REPUBLIC OF UGANDA

UGANDA INVESTMENT AUTHORITY

PROPOSED SECOND UGANDA PRIVATE SECTOR COMPETITIVENESS PROJECT

ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMEWORK FOR KAMPALA INDUSTRIAL BUSINESS PARK (KIBP) AT NAMANVE

FINAL REPORT

SUBMITTED BY
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A. EXECUTIVE SUMMARY

The Uganda Investment Authority (UIA) proposes to construct an Industrial and Business Park at Namanve, approximately 11km east of Kampala. GIBB (Eastern Africa) Ltd was contracted to undertake the final planning and engineering services designs for part of the park in late April 1999. In June 2000, the United Nations International Development Organization (UNIDO) undertook to take over and fund a portion of the Contract.

The park is approximately 894 ha in size and comprises four estates, namely Namanve North, South A, South B and South C estates. Under the Contract, detailed planning and designs were to be provided in respect of Namanve North and South A estates with provision for logical extension of services to Namanve South B and South C estates. This was subsequently changed such that detailed planning and designs would be undertaken in respect of Namanve South A and B estates with provision for extension of services to Namanve North and South C estates.

Inception and Interim reports were submitted in June and October 1999 respectively. The Inception report outlined preliminary planning and the design criteria to be adopted for the engineering designs. The Interim report outlined the planning layouts and preliminary designs in respect of the engineering services. Formal comments on the reports were received by GIBB (Eastern Africa) Ltd in February 2000 and were included Draft Final Design report, which was accompanied by the following documents, submitted in November 2000:

- Environmental Impact Assessment report
- Draft Tender Documents, comprising Contract Documentation, Bills of Quantities, Technical Specifications and Tender Drawings
- Draft Engineer's Cost Estimate (Confidential).

A presentation on the Infrastructure Designs was made to the UIA Board and representatives from other organizations in early February 2001. Comments on the Draft Final Report, Draft Tender Documents, Draft Engineers Cost Estimate Y and Environmental Impact Assessment Report were received early July 2001. Further comments were received in early August 2001 on the Environmental Impact Assessment Report from the National Environment Management Authority (NEMA).

The Final Design Report, Tender Documents and Environmental Impact Assessment Report issued incorporating these comments. The report covers the following detail designs in respect of Namanve South A and B estates:

- Planning
- Roads
- Hydrology and surface water drainage
- Sewerage system
- Sewage treatment works
- Water supply
- Electrical power supply and telecommunications

The following are the salient features to be noted in the planning and design of the estates:
Out of the 894 ha total area of Namanve Industrial and Business Park, approximately 190 ha comprises undevelopable swamps and natural drainage area. About 576 ha of land is available for lease as industrial, business, institutional or residential plots. Of this 116.2 and 147 ha, totaling 263.2 ha of business and industrial plots, lie in South A and B respectively, and comprises the areas to be developed in the first phase.

More than 50% of the area of land in Namanve South A and B consists of swampy wetlands with ground water levels in the lower reaches close to the ground surface. Consequently approximately 60% of the road network will be constructed on imported fill material. The roads are thus between 1.0m and 1.6 m above ground level in these fill areas.

As a result of the topography and ground conditions, the drainage of the site in the lower reaches is difficult. However, as required, most of the drainage has been designed as sub-surface piped drainage except at the lower ends where open channels have been designed due to low gradients. Separate outfalls have been provided from each sub-catchment, draining directly into the wetland.

Due to the topography of the site, the gravity sewerage network consists of relatively deep sewers and includes two sewerage-pumping stations.

The sewage treatment works for Namanve North, South A and South B is located in the swampy area within Namanve South B, just south of the Kampala-Jinja railway line. It incorporates a pumping station at the inlet works. The treatment process utilizes waste stabilization ponds. The construction of the treatment works will be phased and will eventually cover an area of approximately 41 ha. Any developer unable to comply with the requirements of discharge into the main sewerage system will be required to provide treatment facilities on site, before discharging into the parks sewerage system.

A plot has been designated in Namanve North where the proposed 132/33 kV substations will be designed and constructed by the Uganda Electricity Board (UEB). The whole site will be supplied by underground 33 kV ring feeders from the substation. When Namanve North and South C are developed the services in Namanve South A and B will be extended into the new areas.

This report presents the findings and recommendations of an environmental impact assessment (EIA) of the proposed development of Namanve Industrial and Business Park, carried out by GIBB (Eastern Africa) Ltd. for the Uganda Investment Authority (UIA).

Introduction
Chapter 1 outlines the background, scope of work, objectives and methodology of the study. The Uganda Investment Authority (UIA) proposes to develop an industrial and business park in Namanve. The proposed site is located approximately 11 km east of Kampala straddling the Kampala - Jinja road, and is approximately 1,006 ha in area. The site was formerly Namanve Central Forest Reserve and was degazetted by the government of Uganda in 1996. This land was then placed under the ownership of the UIA.
Environmental legislation
Chapter 2 reviews the legislative framework in Uganda with particular reference to relevant environmental legislation. The National Environmental Statute of 1995 regulates environmental issues in Uganda. Schedule III of the statute lists projects requiring environmental impact assessments and urban developments, which include the establishment of industrial estates, are among the projects listed in the Schedule.

Environmental profile
Chapter 3 describes the environmental profile of the project area with regard to both biophysical and socio-economic factors.

Socio-Economic Survey
Chapter 4 provides an overview of the socio-economic situation in area surrounding proposed business park.

Prediction of impacts
Chapter 5 provides a prediction of the environmental impacts expected during the construction and operational phases of the proposed development. In predicting impacts, the following environmental components have been appraised:

- Topography
- Geology and soils.
- Flora and fauna.
- The wetland/swamp area.
- Air, noise and dust pollution.
- Water pollution.
- Waste handling and soil contamination.
- Socio-economy.

Mitigation measures
Chapter 6 provides mitigation measures for the negative impacts predicted in Chapter 5. Table 1 below summarizes the potential impacts identified during the study and the corresponding mitigation measures proposed.

Conclusions and Recommendations
The study has highlighted various existing and potential impacts within the site proposed for the development of Namanve Industrial and Business Park. Mitigation measures have been proposed for potentially adverse impacts. These have been summarized in Chapters 5 and 6. This chapter concludes the report by highlighting the main issues identified in the study.

Location
The location of the proposed project site in Namanve will have a significant impact on the Namanve wetland area. From a socio-economic standpoint, the proposed site is strategically located in terms of proximity to Kampala for trade and commerce transactions. This is advantageous, as there is access to skilled and unskilled labour to work during the construction and operation phases of the project.
Effluent disposal

The environmental impact assessment (EIA) of the proposed development has shown that great concern lies with the disposal of effluent and its impact on the Namanve swamp and ultimately on Lake Victoria, the drinking water source for the residents of Kampala. Industries are required by law to pre-treat their effluent in order to comply with Ugandan effluent regulations for discharge of effluent/wastewater to a sewage treatment works, 1997 and revised in 1999.

It is planned that all industries will pre-treat their waste which will then pass through a sewage treatment works. The outflow will then pass through the natural wetland systems. There is a need to develop stringent monitoring and enforcement of this process.

Given that:
- Once completed Namanve area will be the biggest industrial complex to impact Inner Murchison Bay;
- It will be developed over a considerable period of time (10 years or more);
- The range and types of industries that may be set up there will be diverse,

There is a serious need to guarantee the future of the water quality and to mitigate pollution and eutrophication of the Bay. Regular testing would therefore be required of the effluent at the point it exits each industry and at the influent and effluent points of the sewage treatment works. Monitoring of Lake Victoria water quality, fauna and flora will provide baseline data on the trends of pollution or contamination and its effect on the environment. Industries should therefore be responsible for the proper treatment of their effluent before discharge into any wetland. Strict penalties for defaulters will be absolutely necessary.

Solid waste

UIA should formulate a waste management plan for solid waste for Namanve. All industries should submit a waste management plan detailing all construction and operational waste management and disposal plans.

GIBB understands that the strategy is to outsource solid waste management facilities and maintenance to private companies and contractors. Thus, we would suggest that the concerned districts (Wakiso and Mukono), hold a meeting with UIA and NEMA to discuss available options as soon as possible to identify one to three suitable locations for solid waste disposal. The following issues should be taken into consideration:

- Legal requirements for the disposal of hazardous and non-hazardous waste
- The types of industries in the Park; options for solid waste disposal for the specific industries;
- Environmental impacts, monitoring procedures and mitigation measures for the various disposal methods;
- Recycling and waste reduction activities on an industry specific basis;
- Due consideration of domestic solid waste from the surrounding population incorporating the projected population growth connected with the Industrial Park; and
Disposal of sludge from sewage works.

Toxic and hazardous waste

In terms of industrial layout by category, the information on potential industries or industry types is not yet available from the UIA / management authority. It is strongly recommended that strict adherence to the guidelines issued for Industrial Estates within the Pollution Prevention Abatement Handbook, 1998. In addition to these guidelines, the Pollution Prevention Abatement Handbook sub-divides industry into 40 sectors that range from dairy industries to vegetable oil processors. We would therefore recommend sub-division according to these 40 major sectors and encourage similar industries i.e. food industries to be grouped together and separate from petroleum-based industries.

Of specific concern at Namanve is the high water table in many areas, but not all parts of the Park. Industries that have the potential to contaminate the water table such as petroleum- based, petrochemical-based, tanneries or pulp and paper mills etc. should be located on higher ground and ideally on impermeable soils. In addition, groundwater monitoring wells should be installed.

NEMA is advised to establish standards for treatment and handling of hazardous and toxic waste material and to ensure that viable options exist before allowing industries to generate hazardous waste.

According to the National Environmental Statute of 1995, individual environmental impact assessments will be required by law for the development of each and every industry in the new Park. Risk assessment and risk management is industry-specific. Computer programmes, such as WAZAN (World Bank Hazard Analysis programme) and PHAST (Process Hazards Assessments Screening Tools programme) can be used to model the risk of individual sites and processes.

Soil Contamination/Pollution

No industry should contaminate or pollute the underlying soil/geology. This can be prevented by construction of secondary containment, use of spill prevention equipment, contingency planning (site and park specific), and investing in spill response equipment. Industries should indicate the measures they will employ in preventing soil contamination and pollution as a pre- requisite to obtaining authorization to begin construction.

Measures to be implemented during construction

The construction site should be kept clean at all times and appropriate measures should be taken for the storage, transportation and disposal of waste materials. Sanitary facilities for their work force. Proposed sanity arrangement should be submitted to UIA for approval before commencing construction work.

All vehicles should be maintained in accordance with the original manufacturer's specifications and manuals in order to minimize noise, soil and air pollution caused by oil leaks and emissions.
The Industrial Developers, through their Contractor, shall take all reasonable measures to prevent spillage and leakage of materials likely to pollute air, soils and watercourses. Similarly, precautions should be made to minimise soil erosion from the site through the use of berms or silt fences.

The Industrial Developers, through their Contractor, should take precautions to minimize air pollution. The routing of trucks and other vehicles should minimise and mitigate the effects of generation of dust and vehicle emissions on the surrounding inhabited areas.

The Industrial Developers, through their Contractor, should prepare and implement a Site Environment, Health and Safety Plan detailing preventive measures concerning fire, product release, worker injury and waste management. Where applicable, a detailed Spill Contingency Plan should be put in place according to international standards.

The Industrial Developers, through their Contractor should demonstrate that all materials used (quarry stone, fill material, wood, steel etc.) are from environmentally responsible sources. Wood and wood-products should ideally be certified by the Forestry Stewardship Council or similar organization and all quarry materials should come from quarries or borrow pits that have approved rehabilitation plans.

Monitoring, Management and Capacity Building

As stipulated earlier in the report, it was clear that either a unit within U.I.A be created to oversee the park development or a park authority is created, the latter being the preferred option being the overall work load of U.I.A. In this regard, the consultant given the budgetary constraint of the G.O.U also recommends budgetary support to the unit or authority for a period of four (4) years at which time the park should be self-financing. NEMA should also benefit from Bank support to ensure adherence to national environmental legislation and notably the World Bank safeguard policies.

Other Issues

a) Awareness and education
Officer, in conjunction with the UIA, should immediately work towards the incorporation of the Namanve catchments into the Inner Murchison Bay water-monitoring scheme. In addition, the officer should have a pivotal role in environmental education and awareness for all people working in Namanve.

The Environmental Officer should be made aware of, and be provided with, the latest copy of the existing standards and guidelines for air, water and soil. Particular emphasis should be placed on the implications of Lake Victoria being the source of drinking water for the people of Kampala and its surroundings, in addition to being the sink for waste water disposal for Namanve.

b) Regional planning
The subject site straddles two districts namely Wakiso and Mukono Districts. This implies that the impact of the proposed industrial park will be evident in these two areas. It is important that
the Districts are represented and incorporated in the planning process and the industrial park and its projected impacts are taken into consideration when the planning committees in the respective districts are deliberating on issues.

There should be regional integrated planning to avoid undesirable degradation and unplanned settlement. This would involve input from Wakiso and Mukono District representatives and the UIA planning committee at the pre-construction phase.

c) Awareness promotion
In order to increase the level of awareness about the proposed Namanve project and its implications, planning authorities in the respective districts of Mukono and Wakiso should ensure that the communities around the park are appropriately sensitized about the realities associated with development of an industrial park near them. This should be initiated by the UIA.

d) Alternative water supply
Our socio-economic survey indicated that presently the people living around Namanve North and Namanve South 'A' depend upon water from protected and unprotected springs as well as boreholes some of which are located in the proposed industrial area. The number of people living in or at the periphery of the proposed Park is estimated to be between 5,000 and 8,000. On the assumption that all these people obtain water from sources inside the proposed Park area it will be necessary to provide between 250 m$^3$ and 400 m$^3$ of water per day, based on 50 litres per person per day for low-income settlements. Planning should be initiated to upgrade this provision in five years as it is likely that many people will graduate from low to middle income earners over the forthcoming decade.

We further recommend that this planning be incorporated into the overall planning and costing for water provision to the Industrial Park.

Industries should ensure that routes to natural water sources are preserved for access by villagers. If this is not possible, the industry should offer viable alternatives, including; sinking of boreholes incorporating a system for maintaining the boreholes to ensure sustainable water supply. Coca-Cola has set a precedent by drilling and equipping two boreholes for use by the surrounding community to replace the two wells that will be lost through construction of the proposed facility in Namanve.

e) Wetland
The protection of wetlands in Uganda is a pertinent issue and should be tackled effectively. The main issue will be enforcement of the protection of the swamp area within Namanve. The Wetland Inspection Division and NEMA's monitoring departments both have limited staffing and have a countrywide mandate. The onus will therefore fall on the Environmental Officer proposed to manage the environmental matters within the proposed site. Monitoring of this site will include the suggestions outlined.

f) Transportation
Transportation is an issue as there will be a need to increase the number of public (and private) vehicles on the main Kampala/Jinja road to cater for the large work force that will be commuting daily to the site. This will result in an increase in air pollution and the potential for accidents on the roads.

**g) Construction Materials**
During the construction phase there will be a large demand for construction material such as sand, murram and timber. If not properly regulated this may result in unsightly landscape modification and natural resource depletion.

**h) Flooding**
The subject site has a very low topographic gradient and a shallow water table (1 m.b.g.l. in some places), and this increases the potential for flooding. It is recommended that construction below the 1136.3 lake level be avoided.

**i) Flora and fauna**
There were some flora and fauna of conservation interest identified, which should be protected. This will go hand in hand with the preservation of the areas set aside as conservation areas. Sponsorship for such activities could be obtained from the industries themselves.

**FURTHER WORK**

Further work and investigations are required in the following areas:

- A time series water quality analysis should be carried out on River Namanve and the outlet into Lake Victoria.

- A groundwater and aquifer status survey of the Namanve area should be conducted in conjunction with mapping of possible sources of contamination (such as pit-latrines), and likely contamination migration routes.

- A survey of the health status of the people living in the Namanve area, particularly on respiratory related diseases, should be carried out to establish the health condition of the population. This information could then be used as a point of reference in the event that issues relating to health are raised in connection with the Namanve Industrial Park.

- An air quality survey, particularly for vehicle emissions, should be carried out over a period of time to establish the current air quality standards and to model possible dispersal characteristics of air pollution.

- Plans for solid waste management should be formulated.

- Awareness should be created with regard to the Park's intended functions, particularly among those living adjacent to the proposed park site. This should be carried out before construction begins on the industrial park.
- Environmental management should be institutionalized with the appointment of an Environmental Officer.

- A socio-economic study of the impact of HIV/AIDS and STDs on the communities living adjacent to the proposed project area should be conducted. It is recommended that all the items listed above should be addressed exhaustively at the planning stage of the proposed project. Recommended precautions: Certain precautions should be taken. These include but should not be limited to:

- Identification and harmonization of the activities and expectations of stakeholders. This should involve regular consultative meetings to harmonize development activities.

- Demarcation and possible gazetting of the wetlands (conservation areas) should be undertaken to pre-empt future encroachments;

- The channel in the upper Namanve Swamps should not be lined nor extended to the Kayobe Swamp. This will ensure that the wetland remains intact and there is adequate seepage of treated effluent through the wetland.

B. INTRODUCTION

1. Background

Uganda has achieved remarkable economic growth since the launching of the Economic Recovery Program in 1987 that restored macro-economic stability and spurred private investments. The Government of Uganda (GOU) has embarked on an economic growth strategy to diversify exports and enhance competitiveness based on the "Vision 2025 - A Strategic Framework for National Development" published in 1999, the Medium Term Competitiveness Strategy (MTCS), the Program for Modernization of Agriculture (PMA) and the revised Poverty Eradication Action Plan (PEAP). This strategy is based on the development of a competitive manufacturing sector for both domestic and export markets and the GOU has taken various initiatives to improve the investment climate in Uganda to attract investment.

Uganda is positioning itself to take advantage of export opportunities in emerging sectors such as organic agriculture products, horticulture, information and communication technologies and light manufacturing. The GOU is taking steps to improve the infrastructure for manufacturing including improving the transportation network infrastructure and services to lower costs and improve reliability and efficiency of transport services. The shortage of serviced industrial land is a major constraint for the expansion of the manufacturing sector and the GOU is keen to establish modern industrial parks to facilitate manufacturing investments.

2. The Project

The Objective of the proposed Second Private Sector Competitiveness Project is to assist the Government of Uganda in increasing the growth of its private sector and specifically to increase
the level of exports and to improve the performance of Micro, Small and Medium Enterprises (MSMEs). The project intends to achieve this by improving: (i) the efficiency of trade related services; (ii) the investment climate; (iii) output and employment in firms, in particular MSMEs; (iv) financial markets for MSME; and (v) project implementation and coordination.

3. Key development issues and rationale for Bank involvement

Uganda experienced significant growth in the ’90s and a reduction in the incidence of poverty. The challenge for the Government, since 2000, has been to maintain growth levels beyond 5.6%, in order to achieve similar or higher levels of poverty reduction. This is made more difficult by unfavorable world market prices for traditional export commodities. While maintaining policies that have worked in the past, such as a stable macro economic policy, the Government aims to accelerate the economic transformation process by supporting the private sector's ability to respond to market opportunities. Recent studies and consultation with the private sector confirm that slow growth and inconsistency in emerging export areas are due to inefficiencies in the commodity supply chain. These are caused by: (a) inefficient trade and investment services, including the business environment; (b) inadequate infrastructure; and (c) limited private sector capacity.

To address these issues, The Government has developed a Medium-Term Competitiveness Strategy (MTCS) and Strategic Exports Policy (SEP) and requested support from the donor community to develop and implement development programs that will contribute to the success of this new development scenario. The World Bank's Country Assistance Strategy (CAS) for 2003-006 is currently under preparation, however, the CAS approach will be consistent with the Government's Poverty Eradication Action Plan (PEAP) and the Poverty Reduction Strategy Paper (PRSP). The proposed project supports the achievement of major pillars in the PEAP and PRSP, namely: (i) directly increasing the ability of the poor to raise their incomes; (ii) directly improving the quality of the life of the poor; and (iii) creating an enabling environment for economic growth and structural transformation. The proposed project supports both pillars (i) and (iii). In particular, the project will contribute to increased income of rural households by enabling them to participate in export supply chains that generate increasing value for direct employees or for micro small and medium enterprises (MSME). The project will also include a MSME component within the umbrella IDA/IFC MSME initiative, which went to the board on 12 June 2003.

The Uganda Private Sector Competitiveness Project, which closed in December 2002, was designed to make the private sector more competitive in the domestic and international markets. The project achieved (i) a better-structured and regular private public sector dialogue; (ii) an improvement in institutional capacity in the public and the private sector, such as the Uganda Investment Authority (UIA) and private sector representative organizations such as the Private Sector Foundation Uganda (PSFU); and (iii) an improvement of know-how and management at firm level. The project ICR rated the project as satisfactory. Building on past accomplishments and the established public private public dialogue, the project will address (i) remaining gaps in the business environment which have been highlighted in recent analysis; (ii) scale up the successful firm level capacity building to focus more on exports and (iii) provide a new set of support to improve trade and investment in global export markets. The project design and
approach will build on experiences and best practices from projects funded by other donors, such as USAID, DFID, and the EU and will therefore, seek to expand the outreach or accelerate the implementation of successful projects. The project will also identify key policy issues, which are best addressed through the PRSC policy instrument and incorporate these into PRSC 4 and PRSC 5.

4. Proposed project development objectives

The project objective is to improve the competitiveness of the private sector in international and regional export markets. This will be achieved by: (a) improving the efficiency of trade related services to the private sector; (b) improving the investment climate, by reducing business registration time and simplifying the process of business registration; (c) reducing set up cost and time for enterprises by providing access to minimum infrastructure services; (d) improving supply chain efficiency for high value export crops; and (e) improving the capacity of the private sector in particular MSMEs to respond to changing market requirements.

5. Preliminary project description

Component 1: Improving the efficiency of trade related services
The project will support the Government to (i) streamline procedures, regulations and guidelines in customs administration, export licenses and certification; (ii) establish clear regulation and guidelines for public or private provision of standards and certification of export related products; and (iii) provide institutional and capacity building to public institutions involved in delivering services as in (i) and (ii).

Component 2: Establishing a competitive investment climate
This component will focus on (a) improving the overall business environment: the project will support the government in simplifying and modernizing commercial laws, rationalizing the registration of businesses, particularly in areas that involve MSMEs, and will provide institutional and capacity building for related institutions; (b) establishing a minimum infrastructure platform for rapid export growth: the project will support government to establish private sector led industrial zones to enable quick and easy access to industrial land, and to establish efficient air cargo services by upgrading the airport facilities as an air-cargo hub for Lake Victoria.

Component 3: Improving private sector capacity, in particular MSMEs
The project will support the private sector, in particular MSMEs, to develop their capacity to supply products according to export market requirements and thus to increase their output and increase employment. The project will a) using the matching-grant approach, provide vocational training and business development services; b) improve technology and market information transfer by establishing a business linkage programme; and c) improve financial services by supporting the transition of Micro Finance Institutions (MFIs) to formally registered MFIs (supply side) and encouraging repayment behavior by establishing a "Better Business Behavior registration and compliance program (demand side).
Component 4: Project implementation and coordination Private Sector Foundation Uganda (PSFU), an association comprising of membership organizations (Uganda Manufactures Association, Uganda Farmers Association, etc.) is mandated to lead the private sector dialogue with government and to be the private sector advocate. The project will strengthen the PSFU to (a) make it operationally sustainable; (b) lead private sector dialogue with Government; (c) lead the private sector consultation and (d) implement the private sector project on the behalf of Government and the private sector beneficiaries.

C. ENVIRONMENTAL ASSESSMENT OF PROJECT SITES

The study carried out by GIBBS (Eastern Africa) in its Environmental Impact Assessment of Namanve Industrial and Business Park of March 2002 clearly defines the environmental status, the relevant legislation, the profile of the project area and a prediction of measures that should be put in place.

1. Scope of Work

In developing the ESMF, the consultants carried out the following tasks:

(i) Review the biophysical characteristics of the environment in the areas to be covered by the project, and highlight the major constraints that need to be taken into account in the course of project implementation;

(ii) Assess the potential environmental and social impacts of construction activities in the areas and recommend mitigation measures as appropriate, including cost estimates;

(iii) Assess the potential environmental and social impacts of the provision of water points and sanitation facilities under the project, and make recommendations;

(iv) Assess the need for liquid and solid waste collection, disposal and management under the proposed project, and make recommendations accordingly;

(v) Review Ugandans environmental policies, legislation, regulatory and administrative frameworks in conjunction with the World Banks ten Safe guard policies. Where there are gaps between these policies, make recommendations as to how to close these gaps in the context of the proposed project as appropriate;

(vi) Review the Conventions and Protocols to which Uganda is a signatory;

(vii) Assess existing environmental assessment and management capacity, as well as the capacity to implement the proposed mitigation measures, and make recommendations as appropriate, including potential capacity building and training needs and their costs;
(viii) Prepare an Environmental and Social Management Framework (ESMF), which will allow the screening of the potential enterprises to be located in the park. The screening process will enable the responsible authorities to assess potential environmental and social impacts related to site selection, construction / rehabilitation of accommodations, as well as the provision of water points, solid and liquid waste facilities i.e. treatment plants. The ESMF will further outline a process for mitigation and management of the potential negative impacts as well as regular monitoring and evaluation of these impacts.

(ix) Prepare an Environmental Management Plan (EMP) with appropriate costing and clear institutional arrangements for its implementation. The EMP should outline: (i) potential environmental and social impacts resulting from project for implementation of the mitigation measures; (ii) monitoring indicators; (iii) institutional responsibilities for monitoring the implementation of the mitigation measures; (iv) cost estimates for these activities; and (v) time horizons for implementation of the EMP. This report is essentially based on the report carried out by GIBBS (Eastern Africa) for the Uganda Investment Authority (U.I.A).

<table>
<thead>
<tr>
<th>Table 1: Summary Table</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Potential Impacts</strong></td>
</tr>
</tbody>
</table>
| **General** | • Business Park Authority created  
• Environmental Officer appointed to monitor and report on industry performance  
• Environmental education and awareness training for work force  
• HIV/ AIDS education and awareness campaigns for work force |
| **Topography** | • Topography modification due to cut and fill activities  
• Increased costs in developing low gradient sites (for drainage and sewage treatment works)  
• Regulate the use of borrow sites to ensure that they are legally operated  
• Low lying swampy areas will not be classified for construction of buildings  
• Disposal of black cotton and other clays in environmentally responsible manner  
• Industries not built on slopes greater than 1:12.5  
• Minimize large-scale grading and excavation |
| **Geology and soils** | • Exposure and erosion of topsoil due to vegetation removal  
• Increased exploitation of sand and murrum for construction  
• Set aside an area to stockpile topsoil for future landscaping  
• All illegal mining / quarrying operations should be stopped. Rehabilitate the borrow pits after use |
| **Flora and fauna** | • Removal of vegetation to make way for construction may encroach on the wetland areas  
• The integrity of these areas safeguarded by NEMA  
• UIA, with assistance from Uganda Wildlife Authority, NEMA and other interested agencies, establish directive to |
conserve and manage rare and threatened species

- Business Park Environmental Officer monitors all operations
- Environmental Officer ensures appropriate action taken to conserve species and habitats
- Landscaping to include indigenous species with special emphasis on rare and threatened species as well as fruit producing trees and species having medical uses
- All landscaping include Phoenix reclinata and Rothmannia sp. – UIA to establish minimum number of indigenous trees and plant species to be planted and maintained on each plot, relative to size
- Site plans consider and protect mature indigenous trees
- Public spaces, parks, and sports fields planted with indigenous shade trees
- All proposed businesses submit Environmental Impact Assessment, Conservation and Pollution Prevention Plan

<table>
<thead>
<tr>
<th>Wetland</th>
<th>Pollution by unprocessed effluent / polluted runoff (solids, heavy metals, etc) may kill the wetland vegetation and destroy its effluent stripping capability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All effluent must be pre-treated by the industries before being channeled to the sewage treatment works and finally passed through the wetlands</td>
</tr>
<tr>
<td></td>
<td>Baseline water quality data collected and a wetlands monitoring program implemented</td>
</tr>
<tr>
<td></td>
<td>Business park and road sitting to surrounds actual wetland to provide increased protection</td>
</tr>
<tr>
<td></td>
<td>Business park operate according to standards</td>
</tr>
<tr>
<td></td>
<td>Follow Pollution Prevention Abatement Handbook</td>
</tr>
<tr>
<td></td>
<td>200 ha set aside for wetland conservation with possible regazetting to prevent further encroachment</td>
</tr>
<tr>
<td></td>
<td>Enforce protection of swamp area</td>
</tr>
<tr>
<td></td>
<td>Safeguard integrity of Namave wetlands, outside the Industrial Park, as well as the more extensive Kayobe Swamp fringing the Inner Murchison Bay</td>
</tr>
</tbody>
</table>

- Drainage of the swamp will be enhanced if a lined drainage system is passed through it into the Kayobe

- Creating a lined channel should be avoided to maximize the integrity and natural treatment processes of the wetland
<table>
<thead>
<tr>
<th><strong>Air pollution Emissions</strong></th>
<th><strong>Dust Pollution</strong></th>
<th><strong>Noise pollution</strong></th>
<th><strong>Toxins/ Hazardous Waste</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Increased levels of pollution due to an increase in motorized traffic and emissions from industrial processes</td>
<td>- Traffic emissions monitored and legally permitted levels should not be exceeded</td>
<td>- Movement of vehicles and operation of construction machinery should be confined to daytime</td>
<td>- All effluent treated</td>
</tr>
<tr>
<td>- Modification of microclimate</td>
<td>- Industries comply with air emission standards which are monitored and enforced</td>
<td>- Trucks and heavy vehicles use routes that do not pass directly in front of homes</td>
<td>- Regular testing</td>
</tr>
<tr>
<td>- Un-paved access roads that will be used daily by trucks and other construction vehicles will generate large amounts of dust</td>
<td>- NEMA encourage the use of cleaner production technologies for all industrial processes</td>
<td>- Noise levels not to exceed stipulated levels</td>
<td>- Follow guidelines and standards set forth in Pollution Abatement Handbook</td>
</tr>
<tr>
<td>- Some industrial processes may expose their employees to large amounts of dust and particulate matter</td>
<td>- Proper filtering of industry air emissions</td>
<td>- Avenues of trees along roads to help mitigate vehicular noise and dust</td>
<td>- Substantial penalties for defaulters</td>
</tr>
</tbody>
</table>

**Noise pollution**

- Increased traffic noise from construction and transportation vehicles and machinery

**Toxins/ Hazardous Waste**

- All effluent treated
- Regular testing
- Follow guidelines and standards set forth in Pollution Abatement Handbook
- Substantial penalties for defaulters
- Holding ponds for treated effluent
- Construct secondary containment
- Businesses located on impermeable soils
- Spill prevention equipment
- Contingency plans for individual businesses and for entire business park
- Spill response equipment
- Industries establish plan for pollution prevention prior to authorizing construction
- NEMA establish standards for treatment and handling of hazardous and toxic waste
- UIA and NEMA ensure viable options exist prior to allowing industries to generate hazardous or toxic waste
- Risk assessment and risk management using computer programmes such as
<table>
<thead>
<tr>
<th>Water pollution</th>
<th>World Bank Hazard Analysis programme or Process Hazards Assessments Screening Tools programme to model risk of individual sites and processes</th>
</tr>
</thead>
</table>
| • Industrial effluent may pollute springs, streams and rivers  
• Construction of pit-latrines may reach the high water table and contaminate the aquifer  
• Potential for pollution of groundwater from improper industrial practice  
• Pollution in Inner Murchison Bay and Lake Victoria | • All industries pre-treat effluent before it is sent to the treatment works  
• Industries adhere to Standards for Discharge of Effluent or Wastewater 1999 and Pollution Prevention Abatement Handbook  
• Follow recommendations outlined in National Environment Regulations 2000  
• Stringent monitoring and enforcement of waste treatment and effluent standards  
• Treated waste discharged into waste stabilization ponds and sewage treatment works  
• Latrine construction monitored by public health officials  
• A specific monitoring program implemented by the UIA in conjunction with NEMA and the DWD  
• Regular water quality sampling from River Namanve at outlet into Lake Victoria, Namanve Wetland, and Inner Murchison Bay  
• Regular testing at point of exit for each industry, at influent and effluent points of sewage treatment works  
• Install ground water monitoring wells  
• Water quality samples collected quarterly from all boreholes within a 2 km radius of Industrial Park which also forms baseline data  
• Restoration ecology in area of sewage treatment to upgrade the status of papyrus and other species  
• Water from industrial sites should be passed through oil-water separators to remove impurities before it reaches wetlands |
| **Solid Waste** | • Encourage reduction and recycling of waste  
• UIA formulate waste management plan for solid waste for Namanve  
• All industries submit waste management plan detailing all construction and operational waste management and disposal plans  
• Establish arrangements to utilize landfill at Mpererwe  
• Efforts made by Gov. of Uganda to address need for solid waste and Medical Waste disposal sites |
| **Construction** | • Appropriate storage, transport, and disposal of waste materials  
• Sanitary facilities for work force that does not seep into wetland  
• Proper vehicle maintenance  
• Prevent spillage and leakage of materials  
• Minimize soil erosion through use of berms or silt fences  
• Prepare and implement Site Environmental, Health and Safety Plan  
• Prepare Spill Contingency Plan according to international standards  
• Materials used from environmentally responsible sources ie: wood products certified by Forestry Stewardship Council, quarry materials from sites with approved rehabilitation plans |
| **Social** | • Human health problems.  
• Employment opportunities for unskilled workers during construction for the community living around the project area  
• Increase in HIV / AIDS and STDs cases in the project area  
• Unplanned influx of population and settlement |
| | • Appropriate filtration of smoke stacks  
• Improvement of income levels and living standards for the community  
• Provide training for community members for employment in business park  
• Provide focused training for women which also accounts for special needs ie: child care, etc.  
• The health status of the Namanve area should be monitored and steps taken to prevent occurrence of HIV / AIDS and STDs through education and awareness campaigns in communities and for work force  
• Provide piped water, or where appropriate – boreholes, to surrounding communities  
• Sensitize communities on issues associated with residing near to business park |
2. Environmental Legislation

Environmental legislation, standards and guidelines identified to be relevant for this study include:

- The National Environmental Statute, 1995;
- National Policy for the Conservation and Management of Wetland Resources, 1995;
- Standards for Discharge of Effluent or Wastewater, 1999;
- Draft Standards for Air Quality, 1997;
- Draft Standards for Noise and Vibration, 1997;
- Draft Standards for Soil Pollution, under preparation;

Where considered necessary, Ugandan legislation, standards or guidelines have been compared with other regulations, such as Dutch, or Kenyan regulations.

The National Environmental Statute, 1995

The National Environmental Statute of 1995 regulates environmental issues in Uganda. Schedule III of the statute provides a list of projects that require an environmental impact assessment to be undertaken prior to project implementation. Urban developments, including the establishment of industrial estates, are among the projects listed in the Schedule (page 80, Section 2).

The Statute defines an environmental impact assessment as 'a systematic examination conducted to determine whether or not a project will have any adverse impacts on the environment'. In addition, GIBB has outlined in its report, appropriate mitigation measures for negative impacts, enhancement measures for the identified positive impacts and proposed monitoring procedures for the project.

The National Environmental Management Authority (NEMA) established under the Statute is the principal agency responsible for the management of the environment and was created as a result of the National Environmental Action Plan (NEAP) of 1994.

One of the important functions of NEMA, in addition to reviewing policies and environmental impact statements, is to establish national environmental standards in consultation with various lead agencies. Standards and guidelines identified during the study to be relevant for this project are detailed in table 2 of this report.

The National Environmental Statute also places restrictions on the use of wetlands under Part VII, Environmental Management, (Section 37, page 37). The management of wetlands is given more emphasis in the National Policy for the Conservation and Management of Wetland Resources, 1995, as described in paragraph immediately below.
National Policy for the Conservation and Management of Wetland Resources, 1995
Uganda was the first African country to develop a national wetlands policy. The strategy most pertinent to this study, as outlined in this Policy, is transcribed below:

Any wetland serving as a source of water supply or receiving effluent as part of a designated service to any human settlement shall be declared a fully protected wetland from any encroachment, drainage or modification.

Explanation: Wetlands can preserve the purity of water by their filtration and buffering capacity. One of the important reasons for this policy arises from the extensive draining of wetlands for horticulture where these areas also serve as water purification centres. In addition such drainage has led to changes to the hydrological cycle i.e. increase in floods, reduction in low flows and increase in sediment runoff.

National Environment (Wetlands, River banks and Lake Shore Management) Regulations, 2000
Section 21 of the National Environment Regulations 2000 states that each Local Government shall after the recommendation of the appropriate local environmental committee make by-laws (a) identifying river banks and lake shores within their jurisdiction which are at risk from environmental degradation; (b) promoting soil conservation measures along river banks and lake shores including the following;

(i) Bunding;
(ii) Terracing;
(iii) Mulching;
(iv) Tree planting or agro forestry
(v) Grassing;
(vi) Soil engineering, compaction and placement of fills;
(vii) Zoning and planning;
(viii) Gabions;
(ix) Control of livestock grazing.

Section 29, Part (2), of the same Regulation states that rRivers not specified in the Sixth Schedule shall have a protected zone of thirty meters from the highest water mark of the river. Section 30, Part (1) states that all shores of lakes specified in the Seventh Schedule [Lake Victoria is in the 7th Schedule] to these Regulations shall have a protected zone of two hundred meters measured from the low watermark.

Standards for Discharge of Effluent or Wastewater, 1999
The Ugandan Standards for effluent discharges to land or to an aquatic environment set maximum permissible limits (MPL) for selected parameters. The standards are established for a broad range of organic and inorganic compounds and are summarized in Table 2 below.

General obligations to mitigate pollution and the duty to keep records of offences are also outlined in these Standards, These regulations are particularly pertinent to the proposed development and are quoted below.
**General obligation to mitigate pollution**

Section (4) Part (1) of the Standards for Discharge of Effluent or Wastewater, 1999, states:

Every industry or establishment shall install at its premises anti-pollution equipment for the treatment of effluent and chemical discharge emanating from the industry or establishment.

Section (4) Part (2) of the Standards for Discharge of Effluent or Wastewater states: Anti-pollution equipment installed, under such regulation (1) shall be based on the best practicable means, environmentally sound practice or other guidelines as the Executive Director may determine.

**Duty to keep records (from the Standards for Discharge of Effluent or Wastewater, 1999).**

Section (5) Part (1), (a) of the Effluent Discharge Standards states: Keep a record of the amount of waste generated by the activity and of the parameters of the discharges.

Section (5) Part (1), (b) states: Submit the record referred to in paragraph (a) to the Executive Director and to any other relevant lead agency, every three months from the commencement of the activity for which the permit was issued.

Section (5) Part (1), (c) states: Report to the Executive Director any abnormal discharges. The abnormal discharges are interpreted to be any discharge or emission that exceeds the maximum level listed in the standards articulated above.

**Liabilities for offences (from the Standards for Discharge of Effluent or Wastewater, 1999)**

Section (6) (1) states: A person who contravenes these Regulations (standards for discharge of effluent or wastewater) commits an offence and is liable, on conviction, to imprisonment for a term not exceeding eighteen months or to a fine not less than one hundred and eighty thousand shillings and not more than eighteen million shillings or both.

Section (6) (2) states: The Executive Director may, in addition to any penalty imposed under Sub-Regulation (1), give directions as to steps to be taken to mitigate the damage caused as a result of the contravention, and the person liable shall comply with the directions.

**Draft air quality standards and guidelines, 1997**

Uganda formulated draft air quality standards in 1997. These cover pollution control in the occupational and ambient environment. These standards were being finalized at the time the EIA was carried out.

The draft air quality standards identify the individual pollutants, applicable industrial sources and permissible limits, as outlined in Table 2 below.

**Table 2: Uganda National Standards for Emissions, 1997**

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Exposure time</th>
<th>Standard applicable to</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total suspended particles</td>
<td>24 hr</td>
<td>Industries (e.g. cement, lime), quarry, grain millers, coffee processors, pharmaceuticals and any other trade</td>
<td>300 ug m⁻³</td>
</tr>
<tr>
<td>Pollutant</td>
<td>Duration</td>
<td>Source</td>
<td>Standard</td>
</tr>
<tr>
<td>---------------------------</td>
<td>----------</td>
<td>------------------------------------------------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Sulphur dioxide</td>
<td>24 hr</td>
<td>Combustion processes, boilers or any process involving sulphur burning</td>
<td>0.15 ppm</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>8 hr</td>
<td>Combustion process boilers</td>
<td>9.0 ppm</td>
</tr>
<tr>
<td>Ozone</td>
<td>1 hr</td>
<td>Mineral water bottling</td>
<td>0.10 ppm</td>
</tr>
<tr>
<td>Nitrogen oxides (NO)</td>
<td>24 hr</td>
<td>Combustion process, boilers</td>
<td>0.05 ppm</td>
</tr>
<tr>
<td>Lead</td>
<td>1 month</td>
<td>Battery manufacture and repair, metal fabrication</td>
<td>1.0 ppm</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>8 hr</td>
<td>Breweries, soft drink industries</td>
<td>9.0 ppm</td>
</tr>
<tr>
<td>Sulphur trioxide</td>
<td>24 hr</td>
<td>Sulphur burning sulphuric acid manufacture</td>
<td>200 ug m⁻³</td>
</tr>
<tr>
<td>VOC's (Volatile organic carbons)</td>
<td>8 hr</td>
<td>Breweries, fuel depots and stations,</td>
<td>6 mg m⁻³</td>
</tr>
<tr>
<td>Silica</td>
<td>24 hr</td>
<td>Construction industry, detergent and manufacture, quarries</td>
<td>200 ug m⁻³</td>
</tr>
<tr>
<td>Soot</td>
<td>24 hr</td>
<td>Combustion, charcoal and brick making, boilers</td>
<td>500 ug m⁻³</td>
</tr>
<tr>
<td>Ammonia</td>
<td>24 hr</td>
<td>Refrigeration, chemical stores and labs, fish processing</td>
<td>200 ug m⁻³</td>
</tr>
<tr>
<td>Hydrogen sulphide</td>
<td>8 hr</td>
<td>Waste water treatment, tanneries</td>
<td>15 ug m⁻³</td>
</tr>
<tr>
<td>Acid mist</td>
<td>24 hr</td>
<td>Acid manufacture, battery manufacture and acid changing, chemical stores and labs</td>
<td>100 ug ml⁻¹</td>
</tr>
<tr>
<td>Asbestos</td>
<td>24 hr</td>
<td>Construction industry, garages/car repairs, asbestos manufacture</td>
<td>0.01 fibres ml⁻¹</td>
</tr>
<tr>
<td>Cement</td>
<td>24 hr</td>
<td>Cement industries, construction</td>
<td>200 pg m⁻³</td>
</tr>
<tr>
<td>Lime</td>
<td>24 hr</td>
<td>Tile and brick industries, ceramic industries, construction</td>
<td>200 pg m⁻³</td>
</tr>
<tr>
<td>Ceramics</td>
<td>24 hr</td>
<td>Tile and brick industries, ceramic industries, construction</td>
<td>200 pg m⁻³</td>
</tr>
<tr>
<td>Electrode manufacture emissions</td>
<td>24 hr</td>
<td>Electrode manufacture, garages/car repairs, welding, metal fabrication</td>
<td>150 pg m⁻³</td>
</tr>
<tr>
<td>Cotton fibers</td>
<td>24 hr</td>
<td>Cotton farming, ginning and export, textile manufacture</td>
<td>200 pg m⁻³</td>
</tr>
<tr>
<td>Coffee dust</td>
<td>24 hr</td>
<td>Coffee processing and trading</td>
<td>200 pg m⁻³</td>
</tr>
<tr>
<td>Synthetic fibres</td>
<td>24 hr</td>
<td>Synthetic textiles manufacture</td>
<td>0.01 fibres ml⁻¹</td>
</tr>
<tr>
<td>Tea dust</td>
<td>24 hr</td>
<td>Tea processing and trading</td>
<td>200 pg m⁻³</td>
</tr>
<tr>
<td>Tobacco dust</td>
<td>24 hr</td>
<td>Cigarette manufacture including tobacco curing and tobacco farming</td>
<td>200 pg m⁻³</td>
</tr>
<tr>
<td>Grain dust</td>
<td>24 hr</td>
<td>Grain milling, bakeries, feed mills, breweries, agriculture</td>
<td>200 pg m⁻³</td>
</tr>
<tr>
<td>Wood dust</td>
<td>24 hr</td>
<td>Saw mills, timber works and furniture making, construction</td>
<td>1 mg m⁻³</td>
</tr>
<tr>
<td>Phosphates</td>
<td>24 hr</td>
<td>Fertilizer manufacture, soap and detergents industry</td>
<td>200 pg m⁻³</td>
</tr>
<tr>
<td>Copper dust</td>
<td>1 month</td>
<td>Copper mining and processing, metal works and fabrication</td>
<td>1.0 pg m⁻³</td>
</tr>
<tr>
<td>Pesticides</td>
<td>24 hr</td>
<td>Pest control and plant protection</td>
<td>See Appendix E (Mean daily emissions standards for)</td>
</tr>
<tr>
<td></td>
<td>24 hr</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------</td>
<td>-------</td>
<td>--------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>Hydrocarbons</td>
<td></td>
<td>Chemical stores and labs, fuel depots and stations</td>
<td>5 mg m⁻³</td>
</tr>
<tr>
<td>Bagasse</td>
<td></td>
<td>Sugar processing plants</td>
<td>200 pg m⁻³</td>
</tr>
<tr>
<td>Smoke</td>
<td></td>
<td>Industry, trade or any combustion process</td>
<td>Ringlemann scale No. 2 or 40% observed at 6m or more</td>
</tr>
<tr>
<td>Chlorine</td>
<td></td>
<td>Water treatment, fish processing, chemical stores and labs</td>
<td>200 pg m⁻³</td>
</tr>
</tbody>
</table>

Whatever the regulations, the World Bank safeguard measures will prevail.

D. ENVIRONMENTAL PROFILE

1. Bio-physical setting

This chapter describes the bio-physical setting of the project site. As stated in Section 1, the site is divided into 5 estates namely Namanve North, South A, South B and South C1 and South C2. Century Bottling company (Coca-Cola) have developed a site on the Namanve North estate.

The following environmental components are addressed in this section:

- Topography;
- Geology/geo-morphology;
- Seismicity;
- Soils;
- Climate;
- Hydrology (surface water, groundwater, and flood levels);
- Flora, fauna and avifauna.

2. Topography

Namanve Central Forest Reserve (CFR) was an artificial forest created early this century. It was declared a forest reserve in 1968 for the growing of trees for firewood and not as an animal or vegetation sanctuary. In late 1996, the Government of Uganda de-gazetted 1,006 hectares of the Namanve CFR and re-zoned the area for industrial use. The land was then placed under the ownership of Uganda Investment Authority (UIA). The natural vegetation of the area was originally swamp and closed forest. This was altered by a tree plantation programme in 1928 (Eggeling, 1935). The Forestry Department cleared most of the indigenous forest and planted Eucalyptus trees.

The proposed project site stretches approximately three to four kilometers in width from west to east and about eight kilometers from north to south. Namanve is at a height of about 1,143 m.a.s.l. (UIA Planning Report, 1995).

The general slope is southwards within the Lake Victoria drainage basin. The land is mainly low-lying, surrounded by low relief, expressed by a difference of about 180 metres between hilltops.
and valleys. This forms a repeating pattern of hill, pediment-slope and swamp-filled valley (Pallister, 1959).

Namanve North and South A estates display the greatest variation in topography of the project site. The landscape in these two estates is typified by broad valleys, which are filled with fine sediments deposited by runoff water.

The wetland area flows in a southerly direction draining into Kayobe swamp, and opens out into Murchison Bay to the east of Port Bell.

(a) Namanve North:

Namanve North estate is situated north of the Kampala/Jinja road. This estate is bounded to the southeast by the Namanve Tree Seed Research Station and private land; and to the west partly by the Coca-Cola bottling plant and partly by private land. To the north and south the proposed site is bordered by private land. A murram road runs parallel to the Tree Seed Research Station and continues northwards through the estate, running along the boundary at the northern end.

The northern tip of the estate, tapers off into a narrow almost triangular shape and characterized by the steep slopes of the eastern part of Buto hill.

The River Namanve traverses the site in a north south direction. The land slopes towards the river from the west and north west and into a central valley which is crossed by the (Kampala/Jinja) road. The gradient varies from 1:10 to 1:70 (UNIDO/UNCTAD, 1999).

(b) South A:

South A estate is situated immediately south of the Kampala/Jinja road. The narrow gauge Mombassa-Kampala railway traverses the northern end. The eastern boundary borders the Kabaka's (traditional king) land. A substantial portion of this estate is relatively level with grades in the order of 1:90 (UIA Report, 1997).

On the eastern side of the South A estate the land slopes southwards towards the River Namanve at grades of between 1:25 and 1:75 (UNIDO/UNCTAD, 1999). In this low lying area, poor drainage was evident, particularly in the sections where the Namanve river traverses the Kampala / Jinja road via a culvert, opening out into South B estate.

An area of relatively high ground opposite the entrance to the Coca-Cola site slopes eastwards in the direction of the Kabaka's land and southwest in the direction of River Namanve.

(a) South B:

South B estate is situated immediately south of the old Kampala/Jinja road and south west of South A estate. This estate is bounded to the east by the western slopes of Kolo hill and to the west by the eastern slopes of Kirinya and Bukasa hills and to the south by the Kayobe swamp.
River Namanve runs nearly through the center of the estate and is flanked by low-lying land on either side. Much of this area lies below the estimated 100-year flood level for Lake Victoria, which has been calculated to be 1136.30 a.s.i. (UNIDO/UNCTAD, 1999).

(b) South C (C1 and C2):

South C estate is divided into two areas, namely; C1 (324 ha) and C2 (47 ha), as indicated in Figure 1.

South C1 and C2, which form South C estate are situated south east of South A estate and south east of South B estate. It is located south of the railway line and the access road to the village of Namiryango. The western side of this estate is bounded by the slopes of Kolo hill and the Kayobe Swamp, to the south by the Senyi Forest Plantation and to the east by high ground at Namiryango (UNIDO/UNCTAD, 1999).

A rectangular shaped section of the estate protrudes to the east and has a corridor of low lying land running down its centre in an east - south direction, bordered by the south eastern slopes of Nantabulirwa hill and the western slopes of Namiryango hill.

3. Geology / Geomorphology

The proposed project site is part of the narrow, down-warped northern catchment of Lake Victoria. It is underlain by granitoid schistose rocks of the Basement Complex (Pallister, 1959). These are deeply weathered and generally not exposed at the surface. The hills rise only about 110m above Lake level, and are rounded and capped with laterite soil. The highest point, Nantabulirwa hill, rises to over 1,350m above sea level while Buto hill, the proposed location of the water supply to Namanve North estate, is over 1,316.6m above sea level (Pallister, 1959).

The hills rise abruptly from a series of aggradations slopes, apparently the result of old Lake terraces, from which clay for brick making and sand are currently being extracted. The lithology is poorly exposed and overlain by thick deposits of clay and clayey gravel. It can be inferred that the underlying rocks comprise undifferentiated granitoid gneiss with some later granite including the migmatised Buganda Series. These all belong to the Basement Complex of the Precambrian era. A small section of the project site (part of South C2) is overlain by inter-fingered deposits belonging to the Cainozoic era. These include Holocene swamp, alluvium and lacustrine deposits (Geological survey of Uganda - Kampala, Sheet N. A. 36 - 14. Scale 1: 250,000, 1962).

Table 3 below presents data from the Waterpoint and Groundwater Database (Directorate of Water Development - DWD, 1999). The table provides the average depth to the bedrock taken from nine (9) boreholes within a 2 km radius of the site.

<table>
<thead>
<tr>
<th>Borehole No.</th>
<th>Location (District)</th>
<th>Metres below ground level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Wakiso</td>
<td>42.0</td>
</tr>
<tr>
<td>2</td>
<td>Wakiso</td>
<td>32.0</td>
</tr>
</tbody>
</table>
(a) Seismicity

Figure 3 shows no major fault lines within the project site. However Kampala and its environs are subject to seismic activity and the area is classified as Zone V as defined in the modified Mercalli Scale (UNIDO/UNCTAD, 1999). The Modified Mercalli Intensity Scale is commonly used in the United States by seismologists seeking information on the severity of earthquake effects. Intensity ratings are expressed as Roman numerals between I at the low end and XII at the high end. A Zone V earthquake would exhibit the following: Almost everyone feels movement. Sleeping people are awakened. Doors swing open or close. Dishes are broken. Pictures on the wall move. Small objects move or are turned over. Trees might shake. Liquids might spill out of open containers.

3.4 Soils

Soils in the Namanve area fall within the Buganda Quartenary complex. There are various soil types that fall within this category (Pallister, 1959), ranging from shallow, murram-based lithosols on the ridges, through deep, reddish and free-draining hillside latosols with termitaria, through heavy, brown to grey and black clay loams and finally to sticky valley clays (Banage, 1999).

With reference to Figure 4, two main types of soil occur in the project area. The first belongs to the Buganda Series and comprises red loams or clay-loams and has a high productivity rating. Further south, the soils belong to the Kabira and Katera Series, which comprise yellow red loams, and strong brown loamy sands, which have an agricultural productivity rating that, varies from medium to low nil (Kampala Soils Map, 1:250,000, 1961).

More specifically, two types of clay material have been identified in the Namanve area:
1) Alluvial or transported clays - these are grey plastic clays which appear to be typical swamp clay deposits.
2) Sedentary type clays - these are mottled, grey-yellowish, brown sandy clays formed in-situ by the weathering of the Precambrian granitoid-gneiss and granites. These normally underlie the alluvial clays and are common towards the middle reaches of the gentle slopes of the broad valleys (J.H. Musisi, 1986).

Coarse, medium and fine-grained sands and gravels can be observed in the upper reaches of the broad topographical low (closer to the swamps). At the time of the study the sands and gravel
were being exploited for building and construction activities. The deposits of sands (course, medium and fine-grained) and gravel already mentioned have been legally and illegally exploited in the past. In Namanve South B, C1 and C2 estates, illegal sand extraction has been going on since the 1970s. Spurred by the current building boom in Kampala, this activity has extended all over the reserve. It is particularly prevalent in Namanve North and South C1.

A small portion of the project site in the south eastern corner of South C2 estate is covered by lateritic soils which are about 1 to 2 metres thick and overlie quartzitic gneiss. The remaining area along the eastern boundary between the lateritic soils in the south and the red sands to the north is covered by 40 cm of thick black sandy loams with over 35 cm of conglomerate which in turn overlie gravely white sands (ERS Report, 1997).

With the exposure of the soils after excavation, drying out takes place and this results in oxidation, possibly leading to increased acidity of the soils (Lind, 1956).

4. Climate

(a) Rainfall

The climate in the project area is tropical, relieved by elevation and proximity to Lake Victoria. The area, which borders the Lake, experiences a mean annual rainfall of 1600 - 2000 mm (Mukono District Plan, 1996). There are two wet seasons:

- Long rains - generally begin in March and may extend into July;
- Short rains - normally between September and November

(b) Temperature

January and February are generally the hottest months, May, June and July are the coolest (Eggeling, 1936). Mukono district, in which a greater portion of the project site falls, experiences a mean annual maximum temperature of 25 to 27.5° C, and a mean annual minimum temperature of 15 -17.5° C (Mukono District Plan, 1996).

(c) Wind

The prevailing wind is southeasterly. Diurnal wind variation is experienced due to the proximity of Lake Victoria. A northeasterly wind is often experienced during the night (Brick Making in Mukono District, 1996).

5. Hydrology (Surface water, groundwater, and flood levels)

(a) Surface water

The Namanve Catchment is one of eight drainage areas emptying into Inner Murchison Bay. It is the largest in area (86.7 km2) and has the largest areas of both dry land (65.1 km2) and swamp or wetland (21.6 km2). The catchment has the shape of an inverted equilateral triangle with its apex at Lake Victoria, and the sides bordered by the ridges of the hills of Bukasa, Kirinya, Mukireku
and Kazinga to the west, Buto, Kiwanga, Namanve and Nantabulirwa to the north and north-east and Namilyango, Degeya, Senyi and the Zinga Island to the east (Banage, 1999).

The topography and original drainage were described by Eggeling (1935). Rivers Namanve from the west, Bumbubumbu and Nabubaza from the north and two other easterly streams (Nakigyebe and another - name unknown) originally emptied into the Namanve Swamp. The system was canalised to the Lake to drain the swamp by the Namanve/Bumbubumbu Channel: (2 m wide, 1-2 m deep) between 1929 and 1932 (Eggeling, 1935). Maintenance of the channel was abandoned in 1957 leading to the re-flooding of the surrounding areas and the lower; wetlands (Hughes, 1961). The River Namanve flows through a road culvert on Kampala/Jinja, which was observed to block during periods of heavy rainfall.

As the River Namanve flows into Namanve South A estate, its course straightens out on reaching the thickly vegetated area. It then crosses beneath the Mombasa / Kampala railway and the old Jinja road via a culvert and broadens out into the wetland area. This area is characterized by typical wetland vegetation including papyrus and is the area of slowest movement, indicating a relatively low gradient. The Namanve river follows a course of approximately 5 km through the proposed site area into Kayobe swamp and finally into the open waters of Murchison Bay.

There are few minor tributaries feeding river Namanve and discussions with the District Water Officer of Mukono District revealed that much of the water is derived from small springs. Two streams originate from the two springs that occur at the boundary of the Coca Cola bottling plant and join at the lower end of the plant to form the major drainage outlet (Namanve River) on the site (Coca-Cola Report, 1997).

(b) Groundwater

During the field study, nine boreholes located within a 2 km radius of the proposed project site were identified. Most of the boreholes are located due north of Namanve North estate. The location data were obtained using a Global Positioning System (GPS). Borehole yield data for all the boreholes were not available at the time of the field study. Table 4 lists the locations of boreholes.

---

### Table 4: Borehole location survey in the Namanve area:

<table>
<thead>
<tr>
<th>BH No.</th>
<th>EASTINGS</th>
<th>NOTHTINGS</th>
<th>COUNTY</th>
<th>SUB-COUNTY</th>
<th>DISTRICT</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0464404</td>
<td>0039850</td>
<td>Kyadondo</td>
<td>Kira</td>
<td>Wakiso</td>
<td>National Tree Seed Centre, functioning.</td>
</tr>
<tr>
<td>2</td>
<td>0463676</td>
<td>0039909</td>
<td>Kyadondo</td>
<td>Kira</td>
<td>Wakiso</td>
<td>Mr. Akabwai, functioning.</td>
</tr>
<tr>
<td>3</td>
<td>0463332</td>
<td>0039907</td>
<td>Kyadondo</td>
<td>Kira</td>
<td>Wakiso</td>
<td>Bweyogerere Primary School Junction, at the side of the school, functioning.</td>
</tr>
<tr>
<td>4</td>
<td>0463460</td>
<td>0040416</td>
<td>Kyadondo</td>
<td>Kira</td>
<td>Wakiso</td>
<td>Bweyogerere Health Centre. Currently not functional but the water was not drinkable originally. No. WDD 3678.</td>
</tr>
<tr>
<td>6</td>
<td>0465336</td>
<td>0040394</td>
<td>Mukono</td>
<td>Goma</td>
<td>Mukono</td>
<td>Coca-Cola borehole 2. Not functioning - high iron</td>
</tr>
</tbody>
</table>

27
9 0465363 0040129 Mukono Goma Mukono Coca-Cola borehole 1. Functioning

Source: GIBB data collection
BH No. - Borehole Number (these numbers correspond with those in Figure 2).

Water analysis certificates for the boreholes adjacent to the Coca-Cola Century Bottling Company premises were obtained from the company and are included in Appendix G (BH No. 6 and BH No. 9).

Water samples were collected for physico-chemical analysis from four boreholes; BH No. 1, BH No. 2, BH No. 3 and BH No. 8. The physico-chemical parameters in the samples were analyzed by the Directorate of Water Development (DWD).

Table 5: Summary table of physico-chemical analysis results for Boreholes No. 1, 2, 3 and 8.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Samples</th>
<th>National Guideline Values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BH No.1</td>
<td>BH No.2</td>
</tr>
<tr>
<td>PH (Units)</td>
<td>6.4</td>
<td>6.0</td>
</tr>
<tr>
<td>EC (uS/cm)</td>
<td>133</td>
<td>122</td>
</tr>
<tr>
<td>TDS (mg/l)</td>
<td>93</td>
<td>85</td>
</tr>
<tr>
<td>Turbidity (NTU)</td>
<td>4.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Total Alkalinity</td>
<td>65</td>
<td>51</td>
</tr>
<tr>
<td>(mg/l)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bicarbonate</td>
<td>80</td>
<td>62</td>
</tr>
<tr>
<td>Total hardness (mg/l)</td>
<td>47</td>
<td>39</td>
</tr>
<tr>
<td>Calcium (mg/l)</td>
<td>7.2</td>
<td>12</td>
</tr>
<tr>
<td>Magnesium (mg/l)</td>
<td>7.0</td>
<td>2.1</td>
</tr>
<tr>
<td>Sodium (mg/l)</td>
<td>14.6</td>
<td>12.0</td>
</tr>
<tr>
<td>Potassium (mg/l)</td>
<td>3.8</td>
<td>3.8</td>
</tr>
<tr>
<td>Total Iron (mg/l)</td>
<td>0.23</td>
<td>0.89</td>
</tr>
<tr>
<td>Chloride (mg/l)</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Sulphate (mg/l)</td>
<td>11</td>
<td>3</td>
</tr>
<tr>
<td>Nitrates (mg/l)</td>
<td>0.14</td>
<td>0.42</td>
</tr>
<tr>
<td>Nitrites (mg/l)</td>
<td>0.006</td>
<td>0.012</td>
</tr>
<tr>
<td>Phosphates (mg/l)</td>
<td>0.11</td>
<td>0.18</td>
</tr>
<tr>
<td>BOD (mg/l)</td>
<td>ND</td>
<td>1.4</td>
</tr>
</tbody>
</table>

Source: DWD Technical report on water quality analysis for GIBB WHO guideline
ND - not done

Comments on the physico-chemical analyses:

The results obtained were analyzed to obtain an estimate of the accuracy of the laboratory data. The checks were carried out using the WATEVAL water quality evaluation program written by A.W. Hounslow and Kelly D. Goff.

Table 6: Analysis reliability checks

<table>
<thead>
<tr>
<th>Reliability Check</th>
<th>Attention value</th>
<th>BH No. 1</th>
<th>BH No. 2</th>
<th>BH No. 3</th>
<th>BH No. 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ion balance</td>
<td>Sum cation - sum anions *100 (%)</td>
<td>&gt;5%</td>
<td>-0.23%</td>
<td>7.14%</td>
<td>3.15%</td>
</tr>
<tr>
<td></td>
<td>Sum cations + sum anions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TDS</td>
<td>Difference between TDS reported and TDS calculated (%)</td>
<td>&gt;5%</td>
<td>-38.7%</td>
<td>-19.1%</td>
<td>-92.6%</td>
</tr>
<tr>
<td>Hardness</td>
<td>Difference between reported hardness and calculated hardness (%)</td>
<td>&gt;5%</td>
<td>0.4%</td>
<td>1.0%</td>
<td>0.9%</td>
</tr>
<tr>
<td>TDS/Cond</td>
<td>TDS/Conductivity</td>
<td>&gt;0.55</td>
<td>&lt;0.75</td>
<td>0.97</td>
<td>0.83</td>
</tr>
</tbody>
</table>

The following can be inferred from table 6:

- The solutions tested should be electrically neutral. The sum of cations should equal the sum of anions. The percentage difference in the ion balance should be less than 5% as indicated in Table 6. BH No. 2 and 8 had percentage difference values significantly higher than 5%.
- Calculated hardness should equal reported hardness. A discrepancy may indicate incorrect copying of reported data. This check assumes that hardness was calculated by the lab and not determined chemically.

If should be noted that some margin of error is to be expected in any analysis. The analysis reliability checks summarized in Table 6 indicated that the results from all four boreholes contained a significant margin of error and should therefore be treated with caution. On the whole however, the following can be concluded:

Physical quality: The water from BH No. 1 and BH No. 2 was clear in appearance and had low lornis of turbidity of 4.00 and 2.00 NTU (ref. Table 4) well below the guideline values of 10 NTU and 300NTU for turbidity for drinking water and effluents respectively. BH No. 3 and bi-i No. 8 water were colored in appearance and had elevated turbidity of 17.00 and 11.00 NTU respectively which is above the turbidity guideline value of 10 NTU for drinking water.

Chemical quality: Generally the samples show acceptable chemical characteristics for most of the parameters analyzed, well within the guideline values for both drinking water and effluent standards as indicated. However, BH No. 8 water shows unacceptable physico-chemical characteristics. Minor treatment for the removal of iron and reduction of turbidity is necessary.
for water from this source to comply with the Drinking Water Guidelines and serve as a water supply source.

(c) Flood levels

A site visit carried out after a heavy downpour revealed flooded and water logged areas. Flooding was particularly pronounced in the South A, B and C2 estates.

The maximum historical flood in the Lake Victoria Basin (as measured by DWD level gauge No. 81201 at Jinja) is 1136.3 m.a.s.l. This level was measured in 1964, which is known to have been an exceptionally wet year. Incremental lake levels for various flood return periods are shown in Table 7.

Table 7: Incremental flood levels for various return periods

<table>
<thead>
<tr>
<th>Return periods</th>
<th>Lake level (metres above sea level)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 years</td>
<td>1135.0</td>
</tr>
<tr>
<td>5 years</td>
<td>1135.5</td>
</tr>
<tr>
<td>10 years</td>
<td>1135.8</td>
</tr>
<tr>
<td>25 years</td>
<td>1136.0</td>
</tr>
<tr>
<td>50 years</td>
<td>1136.1</td>
</tr>
<tr>
<td>100 years</td>
<td>1136.2</td>
</tr>
<tr>
<td>Maximum Historical Flood (200 years)</td>
<td>1136.3</td>
</tr>
</tbody>
</table>


6. Flora and fauna

(a) Flora

The natural vegetation of the area was originally swamp and closed forest. This was altered by a tree plantation programme in 1928 (Eggeling, 1935). The Forestry Department cleared most of the indigenous forest and planted Eucalyptus trees (*Eucalyptus robusta* and *Eucalyptus saligna*). These were used for the production of poles, firewood and charcoal (Hughes,1961).

As early as 1934, it was stated that; "The advance of cultivation into areas of natural vegetation has changed the soil composition and structure. There is a delicate balance between plant communities and drainage and the zoning of flora from swamp to dry land" (study by Eggeling, 1934 in Pallister, 1959). Such land when left fallow displays new plant associations.

Historical Flora

The Namanve Central Forest Reserve boasts the first Working Plan of any forest reserve in Uganda (FD/MP, 124/29, see: Hughes, 1961) made in 1929. Similarly, Namanve Swamp was the first wetland to have its ecology documented. Eggeling (1934, 1935) took advantage of the drainage channel traverse cut to investigate the flora and fauna of the swamp. He recognized and described seven plant communities of the virgin swamps as follows:
• Nymphaea (Water Lily) Zone.
• Fringing Papyrus Community.
• Fern and Sedge Community.
• Limnophyton Community.
• Papyrus Swamp.
• Miscanthidium Swamp.
• Phoenix Swamp.

Egeling (1935) mentioned tropical rain forest and mapped the forests of Bukasa, Senyi, Kolo and Namanve but did not categories them. Judging by the present remnants of recorded forest species, these forests would have been similar to others surrounding the northern and western Lake Victoria shores. Changes in these communities have taken place from both ends of the succession. Drainage, human disturbance and afforestation have altered the landward side as had already been noted by Eggeling (1934, 1935). The lakeside flora communities have also experienced changes, particularly due to siltation, water level fluctuations, eutrophication and recently, invasion of the Lake by the water hyacinth (Eichhornia crassipes).

Little, if any, vegetation in the Namanve swamp has not been influenced by man and even the indigenous forests are considered secondary growth. The complex degenerate association of vegetation outside the swamp has largely been induced by cultivation, grazing and fire (Sangster, 1950 in Pallister 1959).

The results of the floral survey conducted as part of this study are described below

(a) Namanve North

Eucalyptus grandis was the major crop in two plots surveyed and the canopy was more or less closed. In the third quadrant E. robusta and E. deglupta were the major trees, but the canopy was more open and the ground waterlogged. The area lies west of the Coca-Cola Century Bottling Company site, across River Namanve. There was considerable diversity, with over 100 plant species found.

The northern part of the area had grassy areas as well as swamps with C. papyrus, Typha australis, Phragmites australis and various sedges. A rare species of Rothmannia sp. (Rubiaceae) was recorded. There was widespread evidence of the area having been disturbed by cultivation, sand and gravel mining, as well as brick making.

(b) South A

The major crop in the estate was E. grandis. This had been harvested and replaced by a tangle of Lantana camara. Further south there was an almost impenetrable wet forest of Phoenix reclinata and other moisture-loving plants. Partly due to the thick canopy of Phoenix and Lantana, there were relatively few other species. The total number of species found was 29.
The rare *Rothmannia sp.* was again recorded here, as was the threatened *Melicia excelsa*. There were stumps of robusta and a few live trees recorded in the Phoenix swamp, apparently affected by the flooding and swamp forest re-growth. Much cultivation and sand mining was observed.

(c) **South B**

There were healthy plantations of *E. grandis* planted by private leasees on the raised ground in the vicinity and to the west an Arboretum was observed. The rest of the area surveyed was a flood plain, which had been heavily inundated by the 1960 floods. Dead trees of the *E. robusta* species were found scattered in the swamp.

The dominant plant species observed was *C. papyrus* and other sedges of the herb and sedge community. Only a few woody and climber species were recorded amongst seventeen species from the survey quadrants. Cattle grazing, cultivation and sand mining were recorded.

(d) **SouthC(C1andC2)**

Much of this area is under cultivation and subject to sand-mining activities. On the raised ground near Kolo, Senyi and Degeya there are private lease woodlots. The rest of the area to the south has papyrus, grass and sedge swamp. The historical swamp-fringing forest has disappeared, but Phoenix fringes still remain. The number of plant species recorded in the area was 26, including those from opportunistic observations.

(e) **The Namanve and Kayobe Swamp System**

South of Namanve South B and west of South C1, there are extensive wetlands. These are an extension of the wetland ecosystem which falls within the degazetted areas, that are proposed to become public open spaces. It is convenient to refer to these as the "Namanve wetlands". Further south, they merge into the large Kayobe Swamp fringing Inner Murchison Bay. Although these wetlands are extra-limital to the proposed Park, they were given a cursory survey because they are proposed to be the receiving environment for future Namanve effluent.

It is worth noting that the conversion of the swamp and indigenous forest into eucalyptus plantations did not completely eliminate the plant biodiversity. Small ecological niches remained and gave rise to continuity of certain species. Some, especially climbers, adapted themselves to plantation forest conditions. In other cases, as mentioned by Eggeling (1934, 1935), new niches were created for additional species. This contrasts with the anticipated conditions of total forest clearance, which will leave no refugia for the species.

The ecological survey indicated that:
- The fringing natural forest has disappeared;
- There has been an over-cutting of *Phoenix reclinata*. However, in places, it is making good regrowth;
- The papyrus community is in good condition and has had little human interference;
- There is greater expanse of *Miscanthidium* than reported by Eggeling (1935) in the mid of the swamp, which appears to be silting up;
• The observation from the Lake found no remains of the water lily community except a few water cabbages (*Pistia stratiotes*) mixed in with the water hyacinth (*Eichhornia c/"ass/toes*). Except on a few grassy beaches (mostly with *Vosia cusp/data*, sedges and ferns), *C.J papyrus* extended to the Lake open water.

**Table 8 Number of plant species found in the proposed Namanve estates**

<table>
<thead>
<tr>
<th>Estate</th>
<th>No. Of Plant Species</th>
<th>No of Quadrants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Namanve North</td>
<td>143</td>
<td>3</td>
</tr>
<tr>
<td>Namanve South A</td>
<td>29</td>
<td>2</td>
</tr>
<tr>
<td>Namanve South B</td>
<td>17</td>
<td>2</td>
</tr>
<tr>
<td>Namanve South C1 and C2</td>
<td>26</td>
<td>2</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>215</strong></td>
<td><strong>9</strong></td>
</tr>
</tbody>
</table>


**Plant species of conservation interest**

Fifteen plant species identified on site are of special interest because they are rare, threatened, or have environmental and economic value. Over and above these, various species found in the wetlands have medicinal, utilitarian or food value (Anon 1996; Omagor, 1996). Others serve in ecological roles in effluent stripping. In Namanve, a number of orchids endemic to swamps are known, whose habitat conditions will be reduced by the construction activities for the proposed Industrial Park. *Cynorchis anacamptoides, Nervitia afze/ii, Habenaria sp, Disa eminii, Satyrium crassicaule, S. ni/oticum,* were found to grow only in modified swamp, while *Eulophia porphrysog/ossa, E. paludicola, E. wilsoni, E.ango/ensis* and *E. a/ata* grow in modified papyrus swamps (Eggeling, 1935).

**Fauna**

Draining of the swamp and repeated slashing of the vegetation necessary for the protection of the young trees in the Eucalyptus woodlots has already caused a number of changes in the status of the fauna living in Namanve.

**Mammals**

A total of 49 rodents and 4 shrews were recorded, representing twelve species. Apart from G. dolichurus caught at the base of a palm tree that is known to be a climber, other species caught in small numbers were just coincidental, they are not specific to the area. The few specimens and species caught from South C1 and C2 were attributed to the fact that traps were laid during the day and were left for one night only. In addition, the abundant food sources in the gardens including cassava, sweet potatoes, etc probably lowered the effect of the bait.

All the species caught are characteristic of savannah habitats, present in woodlands and grasslands in many parts of Uganda (Delany, 1975, Kityo and Dickson, 1996. Information provided by the local farmers and the forest guard, include sightings of wild pigs, bushback, mongoose, cane rats and civets(after Coca Cola report, 1997). Twelve other species of mammals
are also known to have been sighted in the project area as listed and titled "Other mammals opportunistically seen in the region.

Avifauna

Birds have often been suggested as an appropriate group to serve as bio-indicators of environmental conditions (Diamond and Filion, 1987; Furness et al, 1993). They fulfill most of the criteria listed by Pearson (1995) for a good indicator group for monitoring: they are taxonomically well-known and stable, populations are readily surveyed and manipulated, higher taxa occupy a breadth of habitat and a broad geographical range; and populations (for many species at least) are specialized within a narrow habitat.

E. SOCIO-ECONOMIC SURVEY

The following aspects were appraised during the socio-economic survey;
- Population;
- Levels of education;
- Land tenure systems in Uganda;
- Land tenure/land use in Namanve;
- Economic activities;
- Employment;
- Public health;
- Accessibility to public utilities;
- Waste disposal and land pollution;
- Air/ noise pollution;
- Natural resource use / market for natural resources,
- Sites of scenic, architectural, archaeological and religious significance.

1. The socio-economic environment

(a) Population
The community in the area surrounding Namanve is of mixed ethnic backgrounds. This is because the area lies very close to Kampala city. About half of the residents have lived in the area for many decades, and the other half is composed of residents who purchased plots of land and have settled in the area in recent decades. According to the survey carried out, the communities include Baganda (majority), Basoga, Basamya, Banyarwanda, Bakiga, Banyankole, Bagisu and Ateso.

According to the Local Council (L.C.) officials in the area, there are eight L.C.I villages in Mukono district and three L.C.I villages in Wakiso District that share borders with the proposed park. Nantabulirwa, one of the villages in Mukono District, is estimated to have a population of approximately 1,000 people, and it is estimated to have the largest population of all the villages bordering the proposed park. According to the L.C. officials, the rest of the villages are estimated to have an average population ranging from 700 to 900 people each. Thus the estimated total population living around the proposed park ranges between 5,000 and 8,000 people.
(b) Levels of education
The majority of the residents are semi-literate. The sample survey indicated that a few people in surrounding areas could speak English as a second language, and some of them are either retrenched or retired office workers. It was not possible to carry out a thorough survey on the levels of education due to the project time constraint. The comments made here are based on focus group discussions held in Namanve North and Namanve South A.

(c) Land tenure systems in Uganda
There are different types of land tenure systems in Uganda namely:
- Mailo;
- Customary;
- Freehold;
- Leasehold.

Private ownership of land is under leasehold, freehold, and mailo land tenure systems.

Mailo Land Tenure
The Mailo land tenure system under the Uganda Agreement of 1900, resulted in a total of 9,003 square miles of land in Buganda being shared out among the Protectorate Government, the Kabaka (traditional king), chiefs and notables. Mailo land title is issued in perpetuity.

Customary land tenure
Customary land tenure is the oldest from of tenure and can supersede all other forms of land tenure, depending on the particular situation and above all, the length of residency of the occupant.

Freehold land tenure
Freehold land tenure is limited to a number of churches and schools, which had established a presence by 1900. Under freehold tenure, the title runs in perpetuity. Normally, no conditions are attached to how much land can be granted to such institutions.

Leasehold Land Tenure
Public land in Kampala is allocated to the City by the Uganda Land Commission (ULC). The Kampala City Council (KCC) is in turn responsible for leasing land to suitable applicants for development on a leasehold basis. Formal land transfers are regulated and governed by the Urban Authorities Act (1965) and Land Reform Decree (1975). Mailo landowners may also grant leases to various types of developers. Public and private leases typically run for either 49 or 99 years.

In 1996, approximately 1,006 ha of Namanve Central Forest Reserve became the proposed site for an industrial area to be managed by the Uganda Investment Authority (UIA) (UIA Planning Report, 1993).

(d) Land tenure/ land use in Namanve
Namanve Central Forest Reserve (CFR) was an artificial forest created early this century. It was declared a forest reserve in 1968 for the growing of trees for firewood and not as an animal or vegetation sanctuary. In late 1996, the Government of Uganda de-gazetted 1,006 hectares of the
Namanve CFR and re-zoned the area for industrial use. The land was then placed under the ownership of Uganda Investment Authority (UIA). The natural vegetation of the area was originally swamp and closed forest. This was altered by a tree plantation programme in 1928 (Eggeling, 1935). The Forestry Department cleared most of the indigenous forest and planted Eucalyptus trees.

The plan to convert the area to forest plantation was necessitated by:
- The need for fuel for industrial and domestic use;
- The need for fuel for the railway engines of the Kenya and Uganda Railways;
- The demand for poles for electrical transmission and building;
- The public health purpose of controlling malaria by draining swamps;
- Silvicultural research for which an Arboretum was established.

The predominant land tenure systems around Namanve are Mailo land and leasehold. Part of the area bordering the proposed park in Mukono District is Mailo land belonging to the Kabaka (traditional king) of Buganda. Other neighboring areas were also identified as Mailo land belonging to other landlords in the area. The majority of the residents in Nantabulirwa village bordering Namanve South A are squatting on Mailo land. It is worth noting that no people were found living on the land proposed for the industrial park.

Presently, the proposed site supports small-scattered subsistence farms growing mainly cassava, sweet potatoes, sugarcane, yams, cabbage, beans etc. Cattle are also grazed in the area. As part of the compensation agreement residents were granted the right to continue farming in the area until such a time that the site would be needed for development. By allowing continued use by residents additional encroachment into the area was prevented.

Some sections of the proposed site area are used for sand mining and brick making activities. When the area was still a forest reserve, mining activities were discouraged by the Forestry Department (Interim Report on the Evaluation of Namanve North Clay Deposit, May 1990). There seems to be no enforcement of this as sand and clay mining is prevalent in the area.

The Namanve area, being a former forest reserve, is not inhabited. The surrounding areas however, are observed to be densely populated with low-income housing. Some cash crops such as coffee were observed in small stands. Privately owned wood lots comprise mainly of eucalyptus tree species (predominantly in the Namanve North estate). Traces of tropical high forest are evident particularly in South C estate but have been largely degraded or encroached.

(e) Economic Activities
According to the survey, the main economic activities include brick making, sand mining, small-scale peasant agriculture and petty trade. It was observed that sand mining, brick-making, cultivation and cattle grazing were being carried out both within the proposed park site, as well as outside, on private land nearby.

Interviews with the people living in Namanve revealed that peasants were allowed to grow crops such as sweet potatoes and maize on the former forest reserve land after which the Forestry
Department planted eucalyptus trees. Others have continued cultivating on the former reserve land due to shortage of private land for cultivation elsewhere.

It was indicated that most people are engaged in more than one activity. There are no people who solely depend on cultivation because the plots of land are too small to generate sufficient income for survival. Supplementary activities such as petty trade, sand extraction, brick making and sale of manual labour are all carried out as a means of livelihood.

(f) Employment
No detailed survey on employment levels has been carried out in the area. However, it was indicated during discussions that most able-bodied people are unemployed. This was reiterated by a number of middle-aged men who revealed that they had been retrenched and had nothing to do. A number of young men were also observed loitering along the road and at the trading centre in Nantabulirwa. The need for employment was strongly voiced in both Kazinga and Nantabulirwa villages.

(g) Public Health
The sample survey did not address the detailed issues on public health in communities living around the proposed park. Observations and discussions, however, revealed that there is no major problem regarding accessibility to health services since the area lies close to the city (approximately 11 km) where medical services are easily available. It was also noted that currently there is affordable transport to the city for all the people residing within the area around Namanve. It costs Uganda Shs 1,000 (one way) to travel to and from the city. The main concern raised was the high cost of private medical care since affordable public health facilities are limited. Small clinics were observed in trading centres. The survey also revealed that the majority of the people in the areas surveyed had access to public health facilities such as latrines. A few cases were observed where walls of the latrines were partly broken.

(h) Accessibility To Public Utilities
Accessibility to public utilities was addressed for electricity, telephone services, and water supply as follows:

Electricity
It was indicated during discussions that communities around Namanve North and South A have access to electricity. In Namanve North, there is a power grid passing over the area. It was observed that several households in areas around both Namanve North and South A were serviced with electricity, particularly those situated near the road. Some of the households were not connected to the electric power supply because the owners could not afford to pay for electricity.

Telephone Service
Telephone lines are available in Namanve North and South A. The issue regarding the use of telephone services was associated with affordability of the service. The majority of the residents in the area do not use telephones because they cannot afford the costs of installation and operation. In Namanve North and South A, only a few households had access to telephone services.
**Water Supply**

Presently the people living around Namanve North and Namanve South A depend on naturally occurring water sources found in the project site. The water is accessed from protected and unprotected springs as well as boreholes. There is piped water reaching the new Coca-Cola site near Namanve North, but the water is not available to local communities. Around Namanve South A, almost all the residents in Nantabulirwa depend on water wells situated in the proposed project site. There is plenty of naturally occurring water but almost all of it is in the area demarcated for the industrial park. In Namanve North, however, there are natural water sources (springs) available on private land outside the project site. The supply of water in Mukono district is not the responsibility of the National Water and Sewerage Corporation. However, the Government is planning a water project to provide water for the district from Lake Victoria (District State of Environment report - Mukono, 1997). The same applies for Wakiso district.

2. **Waste disposal and land pollution**

**Sanitation and wastewater disposal facilities**

The communities surrounding the proposed park are semi-rural. There are no sewerage facilities in the area. Toilet facilities observed consisted of pit latrines housed in small informal structures.

**Solid waste disposal**

Household solid waste materials are disposed of either in gardens or in the bush that surrounds many of the houses. Small scale burning of household solid waste was also observed. There are no formal waste disposal services available to the communities from their respective districts since the area is regarded as rural and is therefore not covered by the KCC waste disposal system.

Namanve Forest has been used as a dumping ground. Forest Department files record dumping of broken bottles in 1987 "on the road off the Main Highway to Jinja that leads to Namanve Railway Station" by the Lake Victoria Bottling Company (FD/KP File 3/22 vol. II). The Company was supposed to be allocated a dumping pit. No record of the clean up or the pit was found during this study. During the survey, it was observed that large amounts of solid waste are dumped at the project site by commercial waste generators from Kampala and its environs. This was evident in Namanve North, South A and South B areas (Photograph No. 4).

There were complaints by forest officers of similar acts of refuse dumping by KCC in the same location in 1987. Most urban centers dump their waste in open sand/brick mining pits, which are common in close proximity to urban centres (State of the Environment Report, 200/2001). During this study, recent dumping of soft drink and beer cans was discovered along the Old Jinja Road between the Arboretum and the Namanve/Bumbubumbu Channel, in Namanve South B. They were partially removed after media publicity.

In Namanve North, the study also found three recent dump sites of medical waste by the roadside in the Buto stream valley. This indicates an increasing tendency to dispose of urban waste in the area since degazettement.
Currently, there is no waste disposal site within a 5 km radius of the proposed Namanve Industrial and Business park site. The nearest official landfill site is located at Mpererwe approximately 13 km due west of the proposed industrial area and is managed KCC. According to the waste disposal engineers at KCC, there are no plans to cater for the solid waste generated from the industrial and business park at Namanve as this area falls outside their jurisdiction.

Toxic/Hazardous Waste Disposal
Enquiries were made with Forestry Department staff and a search made of their files for evidence that any liquids, chemicals or any other hazardous materials were stored in the Namanve Reserve. No such evidence was found.

(a) Veterinary land use
For some time in the 1970s, an area in Namanve Forest was used for quarantining slaughter cattle from Karamoja for disease control. An area of 477.5 acres (193.2 Ha) adjacent to Bukasa and south of the railway was acquired by the Veterinary Department for this purpose and for other uses. Although only a part of this land was used, a "Machakos" dip and slaughter facilities were erected next to the Arboretum. The entire dip and other concrete structures still exist, though the Veterinary Department ceased using the facilities in the mid-seventies.

The acaricide used has not been identified though in the 1960s it could have been arsenic-based, and the spent material may have been emptied into the swamps nearby (Banage, 1999).

(b) Explosives
The Ministry of Internal Affairs had requested 5 ha of land in Namanve in the early 1990s for use as a national explosives magazine. There is no evidence that a national explosives magazine was ever built on the proposed site. In any case, it would have been located in Bukasa where there is a rifle range, and this is located outside the project site.

3. Air and noise pollution

Air pollution
The sources of air pollution at the time of the study were minimal, and the air quality appears to be good. Existing air polluting activities include vehicle emissions from the Kampala / Jinja road and from trucks and other motor vehicles accessing the sand mining and brick making sites.

In a domestic setting, air pollution results from cooking using wood stoves or open fires and/or the firing process in brick making. The fuel of choice for these processes is mainly firewood.

An additional source of air pollution is from the dry grass, which is placed on the top of the brick kilns and burns for up to 24 hours, producing a large amount of smoke.

Noise pollution
Currently the main sources of noise are from:
- Vehicles transporting sand from the mining areas within the proposed site area in Namanve out towards the main road (particularly in Namanve North and South C).
4. Natural resource use
Since the proposed site was originally a forest reserve, there was legally no use made of the resources from the land. Maintaining the land as a reserve for many years facilitated the retention of natural resources that could have been depleted had it been open to private use.

The major natural resources found in the area include water, sand, clay and trees. Despite the area having been reserved for forestry use, local communities have been extracting those resources both for local use and for sale. The materials consumed locally are mainly water, fuel wood and building materials. The extraction of sand has attracted commercial interests due to high demand from the growing construction industry in Kampala city, and its surroundings.

It is worth noting that the extraction of natural resources in the area is partly carried out on land, which the locals consider to be "common property". Therefore, in their view, resources can be exploited on a "free access" basis. The materials extracted from the former forest reserve are treated as if they were common property, although they are legally owned by the Government.

Sand mining
It was estimated that on average, more than 20 lorries of sand (approximately 20 to 35 tonne capacity) are extracted from the area daily. During the survey, at one point over five lorries carrying sand to the city were seen in a period of about an hour.
Various individuals interviewed indicated that the main reason some members of the communities extract natural resources from the surrounding area is due to their inability to access affordable alternatives. Those who are engaged in sand extraction are driven by the need for income. There are limited sources of income generation in the area, and sand extraction is one of them.

Subsistence farming
People interviewed also mentioned that the land in the reserve is important farmland for the local population. In Kazinga village alone (Namanve North), it was estimated that over 200 households are currently growing food crops such as sweet potatoes and cassava in the area proposed for the industrial park. In South 'A', it was indicated during discussions that more than 50% of the population in Nantabulirwa grow food crops in the reserve.

Fuel-wood collection
In addition to growing food crops and extracting sand from the proposed project site, the communities extract fuel wood and poles from the reserve. It was indicated during discussions that although it was not officially allowed, community members have been going to the reserve, sometimes secretly, to extract resources.

Brick making
Brick making was observed to be one of the major income-generating activities in the area. Bricks are made from clay found near the proposed project site and often within the reserve.
Natural resources found on private land are extracted on a lease basis. It was noted in Kazinga for example, that some form of rent is paid. For instance, UShs 10,000 is paid by brick makers to the landlord for every 1,000 bricks sold. Each brick is sold for between Ushs. 70 - 80.

**Market for natural resources**
The main marketable products based on natural resources are sand and bricks. Some firewood from the forest is also sold, but on a smaller scale. Over the past decade, demand for building materials in and around Kampala city has risen tremendously. This has in turn pushed up the demand for sand and bricks from Namanve due to its proximity to Kampala city.

In addition, over time, the population in Kampala, and the corresponding demand for residential facilities, has been growing. This has created extension of residential buildings eastwards towards Namanve. With this extension, the demand for sand, bricks and fuel wood continues to grow. The fuel wood is particularly in high demand for firing bricks. Concern was expressed in Kazinga village that there is an increasing shortage of fuel wood for firing bricks. It is considered to be a major constraint in the brick-making industry.

**Sites of scenic, architectural, archaeological and religious significance**
Inquiries made at the Department of Surveys and Mapping, and the office of the Commissioner for Antiquities and Museums, did not reveal any recorded areas of specific scenic, architectural, archaeological, or religious significance. In addition, the Forestry Department has no record of sites that fall within this category.

**F. PREDICTION OF IMPACTS**

Any industrial facility has several types of impact on the community and environment in which it is located. The proposed development of Namanve Industrial and Business Park is a large and unique project by Ugandan standards, and the impacts predicted will be on a large scale.

The impacts of an industrial project usually emanate from the industries themselves, from associated activities either during construction, operation or decommissioning of the industries.

The existing and potential environmental impacts related to the activities of the proposed Namanve industrial park can be sub-divided into positive and negative impacts. It is important to consider the duration of the impact and at what phase of the project it occurs, e.g. is it short term or long term and does it occur during construction, operational or decommissioning phases. The impact of the environment on the industrial park has also been considered.

In some cases, the impacts outlined below are generalised as the final list of organizations intending to construct plants in Namanve was unavailable at the time this study was carried out.

1. **The site**

   **Topography**
The topography will be altered by the cut and fill activities that will accompany the construction phase, as the individual industries source material and prepare their sites for constructing their facilities. The impact of this is considered to be moderate and negative.

The low gradient particularly in South B area will present some problems in construction of infrastructure, drainage and sewage treatment works. The impact of this is considered to be significant and negative.

**Geology and soils**
Activities carried out during the site preparation and construction phase will result in exposure of the top soil to erosion particularly in the areas with steep slopes such as Namanve North, and South C2 areas. The impact of this is considered to be slight and negative. The high demand for construction materials such as sand and murrum, may result in unregulated quarries and borrow pits within Namanve and its surroundings. This has the potential to create huge unsightly pits in the landscape. The impact of this is significant and negative.

During construction, there will be a need to rehabilitate areas that are currently being exploited for sand and/or brick making material, to make them suitable for construction. Some of these areas being exploited (particularly in South C1) fall within the area that has been designated as a conservation region for the wetland habitat. In these areas vegetation stripping has taken place, most notably of Phoenix reclinata, and will therefore need to be replanted or replaced. The impact of this is significant and negative.

Forest clearance will impact the soils and water cycle causing greater run-off, erosion, flooding and ultimately contributing to the increasing pollution and eutrophication of the inner Murchison Bay (Kansiime et al. 1994, 1995). As a consequence, the quality of the water supply for Kampala, already affected by developments in the Nakivubo and Wankoloko catchments will receive an extra burden from the Namanve catchment. The impact of this is significant and negative.

**Flora and fauna**
Both floral and faunal habitats will be destroyed or reduced by industrial development. The general impact of forest clearance will be loss of plant species and fauna whose habitats and food chains are destroyed.

Some animal species able to live under urban conditions will adapt to the new habitats created and in some cases there will be substitution with new species. Some bird and mammal species are likely to adapt by becoming scavengers when their natural food chains are disrupted (Banage, 1999). Particularly vulnerable are the species of plants and animals listed as being globally or regionally threatened.. The three species of birds listed as being globally threatened (Collar et al. 1994) are: Papyrus Yellow Warbler (*Cloropeta gracilirostris*), Papyrus Gonoiek (*Laniarius mufumbiri*) and the Great Snipe (*Gallinago media*). Although not sighted in this study, they may be existing in small numbers. The impact of this is considered to be significant and negative.

*The wetland/swamp area*
The proposed development at Namanve has set aside nearly 200 hectares for wetland conservation in sections of South B, C1 and C2 estates. This area is declared un-developable because it is relatively flat (slope of 1:200) and swampy, and would require substantial drainage infrastructure.

There is widespread concern that developments at Namanve will further exacerbate the deteriorating pollution situation in the inner Murchison Bay that is caused by the discharges from the Nakivubo and Wankolokolo catchments. A recently concluded study and monitoring programme of the conditions in Bay catchments, initiated before degazettement, did not include Namanve. Although the Kayobe Wetlands were found to be in good condition in the present survey, no baseline studies have been done on them. There is, however, no reason to suppose that the wetlands will not be adequate to remove nutrients and pollutants as they are known to do elsewhere (Kansiime, et al. 1994 in Banage, 1999).

A sewage treatment plant is proposed. Before passing into the sewage treatment works, there will be pre-treatment of effluent by the industries whose effluent quality does not meet the required standards to be deposited directly in the sewage treatment works. After treatment on site, the effluent will be deposited in the sewage treatment works. The doubly treated industrial effluent and sewage will then be passed through the wetlands first within the Namanve Estate (South B and C1) to finally drain into Kayobe Wetlands and then out into Lake Victoria (Murchison Bay).

This study assumes and advocates that wetlands and conservation areas are those which will be retained in more or less their natural state while public open spaces may be areas more or less drained and landscaped. In this regard, both the large areas in South B and at the southern end of South C1 in which the sewage treatment plants will be located are recommended to be retained as natural wetlands. They will be the immediate receiving environment for the treated effluent and an effort at restoration ecology to upgrade the status of their papyrus and other species stands should be carried out.

The sanitary wetlands in South B and C1, by being kept natural, would not only serve to strip treated effluent, but would also act as sedimentary traps for the increased run-off from a Namanve denuded of its forest trees in developing the Industrial and Business park. For this purpose, the wetlands as prescribed appear adequate but this will necessitate safeguarding the integrity of the Namanve wetlands, outside the Industrial Park, as well as the more extensive Kayobe Swamp fringing the Inner Murchison Bay (Banage, 1999).

2. Air, noise and dust pollution

Air pollution

Emissions of gaseous pollutants can have adverse health or productivity effects on human beings, animals and vegetation and can degrade man-made structures (FEPA, 1995). Areas in which industrial activities could affect air quality may include:

- Climatic impacts (stratospheric ozone depletion, greenhouse effects, etc), caused by emission of carbon dioxide into the atmosphere due to industrial process;
• Acidification of the environment through sulphur and nitrous oxide emissions, caused by the burning of fossil fuels in industrial processes as well as from vehicles and generators. This situation would be made worse by deforestation (removal of carbon sinks);

• Human health impacts; from inhalation of high concentrations of harmful substances especially as an occupational hazard in some industries (such as, building materials used e.g. asbestos);

• Pungent odours from storage of raw materials, disposal of wastes on land-sites, industrial process;

• Continuous air pollution (over a long period of time), due to incineration of solid waste by individual industries on site will take place if no proper legal landfill site is identified for use by the industries in Namanve.

The potential impact of air pollution is industry dependent but is considered to be slight and negative. A list of the specific industries proposed to occupy the site was not available at the time of the assessment.

*Dust*

During construction and particularly during the dry seasons there will be increased levels of dust created in Namanve. This will be caused by the trucks and other vehicles moving within the area and also as a result of removal of much of the vegetation currently covering the proposed site, leaving large areas bare and exposed. The issue of increased dust production will mainly be an occupational health hazard (for those working on site), but will also affect those living directly along the routes to be used by the trucks and other vehicles. This is considered to be a significant and negative impact.

Upon completion some industries may produce dust or particulate matter that is corrosive or irritating to human beings, animals or man-made structures. The impact of this is entirely dependent on the volume and quality of emissions produced.

*Noise pollution*

An increased level of noise is to be expected during the construction and operational phases of industrial development. During the construction phase, one main source of noise will be the increased flow of vehicular traffic, and another from construction machinery on-site. This could affect the human habitations adjacent to the industrial park, as well as the remaining ecological niches (particularly the fauna) that will be conserved.

During the operation phase the main area of noise pollution foreseen will be in the industries whose production process involves the use of loud machinery (e.g. foundries). This will be an occupational problem to be handled by the employers in the affected industries. Again this is industry dependent but the significance of this is considered to be slight and negative. As Uganda currently has power supply fluctuations, the use of generators will be prevalent in the industrial
park and this will be another possible source of noise and air pollution. The impact of this is considered to be significant and negative.

3. Water pollution

Surface water

(a) Effluent discharge

Water quality and related beneficial uses are often most affected by industrial development. Most of the industries that propose to set up in Namanve will produce effluent. The proposed treatment works are designed based on the understanding that NEMA will enforce effluent standards, and that this effluent will be pre-treated and channeled into the R. Namanve which ultimately drains into the Kayobe wetland and then further on into Murchison Bay of Lake Victoria. Of particular concern are industries with high water consumption as their effluent levels may be correspondingly high.

Water quality data for the rivers flowing into R. Namanve were not available from DWD for this study. It was therefore not possible to determine the state of the surface water as an indication of what pollution levels and possible upstream sources could be.

The R. Namanve and associated tributaries will be polluted in the event of discharge of effluent into them by the industries. The specific significance of the impact on the water quality will depend for instance on the flow rates and concentrations of pollutants, such as solids, heavy metals, other toxins, turbidity, alkalinity, acidity, temperature and other parameters of the effluent as well as the volume and quality of receiving waters and their uses (FEPA, EIA Sectoral Guidelines, 1995).

Pollution of the Namanve river will result in contamination of the swamp into which it flows. This could cause the eventual death of riparian plants in this region thereby reducing the effectiveness of the swamp to filter the effluent that will be deposited into it. Although the swamps have an effluent stripping capacity for water flowing through them, there is a limit beyond which this property is no longer available. The impact of pollution of the swamp and the waters beyond it is fundamental as L. Victoria (at the Port Bell point), is the main water source for the Kampala area.

The impact of any industry not complying with the standards given is considered to be significant and negative.

(b) Surface runoff

Areas of hard-standing will increase with the construction of industries, which will increase the volume of runoff from the various sites. Runoff will also be increased when the vegetation is cleared. This will increase the amount of water going to the wetlands in any given event. The impact of unregulated runoff is significant and negative.

Groundwater
The water in the boreholes in the Namanve area is reputedly of good quality and fit for human and animal consumption. Existing boreholes within a 2 km radius of the site are currently used mainly for domestic purposes.

As the water table is shallow, construction of industries in the area has a high potential of reducing the quality of water in the area and the potential for contamination may be escalated by infiltration. Surface spills and illegal dumping of hazardous materials and wastes threaten the groundwater quality. The impact of this is considered to be significant and negative.

The potential for groundwater contamination in the area will also come from the increased population who, it is anticipated, will come to the site as casual labourers (low income bracket), and will live in villages which have no sewerage system in place. Adjacent to the Namanve site, pit latrines will be widely used. Leachate has the potential to contaminate the groundwater from un-supervised digging of pit latrines that reach or drain down to groundwater levels. The potential impact of this is significant and negative.

**Flooding**
This situation is of particular concern as the area is prone to water logging due to a high water table. The potential for flooding is most likely in the regions below the 1136 m a.s.l level which delineates the 200 year recurrence flood level. The potential impact of industries being located below the 1136 m a.S.I. level is significant and negative.

4. Waste handling and soil contamination

**Solid waste**
The absence of a legal, managed waste disposal site in or near Namanve is cause for much concern. To date, the UIA has not made provision for a disposal site in or near the Namanve area, which is outside the jurisdiction of the KCC. Industries in the area will produce large amounts of solid waste and with no proper disposal system in place, large heaps of waste will accumulate around or near Namanve. This may lead some industries to find alternative means of disposal, such as incineration. Century Bottling Company has raised the possibility of acquiring a dedicated portion of land (from the Kampala Municipality) where broken bottles can be stored pending recycling (Coca Cola, 1997). There is also the possibility that some industries may try and locate off site illegal dumping grounds (such as has been the case in some areas of Namanve). The impact of this is significant and negative.

**Toxic and hazardous waste**
Some industries may produce hazardous or toxic waste. Uganda does not have a site for the safe treatment or disposal of this type of waste. This could result in illegal dumping of hazardous wastes into pits, drains or elsewhere. The impact of this is significant and negative.

**Soil contamination**
Unregulated industrial activity may result in contamination of the underlying soils and geology. This could be caused by leaching of contaminants from industrial refuse, or chemical releases. Soil contamination can in turn lead to groundwater contamination. The impact of this is industry dependent, but is considered to be moderate and negative.
5. Socio-economy

Although most of the settlements are outside the area demarcated for development into an industrial park, the people living on the periphery of the proposed site in Namanve will be impacted by developments around them, and will in turn also have an impact on the industrial park.

National and regional economy

The proposed project has the potential to:

- Provide a suitable avenue for foreign investment in Uganda, and thus boost the economy as a whole.
- Encourage secondary development which will occur peripheral to the industrial activity along new access roads, utilities and towns, which will be established to serve industrial facilities.
- Create employment opportunities, both during the construction and operation phases.

Upon completion, it is estimated that there will be about 600 hectares of industrial sites, employing approximately 100 people per hectare. This would translate into 60,000 workers in the Industrial Park when it is fully developed (UNIDO/UNCTAD, 1998). The impact of this is significant and positive.

Industrial work-force in Namanve

The socio-economic survey (Tumusiime, 1999) indicates that there 5,000-8,000 inhabitants in 11 villages surrounding the proposed site, and these people are largely engaged in agriculture. Growth of industry and business may lead to a rapid increase in this population due to an influx of migrant workers, and the growth of nearby town centres (such as Seeta) towards Namanve. If unplanned, this will transform the area into a semi-rural /urban slum, with increased crime and other social vices.

Population levels will rise suddenly with the influx of labourers and this will cause pressure on the need for food, water, shelter, sanitation, medical services, transportation, education and other social services. If not properly planned and managed, fulfilling these basic needs may become a burden and could cause severe social problems.

There is high potential for a marked increase of HIV/AIDS with the introduced community of migrant labourers (truck drivers, casual labourers etc). The impact of this is considered to be significant and negative.

Women

The livelihood of women in particular and men and children in general in the area will be adversely affected by the industrial development. This is due to the fact that women are mainly the ones who cultivate the land, collect firewood and draw water for domestic use. Industrial development will for the most part reduce the land on which they are currently cultivating their crops. Access to water points may be closed off, or may be more difficult to access resulting in increased distances to be traveled to obtain water. In addition, land on which herds of cattle are grazed will be greatly reduced. This impact is significant and negative.
Transportation
If not properly designed and maintained, infrastructure development will result in an increase in feeder roads and thus an increase in associated traffic.

Over 60,000 workers are expected to work either as casual labourers or as full-time employees in Namanve. Many will either cycle, walk or take public transport to work. If one assumes that an average of 30,000 people (half the total estimated work force) will be using public transport to get to work daily, this will result in approximately 2,500 mini-bus journeys (12 people per mini-bus) every morning and evening on the single carriage Kampala-Jinja road. This will place added pressure on the transport system and will ultimately increase both vehicle and human traffic on the roads.

There will be a marked increase in heavy vehicle traffic as trucks and other machinery will be used during the construction phase. During the operation phase, industries will need trucks and trailers to transport their good to various destinations for redistribution. This will result in an increase in slow traffic on the roads increasing the potential for accidents in addition to degradation of the roads. As many of the settlements in the Namanve area have direct roadside frontage, the potential for accidents will increase at the turn-off points. The impact of this is considered to be significant and negative.

G. ESMF, EMP AND MITIGATION MEASURES

In this chapter, where a negative impact has been predicted, appropriate mitigation measures are proposed. It should be noted that these mitigation measures are necessary to ensure that the negative impacts predicted are reduced or removed completely.

1. The site

The true wetland area will be left aside and industries will be constructed on the dry land which surrounds the wetland. The business park, road network, and rail line passing along the edges enclose the wetland in such a way as to provide greater protection than is currently enjoyed by the wetland.

Alternative Site

The site selected was the only feasible site in the area available to the Government of Uganda based on accessibility, ownership, and appropriate land quality. The site is owned by the Government and has no one living in the area. Currently, full time site security is provided by the UIA until such a time that the land would be needed for development of the business park. In 2000 compensation was paid to residents for trees that they were growing in the area under permit from the forestry department. A case-by-case treatment of other residual issues based on cultural norms is nearly completed. However, nearby residents are still allowed to collect water from the existing water sources. As the business park will surround the actual wetland and action to mitigate adverse impacts are planned, it is deemed that these impacts on the wetland will be minor.
Topography

- The steeper areas within Namanve should be developed into housing complexes instead of being used to accommodate industries. Industries should not be built on slopes greater than 1:12.5 as described in further detail in Section 2.1.2 of the Draft Design Report of December 2000. Consideration should therefore be given to construction of housing complexes or establishing recreational areas and green parks in steep areas. It is understood that the UIA or management authority are likely to outsource the development of this land on a competitive basis.

- Large-scale grading and excavation should be minimised.

- In developing industrial sites, if large quantities of fill material are required they must be obtained from sustainable sources and rehabilitation plans implemented. Impact to the water table should be minimised. Disposal of black cotton and other clays must be undertaken in an environmentally responsible manner with rehabilitation preferably using indigenous trees, shrubs and grasses.

Geology and soils

The conservation areas that have been stripped of most of their vegetation due to sand mining and brick-making activities should be re-vegetated. Soil removed from other areas in Namanve to make way for construction, should be used to fill the pits left behind, before planting takes place.

Flora and fauna

The directive to conserve and manage identified species must come from the UIA or management authority. In order for the directive to be feasible, assistance is required from multiple agencies including the Uganda Wildlife Authority (UWA), NEMA, and other interested parities such as the Museums and the Park/Green area officers for the concerned districts. We envisage that the ideal person to co-ordinate this mitigation measure is the Environmental Officer.

When a potential developer proposes to develop a plot of land, the plans must be submitted for approval to the UIA / management authority and the Environmental Officer must be part of the approval process. An Environmental Impact Assessment (EIA) carried out for each industrial development should identify the exact number of plants, birds and other species that require conservation and management identified within a given plot. The Environmental Officer in conjunction with NEMA and UWA would then be in charge of ensuring that appropriate action is taken to conserve these species and their habitats.

Conservation may involve on-site protection, or relocation to an approved site. Innovative and practical solutions may need to be employed which could include the uprooting and replanting of
flora within a given area and the funding/support of green areas with specific habitats in the overall Park.

(a) Flora

This study has highlighted a number of rare and threatened plants, animals and birds.

- The UIA should require that a minimum number of indigenous trees and plant species be planted and maintained on each plot, relative to the size. One such species would be Phoenix reclinata.

- Site plans should take into consideration mature indigenous trees and protect them. Indigenous tree species to be protected include *Pseudospondium microcarpa*, *Beilschmeidia ugandensis*, *Morinda lucida*, *Antiaris toxicaria*, *Maesopsis eminii* and *Lovoa trichiliodes*. This can be regulated by the UIA in conjunction with NEMA and the UWA.

- Public open spaces, parks and sports fields should be planted with local shade trees e.g. *Melicia excelsa*, *Markahamia spp.*, and local grasses e.g. *Paspalum conjugatum* and *P. commersonii* for cover. Avenues of trees along roads will help mitigate vehicular noise and dust.

- Endangered, threatened and rare species (e.g. *Phoenix reclinata*, *Trichilia dregeana*, *Melicia excelsa*), ecologically useful species e.g. *Ficus spp.*, *Canarium schweinfurthii*, *Halea stipulosa*, etc) and the rare *Rothmannia sp.* should be conserved or multiplied and planted as part of the re-vegetation and landscaping activities.

- Ornamental plants e.g. *Marantochloa lucantha*, *M. purpurea*, *Afromomum angustifolia* should be cultivated, to add aesthetic value.

(b) Fauna

- The impact on all fauna will be severe due to habitat loss. By carefully safeguarding refugia during construction, and re-vegetation, use of local plant species as well as establishment of gardens, water pools and parks, after construction, will not only conserve but lead to recovery of some species. UIA would be in charge of overseeing this process, guided by NEMA.

- In addition to the indigenous trees, fruit producing trees e.g. *Ficus*, *Phoenix* and *Canarium* species should be promoted to attract birds as well as to provide perches and nesting sites.

- It would be important to keep the wetlands un-polluted so that the dependent fauna such as amphibians and birds are minimally affected. The areas designated as conservation areas should be managed by the UIA under the guidance of UWA and NEMA.

2. Air, noise and dust pollution
Air pollution

• Industries should comply with the air emission standards outlined during both the construction and operation process. Monitoring programmes should be mandatory and enforced.

• Residential areas should be zoned up-wind of heavy industrial operations. This will help ensure that respiratory health problems are prevented, and will reduce noise impact.

• Industries whose employees are exposed to air pollution as an occupational health hazard should ensure that they issue proper protective equipment. This requirement is industry specific. The industries affected should also employ engineered controls such as appropriate ventilation and air monitoring.

• Appropriate filtration needs to be put in place. Overall filtration mechanisms will ensure that smoke stacks will be kept at a level that does not impact human health or adversely impact the surrounding area.

Noise pollution

• Noise levels should not exceed those stipulated by NEMA.

• During both the construction and operational phases, the contractors should confine the movement of heavy vehicles (trucks, etc.) to daytime hours so as to cause minimal disturbance to people living adjacent to the industrial site.

Dust pollution

• Contractors should minimise dust levels by dousing exposed surfaces regularly with clean water during construction, particularly during dry seasons.

• As far as possible, trucks and heavy vehicles should use routes that do not pass directly in front of people’s homes (particularly those living adjacent to Namanve).

• During operation, industries producing dust will be creating an occupational health hazard to their employees. Proper protective equipment should be issued to all employees at risk. Engineering controls such as appropriate ventilation and air monitoring should also be employed.

3. Water pollution

Surface water
(a) Degradation of river banks

In order to safeguard the existing rivers found in Namanve (R. Namanve, R. Bumbubumbu and R. Nabubasa), the recommendations outlined in the National Environment Regulations (Wetlands, river banks and Lake shore Management), 2000 should be adhered to. This is a particular compliance that can be monitored by the proposed Environmental Officer to ensure that L. Victoria and its associated rivers are protected and properly managed.
(b) Effluent

All industries within Namanve should pre-treat their waste as per Section (4) (1), of the Standards for Discharge of Effluent or Wastewater, 1999, which states: 'Every industry or establishment shall install at its premises anti-pollution equipment for the treatment of effluent and chemical discharge emanating from the industry or establishment.' GIBB's Namanve Industrial and Business Park, Draft Design Report, December 2000 provides the discharge standards for the effluent/wastewater to a sewage treatment works. Thus, effluent entering the central sewage treatment works should comply with these Standards. Regular checks should be made at the influent and effluent points.

- As a double check, occasional samples should be collected from Lake Victoria. The responsibility for this testing is likely to fall with DWD, but may be shared with UIA or the management authority and NEMA.

- A complete assessment of the receiving capacity of the wetland to handle effluent for tertiary treatment should be carried out to ensure that there is minimum impact on the wetland.

- The points at which the treated effluent is deposited into the swamp and the point at which it enters Lake Victoria, should have regular water quality checks organised by NEMA in conjunction with the Environmental Officer.

Table 9: Impacts and Mitigation Measures

<table>
<thead>
<tr>
<th>Potential Impacts</th>
<th>Mitigation Measures</th>
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<tbody>
<tr>
<td>General</td>
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<td></td>
<td>Business Park Authority created</td>
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<td></td>
<td>Environmental Officer appointed to monitor and report on industry performance</td>
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<td></td>
<td>Environmental education and awareness training for work force</td>
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<td></td>
<td>HIV/ AIDS education and awareness campaigns for work force</td>
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<td>Topography</td>
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<td></td>
<td>Regulate the use of borrow sites to ensure that they are legally operated</td>
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<td></td>
<td>Low lying swampy areas will not be classified for construction of buildings</td>
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<td></td>
<td>Disposal of black cotton and other clays in environmentally responsible manner</td>
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<tr>
<td></td>
<td>Industries not built on slopes greater than 1:12.5</td>
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<td></td>
<td>Minimize large-scale grading and excavation</td>
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</table>
| **Geology and soils** | • Exposure and erosion of topsoil due to vegetation removal  
• Increased exploitation of sand and murram for construction | • Set aside an area to stockpile topsoil for future landscaping  
• All illegal mining/quarrying operations should be stopped. Rehabilitate the borrow pits after use |
| **Flora and fauna** | • Removal of vegetation to make way for construction may encroach on the wetland areas | • The integrity of these areas safeguarded by NEMA  
• UIA, with assistance from Uganda Wildlife Authority, NEMA and other interested agencies, establish directive to conserve and manage rare and threatened species  
• Business Park Environmental Officer monitors all operations  
• Environmental Officer ensures appropriate action taken to conserve species and habitats  
• Landscaping to include indigenous species with special emphasis on rare and threatened species as well as fruit producing trees and species having medical uses  
• All landscaping include Phoenix reclinata and Rothmannia sp. – UIA to establish minimum number of indigenous trees and plant species to be planted and maintained on each plot, relative to size  
• Site plans consider and protect mature indigenous trees  
• Public spaces, parks, and sports fields planted with indigenous shade trees  
• All proposed businesses submit Environmental Impact Assessment, Conservation and Pollution Prevention Plan |
| **Wetland** | • Pollution by unprocessed effluent/polluted runoff (solids, heavy metals, etc) may kill the wetland vegetation and destroy its effluent stripping capability | • All effluent must be pre-treated by the industries before being channeled to the sewage treatment works and finally passed through the wetlands  
• Baseline water quality data collected and a wetlands monitoring program implemented  
• Business park and road siting to surrounds actual wetland to provide increased protection  
• Business park operate according to standards  
• Follow Pollution Prevention Abatement Handbook  
• 200 ha set aside for wetland conservation |
<table>
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<tr>
<th>Environmental Issues</th>
<th>Measures</th>
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<tr>
<td>Swamp area</td>
<td>- Enforce protection of swamp area</td>
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<td></td>
<td>- Safeguard integrity of Namave wetlands, outside the Industrial Park, as</td>
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<td>well as the more extensive Kayobe Swamp fringing the Inner Murchison Bay</td>
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<td>- Drainage of the swamp will be enhanced if a lined drainage system is</td>
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<td>passed through it into the Kayobe swamp</td>
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<td>- Creating a lined channel should be avoided to maximize the integrity</td>
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<td>and natural treatment processes of the wetland</td>
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<td>- Traffic emissions monitored and legally permitted levels should not be</td>
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<td>exceeded</td>
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<td>- Industries comply with air emission standards which are monitored and</td>
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<td>enforced</td>
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<td>- NEMA encourage the use of cleaner production technologies for all</td>
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<td>industrial processes</td>
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<td>- Proper filtering of industry air emissions</td>
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<td></td>
<td>- Monitoring studies recommended in order to establish baseline data</td>
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<td></td>
<td>- During construction, un-paved roads should be water sprayed to reduce</td>
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<td>dust</td>
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<td></td>
<td>- Employers should provide protective equipment e.g. dust masks</td>
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<td>- Industries construct well-ventilated factories/workshops</td>
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<td>- Movement of vehicles and operation of construction machinery should be</td>
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<td>confined to daytime</td>
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<td>- Trucks and heavy vehicles use routes that do not pass directly in front</td>
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<td>of homes</td>
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<td>- Noise levels not to exceed stipulated levels</td>
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<td>- Avenues of trees along roads to help mitigate vehicular noise and dust</td>
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<td></td>
<td>- All effluent treated</td>
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<td>- Regular testing</td>
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<td>- Follow guidelines and standards set forth in Pollution Abatement</td>
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<td>Handbook</td>
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<td>- Substantial penalties for defaulters</td>
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<td></td>
<td>- Holding ponds for treated effluent</td>
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<td></td>
<td>- Construct secondary containment</td>
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<td>- Businesses located on impermeable soils</td>
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<td></td>
<td>- Spill prevention equipment</td>
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<td>- Contingency plans for individual businesses and for entire business</td>
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<td></td>
<td>park</td>
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<td>- Spill response equipment</td>
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Air pollution

- Emissions
  - Increased levels of pollution due to an increase in motorized traffic and emissions from industrial processes
  - Modification of microclimate
  - Un-paved access roads that will be used daily by trucks and other construction vehicles will generate large amounts of dust
  - Some industrial processes may expose their employees to large amounts of dust and particulate matter

Dust pollution

- Noise pollution
  - Increased traffic noise from construction and transportation vehicles and machinery

Noise pollution

- Toxins/Hazardous Waste
  - All effluent treated
  - Regular testing
  - Follow guidelines and standards set forth in Pollution Abatement Handbook
  - Substantial penalties for defaulters
  - Holding ponds for treated effluent
  - Construct secondary containment
  - Businesses located on impermeable soils
  - Spill prevention equipment
  - Contingency plans for individual businesses and for entire business park
  - Spill response equipment
- Industries establish plan for pollution prevention prior to authorizing construction
- NEMA establish standards for treatment and handling of hazardous and toxic waste
- UIA and NEMA ensure viable options exist prior to allowing industries to generate hazardous or toxic waste
- Risk assessment and risk management using computer programmes such as World Bank Hazard Analysis programme or Process Hazards Assessments Screening Tools programme to model risk of individual sites and processes
### Water pollution

- Industrial effluent may pollute springs, streams and rivers
- Construction of pit-latrines may reach the high water table and contaminate the aquifer
- Potential for pollution of groundwater from improper industrial practice
- Pollution in Inner Murchison Bay and Lake Victoria

- All industries pre-treat effluent before it is sent to the treatment works
- Industries adhere to Standards for Discharge of Effluent or Wastewater 1999 and Pollution Prevention Abatement Handbook
- Follow recommendations outlined in National Environment Regulations 2000
- Stringent monitoring and enforcement of waste treatment and effluent standards
- Treated waste discharged into waste stabilization ponds and sewage treatment works
- Latrine construction monitored by public health officials
- A specific monitoring program implemented by the UIA in conjunction with NEMA and the DWA
- Regular water quality sampling from River Namanve at outlet into Lake Victoria, Namanve Wetland, and Inner Murchison Bay
- Regular testing at point of exit for each industry, at influent and effluent points of sewage treatment works
- Install ground water monitoring wells
- Water quality samples collected quarterly from all boreholes within a 2 km radius of Industrial Park which also forms baseline data
- Restoration ecology in area of sewage treatment to upgrade the status of papyrus and other species
- Water from industrial sites should be passed through oil-water separators to remove impurities before it reaches wetlands

### Solid Waste

- Encourage reduction and recycling of waste
- UIA formulate waste management plan for solid waste for Namanve
- All industries submit waste management plan detailing all construction and operational waste management and disposal plans
- Establish arrangements to utilize landfill at Mpererwe
- Efforts made by Gov. of Uganda to address need for solid waste and Medical
### Waste disposal sites

**Construction**
- Appropriate storage, transport, and disposal of waste materials
- Sanitary facilities for work force that does not seep into wetland
- Proper vehicle maintenance
- Prevent spillage and leakage of materials
- Minimize soil erosion through use of berms or silt fences
- Prepare and implement Site Environmental, Health and Safety Plan
- Prepare Spill Contingency Plan according to international standards
- Materials used from environmentally responsible sources ie: wood products certified by Forestry Stewardship Council, quarry materials from sites with approved rehabilitation plans

**Social**
- Human health problems.
- Employment opportunities for unskilled workers during construction for the community living around the project area
- Increase in HIV / AIDS and STDs cases in the project area
- Unplanned influx of population and settlement
- Appropriate filtration of smoke stacks
- Improvement of income levels and living standards for the community
- Provide training for community members for employment in business park
- Provide focused training for women which also accounts for special needs ie: child care, etc.
- The health status of the Namanve area should be monitored and steps taken to prevent occurrence of HIV / AIDS and STDs through education and awareness campaigns in communities and for work force
- Provide piped water, or where appropriate – boreholes, to surrounding communities
- Sensitize communities on issues associated with residing near to business park
- Provide environmental education and sensitization to communities and work force
- Regional planning which includes district representatives in planning process

### II. CONCLUSIONS AND RECOMMENDATIONS

The study has highlighted various existing and potential impacts within the site proposed for the development of Namanve Industrial and Business Park. Mitigation measures have been proposed for potentially adverse impacts. This chapter concludes the report by highlighting the main issues identified in the study.
1. Location

The location of the proposed project site in Namanve will have a significant negative impact on the Namanve wetland. Impacts, however, will be mitigated to prevent or reduce the magnitude of negative impacts.

From a socio-economic standpoint, the proposed site is strategically located in terms of proximity to Kampala for trade and commerce transactions. This is advantageous, as there is access to skilled and unskilled labour to work during the construction and operation phases of the project.

2. Effluent disposal

The environmental impact assessment (EIA) of the proposed development has shown that great concern lies with the disposal of effluent and its impact on the Namanve swamp and ultimately on Lake Victoria, the drinking water source for the residents of Kampala. Industries are required by law to pre-treat their effluent in order to comply with Ugandan effluent regulations for discharge of effluent/wastewater to a sewage treatment works, 1997 and revised in 1999.

It is planned that all industries will pre-treat their waste which will then pass through a sewage treatment works. The outflow will then pass through the natural wetland systems. There is a need to develop stringent monitoring and enforcement of this process. The Gaba water supply intake works is some 2 km to the west of the proposed site and while it is unlikely that toxins will reach the works, this cannot be assumed without further work on issues such as water quality, current flows etc.

Given that:
- Once completed Namanve area will be the biggest industrial complex to impact Inner Murchison Bay;
- It will be developed over a considerable period of time (10 years or more);
- The range and types of industries that may be set up there will be diverse,

There is a serious need to guarantee the future of the water quality situation from Gaba Water Works, and to mitigate pollution and eutrophication of the Bay. Regular testing would therefore be required of the effluent at the point it exits each industry and at the influent and effluent points of the sewage treatment works. Monitoring of Lake Victoria water quality, fauna and flora will provide baseline data on the trends of pollution or contamination and its effect on the environment. Industries should therefore be responsible for the proper treatment of their effluent before discharge into any wetland. Strict penalties for defaulters will be absolutely necessary.

3. Waste handling and soil pollution

Solid waste
UIA should formulate a waste management plan for solid waste for Namanve.
All industries should submit a waste management plan detailing all construction and operational waste management and disposal plans.

GIBB understands that the strategy is to outsource solid waste management facilities and maintenance to private companies and contractors. Thus, we would suggest that the concerned districts (Wakiso and Mukono), hold a meeting with UIA and NEMA to discuss available options as soon as possible to identify one to three suitable locations for solid waste disposal. The following issues should be taken into consideration:

- Legal requirements for the disposal of hazardous and non-hazardous waste;
- The types of industries in the Park; options for solid waste disposal for the specific industries;
- Environmental impacts, monitoring procedures and mitigation measures for the various disposal methods;
- Recycling and waste reduction activities on an industry specific basis;
- Due consideration of domestic solid waste from the surrounding population incorporating the projected population growth connected with the Industrial Park; and
- Disposal of sludge from sewage works.

4. Toxic and hazardous waste

In terms of industrial layout by category, the information on potential industries or industry types is not yet available from the UIA / management authority. It is strongly recommended that strict adherence to the guidelines issued for Industrial Estates within the Pollution Prevention Abatement Handbook, 1998. In addition to these guidelines, the Pollution Prevention Abatement Handbook sub-divides industry into 40 sectors that range from dairy industries to vegetable oil processors. We would therefore recommend sub-division according to these 40 major sectors and encourage similar industries i.e. food industries to be grouped together and separate from petroleum-based industries.

Of specific concern at Namanve is the high water table in many areas, but not all parts of the Park. Industries that have the potential to contaminate the water table such as petroleum- based, petrochemical-based, tanneries or pulp and paper mills etc. should be located on higher ground and ideally on impermeable soils. In addition, groundwater monitoring wells should be installed.

NEMA is advised to establish standards for treatment and handling of hazardous and toxic waste material and to ensure that viable options exist before allowing industries to generate hazardous waste.

According to the National Environmental Statute of 1995, individual environmental impact assessments will be required by law for the development of each and every industry in the new Park. Risk assessment and risk management is industry-specific. Computer programmes, such as WAZAN (World Bank Hazard Analysis programme) and PHAST (Process Hazards Assessments Screening Tools programme) can be used to model the risk of individual sites and processes.
5. Soil contamination/pollution

No industry should contaminate or pollute the underlying soil/geology. This can be prevented by construction of secondary containment, use of spill prevention equipment, contingency planning (site and park specific), and investing in spill response equipment. Industries should indicate the measures they will employ in preventing soil contamination and pollution as a prerequisite to obtaining authorisation to begin construction.

6. Measures to be implemented during construction

The construction site should be kept clean at all times and appropriate measures should be taken for the storage, transportation and disposal of waste materials. Sanitary facilities for their workforce. Proposed sanitation arrangements should be submitted to UIA for approval before commencing construction work.

- All vehicles should be maintained in accordance with the original manufacturer's specifications and manuals in order to minimise noise, soil and air pollution caused by oil leaks and emissions.

- The Industrial Developers, through their Contractor, shall take all reasonable measures to prevent spillage and leakage of materials likely to pollute air, soils and watercourses. Similarly, precautions should be made to minimise soil erosion from the site through the use of berms or silt fences.

- The Industrial Developers, through their Contractor, should take precautions to minimize air pollution. The routing of trucks and other vehicles should minimise and mitigate the effects of generation of dust and vehicle emissions on the surrounding inhabited areas.

- The Industrial Developers, through their Contractor, should prepare and implement a Site Environment, Health and Safety Plan detailing preventive measures concerning fire, product release, worker injury and waste management. Where applicable, a detailed Spill Contingency Plan should be put in place according to international standards.

- The Industrial Developers, through their Contractor should demonstrate that all materials used (quarry stone, fill material, wood, steel etc.) are from environmentally responsible sources. Wood and wood-products should ideally be certified by the Forestry Stewardship Council or similar organisation and all quarry materials should come from quarries or borrow pits that have approved rehabilitation plans.

7. Monitoring, Management and Capacity Building (including expenditure)

As stipulated earlier in the report, it was clear that either a unit within U.I.A be created to oversee the park development or a park authority is created, the latter being the preferred option being the overall work load of U.I.A. In this regard, the consultant given the budgetary constraint of the G.O.U also recommended budgetary support to the unit or authority for a period of four (4) years at which time the park should be self-financing. NEMA should also benefit from bank
support to ensure adherence to national environmental legislation and notably the World Bank safe guard policies.

8. Other issues

a) Awareness and education

Officer, in conjunction with the UIA, should immediately work towards the incorporation of the Namanve catchment into the Inner Murchison Bay water-monitoring scheme. In addition, the officer should have a pivotal role in environmental education and awareness for all people working in Namanve.

The Environmental Officer should be made aware of, and be provided with, the latest copy of the existing standards and guidelines for air, water and soil. Particular emphasis should be placed on the implications of Lake Victoria being the source of drinking water for the people of Kampala and its surroundings, in addition to being the sink for waste water disposal for Namanve.

b) Regional planning

The subject site straddles two districts namely Wakiso and Mukono Districts. This implies that the impact of the proposed industrial park will be evident in these two areas. It is important that the Districts are represented and incorporated in the planning process and the industrial park and its projected impacts are taken into consideration when the planning committees in the respective districts are deliberating on issues.

There should be regional integrated planning to avoid undesirable degradation and unplanned settlement. This would involve input from Wakiso and Mukono District representatives and the UIA planning committee at the pre-construction phase.

Socio-economy

c) Awareness promotion

In order to increase the level of awareness about the proposed Namanve project and its implications, planning authorities in the respective districts of Mukono and Wakiso should ensure that the communities around the park are appropriately sensitised about the realities associated with development of an industrial park near them. This should be initiated by the UIA.
d) Alternative water supply

Our socio-economic survey indicated that presently the people living around Namanve North and Namanve South A depend upon water from protected and unprotected springs as well as boreholes some of which are located in the proposed industrial area. The number of people living in or at the periphery of the proposed Park is estimated to be between 5,000 and 8,000. On the assumption that all these people obtain water from sources inside the proposed Park area it will be necessary to provide between 250 m³ and 400 m³ of water per day, based on 50 litres per person per day for low-income settlements. Planning should be initiated to upgrade this provision in five years as it is likely that many people will graduate from low to middle income earners over the forthcoming decade.

We further recommend that this planning be incorporated into the overall planning and costing for water provision to the Industrial Park.

Industries should ensure that routes to natural water sources are preserved for access by villagers. If this is not possible, the industry should offer viable alternatives, including; sinking of boreholes incorporating a system for maintaining the boreholes to ensure sustainable water supply. Coca-Cola has set a precedent by drilling and equipping two boreholes for use by the surrounding community to replace the two wells that were lost through construction of their facility in Namanve.

e) Wetland

The protection of wetlands in Uganda is a pertinent issue and should be tackled effectively. The main issue will be enforcement of the protection of the swamp area within Namanve. The Wetland Inspection Division and NEMA's monitoring departments both have limited staffing and have a countrywide mandate. The onus will therefore fall on the Environmental Officer proposed to manage the environmental matters within the proposed site. Monitoring of this site will include the suggestions outlined.

f) Transportation

Transportation is an issue as there will be a need to increase the number of public (and private) vehicles on the main Kampala/Jinja road to cater for the large work-force that will be commuting daily to the site. This will result in an increase in air pollution and the potential for accidents on the roads.

g) Construction Materials

During the construction phase there will be a large demand for construction material such as sand, murram and timber. If not properly regulated this may result in unsightly landscape modification and natural resource depletion.

h) Flooding
d) Alternative water supply

Our socio-economic survey indicated that presently the people living around Namanve North and Namanve South A depend upon water from protected and unprotected springs as well as boreholes some of which are located in the proposed industrial area. The number of people living in or at the periphery of the proposed Park is estimated to be between 5,000 and 8,000. On the assumption that all these people obtain water from sources inside the proposed Park area it will be necessary to provide between 250 m³ and 400 m³ of water per day, based on 50 litres per person per day for low-income settlements. Planning should be initiated to upgrade this provision in five years as it is likely that many people will graduate from low to middle income earners over the forthcoming decade.

We further recommend that this planning be incorporated into the overall planning and costing for water provision to the Industrial Park.

Industries should ensure that routes to natural water sources are preserved for access by villagers. If this is not possible, the industry should offer viable alternatives, including; sinking of boreholes incorporating a system for maintaining the boreholes to ensure sustainable water supply. Coca-Cola has set a precedent by drilling and equipping two boreholes for use by the surrounding community to replace the two wells that were lost through construction of their facility in Namanve.

e) Wetland

The protection of wetlands in Uganda is a pertinent issue and should be tackled effectively. The main issue will be enforcement of the protection of the swamp area within Namanve. The Wetland Inspection Division and NEMA’s monitoring departments both have limited staffing and have a countrywide mandate. The onus will therefore fall on the Environmental Officer proposed to manage the environmental matters within the proposed site. Monitoring of this site will include the suggestions outlined.

f) Transportation

Transportation is an issue as there will be a need to increase the number of public (and private) vehicles on the main Kampala/Jinja road to cater for the large work-force that will be commuting daily to the site. This will result in an increase in air pollution and the potential for accidents on the roads.

g) Construction Materials

During the construction phase there will be a large demand for construction material such as sand, murrum and timber. If not properly regulated this may result in unsightly landscape modification and natural resource depletion.

h) Flooding
The subject site has a very low topographic gradient and a shallow water table (1 m.b.g.l. in some places), and this increases the potential for flooding. It is recommended that construction below the 1136.3 lake level be avoided.

i) Flora and fauna

There were some flora and fauna of conservation interest identified, which should be protected. This will go hand in hand with the preservation of the areas set aside as conservation areas. Sponsorship for such activities could be obtained from the industries themselves.

I. FURTHER WORK

Further work and investigations are required in the following areas:

- A time series water quality analysis should be carried out on River Namanve and the outlet into Lake Victoria.

- A groundwater and aquifer status survey of the Namanve area should be conducted in conjunction with mapping of possible sources of contamination (such as pit-latrines), and likely contamination migration routes.

- A survey of the health status of the people living in the Namanve area, particularly on respiratory related diseases, should be carried out to establish the health condition of the population. This information could then be used as a point of reference in the event that issues relating to health are raised in connection with the Namanve Industrial Park.

- An air quality survey, particularly for vehicle emissions, should be carried out over a period of time to establish the current air quality standards and to model possible dispersal characteristics of air pollution.

- Plans for solid waste management should be formulated.

- Awareness should be created with regard to the Park's intended functions, particularly among those living adjacent to the proposed park site. This should be carried out before construction begins on the industrial park.

- Environmental management should be institutionalized with the appointment of an Environmental Officer.

- A socio-economic study of the impact of HIV/AIDS and STDs on the communities living adjacent to the proposed project area should be conducted.

is recommended that all the items listed above should be addressed exhaustively at the planning stage of the proposed project. Recommended precautions: Certain precautions should be taken. These include but should not be limited to:
• Identification and harmonisation of the activities and expectations of stakeholders. This should involve regular consultative meetings to harmonise development activities.

• Demarcation and possible gazetting of the wetlands (conservation areas) should be undertaken to pre-empt future encroachments;

• The channel in the upper Namanve Swamps should not be lined nor extended to the Kayobe Swamp. This will ensure that the wetland remains intact and there is adequate Seepage of treated effluent through the wetland.

J. LIST OF PEOPLE I HAVE MET

1. Maggie Kigozi, Executive Director
   Uganda Investment Authority

2. Patrick Nyaika, Director
   Uganda Investment Authority

3. Barnabas Mwesigye
   Uganda Investment Authority

4. Justine Ekaat, Director
   Environmental; monitoring and compliance

5. Nelson Ofwono, Consultant

K. REFERENCES PUBLICATIONS


