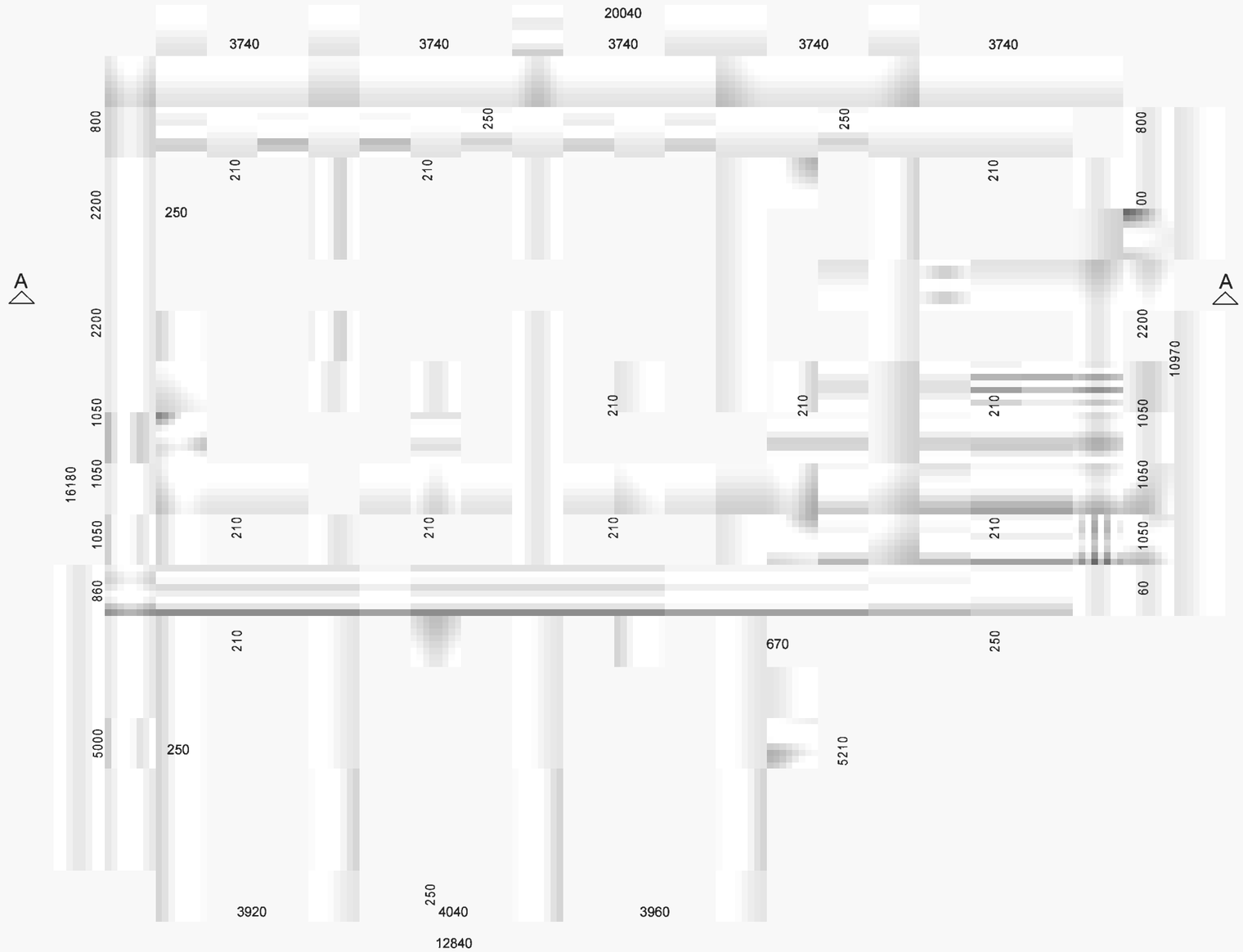
PROJECT
CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM

TITLE
FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - INTEGRATED SETTLER, ABR & ANAEROBIC FILTER - FILTERS PLAN & SECTIONS GENERAL ARRANGEMENTS

REVISION	
DATE	
NATURE OF REV.	
CHECKED BY	
APPROVED BY	

DAR ES SALAAM WATER SUPPLY & SANITATION AUTHORITY (DAWASA)

CONSULTANT
DOHWA Engineering CO., LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS



ABR PLAN VIEW
SCALE 1:50

NOTES:

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   - FOUNDATIONS 50mm
   - SLABS 25mm
   - WALLS AND BEAMS 30mm
9. LAPS TO ALL REINFORCEMENT SHALL BE 50 * BAR DIAMETER UNLESS OTHERWISE SHOWN

DESIGN BY
DRAWN BY
CHECKED BY
APPROVED BY
SHEET NO:

SCALE AS SHOWN
DATE JANUARY-2022
DRAWING NO. FSTP-103-03-1

PROJECT
CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM

TITLE
FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - INTEGRATED SETTLER, ABR & ANAEROBIC FILTER - STRUCTURAL DRAWINGS - PLAN GENERAL ARRANGEMENT

REVISION
DATE
NATURE OF REV.
CHECKED BY
APPROVED BY

CLIENT
DAR ES SALAAM WATER SUPPLY & SANITATION AUTHORITY (DAWASA)
CONSULTANT
DOHWA Engineering CO., LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS

SECTION A-A
SCALE 1:50

SECTION B - B
SCALE 1:50

NOTES:

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DESIGN BY
DRAWN BY
CHECKED BY
APPROVED BY
SHEET NO:

SCALE AS SHOWN
DATE JANUARY-2022
DRAWING NO. FSTP-103-03-2

PROJECT
CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM

TITLE
FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - INTEGRATED SETTLER, ABR & ANAEROBIC FILTER - STRUCTURAL DRAWINGS - SECTION GENERAL ARRANGEMENT

REVISION
DATE
NATURE OF REV
CHECKED BY
APPROVED BY

CLIENT
DAR ES SALAAM WATER SUPPLY & SANITATION AUTHORITY (DAWASA)

TANT
DOHWA Engineering CO., LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS

ABR PLAN VIEW REINFORCEMENTS DETAILS
SCALE 1:50

SECTION 03-03
SCALE 1:50

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN
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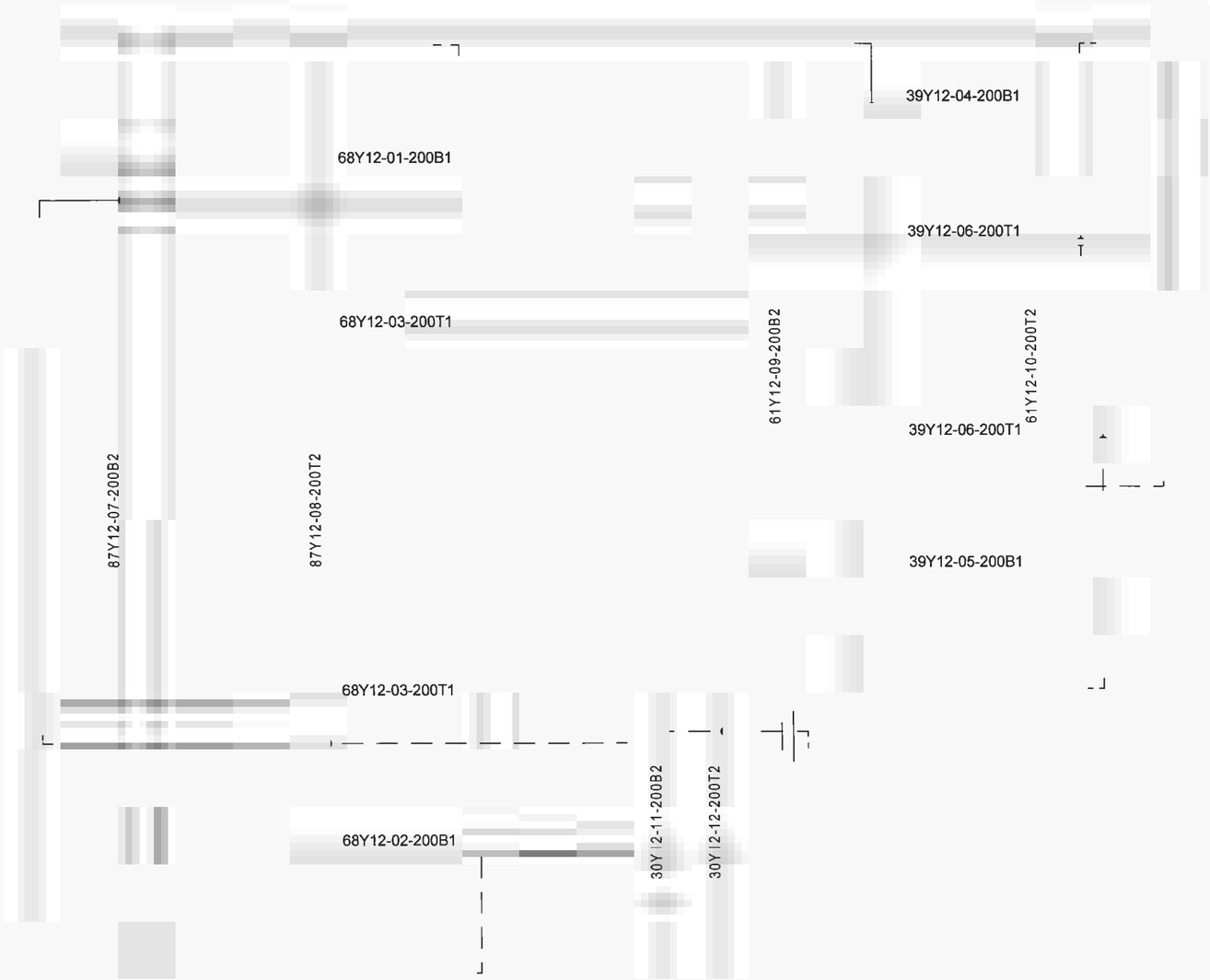
DESIGN BY		
DRAWN BY	**SCALE**	**AS SHOWN**
CHECKED BY		
APPROVED BY	**DATE**	**JANUARY-2022**
SHEET NO:	**DRAWING NO**	**FSTP-103-03-3**

PROJECT
CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM

TITLE
FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - INTEGRATED SETTLER, ABR & ANAEROBIC FILTER - FOUNDATION & WALLS REINFORCEMENTS DETAILS

REVISION	
DATE	
NATURE OF REV.	
CHECKED BY	
APPROVED BY	

DAR ES SALAAM WATER SUPPLY & SANITATION AUTHORITY (DAWASA)
ANT
DOHWA Engineering CO , LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS



ABR BASE REINFORCEMENTS DETAILS
SCALE 1:50

NOTES:

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   - WALLS AND BEAMS 30mm
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DESIGN BY
DRAWN BY
CHECKED BY
APPROVED BY
SHEET NO:

SCALE AS SHOWN
DATE JANUARY-2022
DRAWING NO FSTP-103-03-4

PROJECT
CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM

TITLE
FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - INTEGRATED SETTLER, ABR & ANAEROBIC FILTER - FOUNDATION BASE SLAB REINFORCEMENT DETAILS

REVISION
DATE
NATURE OF REV.
CHECKED BY
APPROVED BY

DAR ES SALAAM WATER SUPPLY & SANITATION AUTHORITY (DAWASA)
TANT
DOHWA Engineering CO., LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS

ABR TOP SLAB REINFORCEMENTS DETAILS

SCALE 1:50

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BAR BENDING SCHEDULE

Diameter	Unit weight (kg/m)	Total weight (kg)
Y08	0.312	282
Y10	0.616	8,865
Y12	0.888	18,408
Y16	1.578	1,058
	Total	28,613

DESIGN BY
DRAWN BY
CHECKED BY
APPROVED BY
SHEET NO:

SCALE AS SHOWN
DATE JANUARY-2022
DRAWING NO. FSTP-103-03-5

PROJECT
CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM

TITLE
FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - INTEGRATED SETTLER, ABR & ANAEROBIC FILTER - TOP SLAB REINFORCEMENT DETAILS & BAR BENDING SCHEDULE

REVISION
DATE
NATURE OF REV
CHECKED BY
APPROVED BY

DAR ES SALAAM WATER SUPPLY & SANITATION AUTHORITY (DAWASA)

DOHWA Engineering CO., LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS

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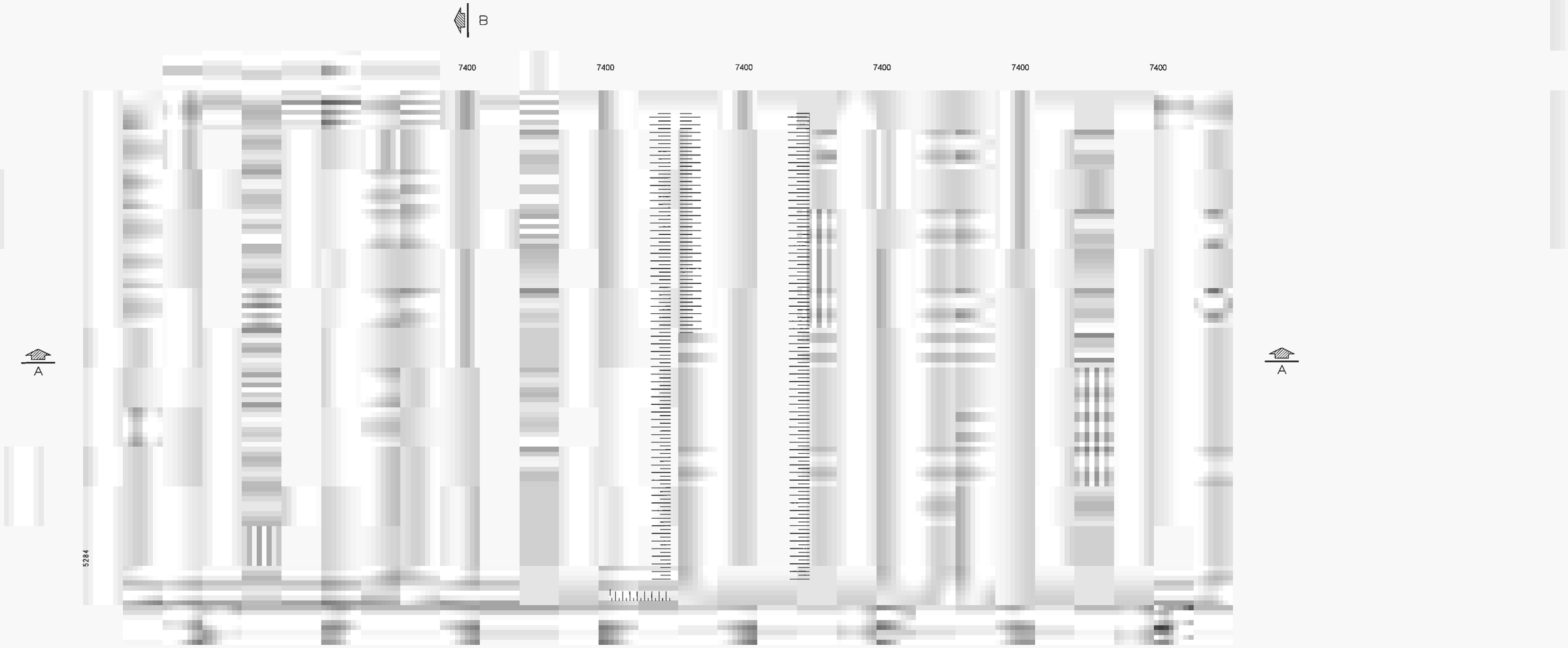

PLAN VIEW
SCALE 1:100

DESIGN BY			
DRAWN BY	SCALE	AS SHOWN	
CHECKED BY			
APPROVED BY	DATE	JANUARY-2022	
SHEET NO:	DRAWING NO	FSTP-103-04-A	

PROJECT
CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM

TITLE
FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - UNPLANTED DRYING BEDS (UDB) PLAN VIEW GENERAL ARRANGEMENT

REVISION	
DATE	
NATURE OF REV.	
CHECKED BY	
APPROVED BY	

DAR ES SALAAM WATER SUPPLY & SANITATION AUTHORITY (DAWASA)

CONSULTANT
DOHWA Engineering CO., LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS

SECTION A-A
SCALE 1:50

NOTES:

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LEGEND:

DRYING BEDS FOR FSTP

1. SLUDGE FEEDING PIPE
2. SLUDGE FEEDING PIPE
3. SLUDGE FEEDING GATE VALVE
4. DRAIN COLLECTION PERFORATED PIPE
5. REMOVABLE PLATE
6. LIGHT METALLIC STRUCTURE AND SEMI TRANSPARENT ROOF COVER
7. COATED MILD STEEL COLUMN - I SECTION
8. GRAVEL BOTTOM LAYER - H=0.2m, GRAVEL Ø 15-30mm
9. INTERMEDIATE SAND LAYER - H=0.1m, SAND Ø 7-15mm
10. TOP SAND LAYER. H=0 1m, SAND Ø 0.2-0 6mm
11. WET SLUDGE LAYER. H=0.4m
12. LEACHATE OUTLET PIPE

SECTION B-B
SCALE 1:50

DESIGN BY
DRAWN BY
CHECKED BY
APPROVED BY
SHEET NO:

SCALE AS SHOWN
DATE JANUARY-2022
DRAWING NO. FSTP-103-04-B

PROJECT
CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM

FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - UNPLANTED DRYING BEDS (UDB) SECTION VIEW GENERAL ARRANGEMENT

REVISION
DATE
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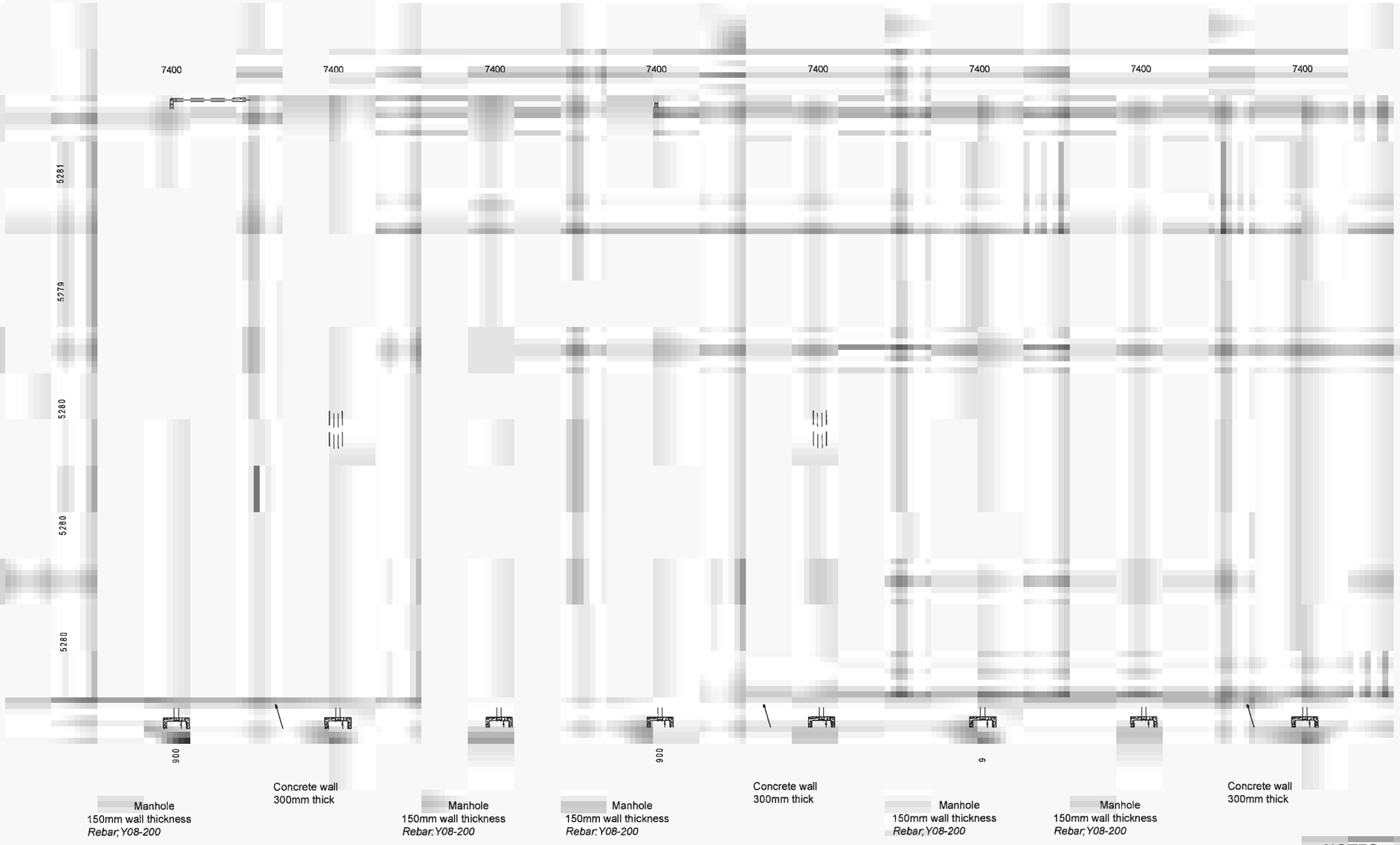
CONSULTANT
DOHWA Engineering CO., LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS



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DESIGN BY		
DRAWN BY	SCALE	AS SHOWN
CHECKED BY		
APPROVED BY	DATE	JANUARY-2022
SHEET NO:	DRAWING NO.	FSTP-103-04-1

PROJECT

CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM

FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - UNPLANTED DRYING BEDS STRUCTURAL DRAWINGS - GENERAL ARRANGEMENTS DETAILS

REVISION	
DATE	
NATURE OF REV.	
CHECKED BY	
APPROVED BY	

DAR ES SALAAM WATER SUPPLY & SANITATION AUTHORITY (DAWASA)

CONSULTANT

DOHWA Engineering CO., LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS

D01

D02

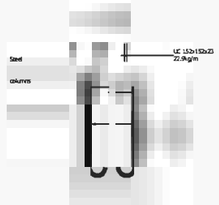
D04

D05

D06

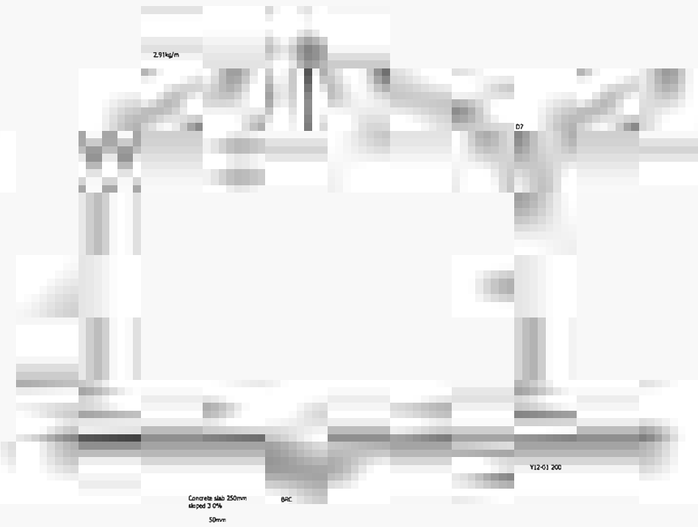
D07

D08



D09

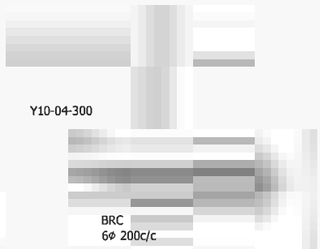
DRYING BED TYPICAL SECTION
SCALE 1:50



DRYING BED REINFORCEMENTS
SCALE 1:50

Connection details

Column section details



Wall section details

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN
2. DO NOT SCALE FROM THIS DRAWING
3. THE SCALES GIVEN ON THIS DRAWING REFER TO THE A1 SIZE ORIGINAL DRAWING
4. THE SUBGRADE SHALL BE COMPACTED TO 99% MAXIMUM DRY DENSITY BEFORE THE PLACEMENT OF HARDCORE
5. CONCRETE SHALL BE CLASS C30/37 FOR STRUCTURAL MEMBERS AND CLASS C8/10 FOR BLINDING
6. THE MAXIMUM SIZE OF AGGREGATE SHALL BE 20mm UNLESS OTHERWISE SHOWN
7. REINFORCEMENT SHALL BE HIGH TENSILE DEFORMED TYPE WITH A CHARACTERISTIC YIELD STRESS OF AT LEAST 429N/mm²
8. COVER TO REINFORCEMENT SHALL BE:
   - FOUNDATIONS 50mm
   - SLABS 25mm
   - WALLS AND BEAMS 30mm
9. LAPS TO ALL REINFORCEMENT SHALL BE 50 * BAR DIAMETER UNLESS OTHERWISE SHOWN

BAR BENDING SCHEDULE

Mark	Diameter	Total Numbers/Area	Length (mm)	Unit weight (kg/m)	Total weight (kg)	Bar bending shape
01	Y12	168	1250	0.888	187	
02	Y12	72	1750	0.888	112	
03	Y08	84	1110	0.312	29	
04	Y10	72	1750	0 616	81	
05	Y10	30	9400	0.616	174	
BRC Mesh	R06	186sqm		2.22kg/m²	413	
				Total per unit	996	
				Nos of Units		
				Total	7,968	

DESIGN BY			
DRAWN BY	SCALE	AS SHOWN	
CHECKED BY			
APPROVED BY	DATE	JANUARY-2022	
SHEET NO:	DRAWING NO.	FSTP-103-04-2	

PROJECT

CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM

FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - UNPLANTED DRYING BEDS STRUCTURAL DRAWINGS - REINFORCEMENTS & STEEL CONNECTION DETAILS

REVISION	
DATE	
NATURE OF REV	
CHECKED BY	
APPROVED BY	

DAR ES SALAAM WATER SUPPLY & SANITATION AUTHORITY (DAWASA)

CONSULTANT

DOHWA Engineering CO , LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS

SECTION M - M
SCALE 1:50

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN
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   - WALLS AND BEAMS 30mm
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DESIGN BY
DRAWN BY
CHECKED BY
APPROVED BY
SHEET NO:

SCALE AS SHOWN
DATE JANUARY-2022
DRAWING NO. FSTP-103-05-1

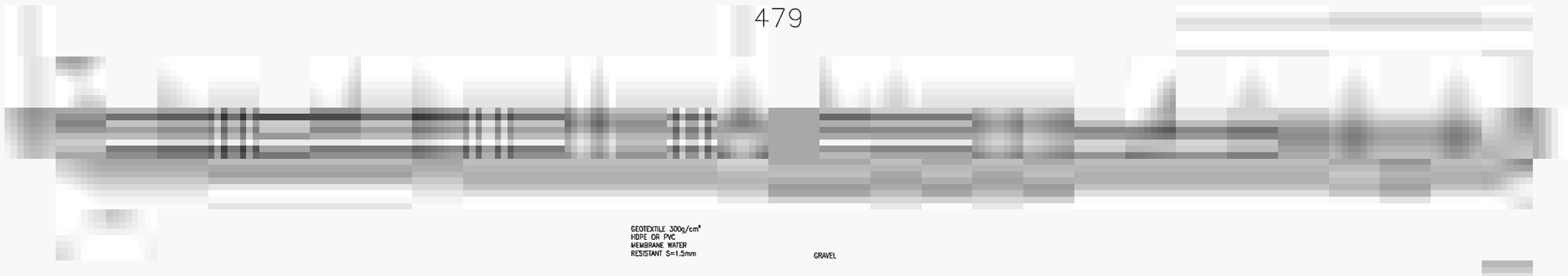
PROJECT
CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM

TITLE
FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - PLANTED GRAVEL FILTER - PLAN VIEW GENERAL ARRANGEMENT DETAILS

REVISION
DATE
NATURE OF REV.
CHECKED BY
APPROVED BY

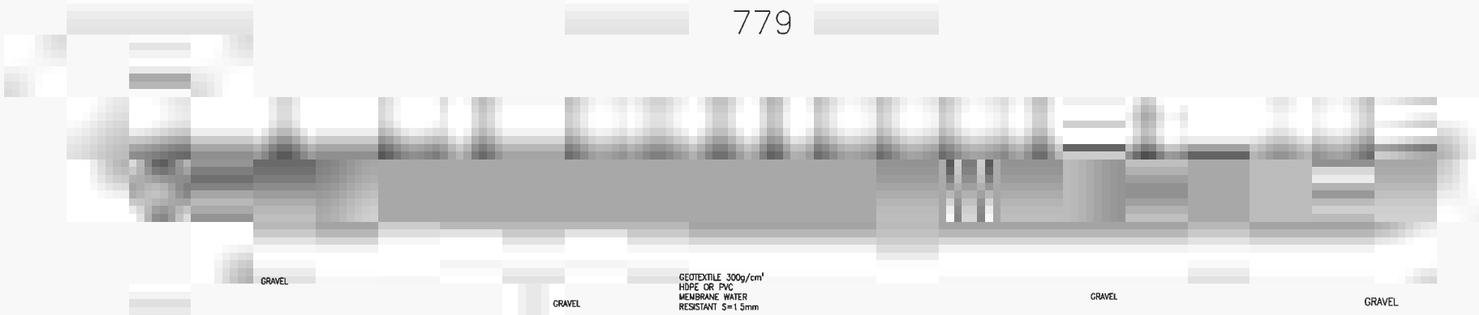
DAR ES SALAAM WATER SUPPLY & SANITATION AUTHORITY (DAWASA)
CONSULTANT
DOHWA Engineering CO., LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS

DETAIL 1



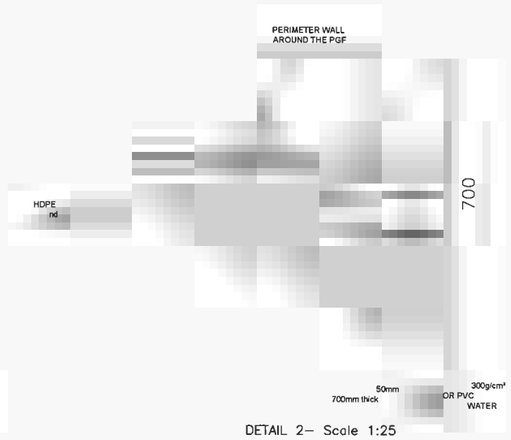
SECTION M - M
SCALE 1:40

DETAIL 2



SECTION L - L
SCALE 1:40

DETAIL 1– Scale 1:25



DETAIL 2– Scale 1:25

NOTES:

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DESIGN BY			
DRAWN BY	SCALE	AS SHOWN	
CHECKED BY			
APPROVED BY	DATE	JANUARY-2022	
SHEET NO:	DRAWING NO.	FSTP-103-05-2	

PROJECT

CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM

TITLE

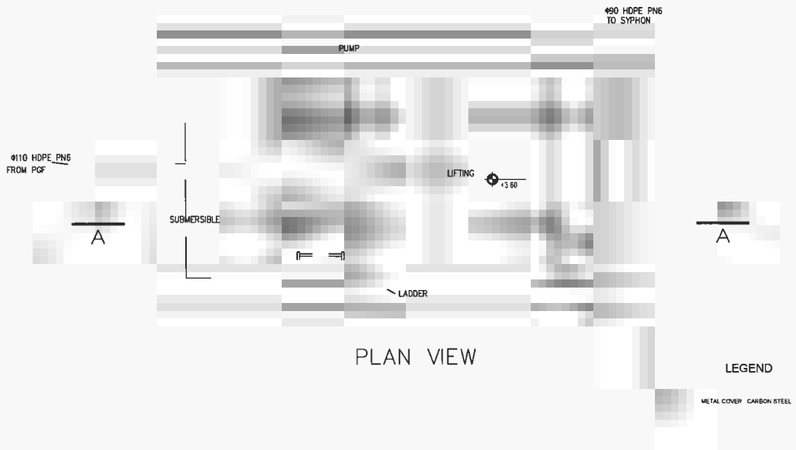
FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - PLANTED GRAVEL FILTER - SECTIONS GENERAL ARRANGEMENT DETAILS

REVISION	
DATE	
NATURE OF REV.	
CHECKED BY	
APPROVED BY	

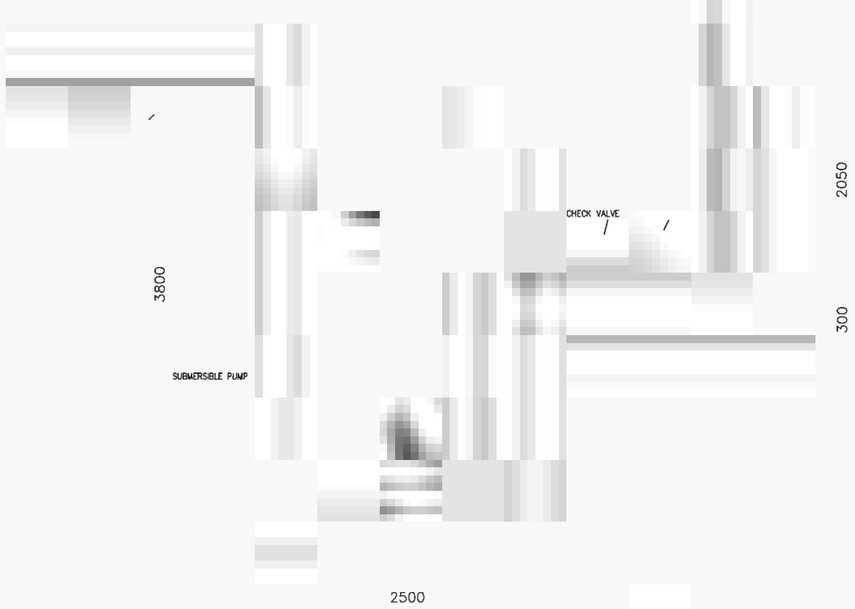
DAR ES SALAAM WATER SUPPLY & SANITATION AUTHORITY (DAWASA)

CONSULTANT

DOHWA Engineering CO., LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS



PLAN VIEW



LEGEND

METAL COVER CARBON STEEL

NOTES:

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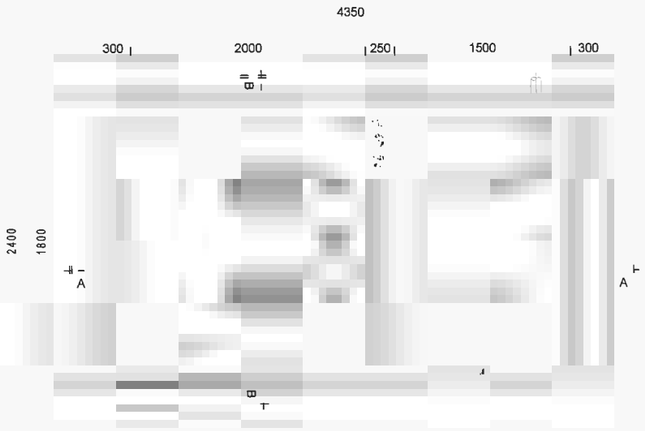
DESIGN BY			PROJECT	CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM
DRAWN BY	SCALE	AS SHOWN		
CHECKED BY			TITLE	FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - PUMP STATION - PLAN & SECTION GENERAL ARRANGEMENT DETAILS
APPROVED BY	DATE	JANUARY-2022		
SHEET NO:	DRAWING NO.	FSTP-103-06		

REVISION	
DATE	
NATURE OF REV.	
CHECKED BY	
APPROVED BY	

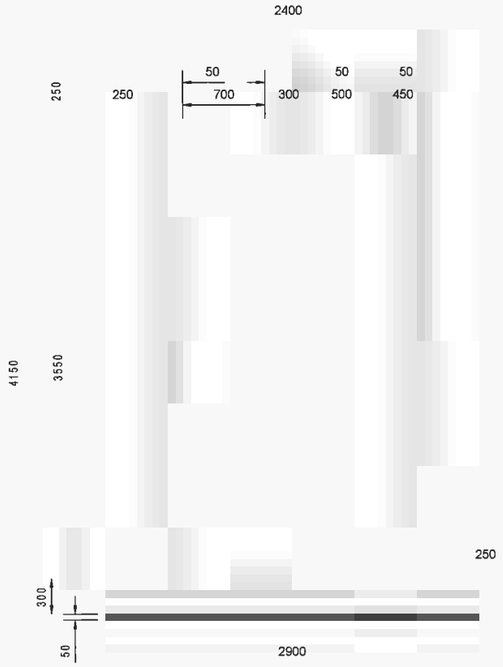
DAR ES SALAAM WATER SUPPLY & SANITATION AUTHORITY (DAWASA)

CONSULTANT

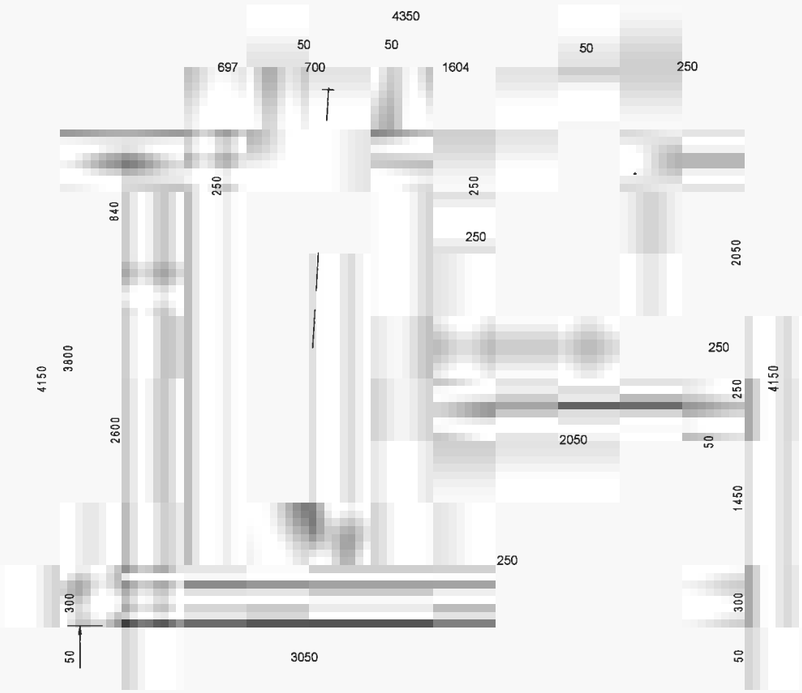
DOHWA Engineering CO., LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS



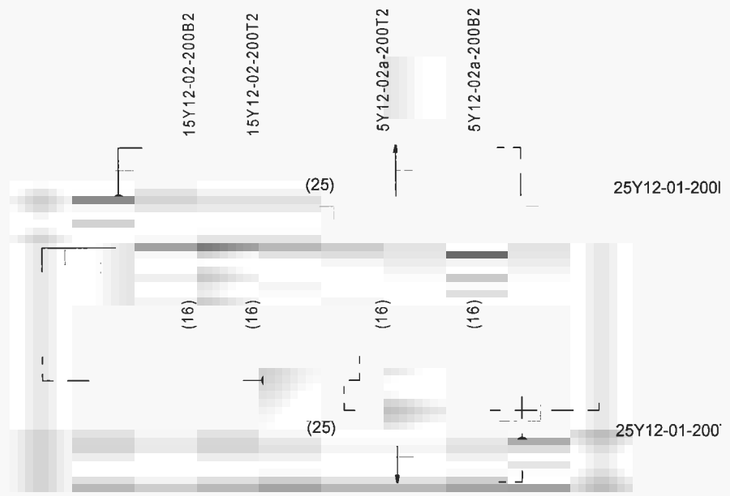
Plan



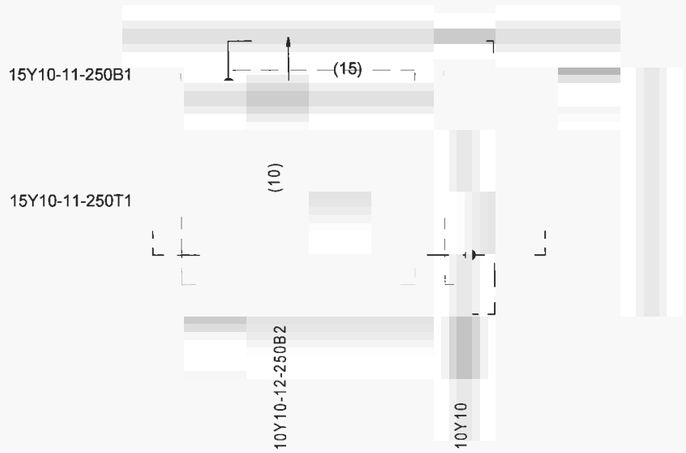
Section B-B



Section A-A



FOUNDATION BASE RC DETAILS



Top slab rc details

NOTES:

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DESIGN BY			
DRAWN BY	SCALE	AS SHOWN	
CHECKED BY			
APPROVED BY	DATE	JANUARY-2022	
SHEET NO:	DRAWING NO.	FSTP-103-06-1	

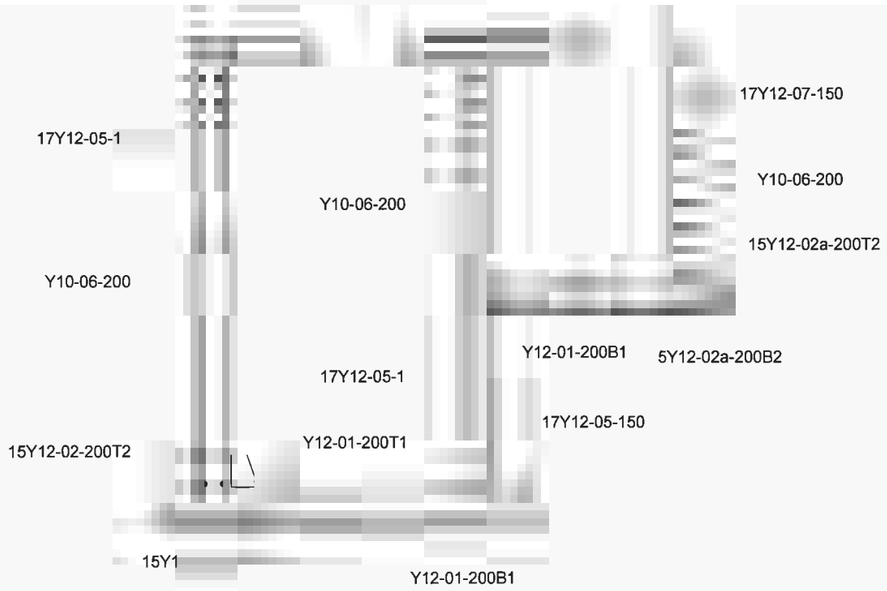
PROJECT
CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM

TITLE
FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - PUMP STATION - STRUCTURAL DRAWINGS PLAN, SECTIONS GENERAL ARRANGEMENT AND REINFORCEMENTS DETAILS

REVISION	
DATE	
NATURE OF REV	
CHECKED BY	
APPROVED BY	

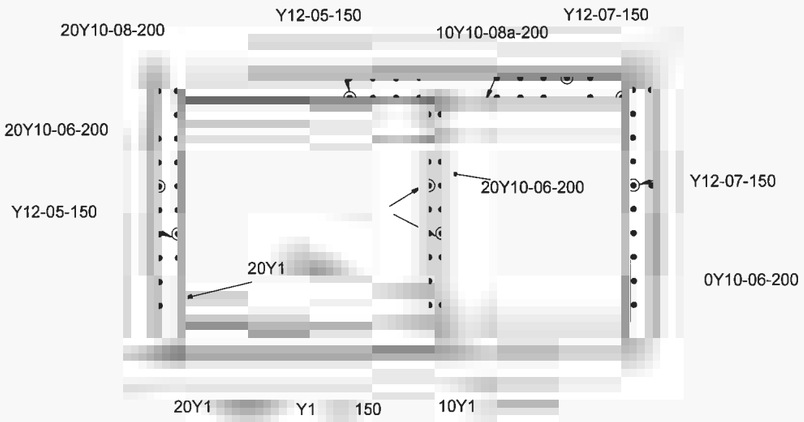
DAR ES SALAAM WATER SUPPLY & SANITATION AUTHORITY (DAWASA)

DOHWA Engineering CO., LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS

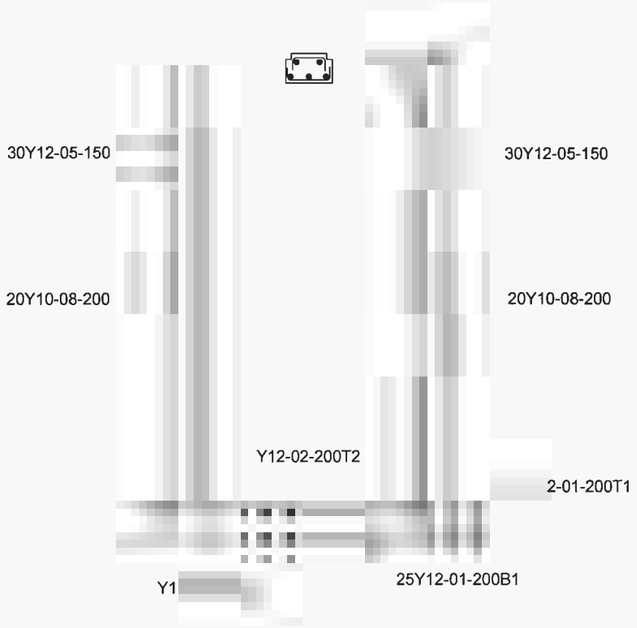


SECTION A-A, RC DETAILS

Mark	Diameter	Total Numbers	Length (mm)	Unit weight (kg/m)	Total weight (kg)	Bar bending shape
01	Y12	60	2700	0.888	144	
02	Y12	26	6100	0.888	141	
03	Y12	42	2300	0.888	86	
04	Y12	22	4700	0.888	92	
05	Y10	234	1700	0.616	245	
06	Y10	28	5350	0.616	93	
07	Y10	14	1450	0.616	13	
08	Y10	28	4300	0.616	75	
09	Y10	28	1850	0.616	32	
				Total	1324	



PLAN-REINFORCEMENTS DETAILS



Section B-B, rc details

NOTES:

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DESIGN BY			
DRAWN BY	SCALE	AS SHOWN	
CHECKED BY			
APPROVED BY	DATE	JANUARY-2022	
SHEET NO:	DRAWING NO.	FSTP-103-06-2	

PROJECT

CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM

FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - PUMP STATION - STRUCTURAL DRAWINGS - REINFORCEMENTS DETAILS & BAR BENDING SCHEDULE

REVISION	
DATE	
NATURE OF REV.	
CHECKED BY	
APPROVED BY	

DAR ES SALAAM WATER SUPPLY & SANITATION AUTHORITY (DAWASA)

CONSULTANT

DOHWA Engineering CO., LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS

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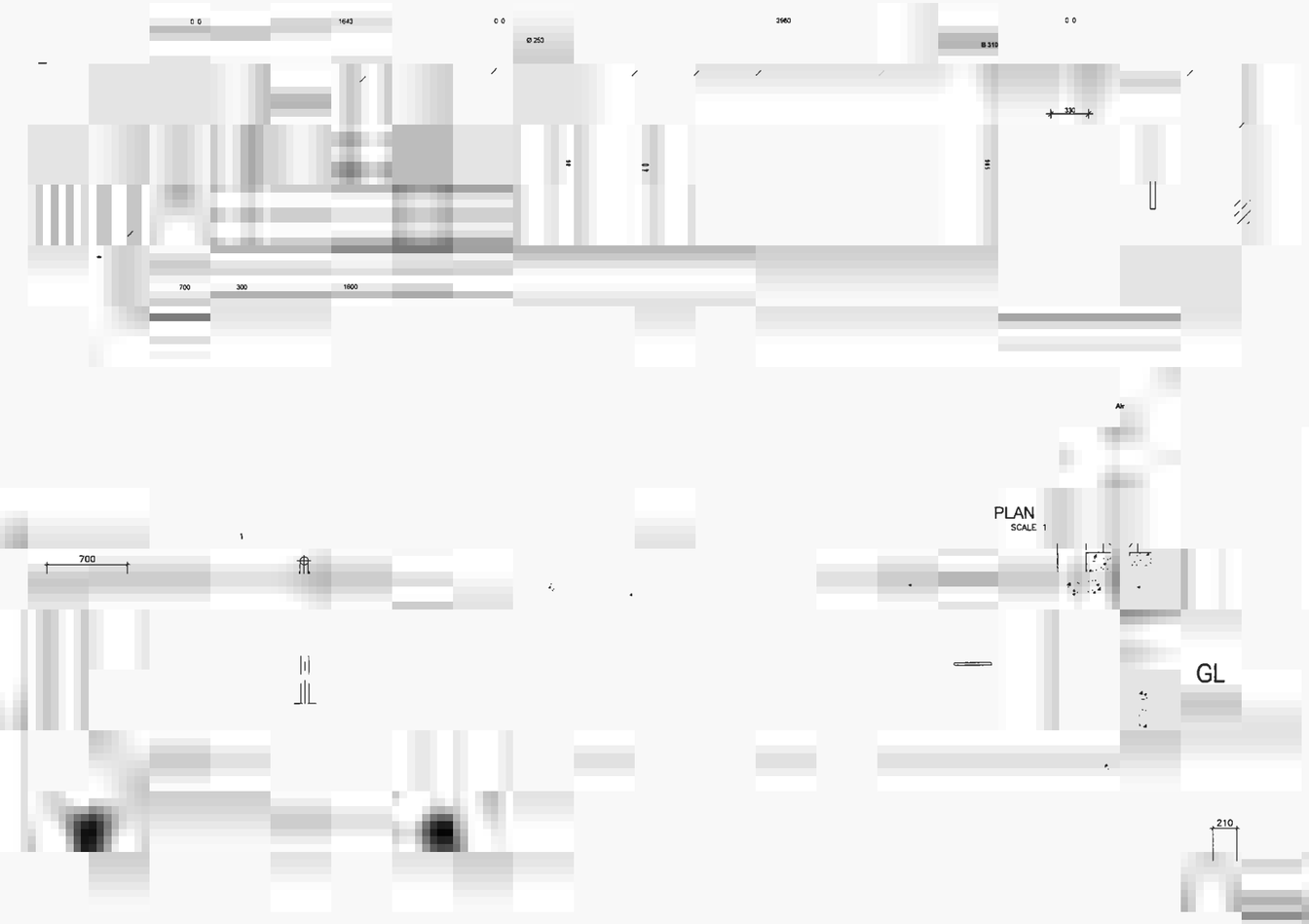

VERTICAL FLOW CONSTRUCTED WETLAND

DESIGN BY			
DRAWN BY	SCALE	AS SHOWN	
CHECKED BY			
APPROVED BY	DATE	JANUARY-2022	
SHEET NO:	DRAWING NO.	FSTP-103-07	

PROJECT
CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM

TITLE
FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - HYDRO-MECHANICAL SIPHON - PLAN & SECTION GENERAL ARRANGEMENT DETAILS

REVISION	
DATE	
NATURE OF REV.	
CHECKED BY	
APPROVED BY	

DAR ES SALAAM WATER SUPPLY & SANITATION AUTHORITY (DAWASA)

CONSULTANT
DOHWA Engineering CO., LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS

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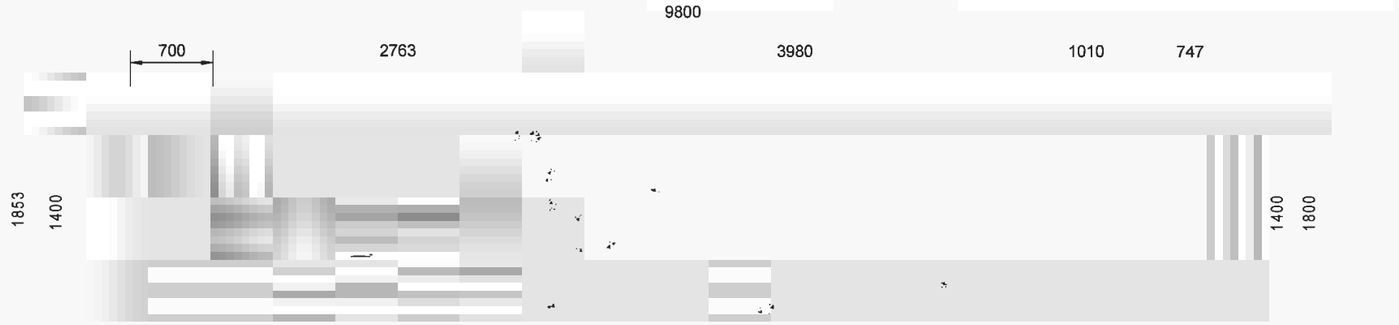

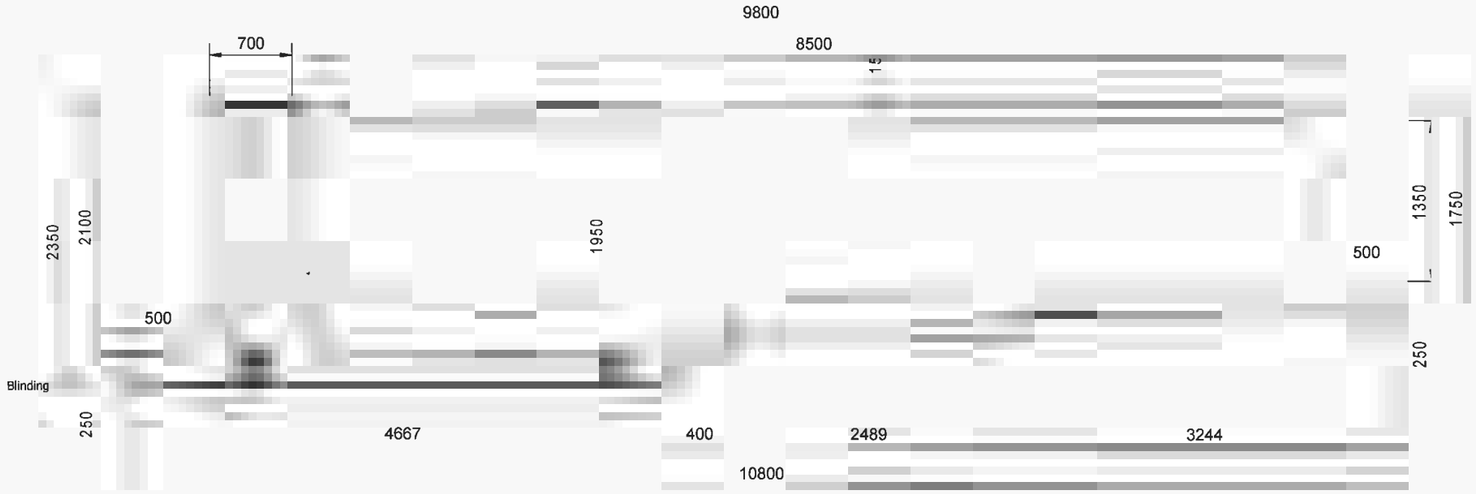

DESIGN BY
DRAWN BY
CHECKED BY
APPROVED BY
SHEET NO:

SCALE AS SHOWN
DATE JANUARY-2022
DRAWING NO. FSTP-103-07-1

PROJECT
CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM

TITLE
FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - HYDRO-MECHANICAL SIPHON - STRUCTURAL PLAN, SECTIONS GENERAL ARRANGEMENT AND REINFORCEMENTS DETAILS

REVISION
DATE
NATURE OF REV.
CHECKED BY
APPROVED BY

DAR ES SALAAM WATER SUPPLY & SANITATION AUTHORITY (DAWASA)

DOHWA Engineering CO., LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS

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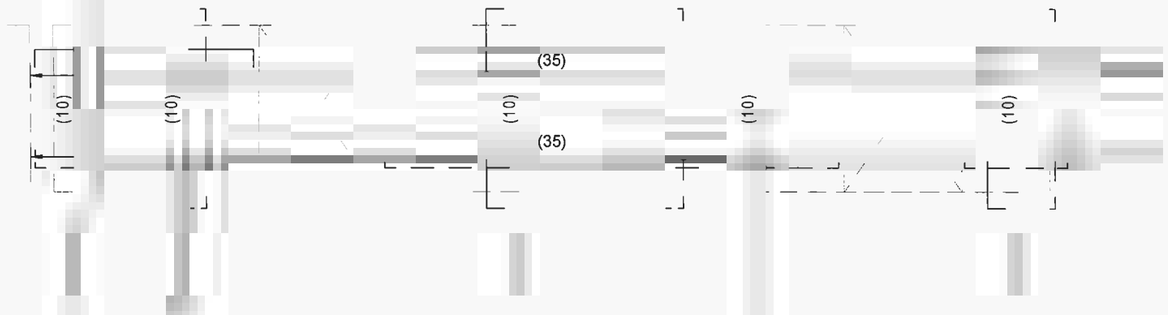
FOUNDATION BASE RC DETAILS



TOP SLAB RC DETAILS

DESIGN BY			PROJECT	REVISION	
DRAWN BY	SCALE	AS SHOWN	CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM	DATE	DAR ES SALAAM WATER SUPPLY & SANITATION AUTHORITY (DAWASA)
CHECKED BY				NATURE OF REV	
APPROVED BY	DATE	JANUARY-2022	TITLE	CHECKED BY	TANT
SHEET NO:	DRAWING NO.	FSTP-103-07-2	FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - HYDRO-MECHANICAL SIPHON - FOUNDATION BASE & TOP SLAB REINFORCEMENTS DETAILS	APPROVED BY	DOHWA Engineering CO , LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS

NOTES:

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   - WALLS AND BEAMS 30mm
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BAR BENDING SCHEDULE

member	Mark	Diameter	Total Numbers/Area	Length (mm)	Unit weight (kg/m)	Total weight (kg)	Bar bending shape
Base	01	Y12	110	3100	0 888	303	
	02	Y12	15	4900	0.888	63	
	03	Y12	15	5300	0.888	71	
	04	Y12	15	2000	0.888	27	
	05	Y12	15	3350	0.888	45	
	06	Y12	15	6160	0.888	82	
	07	Y12	15	4280	0.888	57	
Walls	08	Y10	336	2700	0.616	560	
	09	Y10	54	2000	0.616	67	
	10	Y10	40	10000	0.616	247	
Top Slab	11	Y10	70	2000	0.616	87	
	12	Y10	20	2160	0.616	28	
	13	Y10	20	4200	0.616	52	
	14	Y10	20	1200	0.616	16	
					Total	1,705	

DESIGN BY
DRAWN BY
CHECKED BY
APPROVED BY
SHEET NO:

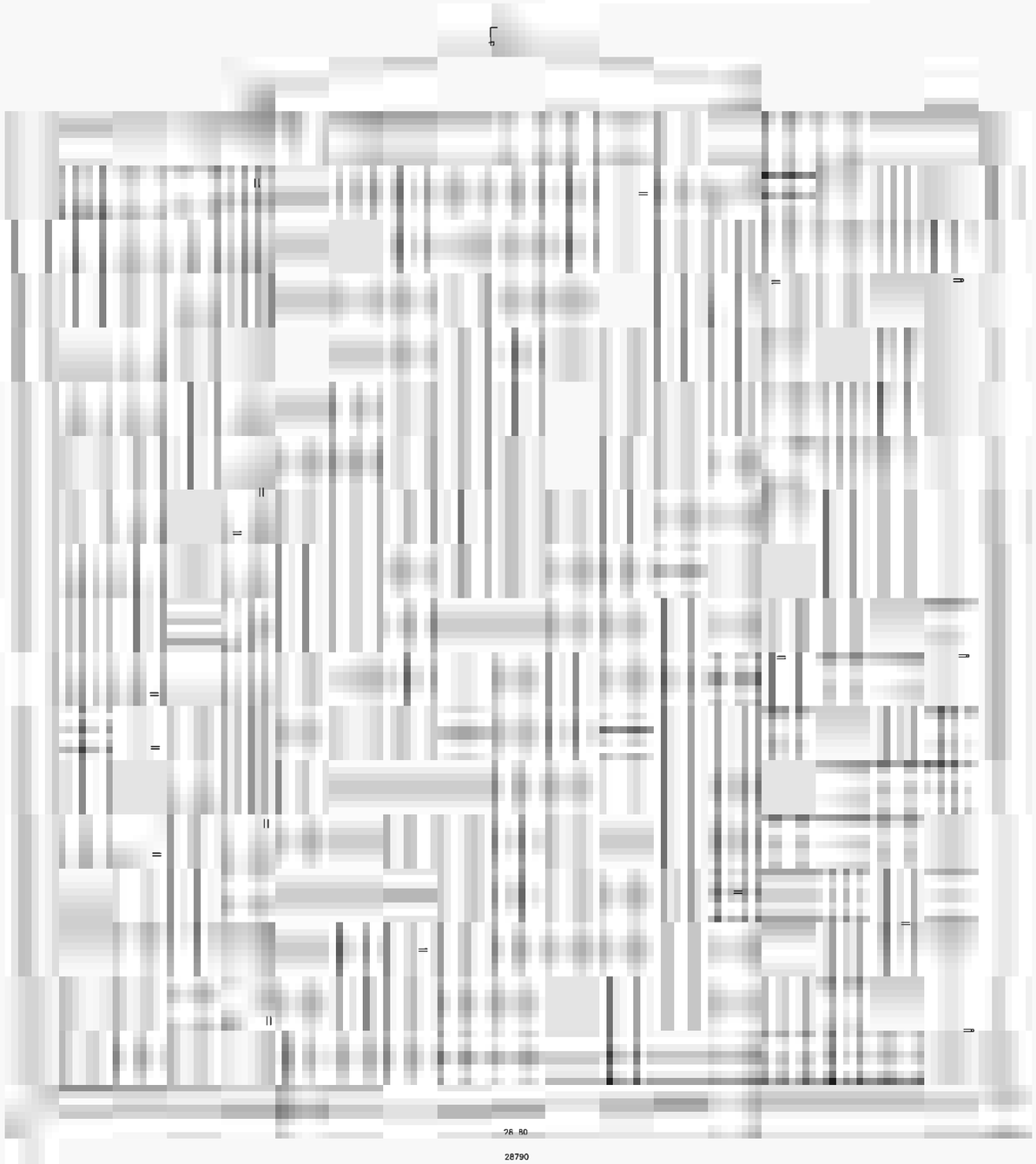
SCALE AS SHOWN
DATE JANUARY-2022
DRAWING NO. FSTP-103-07-3

PROJECT
CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM

FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - HYDRO-MECHANICAL SIPHON - BAR BENDING SCHEDULE

REVISION
DATE
NATURE OF REV.
CHECKED BY
APPROVED BY

DAR ES SALAAM WATER SUPPLY & SANITATION AUTHORITY (DAWASA)
CONSULTANT
DOHWA Engineering CO., LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS



PLAN VIEW
SCALE 1:75

01

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN
2. DO NOT SCALE FROM THIS DRAWING
3. THE SCALES GIVEN ON THIS DRAWING REFER TO THE A1 SIZE ORIGINAL DRAWING
4. THE SUBGRADE SHALL BE COMPACTED TO 99% MAXIMUM DRY DENSITY BEFORE THE PLACEMENT OF HARDCORE
5. CONCRETE SHALL BE CLASS C30/37 FOR STRUCTURAL MEMBERS AND CLASS C8/10 FOR BLINDING
6. THE MAXIMUM SIZE OF AGGREGATE SHALL BE 20mm UNLESS OTHERWISE SHOWN
7. REINFORCEMENT SHALL BE HIGH TENSILE DEFORMED TYPE WITH A CHARACTERISTIC YIELD STRESS OF AT LEAST 429N/mm²
8. COVER TO REINFORCEMENT SHALL BE:
   - FOUNDATIONS 50mm
   - SLABS 25mm
   - WALLS AND BEAMS 30mm
9. LAPS TO ALL REINFORCEMENT SHALL BE 50 * BAR DIAMETER UNLESS OTHERWISE SHOWN

DESIGN BY
DRAWN BY
CHECKED BY
APPROVED BY
SHEET NO:

SCALE AS SHOWN
DATE JANUARY-2022
DRAWING NO. FSTP-103-08-1

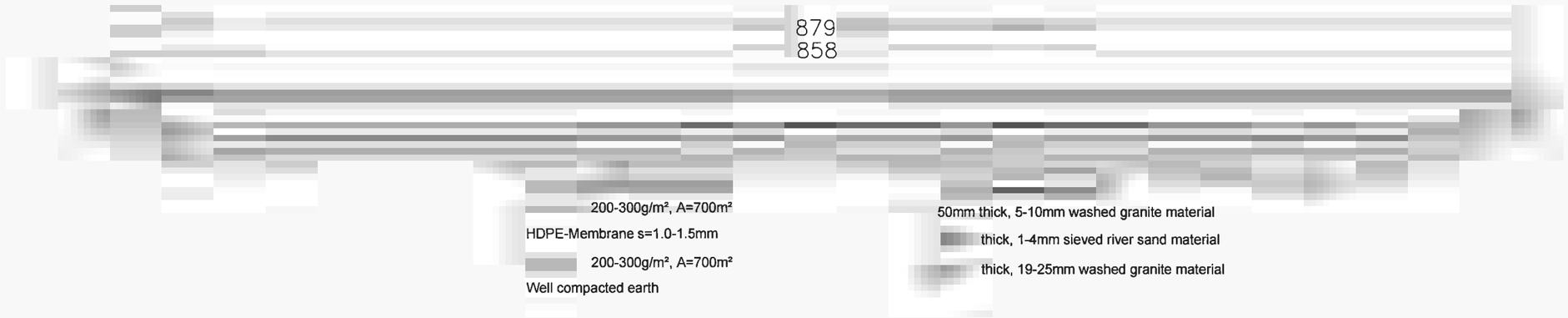
PROJECT
CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM

TITLE
FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - VERTICAL FLOW CONSTRUCTED WETLAND - PLAN GENERAL ARRANGEMENTS DETAILS

REVISION
DATE
NATURE OF REV.
CHECKED BY
APPROVED BY

DAR ES SALAAM WATER SUPPLY & SANITATION AUTHORITY (DAWASA)
CONSULTANT
DOHWA Engineering CO., LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS

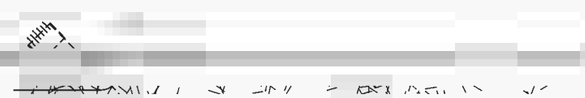
DETAI 1



SECTION 01 - 01
SCALE 1:50

450mm Height x 200mm thick wall to hold membrane and

1:1



HDPE and Geotextile Membranes extend at least 1.2m below perimeter wall

850

Dam lining materials specifications
200-300g/m², A=700m²
HDPE-Membrane s=1.0-1.5mm
200-300g/m², A=700m²
Well compacted earth

Filter materials specifications
50mm thick, 5-10mm washed granite material
thick, 1-4mm sieved river sand material
thick, 19-25mm washed granite al

DETAIL 1 Scale 1:25

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN
2. DO NOT SCALE FROM THIS DRAWING
3. THE SCALES GIVEN ON THIS DRAWING REFER TO THE A1 SIZE ORIGINAL DRAWING
4. THE SUBGRADE SHALL BE COMPACTED TO 99% MAXIMUM DRY DENSITY BEFORE THE PLACEMENT OF HARDCORE
5. CONCRETE SHALL BE CLASS C30/37 FOR STRUCTURAL MEMBERS AND CLASS C8/10 FOR BLINDING
6. THE MAXIMUM SIZE OF AGGREGATE SHALL BE 20mm UNLESS OTHERWISE SHOWN
7. REINFORCEMENT SHALL BE HIGH TENSILE DEFORMED TYPE WITH A CHARACTERISTIC YIELD STRESS OF AT LEAST 429N/mm²
8. COVER TO REINFORCEMENT SHALL BE:
   - FOUNDATIONS 50mm
   - SLABS 25mm
   - WALLS AND BEAMS 30mm
9. LAPS TO ALL REINFORCEMENT SHALL BE 50 * BAR DIAMETER UNLESS OTHERWISE SHOWN

DESIGN BY		
DRAWN BY	SCALE	AS SHOWN
CHECKED BY		
APPROVED BY	DATE	JANUARY-2022
SHEET NO:	DRAWING NO.	FSTP-103-08-2

PROJECT
CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM

FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - VERTICAL FLOW CONSTRUCTED WETLAND - SECTION DETAILS

REVISION	
DATE	
NATURE OF REV.	
CHECKED BY	
APPROVED BY	

DAR ES SALAAM WATER SUPPLY & SANITATION AUTHORITY (DAWASA)
CONSULTANT
DOHWA Engineering CO., LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN
2. DO NOT SCALE FROM THIS DRAWING
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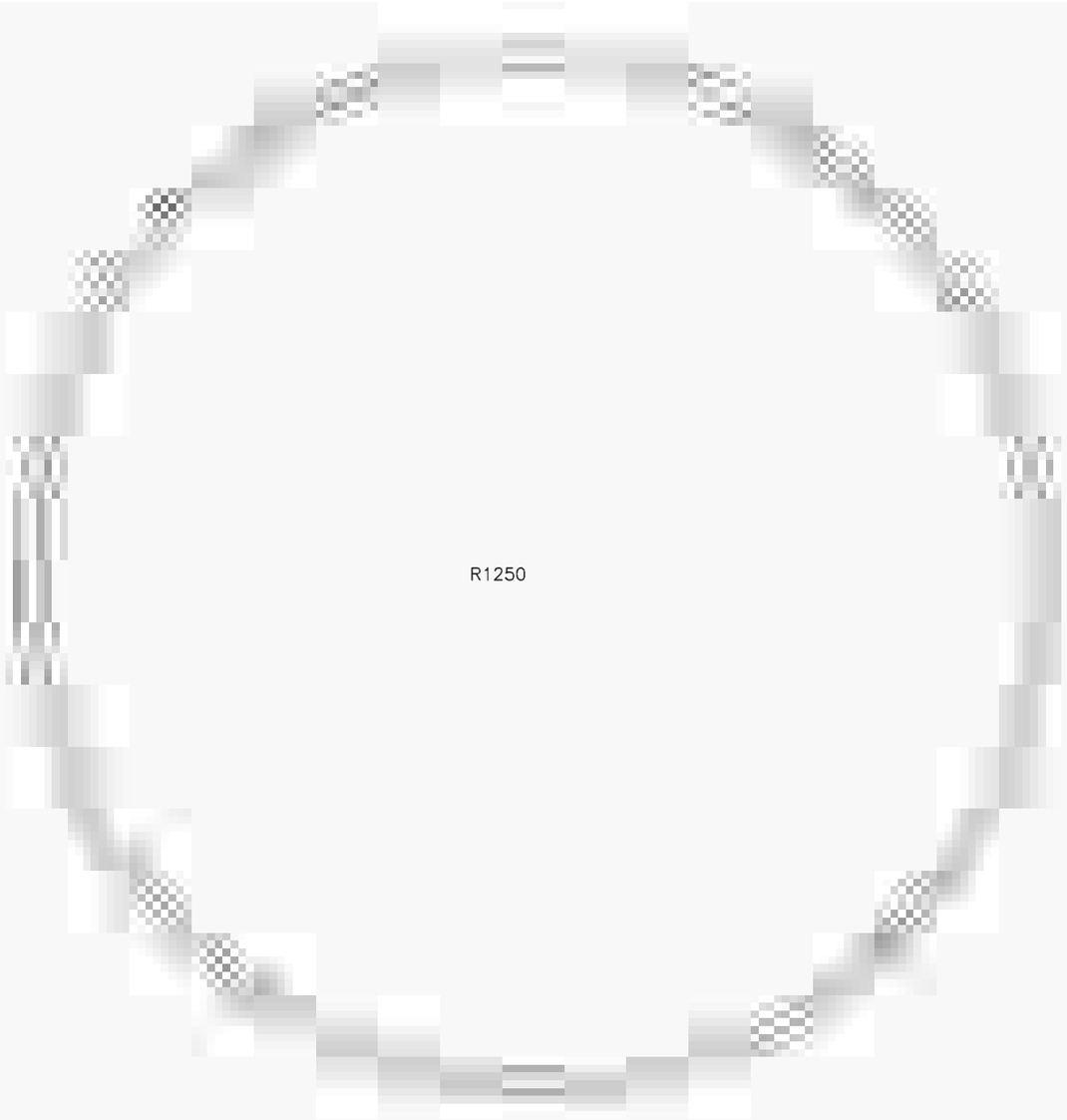
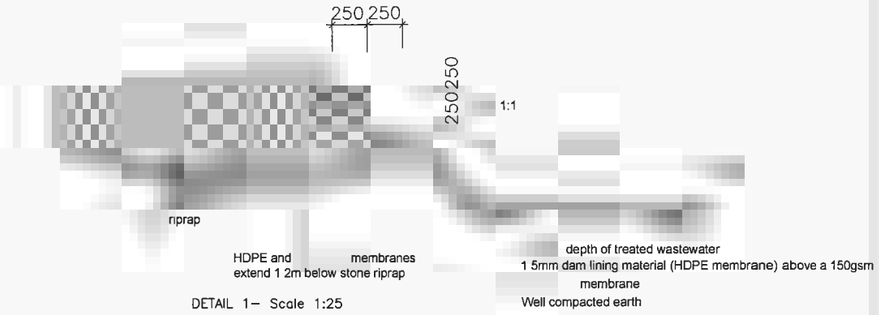


PLAN VIEW
SCALE 1:50

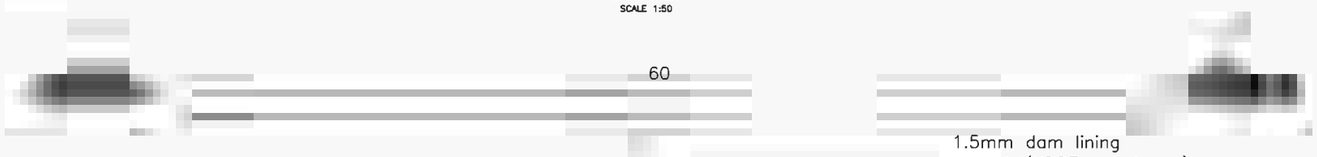


DETAIL 1– Scale 1:25

250x300mm steps depending pond depth in relation to VF–constructed wetland outlet

Stone riprap for water seepage

D 1



SECTION H-H
SCALE 1:50

1.5mm dam lining material(HDPE membrane) a 150gsm geotextile membrane, above a well compacted earth

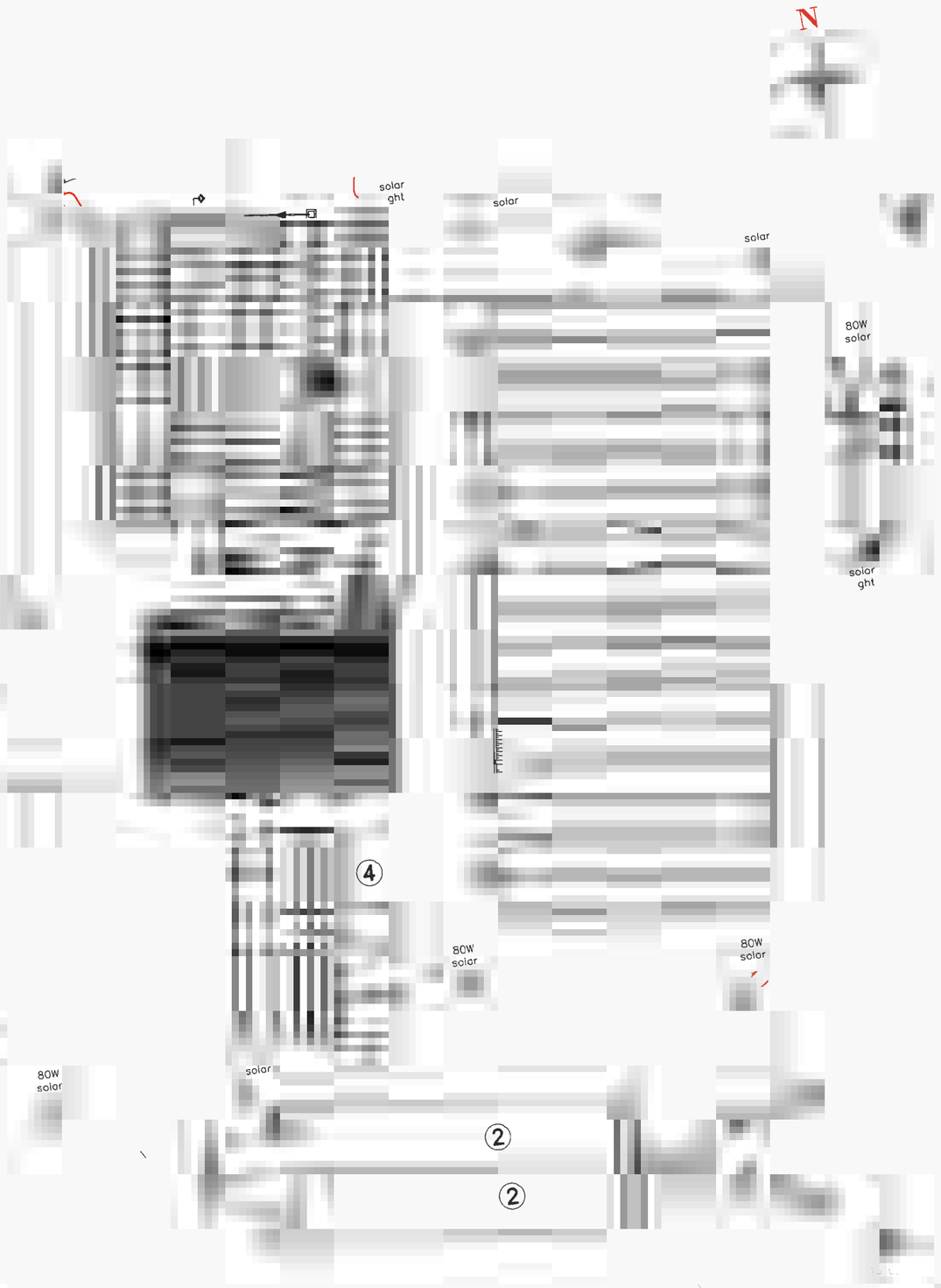
DESIGN BY		
DRAWN BY	SCALE	AS SHOWN
CHECKED BY		
APPROVED BY	DATE	JANUARY-2022
SHEET NO:	DRAWING NO.	FSTP-103-09

PROJECT
CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM

TITLE
FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120m³) GEZAULOLE FSTP - VERTICAL FLOW CONSTRUCTED WETLAND - PLAN GENERAL ARRANGEMENTS DETAILS

REVISION	
DATE	
NATURE OF REV.	
CHECKED BY	
APPROVED BY	

CONSULTANT
DOHWA Engineering CO., LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS



POLISHING POND LOCATION
(480sq m)

10

10

DESIGN BY			PROJECT
DRAWN BY	SCALE	1:250	CONSTRUCTION OF FAECAL SLUDGE TREATMENT PLANTS (FSTP) WORKS IN DAR ES SALAAM
CHECKED BY			
APPROVED BY	DATE	FEBRUARY-2022	TITLE FECAL SLUDGE TREATMENT PLANT - MEDIUM SIZE (120M³)
SHEET NO:	DRAWING NO	FSTP-103 - 10	SITE PLAN FOR SUMANGILA-KIZANI - LIGHTING AND POWER LAYOUT

REVISION	
DATE	**DAR ES SALAAM WATER SUPPLY & SANITATION AUTHORITY (DAWASA)**
NATURE OF REV	CONSULTANT
CHECKED BY	DOHWA Engineering CO., LTD IN ASSOCIATION WITH LUPTAN CONSULTS LTD AND WWS
APPROVED BY	

COARSE AGGREGATE:

Coarse aggregate shall be clean, well-graded crushed granite stone or other equal and approved stone **from Msolwa or Lugoba quarry** and washed if required by the Structural Engineer. The pieces shall be angular or rounded in shape and shall have granular or crystalline or smooth (but not glassy) non-powdery surface. Flakey and laminated pieces, mica and shale shall only be present in such quantities as not to affect adversely the strength and durability of the concrete.

The four nominal aggregate sizes shall be 40mm (1½"); 20mm (3/4"); 10mm (3/8"); 6mm (¼"); and the grading when analysed as described in BS. 812 shall be within the limits given in BS. 882. Structural Engineer will specify sizes of aggregates to be used in specific areas. For most work 20 mm maximum size aggregates will be used. The nominal maximum size of coarse aggregates should be not greater than ¼ of the minimum thickness of concrete section or element.

Results:

1. **Relative and water absorption for aggregates**
    a. Relative density on an oven dry basis – 2.95
    b. Relative density on saturated surface dry basis – 2.97
    c. Apparent relative density – 2.99
    d. Water absorption – 0.4

    (As per CML TEST 2.2, Ref BS 812: Part 2: 1975 which is in the specified limit)

2. **Aggregate Impact Value (AIV)**

    a. AIV (mean value) - 14

    (As per CML TEST 2.8, ref BS 812: Part 112:1990 which is in the specified limit)

3. **Aggregate Crushing Value (ACV)**

    a. ACV (Mean value) - 23

    (As per CML TEST 2.8, ref BS 812: Part 112:1990 which is in the specified limit)

DAR ES SALAAM INST TUTE OF TECHNOLOGY

DEPARTMENT OF CIVIL ENGINEERING

GEOTECHNICAL & HIGHWAY MATERIALS TESTING LABORATORY

RELATIVE DENSITY AND WATER ABSORPTION FOR AGGREGATES

HELPDESK ENGINEERING CO.LTD

SECOND WATER SECTOR SUPPORT PROJECT CONSTRUCTION OF PUBLIC TOILET IN DAR ES SALAAM

SOURCE OF MATERIAL:LUGOBA

METHOD CML TEST ref. BS 812: Part 2: 1975

			A	B	Mean
of saturated surface-d in air	A		382.60	446.90	
ass of vessel + filled with water	B		938.50	981.40	
of vessel filled with water	C		703.70	668.20	
Mass of oven-dry in air	D		381.30	444.70	
density on an oven-dry basis	$\frac{D}{A-(B-C)}$	t/m^3	2.58	3.33	2.95
density on saturated surface-dry basis	$\rho_s = \frac{A}{A-(B-C)}$	t/m^3	2.59	3.34	2.97
relative density	$\frac{D}{D}$	t/m^3	2.60	3.38	2.99
absorption	$\frac{A-D}{D}$	%	0.34	0.49	0.4

Sample Brought By

Tested by JAMES

Certfied by:

ENGINEERS REGISTRATION BOARD
TANZANIA
DAR-E ALAAM INSTITUTE OF TECHNOLOGY
P.O.Box 2958 D -ES-SALAAM
Material No 1.
DATE 6 022

DAR ES SALAAM INSTITUTE OF TECHNOLOGY

DEPARTMENT OF CIVIL ENGINEERING

GEOTECHNICAL & HIGHWAY MATERIALS TESTING LABORATORY

RD CORE

AGGREGATE IMPACT VALUE (AIV)

HELPDESK ENGINEERING CO.LTD

PROJECT: SECOND WATER SECTOR SUPPORT PROJECT CONSTRUCTION OF PUBLIC TOILET IN DAR ES SALAAM

METHOD CML TEST 2.8, ref. BS 812: Part 112: 1990

CONDITION DRY

- 10 mm 2.36 mm SOURCE OF MATERIAL:LUGOBA

METHOD CML TEST ref. BS 812: Part 2: 1975

			1	2
reference				
umber of blows 15 blows)		n	15	15
Mass of tray +	(g)		581.8	526.7
of alone	(g)		0	0
of original test specimen	(g)	M_1	581.8	526.7
of tray + material passing separating sieve (g)			78.2	78.5
of tray alone (g)			0	0
Mass of material passing separating sieve (g)		M_2	78.2	78.5
of tray + material retained on separating sieve(g)			502.4	447.6
Mass of tray alone			0	0
of material retained on separating sieve (g)		M_3	502.4	447.6
of passing and retained on separating sieve			580.6	526.1
Check versus M_1		M_2+M_3		
Imapct Value (in %) - DRY		$(M_2/M_1)100$	13.4	14.9
Imapct Value (in %) - SOAKED				
= Mean value			14	
= Median value			14	

Sample Brought By

Tested by: JAMES

Certfied by: Z.CHACHA

TRATOR BOARD

DAR-ES-SALAAM INSTITUTE OF TECHNOLOGY

P.O. Box AR ES SALAAM

DAR ES SALAAM INSTITUTE OF TECHNOLOGY

DEPARTMENT OF CIVIL ENGINEERING

GEOTECHNICAL & HIGHWAY MATERIALS TESTING LABORATORY

AGG ACV)

HELPDESK ENGINEERING CO.LTD

R: 18.05.2022

SECOND WATER SECTOR SUPPORT PROJECT CONSTRUCTION OF TOILET IN DAR ES SALAAM

METHOD CML TEST 2.8, ref. BS 812: Part 112: 1990

CONDITION DRY

Fraction tested Sepa sieve SOURCE OF MATERIAL: LUGOBA

14 - 10 mm 2.36 mm

METHOD CML TEST 2.2, ref. BS 812: Part 2: 1975

		1	2
n reference		ACV	
LOADING LIMITS			
Mass of +		2574.5	2575.1
of alone		0	0
Mass of original test specimen (g)	M_1	2574.5	2575.1
Mass of tray + material passing separating sieve (g)		584.9	585.1
of tray alone (g)		0	0
Mass of material passing separating sieve (g)	M_2	584.9	585.1
of tray + material retained on separating sieve(g)		1988.3	1989.1
Mass of alone		0	0
ass of material retained on separating sieve (g)	M_3	1988.3	1989.1
Mass of passing and retained on separating sieve	$M_2 + M_3$	2573.2	2574.2
Check versus M			
Crushing Value (in %) - DRY	$(M_2/M_1)100$	22.7	22.7
Crushing Value (in %) - SOAKED			
= Mean value			23
= Median value			23

Sample Brought By

Tested by: C JAMES

Certfied by: C ULIUS Z.CHACHA

RD

R

T

OF

S -

No 006

0

12

FINE AGGREGATES: -

The Contractor shall ensure that the grading of fine aggregate shall be such that not more than 10% by weight shall exceed 5mm in size and not more that 10% by weight shall pass a sieve BS. No. 100. Between these limits the grading shall conform to the grading for either zone 1, 2 or 3 (BS.882).

Results:

1. **Grading Fine aggregates:**

    a. Grading Limits - 2.3

    (As per Specific Limit 2.0 – 3.5, Hence it is passed)

Dar es Salaam Institute of Technology.
& Building Engineering
Department.Materials Testing Laboratory.

FORM NO. AGG-SAND-0001

WATER SECTOR SUPPORT PROJECT
OF PUBLIC TOILET IN DAR ES SALAAM

SOURCE:KISARAWE

FOR N/SAND

BY MMUYA

OF 10.05.2022 19.05.2022

no. of Sample 320 320

Sieve sizes (mm)	Retained	Retained %	Passing %	Retained	Retained %	Passing %	Grading %
20.0							
14.0							
10.0	0	0 0		0.0	0 0	100.0	100
5	0	0.1	99.9	0 8	0.3	99.7	100
2.36	4	1.3	98.7	4.0	1.3	98.7	99
1.18	28	8.7	91.3	28.0		91.2	91
0.600	116			121.5	38.0	62.0	63
0.300	272	85 0	15.0	285.0	89.2	10.8	13
0.150	314	98.2	1.8	317.0	99.2	0.8	1
0.075	319	99 7	0.3	319 1	99 9	0 1	0

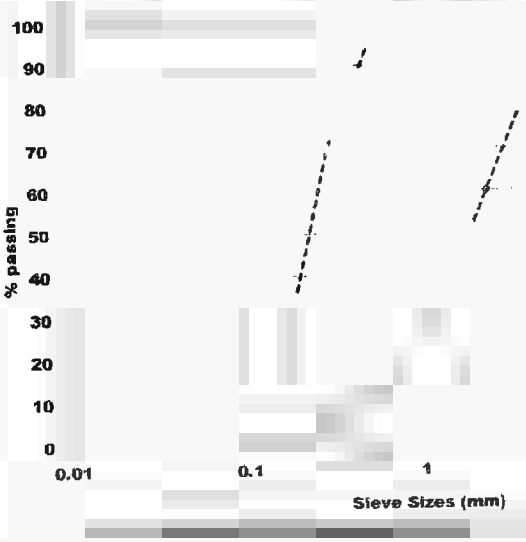
ODULUS 2.3

sizes (mm)	wt (g)	Retain (g)	Pass (g)
A 28 - 20			
B 20 - 14			
C 14 - 10			
D 10 6 3			

100

SPEC LIMIT

sizes	wt.	Retain (g)	Pass
B 20 - 14			
D 10 - 6 3			
=		x 100	
Total wt			



Sieve sizes (mm) % Passing

Sieve sizes (mm)	% Passing	
10.0	100	100
	18	15
	0	1
	2.3	

SPEC LIMIT 2 0-3 5

6 2