Environmental and Social Impact Assessment for the Construction/ Rehabilitation of the National TB Reference Laboratory and Five Satellite Laboratories in Uganda

Project area: Butabika Hospital

(Reference No.: MOH-EAPHLNP/SRVCS/2010-11/00006)

Prepared for:

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Acronyms, units and definitions

Acronyms

CHD:	Community Health Department
ESIA:	Environmental and Social Impact Assessment
ESMP:	Environmental and Social Management Plan
GH:	General Hospital(s)
GIS:	Geographical Information Systems
GOU:	Government of Uganda
HC:	Health Centre (e.g. HC IV, HC III, HC II)
HCF:	Healthcare Facility/ Facilities
HCW:	Healthcare Waste
HSD	Health Sub-District
HSSPII:	Health Services Support Project II
LC:	Local Council
MOH:	Ministry of Health
NEMA:	National Environment Management Authority
NHS:	National Health System
OPD:	Out Patient Department
PCDP:	Public Consultation and Disclosure Plan
PFP:	Private for Profit
PHC:	Primary Health Care
PHP:	Private Health Provider
PID:	Photo-Ionization Detector
PMTCT:	Prevention of Mother to Child Transmission
PNFP:	Private Not for Profit
RRH:	Regional Referral Hospital(s)
TASO:	The Aids Support Organisation
TB:	Tuberculosis
TCMP:	Traditional and Complimentary Medicine Practitioner
TOR:	Terms of Reference
UBOS:	Uganda Bureau of Statistics
UNFPA:	United Nations Fund for Population Activities
UNMHCP:	Uganda National Minimum Healthcare Package
VCT:	Volume Computed Tomography
VHT:	Village Health Team
WB:	World Bank
WHO:	World Health Organization

Units of measures

Ha:	hectare
km:	kilometre
m:	metre

Definitions:

Dioxins or Polychlorinated dibenzodioxins (PCDDs):	These are a group of polyhalogenated compounds which are known to be potent human carcinogens (cancer-causing chemical compounds). Dioxins can occur as by-products of incineration of chlorine-containing substances such as chlorine-containing plastics.
Incineration:	This is a waste treatment technology that involves combustion of organic materials and/or substances converting them into incinerator bottom ash, flue gases, and particulates. Flue gases may contain significant amounts of particulate matter, heavy metals, dioxins, furans, sulphur dioxide and hydrochloric acid. Flue gases should therefore be cleaned before they are dispersed in the atmosphere.
Infectious waste:	This is the portion of medical waste that can transmit disease. On average about 10-15 percent of medical waste is actually infectious waste. Infectious waste comprises five categories: cultures and stocks, human pathological waste, human blood and blood products and sharps.
Hazardous waste:	Shares the properties of a hazardous material (for example, ignitability, corrosivity, reactivity or toxicity), or other physical, chemical, or biological characteristics that may pose a potential risk to human health or the environment if improperly managed.
Hospital waste:	All solid waste, both biological and non-biological, that is produced at a hospital and is discarded without further use.
Medical waste:	Materials generated as a result of patient diagnosis and/or treatment or the immunization of human beings.
Solid (non-hazardous) wastes:	Generally include any garbage, refuse. Examples of such waste include domestic trash and garbage; inert construction / demolition materials; refuse, such as metal scrap and empty containers (except those previously used to contain hazardous materials which should, in principle, be managed as a hazardous waste).

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Executive Summary

01 INTRODUCTION

The Government of the Republic of Uganda, with funding from the International Development Association (IDA), plans to construct/ rehabilitate and equip the National TB Reference Laboratory. This is IDA funding towards the cost of the East African Public Health Laboratories Networking Project. The general objective of the project is to improve access to diagnostic services among vulnerable populations living in the cross-border areas of Kenya, Tanzania, Uganda and Rwanda. The laboratory networking project also aims to address the common challenges facing the four countries, that is, dilapidated infrastructure that was built decades ago; inadequate supply and quality of human resources which are a backbone of quality diagnostics; and manual information systems which are not effective for decision making.

With regard to laboratory services, the Central Public Health Laboratories has the responsibility of coordinating health laboratory services in Uganda, developing policies and guidelines and training and implementing quality assurance schemes for laboratories. A comprehensive national health laboratory services policy was developed and this provides a framework for the future development of laboratory services in the country. The provision of good laboratory services laboratory support for disease surveillance is affected by low levels of funding for laboratory services, a weak regulatory framework and the limited number of laboratory professionals in the country.

02 PROJECT DESCRIPTION

a) Project proponent

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b) Location of project site

The National T.B Reference Laboratory will be located in Butabika a suburb of Kampala city, in Nakawa - Division, Butabika – Parish, Butabika Hospital – LC1 Village. Butabika National Referral Hospital is located in Butabika a neighbourhood within Kampala, Uganda's capital and largest city. It lies in the south-eastern part of the city, in Nakawa Division, adjacent to the northern shores of Lake Victoria. This location is approximately 12 km by road, east of Kampala's central business district. The coordinates of Butabika Hospital are: 36N 462041; 034772.

Box 0.1: Site location according to administrative jurisdiction

Plot 2, Block 237-2383,
GPS coordinates: 36N 462041; 034772
Location according to areas of administrative jurisdiction:

- Butabika Hospital – LC1 Village,
- Butabika – Parish,
- Nakawa – Division,
- Kampala District.

c) Project objectives

The general objective of the project is to improve access to diagnostic services among vulnerable populations living in the cross-border areas of the Republic of Southern Sudan, Democratic Republic of Congo and Uganda. The laboratory networking project also aims to address the common challenges facing the East African countries, that is, dilapidated infrastructure that was built decades ago; inadequate supply and quality of human resources which are a backbone of quality diagnostics; and manual information systems which are not effective for decision making.

d) Project components

The following key works will be undertaken in proposed project on a site of approximately three (3) acres and National T.B Referral Laboratory will comprise of four (4) levels including the Attic level:

- Fencing, ground preparation, drainage, roads,
- Underground rain water tank,
- Generators house and fuel tank,
- Incinerators
- Lagoons and Man holes
- Library, training rooms and laboratories
- Catering facilities; Kitchen, Canteens and outdoor catering
- Animal houses
- Amplification areas.
- Grass gardens.
- Offices

e) Project alternatives

i) 'No Project' Scenario

The existing site is undeveloped covered by gardens and grass. Without the proposed development, the government of Uganda would not have the ability to improve physical functionality of existing national TB laboratories and improve access to diagnostic services among vulnerable populations living in the cross-border areas of Kenya, Tanzania, Uganda and Rwanda.

ii) Alternatives considered

The following alternative options were investigated as part of the project:

- Sources for construction raw materials,
- Solid waste and wastewater management system,
- Sources of energy.

Detailed project alternatives were considered including engineering design options, materials selection and safety considerations. Alternatives were selected based on criteria below:

- Maximisation of development benefits;
- Minimisation of socio-environmental costs;
- Cost effectiveness; and,
- Ease of maintenance.

03 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

The ESIA was conducted under the following policy, legal and institutional framework

a) Policy framework:

- The National Environment Management Policy, 1994
- The National Medical Equipment Policy, 2009
- The National Health Policy, 1999
- National Policy on Injection Safety and Health Care Waste Management, 2004
- National Land Policy, 2011 (Draft)

b) Legal framework

- Constitution of the Republic of Uganda, 1995
- National Environment Act, Cap 153
- Local Governments Act, Cap 243
- Land Act, Cap 227
- KCCA Act 2010
- Public Health Act, Cap 281
- National Environment (Wetlands, River Banks, and Lakeshores management) Regulations, 2000
- National Environment (Standards for Discharge of Effluent into Water or on Land) Regulations, 1999
- National Environment (Noise Standards and Control) Regulations, 2003
- National Environment (Waste Management) Regulations, 1999
- Draft National Air Quality Standards, 2006
- Employment Act, 2006
- Occupational Safety and Health Act (2006)
- Workers' Compensation Act (2000)
- The Physical Planning Act, 2011

c) Institutional framework

- National Environmental Management Authority (NEMA)
- Ministry of Health (MOH)
- Ministry of Gender, Labour and Social Development
- Local Administration Structures

d) World Bank Group guidelines

Under its "General EHS Guidelines (April 30, 2007)", the World Bank has several guidelines, many of which are applicable to various components of the proposed project namely:

i) Air emissions from onsite waste combustion units ("incinerators").
ii) Hazardous waste management.
iii) Noise.
iv) Occupational health and safety (against biological and radiological hazards).
v) Community health and safety including traffic safety such as during project construction or disease prevention (where incinerators emission waft into and affect not only local communities but also patients visiting or admitted in hospital including their attendants and the hospital staff).
vi) Construction and decommissioning.

04 POTENTIAL SOCIO-ENVIRONMENTAL IMPACTS

The report analyses potential project impacts and proposes mitigation (or enhancement) measures and impact management recommendations. These are summarized below.

A. CONSTRUCTION-PHASE IMPACTS

Positive Impacts

i) Income to material/ equipment suppliers and contractors

Development of the project will entail civil works requiring materials such as gravel, bricks, lumber, steel reinforcement and cement. These materials will be procured from local suppliers in Kampala Capital City and Wakiso District. This is a positive but short-term and reversible impact. Considering that construction labour would be local or national but medical equipment procured internationally, this impact has local, national and international spatial extent. This impact could be enhanced by measures proposed below.

Enhancement measure: Earth materials needed for construction, for example, murram, aggregate (stones and sand) are obtained from quarry operations. Conscious or unwitting purchase of these materials from unlicensed operations indirectly supports, encourages and promotes environmental degradation at illegal quarry sites and can cause medium- to long-term negative impacts. It should therefore be a contractual obligation for contractors to procure construction materials from legitimate or licensed sources (as advised by local authorities).

ii) Employment

Construction will avail skilled and unskilled job opportunities. This would be a positive but short-term and reversible impact, lasting only during the construction period.

Enhancement measure: Wherever feasible, local people should be considered for job opportunities commensurate with their level of skills. Adequate occupational health and safety standards should be provided to ensure the work environment is conducive.

Negative Impacts

i) Soil degradation and deprivation of access

Site preparation will involve clearing of vegetation and excavations to obtain a levelled site. This will expose the land stripped of vegetation to agents of erosion such as wind and storm water. During excavation, the soil with extracts of humus shall be removed. Also equipment engaged in activities might cause light contaminations of soil due to leakage of fuels and other liquid form equipment. Inadequate storage of waste generated during construction activities could also potentially contribute to soil contamination.
The site was being used for subsistence farming and during site preparation; there will be loss or deprivation of access to land which is currently used for subsistence farming.

Mitigation strategies:

- The topsoil removed from the site during site preparation will be stored properly (protected from runoff erosion and possible contaminants) for reuse else;
- All waste generated during site preparation and construction will be transported by the contractor or a company that has been specifically contracted to an authorized disposal area. The contractor will seek guidance from Kampala Capital City Authority on the final disposal point;
- Contractor will avoid use of old equipment or even damaged equipment that is most likely to have oil leakages thus contaminate the soils; and
- Contractor will ensure that equipment are properly maintained and fully functional.

ii) Generation of noise

Noise is perceived as one of the most undesirable consequences of construction activity. Relatively high noise levels are expected in the area during construction phase. Considerable levels of noise and vibrations will mainly result from use of heavy equipment including bulldozers, graders and dump trucks during site preparation and construction activities. Though the level of discomfort caused by noise is subjective, the most commonly reported impacts of increased noise levels are interference in oral communication and disturbance in sleep or during resting time, disturbance or discomfort resulting from construction noise cannot be ruled out given that the proposed site is located in the vicinity of other hospital units.

Ambient noise measurements indicated that the environment around the proposed project site is currently experiencing noise close to the limits and sometimes higher. However, construction activities will still contribute to an increase such levels given the nature of trucks used.

Mitigation strategies:

- Contractor will be careful when selecting the working equipment to avoid use of old equipment or damaged equipment with high level of noise emissions that would have a negative impact in the environment.
- Contractor will ensure that equipment is properly maintained and fully functional.
- Contractors should cordon off areas under construction with noise absorbing materials, for example, plywood rather than iron sheets.
- Construction workers should be aware of the sensitive nature of workplaces they are operating in and advised to limit verbal noise or other forms of noise. For example, metallic objects or tools can be passed on to a colleague rather than dropping or throwing them with loud bangs.
- The contractor should ensure that noise levels emanating from machinery, vehicles and noisy construction activities are kept at a minimum for the safety, health and protection of people in the nearby buildings.
- Noise and vibration can also be minimized at the project site and surrounding areas through sensitization of construction truck drivers to switch off vehicle engines while offloading materials.
- All generators and heavy duty equipment should be insulated or placed in enclosures to minimize disrupting ambient noise levels.

iii) Improper management of construction waste

Solid waste and spoil will be generated at the site during site preparation and construction phases. The waste may consist of timber or metal cuttings, excavated materials, paper/cement bags, empty paint and solvent containers, broken glass among others. Some of the waste materials such as paints, cement, adhesives and cleaning solvents contain hazardous substances, while some of the waste materials including metal cuttings and plastic containers are not biodegradable and can have long-term and cumulative effects on the environment. Other wastes which will be generated by non-construction activities because of the presence of the workers at the site include food debris, contaminated water from washing, cleaning equipment, construction tools and vehicles.

Inappropriate disposal of construction waste or spoil could have medium or long-term environmental and public health impact. Improper managing of these wastes could result in:

- Littering and health and safety risks associated with uncontrolled public access to disposal sites;
- Impairment of local air quality and increased health risks due to open burning of wastes; and
- Contamination of soil, surface water and impact on public health when hazardous waste is disposed of improperly.

Mitigation strategies:

- The wastes will be properly segregated and separated to encourage recycling of some useful waste materials, that is, some excavated stone materials can be used as backfills.
- Hazardous waste should not be mixed with other solid waste generated and should be managed by way of incineration or land-filling.
- Waste collection will be made at least once in 24 hours and it should be done in such a way to minimize nuisance of smell and dust during collection.
- The contractor and hospital administration should work hand in hand with the Municipal Council to facilitate sound waste handling and disposal from the site. All wastes must be taken to the approved dumpsites.
- Hazardous wastes such as paints, cement, adhesives should be managed through a third party contractor certified by NEMA. The contractor and hospital administration should work hand in hand to facilitate sound waste handling and disposal from the site.
- Solid waste, where practicable and taking into account health and hygiene issues, will be segregated and collected on-site and stored in suitable containers for removal to approved facilities as agreed with the relevant local authority.
- Washing will be restricted to a paved area to control run off.

iv) Contamination of water resources

Removal of vegetation whose root systems bind the soil may increase the rate of erosion by water or wind in the area. During heavy rainfall, the loss of the moisture retaining function of the vegetation may lead to increased surface run-off, carrying with it eroded soil particles. During construction, there may be need to stockpile assorted materials on site. There is a potential pollution risk if construction materials are not stored or handled responsibly such as to lead to stockpiles wash away. The fuels (mainly diesel) and lubricating oils required by the construction equipment have the potential to contaminate nearby water resources if they leak or are spilled during handling or use. Transportation of pollutants with runoff would affect the water quality hence the communities/ livestock depending on it for water supply. General wastes may have the same effect if not handled properly.

Mitigation strategies:

The contractor should have a contractual obligation to develop and implement a Construction Management Plan (CMP) to include the following:

- Equipment, materials and chemicals must not be stored within or near watercourses;
- Construct a proper drainage system around site and to the final storm water detention or disposal point to stop direct run off into the lake and nearby stabilization ponds;
- All construction equipment will be kept in good operating condition to avoid oil or fuel leakages that might contaminate water resources;
- Materials like sand and aggregates will be kept in bunded areas to avoid being washed away into water resources by runoff; and
- MOH will ensure the contractor complies with its environmental management policies, EIA recommendations and national regulations.

v) Traffic and fugitive emissions

During the construction phase there will be an increase in road traffic associated with material and equipment haulage. This may increase stress on existing infrastructure. Construction traffic typically consists of large, heavy vehicles, which will increase the levels of dust, noise and damage to existing roads. This is a direct, negative but reversible construction phase impact. Ambient air quality measurements indicate that the environment around

the proposed project site is currently devoid of sources of high noise and air pollution. Given the low air pollution levels in the area, construction activities will therefore temporarily increase such levels.

Mitigation strategies:

- The construction activities will be carried out during the day.
- Flagmen/traffic guides will be provided to control travel speeds of construction vehicles along the road especially at trading/ business centres;
- Trucks will be covered during haulage of construction materials to reduce on spillage of materials.
- Wherever dust suppression is necessary, water will be sprayed over dusty areas;
- Keep all construction equipment in good operating condition to reduce exhaust emissions;
- All dust will be quickly swept away to avoid migration to other non-construction areas;
- Ensure that all equipment leaving the site, clean up their tires in case they are dirty;
- Construction work will be undertaken by an experienced and duly registered contractor with a verifiable sense of environmental awareness and responsibility.
- Workers will be provided with PPE and the use of PPE shall be enforced.
- The project area will be cordoned off to minimise on dust and emission migration to nearby facilities by wind.
- All construction equipment and trucks will be kept in good operating condition by regular servicing to reduce noise and exhaust emissions.
- As part of the bidding processes, contractors will be required to provide their environment management plans that meet mitigation actions proposed in this ESIA.

vi) Occupational health safety (OHS) Risks for Contractors

Construction traffic and machinery may pose accident risk to workers either when operated by inexperienced workers or when in a poor mechanical condition. Inadequate OHS could also result from insufficient medical capability at the construction site; or neglect of safety equipment, precautions and procedures. Accidents could cause considerable ecological damage, financial loss and harm to human life. While largely reversible, some impacts such as loss of human life are irreversible.

Mitigation strategies:

- Orient all construction workers on safe work practices and guidelines and ensure that they adhere to them.
- Training should be conducted on how to prevent and manage incidences. This should include proper handling of electricity and water and sensitization on various modes of escape, conduct and responsibility during such incidences. All must fully be aware and mentally prepared for potential emergency.
- Regular drills should constantly follow on various possible incidences. This will test the response of the involved stakeholders. Such drills will keep them alert and they will become more responsive in case of incidences.
- Use signage to warn staff and/ or visitors that are not involved in construction activities of dangerous places.
- Strict instructions should be given for drivers of heavy equipment.
- Supervision of works should be done regularly to ensure that safety conditions are met while any deviation from safety regulations is immediately reclaimed following the best practices regarding safety at work equipment.
- Communication line must be ensured in between workers and drivers of heavy equipment.
- Develop evacuation procedures to handle emergency situations.
- Provide adequate OHS personnel protective gear for the employees.

vii) Risk of accidents

The proposed site is located along Butabika road off Port Bell road and improper turning off from or joining to the road by vehicles and machinery such as graders, wheel loaders and dumpers may result into accidents with other motorists. In addition, there will be trucks transporting construction materials to the site. This traffic movement may result in community risk of traffic-related accidents especially when the safe speed limits are not adhered to.

Construction traffic accidents would be a significant social impact and likely to affect children, women, disabled, elderly people and livestock. The area has a significant number of school going children and other commercial activities. The hospital is also located in the business district of the municipality with a lot of human activity on the adjoining road at the access gate to the hospital. The duration of the risk will be short-term occurring only during the construction phase. Although some effects of the accidents (e.g. minor injuries) may be reversible, loss of human life is irreversible.

Other risks of accidents may arise from hoardings or scaffolding. A hoarding or scaffolding is a temporary structure built around demolition or excavation and building work to secure the site and protect the public, property and infrastructure from damage. The primary objective in the design, installation and maintenance of hoardings and scaffolding on or above hospital site (including footways and carriageways) is to ensure that:

a) These temporary structures have the least adverse impact on pedestrian movement and amenity; and
b) Safe vehicular access is provided, whilst at the same time allowing applicants to meet their statutory responsibilities under the Health and Safety legislation to protect the public place adjoining a work site.

Hoardings and Scaffoldings have adverse impacts on human health and environment in case accidents occur at the site.

Mitigation strategies:

- Adopt best transport safety practices with the goal of preventing traffic accidents and minimizing injuries suffered by project personnel and the public, as follows:

    - Emphasizing safety aspects among project drivers. Specifically ensure drivers respect speed limits through trading centres and areas with public institutions;
    - Adopting limits for trip duration and arranging driver rosters to avoid overtiredness;
    - Position flagmen/traffic guides at road junction to the hospital to control driver speeds;
    - Employ safe traffic control measures, including road signs and flagmen/traffic guides to warn of dangerous conditions and children crossings.

- Ensure contractors regularly maintain vehicles to minimize potentially serious accidents such as those caused by brake failure commonly associated with loaded construction trucks.
- The site, where possible, should be fenced and signalization put in place with security personnel to stop unauthorised people from accessing the site.
- For falling debris, and hoarding/scaffoldings; clear warning signs should be placed around the construction premise, install interceptors and net traps to divert falling parts, and emphasize (provide) personnel protective gears to workers.
- Place clear warning signs around the construction premise (Scaffolds) that indicate falling debris
- Personnel protective gears should be provided to workers on site.
- Follow a guided procedure for installing hoarding and Scaffoldings, including application for a license or permit to erect hoarding structures.

B. OPERATION PHASE IMPACTS

Positive Impacts

i) Improved medical surveillance services

The project will positively impact health of Ugandans and the East African region through easing access to diagnostic services for TB and other communicable diseases. It will help to enhance access to diagnostic services for vulnerable groups; improve capacity to provide specialized diagnostic services and conduct drug resistance monitoring; and strengthen laboratory based disease surveillance to provide early warning of public health events.

Enhancement measures: Appropriate staffing with technical/ medical personnel adequately trained in use of newly installed equipment.

ii) Employment opportunities

Operation of the laboratory will create additional long-term technical and non-technical job opportunities for medical professionals as well as janitors.

Enhancement measure: Wherever feasible, local qualified people should be considered for job opportunities. Adequate occupational health and safety standards should be provided to ensure the work environment is safe and conducive.

Negative Impacts

i) Improper management of waste

As a result of the operation of this laboratory it is expected that some waste is generated. Mainly there will be *domestic waste and hazardous waste* generated. Since laboratory activities involve certain medical examinations and also there will be a need for usage of different sorts of chemicals or reagents, it can be concluded that different types of hazardous wastes shall be generated. Therefore, improper waste decontamination and disposal can cause public health risks due to environmental pollution: impaired air quality, stormwater contamination of water courses and infections when people or children rummage through improperly dumped infectious waste or raw waste stockpiles can be life-threatening.

Mitigation strategies:

- An incinerator will be installed on the site to enhance disposal of relevant material through burning.
- Wastewater discharged from laboratory should be aggregated and eventually pre-treated prior being released in the sewerage and sanitation system.
- Provide appropriate waste bins adequately labelled for the different types of waste generated in the laboratory to allow segregation and collection at the point of generation.
- The collection of waste should be made at least once in 24 hours, and it should be done in such a way to minimize nuisance of smell and dust during collection and all the waste collected must be carried away from the storage site to an approved disposal point.
- Hospital/ Laboratory staff should be trained or educated on the importance and means of waste management and handling during operation.
- The hospital administration should work hand in hand with a private refuse handlers and the
- Municipal Council to facilitate sound waste handling and disposal from the site noting that hazardous waste must not be mixed with municipal waste.

- Overall, ensure proper waste management practices as recommended in the study on improvement of healthcare waste management in Uganda1.

ii) Air pollution due to incineration of waste

Incineration of laboratory waste if carried out in an inappropriate facility could result into localized pollution of air. The key emissions to the air from operation of the incinerators are odour, particulate matter, hydrogen chloride, nitrogen oxides, sulphur dioxide, carbon monoxide, and volatile organic compounds (from methane to polycyclic aromatic hydrocarbons (PAH), dioxins and furans (PCDD/F). Dioxins are known to promote cancers in humans. Downwash of incinerator emissions has potential to degrade indoor air quality of nearby environment or offsite buildings. In addition, to incinerator emissions, there is also a risk of contaminated air from the laboratory mixing with the outside environment if poorly ventilated.

Mitigation strategies:

- Ensure operator of incineration unit is adequately trained to ensure efficient operation;
- The incinerator should be operated at its design temperatures and combustion air supply;
- Consultations with potentially affected people should be done by design consultant to inform choice of the most appropriate location of incinerator;
- The laboratory should be equipped with bio-safety areas and should also be equipped with all necessary equipment and have a ventilation system that fulfils standards of biosafety;
- The incinerator site should be with hard standing and catchments and containment of disinfectants;
- All exhaust air from the laboratory should pass through high efficiency particulate air filters; and
- Waste should not be pre-treated with a chlorine-bearing disinfectant or should not be contained in PVC bags to avoid emission of dioxins or furans during incineration. For the same reason, no other material destined for incineration should contain chlorine-bearing chemicals.

iii) Occupational health and safety risks

Inadequate treatment or handling of contaminated samples or waste can create the potential that the laboratory staff would get exposed to life threatening infections in the course of their normal duties, and in this case brings at risk the health of individuals in the laboratory team and the general public health as well. This transmission can take place through staff equipment, clothing and vehicles transporting samples. The infectious waste could be in gaseous, liquid or solid forms.

Mitigation strategies:

- The primary measure to mitigate OHS impacts is prevention which entails identification of risks and instituting pro-active measures to avoid them. In part this can be achieved by following GIIP or national guidelines. For unavoidable risks, personal protective equipment (PPE) should be provided to workers.
- Orient all staff on safe work practices and guidelines and ensure that they adhere to them.
- Training should be conducted on how to prevent and manage incidences. This should involve proper handling of electricity, water etc. and sensitization on various modes of escape, conduct and responsibility during such incidences.
- Regular drills should constantly follow on various possible incidences. This will test the response of the involved stakeholders. Such drills will keep them alert and they will become more responsive to in the case of incidences.
- Use signage to warn staff and/ or visitors that are not involved in laboratory work of dangerous places.
- Develop evacuation procedures to handle emergency situations.
- Provide adequate OHS personnel protective gear for the employees.

[1] *MoH 2005 (revised march 2009): Improvement of healthcare waste management in Uganda (conducted by Carl Bro)*

iv) Risk of fire outbreak

Without provisions for fire safety, there is a risk of fire outbreak at the facility with disastrous life and financial impact. Fires can start from ignitable materials in laboratories, cigarette smoking in non-designated places or old electrical connections.

Mitigation strategies:

- Provide fire extinguishers at strategic locations within the laboratory and ensure that all fire-fighting equipment are regularly maintained and serviced.
- Key healthcare staff should have basic training in fire control through regular firefighting drills.
- Fire emergency telephone numbers should be displayed in communal areas.
- Install an automatic fire alarm system for the entire laboratory and provide enough water hose reel around the property with a fire reserve water tank attached with an automatic booster pump for hose reel.
- Provide fire hazard signs such as 'No Smoking' signs. Directions to exit in case of any fire incidence and emergency contact numbers should be provided. The contact/emergency numbers should be displayed generously within the facility.

05 ENVIRONMENTAL-SOCIO MANAGEMENT PLAN (ESMP)

This environmental-socio management plan, ESMP (Table ES1) for proposed construction works and operation of laboratory facility, identifies potential environmental and social aspects that should be monitored. It identifies parties responsible for monitoring actions, associated costs, indicators and training or capacity building needs and reporting.

Table ES1: Impact Monitoring and Management Plan

Text Reference	Impact and Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Incremental Costs (USD) for all HCFs sites	Capacity Building and Training Requirements
6.2	**CONSTRUCTION PHASE**						
6.2.1	**Positive impact**						
6.2.2.1	**Income to material/ equipment suppliers**						
	Project will promote local procurement where technically or commercially reasonable and feasible.	Ensure that local communities and businesses benefit from procurement process	Number of local businesses benefiting from construction related procurement	Before and during commencement of construction/ renovation	MOH; Contractor	Negligible	None
	For earth materials, procure from legitimate sources to avoid encouraging environmental degradation	Project's material demand does not encourage environmental degradation	All quarries from which materials (sand, stone) are obtained are licensed by the local authorities.	Before and during construction/ renovation	MOH; Contractor	Negligible	None
6.2.1.2	**Employment**						
	Unskilled labour will be recruited exclusively from local community, and semi-skilled labour will be recruited preferentially from such communities, provided that they have the requisite qualification, competence and desired experience.	The participation of local community members will be maximised during site preparation and construction activities.	Number of local people (unskilled and semi-skilled) employed during construction phase	Before and during construction	MOH; Contractor	Negligible	None
	Contractors will be encouraged to pay a "living wage" to all workers.	Improve livelihood of the local community	No complaints of poor remuneration	Before and during construction	MOH; Contractor	Negligible	None
6.2.2	**Negative impacts**						
6.2.2.1	**Soil degradation and deprivation of access to land**						
	All waste generated during site preparation and construction will be transported by the contractor or a company that has been specifically contracted to an authorized disposal area. The contractor will seek guidance from Kampala Capital City Authority on the final disposal point;	All waste collected and disposed of properly	No complaint of poor management of waste from communities around the site and road. No litter at project site and complaints from authorities	Throughout construction	MOH; Contractor	Negligible (Part of contractor's bid price)	None

Text Reference	Impact and Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Incremental Costs (USD) for all HCFs sites	Capacity Building and Training Requirements
	Contractor will avoid use of old equipment or even damaged equipment that is most likely to have oil leakages thus contaminate the soils;	Uncompromised energy supply to hospital community	No complaint of irregularities in energy supply related to construction activities	Throughout construction	MOH; Contractor	Negligible	None
	Current users of the proposed site for subsistence crop growing will be given time to harvest their produce before start of construction activities	No complaints lodged	Number of complaints	During preparatory stages for construction	MOH	Negligible	None
	Contractor will ensure that equipment are properly maintained and fully functional						
6.2.2.2	**Generation of noise**						
	Contractor should ensure that all equipment and machinery are in good and sound condition of old or damaged equipment with high level of noise emissions that would have a negative impact in the environment	Construction activities generate permissible levels of noise.	Patients and health workers do not complain about noise during construction	During construction	MOH; Contractor	Negligible	None
	Contractor will ensure that equipment is properly maintained and fully functional.	Construction activities generate permissible levels of noise.	Patients and health workers do not complain about noise during construction	During construction	MOH; Contractor	Negligible	None
	Contractors should cordon off areas under construction with noise absorbing materials, for example, plywood rather than iron sheets;	Construction activities generate permissible levels of noise.	Patients and health workers do not complain about noise during construction	During construction	MOH; Contractor	Comprised in cost for control of flying debris	None
	Construction workers should be sensitised on the sensitive nature of workplace they are operating in and advised to limit verbal noise or other forms of noise. For example, metallic objects or tools can be passed on to a colleague rather than dropping or throwing them with	No excessive noise from workers	Patients and health workers do not complain about noise during construction	During construction	MOH; Contractor	Negligible	None

Text Reference	Impact and Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Incremental Costs (USD) for all HCFs sites	Capacity Building and Training Requirements
	loud bangs.						
	The contractor should ensure that noise levels emanating from machinery, vehicles and noisy construction activities are kept at a minimum for the safety, health and protection of people in the nearby buildings.	Construction activities generate permissible levels of noise.	Patients and health workers do not complain about noise during construction	During construction	MOH; Contractor	Negligible	None
	Construction workers and drivers should be sensitised to switch off Equipment, machinery and vehicle engines when not in use and/or offloading materials.	Minimized noise and vibration at the project site.	Patients and health workers do not complain about noise and vibration during construction	During construction	MOH; Contractor	Negligible	None
	Construction activities should be carried out during the day	Afford hospital community noise-free night time to rest	No complaints of restless nights due to noise and vibration from project activities.	During construction	MOH; Contractor	Negligible	None
	All generators and heavy duty equipment should be insulated or placed in enclosures to minimize disrupting ambient noise levels.	Construction activities generate permissible levels of noise.	Patients and health workers do not complain about noise during construction	During construction	MOH; Contractor	Negligible	None
6.2.2.3	**Improper management of waste**						
	Contractor should seek guidance of local environmental officers to identify acceptable disposal sites	Contractor has records of proper waste disposal indicating quantities dumped and location of dumping site,	No report of illegal waste dumping in non-designated areas	Throughout construction	MOH ; Contractor; Local Environmental Officer.	Negligible	None
	Contractors should undertake waste segregation onset to separate hazardous waste from non-hazardous waste	Hazardous waste separated from non-hazardous waste on site and each waste stream disposed of according to NEMA requirements in designated sites.	Separate containers for hazardous waste and non-hazardous waste on site	Throughout construction	MOH ; Contractor; Local Environmental Officer.	Negligible	Likely hazardous and non-hazardous construction waste
	Waste (such as metal scrap or wood waste) that can be reused/ recycled may be given	Amount of waste disposed minimized by reuse, wherever feasible	Record of material types and estimated quantity diverted for reuse	Throughout construction	Contractor; local environment officer	Negligible	None

Text Reference	Impact and Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Incremental Costs (USD) for all HCFs sites	Capacity Building and Training Requirements
	to local people.						
6.2.2.4	**Contamination of water resources**						
	Equipment, materials and chemicals must not be stored within or near watercourses	No illicit sexual relationships among construction workers and local community	All construction workers living in a camp adhere to a "No fraternization" and comply with latest entry time into camp (6PM) set to avoid prostitution.	Throughout construction	MOH; contractor	Negligible	None
	Construct a proper drainage system around site and to the final storm water detention or disposal point to stop direct run off into the lake and nearby stabilization ponds						
	All construction equipment will be kept in good operating condition to avoid oil or fuel leakages that might contaminate water resources	No aggravated spread of HIV/AIDS due to project implementation	All construction workers are aware of HIV/AIDS risk and responsible living.	Throughout construction	MOH; contractor	**USD 600** for 500 HIV/AIDS posters/fliers and free condoms	None
	Materials like sand and aggregates will be kept in bunded areas to avoid being washed away into water resources by runoff						
	MOH will ensure the contractor complies with its environmental management policies, EIA recommendations and national regulations						
6.2.2.5	**Traffic and fugitive emissions**						
	The construction activities will be carried out during the day.						
	Truck drivers will be sensitised on and ensure they observe speed limits on roads especially at business centres	Minimise dust and exhaust emissions	No complaints of trucks ruthless driving from communities along roads used by project vehicles	During construction	MOH; Contractor	Negligible	None
	Trucks will be covered during haulage of construction	No material spills on roads during haulage to sites	No accidents caused by construction material split on road	Throughout construction	MOH ; Contractor;	Negligible (this should be part of	None

Text Reference	Impact and Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Incremental Costs (USD) for all HCFs sites	Capacity Building and Training Requirements
	materials to reduce on spillage of materials				Police	contractor's bid)	
	Wherever dust suppression is necessary, water should be sprayed over dusty areas	Minimise dust levels	Recognition of locales of contractor's efforts to minimise dust nuisance.	During construction	MOH; Contractor	Negligible	None
	All construction equipment will be kept in good operating condition and service regularly to reduce exhaust emissions	Minimise air pollution levels	No complaints of excessive fumes	During construction	MOH; Contractor	Negligible	None
	All dust will be quickly swept away to avoid migration to other non-construction areas	Reduce dust levels in off-site locations	No dust hips on-site	Throughout construction	MOH; Contractor	Negligible	None
	Construction work will be undertaken by an experienced and duly registered contractor with a verifiable sense of environmental awareness and responsibility	Employment of best Construction practices to minimise adverse impacts	Implementation of proposed mitigation measures	Throughout construction	MOH; Contractor	Negligible	None
	Workers will be provided with PPE and the use of PPE shall be enforced	Minimise OHS on workers from fugitive emissions	All workers on-set with appropriate PPE	Throughout construction	MOH; Contractor	Comprised in cost for provision of PPE	None
	The project area will be cordoned off to minimise on dust and emission migration to nearby facilities by wind	No excessive dust emissions noted outside construction areas	No complaints of excessive dust from construction areas	During construction	MOH; Contractor	Comprised in cost for control of flying debris	None
	As part of the bidding processes, contractors will be required to provide own environment management plans that meet mitigation actions proposed in this ESIA						
6.2.2.6	**Occupational health safety (OHS) for contractors**						
	All construction workers will be oriented on safe work practices and guidelines and ensure that they adhere to them.	Reduce OHS on construction workers	Records of workers' orientation	Throughout construction	MOH; Contractor	Negligible	None
	Training will be conducted on how to prevent and manage incidences. This will involve	Reduce OHS on construction workers	Records of training and Impromptu interviews with workers on OHS emergency response	Throughout construction	MOH; Contractor	Negligible	None

Text Reference	Impact and Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Incremental Costs (USD) for all HCFs sites	Capacity Building and Training Requirements
	proper handling of electricity, water etc. and sensitization on various modes of escape, conduct and responsibility during such incidences. All must fully be aware and mentally prepared for potential emergency.						
	Regular drills will constantly follow on various possible incidences. This will test the response of the involved stakeholders. Such drills will keep them alert and they will become more responsive to in the case of incidences.	Reduce OHS on construction workers	Records of drills on OHS emergency response	Throughout construction	MOH; Contractor	Negligible	None
	Signage will be used to warn staff and/ or visitors that are not involved in construction activities of dangerous places.	Reduce OHS on construction workers and the public	Presence of appropriate signage on-site	Throughout construction	MOH; Contractor	Negligible	None
	Supervision of works will be done regularly to ensure that safety conditions are met while any deviation from safety regulations is immediately reclaimed following the best practices regarding safety at work equipment.	Reduce OHS on construction workers	Presence of supervisor on-site	Throughout construction	MOH; Contractor	Negligible	None
	Evacuation procedures should be developed to handle emergency situations.	Reduce OHS on construction workers	Documented Emergency Response Preparedness Plan (ERPP)	Throughout construction	MOH; Contractor	Negligible	None
	Appropriate PPE will be provided to all workers not limited to: • Ear Muffs: One size fits all, comfortable, less ear infection risk • Ear Plugs: Small, lightweight, can get dirty and cause infection	Reduce health and safety risks to construction workers	Zero injuries in any month of construction phase	Before construction	MOH; Contractor	**USD 8,000**	Application of various types of PPE and their proper use.

Text Reference	Impact and Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Incremental Costs (USD) for all HCFs sites	Capacity Building and Training Requirements
	• Face/Eye (Working with any chemical or using any mechanical equipment) • Face Shield: Protect face from splashing and particles • Safety Glasses: Protection from solids (cutting, sanding, grinding) • Safety Goggles: Protects eyes from splashing • Hand (Use correct gloves for the job) • Chemical Gloves: (Nitrile, Latex, PVC) • Gloves for other use: special gloves for cutting, burning, abrasions/ blisters • Body • Overalls: Can protect against dust, vapours, splashes • Foot Protection • If electrical hazard present ensure boots offer protection • Safety Toe/Steel Toe Boots: Always worn when potential for falling hazards exists • Water/Chemical Resistant Boots: Use in a spill situation • Non-slip boots for working on wet/slippery floors.						
6.2.2.7	**Risk of accidents**						

Text Reference	Impact and Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Incremental Costs (USD) for all HCFs sites	Capacity Building and Training Requirements
	Best transport safety practices will be adopted with the goal of preventing traffic accidents and minimizing injuries suffered by project personnel and the public	No road accident by project traffic	No accident occurs in each month of construction duration	During construction	MOH; Contractor	Negligible	Contractor needs road safety awareness to project personnel and the public
	Contractor's vehicles will be regularly maintained to minimize potentially serious accidents such as those caused by brake failure commonly associated with loaded construction trucks	No road accident due to poor mechanical conditions of project vehicles.	No accident occurs in each month of construction duration	During construction	MOH; Contractor	Negligible	None
	The site will be fenced off and signalization put in place with security personnel to stop unauthorised people from accessing the site.						
	For falling debris, and hoarding/scaffoldings; clear warning signs will be placed around the construction premise, install interceptors and net traps to divert falling parts, and emphasize (provide) person protective gears to persons in the area.						
	Ensure drivers respect speed limits through built areas and urban centres.	No road accident by project traffic	No accident occurs in each month of construction duration	During construction	MOH; Contractor	Negligible	Contractor needs speed awareness through built areas and urban areas
	Employ safe traffic control measures, including temporary road signs and flag persons to warn of dangerous conditions and children crossings	No road accident by project traffic	No accident occurs in each month of construction duration	During construction	MOH; Contractor	**USD 500**	None
	Contractors should cordon off areas under construction and provide signage to warn of on-going construction works.	Construction works do not cause injury to patients and health workers	Zero injuries in any month of construction phase	During construction	MOH; Contractor	Negligible	None

Text Reference	Impact and Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Incremental Costs (USD) for all HCFs sites	Capacity Building and Training Requirements
	Contractors should use screens or nets to avoid flying debris and dust	No debris noted outside construction areas	No complaints about flying debris from construction areas (this should be verified by perusal of records in complaints log)	During construction	MOH; Contractor	**USD 2,000**	None
6.2(all sub-sections)	Impact of construction activities	Construction activities do not cause adverse socio-environmental impacts	Annual construction audits do not indicate adverse impacts not mitigated	1 time per year *(NB. Estimated construction duration = 1 year per lot, see Table.20)*	MOH (construction audit may be undertaken by MoH or consultant it hires)	**USD 6,000**	Environmental auditing of construction projects
6.3	**OPERATION PHASE**						
6.3.1	**Positive**						
6.3.1.1	**Improved medical surveillance services**						
	Construction of laboratory facilities should be matched with commensurate staffing with laboratory personnel adequately trained in use of newly installed equipment	Installed laboratory equipment fully utilised to enhance laboratory services at the hospital.	laboratory has trained staff to properly and safely operated provided laboratory equipment	1 month after equipment installation	MOH and supplier	None (procurement cost assumed to include training)	Staff training in operation of newly installed laboratory equipment
	Reduced public risks due to improvement in laboratory waste management	Environmental audits show that medical waste and incinerator emissions do not cause onsite/ offsite public health risk	Annual environmental audits find no plume downwash from incinerators. Incinerators stacks designed based on GIIP / WBG EHS guidelines No un-incinerated medical solid waste on premises or waste dumps	Undertake full environmental audit once per year	MOH	Environmental audit cost: **USD 20,000**.	Operation of incineration units; Decontamination procedure in the laboratory
6.3.1.2	**Employment opportunities**						
	Operation of the laboratory will create additional long-term technical and non-technical job opportunities for laboratory professionals, janitors, etc.	Improve laboratory services	Laboratory has adequate trained staff.	Daily	MOH	Negligible	None
6.3.2	**Negative**						
6.3.2.1	**Improper waste management**						
	Ensure proper waste management practices as recommended in the study on	No community health risk due to improper waste management	No raw medical waste is dumped at public dumps	Daily	Healthcare facility administrator/ Superintend	Negligible	None

Text Reference	Impact and Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Incremental Costs (USD) for all HCFs sites	Capacity Building and Training Requirements
	improvement of laboratory waste management.						
	The collection of waste should be made at least once in 24 hours, and it should be done in such a way to minimize nuisance of smell and dust during collection and all the waste collected must be carried away from the storage site to an approved disposal point.	No accumulation of waste in and around laboratory facility	No smell or accumulated waste in and around the laboratory	Daily	Hospital administrator/ Superintend	Negligible	None
	Provide appropriate waste bins for the different types of waste generated in the laboratory to allow segregation and collection at the point of generation.	Waste segregation and no litter.	Presence of adequate waste bins in and around the laboratory facility	Daily	Hospital administrator/ Superintend	Negligible	None
	Hospital/ Laboratory staff should be trained or educated on the importance and means of waste management and handling during operation.	Proper waste handling and management	Presence of labelled waste bins on-site	Daily	Hospital administrator/ Superintend	Negligible	None
	The hospital administration should work hand in hand with a private refuse handlers and the Municipal Council to facilitate sound waste handling and disposal from the site noting that hazardous waste must not be mixed with municipal waste.	Proper waste disposal	Documentation of formal engagement of refuse handlers	Monthly	Hospital administrator/ Superintend	Negligible	None
	Laboratory should have standard operation and decontamination procedure manuals and clearly displayed at appropriate point(s) with the laboratory	Efficient containment of pathogens	Display at appropriate point(s)	Daily	Hospital administrator/ Superintend	Negligible	None
6.3.2.2	**Air pollution due to incineration of waste**						
	Ensure incinerator stacks designed according to GIIP or WBG guidelines	No offsite air pollution from incineration (such as due to	Visual observation reveal no plume downwash of stack emissions	From start of use of new incinerators	MOH; Hospital administrator	Negligible	None

Text Reference	Impact and Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Incremental Costs (USD) for all HCFs sites	Capacity Building and Training Requirements
		plume downwash).					
	Ensure Training of Incinerator operators for efficient and proper incineration units operations.	Incineration does not generate dioxins	Incinerator operator complete training course	1 month before commissioning incinerator	MOH	**USD 1,000**	Operation of incineration unit/ facility
	The laboratory should provide bio-safety areas equipped with all necessary equipment and have ventilation system that fulfils standards of biosafety;	Pathogen containment	Presence of bio-safety areas	Throughout laboratory operational life	Hospital administrator/ Superintend	Negligible	None
	Ensure that all exhaust air from the laboratory should pass through high efficiency particulate air filters;	Pathogen containment	Presence of air filters	Throughout laboratory operational life	Hospital administrator/ Superintend	Negligible	None
6.3.2.3	**Occupational health and safety risks**						
	All workers to be Provided with appropriate PPE against exposure to infectious pathogens, hazardous chemicals and ionizing radiation in accordance with recognized international safety standards and guidelines.	Minimal work-related injuries or infections	All healthcare staff have necessary PPE.	Daily	Healthcare facility administrator/ Superintend	Negligible since all requisite PPE to be provided as part of by equipment supplier bid.	None
	Orient all staff on safe work practices and guidelines and ensure that they adhere to them.	Reduce staff OHS	Records of staff orientation on safety practices and guidelines	Throughout laboratory operational life	Hospital administrator/ Superintend	Negligible	Safety practices and guidelines
	Training should be conducted on how to prevent and manage incidences. This should involve proper handling of electricity, water etc. and sensitization on various modes of escape, conduct and responsibility during such incidences	Reduce incidences in and around laboratory facility	Records of staff training on prevention of incidences	Throughout laboratory operational life	Hospital administrator/ Superintend	Negligible	Prevention and manage incidences.
	Regular drills should constantly follow on various possible incidences. This will test the response of the involved	Staff preparedness to combat possible incidences	Records of incidence prevention drills	Throughout laboratory operational life	Hospital administrator/ Superintend	Negligible	None

Text Reference	Impact and Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Incremental Costs (USD) for all HCFs sites	Capacity Building and Training Requirements
	stakeholders. Such drills will keep them alert and they will become more responsive to in the case of incidences.						
	Use signage to warn staff and/ or visitors that are not involved in laboratory work of dangerous places	Public and other staff safety	Presence of appropriate and clear signage in and around laboratory facility	Throughout laboratory operational life	Hospital administrator/ Superintend	Negligible	None
	Develop evacuation procedures to handle emergency situations.	Public and other staff safety	Evacuation procedure document	Throughout laboratory operational life	Hospital administrator/ Superintend	Negligible	None
6.3..2.4	**Risk of fire outbreak**						
	Ensure Provision of fire extinguishers at strategic locations within the laboratory and ensure that all fire-fighting equipment are regularly maintained and serviced.	Laboratory has basic capacity to fend off a small or average fire outbreak	Each laboratory unit has a minimum of 1 medium-size fire extinguishers (one of which should be for electrical fires) .	During equipment installation upon completion of construction/ renovation works	MOH	**USD 2,500** (100 per extinguisher)	Basic firefighting skills
	Ensure that Key laboratory staff have basic training in fire control.	Laboratory has basic capacity to fend off a small or average fire outbreak	At least 2 medical staff have certificate of basic firefighting.	During equipment installation upon completion of construction/ renovation works	MOH	To be provided as part of by equipment supplier bid.	Fire drills
	Fire emergency telephone numbers should be displaced in communal areas.	Laboratory has capacity to contact fire department in case of major fire outbreak	Fire emergency telephone numbers displaced in at least 2 communal areas	Throughout operation life of laboratory	MOH	Negligible	None
	Install an automatic fire alarm system for the entire laboratory and provide enough water hose reel around the property with a fire reserve water tank attached with an automatic booster pump	Laboratory has basic capacity to fend off a small or average fire outbreak	Presence of automatic fire alarm system, adequate water hose reel and reverse water tank equipped with automatic booster pump	Throughout operation life of laboratory	MOH	Negligible	None

Text Reference	Impact and Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Incremental Costs (USD) for all HCFs sites	Capacity Building and Training Requirements
	for hose reel.						
	Laboratory facility should have a fire emergency management plan. And should undertake fire drills at a minimum once a year.	Laboratory has basic capacity to fend off a small or average fire outbreak	A documented fire emergency plan. A documented fire drill.	Throughout operation life of laboratory	MOH	Negligible	None
	Provide fire hazard signs such as 'No Smoking' signs. Directions to exit in case of any fire incidence and emergency contact numbers should be provided.	Laboratory has basic capacity to fend off a small or average fire outbreak	Presence of fire hazard signs and exit in appropriate points	Throughout operation life of laboratory	MOH	Negligible	None
TOTAL COST						**USD 40,600**	

06 CONCLUSION

The proposed project has potential to significantly improve quality of laboratory services and efficiency of service provision in the East African region (especially in Uganda) with socio-environmental benefits such as reduced morbidity and increased productivity of labour hence higher household incomes; opportunity to have access to laboratory services hitherto unavailable in Uganda due to lack of equipment or facilities. Besides, project development and operation will provide considerable economic opportunity for material/equipment suppliers, construction contractors and medical professionals.

Key significant negative impacts may arise from laboratory waste handling and management, especially within the laboratory facilities and incineration. When incinerator stacks adopt a standard height irrespective of density of habitation and nature of nearby buildings, there is a risk of chronic exposure to incineration emissions due to plume downwash. Likewise, when laboratory management adopt standard pathogen containment and decontamination protocols, there is a risk of infection from residual pathogens. Where raw medical waste continues to be improperly dumped at public dumps the project would aggravate public health risk when children or people rummage through potentially infectious waste. These impacts would be accelerated by inadequately trained incinerator operators, laboratory staff and poor laboratory practices.

All potential adverse impacts can be mitigated when measures proposed (Chapter 6) are implemented, in which case benefits of this project to the nation would by far outweigh potential negative effects.

1 INTRODUCTION

1.1 PROJECT BACKGROUND

The Government of the Republic of Uganda, with funding from the International Development Association (IDA), plans to construct/ rehabilitate and equip the National TB Reference Laboratory. This is IDA funding towards the cost of the East African Public Health Laboratories Networking Project. The general objective of the project is to improve access to diagnostic services among vulnerable populations living in the cross-border areas of Kenya, Tanzania, Uganda and Rwanda. The laboratory networking project also aims to address the common challenges facing the four countries, that is, dilapidated infrastructure that was built decades ago; inadequate supply and quality of human resources which are a backbone of quality diagnostics; and manual information systems which are not effective for decision making.

1.2 OVERVIEW OF UGANDA'S HEALTH SECTOR

The health services provision in the country has always been guided by a clear strategic framework to ensure all actions are aimed at improving the health of the people, in a manner that is responsive to their legitimate health needs, and ensure fairness in financing of services being accessed. The Health Services Support Project (HSSP) provides the medium-term strategic framework and focus that the Government intends to pursue in regard to attaining the health goals for the country and it is developed with the prevailing socio-economic and development context in mind. It is anchored on the National Health Policy II (NHP II) and the National Development Plan ensuring its goals and deliverables are aimed at achieving the overall goals and deliverables of the country.

The National Health System (NHS) is made up of the public and the private sectors. The public sector includes all Government of Uganda (GOU) health facilities under the Ministry of Health (MOH), health services of the Ministries of Defence (Army), Education, Internal Affairs (Police and Prisons) and Ministry of Local Government (MOLG). The private health delivery system consists of Private Not for Profit (PNFPs) providers, Private Health Practitioners (PHPs), and the Traditional and Complementary Medicine Practitioners (TCMPs).

The provision of health services in Uganda is decentralised with districts and health sub-districts (HSDs) playing a key role in the delivery and management of health services at those levels. The health services are structured into National Referral Hospitals (NRHs), Regional Referral Hospitals (RRHs), General Hospitals, Health Centre (HC) IVs, HC IIIs, HC IIs and Village Health Teams (HC Is).

The National Hospital Policy (2005), operationalized during HSSP II, spells out the role and functions of hospitals at different levels in the NHS. Hospitals provide technical back up for referral and support functions to district health services. Hospital services are provided by the public, private health providers (PHPs) and private not for profit (PNFPs). The public hospitals are divided into three groups:

i) **General Hospitals** provide preventive, promotive, curative, maternity, in-patient health services, surgery, blood transfusion, laboratory and medical imaging services. They also provide in-service training, consultation and operational research in support of the community-based health care programmes.

ii) **Regional Referral Hospitals (RRHs)** offer specialist clinical services such as psychiatry, Ear, Nose and Throat (ENT), ophthalmology, higher level surgical and medical services, and clinical support services (laboratory, medical imaging and pathology). They are also involved in teaching and research. This is in addition to services provided by general hospitals.

iii) **National Referral Hospitals (NRHs)** provide comprehensive specialist services and are involved in health research and teaching in addition to providing services offered by general hospitals and RRHs.

All hospitals are supposed to provide support supervision to lower levels and to maintain linkages with communities through Community Health Departments (CHDs). Currently, there are 65 public hospitals: 2NRHs, 11 RRHs and 52 general hospitals. There are 56 PNFP and 9 PHP hospitals. With decentralisation, the public general hospitals are managed by the local governments. The RRHs have been granted self-accounting status and remain under MOH oversight. The NRHs, namely Mulago and Butabika, are semi-autonomous. All PNFP hospitals are autonomous as granted by their respective legal proprietors.

a) District health systems

The Constitution (1995) and the Local Government Act (1997) mandate the Local Governments (LGs) to plan, budget and implement health policies and health sector plans. The LGs have the responsibility recruitment, deployment, development and management of human resource (HR) for district health services, development and passing of health related by-laws and monitoring of overall health sector performance. LGs manage public general hospitals and HCs and also supervise and monitor all health activities (including those in the private sector) in their respective areas of responsibility. The public private partnership at district level is however still weak.

b) Health Sub-District (HSD) system

The HSDs are mandated with planning, organization, budgeting and management of the health services at this and lower health centre levels. HSDs carries an oversight function of overseeing all curative, preventive, promotive and rehabilitative health activities including those carried out by the PNFPs and PFP service providers in the health sub district. The headquarters of an HSD will remain a HC IV or a selected general hospital.

Health Centres III, II and Village Health Teams (HC I)

HC IIIs provide basic preventive, promotive and curative care. They also provide support supervision of the community and HC IIs under their jurisdiction. There are provisions for laboratory services for diagnosis, maternity care and first referral cover for the sub-county. The HC IIs provide the first level of interaction between the formal health sector and the communities. HC IIs only provide out patient care, community outreach services and linkages with the Village Health Teams (VHTs). A network of VHTs has been established in Uganda which is facilitating health promotion, service delivery, community participation and empowerment in access to and utilization of health services. The VHTs are responsible for:

- Identifying the community's health needs and taking appropriate measures;

- Mobilizing community resources and monitoring utilization of all resources for their health;
- Mobilizing communities for health interventions such as immunization, malaria control, sanitation
- and promoting health seeking behaviour;
- Maintaining a register of members of households and their health status;
- Maintaining birth and death registration; and
- Serving as the first link between the community and formal health providers.
- Community based management of common childhood illnesses including malaria, diarrhoea and pneumonia; and management and distribution of any health commodities availed from time to time.

c) Laboratory services provision

With regard to laboratory services, the Central Public Health Laboratories has the responsibility of coordinating health laboratory services in Uganda, developing policies and guidelines and training and implementing quality assurance schemes for laboratories. A comprehensive national health laboratory services policy was developed and this provides a framework for the future development of laboratory services in the country. The provision of good laboratory services laboratory support for disease surveillance is affected by low levels of funding for laboratory services, a weak regulatory framework and the limited number of laboratory professionals in the country.

2 PROJECT DESCRIPTION

2.1 PROPONENT CONTACT

Name and address: MINISTRY OF HEALTH
Ministry of Health Headquarters
Plot 6/7 Lourdel Road,
P.O. Box 7272, Kampala, Uganda
T: +256-414-340872, Fax: 256-41-4231584.

2.2 LOCATION OF PROJECT SITE

Butabika National Referral Hospital is located in Butabika a suburb of Kampala, Uganda's capital and largest city. It lies in the south-eastern part of the city, in Nakawa Division, adjacent to the northern shores of Lake Victoria. This location is approximately 12 km by road, east of Kampala's central business district. The coordinates of Butabika Hospital are: 36N 462041; 034772.

Kampala District is situated at the centre of Uganda's "urbanised" corridor. Kampala is the only district in Uganda which is entirely designated as an urban municipality. Kampala is located on the northern shores of Lake Victoria and is bordered by Wakiso District to the North, East, West and South-west, covering an area of 195 km^2 and is situated at an average altitude of 3910 ft. (1120 m) above sea level. It is situated on 24 low flat topped hills that are surrounded by wetland valleys. Details of the location for the proposed National T.B Reference Laboratory are provided Box 2.1. The satellite imagery in Figure 2.1 presents the proposed site location and surroundings.

Box 2.1: Site location according to administrative jurisdiction

Plot 2, Block 237-2383,
GPS coordinates: 36N 462041; 034772
Location according to areas of administrative jurisdiction:

- Butabika Hospital – LC1 Village,
- Butabika – Parish,
- Nakawa – Division,
- Kampala District.

2.3 PROJECT OBJECTIVES

The general objective of the project is to improve access to diagnostic services among vulnerable populations living in the cross-border areas of the Republic of Southern Sudan, Democratic Republic of Congo and Uganda. The laboratory networking project also aims to address the common challenges facing the East African countries, that is, dilapidated infrastructure that was built decades ago; inadequate supply and quality of human resources which are a backbone of quality diagnostics; and manual information systems which are not effective for decision making.

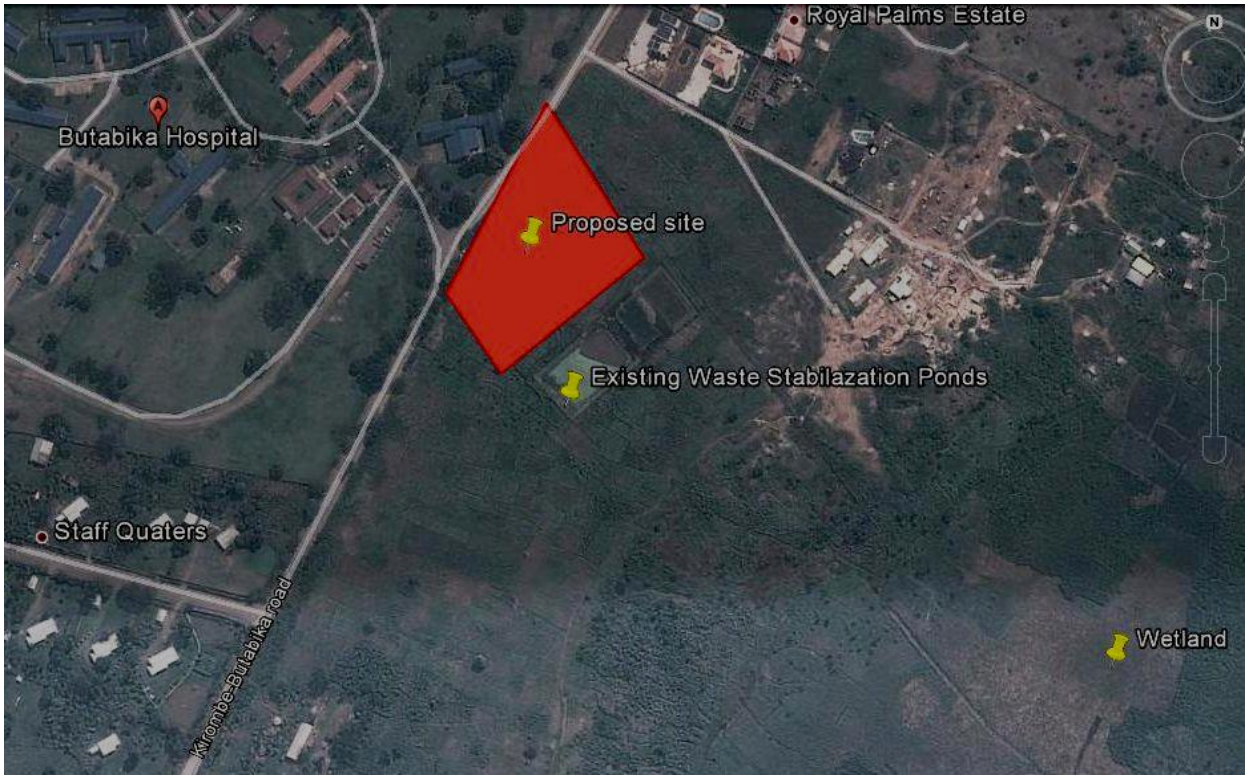


Figure 2.1 Location of the proposed project site

2.4 PROJECT COMPONENTS

The following key works will be undertaken in proposed project on a site of approximately three (3) acres and National T.B Referral Laboratory will comprise of four (4) levels including the Attic level:

- Fencing, ground preparation, drainage, roads,
- Underground rain water tank,
- Generators house and fuel tank,
- Incinerators
- Lagoons and Man holes
- Library, training rooms and laboratories
- Catering facilities; Kitchen, Canteens and outdoor catering
- Animal houses
- Amplification areas.
- Grass gardens.
- Offices

2.4.1 Modifications of the Built Space

a) Fencing

A well-built fence will be constructed at the site after ground clearing to avoid interference and roaming animals from the site during and after construction of the National T.B Referral Hospital. Currently there some crops grown at the proposed site and an out of use limbo.

b) Underground rain water tank

An Underground rain water tank will be constructed as another source of water for the Hospital plus piped water that will be supplied from the taps. The Underground rain water tanks will act as Water reservoirs that will distribute and help with water needs during peak usage times.

c) Incinerator

An incinerator will be constructed to handle Medical waste, which will be designed based on the GIIP/ WBG EHS guidelines to ensure that incinerator emissions do not cause offsite public health risk. There will be no un-incinerated medical solid waste on premises or waste dumps.

Photo 2.1: Proposed site for the laboratory with an abandoned mortuary and stabilisation ponds nearby

d) Waste handling facilities

Wastewater treatment system shall be constructed that will be used to treat the facility wastewater to meet the national effluent discharge standards; the treatment facility will entail construction of manholes and lagoons. The development will have a solid waste storage area where sorting, prior to removal and recycling of hospital waste, will take place to minimize health risks due to improper waste management.

e) Offices

The development will have office space for administration and management of the laboratory facility. In addition, the facility will include training rooms and laboratories in which students will be trained plus a library.

f) Catering facilities

The catering facilities shall include the Kitchen, Canteens and outdoor catering. All functional areas shall be installed with an effective ventilation system.

2.4.2 Equipment to be Installed

a) Generator

The main energy source to be used at the facility would be hydro-power; however a generator would be installed for power emergencies. Generators are bonded to contain any oil spills and this will be minimized by building a generator house. Fuel will be stored in a fuel tank.

b) Fire fighting

Equipment will include fire extinguishers and fire trailers that will be installed at the site to safe guard the area against any fire emergencies. Emergency assembly points will be clearly marked and sand heaps provided for firefighting.

2.4.3 Utilities/Resources Required

The project will need the following resources and utilities:

i) Electricity
ii) Laboratory equipment
iii) Generator
iv) Water
v) Fuel (diesel, petrol)
vi) Construction and operation labour: the former being short-term while operation-phase job opportunities would be long-term
vii) Construction materials (concrete, cement, aggregate, steel, roofing and finishing materials, glass)

While contractors would purchase most construction materials from local suppliers, some might be imported. All laboratory equipment would be imported.

2.5 PROJECT ALTERNATIVES

2.5.1 'No Project' Scenario

The existing site is undeveloped covered by gardens and grass. Without the proposed development, the government of Uganda would not have the ability to improve physical functionality of existing national TB laboratories and improve access to diagnostic services among vulnerable populations living in the cross-border areas of Kenya, Tanzania, Uganda and Rwanda.

2.5.2 Alternatives Considered

The alternative options investigated as part of the project were: sources for construction raw materials, solid waste and wastewater management system, and sources of energy.

Detailed project alternatives were considered including engineering design options, materials selection and safety considerations. Alternatives were selected based on criteria below:

- Maximisation of development benefits;
- Minimisation of socio-environmental costs;
- Cost effectiveness; and,
- Ease of maintenance.

2.6 PROJECT CLASSIFICATION FOR ESIA PURPOSES

2.6.1 Classification according to Uganda's National Environment Act, Cap 153

The Third Schedule of the National Environment Act prescribes projects for which EIA is mandatory and according to Section 1 and Section 12 (b and d) in this Schedule, the project should undertake detailed EIA.

2.6.2 Project Classification according to World Bank

The Bank classifies a proposed project into one of four categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts.

a) Category A

A proposed project is classified as Category A if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. The project impacts may affect an area broader than the sites or facilities subject to physical works. Environmental assessment for a Category A project examines the project's potential negative and positive environmental impacts, compares them with those of feasible alternatives including the "without project" situation, and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance.

b) Category B

A proposed project is classified as Category B if it's potential adverse environmental impacts on human populations or environmentally important areas, including wetlands, forests, grasslands, and other natural habitats, are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigation measures can be designed more readily than for Category A projects. Here the assessment also involves examination of the project's potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance.

The proposed project is classified as EA Category B. The proposed construction, equipping and operation of the proposed laboratory will be restricted within the hospital premises with the exception of waste management/ pollutants generated that may go beyond the boundaries of the hospital. The project will not directly affect ecosystems such wetlands, forests, grasslands, etc.

c) Category C

A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts. Beyond screening, no further environmental assessment is required for a Category C project.

d) Category FI

A proposed project is classified as Category FI if it involves investment of Bank funds through a financial intermediary, in subprojects that may result in adverse environmental impacts.

3 ESIA METHODOLOGY

3.1 INTRODUCTION

This section describes the broad principles of methodology of the ESIA indicating approaches, practices and techniques used for impact identification, quantification, analysis and abatement. Impacts of the project were predicted in relation to environmental and social receptors and natural resources. This was accomplished by comparing prevailing conditions ("pre-project") and "post-project" situations.

The requirement for environmental assessment in Uganda is set out by the National Environment Act (1995) and the Environmental Impact Assessment Regulations (1998). The process was guided by the EIA Guidelines (NEMA, 1997).

The methodology used consisted of a review of Uganda's institutional arrangements, regulations and policies and those of the World Bank and World Health Organisation. Also done were baseline measurements, identification of impact receptors and their relation to project's site. Consultation with NEMA, Kampala Capital City Authority officials from the Directorate of Health and Environment, Area Local Council and communities. Other activities included data collection and analysis, review of engineering designs of the laboratory, utilizing national, WHO guidelines and relevant healthcare waste management literature

Impacts of the project were predicted in relation to environmental and social receptors and natural resources. This was accomplished by comparing prevailing conditions ("pre-project") and "post-project" situations.

3.2 ESTABLISHMENT OF ENVIRONMENTAL AND SOCIO-ECONOMIC BASELINE CONDITIONS

Baseline air quality and noise levels were measured, not only to inform construction contractors about pre-construction conditions existing at proposed sites, but also the first annual environmental audit: subsequent baseline conditions would be those values measured in the first annual full environmental audit. These were determined through the following actions:

Air quality: Baseline air quality was measured using a pair of digital MX6 iBrid™ portable gas meters (Industrial Scientific-Oldham) and a Microdust 880nm digital aerosol monitor (Casella®) (Photo 3.1). Measurement points or locations were selected basing on presence of potential receptors (Figure 3.1).

Ambient noise: Measurement of ambient noise levels was carried out using a precision integrating sound level meter (Photo 3.2), with an active range of 0-140 decibels (dB) and complying with IEC 651 and ANSI S4 standards. Baseline noise measurements were undertaken at locations around the proposed storage facility site with potential receptors. A Casella CEL-621C digital noise logger was set to record for a sample period of ten minutes at each of the selected locations. The assessment procedure involved recording the LA_{MAX} and LA_{MIN} decibel levels. Measurement points (Figure 3.2) were recorded using a GPS receiver and the noise sources together with the ambient environment at each location noted.

CASELLA Microdust meter

Digital 6-gas MX6 Ibrid meter

Photo 3.1: Digital CASELLA microdust and 6-gas MX6 iBrid™ meters to be used measure air quality

Noise measurement will be done with a CASELLA CEL-621C2/K1 Integrating 1/3 Octave Band Sound Level Meter (Class2)

Photo 3.2: Noise measurement meter

To establish the socio-economic baseline parameters: consultative meetings were conducted in the neighbouring communities to obtain primary data in the project area and with relevant agencies for secondary data. Secondary data collected included population, household energy sources, education and health status, waste management and sanitary facilities, food and cash crops, water sources, sources of income and existing land tenure systems, among others.

3.3 CONSULTATION AND PROJECT DISCLOSURE

Relevant and adequate project information was provided to stakeholders to enable them to understand project risks, impacts and opportunities. Stakeholder consultation aimed at:

- Generating understanding of the project
- Understanding local expectations of the project
- Characterising potential environmental, socio-economic impacts
- Garnering consensus on mitigation options

The techniques used were: face-to-face or telephone interviews, data and literature review and email consultation correspondences

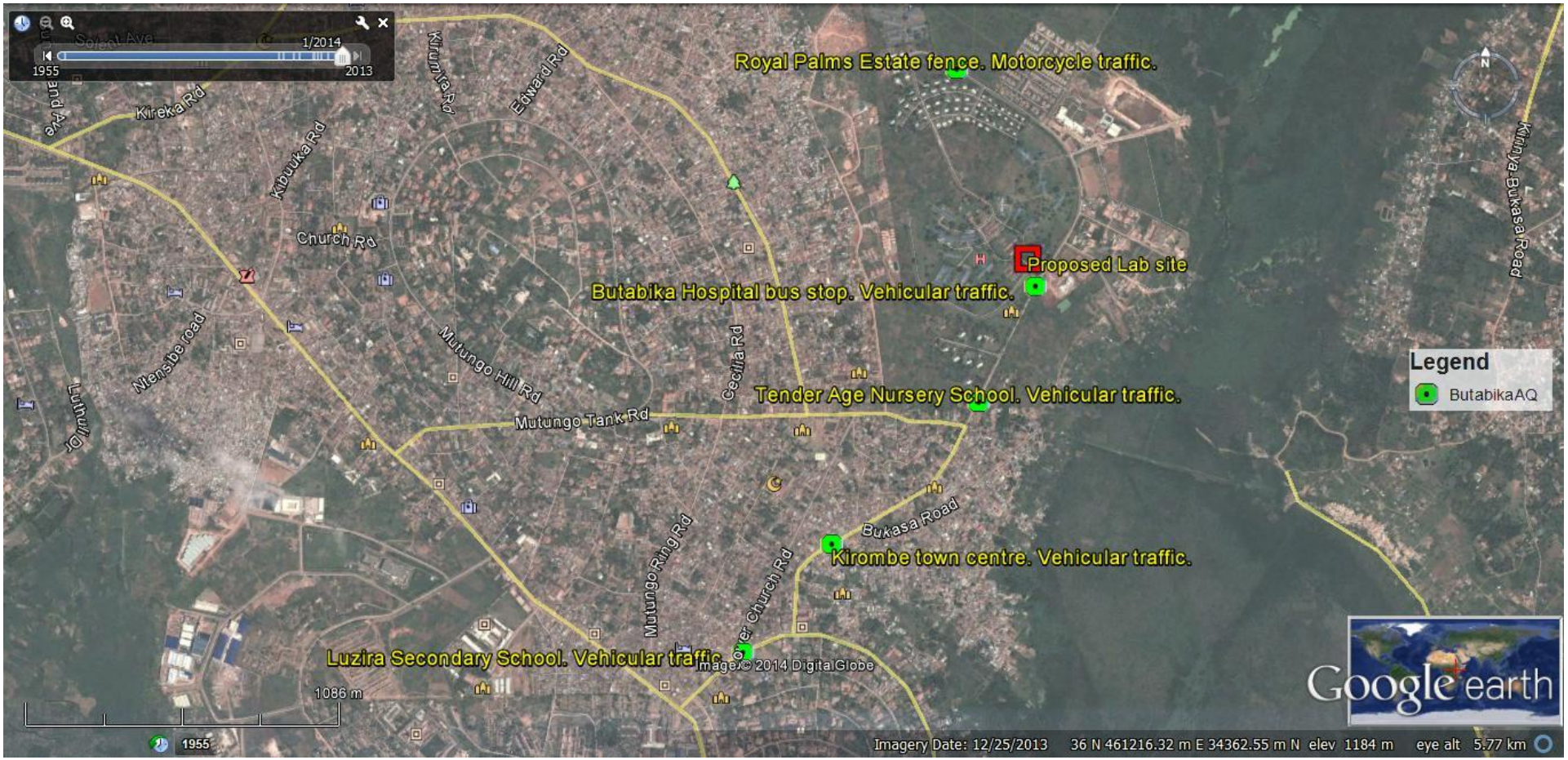


Figure 3.1 Air quality measurement points

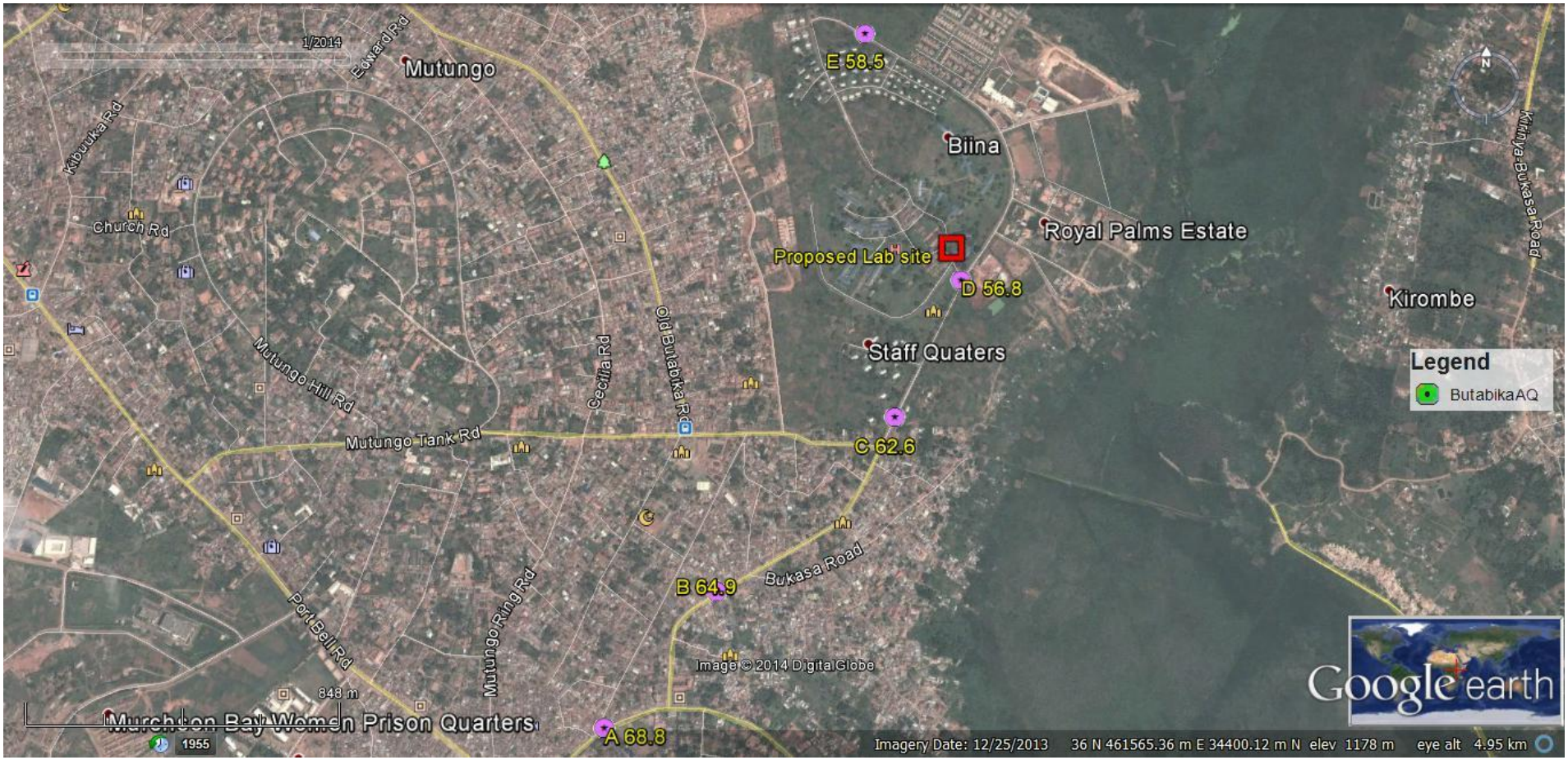


Figure 3.2 Noise measurement points

3.4 REVIEW OF POLICY, REGULATIONS, INSTITUTIONAL FRAMEWORK, INTERNATIONAL GUIDELINES

This was done to determine if the proposed project was in line with national policies and met environmental laws and regulations, to achieve this, the following actions were undertaken:

i) Review of national environmental laws, policies and institutional framework.
ii) Review of World Bank Group (IDA is one of the 5 World Bank Group member organizations) guidelines on environment.
iii) Review of World Health Organisation (WHO) guidelines on biosafety

3.5 OVERVIEW OF THE FLOOD ANALYSIS METHODOLOGY

3.5.1 Return Period

The return period, or recurrence interval, is the average duration (years) between successive flood events of similar or higher magnitude over the long term. Return periods have an inverse relationship with risk associated with failure due to flooding. Longer return periods imply lower risk of failure due to flood damage and vice versa. The factors considered in selecting the design return period include construction cost and level of acceptable risk to life and property and design life of project (physical life or economic life). The following return periods were considered appropriate for the current study (Table 3.1). The associated risks of at least one failure for an assumed project life of 30 years are also shown in the Table 3.1.

Table 3.1: Return periods and associated risks of at least one failure for a project life of 30 years.

Return period (years)	Risk of failure for 30 year project life (%)
10	96
25	71
50	45
100	26
500	6

3.5.2 Flood Analysis Methods

By definition flood flows are rare events and data availability is a major issue. Sometimes, the data is completely unavailable (in ungauged sites) or where flow data are available, extreme flood conditions may be such that no flow measurements can be taken and estimates have to be made (i.e. extrapolation of rating curves). Careful consideration of the available data is important before selecting the analysis method. In order of preference, Watkins and Fiddes (1984) recommended the following methods for estimating design floods:

- Methods based on analysing flow data i.e. Extreme value analysis, Flood transposition, Slope-area method, Bank full flows
- Regional flood formulae like envelope curves
- Rainfall runoff models i.e. the rational method, unit hydrograph techniques and synthetic hydrograph

- Hybrid methods based on a regionalization of rainfall runoff models i.e. the ORSTOM method (developed in West Africa), TRRL method (based on 14 catchments in Kenya and Uganda), the SCS curve number method and the generalized tropical flood model.

The choice between these methods depends on whether the detailed shape of the flood or the probable maximum flood is needed and on availability of the reliable flow records at the design site or nearby sites, whether on the same river or some other catchment. It also depends on availability of suitable data.

The TRRL East African model of flood analysis has been found to provide more reliable estimates for small catchments especially in areas where the gauging network is very sparse. The following advantages of the method make it suitable for applying in the study area:

- It was experimentally derived and tested using measurements of rainfall and runoff 14 representative catchments in Kenya and Uganda for 4 years and is specifically tailored for use in flood estimation for highways bridges and culverts.
- The methodology for development of the model made extensive use of reliable rainfall records for over 867 stations available in the archives of the East African Meteorological Department with a record length of 10-40 years. Depth-duration data were obtained for stations in Kenya, Tanzania and Uganda (Busia, Kasese, Wadelai, Matuga, Atumatak, Entebbe, Gulu, Kampala, Jinja, Mbarara, Tororo, and Fort Portal).
- It incorporates both unit hydrograph approaches and regionalization techniques.
- It was designed to provide estimates of peak discharges at recurrence intervals of 5-25 and up to an upper limit of 50-100 years (or even higher) for small catchments of up to 200 km2.
- Areal reduction factors for East African rain gauge networks as well as variations in vegetation are also incorporated in the model

3.5.3 The TRRL Model Methodology

The steps involved in estimating the design flood for different recurrence intervals using the TRRL Model were derived from Watkins and Fiddes (1984) in as follows:

i) The catchment upstream of each bridge site was generated using an ASTER digital elevation model (DEM) of the area. The grid size of the DEM is 30 m.
ii) Catchment area (A), land slope and channel slope were measured from the map
iii) From site inspection the catchment type was established and the surface cover flow time (TS) was computed
iv) Soil type was determined by both visual geotechnical investigations and available soil maps the soil permeability class and slope class were established, the basic runoff coefficient (CS) was determined.
v) The land use factor (CL) and catchment wetness factor (CW) were determined
vi) The runoff coefficient (CA)was computed
vii) The base time (TB) was computed
viii) The 'Kampala Equation' was used to estimate the areal reduction factor to take into account that tropical catchments rarely receive rainfall uniformly over the entire catchment.

ix) The design storm rainfall (P) for each recurrence interval, to be allowed for during base time was then computed.

x) The average flow $(\overline{Q})$ during base time was calculated from

$$\overline{Q} = \frac{C_A P A}{360 T_B} \qquad \text{(Equation 1)}$$

xi) The design peak $(\hat{Q})$ was the computed from

$$\hat{Q} = F\overline{Q} \qquad \text{(Equation 2)}$$

Where *F* is a constant

3.6 IMPACT IDENTIFICATION AND ANALYSIS

3.6.1 Impact Description

Describing a potential impact involved an appraisal of its characteristics, together with the attributes of the receiving environment. Relevant impact characteristics included whether the impact is:

- Adverse or beneficial;
- Direct or indirect;
- Short, medium, or long-term in duration; and permanent or temporary;
- Affecting a local, regional or global scale; including trans-boundary; and
- Cumulative (such an impact results from the aggregated effect of more than one project occurring at the same time, or the aggregated effect of sequential projects. A cumulative impact is "the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions").

Each of these characteristics is addressed for each impact. Consideration of the above gives a sense of the relative **intensity** of the impact. The **sensitivity** of the receiving environment was determined by specialists based on the baseline data collected during the study.

3.6.2 Impact Evaluation

Each impact is evaluated using the criteria listed in Table 3.2. To provide a relative illustration of impact severity, it is useful to assign numerical or relative descriptors to the impact intensity and receptor sensitivity for each potential impact. Each is assigned a numerical descriptor of 1, 2, 3, or 4, equivalent to very low, low, medium or high. The severity of impact was then indicated by the product of the two numerical descriptors, with severity being described as negligible, minor, moderate or major, as illustrated in Table 3.2. This is a qualitative method designed to provide a broad ranking of the different impacts of a project. Illustrations of the types of impact that were assigned the different grades of severity are given in Table 3.3.

Table 3.2: Classification of impact evaluation

	Classification	Description
1	Extent:	Evaluation of the area of occurrence/influence by the impact on the subject environment; whether the impact will occur on site, in a limited area (within 2 km radius of the site); locally (within 5 km radius of the site); regionally (district wide, nationally or internationally).
2	Persistence/Duration:	Evaluation of the duration of impact on the subject environment, whether the impact was temporary (<1 year); short term (1 – 5 years); medium term (5 – 10 years); long term (>10); or permanent.
3	Social Context / Sensitivity or Potential for Stakeholder Conflict:	Assessment of the impacts for sensitive receptors in terms of ecological, social sensitivity and such things as rare and endangered species, unusual and vulnerable environments, architecture, social or cultural setting, major potential for stakeholder conflicts. The sensitivity classification is shown below: ***High sensitivity:*** Entire community displacement, destruction of world heritage and important cultural sites, large scale stakeholder conflict, etc. ***Medium sensitivity:*** Displacement of some households, moderate level of stakeholder concern ***Low sensitivity:*** No displacements, no potential for stakeholder conflict.
4	Regulatory and Legal Compliance:	Evaluation of the impact against Local and International legislative requirements. ***High:*** Prohibition terms for specific activities/emissions. Major breach of regulatory requirements resulting in potential prosecution or significant project approval delays. ***Medium:*** Potential breach of specific regulatory consent limits resulting in non-compliance. ***Low:*** No breach of specific regulatory consent limits anticipated.
5	Overall Impact rating (Severity):	Using a combination of the above criteria, the overall severity of the impact was assigned a rating Severe, Substantial, Moderate, Minor and negligible. Refer to Table 5.2 for broad categories of impact for each rating. **Note:** These are just guidelines that will constitute professional judgement required in each individual case.

3.6.3 Impact Significance

Impact significance is determined from an impact significance matrix (Table 3.3) which compares severity of the impact with probability of its occurrence. Impact significance criteria are as follows:

- ***Very High (VH) and High (H):*** These denote that the impact is unacceptable and further mitigation measures must be implemented to reduce the significance. Shaded red in the Table 4.2.
- ***Medium (M):*** Impacts in this region are considered tolerable but efforts must be made to reduce the impact to levels that are as low as reasonably practical. Shaded yellow in the impact significance matrix.
- ***Low (L):*** Impacts in this region are considered acceptable. Shaded green.

Table 3.3: Determination of impact severity

			Sensitivity of receptor			
			Very low	Low	Medium	High
			1	2	3	4
Intensity of impact	Very low	1	1 Negligible	2 Minor	3 Minor	4 Minor
	Low	2	2 Minor	4 Minor	6 Moderate	8 Moderate
	Medium	3	3 Minor	6 Moderate	9 Moderate	12 Major
	High	4	4 Minor	8 Moderate	12 Major	16 Major

3.7 CUMULATIVE IMPACTS

Cumulative effects manifest when socio-environmental conditions are already or will be affected by past or reasonably probable future development or activities. The ESIA identified current, past and probable future similar activities that may compound socio-environmental conditions in the project area.

3.8 MITIGATION OF ENVIRONMENTAL IMPACTS

Mitigation measures are designed in order to avoid, reduce, mitigate, or compensate for adverse environmental and social impacts and inform the Environmental and Social Management Plan (ESMP).

4 ENVIRONMENT AND SOCIO-ECONOMIC BASELINE

4.1 INTRODUCTION

This section describes environmental and social baseline conditions of the area in which the proposed National Tuberculosis Reference Laboratory is to be located and which impacts may be experienced. The description is designed to enable identification of particularly sensitive receptors and resources around the proposed site that may be vulnerable to impacts arising from the project.

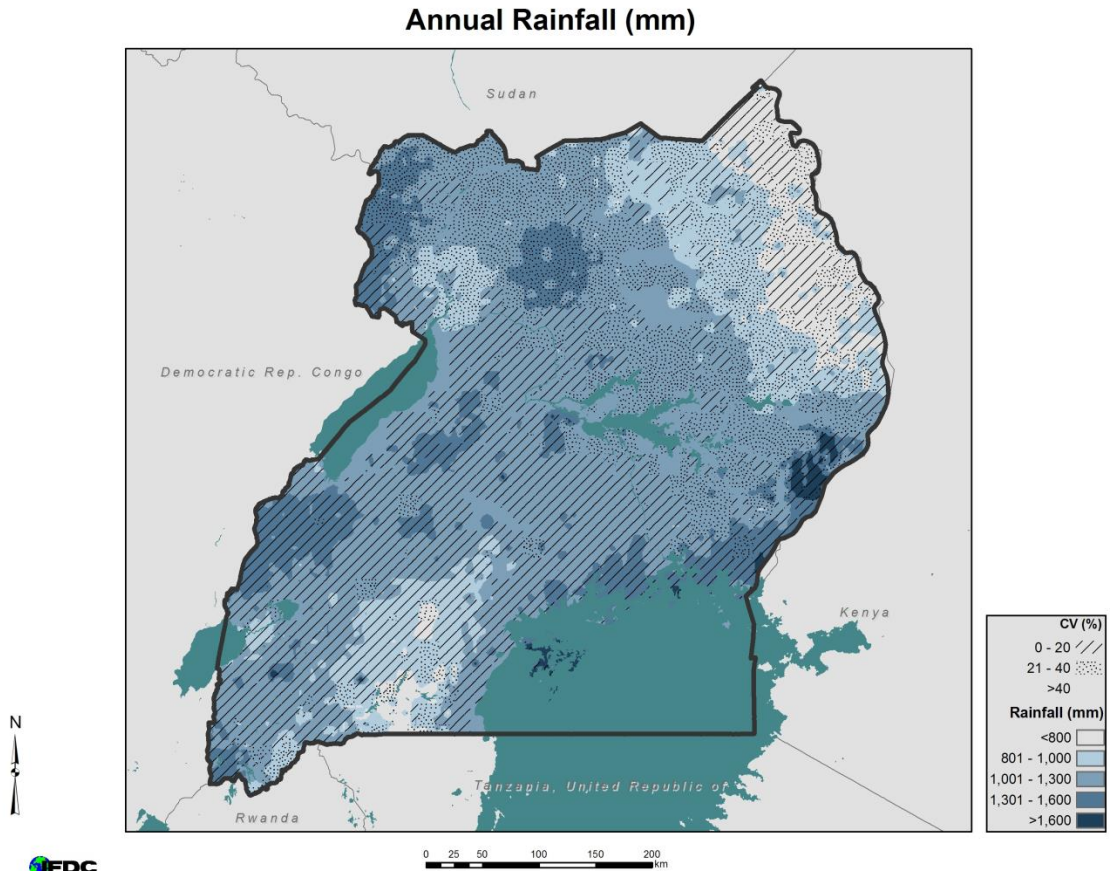
4.2 ENVIRONMENT PROFILE

4.2.1 Climate

Kampala features a tropical wet and dry climate. However, due to the City's higher altitudes, average temperatures are noticeably cooler than is typical for other cities with this type of climate. Kampala seldom gets very hot during the course of the year, the warmest month being January. The average temperature for Kampala is 21.9°C, with an annual range of 2.4°C with relative humidity of about 53 to 89 percent. Temperature peaks are experienced January to March and October to December, being higher in the former months. Kampala District exhibits a Bi-modal rainfall pattern receiving annual rainfall ranging between 1750 mm and 2000 mm (Figure 4.1) with peaks being March to May and September to November (Figure 4.2). There is a lengthy rainy season from August to December and another shorter rainy season that begins in February and lasts until June. However, the shorter rainy season sees substantially heavier rainfall per month, with the month of April typically seeing the heaviest amount of precipitation at an average of around 175 mm. A summary of climatic data is presented in Table 4.1.

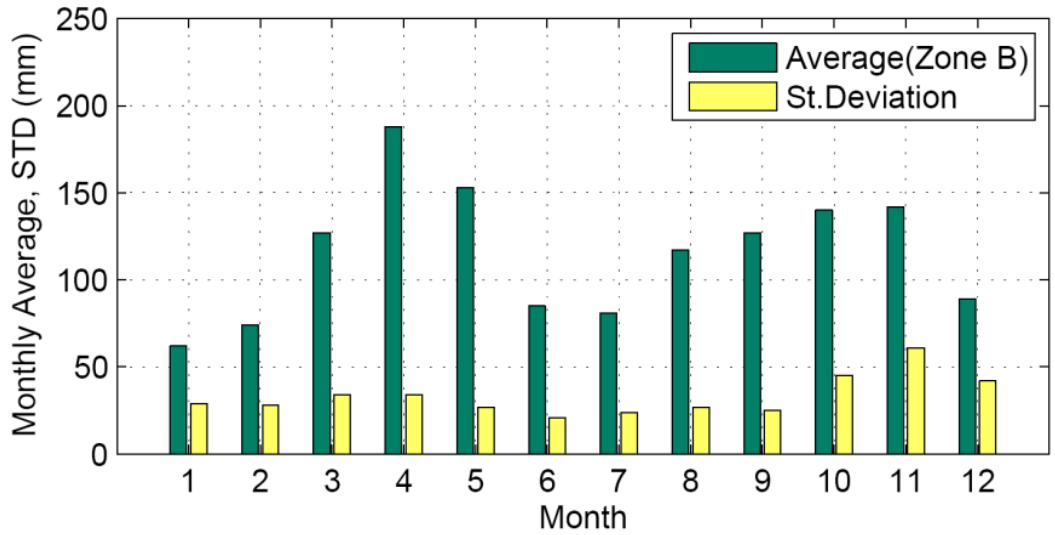
The Lake Victoria region to which the City belongs has generally lower amounts of sunshine than most of the country which makes the evaporation rate relatively low. As a result of high rainfall and low sunshine among other meteorological factors, the City shows a slight surplus or an almost even water balance.

The proposed site falls within climatic Zone B according to the Uganda Hydroclimatic Study (2001). The zone receives an average of 1,270 mm of rainfall which is principally spread over two rainy seasons: the long rains of March to May and the short rains of September to November (Figure 4.2).



Source: IFDC (www.amitsa.org)

Figure 4.1 Distribution of annual rainfall in Uganda



Source: Hydroclimatic study (2001)

Figure 4.2 Average Rainfall for the Luzira area

Table 4.1: Summary of climatic data of Kampala District

Climate data for Kampala													
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Record high °C (°F)	33 (91)	36 (97)	33 (91)	33 (91)	29 (84)	29 (84)	29 (84)	29 (84)	31 (88)	32 (90)	32 (90)	32 (90)	36 (97)
Average high °C (°F)	28.5 (83.3)	29.3 (84.7)	28.7 (83.7)	27.7 (81.9)	27.2 (81)	26.9 (80.4)	26.7 (80.1)	27.2 (81)	27.9 (82.2)	27.7 (81.9)	27.4 (81.3)	28 (82)	27.8 (82)
Daily mean °C (°F)	22.7 (72.9)	22.6 (72.7)	22.6 (72.7)	21.9 (71.4)	21.4 (70.5)	21 (70)	20.6 (69.1)	20.9 (69.6)	21.3 (70.3)	21.8 (71.2)	21.9 (71.4)	21.9 (71.4)	21.72 (71.1)
Average low °C (°F)	17.9 (64.2)	18.3 (64.9)	18.2 (64.8)	18.1 (64.6)	17.9 (64.2)	17.7 (63.9)	17.2 (63)	17.0 (62.6)	17.2 (63)	17.5 (63.5)	17.5 (63.5)	17.8 (64)	17.7 (63.9)
Record low °C (°F)	12 (54)	14 (57)	13 (55)	14 (57)	15 (59)	12 (54)	12 (54)	12 (54)	13 (55)	13 (55)	14 (57)	12 (54)	12 (54)
Rainfall mm (inches)	71 (2.8)	54 (2.13)	119 (4.69)	174 (6.85)	124 (4.88)	66 (2.6)	56 (2.2)	91 (3.58)	106 (4.17)	126 (4.96)	152 (5.98)	86 (3.39)	1,225 (48.23)
Average rainy days (≥ 1 mm)	7	8	12	16	13	8	7	9	11	15	14	10	130
% Humidity	66	68.5	73	78.5	80.5	78.5	77.5	77.5	75.5	73.5	73	71.5	74.5
Mean monthly sunshine hours	155	170	155	120	124	180	186	155	150	155	150	124	1,824
Source #1: World Meteorological Organization, Climate-Data.org *for mean temperatures*													

4.2.2 Air

Uganda's emission data is still lacking and there are trends in emissions. Like elsewhere in the country, motor vehicles are major emission sources for several air pollutants, including nitrogen oxides (NO_X), carbon monoxide (CO), particulate matter (PM), and hydrocarbons (HCs) (WHO, 2005).Steady growth in vehicular populations has put environmental stress on urban centres in various forms particularly causing poor air quality. The rapid growth in Kampala's population and a resurgence of economic activities has resulted in significant volumes of vehicular traffic and increased traffic congestion at key locations throughout the urban road network. Unfortunately these vehicles are not evenly distributed in the country; most of them are in Kampala, where they cause traffic congestion, resulting in increased fuel consumption. Because of prolonged traffic congestion, coupled within efficient carburetion, a lot of exhaust fumes are released into the environment. In addition to motor vehicles, motor cycles also contribute a significant portion to the emissions in Kampala. An estimated 918.2 tonnes of greenhouse gases were released in Kampala from vehicles in 1995 (Magezi, 1996). During strong winds dust is generated from the non-tarmacked roads, exposed bare ground, sidewalks along roads and dug out ditches for underground cables or pipes, etc.

Measurements carried out at selected locations at the proposed project area indicated an environment free from carbon monoxide, ammonia, nitrogen and nitrogen oxide emissions as indicated in Table 4.2.

Table 4.2: Air quality at the proposed project area

Easting	Northing	Particulates ($\mu g/m^3$)	LEL (%)	H_2 (ppm)	PID (ppm)	CO_2 (ppm)	O_2 (%)	Remark
461074	33445	59	2	1	12	0.03	20.9	Luzira Secondary School. Vehicular traffic
461377	33810	53	0	0	11.2	0.03	21	Kirombe town centre. Vehicular traffic.
461875	34291	35	3	0	5.3	0.03	20.9	Tender Age Nursery School. Vehicular traffic.
462069	34682	35	4	0	4.6	0.03	20.9	Butabika Hospital bus stop. Vehicular traffic.
461801	35415	35	1	0	2.8	0.03	20.9	Royal Palms Estate fence. Motorcycle traffic.

4.2.3 Noise

Like elsewhere in Uganda, and specifically in Kampala, the major sources of noise include humans, transportation, entertainment and industrial activities. The most common form of noise pollution is from transportation, principally motor vehicles. Bars and clubs also emit noise in excess of permissible levels and play loud music without soundproof facilities contrary to the law. Several residential areas have steadily been submerged by bars and nightclubs especially in Makindye, Nakawa and Rubaga divisions. Other sources are car alarms, office equipment, factory machinery, construction work, grounds keeping equipment, barking dogs, appliances, power tools, audio entertainment systems, etc. Noise levels recorded at the proposed project area are presented in Table 3.2.

The proposed site is adjoined by Butabika Hospital, residential and commercial establishments along the Butabika road. Daytime background noise levels ranged between 44.0 – 88.3dB (A) (Table 4.3).

Table 4.3: Levels of noise at the proposed project area

Easting	Northing	LAF_{Max}	LA_{eq}	LA_{90}	LA_{50}	Remark
268013	333908	66.4	52.4	47.5	51.5	Human conversation. Chirping birds. Road traffic.
268112	333967	54.3	45	42.5	44.0	Chirping birds. Human conversation. Crowing cockerel.
268056	334122	56.2	44.5	41.5	43.5	Human conversation. Aircraft overhead. Chirping birds.
268010	334056	68.1	48.7	44.5	47.5	Human conversation. Chirping birds
267293	333993	76.1	62.4	55.5	60.5	Vehicular traffic. Human conversation.

4.2.4 Light

Lighting is overwhelmingly produced from grid power. Kampala is well connected to grid power and most homesteads, industrial and commercial facilities use this power as a source for lighting. However, the proposed site has no buildings and hence minimal lighting during the night. The area is mostly dark at night except light from traffic on the road and from establishments (Butabika Hospital, commercial and residential buildings) in the vicinity.

4.2.5 Water Resources and Drainage

4.2.5.1 Water resources

Kampala Capital City is located to the north of Lake Victoria, the largest inland freshwater lake on Earth. The City is drained by numerous streams and has many wetlands associated with Lakes Victoria and Kyoga drainage systems. Wetlands cover approximately 16 percent of the City (KCCA 2012).The wetlands in Kampala are permanently waterlogged due to a combination of impeded drainage and year-round rainfall. The proposed project site is located at the peripheral of Lake Victoria shores with wetlands in its vicinity.

With regard to groundwater resources, in Uganda, the groundwater aquifers occur both in the overburden (regolith) and the fractured bedrock. These aquifers are limited in extent and their distribution is highly variable (Figure 4.3). The availability of groundwater depends on the prevailing hydrogeological conditions and the land use practices in the watersheds that recharge the aquifers; and the topographical conditions. As can be observed from Figure 3.3, the project site is located in an area with a total annual groundwater recharge varying from 225 to 250 mm per annum.

4.2.5.2 Drainage

The area that drains into the proposed site is dominated by Butabika Hospital, for which the built up area is about 35 percent (Figure 4.4). The total drainage area is about 0.2 km^2 with an average catchment slope of 9.7 percent. The proposed site is mainly dominated by undisturbed vegetation with some seasonal agricultural plots in some places. As such, the drainage of the proposed site is via natural pathways through the vegetation with significant infiltration.

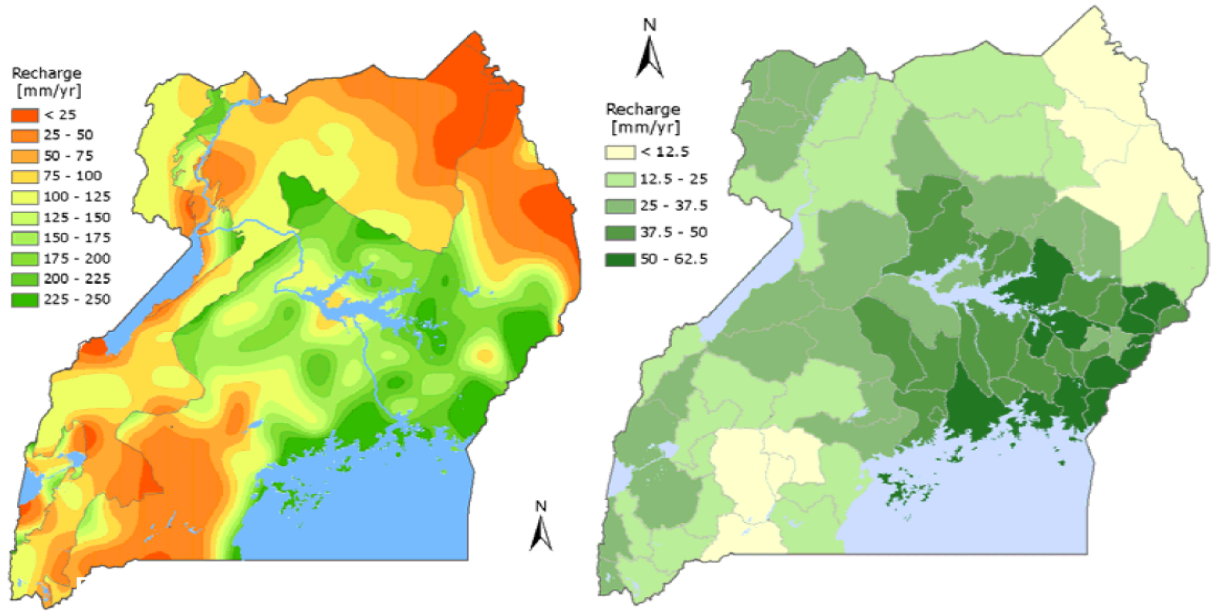


Figure 4.3 Left: Estimated total annual groundwater recharge in an average year. Right: Estimated sustainable available groundwater resource per year

Photo 4.1: Drainage channel with water supply lines running from Butabika Hospital and through the proposed site

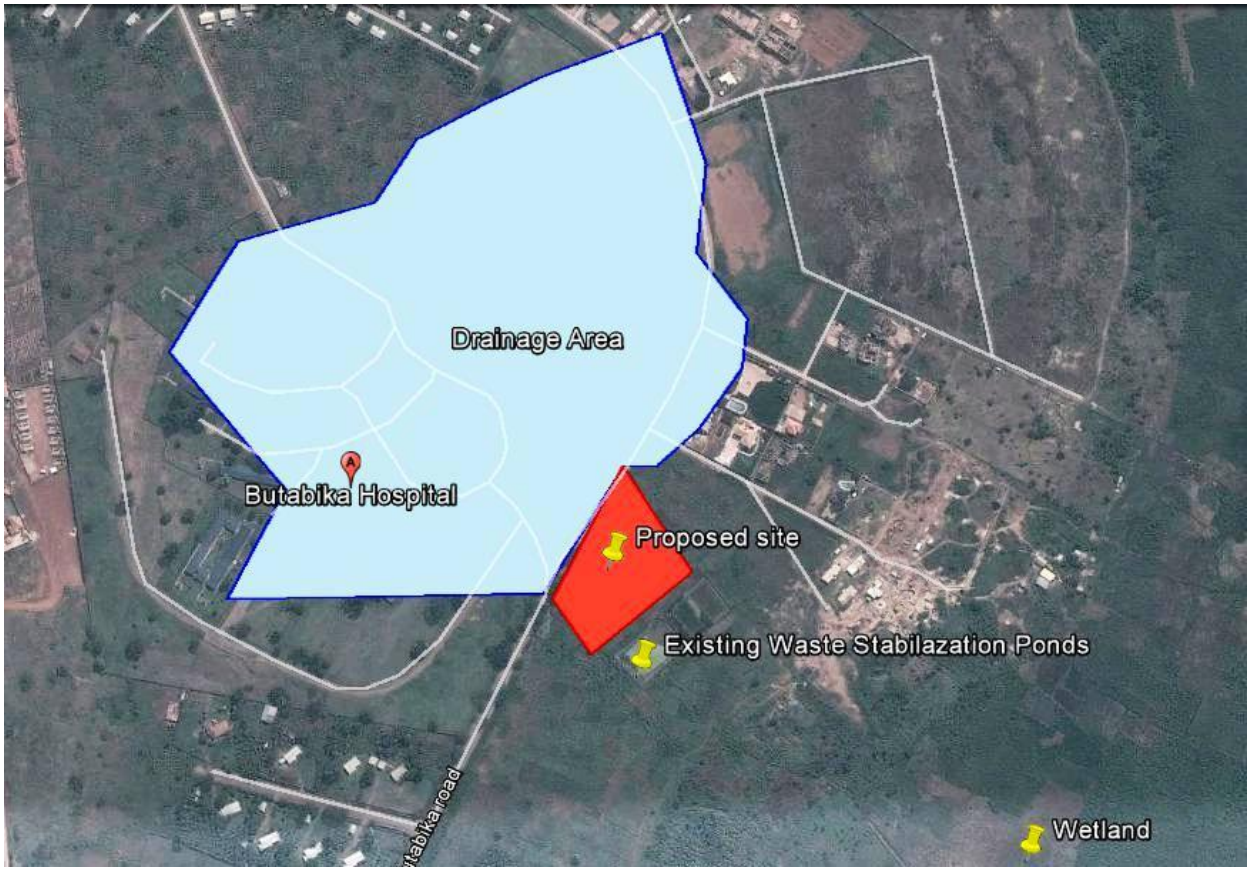


Figure 4.4 Drainage area

Off-site flood assessment: The upstream catchment area that is drained towards the proposed site is about 20 ha sloping at about 10%. The watershed is dominated by Butabika Hospital which is mainly made the hospital structures interspaced by extensive lawns. The runoff from built-up areas is expected to be very high (approaching 100%) while runoff from the vegetation dominated areas is expected to be much lower due to infiltration and other processes. Table 4.4 shows the computation of the 10, 25, 50, 100, 500 year flood estimates using the TRRL methodology. The 10 year storm rainfall was estimated at 71 mm rising to 155 mm for the 500 year flow. The peak flow for a 10 year return period was estimated at 2.7 m^3/s rising to about 5.9 m^3/s for the 500 year flood. However, as noted in **Error! Reference source not found.**, there is a 96% risk associated with the 10 year flow for a project life of 30 years while the risk associated with the 500 year flow is just 6%. Ideally, the off-site runoff should not be a challenge for the proposed project if proper drainage had been provided for the Butabika-Kirombe road. However, from observations during the field visit, there was no evidence of this. Therefore, it might be necessary to provide for the drainage of this water around the site.

Table 4.4: Off-site flood estimates – stormwater drainage towards proposed site

Parameter	***Abbreviation***	***Return period (n)***				
		10 yrs	***25 yrs***	***50 yrs***	***100 yrs***	***500 yrs***
Area (km2)	*A*	0.20	0.20	0.20	0.20	0.20
Catchment slope	*Sr*	9.7%	9.7%	9.7%	9.7%	9.7%
Slope class	*S*	4	4	4	4	4
Surface cover flow time (hr)	*Ts (hr)*	0	0	0	0	0
Soil class	*I*	3	3	3	3	3
Basic runoff coefficient	*Cs*	45%	45%	45%	45%	45%

Parameter	Abbreviation	Return period (n)				
		10 yrs	25 yrs	50 yrs	100 yrs	500 yrs
Land use factor	*CL*	1.0	1.0	1.0	1.0	1.0
Catchment wetness factor	*Cw*	0.75	0.75	0.75	0.75	0.75
Percentage of runoff	*Ca*	34%	34%	34%	34%	34%
Base time (hr)	*TB*	0.8	0.8	0.8	0.8	0.8
2yr, 24 hr rainfall (mm)		70	70	70	70	70
Return Period (Years)		10	25	50	100	500
10:2 year ratio		1.64	1.64	1.64	1.64	1.64
n:10 year ratio (n=return period)		1.00	1.20	1.34	1.64	2.19
n:2 year ratio		1.65	1.96	2.20	2.68	3.59
Constant b	*b*	0.3	0.3	0.3	0.3	0.3
Constant n	*n*	0.95	0.95	0.95	0.95	0.95
Area reduction factor	*ARF*	0.98	0.98	0.98	0.98	0.98
Rainfall ratio	*RR*	0.63	0.63	0.63	0.63	0.63
n-yr 24-hr storm depth (mm)	*mm*	71.2	84.8	95.1	116.0	155.3
Average flow during base time (m^3/s)	*m^3/s*	1.6	1.9	2.1	2.6	3.5
Peak factor		1.7	1.7	1.7	1.7	1.7
Peak flow for given return period (m^3/s)	***m^3/s***	**2.7**	**3.2**	**3.6**	**4.4**	**5.9**

On-site flood assessment: Implementation of the project will result in changes to the flow generation characteristics of the proposed site. Considerable parts of the site will be turned into impervious surfaces, thereby resulting in more peaked flow. The proposed site has an area of about 1.3 ha sloping at about 11.3 percent. The current vegetation is mainly composed of thick bushes with scattered trees. Changes due to construction of the proposed project will result in reduction of permeability and an increase in runoff intensity. Table 4.5 shows the computation of the 10, 25, 50, 100, 500 year flood estimates using the TRRL methodology. The 10 year storm rainfall was estimated at 39 mm rising to 85 mm for the 500 year flow. The peak flow for a 10 year return period was estimated at 1.0 m3/s rising to about 2.1 m3/s for the 500 year flood. It is necessary for the proposed project to provide for appropriate drainage of the stormwater.

Table 4.5: On-site flood estimates – stormwater generation on proposed site

Parameter	Abbreviation	Return period (n)				
		10 yrs	25 yrs	50 yrs	100 yrs	500 yrs
Area (km2)	*A*	0.013	0.013	0.013	0.013	0.013
Catchment slope	*Sr*	11.5%	11.5%	11.5%	11.5%	11.5%
Slope class	*S*	4	4	4	4	4
Surface cover flow time (hr)	*Ts (hr)*	0	0	0	0	0
Soil class	*I*	2	2	2	2	2
Basic runoff coefficient	*Cs*	57%	57%	57%	57%	57%
Land use factor	*CL*	1.5	1.5	1.5	1.5	1.5
Catchment wetness factor	*Cw*	1.0	1.0	1.0	1.0	1.0
Percentage of runoff	*Ca*	86%	86%	86%	86%	86%
Base time (hr)	*TB*	0.2	0.2	0.2	0.2	0.2
2yr, 24 hr rainfall (mm)		70	70	70	70	70
Return Period (Years)		10	25	50	100	500
10:2 year ratio		1.64	1.64	1.64	1.64	1.64
n:10 year ratio (n=return period)		1.00	1.20	1.34	1.64	2.19

Parameter	*Abbreviation*	*Return period (n)*				
		10 yrs	*25 yrs*	*50 yrs*	*100 yrs*	*500 yrs*
n:2 year ratio		1.65	1.96	2.20	2.68	3.59
Constant b	*b*	0.3	0.3	0.3	0.3	0.3
Constant n	*n*	0.95	0.95	0.95	0.95	0.95
Area reduction factor	*ARF*	0.99	0.99	0.99	0.99	0.99
Rainfall ratio	*RR*	0.34	0.34	0.34	0.34	0.34
n-yr 24-hr storm depth (mm)	*mm*	39.1	46.6	52.2	63.7	85.2
Average flow during base time (m3/s)	*m3/s*	0.6	0.7	0.8	0.9	1.2
Peak factor		1.7	1.7	1.7	1.7	1.7
Peak flow for given return period (m^3/s)	***m^3/s***	**1.0**	**1.1**	**1.3**	**1.6**	**2.1**

Impact of nearby wetland on proposed site: The global Aster GDEM dataset (http://asterweb.jpl.nasa.gov/gdem.asp), a longitudinal profile running from Butabika Hospital through the proposed site (**Error! Reference source not found.**) to the wetland was prepared and is shown in **Error! Reference source not found.**. The mean elevation at the proposed site is about 1164 m asl (above sea level) while that at the wetland is about 1134 m asl. Therefore, the proposed site is about 30 m above the wetland. The accuracy of the ASTER GDEM data is given as about 3 m. The worst case scenario is if the mean elevation at the proposed site is overestimated by 3 m while the wetland elevation is underestimated by the same amount. This would imply that the difference in elevation between the proposed site and the swamp is about 24 m.

The elevation of the swamp is controlled by water level variations in Lake Victoria. Over the course of the 20th century, the water levels in Lake Victoria varied by up to 3 m in response to rainfall variations in the basin (http://www.eoearth.org/article/Lake_Victoria). The 3 m change was recorded in the early 1960s and there have been many studies carried out to try and understand its causes. However, in the context of this study, a 3 m increase in lake levels would imply that the elevation of the proposed site would still be at least 21 m above the wetland elevation.

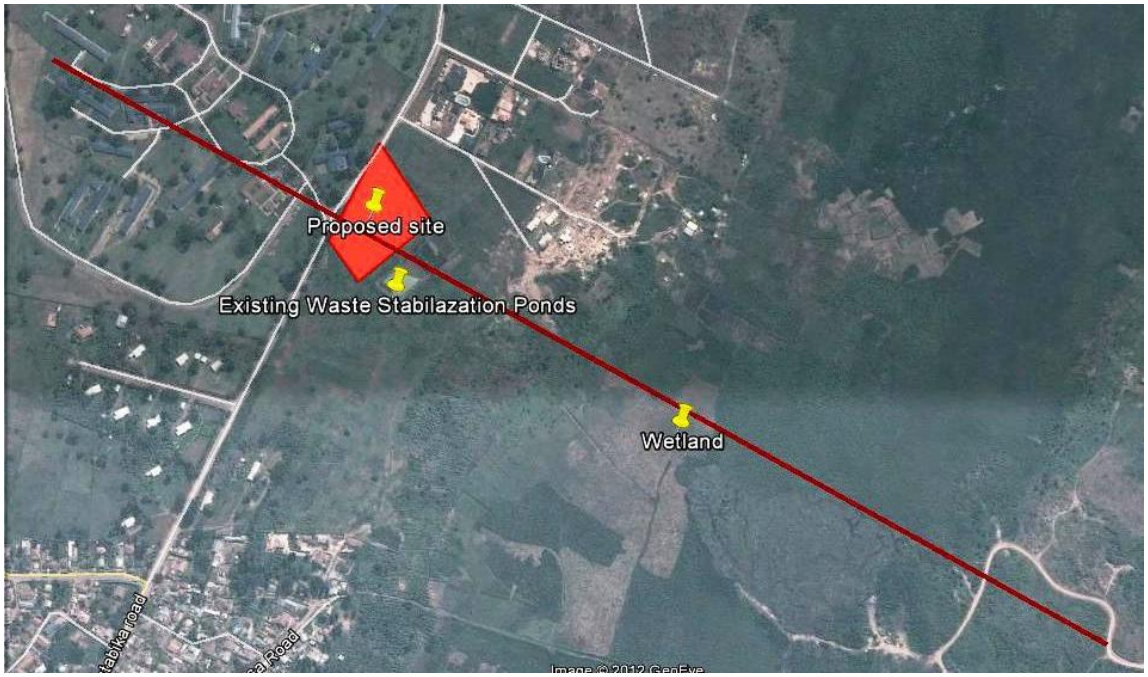


Figure 4.5 Line along longitudinal section (red line)

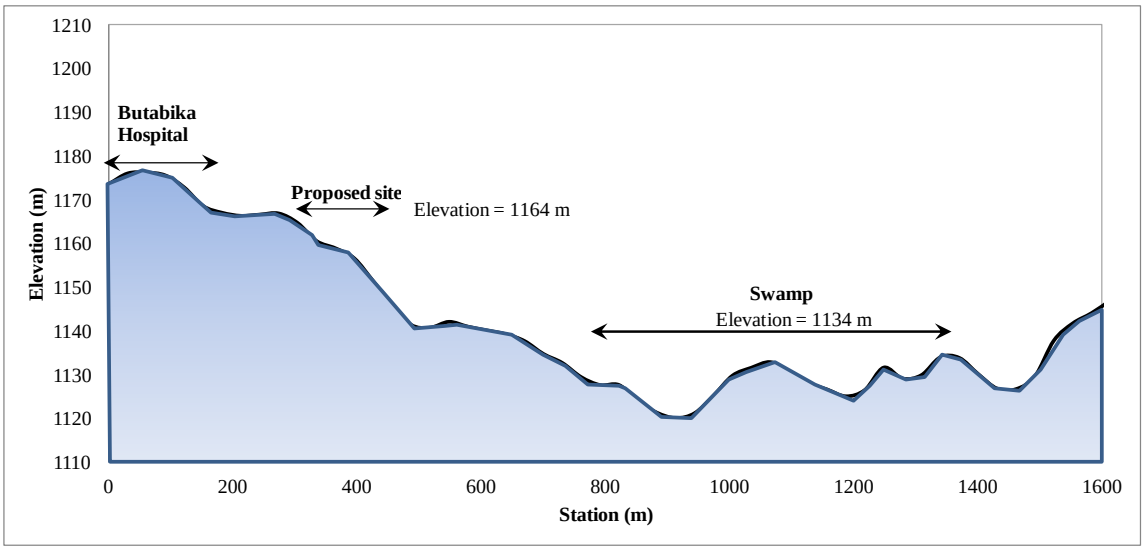


Figure 4.6 Longitudinal profile through proposed site

From this assessment, it can be summarised:

- Variations in mean wetland elevation will not have any impact on developments at the proposed site.

- **Off-site flood estimates:** The estimates of storm rainfall and peak runoff for different return periods and risk levels that originates upstream of the proposed site but potentially draining through the site are summarised in Table 4.6.

Table 4.6: Storm rainfall and peak runoff from outside proposed site

T (years)	Risk level (for 30 year project life)	Rainfall storm (mm)	Peak flow (m3/s)
10	96%	115.2	2.7
25	71%	137.3	3.2
50	45%	154.0	3.6
100	26%	187.8	4.4
500	6%	251.4	5.9

- **On-site flood estimates:** The estimates of storm rainfall and peak runoff that are generated in the proposed site for different return periods and risk levels are summarised in Table 4.7. The conveyance of these flows should be considered in the design of the drainage facilities for the site.

Table 4.7: Storm rainfall and peak runoff generated at proposed site

T (years)	Risk level (for 30 year project life)	Rainfall storm (mm)	Peak flow (m3/s)
10	96%	115.2	1.0
25	71%	137.3	1.1
50	45%	154.0	1.3
100	26%	187.8	1.6
500	6%	251.4	2.1

Effect of nearby wetland on proposed site: Assessment of elevation differences between the proposed site and the wetland as well as historical variations in Lake Victoria water levels showed that developments at the proposed site would not be affected by variations in water levels in the swamp. In the worst case scenario, the elevation of the proposed site would be at least 21 m above the elevation of the wetland.

4.2.6 Geology, Geomorphology and Soils

The topography of the City is characterised by a series of low lying hills with flat hill tops typical of the Central Region of Uganda (Hickman and Dickens, 1981). Owing to alluvial aggregation, low gradient and frequent local tilting, many valley floors have become seasonal or permanent swamps. For Nakawa Division, in which the project site is located, the topography is characterized by flat-topped hills divided by shallow valleys forming swamps most of which flow into Lake Victoria. The streams are characterized by low gradient and comparatively broad valley floors.

The soil geology from which the soils of the corridor formed belongs to the Basement Complex (Figure 4.7). It consists of a variety of metamorphic largely granitoid rocks, acid gneisses, schists and sand stones. Most of these rocks are highly weathered. No geologic structures such as faults are expected on the proposed site.

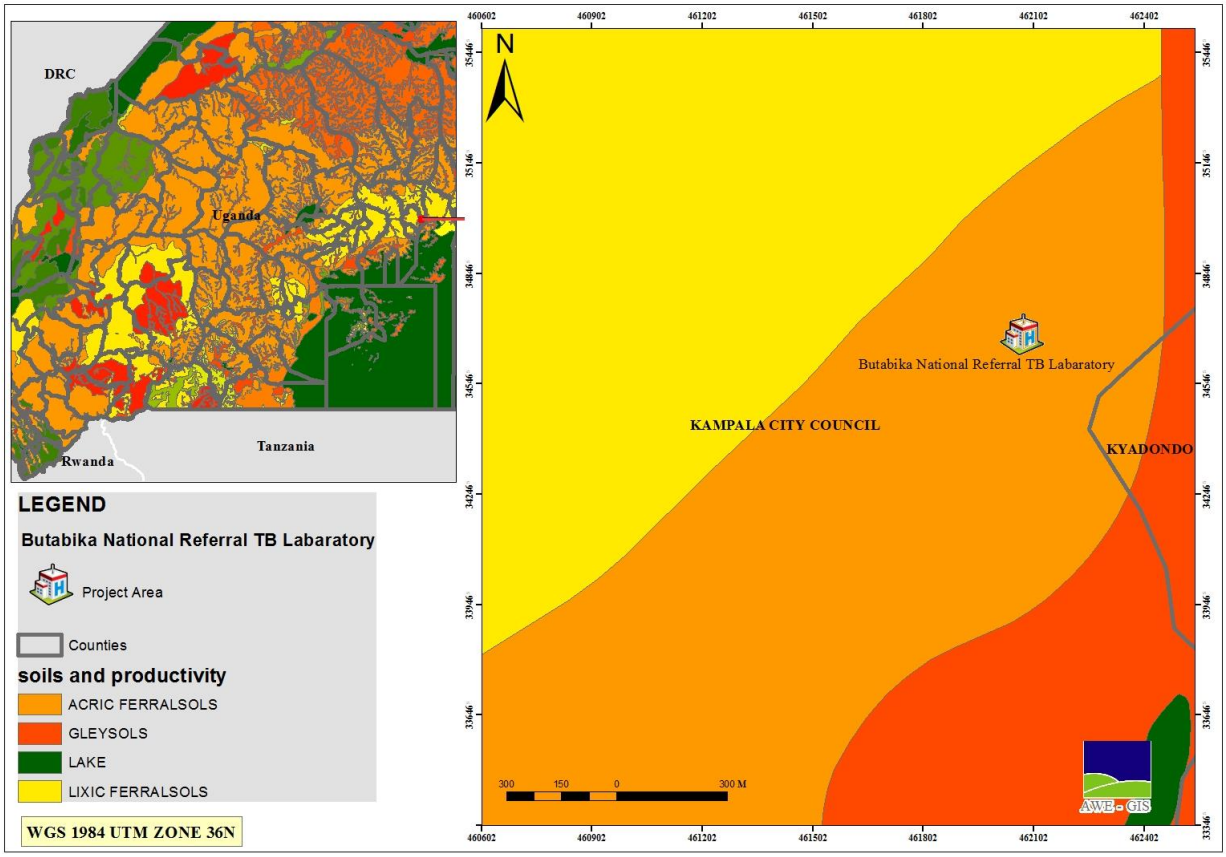


Figure 4.7 Types of soils at the project

4.2.7 Flora/ Vegetation and Fauna

Kampala has numerous wetlands covering 16 per cent of the district (Wetland Newsletter, 1996). The major wetlands are associated with Lake Victoria and Kyoga drainage systems. They include Lubigi, Kiwembo, Nakivuubo, Nsooba-Bulyera, Nalukolongo, Mayanja, Nabisasiro, Kansanga, Walufumba-Nalubega and Kirombe swamp systems. Many wetlands around Kampala city have been drained and turned into agricultural areas or developed for commercial, industrial and sometimes residential purposes. The unclaimed swamps around Kampala city are covered by both grasses and sedges. The most common species are papyrus including, *Miscanthidiumvioleceum, Phragmitesmaurtianus, Cyperuslatifolius* and *Typhaaustralis*.

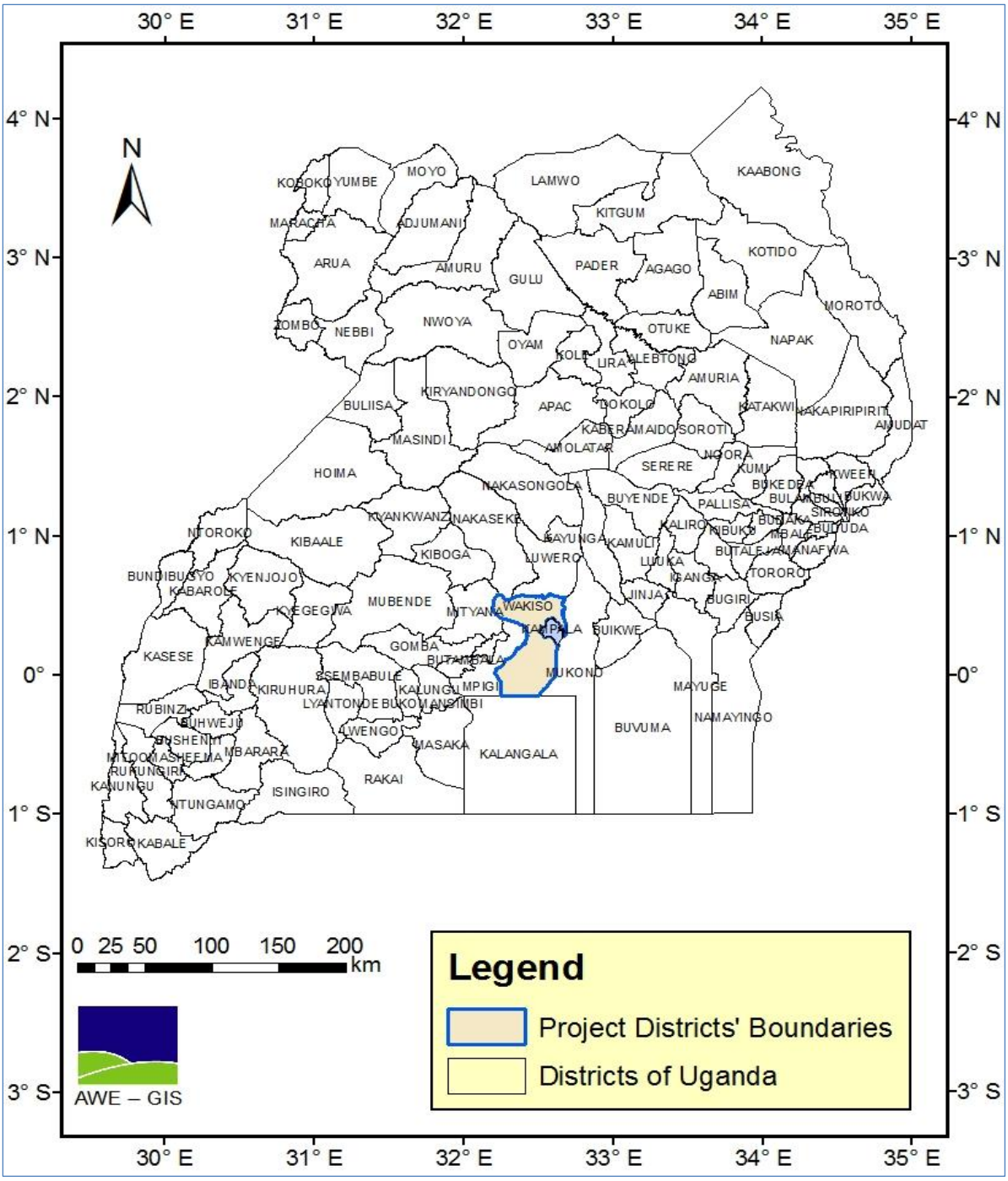
Only a small proportion of the vegetation in Nakawa Division can be considered as natural. Vegetation on hills which was originally shrubs and forests has been modified by residential development. The proposed site is located at the peripheral of the Kirombe swamp system. No fauna of conservation concern was identified at the site, obviously due to activities such as gardening that rid this location of pristine habitat conditions.

Photo 4.2: Subsistence gardening at the proposed project site

4.3 SOCIO-ECONOMIC AND LAND USE ACTIVITIES

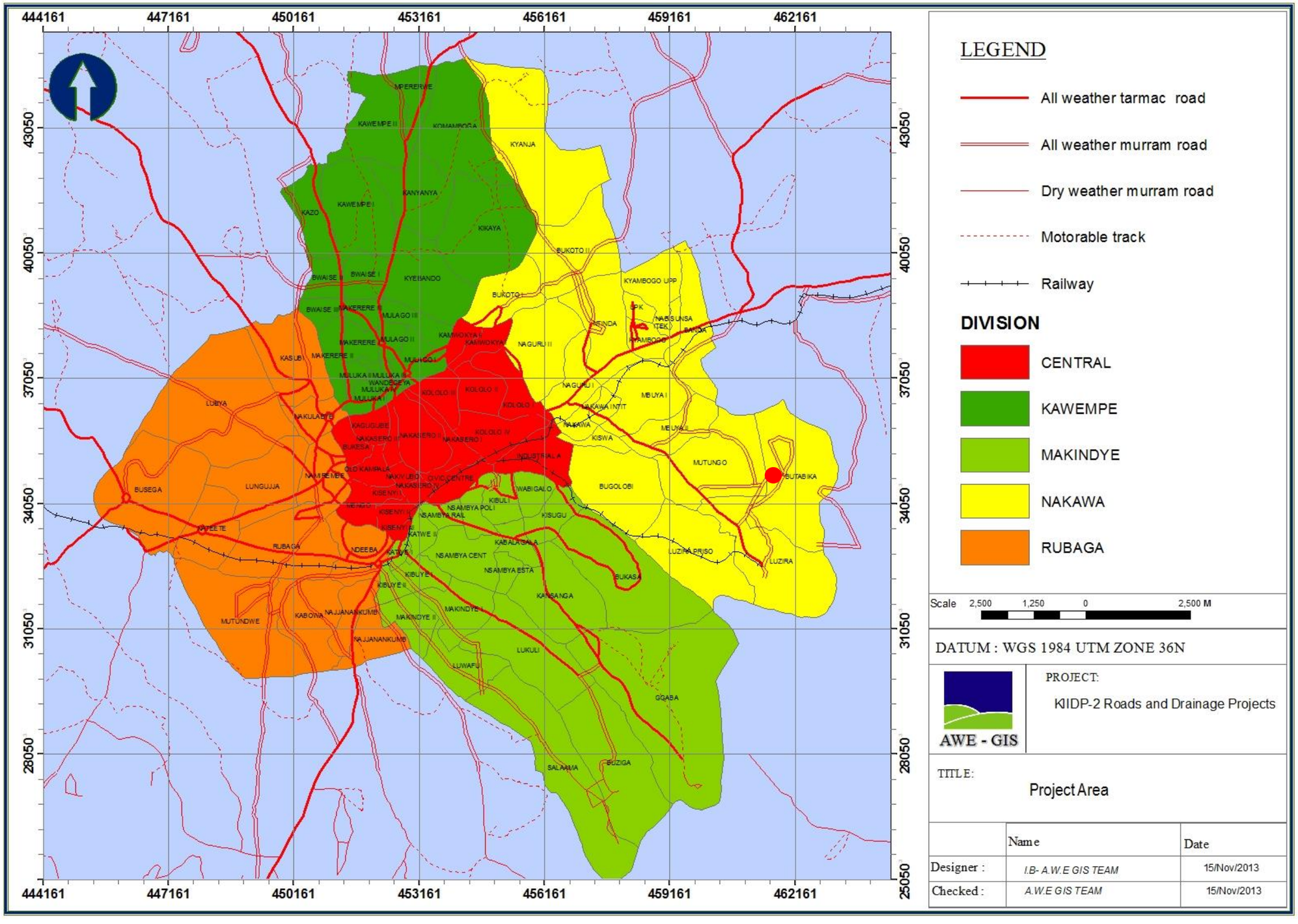
4.3.1 Administrative Structure

The project area is in Kampala District which is located at the centre of Uganda's "urbanised" corridor (Figure 4.8). The District is more developed in terms of infrastructure, urbanisation, industrialisation, commerce and trade than other districts within Uganda. However, as it develops, greater industrialisation and urbanisation, the district is experiencing environmental stresses including habitant destruction, pollution, occupational health risks, deforestation and wetland destruction. The District is divided into five administrative divisions of Central, Nakawa, Makindye, Kawempe and Rubaga (Figure 4.9). The five divisions are further subdivided into 99 parishes and 802 villages/cells. Kampala City, which has a district status, has a City Council Authority (Kampala City Council Authority – KCCA) comprising of 30 councillors with the Executive Director, Town clerk and chaired by the Lord Mayor, who is the political head of the District. The proposed project site is located in Nakawa Urban Council.



Source: Districts of Uganda, 2010

Figure 4.8 Location of Kampala District



LEGEND

All weather tarmac road

All weather murram road

Dry weather murram road

Motorable track

Railway

DIVISION

CENTRAL

KAWEMPE

MAKINDYE

NAKAWA

RUBAGA

Scale 2,500 1,250 0 2,500 M

DATUM : WGS 1984 UTM ZONE 36N

AWE - GIS

PROJECT:
KIDP-2 Roads and Drainage Projects

TITLE:
Project Area

	Name	Date
Designer :	*I.B- A.W.E GIS TEAM*	15/Nov/2013
Checked :	*A.W.E GIS TEAM*	15/Nov/2013

Figure 4.9 Kampala City and its five administrative divisions

4.3.2 Land Use Activities

The principle land use in Kampala Capital City is mainly residential. Small-scale agriculture is widely distributed in exiting residential areas as well periphery areas, which may not have been transformed into other uses. Vacant land constitutes less than 10 percent of the Kampala City's landmass, with another 7 percent being wetlands. Employment associated uses and public services and facilities account for 10 percent and 6 percent of Kampala City's landmass, respectively. Forests have been virtually eradicated from the Kampala City with only 58 Ha left. Detailed land use in Kampala by area of occupancy is presented in Table 4.8 and Figure 4.10.

There is a multiplicity of economic activities in Kampala, as with any urban area, a substantial number of people are engaged in small-scale enterprises as a source of livelihood. The predominant occupation is trading which accounts for over 95 percent of the "self-employed" people. Nakawa Urban Council is endowed with industrial establishments that are a source of employment as well as goods. Over the years, Nakawa which was mostly covered by wetlands has grown into a bustling industrial area with small, medium, large industries and higher education institutions.

Table 4.8: Land use coverage in Kampala

Field	Land use category	Area (Ha)	Percentage coverage
Employment	Small scale and informal commercial activities	441	2.49
	Formal commercial offices	331	1.87
	Government	196	1.11
	Industrial	737	4.16
	Mixed use	230	1.30
	Quarry	57	0.32
	Transport	53	0.30
	Utilities	27	0.15
Peri Urban	Peri urban	204	1.15
Public	Community facilities	875	4.94
	Park and Sport	91	0.51
Residential	Apartments/ flats	60	0.34
	High Income	2077	11.73
	Low Income	5180	29.25
	Middle Income	2573	14.53
	Very low income	1467	8.28
Undeveloped	Informal agriculture	265	1.50
	Forest	58	0.33
	Inland water	1	0.01
	Vacant land	1531	8.65
	Wetland	1254	7.08
TOTAL		**17708**	**100.0**

Source: KCCA, 2012

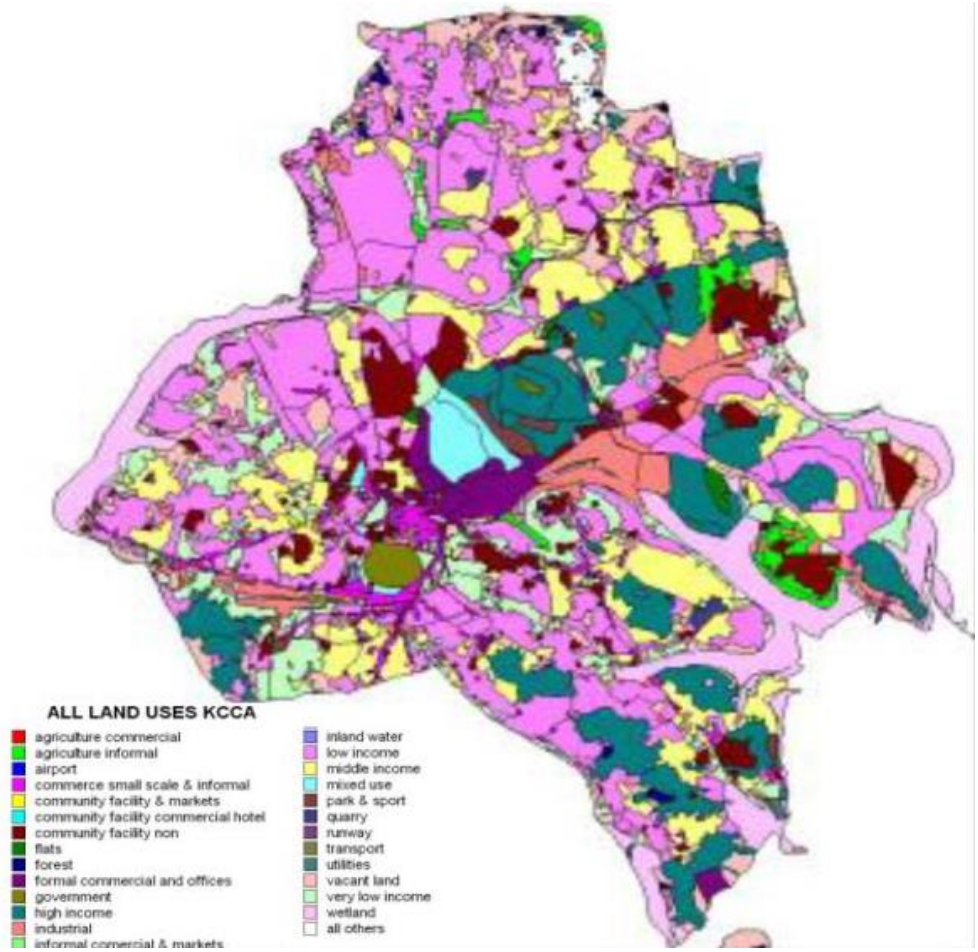


Figure 4.10 Kampala Land Use, 2011

4.3.3 Social and Demographic Structure

4.3.3.1 Population

The regional distribution of the population shows that Eastern region had the highest proportion (30%) while Northern had the lowest (20%) (Table 4.9). There was a decline in the proportion of the population in Central region from 29 to 27 percent and Western from 26 to 24 percent while in Eastern region it increased from 25 to 30 percent when compared to 2005/06. Northern region remained more or less the same over the two survey periods. Kampala Capital City is located in the central region. According to the 2002 national census figures, Kampala then had a population of approximately 1,189,100. The Uganda Bureau of Statistics estimated the population of Kampala in 2011 and 2012 as indicated in Table 4.10 while a break-down of this population by administrative division is presented in Table 4.11. Estimated population density for Kampala metropolitan area is presented in Figure 4.11.

Kampala's population has been formed by continuous waves of immigration. As such, the City's society has and is constantly struggling to climb the socioeconomic ladder, and socio-economic mobility is neither guaranteed nor always linear. Kampala's population is young, albeit older than the national averages, with an estimated median age of 23 and an estimated average age of 24 years. Kampala has an extremely low Dependency Ratio 9 of 45 dependants to 100 persons of economic activity age, largely a result of in-migration from rural areas. The 20-29 age group accounts for over one quarter of

Kampala's population indicating both the scale and the impact of in-migration of young adults from the rural areas.

Table 4.9: Distribution of population by region (%)

Region	2005/06	2009/10
Central	29.2	26.5
Eastern	25.2	29.6
Northern	19.7	20.0
Western	25.9	24.0

Source: 2012 Statistical Abstract

Table 4.10: Projected population of Kampala

Year	1991	2002	2011	2012
Population	774,241	1,189,142	1,659,700	1,723,300

Source: 2012 Statistical Abstract

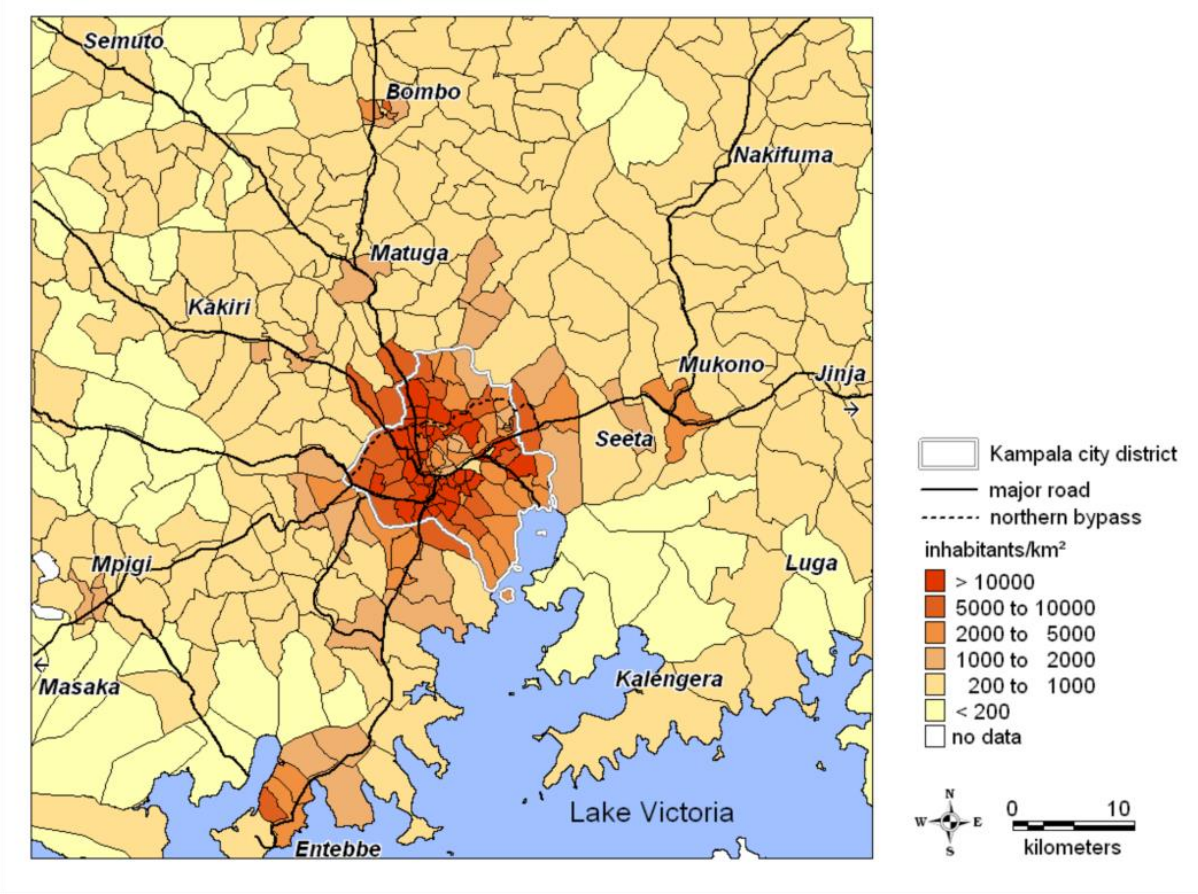
Table 4.11: Population of Kampala population by division and sex

	House hold	Male	Female	Total	Percent of Total
Kampala Capital City	306,178	569,075	620,067	1,189,142	3.8
Central Division	22,774	44,001	44,093	88,094	3.7
Kawempe Division	68,952	123,502	138,663	262,165	3.7
Makindye Division	78,623	145,556	157,615	303,171	3.8
Nakawa Division	59,117	118,098	122,526	240,624	3.9
Rubaga Division	76,712	137,918	157,170	295,088	3.8

Source: Uganda Bureau of Statistics, 2002

4.3.3.2 Household characteristics

Nationally, it is estimated that there are 5.28 million housing units for the 2008 total population of 29.6 million people. Approximately 23 percent of households are thought to be female headed, though this is higher at 28 per cent in urban areas. In 2009/10, the average household size in Uganda was estimated at 5.0. Apart from Central region where the average household size decreased from 5 to 4, the rest of the regions remained the same when compared to 2005/06. The household size in the central region has consistently been lower than in other regions over the three surveys. The proportion of female headed households in Central region remained more or less the same. The average household size in the central region during survey carried out in 2009/10 was 4.1 while the proportion of households headed by females stood at 29.7 percent. The national average household size and the proportion of female headed households were 5.0 and 30.1 percent, respectively. The average household size in Kampala is 3.8 lower than the national household size.



Source: Vermeiren et al., 2012

Figure 4.11 Estimated population density (2010) for Kampala metropolitan area at parish level

4.3.4 Education

Basic education is a fundamental human right and a component of wellbeing. Education is also a key determinant of the lifestyle and status an individual enjoys in a society. Studies have consistently shown that educational attainment has a strong effect on the behaviour and attitude of individuals. In general, the higher the level of education an individual has attained, the more knowledgeable they are about the need and use of available facilities in their communities. Kampala has different types of education institutions that include:

- Government-aided Primary schools and Secondary schools;
- Private schools (both Primary and Secondary); and,
- Community schools, which include specialist institutions such as schools for Special Needs Education.

There are an estimated 1,500 schools in Kampala. These include over 1,250 Primary schools and over 250 Secondary schools. Primary pupils generally attend school in their residential neighbourhood, whilst secondary pupils tend to travel, generally to or within the Kampala City. As is to be expected schools in Kampala are larger than the national average, secondary schools are significantly larger than primary schools but in comparative terms remain relatively small and private schools are significantly smaller than public schools. The number of different categories of schools per division is presented in Table 4.12.

Table 4.12: Number of the different categories of schools per division

Division	Pre-Primary Schools	Primary Schools	Secondary Schools	Tertiary School	Schools For SNE	Total
Rubaga	201	273	83	13	04	574
Makindye	173	213	65	04	-	455
Kawempe	194	217	40	-	01	452
Central	37	50	27	08	-	122
Nakawa	115	119	33	-	-	267
Total	**720**	**872**	**248**	**25**	**05**	**1870**

Source: District Development Plan 2007/08 – 2009/10

The percentage distribution of household members (males and females) aged 10 years and above by level of literacy is presented in Table 4.13 while the percentage distribution of persons aged 6 – 24 years by schooling status and selected background characteristics is given in Table 4.14. The results show that the literacy rate was still higher than in the central region and the country at large from surveys carried out in period 2005/06 and 2009/10. The education system in Kampala is of major economic significance to the City. Education is estimated to provide well over 100,000 jobs (academic staff, teachers and support staff) and contributes upwards of US$ 700 million annually to the local economy. Kampala is also the centre of higher education in Uganda. It hosts Makerere University, Kyambogo University, Makerere Business School, Kampala International University and Gaba Seminary amongst others.

Table 4.13: Distribution of literate persons aged 10 years and above by region (%)

Region	2005/06		2009/10	
	Male	Female	Male	Female
Kampala	92	90	95	90
Central	82	78	84	81
Uganda	76	63	79	66

Source: District Development Plan 2007/08 – 2009/10

Table 4.14: Percentage distribution of persons aged 6 – 24 years by schooling status (2009/10)

	Never attended	Attended school in the past	Attending
Kampala	4.9	33.5	61.6
Central	8.0	24.6	67.5
Uganda	9.8	21.2	69.0

Source: District Development Plan 2007/08 – 2009/10

4.3.5 Health

Life in Kampala is fraught with health risks: endemic diseases associated with the wetlands, malaria in particular but also bilharzia and diarrhoea; contagious diseases associated with poor sanitary conditions compounded by the warm climate; road safety and work related accidents; HIV-AIDS; and more (KCCA, 2012).

The health system in Uganda is hierarchical with outreach health workers in the field at the lowest rung to Mulago Hospital in Kampala, the primary referral hospital in the country. In Kampala, health services are widely distributed in the KCCA, particularly the in Inner City and still reasonably accessible in KCCA Outer Suburbs. Specialised capacities are generally concentrated in and around the City Centre. Health services, apart from the main hospital and higher order HCs, are largely private sector (Table 4.15). As per financial 2009/10, the number of health facilities and health indicators in Kampala were as presented in Table 4.16 and Table 4.17, respectively.

Table 4.15: Ownership of health facilities by category in Kampala, 2011

Health Centre/ Hospital	Government/ KCCA (%)	NGO/ CBO (%)	Private (%)
HC II	0.3	0.4	99
HC III	13	14	73
HC IV	38	15	46
HC V	14	29	57
Hospital	36	21	43

Source: District Development Plan 2007/08 – 2009/10

Table 4.16: Health facilities within Kampala City

Category of Health Facilities						
Division	Hospital	KCC	Health Centre	Maternity Centre	Nursing Home	Private Clinic
Central	5	3	6	-	108	104
Kawempe	1	2	-	-	169	74
Makindye	2	1	-	-	186	72
Nakawa	5	2	10	-	121	100

Source: District Development Plan 2007/08 – 2009/10

Table 4.17: Health indicators

Health Indicators	Kampala	National
Total fertility rate	5.21	6.9
Teenage pregnancy	18.5	16.6
Below 5 years mortality ratio	129.0	147.0
Infant mortality ratio	83.0	
Crude death rate	17.3 per population per year	
Life expectancy rate	56.4years	
Mother mortality rate		
Cause for specific mortality rates.	Malaria (15%)	
	Respiratory tract infection (9.9%) AIDS (8.1%)	
		Diarrhoea Diseases (12.3%)

Source: District Development Plan 2007/08 – 2009/10

The state of most HC and even hospital facilities is by and large poor, indeed sub-standard with sanitation and hygiene constituting serious challenges and patient comfort and convenience largely an unknown concept. Medical waste disposal is effectively only organised in the hospitals. In HCs medical waste is generally burnt on-site.

In addition, public sector facilities in Uganda suffer from stringent budgetary constraints and in Kampala at least severe staffing problems given remuneration levels (in effect Kampala is investing in and training medical personnel who then cannot afford to work and provide services in the City).

According to the Health Sector Strategic Plan (HSSP III), communicable diseases such as malaria, HIV/AIDS and TB account for over half of the total burden of disease and are leading causes of ill health and mortality in Uganda. In a survey carried out by UNBS (2012), respiratory infections were more prevalent in Kampala and the western region (19 and 18 percent) respectively; than in other regions of the country (Table 4.18). Nationally, approximately 36000 tuberculosis (TB) cases are notified to the National Tuberculosis and Leprosy Program with 9000 (25%) being notified by Kampala.

Table 4.18: Distribution of population by type of illness/ major symptoms suffered within 30 days prior to the survey by region in 2009/10

Region	Percentage distribution						
	Malaria	Respiratory infections	Diarrhoea	Urinary tract infections	Skin infection	Injury	Others
Kampala	44.6	19.0	0.8	0.2	0.8	2.5	32.2
Central	53.2	15.0	1.8	0.1	1.5	2.2	26.3
Uganda	52.1	14.8	3.1	0.2	1.6	2.7	25.5

Source; District Development Plan 2007/08 – 2009/10

4.3.6 Employment

The correlation between high education and socio-economic status is often dissipated by the limited availability of appropriate employment opportunity. Absolute income constraints limit welfare levels even for the middle classes and a significant proportion of young, relatively higher income families "choose" to live in inadequate rental residences in order to save towards buying land and constructing a house in the future. Kampala district together with the rest of Central region had the highest proportion of the working population (30%), while Northern region had the least share of 19 percent. Unemployment is high (close to 20%) and under-employment even higher.

4.3.7 Infrastructure

4.3.7.1 Water supply

Kampala's formal water supply is drawn from Lake Victoria's Inner Murchison Bay (Water-technology.net, 2010).The Kampala water supply area consists of 11 subsystems, which do not match Kampala administrative boundaries. The project area is supplied from the high level network is by gravity from Muyenga to the consumers, or via other reservoirs/ tanks located in Naguru, Mutungo, and smaller tanks located in Upper Mutungo. Communities with no access to piped water, rely on sources like protected springs and rainwater harvesting.

4.3.7.2 Solid waste management

The city remains severely burdened with un-collected garbage. According to UWASNET, out of 1200–1500 tonnes of garbage estimated to be generated per day, only 400-500 tonnes is collected, giving a collection efficiency of approximately 40 percent according to the Solid Waste Management Strategy (SWMS) December 2002 revised in 2006. This implies that 60 percent of the garbage generated daily is

not collected and disposed often resulting in big public nuisances. The presence of un-collected garbage all over the city puts the lives of dwellers at risk from associated of environmental health conditions and diseases.

According to the Solid Waste Management (SWM) Strategy of December 2002, 70 – 80 percent of the garbage generated in the city is organic while the rest is inorganic comprising of glass, paper, metals construction and demolition waste (UWSNET/Water Aid).

Despite the various interventions, the amount of solid waste generated overwhelms the Kampala Capital City Authority's (KCCA) capacity for collection and disposal; given the fact that cost of SW collection alone is enormous. The increasing volume of solid waste generated in the city is as a result of the growing urban population, increased concentration of industries, poor behaviour and consumption habits of residents and inappropriate waste management practices. Most of the un-collected garbage is found in slum areas of the city occupied by the majority poor.

KCCA or its agents, servants or licensed collectors are required to ensure that solid waste in the district is collected and transported to treatment installations or approved disposal sites. Various refuse generators should be correctly identified, categorized and mapped to enable determination of the revenue potential. The City Council Authority has also registered an increase of private solid waste collectors from 6 in 2008 to the current 22 companies.

It is therefore important that the T.B National Referral Hospital will design appropriate methods to manage domestic solid waste. The medical waste will be handled in the incinerator which part of the package for the proposed laboratory and may not be sufficient for all the waste generated at the facility.

4.3.7.3 Archaeology and cultural heritage

Kampala also has a large number of historic buildings, many of them of cultural significance, which demand protection and where possible public access. These are generally concentrated in but not limited to: Old Kampala; The Historic Centre (the Kibuga); Makerere University; Old Colonial Suburbs; The City Centre; Historic schools, hospitals and missionary compounds (Figure 4.12).

The Kibuga - Kampala's Historic Centre hosts the primary institutions of the Buganda Kingdom, themselves housed in significant historic structures, with assorted other institutions and clear structuring, Mengo Hill and the adjacent Namirembe Hill retain unique value and opportunity - as a place, a cultural centre, a tourist attraction and potentially one of the most attractive quarters of the City. The Lubiri - the Royal walled compound retains unique potential. The Twekobe, the Palace, recently renovated, is also a major cultural facility. The Bulange - of particular cultural significance and anchoring the Kabaka Anjagala Road. The Kabaka Anjagala Road - linking the Bulange to the Lubiri, with the basic elements of a tree lined boulevard; Kabaka's Circle - with particular ceremonial value and impressive views; Kabaka's Lake - with significant development potential as a recreational and tourism node; and more.

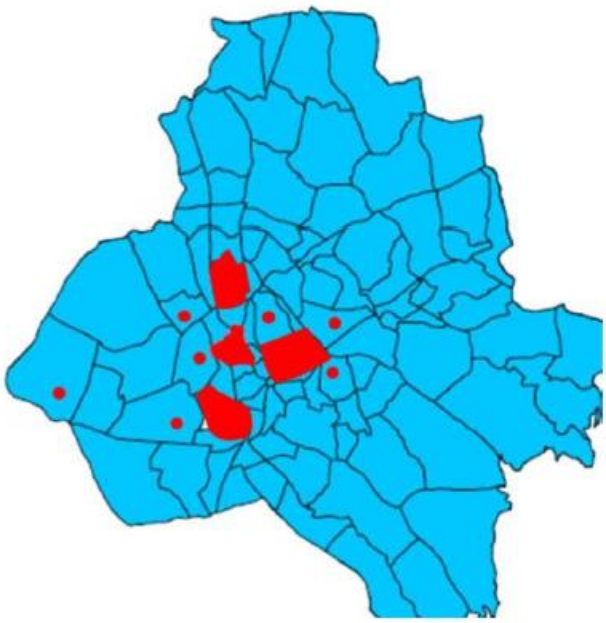


Figure 4.12 Primary distribution of historic buildings in Kampala

Makerere University (MAK), is Uganda's largest and leading tertiary education institution hosting a student body approaching 35,000 (approximately 90% undergraduate) producing some 12,500 graduates annually, distinctly slanted to the Arts and Humanities as opposed to the Sciences and Applied Sciences. The Makerere University campus of some 1.2 km^2 is located on Makerere Hill, immediately north of the City Centre, in close proximity to Mulago Hospital located to its east. Makerere's reputation and standing has attracted the establishment of a number of other institutions of higher learning in the area, turning the entire area into the locus of tertiary education in Kampala and filling the area, including its slums, with full-time and part-time students, making it one of the most vibrant and crowded segments of the City. Moreover, Makerere is a major factor in the emergence of Kampala as an attractor of foreign students to the City.

No cultural site was identified in the vicinity of the project site.

5 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

5.1 INTRODUCTION

In Uganda, the key legislation governing an ESIA study includes the National Environmental Act (Cap 153) of the laws of Uganda and the Environmental Impact Assessment Regulations (1998). National Environmental Act established NEMA and entrusts it with the responsibility to ensure compliance with ESIA process and procedures in planning and execution of development projects. The procedures require that a project proponent prepares an EIS with a clear assessment of relevant potential impacts, based on terms of reference (TORs) developed from a scoping exercise. This requires that the ESIA addresses potential direct and indirect socio-environmental impacts during the pre-construction, construction, operation and decommissioning phases together with attendant environmental and social management plan (ESMP).

Policies, legal and institutional framework considered relevant to this proposed project are discussed in this section. Various laws here reviewed relate to minimum acceptable construction operational requirements, environmental quality, land use, public health, occupational safety, labour standards and international legal obligations. The construction and equipping of health faculties ESIA was also be benchmarked against international best-practice standards of the World Bank and WHO.

5.2 POLICY FRAMEWORK

5.2.1 The National Environment Management Policy, 1994

The overall goal of this policy is the promotion of sustainable economic and social development mindful of the needs of future generations and the EIA is one of the vital tools it considers necessary to ensure environmental quality and resource productivity on a long-term basis. It calls for integration of environmental concerns into development policies, plans and projects at national, district and local levels. Hence, the policy requires that projects or policies likely to have significant adverse ecological or social impacts undertake an EIA before their implementation. This is also reaffirmed in the National Environment Act, Cap 153 which makes EIA a requirement for eligible projects (Third Schedule).

5.2.2 The National Medical Equipment Policy, 2009

The objective of the policy is to ensure equipment and furniture are managed economically, efficiently, effectively and sustainably through guided:

- Acquisition of medical equipment and furniture,
- Utilization, regulation and quality assurance of medical equipment and furniture,
- Maintenance of medical equipment and furniture,
- Monitoring and evaluation of performance of medical equipment and furniture and
- Proper disposal of medical equipment and furniture.

5.2.3 The National Health Policy, 1999

The overall objective of health sector policy is to reduce mortality, morbidity and fertility, and the disparities therein. Ensuring access to the minimum health care package is a central strategy to this goal. This project is therefore in line with the strategies of this policy.

5.2.4 National Policy on Injection Safety and Health Care Waste Management, 2004

The policy aims at ensuring safe injection practices and proper management of healthcare waste through appropriate procurement, distribution and monitoring of equipment/ supplies and increased awareness.

5.2.5 National Land Policy, 2011 (Draft)

The Policy calls for adoption of an open policy on information to the public and seek consent of communities and local governments concerning prospecting and mining of these resources; (iii) Allow to the extent possible, co-existence of individuals and communities owning land in areas where petroleum and minerals are discovered with extraction activity; (iv) Protect the land rights and land resources of individuals and communities owning land in areas where mineral and petroleum deposits exist or are discovered; (v) Provide for restitution of land rights in event of minerals or oil being exhausted or expired depending on mode of acquisition; (vi) Guarantee the right to the sharing of benefits by land owning communities and recognize the stake of cultural institutions over ancestral lands with minerals and petroleum deposits. This policy will apply to Components 1 and 2 of KIIDP-2.

5.3 LEGAL FRAMEWORK

5.3.1 Constitution of the Republic of Uganda, 1995

The 1995 Uganda Constitution provides that every person has a right to own property [Section 26.1] and that no person shall be deprived of property or any interest in or right over property without payment of fair and adequate compensation. The same constitution gives government powers to acquire land (compulsory acquisition) in public interest [Article 273(a)].

The Constitution [Chapter 3, Article 17J] entrusts Government with the duty of ensuring that Ugandans enjoy a healthy environment.

5.3.2 National Environment Act, Cap 153

The National Environment Act (Chapter 153 of Laws of Uganda) establishes and defines functions of NEMA as a body responsible for management, monitoring and supervision of all environmental conservation activities (Section 4). This act provides for various strategies and tools for environment management, which also includes the EIA (Section 19) for projects likely to have significant environmental impacts. The Act also mandates NEMA with a leading role to review environmental impact statements. NEMA sets multimedia environmental standards (Sections 24 - 32) to prevent contamination of air, water and soil resources. The Act also mandates NEMA with responsibility for in-situ and ex-situ conservation of biological fauna and flora resources either on land or in water (Sections 42 and 43). Section 48 empowers NEMA, district environment committees and local environment committees to be responsible for monitoring of local land-use plans, which should be in conformity with national land-use plan. Section 106 outlines provisions to enable compliance with obligations of international environmental conventions.

Section 35 entrusts NEMA, lead agencies and local government environment committees with powers to protect the environment from human activities that could adversely affect it. Section 56 prohibits discharge of hazardous substances, chemicals, oil, etc. into the environment except in accordance with guidelines prescribed by NEMA.

The Act outlines principles of environmental management and rights to a decent environment and also sets out principles for:

- Institutional arrangements;
- Environmental planning;
- Environmental regulations;
- Environmental standards;
- Environmental restoration orders and easements;
- Records, inspection and analysis;
- Financial instruments;
- Offences;
- Judicial proceedings; and
- International obligations.

The Third Schedule of the National Environment Act (Cap 153) does not specifically list healthcare facilities under scheduled projects, nonetheless, two sections thereof related to function or waste management mean that these facilities are not exonerated from the general EIA process. Section 12 on the Schedule requires that projects related to:

a) Sites solid waste disposal;
b) Sites for hazardous waste disposal;
c) Sewage disposal;
d) Atmospheric emissions;
e) Offensive odours; should undertake a full EIA.

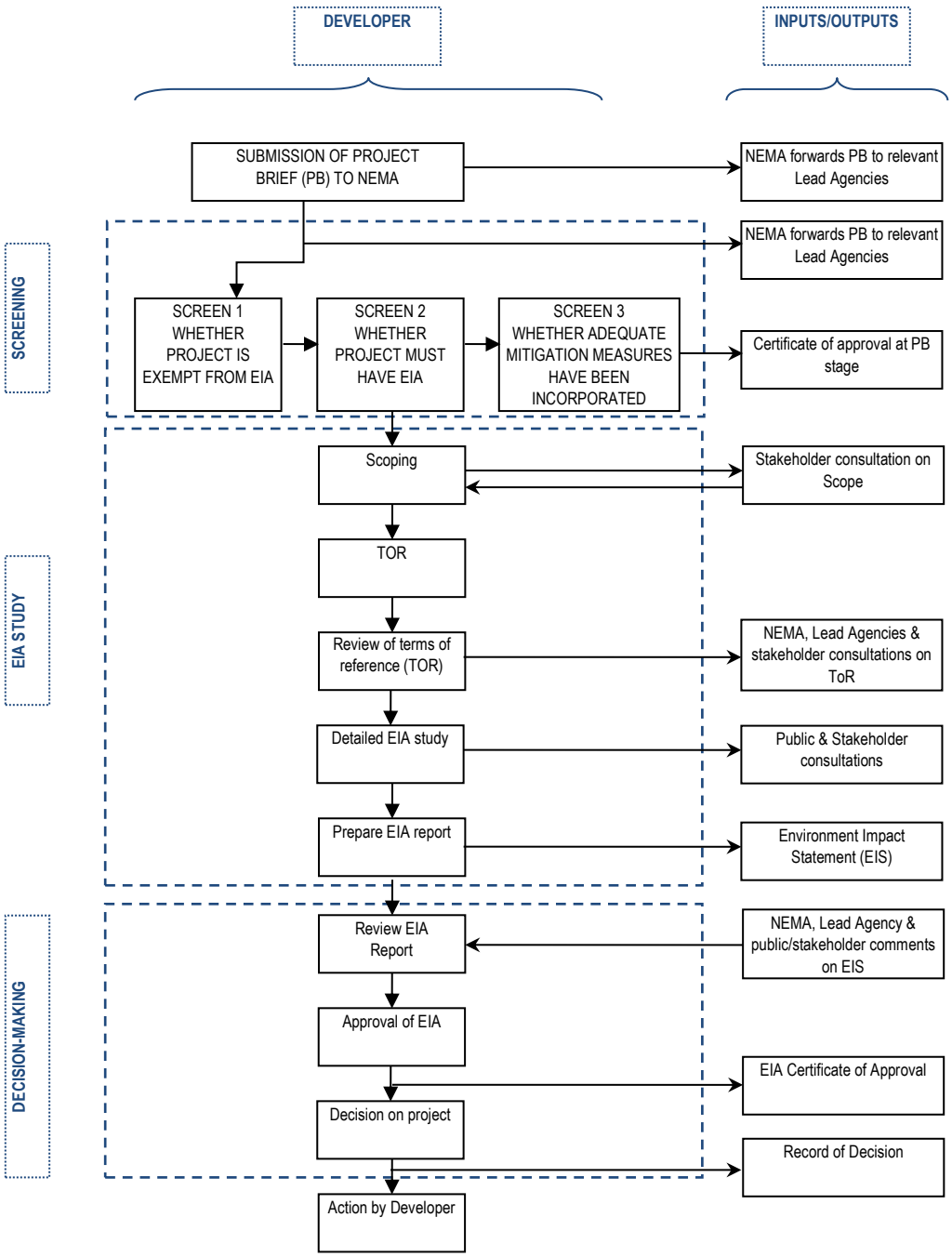
This Act also formed the basis for enactment of the Environmental Impact Assessment Guidelines, 1997 and Environmental Impact Assessment Regulations, 1998 which together prescribe the EIA process in Uganda. The process is schematically presented in NEMA's Environmental Impact Assessment (EIA) Reference Manual as shown in Figure 5.1.

5.3.3 Local Governments Act, Cap 243

This Act provides for decentralized governance and devolution of central government functions, powers and services to local governments that have own political and administrative set-ups. According to Section 9 of the Act, a local government is the highest political and administrative authority in its area of jurisdiction and shall exercise both legislative and executive powers in accordance with the Constitution.

5.3.4 Land Act, Cap 227

The Land Act provides for tenure, ownership and management of land. Land is to be used in compliance with relevant national laws such as listed in Section 43 including the Water Act and National Environment Act. Section 44 reiterates the constitutional mandate for government or a local government to protect environmentally-sensitive areas for the common good of the people in Uganda. The Act describes land ownership types of tenure of and echoes requirement of the Constitution to equitably compensate persons losing land to a given development.



Source: EIA Guidelines for the Energy Sector (NEMA, 2004)

Figure 5.1 ESIA process

5.3.5 KCCA Act 2010

An Act to provide, in accordance with article 5 of the Constitution, for Kampala as the capital city of Uganda; to provide for the administration of Kampala by the Central Government; to provide for the territorial boundary of Kampala; to provide for the development of Kampala Capital City; to establish the

Kampala Capital City Authority as the governing body of the city and provide for a Metropolitan Physical Planning Authority for Kampala.

Section 7(1) lists functions of KCCA as, among others to:

- promote economic development in the capital city;
- construct and maintain roads;
- construct and maintain major drains;
- install and maintain street lights;
- organize and manage traffic;
- carry out physical planning and development control;
- monitor the delivery of services within its area of jurisdiction;

5.3.6 Public Health Act, Cap 281

Section 105 of the Public Health Act, 1964 requires local authorities to take measures to prevent pollution of public water resources. This Act aims at avoiding pollution of environmental resources that support health and livelihoods of communities. This is Act is relevant because some of the waste generated in the laboratory have potential to pollute the environment and affect the health of the communities.

5.3.7 National Environment (Wetlands, River Banks, and Lakeshores management) Regulations, 2000

These regulations provide principles for sustainable use and conservation of wetlands, riverbanks and lakeshores. Relevance of these regulations to the EIA study is embedded in the following requirements:

- EIA is mandatory for all major activities on riverbanks and lakeshores,
- Measures should be put in place for protection of riverbanks and lakeshores such as prevention of soil erosion, siltation and water pollution.

These regulations are relevant to the Project since the proposed site is located about from the shores of Lake Victoria (Inner Murchison Bay) hence there is potential for activities to cause soil erosion and sedimentation into the nearby wetland.

5.3.8 National Environment (Standards for Discharge of Effluent into Water or on Land) Regulations, 1999

Section 6 (2) details maximum permissible limits for 54 regulated contaminants which must not be exceeded before effluent is discharged into water or on land. For this project, this standard is appliance to liquid waste/ sewage disposal from the laboratory.

5.3.9 National Environment (Noise Standards and Control) Regulations, 2003

Part III Section 8 (1) requires facility operators, to use the best practicable means to ensure that the emission of noise does not exceed the permissible noise levels. The regulations require that persons to be exposed to occupational noise exceeding 85 dBA for eight hours in a day should be provided with requisite ear protection.

Table 5.1: National discharge standards for selected pollutants

Parameter	National discharge standards
BOD_5 (mg/l)	50
Suspended solids (mg/l)	100
Faecal coliforms	10,000 counts/ 100ml
Chlorine residual (mg/l)	1 mg/l
pH	6-8
Phenols (µg/l)	0.2 mg/l
Oil and grease (mg/l)	10 mg/l
Total Phosphorus (mg/l)	10 mg/l
Temperature	20-35°C

Source: The National Environment (Standards for Discharge of Effluent into Water or on Land) Regulations, 1999.

Table 5.2: Regulatory noise limits

Facility	Noise limits dB (A) (Leq)	
	Day*	Night*
Construction sites	60	50
Mixed residential (with some commercial and entertainment)	55	45
*Time frame: Day 6.00 a.m -10.00 p.m; Night 10.00 p.m. - 6.00 a.m.		

Source: The National Environment (Noise Standards and Control) Regulations, 2003.

These regulations would be applicable during project construction activities.

5.3.10 National Environment (Waste Management) Regulations, 1999

These regulations require waste disposal in a way that would not contaminate water, soil, and air or impact public health. According to the regulations, waste haulage and disposal should be done by licensed entities.

5.3.11 Draft National Air Quality Standards, 2006

The draft national air quality standards provide the following regulatory limits (Table 5.3).

5.3.12 Employment Act, 2006

Employment Act, 2006 repeals Employment Act (Cap 219) enacted in 2000. This Act is the principal legislation that seeks to harmonize relationships between employees and employers, protect workers interests and welfare and safeguard their occupational health and safety through:

i) Prohibiting forced labour, discrimination and sexual harassment at workplaces (Part II; Part IV).
ii) Providing for labour inspection by the relevant ministry (Part III).
iii) Stipulating rights and duties in employment (weekly rest, working hours, annual leave, maternity and paternity leaves, sick pay, etc. (Part VI).
iv) Continuity of employment (continuous service, seasonal employment, etc (Part VIII).

This Act is relevant to the project both during the construction and operational phase.

Table 5.3: Uganda's regulatory air quality standards for selected pollutants

Pollutant	Averaging time for ambient air	Standard for ambient air
Carbon dioxide (CO_2)	8 hour	9.0 ppm
Carbon monoxide (CO)	8 hour	9.0 ppm
Hydrocarbons	24 hour	5 mg m^{-3}
Nitrogen oxides (NO_x)	24 hour 1 year arithmetic mean	0.10 ppm
Smoke	Not to exceed 5 minutes in any one hour	Ringlemann scale No.2 or 40% observed at 6m or more
Soot	24 hour	500 µg Nm^{-3}
Sulphur dioxide (SO_2)	24 hour	0.15 ppm
Sulphur trioxide (SO_3)	24 hour	200 µg Nm^{-3}

Note: ppm = parts per million; "N" in µg/Nm-3 connotes normal atmospheric conditions of pressure and temperature (25oC and 1 atmosphere).

5.3.13 Occupational Safety and Health Act (2006)

The Act replaces the Factories Act (1964). It departs from the original listing of "don'ts" and adopts a scientific approach in which technical measures required for protection of workers are prescribed, hence taking on a "preventive approach".

The Act provides for prevention and protection of persons at all workplaces from injuries, diseases, death and damage to property. It covers not just the "factory" (as did the Factories Act) but also any workplace where persons are employed and its provisions extend not just to employees but to any other persons that may be legitimately present in a workplace and are at risk of injury or disease. Employers must protect workers from adverse weather and provide clean and healthy work environment, sanitary conveniences, sanitary and personnel protective gear.

For this project this Act is applicable relation to protection of the construction workers and health workers (and medical waste collectors) against secondary injuries during execution of their duties or work.

5.3.14 Workers' Compensation Act (2000)

Section 28 of The Workers‟ Compensation Act (2000) states that:

- Where a medical practitioner grants a certificate that a worker is suffering from a scheduled disease causing disablement or that the death of a workman was caused by any scheduled disease; and,
- The disease was due to the nature of the worker's employment and was contracted within 24 months immediately previous to the date of such disablement or death, the worker or, if he or she is deceased, his or her dependants shall be entitled to claim and to receive compensation under this Act as if such disablement or death had been caused by an accident arising out of and in the course of his or her employment.

This Act is relevant to the Project as labour will be employed for construction and operation/maintenance activities. Provision of personal protective equipment (PPE) to employees is

required to minimise accidents and injuries. Contractors must ensure that workers constructing the proposed project have safety gear to ensure compliance with this Act.

5.3.15 The Physical Planning Act, 2011

This Act replaced the Town and Country Planning Act, Cap 246 which was enacted in 1951 and revised in 1964 but is now inconsistent with contemporary government system in Uganda. The 1951 Act was enacted to regulate and operate in a centralised system of governance where physical planning was carried out at national level through the Town and Country Planning Board. Implementation of the Act was supervised by local governments, especially the urban local governments.

Uganda has since gone through many social, political and economic changes. For example, promulgation of the 1995 Constitution established a decentralised system of governance which divulged powers and functions including physical planning, finance and execution of projects from the central government to local governments. This therefore created a need to enact a physical planning legislation which is consistent with this Constitutional requirement. The Physical Planning Act, 2011 establishes district and urban physical planning committees, provides for making and approval of physical development plans and applications for development.

Section 37 of The Physical Planning Act, 2011 requires an EIA permit for developments before they are implemented, stating:

"Where a development application related to matters that require an environmental impact assessment, the approving authority may grant preliminary approval subject to the applicant obtaining an EIA."

Implementation of the laboratory will have to consider requirement of this Act when prescribed by the local government (KCCA). KCCA has jurisdiction over the area covered by the project and therefore have regulatory control to ensure that this project conforms to local physical planning requirements.

5.4 INSTITUTIONAL FRAMEWORK

5.4.1 National Environmental Management Authority (NEMA)

The National Environmental Act, Cap 153 establishes NEMA as the principal agency responsible for coordination, monitoring and supervision of environmental conservation activities. NEMA is under the Ministry of Water and Environment (MWE) but has a cross-sectoral mandate to oversee the conduct of EIAs through issuance of guidelines, regulations and registration of practitioners. It reviews and approves environmental impact statements in consultation with any relevant lead agencies.

NEMA works with District Environment Officers and local environment committees at local government levels who also undertake inspection, monitoring and enforce compliance on its behalf. In Government ministries, NEMA works with Environmental Liaison Units to ensure incorporation of environmental issues in their activities, policies and programs.

5.4.2 Ministry of Health (MOH)

This project will be executed by MOH which is to undertake policy formulation, quality assurance, coordination, monitoring and evaluation of health service delivery in Uganda.

5.4.3 Ministry of Gender, Labour and Social Development

This ministry sets policy direction and monitoring functions related to labour, gender and general social development. Its OHS Department in the ministry is responsible for inspection and mentoring of occupational safety in workplaces and this could be during project construction and operation of the laboratory facilities.

5.4.4 Local Administration Structures

The proposed project is within the jurisdiction of KCCA. The Authority is the governing body of the city and is responsible for physical planning of the city.

Equally important are village-level local council administration (LC I and LC III). Leaders at these levels of local administration are closer to residents and therefore important in effective community mobilization, sensitization and dispute resolution given that the laboratory is also going to serve cross-border communities.

5.5 WORLD BANK GROUP POLICIES AND GUIDELINES

This project has been benchmarked against World Bank Group (WBG) standards since IDA is one of the 5 member organizations of the WBG. These standards, practices or guidelines are discussed below.

5.5.1 World Bank Operating Policies

The World Bank requires environmental assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable, and thus to improve decision making. Environmental Assessment is one of the 10 environmental and social Safeguard Policies that WBG uses to examine potential environmental risks and benefits associated with Bank lending operations. The Bank's Environmental Assessment policy and procedures are described in Operational Policy/Bank Procedures - OP/BP 4.01.

Detailed advice and guidance on the conduct of environmental assessment is provided publicly by the World Bank in its Environmental Sourcebook and updates. During project preparation, the World Bank examines the implications of the proposed project for a series of policies below:

- Environmental Assessment;
- Natural Habitats;
- Forestry;
- Pest Management;
- Cultural Property;
- Indigenous Peoples;
- Involuntary Resettlement;
- Safety of Dams;
- Projects in International Waters; and
- Projects in Disputed Areas.

From the nature of proposed project and the fact that project activities would largely entail construction of new buildings on hospital premises, only policy OP/BP 4.01 would be triggered by this project.

5.5.2 WB Guidelines

Under its "General EHS Guidelines (April 30, 2007)", the World Bank has several guidelines shown in Table 5.4, many of which are applicable to various components of the proposed project namely:

i) Air emissions from onsite waste combustion units ("incinerators")
ii) Hazardous waste management
iii) Noise
iv) Occupational health and safety (against biological and radiological hazards).
v) Community health and safety including traffic safety such as during project construction or disease prevention (where incinerators emission waft into and affect not only local communities but also patients visiting or admitted in hospital including their attendants and the hospital staff).
vi) Construction and decommissioning.

Table 5.4: WBG General EHS Guidelines (April 30, 2007)

1. Environmental
1.1 Air Emissions and Ambient Air Quality
1.2 Energy Conservation
1.3 Wastewater and Ambient Water Quality
1.4 Water Conservation
1.5 Hazardous Materials Management
1.6 Waste Management
1.7 Noise
1.8 Contaminated Land
2. Occupational Health and Safety
2.1 General Facility Design and Operation
2.2 Communication and Training
2.3 Physical Hazards
2.4 Chemical Hazards
2.5 Biological Hazards
2.6 Radiological Hazards
2.7 Personal Protective Equipment (PPE)
2.8 Special Hazard Environments
2.9 Monitoring
3. Community Health and Safety
3.1 Water Quality and Availability
3.2 Structural Safety of Project Infrastructure
3.3 Life and Fire Safety (L&FS)
3.4 Traffic Safety
3.5 Transport of Hazardous Materials
3.6 Disease Prevention
3.7 Emergency Preparedness and Response
4. **Construction and Decommissioning**
4.1 Environment
4.2 Occupational Health and Safety
4.3 Community Health and Safety

While most of above WBG guidelines apply to the proposed project in one way or the other, in sections below are discussed four environmental, health and safety (EHS) guidelines, namely:

i) EHS Guidelines - Air Emissions And Ambient Air Quality
ii) EHS Guidelines - Waste Management
iii) EHS Guidelines - Health Care Facilities
iv) EHS Guidelines - Hazardous Materials Management
v) EHS Guidelines - Construction and Decommissioning

5.5.2.1 WBG EHS Guidelines: "Air emissions and ambient air quality"

a) General approach

These guidelines require projects with "significant" sources of air emissions, and potential for significant impacts to ambient air quality to prevent or minimize impacts by ensuring that emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and standards by applying national legislated standards (or in their absence, the current WHO Air Quality Guidelines, or other internationally recognized sources). Uganda currently has (draft) national air quality standards applicable to this project, specifically incinerator emissions. The standards, however, make no mention of dioxins which are potent cancer-inducing, expected in incineration emissions.

In these guidelines "significant" refers to sources which can contribute a net emissions increase of one or more of the following pollutants within a given air shed:

- Particulate matter of size 10 microns (PM10): 50 tons per year (tpy);
- Oxides of nitrogen (NOx): 500 tpy;
- Sulphur dioxide (SO_2): 500 tpy; or as established through national legislation;
- Equivalent heat input of 50 MWth or greater.

Going by this classification, all onsite incineration units at the laboratory/ hospital facilities are "non-significant" sources since no unit at the facilities had capacity to generate the foregoing levels of air pollutants. Two national documents on healthcare waste indicate that a hospital generates 0.1 kg/bed/day excluding pathological waste.

The fact that onsite incineration units burn small waste volumes and generate low levels of emissions could be the reason such "non-significant" units are not provided with (and probably do not require) emissions control.

It should nonetheless be noted WBG guidelines advise that impact significance of emission of inorganic and organic pollutants should be established on a project-specific basis taking into account toxic and other properties of the pollutant. While emissions from such small combustion units are considered low and, with a sufficiently tall stack, would be easily dispersed in the atmosphere with little health risk, locating incineration units close to dwellings and healthcare buildings poses a risk of downwash and emissions wafting into indoor environment- a paradoxical situation for facilities supposed to heal the sick.

Incineration emissions from healthcare facilities may contain significant amounts of particulate matter, heavy metals, dioxins, furans, sulphur dioxide and hydrochloric acid. Of key concern are dioxins which are potent cancer-inducing compounds.

The temperatures needed to breakdown dioxin are typically not reached when burning waste in open air (200-400°C) causing high dioxin emissions. Dioxin can only be destroyed above 850°C, otherwise it remains in atmosphere emissions or in incineration ash where it can leach into groundwater when rain falls on ash piles.

b) Emissions control recommendations

To control emission from small combustion sources, WBG guidelines provide several recommendations but in the context of this project, one factor that can be improved is incinerator stack height. Indeed the guidelines advise that stack height for all point sources of emissions, (whether "significant" or not) should be designed according to good international industry practice (GIIP) (see Figure 5.2) to avoid high ground-level pollutant concentrations due to downwash, building wakes or eddy effects and to ensure reasonable dispersion to minimize environmental or health impacts. These guidelines also recommend annual stack emission testing for NOx and SO_2.

Annex 1.1.3 - Good International Industry Practice (GIIP)

Stack Height

(Based on United States 40 CFR, part 51.100 (ii)).

$H_G = H + 1.5L$; where

H_G = GEP stack height measured from the ground level elevation at the base of the stack

H = Height of nearby structure(s) above the base of the stack.

L = Lesser dimension, height (h) or width (w), of nearby structures

"Nearby structures" = Structures within/touching a radius of 5L but less than 800 m.

Source: (WBG EHS Guidelines, April 2007, pg

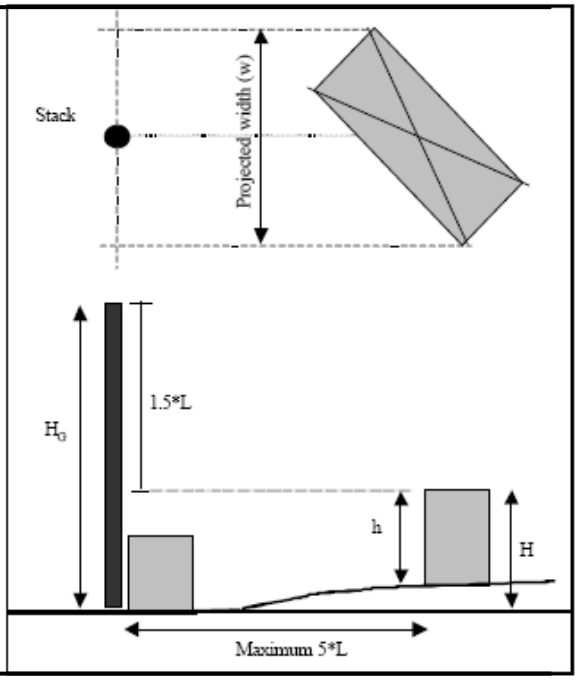


Figure 5.2 Recommended stack design for small combustion sources

c) Implication for this project

For this project, unless space is a critical limitation, this stack design approach should be adopted wherever incinerators are installed. The guidelines discourage open-burning of solid wastes, whether hazardous or non-hazardous, is not considered good practice and should be avoided, as the generation of polluting emissions from this type of source cannot be controlled.

While small onsite incineration units handling minimal healthcare waste volumes might not require emission control according to these Guidelines, the management including disposal of healthcare waste has become an issue of growing concern in many places in Uganda. Infectious medical waste has been dumped indiscriminately, burned uncontrollably and buried irresponsibly posing considerable public health risk. To abate this impact, government should start to think of a medium-term approach where

medical waste is incinerated at centralized (local, regional or national) facilities designed to offer the following social-environmental benefits:

- Total destruction of hazardous constituents (e.g. dioxins only destroyed >850°C).
- Destruction of Infectious Waste.
- Scrub or treat to remove obnoxious gaseous emissions (dioxins, respirable particulates or $PM_{2.5}$, mercury, etc.).
- Assured process control.
- Cost-effective operation.

This approach would necessitate appropriate policy and regulatory framework to induce private sector involvement.

5.5.2.2 WBG EHS Guidelines: "Waste management"

a) General approach

These guidelines apply to both non-hazardous and hazardous waste. They advocate for waste management planning where waste should be characterized according to: composition, source, types, and generation rates.

This is essential for laboratory facility comprised in this project since there is a need to segregate the different categories of waste generated both at the laboratory level and overall hospital level.

These guidelines call for implementation of a waste management hierarchy that comprises prevention, recycling/reuse; treatment and disposal. The guidelines require segregation of conventional waste from hazardous waste streams and if generation of hazardous waste cannot be prevented (as is the case at healthcare facilities); its management should focus on prevention of harm to health, safety, and environment, according to the following principles:

- Understanding potential impacts and risks associated with management of any generated hazardous waste during its complete lifecycle.
- Ensuring that people handling, treating and disposing of hazardous waste are reputable and legitimate enterprises, licensed by the relevant regulatory agencies and following good industry practice.
- Ensuring compliance with applicable regulations.

b) Implication for this project

The laboratory will generate relatively small quantities of (hazardous and non- hazardous) waste and for large generators (for example, the project hospitals), the Guidelines recommend monitoring to include:

i) Regular visual inspection of all waste storage collection and storage areas for evidence of accidental releases and to verify that wastes are properly labelled and stored.
ii) Regular audits of waste segregation and collection practices.

iii) Tracking of waste generation trends by type and amount of waste generated, preferably by facility departments.
iv) Keeping manifests or other records that document the amount of waste generated and its destination.
v) Periodic auditing of third party treatment and disposal services including re-use and recycling facilities when significant quantities of hazardous wastes are managed by third parties. Whenever possible, audits should include site visits to the treatment storage and disposal location.

5.5.2.3 WBG EHS Guidelines: "facility design"

a) Applicability

The EHS Guidelines for facility design include information relevant to management of EHS issues associated with laboratories which includes a diverse range of activities involving a referral hospital; inpatient and outpatient facilities. These guidelines are applicable for planning new laboratory facilities.

b) Laboratory facility design considerations

These guidelines advise that design and functional layout of laboratory should ensure the following:

- Separation of clean / sterilized and dirty / contaminated materials and people flows;
- Development and inclusion of adequate disinfection / sterilization procedures and facilities;
- Adequate space for the storage of recyclable materials (e.g. cardboard and plastic) for pickup;
- Ventilation systems that provide isolation and protection from airborne infections;
- Design of water systems to provide adequate supplies of potable water to reduce risks of exposure waterborne pathogens;
- Provision of hazardous material and waste storage and handling areas;
- Selection of easily cleaned building materials that do not support microbiological growth, are slip-resistant, non-toxic, and non-allergenic, and do not include volatile organic compound (VOC)-emitting paints and sealants.

c) Waste management

Waste from laboratory can be divided into two groups:

- General waste similar in composition to domestic waste, generated during administrative, housekeeping, and maintenance functions.
- Specific categories of hazardous healthcare waste (see as detailed in Table 5.5).

Laboratory facilities should establish, operate and maintain a health care waste management system (HWMS) adequate for the scale and type of activities and identified hazards but entailing:

i) Waste minimization, reuse, and recycling
ii) Waste segregation at the point of generation,
iii) On-site handling, collection, transport and storage based on safe practices below;

- Seal and replace waste bags and containers when they are approximately three quarters full. Full bags and containers should be replaced immediately;
- Identify and label waste bags and containers properly prior to removal;
- Transport waste to storage areas on designated trolleys / carts, which should be cleaned and disinfected regularly;
- Waste storage areas should be located within the facility and sized to the quantities of waste generated;
- Unless refrigerated storage is possible, storage times between generation and treatment of waste should not exceed (in Warm climate) 48 hours during cool season, 24 hours during hot season;
- Store radioactive waste in containers to limit dispersion, and secure behind lead shields;
- Packaging containers for sharps should be puncture-proof;

These guidelines recognize incineration as a key source of air emission at healthcare facilities and pollutants emitted from incineration include:

i) Heavy metals
ii) Organics in flue gas
iii) Various organic compounds (dioxins and furans)
iv) Hydrogen chloride (HCl) and fluorides and potentially other halogens-hydrides (e.g. bromine and iodine)
v) Typical combustion products such as sulphur oxides (SOx), nitrogen oxides (NOx), volatile organic compounds, monoxide (CO), carbon dioxide (CO_2), and nitrous oxide (N_2O).
vi) Incineration residues such as fly ash and bottom ash may contain high concentrations of persistent organic pollutants (POPs).

For being ineffective in regard to emissions control, these WBG Guidelines caution against use of single-chamber and brick incinerators should be used only as a last resort option.

The Guidelines advise against mixing domestic and hazardous waste. Waste should be segregated at point of generation and non-hazardous waste, such as paper and cardboard, glass, aluminium and plastic, should be collected separately for possible recycling. Food waste should be segregated and composted. Infectious and / or hazardous wastes should be identified and segregated according to its category using a colour-coded system (see Table 5.5 which provides good reference information for especially healthcare facility operators). If different types of waste are mixed accidentally, waste should be treated as hazardous.

d) Occupational health and safety

Health and safety hazards in healthcare facilities may affect healthcare providers, cleaning and maintenance personnel, and workers involved in waste management handling, treatment and disposal. Typical hazards which should be prevented with proper safety gear and practices include:

- Exposure to infections and diseases (blood-borne pathogens, and other potential infectious materials (OPIM)
- Exposure to hazardous materials / waste

- Fire safety
- Exposure to radiation

Occupational radiation exposure may result from equipment emitting X-rays and gamma rays (e.g. CT scanners), radiotherapy machines, and equipment for nuclear medicine activities. HCF operators should develop a comprehensive plan to control radiation exposure in consultation with the affected workforce. This plan should be refined and revised as soon as practicable on the basis of assessments of actual radiation exposure conditions, and radiation control measures should be designed and implemented accordingly.

Table 5.5: Treatment and disposal methods for categories of healthcare waste

Type of waste	Summary of treatment and disposal options / notes
Infectious waste: Includes waste suspected to contain pathogens (e.g. bacteria, viruses, parasites, or fungi) in sufficient concentration or quantity to cause disease in susceptible hosts. Includes pathological and anatomical material (e.g. tissues, organs, body parts, human foetuses, animal carcasses, blood, and other body fluids), clothes, dressings, equipment / instruments, and other items that may have come into contact with infectious materials.	**Waste Segregation Strategy**: Yellow or red coloured bag / container, marked "infectious" with international infectious symbol. Strong, leak proof plastic bag, or container capable of being autoclaved. **Treatment**: Chemical disinfection; Wet thermal treatment; Microwave irradiation; Safe burial on hospital premises; Sanitary landfill; Incineration (Rotary kiln; pyrolytic incinerator; single-chamber incinerator; drum or brick incinerator) ▪ Highly infectious waste, such as cultures from lab work, should be sterilized using wet thermal treatment, such as autoclaving. **Anatomical waste** should be treated using Incineration (Rotary kiln; pyrolytic incinerator; single-chamber incinerator; drum or brick incinerator).
Sharps: Includes needles, scalpels, blades, knives, infusion sets, saws, broken glass, and nails etc.	**Waste Segregation Strategy**: Yellow or red color code, marked "Sharps". Rigid, impermeable, puncture-proof container (e.g. steel or hard plastic) with cover. Sharps containers should be placed in a sealed, yellow bag labelled "infectious waste". **Treatment**: Chemical disinfection; Wet thermal treatment; Microwave irradiation; Encapsulation; Safe burial on hospital premises; Incineration (Rotary kiln; pyrolytic incinerator; single-chamber incinerator; drum or brick incinerator) ▪ Following incineration, residues should be landfilled. ▪ Sharps disinfected with chlorinated solutions should not be incinerated due to risk of generating POPs. ▪ Needles and syringes should undergo mechanical mutilation (e.g. milling or crushing) prior to wet thermal treatment
Pharmaceutical waste: Includes expired, unused, spoiled, and contaminated pharmaceutical products, drugs, vaccines, and sera that are no longer needed, including containers and other potentially contaminated materials (e.g. drug bottles vials, tubing etc.).	**Waste Segregation Strategy**: Brown bag / container. Leak-proof plastic bag or container. **Treatment**: Sanitary landfill[a]; Encapsulation[a]; Discharge to sewer [a]; Return expired drugs to supplier; Incineration (Rotary kiln; pyrolytic incinerator [a]); Safe burial on hospital premises[a] as a last resort. ▪ Small quantities: Landfill disposal acceptable, however cytotoxic and narcotic drugs should not be landfilled. Discharge to sewer only for mild, liquid pharmaceuticals, not antibiotics or cytotoxic drugs, and into a large water flow. Incineration acceptable in pyrolytic or rotary kiln incinerators, provided pharmaceuticals do

Type of waste	Summary of treatment and disposal options / notes
	not exceed 1 percent of total waste to avoid hazardous air emissions. Intravenous fluids (e.g. salts, amino acids) should be landfilled or discharged to sewer. Ampoules should be crushed and disposed of with sharps. ▪ Large quantities: Incineration at temperatures exceeding 1200 °C. Encapsulation in metal drums. Landfilling not recommended unless encapsulated in metal drums and groundwater contamination risk is minimal.
Genotoxic / cytotoxic waste: Genotoxic waste may have mutagenic, teratogenic, or carcinogenic properties, and typically arises from the faeces, urine, and vomit of patients receiving cytostatic drugs, and from treatment with chemicals and radioactive materials. Cytotoxic drugs are commonly used in oncology and radiology departments as part of cancer treatments.	**Waste Segregation Strategy:** See above for "infectious waste". Cytotoxic waste should be labelled "Cytotoxic waste". **Treatment**: Return expired drugs to supplier; Chemical degradation; Encapsulation[a]; Inertization; Incineration (Rotary kiln, pyrolytic incinerator): ▪ Cytotoxic waste should not be landfilled or discharged to sewer systems. ▪ Incineration is preferred disposal option. Waste should be returned to supplier where incineration is not an option. Incineration should be undertaken at specific temperatures and time specifications for particular drugs. Most municipal or single chamber incinerators are not adequate for cytotoxic waste disposal. Open burning of waste is not acceptable.
Chemical waste: Waste may be hazardous depending on the toxic, corrosive, flammable, reactive, and genotoxic properties. Chemical waste may be in solid, liquid, or gaseous form and is generated through use of chemicals during diagnostic / experimental work, cleaning, housekeeping, and disinfection. Chemicals typically include formaldehyde, photographic chemicals, halogenated and nonhalogenated solvents, organic chemicals for cleaning / disinfecting, and various inorganic chemicals (e.g. acids and alkalis).	**Waste Segregation Strategy**: Brown bag / container. Leak-proof plastic bag or container resistant to chemical corrosion effects. **Treatment**: Return unused chemicals to supplier; Encapsulation[a]; Safe burial on hospital premises[a]; Incineration (Pyrolytic incinerator[a]: ▪ Facilities should have permits for disposal of general chemical waste (e.g. sugars, amino acids, salts) to sewer systems. ▪ Small hazardous quantities: Pyrolytic incineration, encapsulation, or landfilling. ▪ Large hazardous quantities: Transported to appropriate facilities for disposal, or returned to the original supplier using shipping arrangements that abide by the Basel Convention. Large quantities of chemical waste should not be encapsulated or landfilled.
Radioactive waste: Includes solid, liquid, and gaseous materials that have been contaminated with radionuclides. Radioactive waste originates from activities such as organ imaging, tumour localization, radiotherapy, and research / clinical laboratory procedures, among others, and may include glassware, syringes, solutions, and excreta from treated patients.	**Waste Segregation Strategy:** Lead box, labelled with the radioactive symbol. **Treatment**: Radioactive waste should be managed according to national requirements and current guidelines from the International Atomic Energy Agency. IAEA (2003). Management of Waste from the Use of Radioactive Materials in Medicine, Industry and Research. IAEA Draft Safety Guide DS 160, 7 February 2003.
Waste with high content of heavy metals: Batteries, broken thermometers, blood pressure gauges, (e.g. mercury and cadmium	**Waste Segregation Strategy:** Waste containing heavy metals should be separated from general health care waste. **Treatment**: Safe storage site designed for final disposal of hazardous waste.

Type of waste	Summary of treatment and disposal options / notes
content).	▪ Waste should not be burned, incinerated, or landfilled. Transport to specialized facilities for metal recovery.
Pressurized containers: Includes containers / cartridges / cylinders for nitrous oxide, ethylene oxide, oxygen, nitrogen, carbon dioxide, compressed air and other gases.	**Waste Segregation Strategy:** Pressurized containers should be separated from general health care waste. **Treatment**: Recycling and reuse; Crushing followed by landfill ▪ Incineration is not an option due to explosion risks ▪ Halogenated agents in liquid form should be disposed of as chemical waste.
General health care waste (including food waste and paper, plastics, cardboard)**:**	**Waste Segregation Strategy**: Black bag / container. Halogenated plastics such as PVC should be separated from general health care facility waste to avoid disposal through incineration and associated hazardous air emissions from exhaust gases (e.g. hydrochloric acids and dioxins). **Treatment:** Disposal as part of domestic waste. Food waste should be segregated and composted. Component wastes (e.g. paper, cardboard, recyclable plastics [PET, PE, PP], glass) should be segregated and sent for recycling where available.
***Source**: Safe Management of Wastes from Health-Care Activities. International Labour Organization (ILO), Eds. Pruss, A. Giroult, and P. Rushbrook (1999)* ***Notes:** a. Small quantities only*	

5.5.2.4 Air emission levels for hospital waste incineration facilities

WBG Guidelines advise emission levels of healthcare waste incinerators presented in Table 5.6.

Table 5.6: Air emission levels for hospital waste incineration facilities

Pollutant	Unit	Guideline value
Total Particulate matter (PM)	mg/Nm^3	10
Hydrogen Chloride (HCl)	mg/Nm^3	10
Total organic carbon (TOC)	mg/Nm^3	10
Hydrogen Fluoride (HF)	mg/Nm^3	1
Sulfur dioxide (SO2)	mg/Nm^3	50
Carbon Monoxide (CO)	mg/Nm^3	50
NOX	mg/Nm^3	200-400[a]
Mercury (Hg)	mg/Nm^3	0.05
Sb, As, Pb, Cr, Co, Cu, Mn, Ni, and V	mg/Nm^3	0.05
Polychlorinated dibenzodioxin and dibenzofuran (PCDD/F)	ng/Nm^3TEQ	0.1
Notes: a. 200 mg/m^3 for new plants or for existing incinerators with a nominal capacity exceeding 6 tonnes per hour; 400 mg/m^3 for existing incinerators with a nominal capacity of 6 tonnes per hour or less. b. Oxygen level for incinerators is 7 percent.		

5.5.2.5 WBG EHS Guidelines: "Hazardous materials management"

a) Application and approach

These guidelines apply to projects that use, store, or handle any quantity of hazardous materials (Hazmats), defined as materials that represent a risk to human health, property, or the environment due to their physical or chemical characteristics. Hazmats can be classified according to the hazard as

explosives; compressed gases, including toxic or flammable gases; flammable liquids; flammable solids; oxidizing substances; toxic materials; radioactive material; and corrosive substances.

b) General hazardous materials management

Facilities which manufacture, handle, use, or store hazardous materials should establish management programs that are commensurate with the potential risks present. The main objectives of projects involving hazardous materials should be the protection of the workforce and the prevention and control of releases and accidents. These objectives should be addressed by integrating prevention and control measures, management actions, and procedures into day-to-day business activities.

5.5.2.6 WBG EHS Guidelines: "Construction and decommissioning"

These provide guidance, specific guidance on prevention and control of community health and safety impacts that may occur during new project development or due to expansion or modification of existing facilities. By thematic categories, they address three major aspects (environment, OHS and community health and safety) below.

a) Environment:

- **Noise and vibration:** During construction and decommissioning activities, noise and vibration may be caused by the operation of pile drivers, earth moving and excavation equipment, concrete mixers, cranes and the transportation of equipment, materials and people.
- **Air quality:** Project construction of new buildings that will require materials to be trucked in to the site and this could generate fugitive dust affecting adjoining service areas or communities. A secondary source of emissions may include exhaust from diesel engines of earth moving equipment, as well as from open burning of construction waste on-site.
- **Solid waste:** During project implementation, non-hazardous solid waste generated at construction sites would include, scrap wood, glass cullet and metal.
- **Hazardous materials:** Asbestos might be encountered where entire buildings will be demolished and rebuilt.

b) Occupational Health and Safety

Likely OHS risks during construction of the proposed laboratory include over-exertion, slips and falls, work at heights, hotworks (welding) and electrocution, being struck by objects, injury by moving machinery and dust from construction activities.

c) Community Health and Safety:

The guidelines recommend implementation of risk management strategies to protect general community from physical, chemical, or other hazards associated with sites under construction and decommissioning. Key areas to consider are:

- **General site hazards:** where construction activities can injure people in or near buildings under construction.
- **Disease Prevention:** ensuring that risk of disease from construction-related activities (e.g. from water ponding).

- **Traffic Safety:** Construction activities may result in a significant increase in movement of heavy vehicles for the transport of construction materials and equipment increasing the risk of traffic-related accidents and injuries to workers and local/ hospital communities.

5.6 COMPARISON OF UGANDA STANDARDS AND WBG REQUIREMENTS

All key principles of the World Bank Operation Policies have been incorporated into the new IFC Performance Standards. There are differences between Uganda's guidelines and those of the WBG, not only about waste management and air quality but also resettlement as outlined in Table 5.7.

5.7 WORLD HEALTH ORGANISATION (WHO) GUIDELINES

This project has been benchmarked against World Health Organisation (WHO) guidelines for basic laboratories (WHO, 2004) and low-risk TB laboratories (WHO, 2012) since the project laboratory will be a biosafety level 2 TB laboratory designated to handle samples prone to generate aerosols.

Table 5.7: Comparison of Uganda requirements and those of WBG including IFC

Issue	Uganda requirement	IFC	World Bank requirement
Social and Environmental Assessment and Management System	EIA process based on 13 categories listed in the Third Schedule of *The National Environment Act (Cap 153)* as projects that must have EIA undertaken.	Documentation and processes are driven by risks and impacts, not project categorization.	Driven by project categorization.
		Goes beyond assessment to address implementation through the use of a social and environmental management system.	OP 4.01 mostly focuses on assessment only.
Involuntary Resettlement	Ugandan EIA guidelines/ regulations have no specific guidelines on resettlement action plans (RAP) apart from requiring analysis of social impact assessment.	Requires clients to establish a grievance mechanism.	No equivalent requirement in OP 4.01.
Healthcare Waste Management	Uganda has no specific environmental guidelines for healthcare sector.	Guidelines exist: (www.ifc.org/ifcext/enviro.nsf/Content/EnvironmentalGuidelines)	
Incineration and emissions control	No national standards on design or general performance of incineration facilities. Emissions from incineration facilities expected to comply with national (draft) air quality standards. Uganda's air quality standards make no mention of dioxins (known carcinogenic or cancer-inducing) compounds from combustion / incineration facilities.	Detailed guidelines on incineration at healthcare facilities provided in: *"Environmental, Health and Safety Guidelines-HEALTHCARE FACILITIES".* World Bank has air quality standards (World Bank Group EHS Guidelines: *AIR EMISSIONS AND AMBIENT AIR QUALITY*, April 2007) for continuous point source emissions sources. *"Environmental, Health and Safety Guidelines-HEALTHCARE FACILITIES* detail air emission levels for hospital waste incineration facilities including dioxins.	

Issue	Uganda requirement	IFC	World Bank requirement
Air quality standards	Uganda's national air quality standards do not specify size/ capacity of facility they apply to.	WBG Guidelines apply to **significant** emissions sources which are able to contribute a net emissions increase of one or more of the following pollutants within a given airshed: ▪ PM_{10}: 50 tons per year (tpy); ▪ NOx: 500 tpy; ▪ SO_2: 500 tpy; ▪ Combustion sources with an equivalent heat input of 50 MWth or greater.	

5.8 WHO BIOSAFETY GUIDELINES: "FACILITY DESIGN"

a) Applicability

The WHO Guidelines for facility design include information relevant to management of Biosafety issues associated with laboratories which includes a diverse range of activities involving a referral hospital; inpatient and outpatient facilities.

b) Laboratory facility design considerations

These guidelines advise that design and functional layout of laboratory should ensure the following:

- Ample space must be provided for the safe conduct of laboratory work and for cleaning and maintenance.
- Walls, ceilings and floors should be smooth, easy to clean, impermeable to liquids and resistant to the chemicals and disinfectants normally used in the laboratory.
- Floors should be slip-resistant.
- Bench tops should be impervious to water and resistant to disinfectants, acids, alkalis, organic solvents and moderate heat.
- Illumination should be adequate for all activities. Undesirable reflections and glare should be avoided.
- Laboratory furniture should be sturdy. Open spaces between and under benches, cabinets and equipment should be accessible for cleaning.
- Storage space must be adequate to hold supplies for immediate use and thus prevent clutter on bench tops and in aisles. Additional long-term storage space, conveniently located outside the laboratory working areas, should also be provided.
- Space and facilities should be provided for the safe handling and storage of solvents, radioactive materials, and compressed and liquefied gases.
- Facilities for storing outer garments and personal items should be provided outside the laboratory working areas.
- Facilities for eating and drinking and for rest should be provided outside the laboratory working areas.
- Hand-washing basins, with running water if possible, should be provided in each laboratory room, preferably near the exit door.
- Doors should have vision panels, appropriate fire ratings, and preferably be self-closing.
- At Biosafety Level 2, an autoclave or other means of decontamination should be available in appropriate proximity to the laboratory.

- Safety systems should cover fire, electrical emergencies, and emergency shower and eyewash facilities.
- First-aid areas or rooms suitably equipped and readily accessible should be available
- Consideration should be given to the provision of mechanical ventilation systems that provide an inward flow of air without recirculation. If there is no mechanical ventilation, windows should be able to be opened and should be fitted with arthropod-proof screens.
- A dependable supply of good quality water is essential. There should be no cross-connections between sources of laboratory and drinking-water supplies. An anti-backflow device should be fitted to protect the public water system.
- There should be a reliable and adequate electricity supply and emergency lighting to permit safe exit. A stand-by generator is desirable for the support of essential equipment, such as incubators, biological safety cabinets, freezers, etc.
- There should be a reliable and adequate supply of gas. Good maintenance of the installation is mandatory.
- Laboratories are occasionally the targets of vandals. Physical and fire security must be considered. Strong doors, screened windows and restricted issue of keys are compulsory. Other measures should be considered and applied, as appropriate, to augment security.

c) Waste Handling

Waste from laboratory can be divided into five groups:

1. Non-contaminated (non-infectious) waste that can be reused or recycled or disposed of as general, "household" waste;
2. Contaminated (infectious) "sharps" – hypodermic needles, scalpels, knives and broken glass; these should always be collected in puncture-proof containers fitted with covers and treated as infectious;
3. Contaminated material for decontamination by autoclaving and thereafter washing and reuse or recycling;
4. Contaminated material for autoclaving and disposal; and
5. Contaminated material for direct incineration.

In laboratories, decontamination of wastes and their ultimate disposal are closely interrelated. In terms of daily use, few if any contaminated materials will require actual removal from the laboratory or destruction. The overriding principle is that all infectious materials should be decontaminated, autoclaved or incinerated within the laboratory.

Laboratory facilities should establish, operate and maintain a contamination containment system adequate for the scale and type of activities and identified hazards but entailing:

- A system to identify and separate infectious materials and their containers should be adopted. Categories should include:
  - Sharps
  - Contaminated (potentially infectious) materials for autoclaving and reuse
  - Contaminated (potentially infectious) materials for disposal
- Effective decontamination or disinfection of objects or material by an approved procedure.

- Containment of decontamination potential hazard residues prior to disposal.
- Appropriate packaging for immediate on-site incineration or transfer to another facility.

These guidelines recognize breakdown of the pathogen containment as a key source of contamination in laboratory facilities.

d) Chemical, fire, electrical, radiation and equipment safety

Workers in clinical laboratories are not only exposed to pathogenic microorganisms, but also to chemical, electrical, radiation and fire hazards. In addition, a breakdown in the containment of pathogenic organisms may be the indirect result of chemical, fire, electrical or radiation accidents. It is therefore essential to maintain high standards of chemical, fire, electrical, radiation and equipment safety in any microbiological laboratory.

It is mandatory that Laboratory facilities establish and maintain operation and safety manual adequate for the scale and type of activities but entailing:

- Staff induction and regular training on health and safety;
- Chemical containers clearly labelled and capped;
- Keep records of material safety data sheets or other chemical hazard information from chemical manufacturers and/or suppliers, and made accessible in laboratories where these chemicals are used;
- Only amounts of chemicals necessary for daily use should be stored in the laboratory. Bulk stocks should be kept in specially designated rooms or buildings;
- Avail appropriate spillage charts and displayed in a prominent position in the laboratory;
- Provision of chemical spill kits;
- Compressed gas cylinders and liquefied gas containers securely fixed (e.g. chained) to the wall;
- Prominent display of fire warnings, instructions and escape routes in each room and in corridors and hallways;
- Provision of fire-fighting equipment placed near room doors and at strategic points in corridors and hallways: Fire extinguishers should be regularly inspected and maintained, and their shelf-life kept up to date;
- Regular inspection and testing of all electrical installations and equipment, including earthing/ grounding systems;
- Installation of Circuit-breakers and earth-fault-interrupters in appropriate laboratory electrical circuits;
- Earthing/ grounding all laboratory electrical equipment, preferably through three-prong plugs;
- All laboratory electrical equipment and wiring should conform to national electrical safety standards and codes.

6 POTENTIAL ENVIRONMENTAL & SOCIO-ECONOMIC IMPACTS

6.1 INTRODUCTION

In this chapter, prediction and analyses possible positive and negative impacts of construction, equipping and operation of the Butabika National T.B Reference Laboratory is presented. Impact analysis involved determination of magnitude, extent, duration and significance of potential impacts. A detailed assessment of impacts is presented in sections below.

6.2 CONSTRUCTION-PHASE IMPACTS

6.2.1 Positive Impacts

6.2.1.1 Income to material/ equipment suppliers and contractors

Development of the project will entail civil works requiring materials such as gravel, bricks, lumber, steel reinforcement and cement. These materials will be procured from local suppliers in Kampala Capital City and Wakiso District. This is a positive but short-term and reversible impact. Considering that construction labour would be local or national but medical equipment procured internationally, this impact has local, national and international spatial extent. This impact could be enhanced by measures proposed below.

Enhancement measure: Earth materials needed for construction, for example, murram, aggregate (stones and sand) are obtained from quarry operations. Conscious or unwitting purchase of these materials from unlicensed operations indirectly supports, encourages and promotes environmental degradation at illegal quarry sites and can cause medium- to long-term negative impacts. It should therefore be a contractual obligation for contractors to procure construction materials from legitimate or licensed sources (as advised by local authorities).

6.2.1.2 Employment

Construction will avail skilled and unskilled job opportunities. This would be a positive but short-term and reversible impact, lasting only during the construction period.

Enhancement measure: Wherever feasible, local people should be considered for job opportunities commensurate with their level of skills. Adequate occupational health and safety standards should be provided to ensure the work environment is conducive.

6.2.2 Negative Impacts

6.2.2.1 Soil degradation and deprivation of access

Site preparation will involve clearing of vegetation and excavations to obtain a levelled site. This will expose the land stripped of vegetation to agents of erosion such as wind and storm water. During excavation, the soil with extracts of humus shall be removed. Also equipment engaged in activities might cause light contaminations of soil due to leakage of fuels and other liquid form equipment. Inadequate storage of waste generated during construction activities could also potentially contribute to soil contamination. The site was being used for subsistence farming and during site preparation; there will be loss or deprivation of access to land which is currently used for subsistence farming.

Owing to the project footprint, and the fact that this parcel of land had already been demarcated and fenced off, receptor ***sensitivity*** is assessed to be ***low***. The impact ***intensity*** is ***low*** due to the temporary nature of construction activities giving rise to ***minor*** impact significance.

Impact significance:

			Sensitivity of receptor			
			Very low 1	**Low 2**	**Medium 3**	**High 4**
Intensity of impact	**Very low**	**1**	1 Negligible	2 Minor	3 Minor	4 Minor
	Low	**2**	2 Minor	4 Minor	6 Moderate	8 Moderate
	Medium	**3**	3 Minor	6 Moderate	9 Moderate	12 Major
	High	**4**	4 Minor	8 Moderate	12 Major	16 Major

Mitigation strategies:

i) The topsoil removed from the site during site preparation will be stored properly (away from runoff and possible contaminants) for reuse else;
ii) All waste generated during site preparation and construction will be transported by the contractor or a company that has been specifically contracted to an authorized disposal area. The contractor will seek guidance from Kampala Capital City Authority on the final disposal point;
iii) Contractor will avoid use of old equipment or even damaged equipment that is most likely to have oil leakages thus contaminate the soils; and
iv) Contractor will ensure that equipment are properly maintained and fully functional

6.2.2.2 Generation of noise

Noise is perceived as one of the most undesirable consequences of construction activity. Relatively high noise levels are expected in the area during construction phase. Considerable levels of noise and vibrations will mainly result from use of heavy equipment including bulldozers, graders and dump trucks during site preparation and construction activities. Though the level of discomfort caused by noise is subjective, the most commonly reported impacts of increased noise levels are interference in oral communication and disturbance in sleep or during resting time, disturbance or discomfort resulting from construction noise cannot be ruled out given that the proposed site is located in the vicinity of other hospital units.

Ambient noise (Table 4.3) measurements indicate that the environment around the proposed project site is currently experiencing noise close to the limits and sometimes higher (Table 5.2). However, construction activities will still contribute to an increase such levels given the nature of trucks used.

Due to the intermittent and short-term nature of the activities, the ***intensity*** of impact is assessed as ***low*** and ***sensitivity*** of the receptors as ***medium***, given that area is near a hospital for the mentally sick. This results into a ***moderate*** impact significance.

Impact significance:

			Sensitivity of receptor			
			Very low 1	**Low 2**	**Medium 3**	**High 4**
Intensity of impact	**Very low**	**1**	1 Negligible	2 Minor	3 Minor	4 Minor
	Low	**2**	2 Minor	4 Minor	6 Moderate	8 Moderate
	Medium	**3**	3 Minor	6 Moderate	9 Moderate	12 Major
	High	**4**	4 Minor	8 Moderate	12 Major	16 Major

Mitigation strategies:

i) Contractor will be careful when selecting the working equipment to avoid use of old equipment or damaged equipment with high level of noise emissions that would have a negative impact in the environment.
ii) Contractor will ensure that equipment is properly maintained and fully functional.
iii) Contractors should cordon off areas under construction with noise absorbing materials, for example, plywood rather than iron sheets.
iv) Construction workers should be aware of the sensitive nature of workplaces they are operating in and advised to limit verbal noise or other forms of noise. For example, metallic objects or tools can be passed on to a colleague rather than dropping or throwing them with loud bangs.
v) The contractor should ensure that noise levels emanating from machinery, vehicles and noisy construction activities are kept at a minimum for the safety, health and protection of people in the nearby buildings.
vi) Noise and vibration can also be minimized at the project site and surrounding areas through sensitization of construction truck drivers to switch off vehicle engines while offloading materials.
vii) All generators and heavy duty equipment should be insulated or placed in enclosures to minimize disrupting ambient noise levels.

6.2.2.3 Improper management of construction waste

Solid waste and spoil will be generated at the site during site preparation and construction phases. The waste may consist of timber or metal cuttings, excavated materials, paper/cement bags, empty paint and solvent containers, broken glass among others. Some of the waste materials such as paints, cement, adhesives and cleaning solvents contain hazardous substances, while some of the waste materials including metal cuttings and plastic containers are not biodegradable and can have long-term and cumulative effects on the environment. Other wastes which will be generated by non-construction activities because of the presence of the workers at the site include food debris, contaminated water from washing, cleaning equipment, construction tools and vehicles.

Inappropriate disposal of construction waste or spoil could have medium or long-term environmental and public health impact. Improper managing of these wastes could result in:

- Littering and health and safety risks associated with uncontrolled public access to disposal sites;
- Impairment of local air quality and increased health risks due to open burning of wastes; and
- Contamination of soil, surface water and impact on public health when hazardous waste is improperly disposed of.

Extent of this impact will be local to areas where waste is dumped or their immediate neighbourhoods. The impact ***intensity*** is assigned ***low*** because there are licensed solid waste collection companies operating in the area and the contractor would hire them for proper management of the waste. The ***sensitivity*** of receptors is assessed as ***'low'*** given that similar activities have and are taking place in the area and that an experienced contractor will be hired. This gives rise to a ***minor*** impact significance.

Impact significance:

			Sensitivity of receptor			
			Very low 1	**Low 2**	**Medium 3**	**High 4**
Intensity of impact	**Very low**	**1**	1 Negligible	2 Minor	3 Minor	4 Minor
	Low	**2**	2 Minor	4 Minor	6 Moderate	8 Moderate
	Medium	**3**	3 Minor	6 Moderate	9 Moderate	12 Major
	High	**4**	4 Minor	8 Moderate	12 Major	16 Major

Mitigation strategies:

i) The wastes will be properly segregated and separated to encourage recycling of some useful waste materials, that is, some excavated stone materials can be used as backfills.
ii) Hazardous waste should not be mixed with other solid waste generated and should be managed by way of incineration or land-filling.
iii) Waste collection will be made at least once in 24 hours and it should be done in such a way to minimize nuisance of smell and dust during collection.
iv) The contractor and hospital administration should work hand in hand with the Municipal Council to facilitate sound waste handling and disposal from the site. All wastes must be taken to the approved dumpsites.
v) Hazardous wastes such as paints, cement, adhesives should be managed through a third party contractor certified by NEMA. The contractor and hospital administration should work hand in hand to facilitate sound waste handling and disposal from the site.
vi) Solid waste, where practicable and taking into account health and hygiene issues, will be segregated and collected on-site and stored in suitable containers for removal to approved facilities as agreed with the relevant local authority.
vii) Washing will be restricted to a paved area to control run off.

6.2.2.4 Contamination of water resources

Removal of vegetation whose root systems bind the soil may increase the rate of erosion by water or wind in the area. During heavy rainfall, the loss of the moisture retaining function of the vegetation may lead to increased surface run-off, carrying with it eroded soil particles. During construction, there may be need to stockpile assorted materials on site. There is a potential pollution risk if construction materials are not stored or handled responsibly such as to lead to stockpiles wash away. The fuels (mainly diesel) and lubricating oils required by the construction equipment have the potential to contaminate nearby water resources if they leak or are spilled during handling or use. Transportation of pollutants with runoff would affect the water quality hence the communities/ livestock depending on it for water supply. General wastes may have the same effect if not handled properly.

The gently sloping terrain makes soil erosion and sedimentation likely impacts (Section 4.2.5.2). The sensitivity of the receptor is medium because of the waste stabilisation ponds downstream of the site which is the sewage treatment system for Butabika hospital. The intensity of the impact is assessed as medium give that the area is already experiencing relatively high levels of runoff towards the pond system and wetland. This results in a moderate impact significance.

Impact significance:

			Sensitivity of receptor			
			Very low 1	**Low 2**	**Medium 3**	**High 4**
Intensity of impact	**Very low**	**1**	1 Negligible	2 Minor	3 Minor	4 Minor
	Low	**2**	2 Minor	4 Minor	6 Moderate	8 Moderate
	Medium	**3**	3 Minor	6 Moderate	9 Moderate	12 Major
	High	**4**	4 Minor	8 Moderate	12 Major	16 Major

Mitigation strategies:

The contractor should have a contractual obligation to develop and implement a Construction Management Plan (CMP) to include the following:

i) Equipment, materials and chemicals must not be stored within or near watercourses;
ii) Construct a proper drainage system around site and to the final storm water detention or disposal point to stop direct run off into the lake and nearby stabilization ponds;
iii) All construction equipment will be kept in good operating condition to avoid oil or fuel leakages that might contaminate water resources;
iv) Materials like sand and aggregates will be kept in bunded areas to avoid being washed away into water resources by runoff; and
v) MOH will ensure the contractor complies with its environmental management policies, EIA recommendations and national regulations.

6.2.2.5 Traffic and fugitive emissions

During the construction phase there will be an increase in road traffic associated with material and equipment haulage. This may increase stress on existing infrastructure. Construction traffic typically consists of large, heavy vehicles, which will increase the levels of dust, noise and damage to existing roads. This is a direct, negative but reversible construction phase impact. Ambient air quality measurements indicate that the environment around the proposed project site is currently devoid of sources of high noise and air pollution. Given the low air pollution levels in the area, construction activities will therefore temporarily increase such levels.

The above impacts would mostly be linear and spatial in extent limited to road routes. They would therefore affect roadside communities, communities neighbouring the proposed site and road users. The manageability of the impact is high since typical impacts are well understood in conventional infrastructure construction industry and the ability to adapt to the impact is high because construction activities have been going on in the area. Due to the intermittent and short-term nature of the activities, the ***intensity*** of impact is assessed as ***low*** and ***sensitivity*** of the receptors as ***low***.

Impact significance:

			Sensitivity of receptor			
			Very low 1	**Low 2**	**Medium 3**	**High 4**
Intensity of impact	**Very low**	**1**	1 Negligible	2 Minor	3 Minor	4 Minor
	Low	**2**	2 Minor	4 Minor	6 Moderate	8 Moderate
	Medium	**3**	3 Minor	6 Moderate	9 Moderate	12 Major
	High	**4**	4 Minor	8 Moderate	12 Major	16 Major

Mitigation strategies:

i) The construction activities will be carried out during the day.
ii) Control travel speeds of construction vehicles along the road especially at trading/ business centres;
iii) Trucks will be covered during haulage of construction materials to reduce on spillage of materials.
iv) Wherever dust suppression is necessary, water will be sprayed over dusty areas;
v) Keep all construction equipment in good operating condition to reduce exhaust emissions;
vi) All dust will be quickly swept away to avoid migration to other non-construction areas;
vii) Ensure that all equipment leaving the site, clean up their tires in case they are dirty;
viii) Construction work will be undertaken by an experienced and duly registered contractor with a verifiable sense of environmental awareness and responsibility.
ix) Workers will be provided with PPE and the use of PPE shall be enforced.
x) The project area will be cordoned off to minimise on dust and emission migration to nearby facilities by wind.
xi) All construction equipment and trucks will be kept in good operating condition by regular servicing to reduce noise and exhaust emissions.

xii) As part of the bidding processes, contractors will be required to provide their environment management plans that meet mitigation actions proposed in this ESIA.

6.2.2.6 Occupational health safety (OHS) Risks for Contractors

Construction traffic and machinery may pose accident risk to workers either when operated by inexperienced workers or when in a poor mechanical condition. Inadequate OHS could also result from insufficient medical capability at the construction site; or neglect of safety equipment, precautions and procedures.

Accidents could cause considerable ecological damage, financial loss and harm to human life. While largely reversible, some impacts such as loss of human life are irreversible. The receptor ***sensitivity*** is considered ***high*** given that such impacts may be irreversible once they occur. The impact ***intensity*** is considered to be ***medium*** since MOH will procure a qualified contractor who is aware of OHS measures. Nevertheless, this gives rise to an impact of major severity.

Impact significance:

			Sensitivity of receptor			
			Very low 1	**Low 2**	**Medium 3**	**High 4**
Intensity of impact	**Very low**	**1**	1 Negligible	2 Minor	3 Minor	4 Minor
	Low	**2**	2 Minor	4 Minor	6 Moderate	8 Moderate
	Medium	**3**	3 Minor	6 Moderate	9 Moderate	12 Major
	High	**4**	4 Minor	8 Moderate	12 Major	16 Major

Mitigation strategies:

i) Orient all construction workers on safe work practices and guidelines and ensure that they adhere to them.
ii) Training should be conducted on how to prevent and manage incidences. This should involve proper handling of electricity, water etc. and sensitization on various modes of escape, conduct and responsibility during such incidences. All must fully be aware and mentally prepared for potential emergency.
iii) Regular drills should constantly follow on various possible incidences. This will test the response of the involved stakeholders. Such drills will keep them alert and they will become more responsive to in the case of incidences.
iv) Use signage to warn staff and/ or visitors that are not involved in construction activities of dangerous places.
v) Strict instructions should be given for drivers of heavy equipment.
vi) Supervision of works should be done regularly to ensure that safety conditions are met while any deviation from safety regulations is immediately reclaimed following the best practices regarding safety at work equipment.
vii) Communication line must be ensured in between workers and drivers of heavy equipment.
viii) Develop evacuation procedures to handle emergency situations.

ix) Provide adequate OHS personnel protective gear for the employees. The guide below should be useful:

Hearing (Over 80 Decibels for 8 hours a day requires hearing protection)

- Ear Muffs: One size fits all, comfortable, less ear infection risk
- Ear Plugs: Small, lightweight, can get dirty and cause infection

Face/Eye (Working with any chemical or using any mechanical equipment)

- Face Shield: Protect face from splashing and particles
- Safety Glasses: Protection from solids (cutting, sanding, grinding)
- Safety Goggles: Protects eyes from splashing

Hand (Use correct gloves for the job)

- Chemical Gloves: (Nitrile, Latex, PVC)
- Gloves for other use: special gloves for cutting, burning, abrasions/ blisters

Body

- Overalls: Can protect against dust, vapours, splashes

Foot Protection

- If electrical hazard present ensure boots offer protection
- Safety Toe/Steel Toe Boots: Always worn when potential for falling hazards exists
- Water/Chemical Resistant Boots: Use in a spill situation
- Non-slip boots for working on wet/slippery floors.

6.2.2.7 Risk of accidents

The proposed site is located along Butabika road off Port Bell road and improper turning off from or joining to the road by vehicles and machinery such as graders, wheel loaders and dumpers may result into accidents with other motorists. In addition, there will be trucks transporting construction materials to the site. This traffic movement may result in community risk of traffic-related accidents especially when the safe speed limits are not adhered to.

Construction traffic accidents would be a significant social impact and likely to affect children, women, disabled, elderly people and livestock. The area has a significant number of school going children and other commercial activities. The hospital is also located in the business district of the municipality with a lot of human activity on the adjoining road at the access gate to the hospital. The duration of the risk will be short-term occurring only during the construction phase. Although some effects of the accidents (e.g. minor injuries) may be reversible, loss of human life is irreversible.

Other risks of accidents may arise from hoardings or scaffolding. A hoarding or scaffolding is a temporary structure built around demolition or excavation and building work to secure the site and protect the public, property and infrastructure from damage. The primary objective in the design, installation and maintenance of hoardings and scaffolding on or above hospital site (including footways and carriageways) is to ensure that:

a) These temporary structures have the least adverse impact on pedestrian movement and amenity; and

b) Safe vehicular access is provided, whilst at the same time allowing applicants to meet their statutory responsibilities under the Health and Safety legislation to protect the public place adjoining a work site.

Hoardings and Scaffoldings have adverse impacts on human health and environment in case accidents occur at the site.

The receptor sensitivity is ***high*** given the number pedestrians and commercial activities along the roads while the intensity is ***medium*** given the temporary nature of the construction activities. The impact severity is thus assessed to be ***major***.

Impact significance:

			Sensitivity of receptor			
			Very low 1	**Low 2**	**Medium 3**	**High 4**
Intensity of impact	**Very low**	**1**	1 Negligible	2 Minor	3 Minor	4 Minor
	Low	**2**	2 Minor	4 Minor	6 Moderate	8 Moderate
	Medium	**3**	3 Minor	6 Moderate	9 Moderate	12 Major
	High	**4**	4 Minor	8 Moderate	12 Major	16 Major

Mitigation strategies:

i) Adopt best transport safety practices with the goal of preventing traffic accidents and minimizing injuries suffered by project personnel and the public, as follows:

- Emphasizing safety aspects among project drivers. Specifically ensure drivers respect speed limits through trading centres and areas with public institutions;
- Adopting limits for trip duration and arranging driver rosters to avoid overtiredness;
- Position traffic guides at road junction to the hospital to control driver speeds;
- Employ safe traffic control measures, including road signs and flagmen/traffic guides to warn of dangerous conditions and children crossings.

ii) Ensure contractors regularly maintain vehicles to minimize potentially serious accidents such as those caused by brake failure commonly associated with loaded construction trucks.

iii) The site, where possible, should be fenced and signalization put in place with security personnel to stop unauthorised people from accessing the site.

iv) For falling debris, and hoarding/scaffoldings; clear warning signs should be placed around the construction premise, install interceptors and net traps to divert falling parts, and emphasize (provide) personnel protective gears to persons in the area.

v) Place clear warning signs around the construction premise (Scaffolds) that indicate falling debris

vi) Personnel protective gears should be provided to workers on site

vii) Follow a guided procedure for installing hoarding and Scaffoldings, including application for a license or permit to erect hoarding structures

6.3 OPERATION PHASE IMPACTS

6.3.1 Positive Impacts

6.3.1.1 Improved medical surveillance services

The project will positively impact health of Ugandans and the East African region through easing access to diagnostic services for TB and other communicable diseases. It will help to enhance access to diagnostic services for vulnerable groups; improve capacity to provide specialized diagnostic services and conduct drug resistance monitoring; and strengthen laboratory based disease surveillance to provide early warning of public health events.

Enhancement measures: Appropriate staffing with technical/ medical personnel adequately trained in use of newly installed equipment.

6.3.1.2 Employment opportunities

Operation of the laboratory will create additional long-term technical and non-technical job opportunities for medical professionals, janitors, etc.

Enhancement measure: Wherever feasible, local qualified people should be considered for job opportunities. Adequate occupational health and safety standards should be provided to ensure the work environment is conducive.

6.3.2 Negative Impacts

Negative impacts during operation of the laboratory may arise from:

i) Improper waste management (including laboratory/medical waste and wastewater discharges);
ii) Misuse or inability to use installed equipment for improved service delivery;
iii) Lack of maintenance, hence laboratory facilities degenerating to decay again;
iv) Safety and occupational risk to health workers; and
v) Risk of fire outbreak
vi) Emissions from the incinerator.

6.3.2.1 Improper management of waste

As a result of the operation of this laboratory it is expected that some waste is generated. Mainly there will be *domestic waste and hazardous waste.* Since laboratory activities involve certain medical examinations and also there will be a need for usage of different sorts of chemicals or reagents, it can be concluded that different types of hazardous wastes shall be generated. Therefore, improper waste decontamination and disposal can cause public health risks due to environmental pollution: impaired air quality, stormwater contamination of water courses and infections when people or children rummage through improperly dumped infectious waste or raw waste stockpiles can be life-threatening.

The World Health Organization (WHO) classifies as infectious waste: sharps (needles, scalpels, etc.), laboratory cultures and stocks, blood and blood products, pathological wastes, and wastes generated from patients in isolation because they are known to have infectious diseases. Medical wastes can also include chemicals and other hazardous materials used in patient diagnosis and treatment. These

constitute a grave risk, if they are not properly treated or disposed or are allowed to get mixed with other municipal waste. Examples of the types of bio-medical waste expected to be generated from the laboratory during the operational stage are indicated in Table 6.1.

Table 6.1: Expected waste from the laboratory

Type of waste	Waste description
Infectious solid waste	Items contaminated with blood and body fluids, including cotton, pathological wastes, infected blood, patient samples and specimens
Microbiology Waste	Cultures; stocks and microorganisms; dishes and devices used for culture
Sharps	Needles; syringes; scalpels; blades; glass, etc
Disposables	Disposables other than sharps, e.g. Gloves, valves, and any other infected plastics
Liquid Waste	Waste generated in the laboratories
Chemical Waste	Chemicals used in the production of biological, laboratory reagents; film developer; disinfectants that are expired or no longer needed; solvents; outdated, contaminated and discarded chemicals
Incineration Ash	Ash from the incineration of any biomedical waste

Likelihood of the impact occurring is low given that the hospital is currently managing their waste fairly well. It is a long-term impact, local and cumulative in nature hence the ***intensity*** of the impact will also be ***low.*** However, ***sensitivity*** of receptors due to improper medical waste management is ***medium***, thereby giving a ***moderate*** impact significance.

Impact significance:

			Sensitivity of receptor			
			Very low 1	**Low 2**	**Medium 3**	**High 4**
Intensity of impact	**Very low**	**1**	1 Negligible	2 Minor	3 Minor	4 Minor
	Low	**2**	2 Minor	4 Minor	6 Moderate	8 Moderate
	Medium	**3**	3 Minor	6 Moderate	9 Moderate	12 Major
	High	**4**	4 Minor	8 Moderate	12 Major	16 Major

Mitigation strategies:

i) An incinerator will be installed on the site to enhance disposal relevant material through burning.
ii) Wastewater discharged from laboratory should be aggregated and eventually pre-treated prior being released in the sewerage and sanitation system.
iii) Provide appropriate waste bins adequately labelled for the different types of waste generated in the laboratory to allow segregation and collection at the point of generation.
iv) The collection of waste should be made at least once in 24 hours, and it should be done in such a way to minimize nuisance of smell and dust during collection and all the waste collected must be carried away from the storage site to an approved disposal point.
v) Hospital/ Laboratory staff should be trained or educated on the importance and means of waste management and handling during operation.

vi) The hospital administration should work hand in hand with a private refuse handlers and the
vii) Municipal Council to facilitate sound waste handling and disposal from the site noting that hazardous waste must not be mixed with municipal waste.
viii) Overall, ensure proper waste management practices as recommended in the study on improvement of healthcare waste management in Uganda[2].

6.3.2.2 Air pollution due to incineration of waste

Incineration of laboratory waste if carried out in an inappropriate facility could result into localized pollution of air. The key emissions to the air from operation of the incinerators are odour, particulate matter, hydrogen chloride, nitrogen oxides, sulphur dioxide, carbon monoxide, and volatile organic compounds (from methane to polycyclic aromatic hydrocarbons (PAH), dioxins and furans (PCDD/F) Dioxins are known to promote cancers in humans. Downwash of incinerator emissions has potential to degrade indoor air quality of nearby environment or offsite buildings. In addition, to incinerator emissions, there is also a risk of contaminated air from the laboratory mixing with the outside environment if poorly ventilated.

Duration of onsite and offsite air pollution would be *long-term* lasting entire life of incineration units and cumulative in nature since there are incinerators being operated on site. The ***intensity*** of the impact will be ***low*** if incinerator stacks design proposed in WBG EHS Guidelines: "Air emissions and ambient air quality" (see Section 0) is adopted. However, ***sensitivity*** of health of patients and nearby communities to potential air pollution is ***medium*** since there are operating units in place, thereby giving a ***moderate*** impact significance.

Impact significance:

			Sensitivity of receptor			
			Very low 1	**Low 2**	**Medium 3**	**High 4**
Intensity of impact	**Very low**	**1**	1 Negligible	2 Minor	3 Minor	4 Minor
	Low	**2**	2 Minor	4 Minor	6 Moderate	8 Moderate
	Medium	**3**	3 Minor	6 Moderate	9 Moderate	12 Major
	High	**4**	4 Minor	8 Moderate	12 Major	16 Major

Mitigation strategies:

i) Ensure operator of incineration unit is adequately trained to ensure efficient operation;
ii) The incinerator should be operated at its design temperatures and combustion air supply;
iii) Consultations with potentially affected people should be done by design consultant to inform choice of the most appropriate location of incinerator;
iv) The laboratory should be equipped with bio-safety areas and should also equipped with all necessary equipment and have a ventilation system that fulfils standards of biosafety;
v) The incinerator site should be with hard standing and catchments and containment of disinfectants;

[2] *MoH 2005 (revised march 2009): Improvement of healthcare waste management in Uganda (conducted by Carl Bro)*

vi) All exhaust air from the laboratory should pass through high efficiency particulate air filters; and
vii) Waste should not be pre-treated with a chlorine-bearing disinfectant or should not be contained in PVC bags to avoid emission of dioxins or furans during incineration. For the same reason, no other material destined for incineration should contain chlorine-bearing chemicals.

6.3.2.3 Occupational health and safety risks

Inadequate treatment or handling of contaminated samples or waste can create the potential that the laboratory staff would get exposed to life threatening infections in the course of their normal duties, and in this case brings at risk the health of individuals in the laboratory team and the general public health as well. This transmission can take place through staff equipment, clothing and vehicles transporting samples. The infectious waste could be in gaseous, liquid or solid forms. A list of OHS risk sources for staff is presented below:

i) Inadequate lighting and ventilation in workplaces
ii) Lack of safe access particularly for disabled employees
iii) Lack of adequate training (or neglect of safety precautions/ guidelines) in use of equipment and handling of samples
iv) Misuse of equipment and materials for functions they are not designed
v) Lack of safety signage in specific areas
vi) Electrical hazard
vii) Eye hazards such as splashes
viii) Chemical hazards (acids, alkalis, expired drugs, oxidizing and reactive chemicals)
ix) Biological hazards (samples of blood or other body fluids with potential to cause diseases). Biological agents can be classified into four groups[3]:

1: Biological agents unlikely to cause human disease;
2: Biological agents that can cause human disease and are likely to require additional controls, but are unlikely to spread to the community;
3: Biological agents that can cause severe human disease, present a serious hazard to workers, and may present a risk of spreading to the community, for which there usually is effective prophylaxis or treatment available and are thereby likely to require extensive additional controls;
4: Biological agents that can cause severe human disease, are a serious hazard to workers, and present a high risk of spreading to the community, for which there is usually no effective prophylaxis or treatment available.

Duration of the impact would be long-term lasting entire life of the affected person or short-term depending of the hazard exposed to. The intensity of the impact is ***low*** if ''facility design'' (see section 0) proposed in WBG EHS Guidelines is adopted and PPE used by workers. However, ***sensitivity*** on the receptors will be ***high***, thereby giving a ***moderate*** impact *significance*.

[3] *World Health Organization (WHO) Classification of Infective Microorganisms by Risk Group (2004).*

Impact significance:

			Sensitivity of receptor			
			Very low 1	**Low 2**	**Medium 3**	**High 4**
Intensity of impact	**Very low**	**1**	1 Negligible	2 Minor	3 Minor	4 Minor
	Low	**2**	2 Minor	4 Minor	6 Moderate	8 Moderate
	Medium	**3**	3 Minor	6 Moderate	9 Moderate	12 Major
	High	**4**	4 Minor	8 Moderate	12 Major	16 Major

Mitigation strategies:

i) The primary measure to mitigate OHS impacts is prevention which entails identification of risks and instituting pro-active measures to avoid them. In part this can be achieved by following GIIP or national guidelines. For unavoidable risks, personal protective equipment (PPE) should be provided to workers.
ii) Orient all staff on safe work practices and guidelines and ensure that they adhere to them.
iii) Training should be conducted on how to prevent and manage incidences. This should involve proper handling of electricity, water etc. and sensitization on various modes of escape, conduct and responsibility during such incidences.
iv) Regular drills should constantly follow on various possible incidences. This will test the response of the involved stakeholders. Such drills will keep them alert and they will become more responsive to in the case of incidences.
v) Use signage to warn staff and/ or visitors that are not involved in laboratory work of dangerous places.
vi) Develop evacuation procedures to handle emergency situations.
vii) Provide adequate OHS personnel protective gear for the employees.

6.3.2.4 Risk of fire outbreak

Without provisions for fire safety, there is a risk of fire outbreak at the facility with disastrous life and financial impact. Fires can start from ignitable materials in laboratories, cigarette smoking in non-designated places or old electrical connections.

Duration of the impact would be long-term lasting entire life of laboratory operation phase, local in spatial extent affecting onsite facilities, patients, health workers and neighbouring communities with possibly irreversible and the likelihood of the impact occurring and its intensity are ***low*** if ''facility design'' (see section 0) proposed in WBG EHS Guidelines and WHO "facility design" (see section 0) are adopted. However, ***sensitivity*** on the receptors will be ***medium***, thereby giving a ***moderate*** impact ***significance***.

Impact significance:

			Sensitivity of receptor			
			Very low 1	**Low 2**	**Medium 3**	**High 4**
Intensity of impact	**Very low**	**1**	1 Negligible	2 Minor	3 Minor	4 Minor
	Low	**2**	2 Minor	4 Minor	6 Moderate	8 Moderate
	Medium	**3**	3 Minor	6 Moderate	9 Moderate	12 Major
	High	**4**	4 Minor	8 Moderate	12 Major	16 Major

Mitigation strategies:

i) Provide fire extinguishers at strategic locations within the laboratory and ensure that all fire-fighting equipment are regularly maintained and serviced.
ii) Key healthcare staff should have basic training in fire control through regular fire fighting drills.
iii) Fire emergency telephone numbers should be displayed in communal areas.
iv) Install an automatic fire alarm system for the entire laboratory and provide enough water hose reel around the property with a fire reserve water tank attached with an automatic booster pump for hose reel.
v) Provide fire hazard signs such as 'No Smoking' signs. Directions to exit in case of any fire incidence and emergency contact numbers should be provided. The contact/emergency numbers should be displayed generously within the facility.

7 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

This environmental and social management plan, (ESMP) (Table 7.1) for proposed construction works and operation of laboratory facility, identifies potential environmental and social aspects that should be monitored. It identifies parties responsible for monitoring actions, associated costs, indicators and training or capacity building needs and reporting. Various aspects of the ESMP are detailed in sections below

7.1 INSTITUTIONAL ARRANGEMENTS

a) Institutional structure and responsibilities

Institutional responsibility of implementing this ESMP will rest with the Project Coordination Unit, PCU (or Task Team) at MOH. A key role of the unit would be among others, to review consultants' reports for compliance with the ESMP. Other roles will be:

- Monitoring implementation of mitigation actions by contractors
- Coordinating training and capacity building where planned
- Periodically report to IDA about implementation of the ESMP

The Project Coordination Unit is led by a Project Coordinator (PC), assisted by a Deputy Project Coordinator (DPC) under whom are 9 Component Coordinators (CC) each for areas such as Human Resource, Health Infrastructure, Leadership and Management, etc. Under CCs are 11 Focal Persons (FP) who have supervisory roles and are responsible for collecting information about respective components. Supervision of implementing this ESMP will under the Health Infrastructure component by the "Senior Engineer-Sanitary" in the Environmental Health Division.

MOH should ensure that all its personnel to be involved in implementation of this ESMP are adequately qualified and were appointed based on their qualification and suitability for respective roles. There is thus no training provided for them under this ESMP.

Oversight to ensure mitigation actions are implemented will rest with the Health Infrastructure Division (HID) at Ministry of Health but health workers at facility level, Project Coordination Unit, In-charge Officials of each facilities and Clerk of Works will have similar responsibility.

MOH shall require contractors to comply with this ESMP and where a contractor has an Environmental Officer she/he will undertake environmental supervision during construction. However, since construction duration is short (1 year) where a contactor does not have an Environmental Officer the supervising engineer or site manager/ contract manager should be given environmental orientation relevant to this ESMP so as to execute required environmental supervision roles. This might not be necessary if the supervising engineer has working environmental knowledge (most civil engineers do). Additionally a "Clerk of Works" should be employed to represent client's environmental objectives and interests during construction phase. As a hiring criterion, such a person should have a background in environmental issues, particularly associated with construction projects.

In each District is found a District Environmental officer (DEO) responsible for overseeing environmental protection on behalf of NEMA. However in town councils and municipalities, this role is undertaken by Town- and Municipal Environmental Officers respectively. These will have implementation and monitoring roles during execution of this ESMP. Usually, these officials lack adequate facilitation so the project will need to provide auxiliary financial assistance for them to have effective participation in this project. This has been provided in the ESMP (Sec 6.2.2.5). Based on their professional knowledge or recommendations in this ESIA, local environmental officers may have role in project design as advisors to engineering consultants on aspects such as location of onsite incineration units.

b) Monitoring and reporting arrangements

Monitoring will verify if predicted impacts have actually occurred and check that mitigation actions recommended in the ESIA are implemented and their effectiveness. Monitoring will also identify any unforeseen impacts that might arise from project implementation.

Who monitors and how: Monitoring will be undertaken by MOH (PCU) and Environmental Officers who represent NEMA at local administrative. Monitoring by NEMA in this case can be considered "third party monitoring" but this is its regulatory mandate according to Sections 6 and 7 of the National Environment Act (Cap 135).

Another government agency that may undertake "third party monitoring" is the Occupational Health and Safety Department in Ministry of Gender, Labour and Social Development (MGLSD). This unit has authority to inspect any facility for compliance with national requirements on safety in workplaces. The project shall make no funding to MGLSD since this is provided for in its annual budget.

Monitoring will be done through site inspection, review of grievances logged by stakeholders and *ad hoc* discussions with potentially affected persons (construction workers, residents near the hospital, patients and healthcare staff). At each monitoring, a discussion with a chairperson of environment committee of the area's local council (LC) could provide insight into views and grievances community has about the project.

Frequency: Monitoring will be undertaken monthly over the 1 year construction period.

Audits: Audits will be necessary both during construction and project operation. While construction audits will aim to verify compliance to impact mitigation requirements, post-construction audits are a regulatory requirement within 12 months and not more than 36 months after completion of construction, according to national EIA Regulations, 1998 Section 31(2).

Since construction duration is estimated to be 1 year, this ESMP has included a budget for **1 year's** construction audit and a separate provision so that from year 2 to 5th (4 audits) audits done are a full environmental audits as per Uganda requirements.

Both construction and post-construction audits can be conducted internally (by MOH) or by a consultant hired by MOH. If undertaken by a hired consultant, a budget has been proposed for both in this ESMP.

Reporting: Concise monthly monitoring reports should be compiled by MOH's Project Coordination Unit (PCU) and shared with IDA or other interested stakeholder.

Construction- and post-construction phase auditing should culminate in reports that MOH shall share with IDA, NEMA or other interested stakeholders. Note that while MOH is under no obligation to disclose construction phase audits, annual post-construction audits must be submitted to NEMA as a regulatory requirement as per Section 31(2) of National EIA Regulations, 1998.

7.2 GRIEVANCE MECHANISM

This section describes avenues for affected persons to lodge a complaint or express a grievance against the project, its staff or contractors during project implementation. It also describes the procedures, roles and responsibilities for addressing grievances and resolving disputes. Every aggrieved person shall be able to trigger this mechanism to quickly resolve their complaints.

The objectives of the grievance process are:

i) Provide affected people with avenues for making a complaint or resolving any dispute that may arise during the course of land and asset acquisition, including during the process of moving homes;
ii) Ensure that appropriate and mutually acceptable corrective actions are identified and implemented to address complaints;
iii) Verify that complaints are satisfied with outcomes of corrective actions;
iv) Avoid the need to resort to judicial proceedings.

The grievance mechanism at each healthcare facility will be fed from three main sources:

- Community residents, patients or health workers.
- Supervising engineer, clerk of works or contractor.
- Monitoring team who will forward issues/concerns identified in the field.

Steps of the grievance process are described below. A flow chart outlining the main actions and decision points is shown in Figure 7.1.

Step 1: Receipt of complaint

A verbal or in written complaint from a complainant will be received by the Clerk of Works and recorded in a complaints log s(he) keeps on site. The log will indicate grievances, date lodged, action taken to address complaint or reasons the grievance was not acted on; information provided to complainant and date the grievance was closed. Grievances should be lodged at any time, either directly to the Clerk of Works' office or through the Local Council Chairperson. The process for lodging a complaint is outlined below:

i) Clerk of Works receives complaint(s) from complainant and records it in log (in English).

ii) Clerk of Works reads the recorded complaint translating it into local language for the complainant to confirm correct detail of complaint has been documented.
iii) Complainant signs the log to confirm grievance was accurately recorded.

Step 2: Determination of corrective action

If in his/her view, a grievance can be solved at this stage, the Clerk of Works will determine a corrective action in consultation with the aggrieved person. Remedial action(s) and timeframe within which they must be accomplished has been described and the party responsible for implementing them will be recorded in the complaint log.

Grievances will be resolved and status reported back to complainants within 5 days. If more time is required this will be communicated clearly and in advance to the aggrieved person. For cases that are not resolved within the stipulated time, detailed investigations will be undertaken and results discussed not more than 1 month from lodging a grievance.

Step 3: Meeting with the complainant

The proposed corrective action and the timeframe in which it is to be implemented will be discussed with the complainant within 5 days of receipt of the grievance. Consent to proceed with the corrective action will be sought from the complainant and witnessed by a local council chairperson (LC Chairman).

Step 4: Implementation of corrective action

Agreed corrective action will be undertaken by the project or its contractor within the agreed timeframe. The date of the completed action will be recorded in the log against the complainant's grievance.

Step 5: Verification of corrective action

To verify satisfaction, the aggrieved person will be asked to return if not satisfied with the corrective action.

Step 6: Action by MOH and project contractors

If the Clerk of Works cannot solve the grievance, he will refer it to MOH (and contractor) through the Supervising Engineer. It is believed all possible grievances can be solved at this level.

The grievance process to be followed is depicted in Figure 7.1.

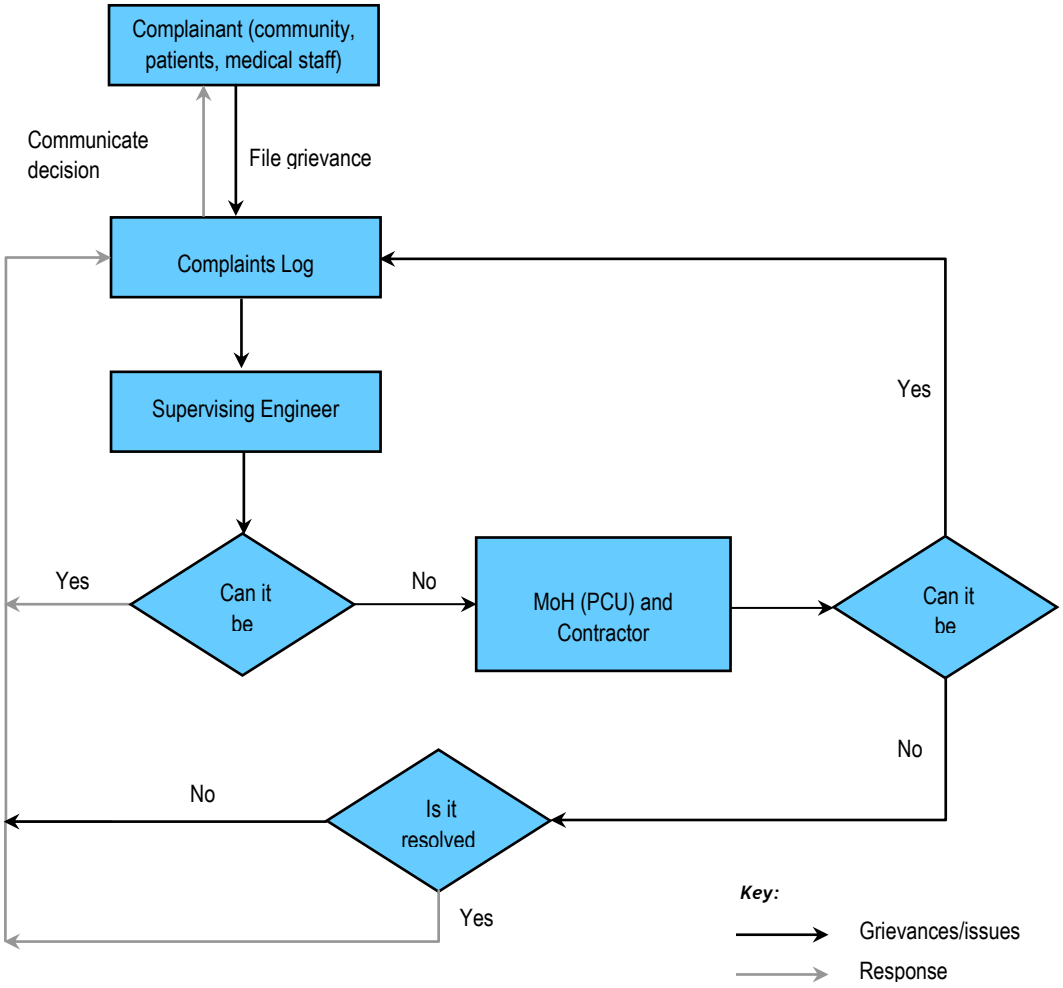


Figure 7.1 Grievance management mechanism

Table 7.1: Impact Monitoring and Management Plan.

Text Reference	Impact and Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Incremental Costs (USD) for all HCFs sites	Capacity Building and Training Requirements
6.2	**CONSTRUCTION PHASE**						
6.2.1	**Positive impact**						
6.2.2.1	**Income to material/ equipment suppliers**						
	Project will promote local procurement where technically or commercially reasonable and feasible.	Ensure that local communities and businesses benefit from procurement process	Number of local businesses benefiting from construction related procurement	Before and during commencement of construction/ renovation	MOH; Contractor	Negligible	None
	For earth materials, procure from legitimate sources to avoid encouraging environmental degradation	Project's material demand does not encourage environmental degradation	All quarries from which materials (sand, stone) are obtained are licensed by the local authorities.	Before and during construction/ renovation	MOH; Contractor	Negligible	None
6.2.1.2	**Employment**						
	Unskilled labour will be recruited exclusively from local community, and semi-skilled labour will be recruited preferentially from such communities, provided that they have the requisite qualification, competence and desired experience.	The participation of local community members will be maximised during site preparation and construction activities.	Number of local people (unskilled and semi-skilled) employed during construction phase	Before and during construction	MOH; Contractor	Negligible	None
	Contractors will be encouraged to pay a "living wage" to all workers.	Improve livelihood of the local community	No complaints of poor remuneration	Before and during construction	MOH; Contractor	Negligible	None
6.2.2	**Negative impacts**						
6.2.2.1	**Soil degradation and deprivation of access to land**						
	All waste generated during site preparation and construction will be transported by the contractor or a company that has been specifically contracted to an authorized disposal area. The contractor will seek guidance from Kampala Capital City Authority on the final disposal point;	All waste collected and disposed of properly	No complaint of poor management of waste from communities around the site and road. No litter at project site and complaints from authorities	Throughout construction	MOH; Contractor	Negligible (Part of contractor's bid price)	None

Text Reference	Impact and Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Incremental Costs (USD) for all HCFs sites	Capacity Building and Training Requirements
	Contractor will avoid use of old equipment or even damaged equipment that is most likely to have oil leakages thus contaminate the soils;	Uncompromised energy supply to hospital community	No complaint of irregularities in energy supply related to construction activities	Throughout construction	MOH; Contractor	Negligible	None
	Current users of the proposed site for subsistence crop growing will be given time to harvest their produce before start of construction activities	No complaints lodged	Number of complaints	During preparatory stages for construction	MOH	Negligible	None
	Contractor will ensure that equipment are properly maintained and fully functional						
6.2.2.2	**Generation of noise**						
	Contractor should ensure that all equipment and machinery are in good and sound condition of old or damaged equipment with high level of noise emissions that would have a negative impact in the environment	Construction activities generate permissible levels of noise.	Patients and health workers do not complain about noise during construction	During construction	MOH; Contractor	Negligible	None
	Contractor will ensure that equipment is properly maintained and fully functional.	Construction activities generate permissible levels of noise.	Patients and health workers do not complain about noise during construction	During construction	MOH; Contractor	Negligible	None
	Contractors should cordon off areas under construction with noise absorbing materials, for example, plywood rather than iron sheets;	Construction activities generate permissible levels of noise.	Patients and health workers do not complain about noise during construction	During construction	MOH; Contractor	Comprised in cost for control of flying debris	None
	Construction workers should be sensitised on the sensitive nature of workplace they are operating in and advised to limit verbal noise or other forms of noise. For example, metallic objects or tools can be passed on to a colleague rather than dropping or throwing them with	No excessive noise from workers	Patients and health workers do not complain about noise during construction	During construction	MOH; Contractor	Negligible	None

Text Reference	Impact and Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Incremental Costs (USD) for all HCFs sites	Capacity Building and Training Requirements
	loud bangs.						
	The contractor should ensure that noise levels emanating from machinery, vehicles and noisy construction activities are kept at a minimum for the safety, health and protection of people in the nearby buildings.	Construction activities generate permissible levels of noise.	Patients and health workers do not complain about noise during construction	During construction	MOH; Contractor	Negligible	None
	Construction workers and drivers should be sensitised to switch off Equipment, machinery and vehicle engines when not in use and/or offloading materials.	Minimized noise and vibration at the project site.	Patients and health workers do not complain about noise and vibration during construction	During construction	MOH; Contractor	Negligible	None
	Construction activities should be carried out during the day	Afford hospital community noise-free night time to rest	No complaints of restless nights due to noise and vibration from project activities.	During construction	MOH; Contractor	Negligible	None
	All generators and heavy duty equipment should be insulated or placed in enclosures to minimize disrupting ambient noise levels.	Construction activities generate permissible levels of noise.	Patients and health workers do not complain about noise during construction	During construction	MOH; Contractor	Negligible	None
6.2.2.3	**Improper management of waste**						
	Contractor should seek guidance of local environmental officers to identify acceptable disposal sites	Contractor has records of proper waste disposal indicating quantities dumped and location of dumping site,	No report of illegal waste dumping in non-designated areas	Throughout construction	MOH ; Contractor; Local Environmental Officer.	Negligible	None
	Contractors should undertake waste segregation onset to separate hazardous waste from non-hazardous waste	Hazardous waste separated from non-hazardous waste on site and each waste stream disposed of according to NEMA requirements in designated sites.	Separate containers for hazardous waste and non-hazardous waste on site	Throughout construction	MOH ; Contractor; Local Environmental Officer.	Negligible	Likely hazardous and non-hazardous construction waste
	Waste (such as metal scrap or wood waste) that can be reused/ recycled may be given	Amount of waste disposed minimized by reuse, wherever feasible	Record of material types and estimated quantity diverted for reuse	Throughout construction	Contractor; local environment officer	Negligible	None

Text Reference	Impact and Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Incremental Costs (USD) for all HCFs sites	Capacity Building and Training Requirements
	to local people.						
6.2.2.4	**Contamination of water resources**						
	Equipment, materials and chemicals must not be stored within or near watercourses	No illicit sexual relationships among construction workers and local community	All construction workers living in a camp adhere to a "No fraternization" and comply with latest entry time into camp (6PM) set to avoid prostitution.	Throughout construction	MOH; contractor	Negligible	None
	Construct a proper drainage system around site and to the final storm water detention or disposal point to stop direct run off into the lake and nearby stabilization ponds						
	All construction equipment will be kept in good operating condition to avoid oil or fuel leakages that might contaminate water resources	No aggravated spread of HIV/AIDS due to project implementation	All construction workers are aware of HIV/AIDS risk and responsible living.	Throughout construction	MOH; contractor	**USD 600** for 500 HIV/AIDS posters/fliers and free condoms	None
	Materials like sand and aggregates will be kept in bunded areas to avoid being washed away into water resources by runoff						
	MOH will ensure the contractor complies with its environmental management policies, EIA recommendations and national regulations						
6.2.2.5	**Traffic and fugitive emissions**						
	The construction activities will be carried out during the day.						
	Truck drivers will be sensitised on and ensure they observe speed limits on roads especially at business centres	Minimise dust and exhaust emissions	No complaints of trucks ruthless driving from communities along roads used by project vehicles	During construction	MOH; Contractor	Negligible	None
	Trucks will be covered during haulage of construction	No material spills on roads during haulage to sites	No accidents caused by construction material split on road	Throughout construction	MOH ; Contractor;	Negligible (this should be part of	None

Text Reference	Impact and Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Incremental Costs (USD) for all HCFs sites	Capacity Building and Training Requirements
	materials to reduce on spillage of materials				Police	contractor's bid)	
	Wherever dust suppression is necessary, water should be sprayed over dusty areas	Minimise dust levels	Recognition of locales of contractor's efforts to minimise dust nuisance.	During construction	MOH; Contractor	Negligible	None
	All construction equipment will be kept in good operating condition and service regularly to reduce exhaust emissions	Minimise air pollution levels	No complaints of excessive fumes	During construction	MOH; Contractor	Negligible	None
	All dust will be quickly swept away to avoid migration to other non-construction areas	Reduce dust levels in off-site locations	No dust hips on-site	Throughout construction	MOH; Contractor	Negligible	None
	Construction work will be undertaken by an experienced and duly registered contractor with a verifiable sense of environmental awareness and responsibility	Employment of best Construction practices to minimise adverse impacts	Implementation of proposed mitigation measures	Throughout construction	MOH; Contractor	Negligible	None
	Workers will be provided with PPE and the use of PPE shall be enforced	Minimise OHS on workers from fugitive emissions	All workers on-set with appropriate PPE	Throughout construction	MOH; Contractor	Comprised in cost for provision of PPE	None
	The project area will be cordoned off to minimise on dust and emission migration to nearby facilities by wind	No excessive dust emissions noted outside construction areas	No complaints of excessive dust from construction areas	During construction	MOH; Contractor	Comprised in cost for control of flying debris	None
	As part of the bidding processes, contractors will be required to provide own environment management plans that meet mitigation actions proposed in this ESIA						
6.2.2.6	**Occupational health safety (OHS) for contractors**						
	All construction workers will be oriented on safe work practices and guidelines and ensure that they adhere to them.	Reduce OHS on construction workers	Records of workers' orientation	Throughout construction	MOH; Contractor	Negligible	None
	Training will be conducted on how to prevent and manage incidences. This will involve	Reduce OHS on construction workers	Records of training and Impromptu interviews with workers on OHS emergency response	Throughout construction	MOH; Contractor	Negligible	None

Text Reference	Impact and Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Incremental Costs (USD) for all HCFs sites	Capacity Building and Training Requirements
	proper handling of electricity, water etc. and sensitization on various modes of escape, conduct and responsibility during such incidences. All must fully be aware and mentally prepared for potential emergency.						
	Regular drills will constantly follow on various possible incidences. This will test the response of the involved stakeholders. Such drills will keep them alert and they will become more responsive to in the case of incidences.	Reduce OHS on construction workers	Records of drills on OHS emergency response	Throughout construction	MOH; Contractor	Negligible	None
	Signage will be used to warn staff and/ or visitors that are not involved in construction activities of dangerous places.	Reduce OHS on construction workers and the public	Presence of appropriate signage on-site	Throughout construction	MOH; Contractor	Negligible	None
	Supervision of works will be done regularly to ensure that safety conditions are met while any deviation from safety regulations is immediately reclaimed following the best practices regarding safety at work equipment.	Reduce OHS on construction workers	Presence of supervisor on-site	Throughout construction	MOH; Contractor	Negligible	None
	Evacuation procedures should be developed to handle emergency situations.	Reduce OHS on construction workers	Documented Emergency Response Preparedness Plan (ERPP)	Throughout construction	MOH; Contractor	Negligible	None
	Appropriate PPE will be provided to all workers not limited to: • Ear Muffs: One size fits all, comfortable, less ear infection risk • Ear Plugs: Small, lightweight, can get dirty and cause infection	Reduce health and safety risks to construction workers	Zero injuries in any month of construction phase	Before construction	MOH; Contractor	**USD 8,000**	Application of various types of PPE and their proper use.

Text Reference	Impact and Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Incremental Costs (USD) for all HCFs sites	Capacity Building and Training Requirements
	• Face/Eye (Working with any chemical or using any mechanical equipment) • Face Shield: Protect face from splashing and particles • Safety Glasses: Protection from solids (cutting, sanding, grinding) • Safety Goggles: Protects eyes from splashing • Hand (Use correct gloves for the job) • Chemical Gloves: (Nitrile, Latex, PVC) • Gloves for other use: special gloves for cutting, burning, abrasions/ blisters • Body • Overalls: Can protect against dust, vapours, splashes • Foot Protection • If electrical hazard present ensure boots offer protection • Safety Toe/Steel Toe Boots: Always worn when potential for falling hazards exists • Water/Chemical Resistant Boots: Use in a spill situation • Non-slip boots for working on wet/slippery floors.						
6.2.2.7	**Risk of accidents**						

Text Reference	Impact and Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Incremental Costs (USD) for all HCFs sites	Capacity Building and Training Requirements
	Best transport safety practices will be adopted with the goal of preventing traffic accidents and minimizing injuries suffered by project personnel and the public	No road accident by project traffic	No accident occurs in each month of construction duration	During construction	MOH; Contractor	Negligible	Contractor needs road safety awareness to project personnel and the public
	Contractor's vehicles will be regularly maintained to minimize potentially serious accidents such as those caused by brake failure commonly associated with loaded construction trucks	No road accident due to poor mechanical conditions of project vehicles.	No accident occurs in each month of construction duration	During construction	MOH; Contractor	Negligible	None
	The site will be fenced off and signalization put in place with security personnel to stop unauthorised people from accessing the site.						
	For falling debris, and hoarding/scaffoldings; clear warning signs will be placed around the construction premise, install interceptors and net traps to divert falling parts, and emphasize (provide) person protective gears to persons in the area.						
	Ensure drivers respect speed limits through built areas and urban centres.	No road accident by project traffic	No accident occurs in each month of construction duration	During construction	MOH; Contractor	Negligible	Contractor needs speed awareness through built areas and urban areas
	Employ safe traffic control measures, including temporary road signs and flag persons to warn of dangerous conditions and children crossings	No road accident by project traffic	No accident occurs in each month of construction duration	During construction	MOH; Contractor	**USD 500**	None
	Contractors should cordon off areas under construction and provide signage to warn of on-going construction works.	Construction works do not cause injury to patients and health workers	Zero injuries in any month of construction phase	During construction	MOH; Contractor	Negligible	None

Text Reference	Impact and Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Incremental Costs (USD) for all HCFs sites	Capacity Building and Training Requirements
	Contractors should use screens or nets to avoid flying debris and dust	No debris noted outside construction areas	No complaints about flying debris from construction areas (this should be verified by perusal of records in complaints log)	During construction	MOH; Contractor	**USD 2,000**	None
6.2(all sub-sections)	Impact of construction activities	Construction activities do not cause adverse socio-environmental impacts	Annual construction audits do not indicate adverse impacts not mitigated	1 time per year *(NB. Estimated construction duration = 1 year per lot, see Table.20)*	MOH (construction audit may be undertaken by MoH or consultant it hires)	**USD 6,000**	Environmental auditing of construction projects
6.3	**OPERATION PHASE**						
6.3.1	**Positive**						
6.3.1.1	**Improved medical surveillance services**						
	Construction of laboratory facilities should be matched with commensurate staffing with laboratory personnel adequately trained in use of newly installed equipment	Installed laboratory equipment fully utilised to enhance laboratory services at the hospital.	laboratory has trained staff to properly and safely operated provided laboratory equipment	1 month after equipment installation	MOH and supplier	None (procurement cost assumed to include training)	Staff training in operation of newly installed laboratory equipment
	Reduced public risks due to improvement in laboratory waste management	Environmental audits show that medical waste and incinerator emissions do not cause onsite/ offsite public health risk	Annual environmental audits find no plume downwash from incinerators. Incinerators stacks designed based on GIIP / WBG EHS guidelines No un-incinerated medical solid waste on premises or waste dumps	Undertake full environmental audit once per year	MOH	Environmental audit cost: **USD 20,000**.	Operation of incineration units; Decontamination procedure in the laboratory
6.3.1.2	**Employment opportunities**						
	Operation of the laboratory will create additional long-term technical and non-technical job opportunities for laboratory professionals, janitors, etc.	Improve laboratory services	Laboratory has adequate trained staff.	Daily	MOH	Negligible	None
6.3.2	**Negative**						
6.3.2.1	**Improper waste management**						
	Ensure proper waste management practices as recommended in the study on	No community health risk due to improper waste management	No raw medical waste is dumped at public dumps	Daily	Healthcare facility administrator/ Superintend	Negligible	None

Text Reference	Impact and Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Incremental Costs (USD) for all HCFs sites	Capacity Building and Training Requirements
	improvement of laboratory waste management.						
	The collection of waste should be made at least once in 24 hours, and it should be done in such a way to minimize nuisance of smell and dust during collection and all the waste collected must be carried away from the storage site to an approved disposal point.	No accumulation of waste in and around laboratory facility	No smell or accumulated waste in and around the laboratory	Daily	Hospital administrator/ Superintend	Negligible	None
	Provide appropriate waste bins for the different types of waste generated in the laboratory to allow segregation and collection at the point of generation.	Waste segregation and no litter.	Presence of adequate waste bins in and around the laboratory facility	Daily	Hospital administrator/ Superintend	Negligible	None
	Hospital/ Laboratory staff should be trained or educated on the importance and means of waste management and handling during operation.	Proper waste handling and management	Presence of labelled waste bins on-site	Daily	Hospital administrator/ Superintend	Negligible	None
	The hospital administration should work hand in hand with a private refuse handlers and the Municipal Council to facilitate sound waste handling and disposal from the site noting that hazardous waste must not be mixed with municipal waste.	Proper waste disposal	Documentation of formal engagement of refuse handlers	Monthly	Hospital administrator/ Superintend	Negligible	None
	Laboratory should have standard operation and decontamination procedure manuals and clearly displayed at appropriate point(s) with the laboratory	Efficient containment of pathogens	Display at appropriate point(s)	Daily	Hospital administrator/ Superintend	Negligible	None
6.3.2.2	**Air pollution due to incineration of waste**						
	Ensure incinerator stacks designed according to GIIP or WBG guidelines	No offsite air pollution from incineration (such as due to	Visual observation reveal no plume downwash of stack emissions	From start of use of new incinerators	MOH; Hospital administrator	Negligible	None

Text Reference	Impact and Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Incremental Costs (USD) for all HCFs sites	Capacity Building and Training Requirements
		plume downwash).					
	Ensure Training of Incinerator operators for efficient and proper incineration units operations.	Incineration does not generate dioxins	Incinerator operator complete training course	1 month before commissioning incinerator	MOH	**USD 1,000**	Operation of incineration unit/ facility
	The laboratory should provide bio-safety areas equipped with all necessary equipment and have ventilation system that fulfils standards of biosafety;	Pathogen containment	Presence of bio-safety areas	Throughout laboratory operational life	Hospital administrator/ Superintend	Negligible	None
	Ensure that all exhaust air from the laboratory should pass through high efficiency particulate air filters;	Pathogen containment	Presence of air filters	Throughout laboratory operational life	Hospital administrator/ Superintend	Negligible	None
6.3.2.3	**Occupational health and safety risks**						
	All workers to be Provided with appropriate PPE against exposure to infectious pathogens, hazardous chemicals and ionizing radiation in accordance with recognized international safety standards and guidelines.	Minimal work-related injuries or infections	All healthcare staff have necessary PPE.	Daily	Healthcare facility administrator/ Superintend	Negligible since all requisite PPE to be provided as part of by equipment supplier bid.	None
	Orient all staff on safe work practices and guidelines and ensure that they adhere to them.	Reduce staff OHS	Records of staff orientation on safety practices and guidelines	Throughout laboratory operational life	Hospital administrator/ Superintend	Negligible	Safety practices and guidelines
	Training should be conducted on how to prevent and manage incidences. This should involve proper handling of electricity, water etc. and sensitization on various modes of escape, conduct and responsibility during such incidences	Reduce incidences in and around laboratory facility	Records of staff training on prevention of incidences	Throughout laboratory operational life	Hospital administrator/ Superintend	Negligible	Prevention and manage incidences.
	Regular drills should constantly follow on various possible incidences. This will test the response of the involved	Staff preparedness to combat possible incidences	Records of incidence prevention drills	Throughout laboratory operational life	Hospital administrator/ Superintend	Negligible	None

Text Reference	Impact and Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Incremental Costs (USD) for all HCFs sites	Capacity Building and Training Requirements
	stakeholders. Such drills will keep them alert and they will become more responsive to in the case of incidences.						
	Use signage to warn staff and/ or visitors that are not involved in laboratory work of dangerous places	Public and other staff safety	Presence of appropriate and clear signage in and around laboratory facility	Throughout laboratory operational life	Hospital administrator/ Superintend	Negligible	None
	Develop evacuation procedures to handle emergency situations.	Public and other staff safety	Evacuation procedure document	Throughout laboratory operational life	Hospital administrator/ Superintend	Negligible	None
6.3..2.4	**Risk of fire outbreak**						
	Ensure Provision of fire extinguishers at strategic locations within the laboratory and ensure that all fire-fighting equipment are regularly maintained and serviced.	Laboratory has basic capacity to fend off a small or average fire outbreak	Each laboratory unit has a minimum of 1 medium-size fire extinguishers (one of which should be for electrical fires) .	During equipment installation upon completion of construction/ renovation works	MOH	**USD 2,500** (100 per extinguisher)	Basic firefighting skills
	Ensure that Key laboratory staff have basic training in fire control.	Laboratory has basic capacity to fend off a small or average fire outbreak	At least 2 medical staff have certificate of basic firefighting.	During equipment installation upon completion of construction/ renovation works	MOH	To be provided as part of by equipment supplier bid.	Fire drills
	Fire emergency telephone numbers should be displaced in communal areas.	Laboratory has capacity to contact fire department in case of major fire outbreak	Fire emergency telephone numbers displaced in at least 2 communal areas	Throughout operation life of laboratory	MOH	Negligible	None
	Install an automatic fire alarm system for the entire laboratory and provide enough water hose reel around the property with a fire reserve water tank attached with an automatic booster pump	Laboratory has basic capacity to fend off a small or average fire outbreak	Presence of automatic fire alarm system, adequate water hose reel and reverse water tank equipped with automatic booster pump	Throughout operation life of laboratory	MOH	Negligible	None

Text Reference	Impact and Mitigation/Enhancement commitments	Desired Outcomes	Monitoring: Performance Indicators/Targets or Acceptance Criteria	Timing	Responsibility	Incremental Costs (USD) for all HCFs sites	Capacity Building and Training Requirements
	for hose reel.						
	Laboratory facility should have a fire emergency management plan. And should undertake fire drills at a minimum once a year.	Laboratory has basic capacity to fend off a small or average fire outbreak	A documented fire emergency plan. A documented fire drill.	Throughout operation life of laboratory	MOH	Negligible	None
	Provide fire hazard signs such as 'No Smoking' signs. Directions to exit in case of any fire incidence and emergency contact numbers should be provided.	Laboratory has basic capacity to fend off a small or average fire outbreak	Presence of fire hazard signs and exit in appropriate points	Throughout operation life of laboratory	MOH	Negligible	None
TOTAL COST						**USD 40,600**	

8 CONCLUSION

The proposed project has potential to significantly improve quality of laboratory services and efficiency of service provision in the East African region (especially in Uganda) with socio-environmental benefits such as reduced morbidity and increased productivity of labour hence higher household incomes; opportunity to have access to laboratory services hitherto unavailable in Uganda due to lack of equipment or facilities. Besides, project development and operation will provide considerable economic opportunity for material/ equipment suppliers, construction contractors and medical professionals.

Key significant negative impacts may arise from laboratory waste handling and management, especially within the laboratory facilities and incineration. When incinerator stacks adopt a standard height irrespective of density of habitation and nature of nearby buildings, there is a risk of chronic exposure to incineration emissions due to plume downwash. Likewise, when laboratory management adopt standard pathogen containment and decontamination protocols, there is a risk of infection from residual pathogens. Where raw medical waste continues to be improperly dumped at public dumps the project would aggravate public health risk when children or people rummage through potentially infectious waste. These impacts would be accelerated by inadequately trained incinerator operators, laboratory staff and poor laboratory practices. Therefore, in order to avert such impacts during operation of the laboratory facilities, the recommended mitigation measures should be adhered to.

All potential adverse impacts can be mitigated when measures proposed (Chapter 6) are implemented, in which case benefits of this project to the nation would by far outweigh potential negative effects.

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APPENDIX A: STAKEHOLDER ENGAGEMENT

Meeting 1: At Butabika Hospital **Date:03/10/2012**

Meeting with:	**Name and Designation** Dr. D. Basangara - Deputy Director (0752692524) Mr. Misusera Katenda - Senior Lab Technology (0772848761) Mr. John Kodih Wanyama - Principal Nursing Officer (078282821)
Present:	Dr. Herbert Mpagi Kalibbala (AWE) -Team Leader Mr. Ben Oyen(AWE) Ms. RitahNabaggala (AWE)
Issues revealed	▪ The Site is located at Butabika Village opposite Butabika National Referral Hospital, (Area coordinates 36N 032 4849; 023 8247). The site is located in Nakawa Division. ▪ Contractors should be aware of the nature of our patients because they will always disrupt their work. ▪ There is need to sensitize the community about the project. ▪ There may be added traffic because one road that is used by the community and the contractor at the same time. ▪ Drainage and underground Lagoons should be observed during construction. ▪ The contractor should add bumps to be reduced on accidents risks associated with construction vehicles. ▪ Security personnel at the site should be very sensitive to the patients because the hospital works 24hours. ▪ The new project must observe proper waste management on site; during and after construction. ▪ There are Lagoons at the proposed site. ***Risks*** ▪ T.B spreads very first in mental institutions, so cautions must be taken to avoid it. ▪ T.B is an Air borne disease, so proper waste management must be observed.

Meeting with:	Name and Designation
	Kasule Abbey Ssekikali – Chairman, LC I Bbiina Mr. A. Kirigwajjo – Councillor Butabika Mr. G. Seruyima – Youths Chairman, Kirombe B Mr. Hassan Wangalwa – Chairman, LC I Bbiina D Ms. Prossy Kasule – S/W/A Bbiina D Mr. Tamale T. Katumba – Chairperson, LC I Kirombe B Ms. Cissy Tenywa – Chairperson, LC II Dr. Amooti John Muhumuza – Chairperson, LC I Butabika Hospital zone Ms. Cathy Magumba – Women Councillor, LC III Mr. Abdul Tebusweka Mr. Ahamad Katamba
Present:	Dr. Herbert Mpagi Kalibbala (AWE) Eng. Lammeck Kajubi (AWE)
Issues revealed	▪ T.B. is highly infectious and air borne, probably there is need to immunise the neighbouring community against TB especially the children. ▪ Concerns raised about the waste from the laboratory and protecting the community from infections of T.B ▪ Compensation of the people having gardens at the proposed site. The developer should agree with these people on the way forward. ▪ Protection should be provided to the workers and laboratory staff ▪ The community should be informed in advance in case of a problem or accident within the premises, especially during transportation of samples. ▪ Protection of the mentally sick people should be considered both during construction and operation of the facility to harm them. ▪ There was fear of emission of air with TB bacteria to the community and this should be taken into consideration during construction of the laboratory to make provision for disinfecting the air from the laboratory. ▪ The local people, with the assistance of the local leaders, should be given priority when it comes to employment especially unskilled labour during construction. ▪ Local communities around the facility should be trained in international safety measures. ▪ Spraying with water should be done during construction to suppress dust.

CONSTRUCTION & EQUIPPING OF THE NATIONAL TB REFERAL LABORATORY IN BUTABIKA

Stakeholder meeting with Kirombe LC II local leaders

Date : 27/ Oct/2012
Venue : Kirombe LC office

	Name	Designation	Sign
1	KASULE Abbey Ssekimanki	CHAIRMAN BBIINA C'LC1 0712304482	
2	Kirigwajjo AT	Councillor Butabika Kirigwajjo AT	
3	SERUYIMA Gilbert	TOWN Clerk Kirombe TC	
4	Wangalwa Hassan	Chairman Bbiina 'D' 0701-613257	
5	Kasule Prossy	S/W/A Bbiina D 0774595547	
6	Tamale T. Katumba	Chairperson Kirombe B 0783471402	
7	Cissy Tenywa	chairperson LC 2 0772889186	
8	Muhumuza John Amooti	Chairperson LC I Block Hap Zone 0772479439	
9	MAGUMBA OLIVE	Woman Councilor LC III 0774227736	
(Absent) 10	Tebusweka Yusuf*	0775 586817	
11	Hatamba Ahmad.	0755171619	

Stakeholder consultation record:

Name of agency/stakeholder/community:	BUTABIKA REFERRAL HOSPITAL.				
Purpose of consultation (*tick appropriate box*):	Scoping:	x	ESIA:	x	
	Sensitisation:	x	RAP:	x	
	Environmental Audit:		Other (specify):		
Date:					
Project name:	~~Isimba Hydropower Project~~ RECONSTRUCTION/REHABILITATION AND EQUIPPING OF THE NATIONAL TB REFERENCE LABORATORY AND FIVE SATELLITE LABORATORIES IN ARUA, GULU, MBALE, MBARARA & MULAGO				
Proponent:					

Name of person	Village name	Contact	Sign/ Initial
KIRIGWAJJO ANDREW T.	Bbiina A. Zone	0752988294	Kirigwajjo AT
Nuwamanya John Amooti	Butabika Hospital Zone	0772479489	[signature]

KAMPALA CAPITAL CITY AUTHORITY
For a better City

DIRECTORATE OF PUBLIC HEALTH AND ENVIRONMENT

REF: **PHE/KCCA/702**

DATE: 06 May 2014

STAKEHOLDER COMMENTS ON PROPOSED ENVIRONMENT AND SOCIAL IMPACT ASSESSMENT FOR RECONSTRUCTION/ REHABILITATION AND EQUIPPING OF THE NATIONAL TB REFERENCE LABORATORY AND FIVE SATELLITE LABORATORIES IN ARUA, GULU, MBALE MBARARA AND MULAGO.

- The proposed Butabika site partially lies within and or in close proximity to the Kinawataka wetland. Proposed activities therefore should be planned in view of this to reduce pollution and further degradation of this fragile ecosystem.
- Involve NEMA in assessing specifications for incinerators before actual purchase and installation.
- The area looks to have been encroached on by squatters, this therefore needs to be handled well in terms of sensitisation, before resettlement for successful implementation of the project.
- Local community and leadership needs to be involved to understand the project and implications to their livelihoods.
- Clearly define the Resettlement Action Plan in terms of: existing structural developments, livelihood activities, land ownership if any, asset valuation etc. to avoid reoccurrence of disputes among the squatters during and after the compensation exercise.

P. O. Box 7010 Kampala- Uganda
Plot 1-3 Apollo Kaggwa Road
Tel: 0414 231 446 / 0204 660 000
Web: www.kcca.go.ug, Email: info@kcca.go.ug
f: facebook.com/kccaug, t: @KCCAUG

KCCA
KAMPALA CAPITAL CITY AUTHORITY
For a better City

- Adhere to all the Occupational Health and Safety procedures at all stages of the project.
- Involve a wide cross section of stakeholders e.g. Wetland management Department in the Ministry of Water and Environment, National Environment Management Authority, National Council for Science and Technology, Atomic council, relevant Officials from the Districts where the hospitals are located, Physical planning and Engineering Directorates in Kampala Capital City Authority among others.
- The Terms of Reference seem to be generalised however emphasis should also be put on addressing site specific issues.

NOTE: Most of the issues discussed above apply to the Butabika site and a few generalised for all the sites.

James Semuwemba, PhD

P. O. Box 7010 Kampala- Uganda
Plot 1-3 Apollo Kaggwa Road
Tel: 0414 231 446 / 0204 660 000
Web: www.kcca.go.ug, Email: info@kcca.go.ug
f: facebook.com/kccaug, t: @KCCAUG

APPENDIX B: SITE LAYOUT

LOCATION PLAN
scale 1: 500

SITE PLAN
scale 1: 500

PAN MODERN CONSULT LTD
Architects, Engineers and Project Managers.
PLOT 20, KENETH DALE, OFF KIIRA ROAD, KAMWOKYA, P.O BOX 4680, TEL 041- 250 353 KAMPALA.

GENERAL NOTES
(1) Contractor to verify dimensions on site before commencement of works and report any discrepancies to consulting Architect.
(2) Architectural drawings to be read with relevant structural, mechanical and electrical drawings.
(3) All retaining walls to be damp proofed (DPC) engineer's specification and detailing.
(4) Drainage pipes under drive ways to have 150mm concrete surrounding.
(5) Elevation 0 is 1150m above Sea Level

KEY FINISHING
FLOOR — SKIRTING
WALLS — CEILING

FLOOR
(A) 50mm Cement/Sand Screed
(B) In situ Concrete finish
(C) 9mm thick Ceramic Tiles
(D) 25mm thick Granite
(E) Epoxy floor finish

SKIRTING
(A) 150mm Cement/Sand Plaster
(B) 25mm, 150mm high Hardwood
(C) 9mm, 150mm high Ceramic Tiles
(D) 150mm high Granite
(E) Epoxy skirting finish

WALLS
(A) 12mm thick painted Cement/Sand Plaster
(B) Wall paper
(C) 6mm Ceramic Tiles
(D) Glass in Aluminium
(E) Epoxy wall finish

CEILING
(A) Painted Cement/Sand Plaster
(B) Powder coated aluminium suspended ceiling (Hunter doorglass)
(C) Armstrong ceiling
(D) Gypsum Board ceiling

REVISIONS		
NO.	DATE.	DESCRIPTION

ISSUES				
NO.	DATE.	ISSUED TO	NO.	DATE.

CLIENT
AMERICAN CONSULATE GENERAL RPSO

PROJECT
PROPOSED NATIONAL HEALTH LABORATORIES BUTABIKA - KAMPALA

DRAWING TITLE
LOCATION AND SITE PLANS

JOB NO.	DWG REF
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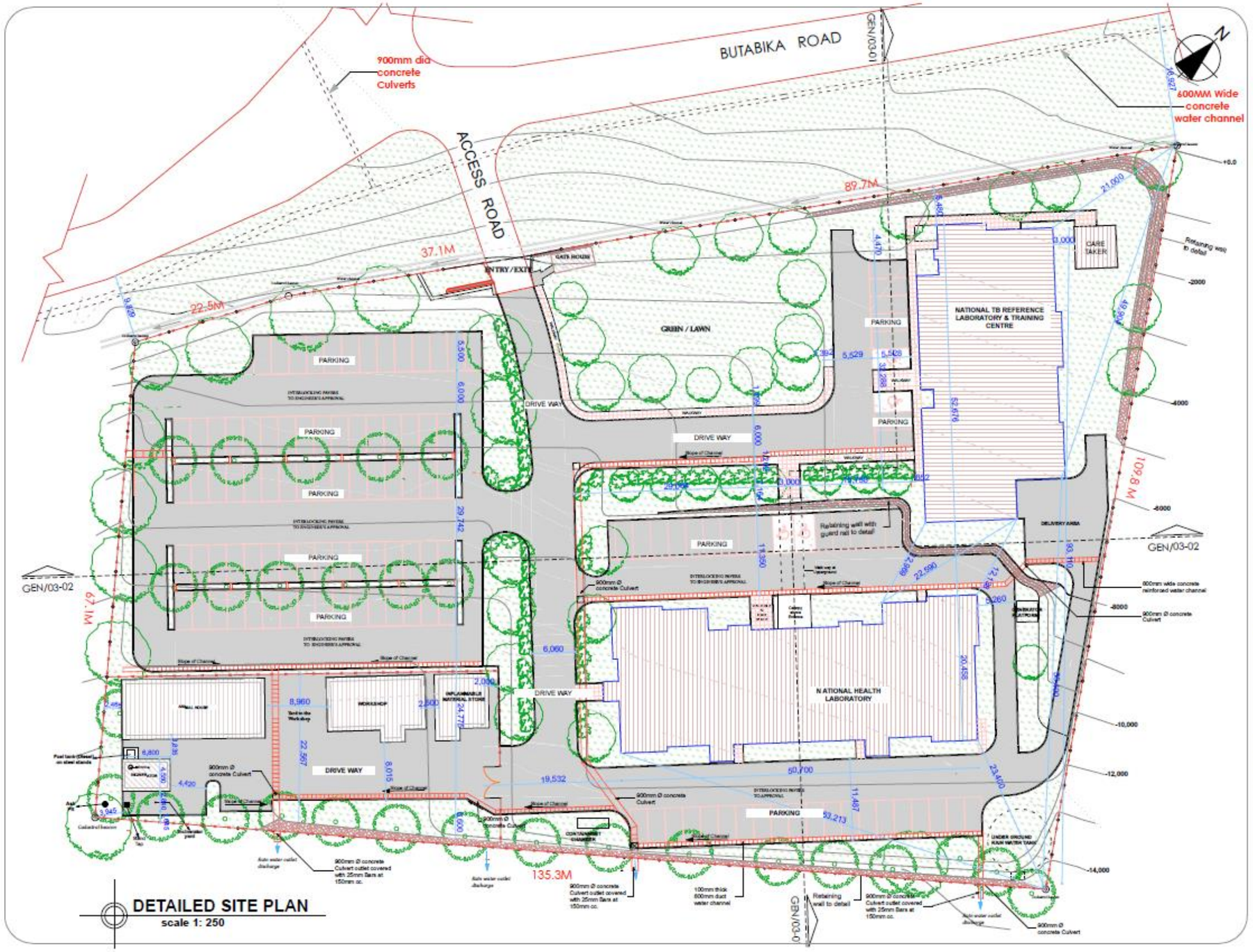
DATE DEC. 2011	
DRAWN BY L.H	
CHECKED BY ARCH. M.D	

Drawing No.
GEN/01



DETAILED SITE PLAN
scale 1: 250

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GENERAL NOTES
(1) Contractor to verify dimensions on site before commencement of works and report any discrepancies to consulting Architect.
(2) Architectural drawings to be read with relevant structural, mechanical and electrical drawings.
(3) All retaining walls to be design proofed (Let engineer's specification and detailing.
(4) Drainage pipes under diffe ways to have 150mm concrete surrounding.
(5) Elevation 0 is 1188m above Sea Level

KEY FINISHING
FLOOR — SKIRTING
WALLS — CEILING

FLOOR
(A) 50mm Cement/Sand Screed
(B) In situ Concrete finish
(C) 9mm thick Ceramic Tiles
(D) 25mm thick Granite
(E) Epoxy floor finish

SKIRTING
(A) 150mm Cement/Sand Plaster
(B) 25mm, 150mm high Hardwood
(C) 9mm, 150mm high Ceramic Tiles
(D) 150mm high Granite
(E) Epoxy skirting finish

WALLS
(A) 12mm thick painted Cement/Sand Plaster
(B) Wall paper
(C) 9mm Ceramic Tiles
(D) Glass in Aluminium
(E) Epoxy wall finish

CEILING
(A) Painted Cement/Sand Plaster
(B) Powder coated alum.m/um suspended ceiling (Hunter douglass)
(C) Armstrong ceiling
(D) Gypsum Board ceiling

REVISIONS

NO.	DATE.	DESCRIPTION

ISSUES

NO.	DATE.	ISSUED TO	NO.	DATE.

CLIENT
AMERICAN CONSULATE GENERAL RPSO

PROJECT
PROPOSED NATIONAL HEALTH LABORATORIES BUTABIKA - KAMPALA

DRAWING TITLE
DETAILED SITE PLAN

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DATE DEC. 2011	
DRAWN BY L.H	
CHECKED BY ARCH. M.D	

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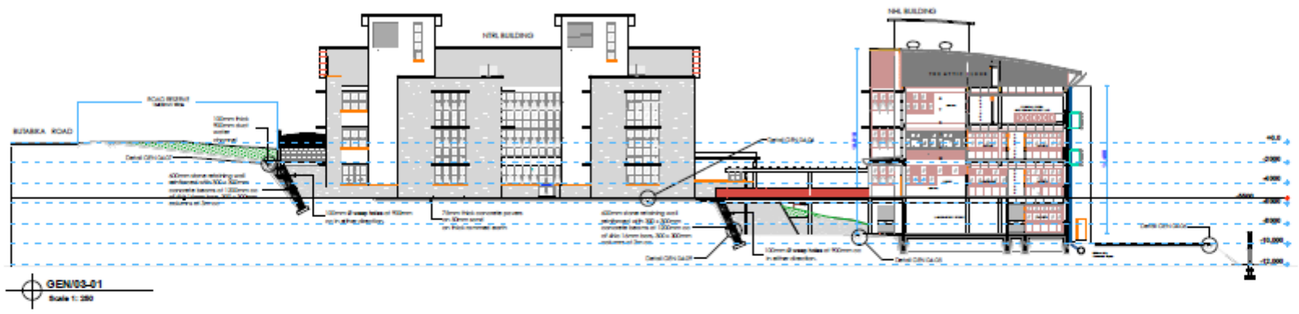

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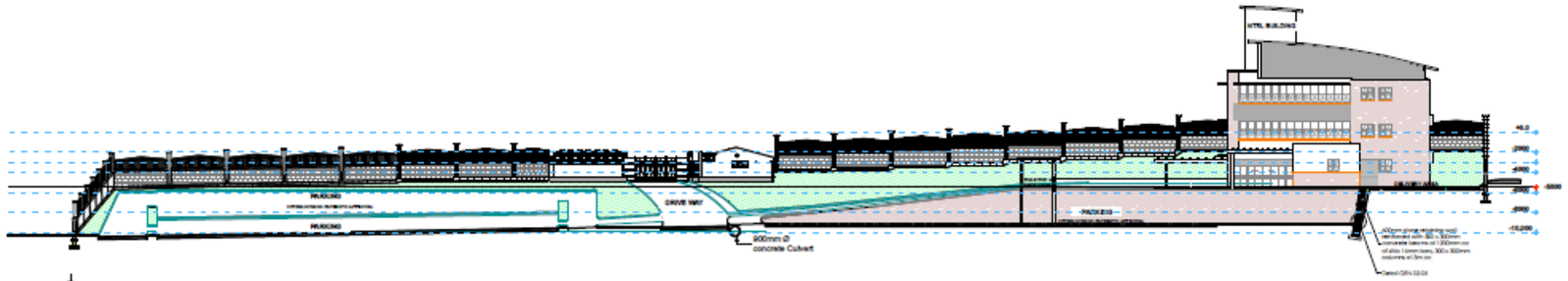

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P.O BOX 4850, TEL 041- 250 353
KAMPALA.

GENERAL NOTES

(1) Contractor to verify dimensions on site before commencement of works and report any discrepancies to consulting Architect.

(2) Architectural drawings to be read with relevant structural, mechanical and electrical drawings.

(3) All existing walls to be damp proofed and engineer's specification and detailing.

(4) Drainage pipes under driveways to have 150mm concrete surrounding.

(5) Elevation 0 is 1199m above Sea Level

KEY FINISHING

FLOOR · SKIRTING · WALLS · CEILING

FLOOR
(A) 30mm Cement/Sand Screed
(B) In situ Concrete finish
(C) 9mm thick Ceramic Tiles
(D) 25mm thick Granite
(E) Epoxy floor finish

SKIRTING
(A) 150mm Cement/Sand Plaster
(B) 25mm, 150mm high Hardwood
(C) 9mm, 150mm high Ceramic Tiles
(D) 150mm high Granite
(E) Epoxy skirting finish

WALLS
(A) 12mm thick painted Cement/Sand Plaster
(B) Wall paper
(C) 6mm Ceramic Tiles
(D) Glass In Aluminium
(E) Epoxy wall finish

CEILING
(A) Painted Cement/Sand Plaster
(B) Powder coated aluminium suspended ceiling (Hunter doorglass)
(C) Armstrong ceiling
(D) Gypsum Board ceiling

REVISIONS		
NO.	DATE.	DESCRIPTION

ISSUES				
NO.	DATE.	ISSUED TO	NO.	DATE.

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PROJECT
PROPOSED NATIONAL HEALTH LABORATORIES BUTABIKA - KAMPALA

DRAWING TITLE
SITE SECTION AND DETAILS

JOB NO.	**DWG REF**
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DRAWN BY WAD.W	
CHECKED BY ARCH. M.D	

Drawing No.
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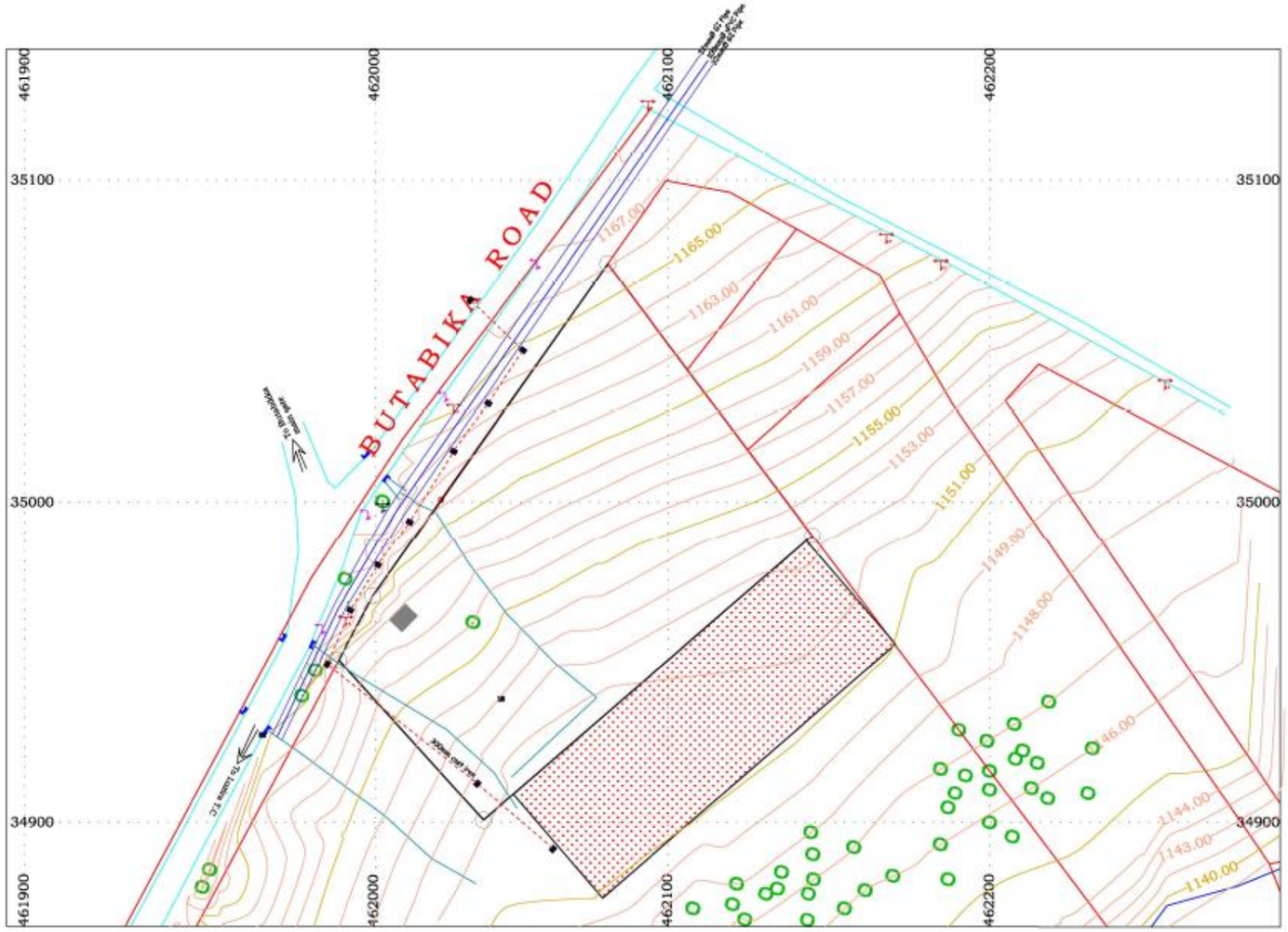

N

Description	Symbols
Tree	
Contour	
Man Hole	
Telephone Pole	
Electric Pole	
Drainage	
House	
Lagoon	
Existing road	
Planned road	
Culvert	
Plot Boundary	
3 Acres Boudary	
300mmØ underground sewer line	
Security Light	

NOTES

DATUM:

HORIZ: UTM VERT: UTM

CONTOUR INTERVAL: 1.0M

GRID INTERVAL: 100M

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KAMPALA.

GENERAL NOTES

(1) Contractor to verify dimensions on site before commencement of works and report any discrepancies to consulting Architect.

(2) Architectural drawings to be read with relevant structural, mechanical and electrical drawings.

(3) All retaining walls to be carry proofed civil engineer's specification and detailing.

(4) Drainage pipes under drive ways to have 150mm concrete surrounding.

Symbol	Description
	Contour
	Man Hole
	Telephone Pole
	Electric Poles
	Drainage
	House
	Floor Drain

REVISIONS		
NO.	DATE.	DESCRIPTION

ISSUED				
NO.	DATE.	ISSUED TO	NO.	DATE.

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PROJECT
PROPOSED NATIONAL HEALTH LABORATORIES, BUTABIKA, KAMPALA

DRAWING TITLE
SITE TOPOGRAPHY

JOB NO.	REF
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DATE DEC 2011	0
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CHECKED BY IS	

Drawing No.
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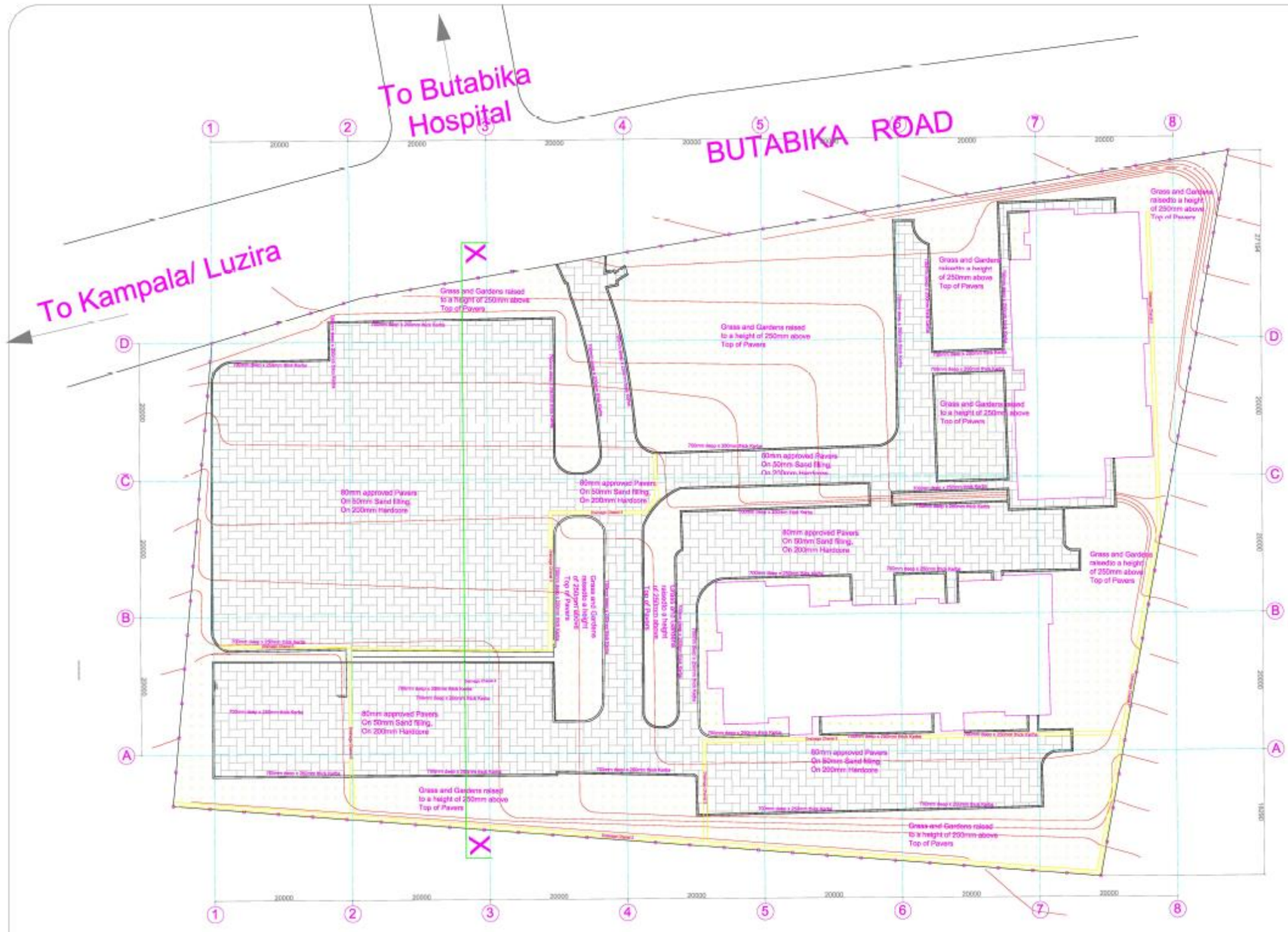

SITE PLAN
(Scale 1:250)

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PLOT 20, KENETH DALE,
OFF KIRA ROAD, KAMWOKYA,
P.O BOX 4558, TEL 041- 250 383
KAMPALA.

CIVIL STRUCTURAL ENGINEERS
IPL INFRASTRUCTURE PROJECTS LTD
POBOX 33224,
TEL 341980 KAMPALA

GENERAL NOTES
(1) Contractor to verify dimensions on site before commencement of works and report any discrepancies to consulting Architect.
(2) Architectural drawings to be read with relevant structural, mechanical and electrical drawings.
(3) All retaining walls to be deep pierled civil engineer's specification and drawing.
(4) Foundations shall generally be taken down 1500mm below existing ground level and all excavations confirmed by the engineer before concrete blinding
(5) Backfill material to be approved excreas and compacted in 200mm max layers at 95% MDD
(6) Concrete Mixes
a) Mass concrete to have a minimum strength of 10N/mm2 at 28 days with 20mm maximum aggregate
b)Reinforced concrete to have a minimum strength of 25N/mm2 at 28 days with 20mm maximum aggregate
(7) Reinforcements
a) High tensile bars designated in the drawings to be ribbed bars to BS 4461
b)Mild steel to be round bars to BS 4449
c)Mesh reinforcements to comply with the requirements of BS 4483
(8) Minimum Cover to all steel in:
a) Foundations,slab,columns and grouted beams = 50
b)Slabs = 20
c)Beams = 25
d)Columns =30
(9) All dimensions are in metric millimetres
(10) Elevation 0 is 1158m above Sea level

REVISIONS

NO.	DATE.	DESCRIPTION

ISSUES

NO.	DATE.	ISSUED TO	NO.	DATE.

CLIENT
AMERICAN CONSULATE GENERAL (RPSO)

PROJECT
PROPOSED NATIONAL HEALTH LABORATORIES BUTABIKA- KAMPALA

DRAWING TITLE
LAYOUT OF CIVIL WORKS

JOB NO.		REF
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DATE	DEC 2011	
DRAWN BY	HMS	
CHECKED BY	CT	

Drawing No.
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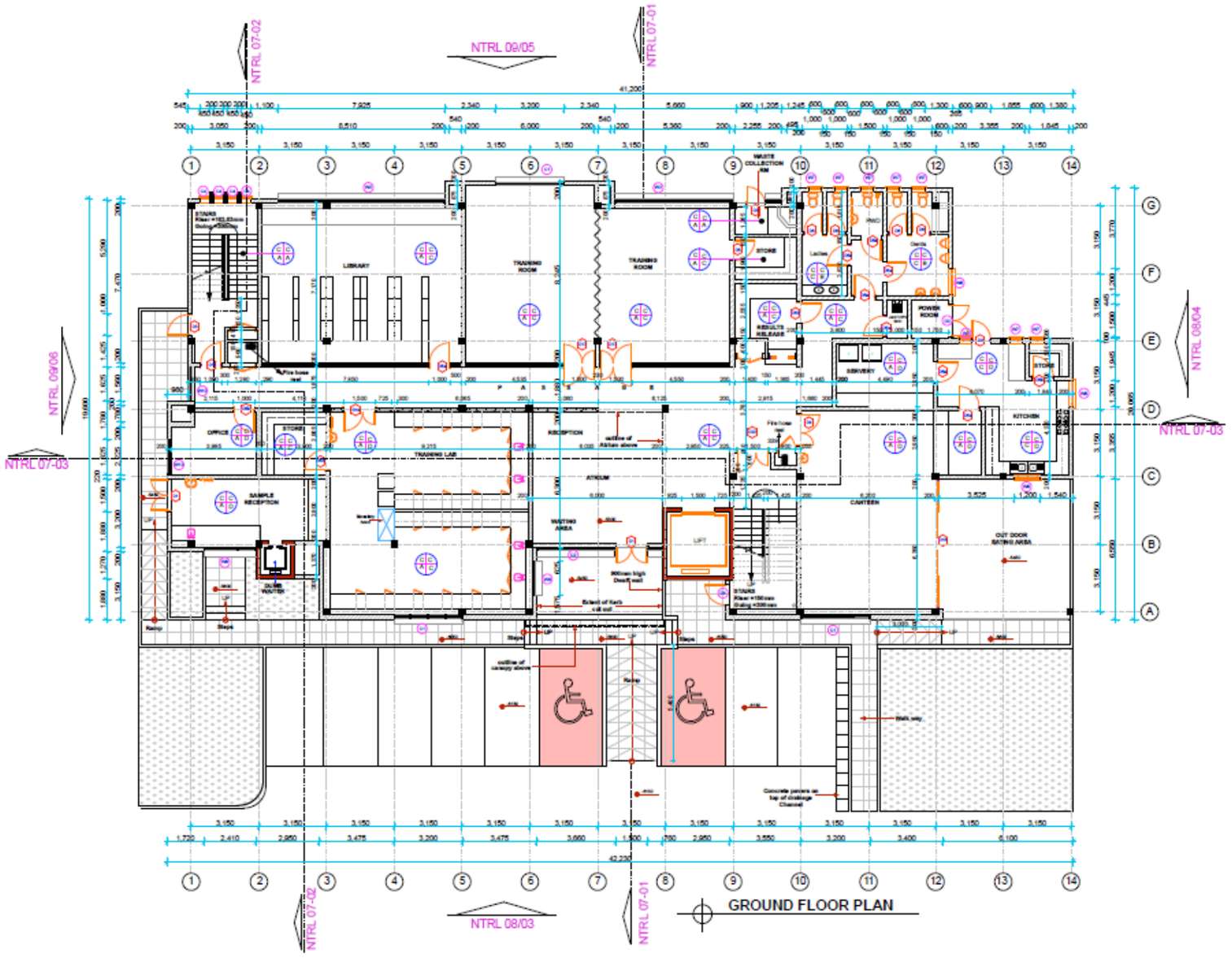

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Architects, Engineers and Project Managers.

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GENERAL NOTES

(1) Contractor to verify dimensions on site before commencement of works and report any discrepancies to consulting Architect.

(2) Architectural drawings to be read with relevant structural, mechanical and electrical drawings.

(3) All retaining walls to be damp proofed civil engineer's specification and detailing.

(4) Drainage pipes under drive ways to have 150mm concrete surrounding.

KEY FINISHING

FLOOR, SKIRTING, WALLS, CEILING

FLOOR
(A) 30mm Cement/Sand Screed
(B) In situ Concrete finish
(C) 8mm thick Porcelain Tiles
(D) 20mm thick Granite
(E) Epoxy floor finish

SKIRTING
(A) 150mm Cement/Sand Plaster
(B) 25mm, 150mm high Hardwood
(C) 8mm, 150mm high Porcelain Tiles
(D) 150mm high Granite
(E) Epoxy skirting finish

WALLS
(A) 12mm thick painted Cement/Sand Plaster
(B) Wallpaper
(C) 8mm Ceramic Tiles
(D) Glass in aluminium
(E) Epoxy wall finish

CEILING
(A) Painted Cement/Sand Plaster
(B) Powder coated aluminium suspended ceiling
(C) Armstrong ceiling
(D) Gypsum Board ceiling
(E) Epoxy paint

REVISIONS

NO.	DATE.	DESCRIPTION

ISSUES

NO.	DATE.	ISSUED TO	NO.	DATE.

CLIENT
AMERICAN CONSULATE GENERAL RPSO

PROJECT
PROPOSED NATIONAL T.B REFERENCE LABORATORIES BUTABIKA - KAMPALA

DRAWING TITLE
GROUND FLOOR PLAN

JOB NO.	DWG REF
SCALE 1:100	REVISION NO.
DATE DEC. 2011	
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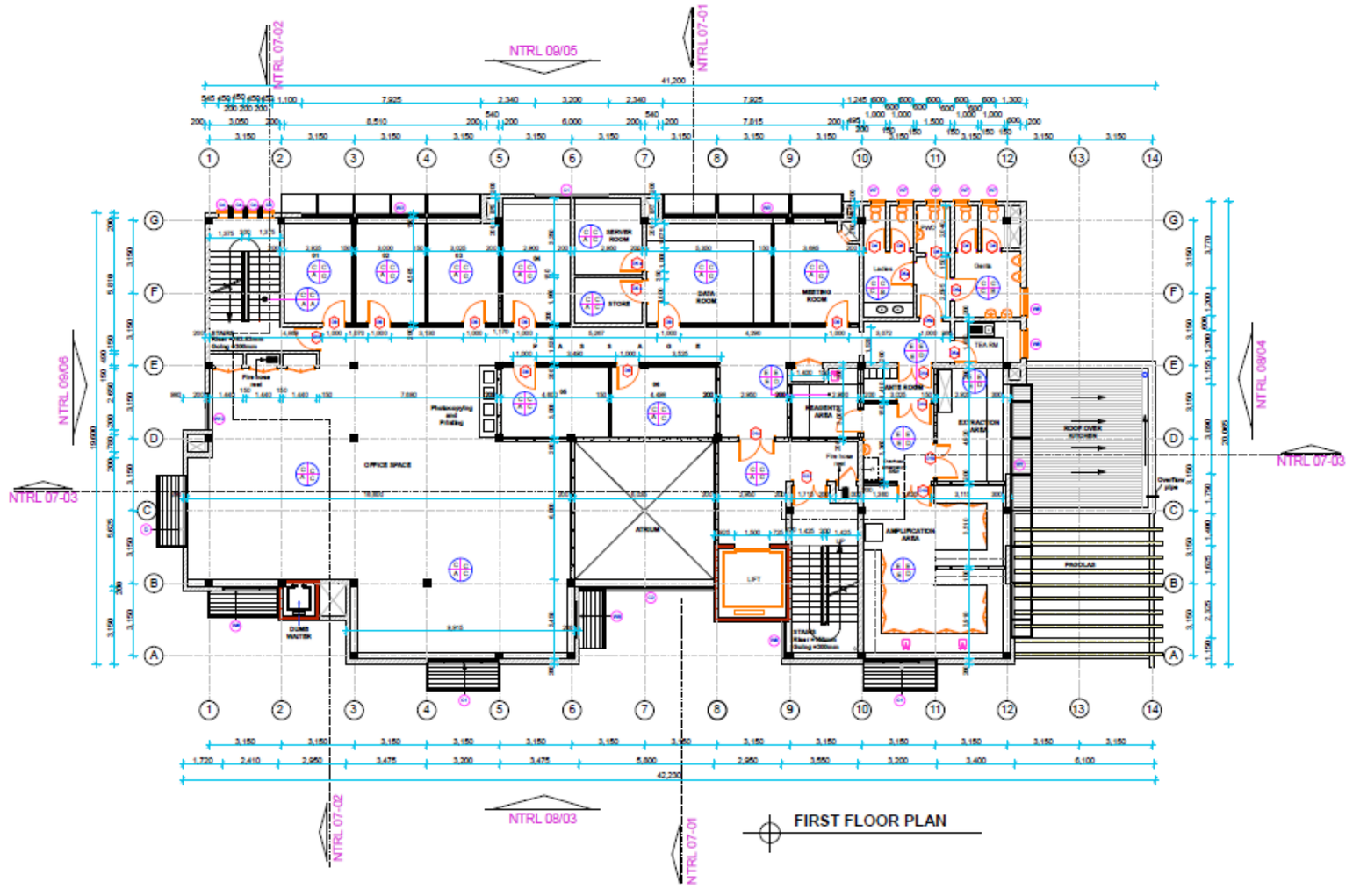
Drawing No.
NTRL/01



FIRST FLOOR PLAN

PAN MODERN CONSULT LTD

Architects, Engineers and Project Managers.

PLOT 20, KENETH DALE, OFF KIIRA ROAD, KAMWOKYA, P.O BOX 4880, TEL 041- 280 383 KAMPALA.

GENERAL NOTES

(1) Contractor to verify dimensions on site before commencement of works and report any discrepancies to consulting Architect.

(2) Architectural drawings to be read with relevant structural, mechanical and electrical drawings.

(3) All retaining walls to be damp proofed civil engineer's specification and detailing.

(4) Drainage pipes under drive ways to have 150mm concrete surrounding.

KEY

FINISHING FLOOR, SKIRTING, WALLS, CEILING

FLOOR
(A) 30mm CementSand Screed
(B) In situ Concrete finish
(C) 9mm thick Porcelain Tiles
(D) 20mm thick Granite
(E) Epoxy floor finish

SKIRTING
(A) 150mm CementSand Plaster
(B) 20mm, 150mm high Hardwood
(C) 9mm, 150mm high Porcelain Tiles
(D) 150mm high Granite
(E) Epoxy skirting finish

WALLS
(A) 12mm thick painted CementSand Plaster
(B) Wallpaper
(C) 9mm Ceramic Tiles
(D) Glass in aluminium
(E) Epoxy wall finish

CEILING
(A) Painted CementSand Plaster
(B) Powder coated aluminiumsuspended ceiling
(C) Armstrong ceiling
(D) Gypsum Board ceiling
(E) Epoxy paint

REVISIONS		
NO.	DATE.	DESCRIPTION

ISSUES				
NO.	DATE.	ISSUED TO	NO.	DATE.

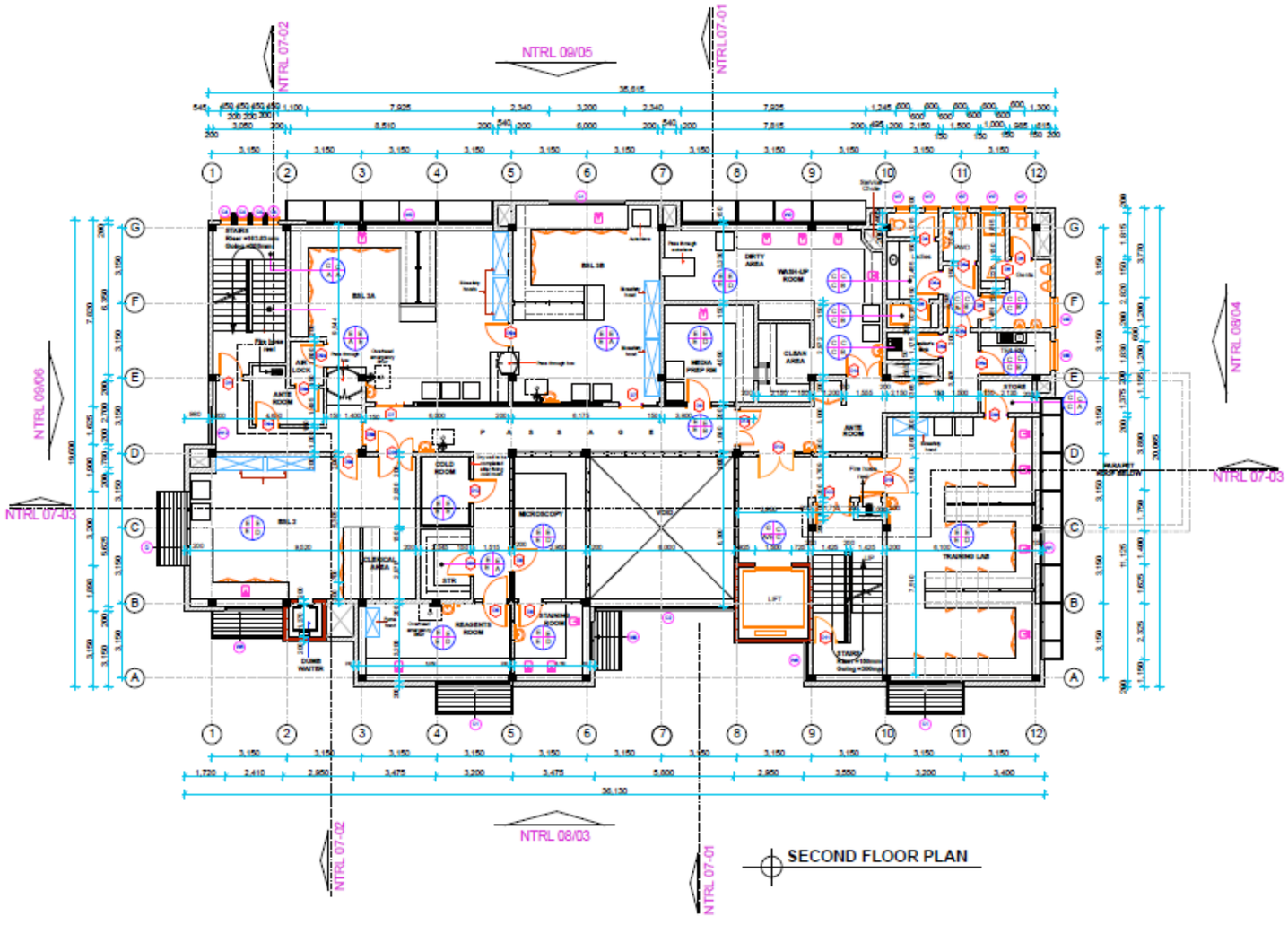
CLIENT
AMERICAN CONSULATE GENERAL RPSO

PROJECT
PROPOSED NATIONAL T.B REFERENCE LABORATORIES BUTABIKA - KAMPALA

DRAWING TITLE
FIRST FLOOR PLAN

JOB NO.	DWG REF
SCALE 1:100	REVISION NO.
DATE DEC. 2011	
DRAWN BY S.B	
CHECKED BY ARCH. M.D	

Drawing No.
NTRL/02



PAN MODERN CONSULT LTD

Architects, Engineers and Project Managers.

PLOT 20, KENETH DALE,
OFF KIIRA ROAD, KAMWOKYA,
P.O BOX 4888, TEL 041- 286 383
KAMPALA.

GENERAL NOTES

(1) Contractor to verify dimensions on site before commencement of works and report any discrepancies in writing to Architect.

(2) Architectural drawings to be read with relevant structural, mechanical and electrical drawings.

(3) All retaining walls to be damp proofed with engineer's specification and detailing.

(4) Drainage pipes under drive ways to have 150mm concrete surrounding.

KEY FINISHING

FLOOR | SKIRTING | WALLS | CEILING

FLOOR
(A) 30mm Cement/Sand Screed
(B) In situ Concrete finish
(C) 9mm thick Porcelain Tiles
(D) 20mm thick Granite
(E) Epoxy floor finish

SKIRTING
(A) 150mm Cement/Sand Plaster
(B) 20mm, 150mm high Hardwood
(C) 9mm, 150mm high Porcelain Tiles
(D) 150mm high Granite
(E) Epoxy skirting finish

WALLS
(A) 12mm thick painted Cement/Sand Plaster
(B) Wallpaper
(C) 9mm Ceramic Tiles
(D) Glass in aluminium
(E) Epoxy wall finish

CEILING
(A) Painted Cement/Sand Plaster
(B) Powder coated aluminiumsuspended ceiling
(C) Armstrong ceiling
(D) Gypsum Board ceiling
(E) Epoxy paint

REVISIONS

NO.	DATE.	DESCRIPTION

ISSUES

NO.	DATE.	ISSUED TO	NO.	DATE.

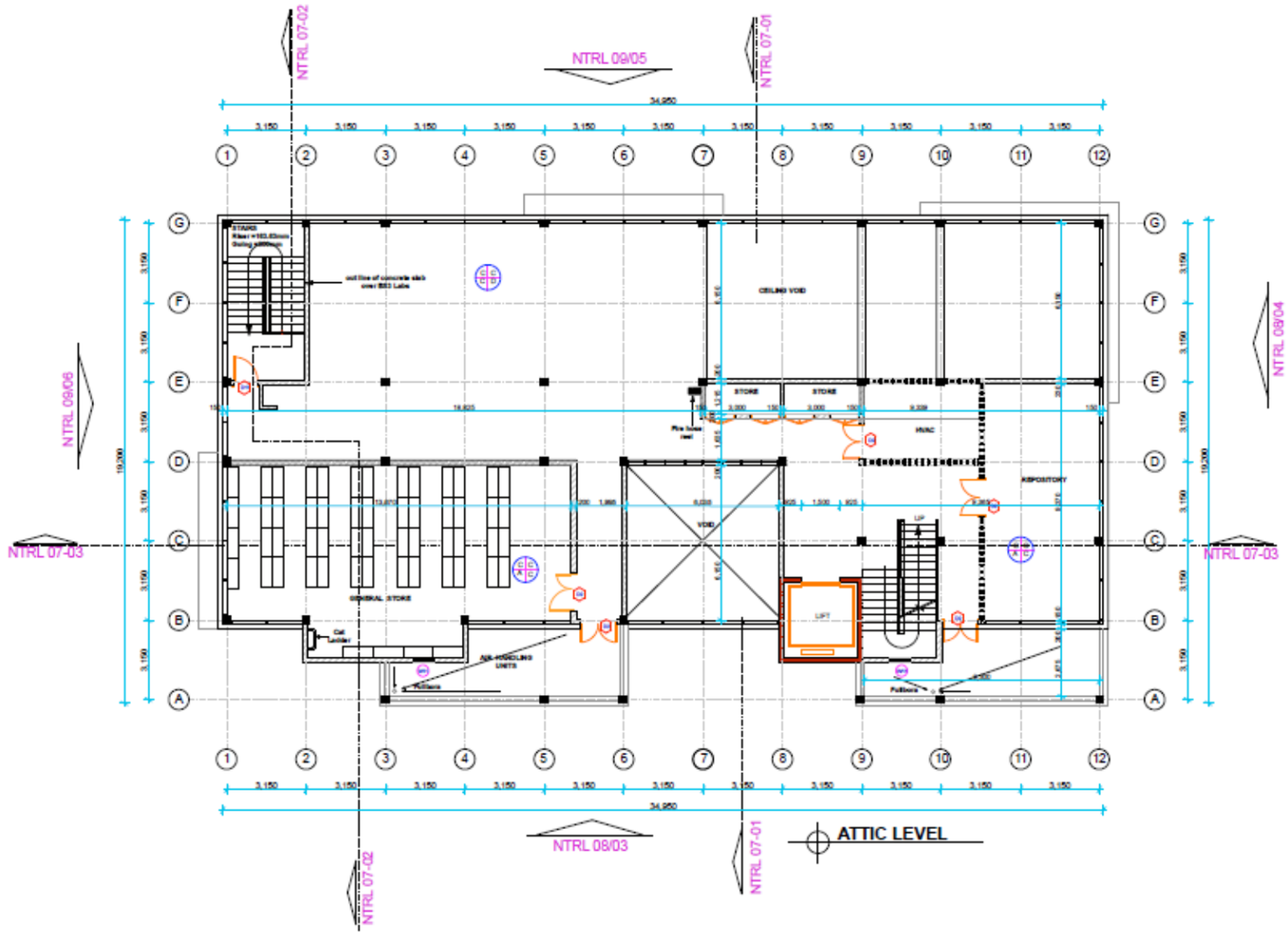
CLIENT
AMERICAN CONSULATE GENERAL RPSO

PROJECT
PROPOSED NATIONAL T.B REFERENCE LABORATORIES BUTABIKA - KAMPALA

DRAWING TITLE
SECOND FLOOR PLAN

JOB NO.	DWG REF
SCALE 1:100	REVISION NO.
DATE DEC. 2011	
DRAWN BY S.B	
CHECKED BY ARCH. M.D	

Drawing No.
NTRL/03



PAN MODERN CONSULT LTD

Architects, Engineers and Project Managers.

PLOT 20, KENETH DALE, OFF KIIRA ROAD, KAMWOKYA, P.O BOX 4888, TEL 041- 250 383 KAMPALA.

GENERAL NOTES

(1) Contractor to verify dimensions on site before commencement of works and report any discrepancies to consulting Architect.

(2) Architectural drawings to be read with relevant structural, mechanical and electrical drawings.

(3) All retaining walls to be damp proofed civil engineer's specification and detailing.

(4) Drainage pipes under drive ways to have 150mm concrete surrounding.

KEY FINISHING

FLOOR, SKIRTING, WALLS, CEILING

FLOOR
(A) 30mm Cement/Sand Screed
(B) In situ Concrete finish
(C) 9mm thick Porcelain Tiles
(D) 25mm thick Granite
(E) Epoxy floor finish

SKIRTING
(A) 150mm Cement/Sand Plaster
(B) 20mm, 150mm high Hardwood
(C) 9mm, 150mm high Porcelain Tiles
(D) 150mm high Granite
(E) Epoxy skirting finish

WALLS
(A) 12mm thick painted Cement/Sand Plaster
(B) Wallpaper
(C) 9mm Ceramic Tiles
(D) Glass in aluminium
(E) Epoxy wall finish

CEILING
(A) Painted Cement/Sand Plaster
(B) Powder coated aluminium suspended ceiling
(C) Armstrong ceiling
(D) Gypsum Board ceiling
(E) Epoxy paint

REVISIONS		
NO.	DATE.	DESCRIPTION

ISSUED				
NO.	DATE.	ISSUED TO	NO.	DATE.

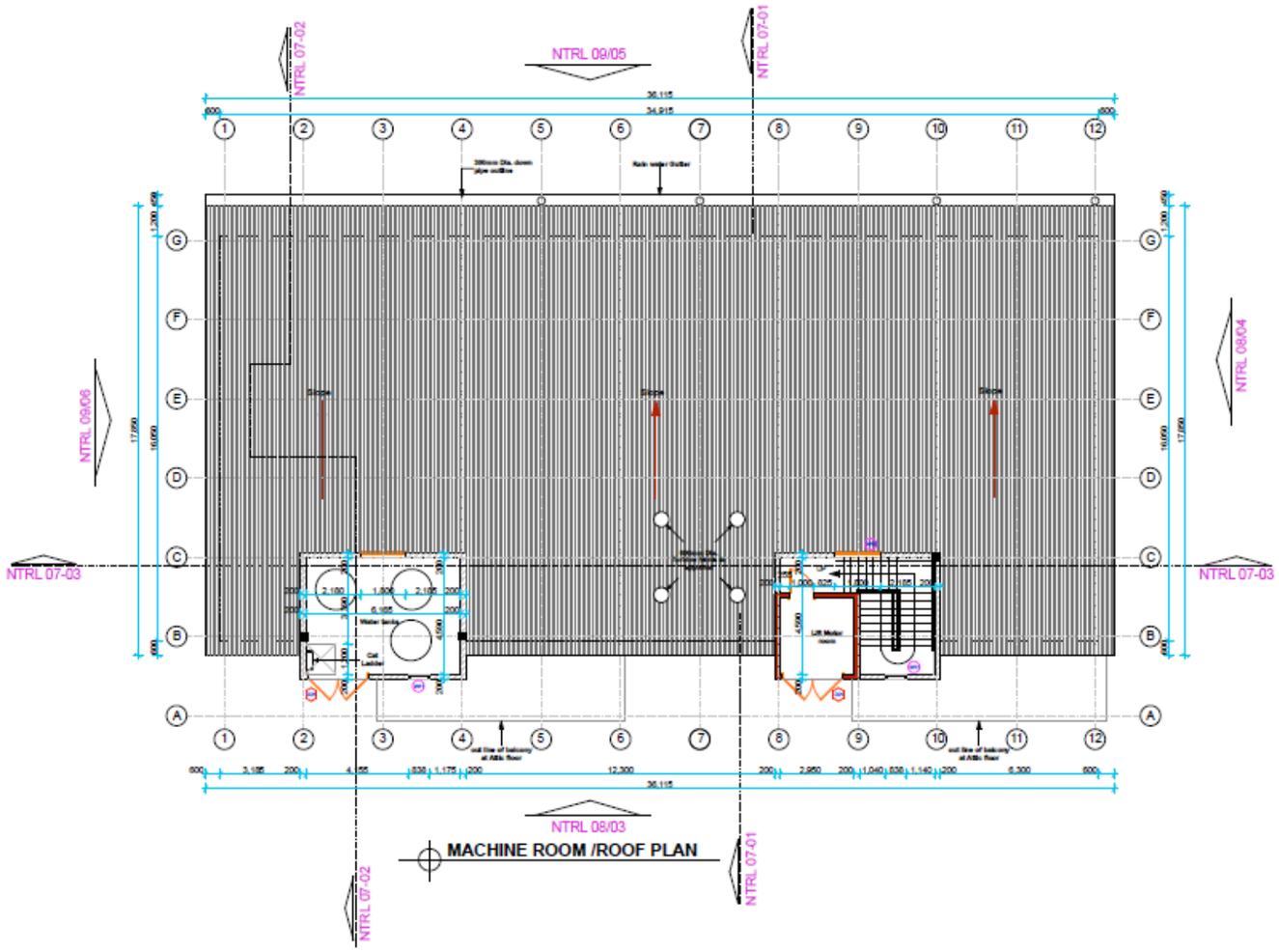
CLIENT
AMERICAN CONSULATE GENERAL RPSO

PROJECT
PROPOSED NATIONAL T.B REFERENCE LABORATORIES BUTABIKA - KAMPALA

DRAWING TITLE
ATTIC FLOOR

JOB NO.	DWG REF
SCALE 1:100	REVISION NO.
DATE DEC. 2011	
DRAWN BY S.B	
CHECKED BY ARCH. M.D	

Drawing No.
NTRL/04



PAN MODERN CONSULT LTD

Architects, Engineers and Project Managers.

PLOT 20, KENETH DALE,
OFF KIIRA ROAD, KAMWOKYA,
P.O BOX 4880, TEL 041- 280 383
KAMPALA.

GENERAL NOTES

(1) Contractor to verify dimensions on site before commencement of works and report any discrepancies to consulting Architect.

(2) Architectural drawings to be read with relevant structural, mechanical and electrical drawings.

(3) All retaining walls to be clancy proofed until engineer's specification and detailing.

(4) Drainage pipes under drive ways to have 150mm concrete surrounding.

KEY FINISHING

FLOOR, SKIRTING, WALLS, CEILING

FLOOR
(A) 30mm CementSand Screed
(B) In situ Concrete finish
(C) 9mm thick Porcelain Tiles
(D) 20mm thick Granite
(E) Epoxy floor finish

SKIRTING
(A) 150mm CementSand Plaster
(B) 20mm, 150mm high Hardwood
(C) 9mm, 150mm high Porcelain Tiles
(D) 150mm high Granite
(E) Epoxy skirting finish

WALLS
(A) 12mm thick painted CementSand Plaster
(B) Wallpaper
(C) 9mm Ceramic Tiles
(D) Glass in aluminium
(E) Epoxy wall finish

CEILING
(A) Painted CementSand Plaster
(B) Powder coated aluminium suspended ceiling
(C) Armstrong ceiling
(D) Gypsum Board ceiling
(E) Epoxy paint

REVISIONS		
NO.	DATE.	DESCRIPTION

ISSUES				
NO.	DATE.	ISSUED TO	NO.	DATE.

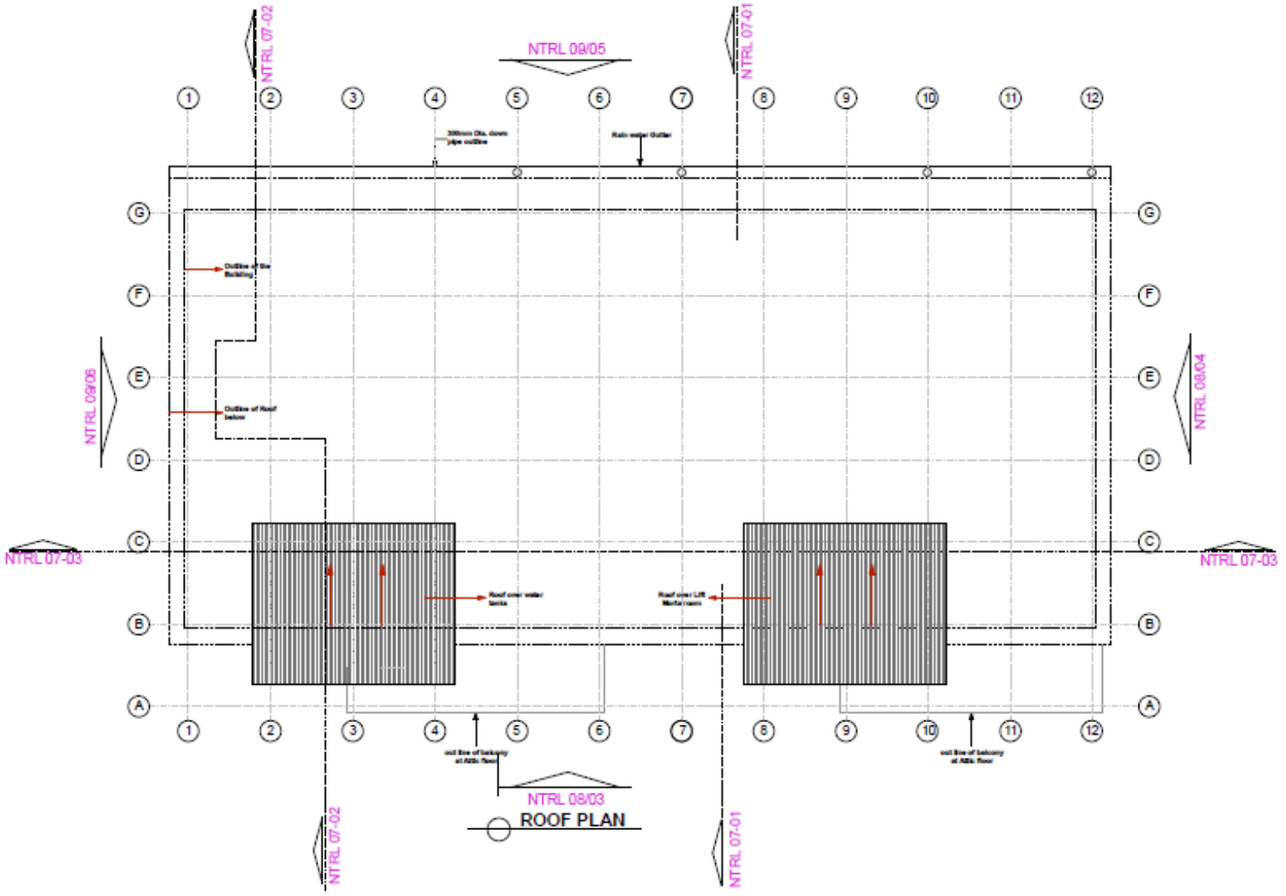
CLIENT
AMERICAN CONSULATE GENERAL RPSO

PROJECT
PROPOSED NATIONAL T.B REFERENCE LABORATORIES BUTABIKA - KAMPALA

DRAWING TITLE
MACHINE ROOM / ROOF PLAN

JOB NO.	DWG REF
SCALE 1:100	REVISION NO.
DATE DEC. 2011	
DRAWN BY S.B	
CHECKED BY ARCH. M.D	

Drawing No.
NTRL/05



ROOF PLAN

PAN MODERN CONSULT LTD

Architects, Engineers and Project Managers.

PLOT 20, KENETH DALE,
OFF KIIRA ROAD, KAMWOKYA,
P.O BOX 4889, TEL 041- 250 383
KAMPALA.

GENERAL NOTES

(1) Contractor to verify dimensions on site before commencement of works and report any discrepancies to consulting Architect.

(2) Architectural drawings to be read with relevant structural, mechanical and electrical drawings.

(3) All retaining walls to be damp proofed civil engineer's specification and detailing.

(4) Drainage pipes under drive ways to have 150mm concrete surrounding.

KEY FINISHING

FLOOR, SKIRTING, WALLS, CEILING

FLOOR
(A) 30mm Cement/Sand Screed
(B) In situ Concrete finish
(C) 9mm thick Porcelain Tiles
(D) 25mm thick Granite
(E) Epoxy floor finish

SKIRTING
(A) 150mm Cement/Sand Plaster
(B) 25mm, 150mm high Hardwood
(C) 9mm, 150mm high Porcelain Tiles
(D) 150mm high Granite
(E) Epoxy skirting finish

WALLS
(A) 12mm thick painted Cement/Sand Plaster
(B) Wallpaper
(C) 9mm Ceramic Tiles
(D) Glass in aluminium
(E) Epoxy wall finish

CEILING
(A) Painted Cement/Sand Plaster
(B) Powder coated aluminiumsuspended ceiling
(C) Armstrong ceiling
(D) Gypsum Board ceiling
(E) Epoxy paint

REVISIONS

NO.	DATE.	DESCRIPTION

ISSUES

NO.	DATE.	ISSUED TO	NO.	DATE.

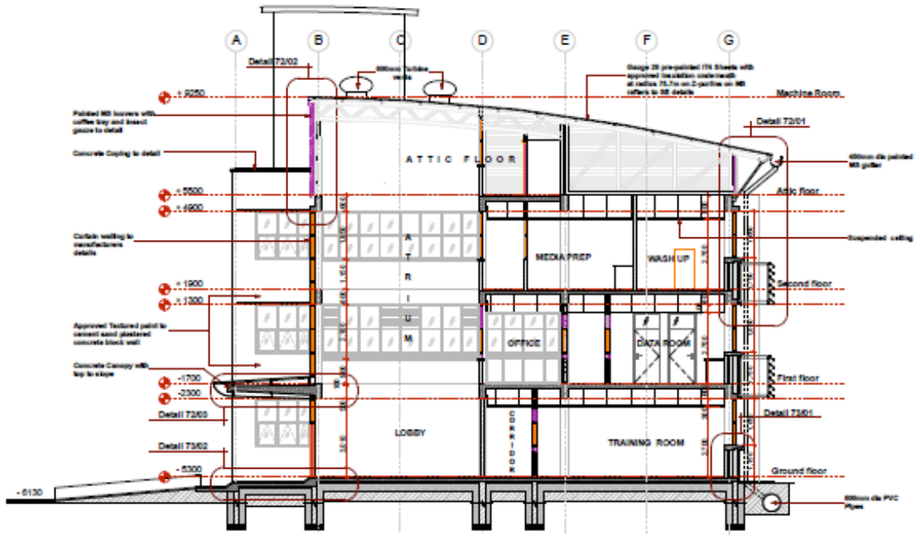
CLIENT
AMERICAN CONSULATE GENERAL RPSO

PROJECT
PROPOSED NATIONAL T.B REFERENCE LABORATORIES BUTABIKA - KAMPALA

DRAWING TITLE
ROOF PLAN

JOB NO.	DWG REF
SCALE 1:100	REVISION NO.
DATE DEC. 2011	
DRAWN BY S.B	
CHECKED BY ARCH. M.D	

Drawing No.
NTRL/06



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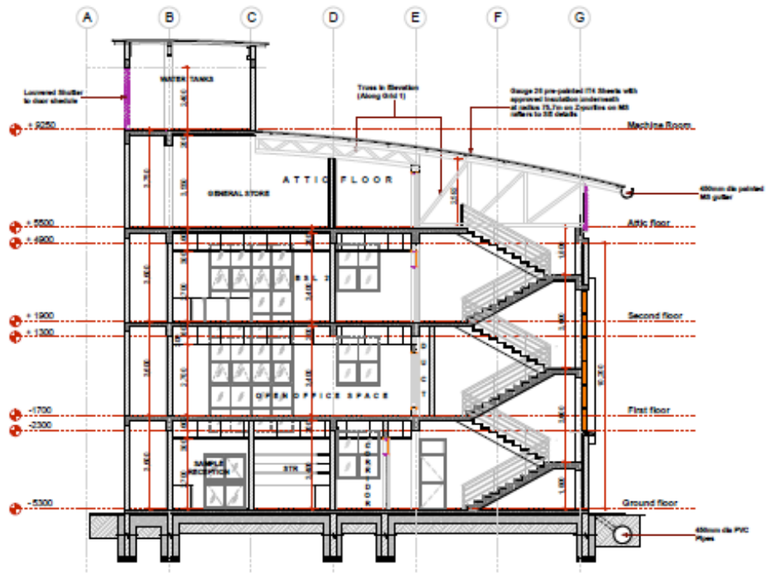

SECTION/07/02
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SECTION 07/03
Scale: 1:100

PAN MODERN CONSULT LTD

Architects, Engineers and Project Managers.

PLOT 20, KENETH DALE,
OFF KIIRA ROAD, KANWOKYA,
P.O BOX 4888, TEL 041- 286 383
KAMPALA.

GENERAL NOTES

(1) Contractor to verify dimensions on site before commencement of works and report any discrepancies to consulting Architect.

(2) Architectural drawings to be read with relevant structural, mechanical and electrical drawings.

(3) All retaining walls to be damp proofed civil engineer's specification and detailing.

(4) Drainage pipes under drive ways to have 150mm concrete surrounding.

(5) Kerb Box 0 to 150mm above Sea Level.

KEY FINISHING

FLOOR, SKIRTING, WALLS, CEILING

FLOOR
(A) 50mm Cement/Sand Screed
(B) In situ Concrete finish
(C) 9mm thick Porcelain Tiles
(D) 25mm thick Granite
(E) Epoxy floor finish

SKIRTING
(A) 150mm Cement/Sand Plaster
(B) 25mm, 150mm high Hardwood
(C) 9mm, 150mm high Porcelain Tiles
(D) 150mm high Granite
(E) Epoxy skirting finish

WALLS
(A) 12mm thick painted Cement/Sand Plaster
(B) Wallpaper
(C) 9mm Ceramic Tiles
(D) Glass in aluminium
(E) Epoxy wall finish

CEILING
(A) Painted Cement/Sand Plaster
(B) Powder coated aluminium suspended ceiling
(C) Armstrong ceiling
(D) Gypsum Board ceiling

REVISIONS		
NO.	DATE.	DESCRIPTION

ISSUES				
NO.	DATE.	ISSUED TO	NO.	DATE.

CLIENT
AMERICAN CONSULATE GENERAL RPSO

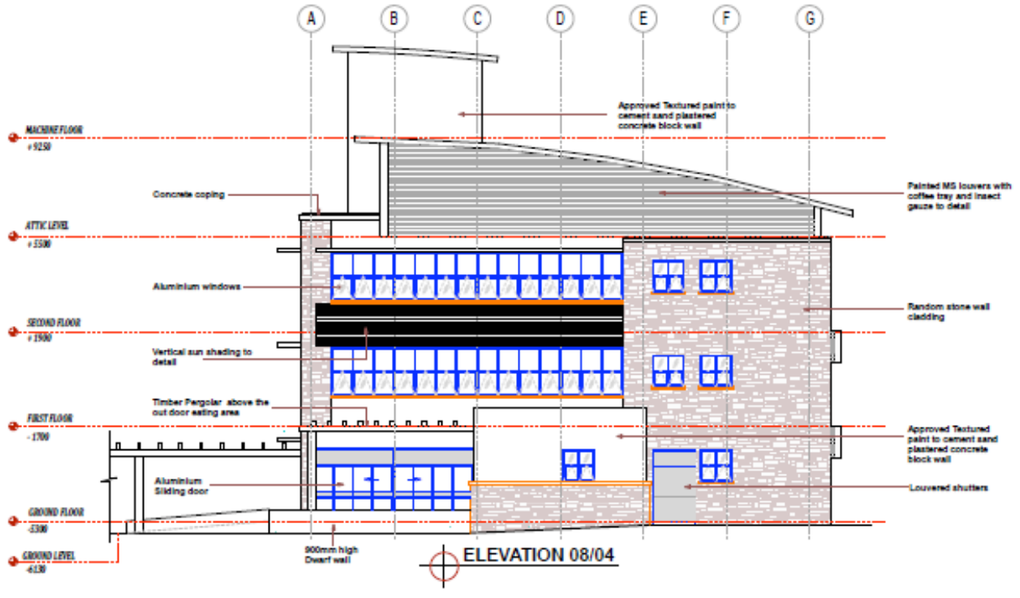
PROJECT
PROPOSED NATIONAL T.B REFERENCE LABORATORIES
BUTABIKA - KAMPALA

DRAWING TITLE
SECTIONS 01& 02

JOB NO.	DWG REF
SCALE 1:100	REVISION NO.
DATE DEC. 2011	
DRAWN BY S.B	
CHECKED BY ARCH. M.D	

Drawing No.
NTRL/07

ELEVATION 08/03



ELEVATION 08/04

PAN MODERN CONSULT LTD

Architects, Engineers and Project Managers.

PLOT 20, KENETH DALE, OFF KIIRA ROAD, KANWOKYA, P.O BOX 4880, TEL 041- 250 383 KAMPALA.

GENERAL NOTES

(1) Contractor to verify dimensions on site before commencement of works and report any discrepancies to consulting Architect.

(2) Architectural drawings to be read with relevant structural, mechanical and electrical drawings.

(3) All retaining walls to be damp proofed civil engineer's specification and detailing.

(4) Drainage pipes under drive ways to have 150mm concrete surrounding.

(5) Elevation 0 is 1100m above Sea Level

KEY FINISHING

FLOOR — SKIRTING — WALLS — CEILING

FLOOR
(A) 30mm Cement/Sand Screed
(B) In situ Concrete finish
(C) 9mm thick Porcelain Tiles
(D) 25mm thick Granite
(E) Epoxy floor finish

SKIRTING
(A) 150mm Cement/Sand Plaster
(B) 25mm, 150mm high Hardwood
(C) 9mm, 150mm high Porcelain Tiles
(D) 150mm high Granite
(E) Epoxy skirting finish

WALLS
(A) 12mm thick painted Cement/Sand Plaster
(B) Wallpaper
(C) 9mm Ceramic Tiles
(D) Glass in aluminium
(E) Epoxy wall finish

CEILING
(A) Painted Cement/Sand Plaster
(B) Powder coated aluminiumsuspended ceiling
(C) Armstrong ceiling
(D)Gypsum Board ceiling

REVISIONS		
NO.	DATE.	DESCRIPTION

ISSUED				
NO.	DATE.	ISSUED TO	NO.	DATE.

CLIENT
AMERICAN CONSULATE GENERAL RPSO

PROJECT
PROPOSED NATIONAL T.B REFERENCE LABORATORIES BUTABIKA - KAMPALA

DRAWING TITLE
ELEVATIONS-03 & 04

JOB NO.	**DWG REF**
SCALE 1:100	**REVISION NO.**
DATE DEC. 2011	
DRAWN BY S.B	
CHECKED BY ARCH. M.D	

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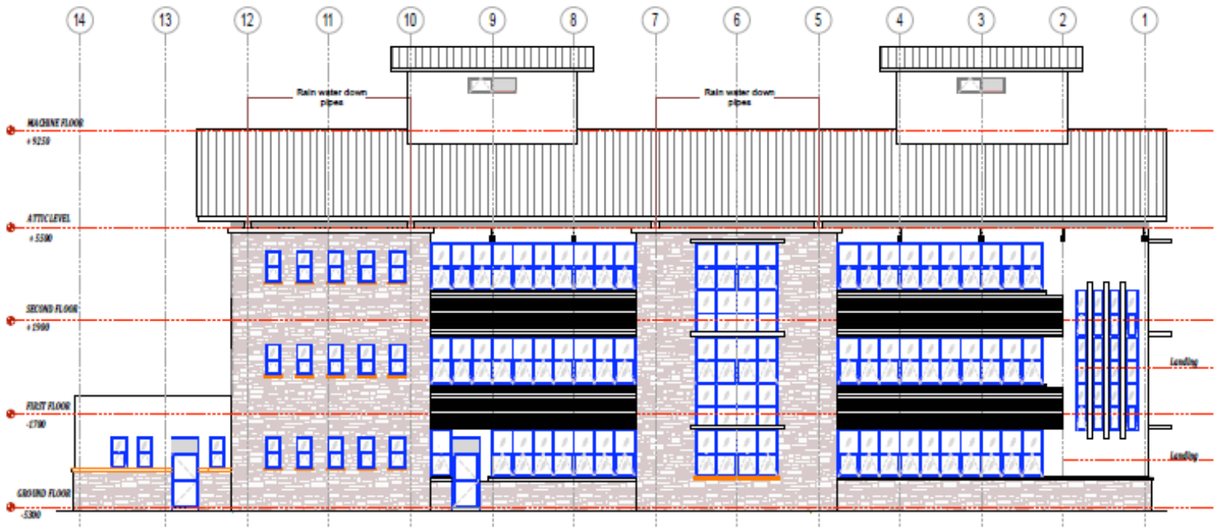
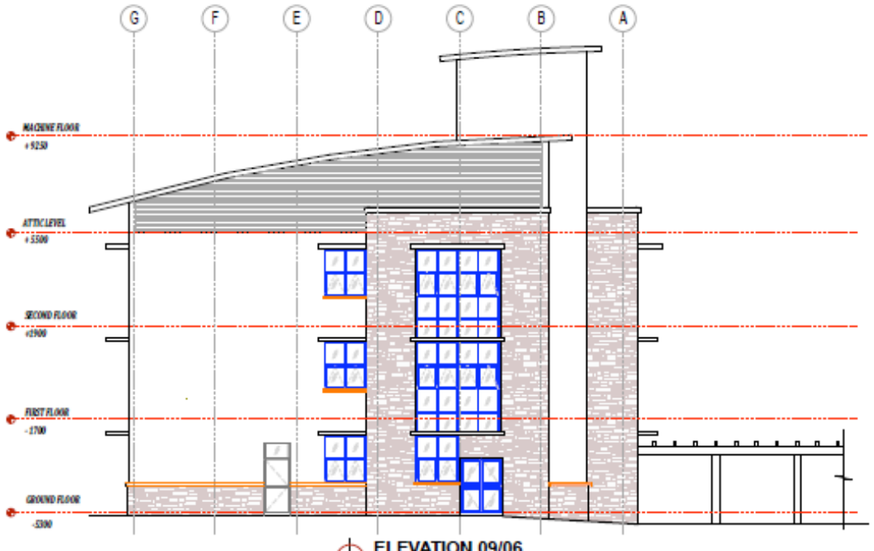
NTRL/08



ELEVATION 09/05



ELEVATION 09/06

PAN MODERN CONSULT LTD

Arohitects, Engineers and Project Managers.

PLOT 20, KENETH DALE, OFF KIIRA ROAD, KANWOKYA, P.O BOX 4869, TEL 041- 250 383 KAMPALA.

GENERAL NOTES

(1) Contractor to verify dimensions on site before commencement of works and report any discrepancies to consulting Architect.

(2) Architectural drawings to be read with relevant structural, mechanical and electrical drawings.

(3) All retaining walls to be damp proofed -DNP engineer's specification and detailing.

(4) Drainage pipes under drive ways to have 150mm concrete surrounding.

(5) Elevation 0 is 1100m above Sea Level

KEY FINISHING

FLOOR, SKIRTING, WALLS, CEILING

FLOOR
(A) 50mm Cement/Sand Screed
(B) In situ Concrete finish
(C) 9mm thick Porcelain Tiles
(D) 25mm thick Granite
(E) Epoxy floor finish

SKIRTING
(A) 150mm Cement/Sand Plaster
(B) 25mm, 150mm high Hardwood
(C) 9mm, 150mm high Porcelain Tiles
(D) 150mm high Granite
(E) Epoxy skirting finish

WALLS
(A) 12mm thick painted Cement/Sand Plaster
(B) Wallpaper
(C) 9mm Ceramic Tiles
(D) Glass in aluminium
(E) Epoxy wall finish

CEILING
(A) Painted Cement/Sand Plaster
(B) Powder coated aluminiumsuspended ceiling
(C) Armstrong ceiling
(D) Gypsum Board ceiling

REVISIONS

NO.	DATE.	DESCRIPTION

ISSUES

NO.	DATE.	ISSUED TO	NO.	DATE.

CLIENT
AMERICAN CONSULATE GENERAL RPSO

PROJECT
PROPOSED NATIONAL T.B REFERENCE LABORATORIES BUTABIKA - KAMPALA

DRAWING TITLE
ELEVATIONS-05 &06

JOB NO.	DWG REF
SCALE 1:100	REVISION NO.
DATE DEC. 2011	
DRAWN BY S.B	
CHECKED BY ARCH. M.D	

Drawing No.
NTRL/09

APPENDIX C: TERMS OF REFERENCE FOR THE ESIA

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY (NEMA)

NEMA House
Plot 17,19 & 21, Jinja Road.
P.O.Box 22255, Kampala, UGANDA.

Tel: 256-414- 251064, 251065, 251068
342758, 342759, 342717
Fax: 256-414-257521 / 232680
E-mail: info@nemaug.org
Website: www.nemaug.org

NEMA/4.5

16th January, 2014

The Permanent Secretary,
Ministry of Health,
Plot 6/7 Lourdel Road, Kampala,
P. O. Box 7272,
KAMPALA.

Tel: +256 (0)414 340872

RE: REVIEW OF SCOPING REPORT AND TERMS OF REFERENCE PERTAINING TO THE PROPOSED NATIONAL TUBERCULOSIS REFERENCE LABORATORY, AT BUTABIKA, KAMPALA

This is in reference to the letter this Authority received on 28th November, 2013, submitting the Scoping Report and Terms of Reference (TOR) for carrying out an environment impact assessment (EIA) for the proposed construction/rehabilitation of the National Tuberculosis Reference Laboratory, on Plot 2, Block 237-2383, in Butabika Hospital Village (LC-1), Butabika Parish, Nakawa Division, Kampala District, for review and consideration for approval. This Authority has finalised the review and grants formal **APPROVAL** of the said Scoping Report and TOR.

Please, note that approval of the Scoping Report and TOR DOES NOT give you permission to start implementing any of the proposed project activities.

In addition, you advised to be mindful of the need to consider some of the key aspects highlighted below, during the conduct of the EIA and preparation of the EIA report, respectively.

(i) Carry out comprehensive consultations with all the relevant key stakeholders including the Kampala Capital City Authority, the Ministry of Works and Transport, and the local communities in the neighbourhood; and, ensure that the **views of the aforementioned categories of stakeholders are well documented and appended to the EIA report.**

(ii) Provide **comprehensive baseline data/information** relating to the project sites/areas and its immediate surroundings, and a **set of coloured photographs** showing the current state of the proposed project site.

(iii) **Outline the proposed phases of development** of the said project area in relation to the proposed five satellite laboratories, and indicate what phase(s) the proposed EIA is focusing on – *that is, whether only the Butabika site, or Butabika site plus other five sites (note that separate EIAs will be required for the proposed five satellite laboratory sites)*

(iv) Provide comprehensive description of the proposed **project components, activities, and size of the workforce.**

1 of 2

16/1/14

(v) Ensure that soil and air quality as well noise level analyses are carried out relating to the project area, and that the baseline soil and air quality, and noise level **analyses results are appended to the EIA report.**

(vi) Provide **coloured, well-labelled and legible location and google maps** *(preferably each covering A-4 or larger paper size)* that are clear, and a **set of GPS coordinates.**

(vii) Include in the EIA report **clear, well-labelled and legible copy of the proposed site lay-out plan** *(preferably covering A-3 or larger paper size)*, that shows clearly the boundaries of the project site and set up of the project infrastructure.

(viii) Provide **comprehensive analyses of alternatives** – in terms of project design, location, technology, among other aspects.

(ix) Provide **detailed evaluation of the potential environmental impacts and risks** associated with the proposed project components and activities.

(x) Provide **comprehensive mitigation and environmental monitoring plans** (*preferably in table matrix format*), respectively, that relate to the identified potential environmental impacts associated with the proposed project.

(xi) Consider any other critical environmental aspects/concerns not initially foreseen during the preparation of the Scoping Report and TOR, and include an evaluation of such aspects/concerns in the EIA report.

(xii) Append to the EIA report copies of the **authentic land acquisition/ownership documents.**

(xiii) Ensure that the total project (investment) cost is included in the appropriate section of the EIA report as well as in the letter that will be used to submit copies of the EIA report to this Authority for review.

This is, therefore, to recommend that you proceed with carrying out the EIA for the proposed project. We look forward to your cooperation and receipt of copies of a comprehensive EIA report, for our further action.

(NOTE: THIS IS NOT A CERTIFICATE OF APPROVAL)

Waiswa–Ayazika
FOR: EXECUTIVE DIRECTOR

C.c Eng. Lammeck Kajubi,
Air, Water Earth (AWE) Ltd.,
27, Binayomba Road, Bugolobi
P.O. Box 22428,
KAMPALA.

Tel: +256 (0)782 580480 / (0)772496451