E464
Volume 4

BUJAGALI PROJECT
TRANSMISSION SYSTEM
UGANDA

Prepared for:
AF NILE POWER
Richmond, UK

Prepared by:
ESG International Inc.
Guelph, Canada

ENVIROMENTAL IMPACT STATEMENT
March, 2001

FILE COPY
The complete Bujagali Project EIA consists of 7 documents

Note: The transmission system documentation is, for the most part, the same as that submitted to the Ugandan National Environmental Management Authority (NEMA) in December 2000. Details of the changes made to the documentation between December 2000 and the present submission are available from AESNP. Only the graphics that have been changed since December, 2000 have new dates.
EXISTING ENVIRONMENTAL AND SOCIAL CONDITIONS

3. Consonance Analysis of EI/S Requirements

4.2 Need for the Project .................................................................................. 98
4.3 Technical Options .................................................................................. 103
4.4 Alternative Options and Transmission Line Corridors .......................... 109
4.5 Substation Site Alternatives ............................................................... 122
4.6 Route and Site Optimisation: Stage 1 ......................................................... 126
4.7 Route and Site Optimisation: Stage 2 ......................................................... 137
4.8 Other Alternatives Considered .............................................................. 138
4.9 Summary .................................................................................................. 140

5. PROJECT CONSTRUCTION, OPERATION AND DECOMMISSIONING .... 145
5.1 Life Cycle Overview ............................................................................... 145
5.2 Transmission Line ................................................................................ 146
5.2.1 Key Activities and Programme ............................................................ 146
5.2.2 Procurement, Manufacturing and Transportation ............................... 148
5.2.3 Construction Overview ...................................................................... 150
5.2.4 Access Roads ...................................................................................... 157
5.2.5 Equipment .......................................................................................... 165
5.2.6 Labour Force ....................................................................................... 166
5.2.7 Testing and Commissioning ................................................................. 166
5.2.8 Operation and Maintenance ............................................................... 166
5.3 Kawanda Substation .............................................................................. 173
5.3.1 Engineering ........................................................................................ 174
5.3.2 Procurement, Manufacturing and Transport ......................................... 174
5.3.3 Labour Force ....................................................................................... 177
5.3.4 Testing and Commissioning ................................................................. 177
5.3.5 Operation and Maintenance ............................................................... 178
5.3.6 Decommissioning ................................................................................ 178

6. Public Consultation and Disclosure Programme ........................................ 179
6.1 Regulatory Context ................................................................................ 179
6.1.1 Government of Uganda Requirements ................................................ 179
6.1.2 World Bank Group Requirements ....................................................... 179
6.2 Consultation and Disclosure Methodology .............................................. 183
6.2.1 Consultation ........................................................................................ 183
6.2.2 Disclosure and Accompanying Consultation Activities ......................... 184
6.3 Results of the Consultation Activities ...................................................... 193
6.4 The Panel of Experts .............................................................................. 199

7. Impact Identification, Management & Monitoring ...................................... 201
7.1 Compliance Screening ........................................................................... 201
7.1.1 Government of Uganda Policies and Regulations .................................. 201
7.1.2 World Bank/International Financial Corporation Policies and Procedures 203
7.1.3 African Development Bank (AfDB) Policies and Procedures .................. 204
7.1.4 International Treaties and Conventions ............................................... 205
7.2 Key Project Issues ................................................................................. 207
7.2.1 Resettlement and Compensation .......................................................... 207
7.2.2 Impacts on Forest Reserve Lands ......................................................... 213
7.2.3 Impacts on Lubigi Swamp ................................................................. 223
7.2.4 Impacts on Public Health .................................................................... 225
7.2.5 Impacts on Aesthetics .......................................................................... 230
7.2.6 General Construction Related Issues ................................................. 233
7.2.7 Cumulative Effects ............................................................................. 234
7.2.8 Developmental & Community Benefits .......................................................... 237
7.3 Summary of Impact Management, Net Effects and Monitoring Measures ............. 237

8. Environmental Action Plan ................................................................................. 261
8.1 Environmental Management .............................................................................. 262
8.2 Relationship of the EAP to other Project Plans .................................................... 263
8.3 EAP Component Plans ......................................................................................... 264
8.3.1 AESNP Environmental Manual ........................................................................ 264
8.3.2 Public Consultation and Disclosure Plan (PCDP) ............................................. 266
8.3.3 Resettlement Action Plan (RAP) ...................................................................... 266
8.4 Construction Contractor’s Plans ................................................................. 267
8.4.1 Hydropower Facility Environmental Mitigation Plan and Environmental Monitoring Plan (EMP and EMoP) ......................................................... 271
8.4.2 UEB Transmission System Environmental Mitigation Plan (UEMP) .......... 271
8.4.3 UEB Transmission System Environmental Monitoring Plan (UEMoP) .......... 272
8.4.4 Health and Safety Management Procedures .................................................. 273
8.5 Implementation of the Environmental Action Plan ............................................. 273
8.5.1 AESNP’s Commitments .................................................................................. 273
8.5.2 BEC’s Commitments ..................................................................................... 287
8.5.3 Reporting lines and decision-making .............................................................. 288
8.5.4 Environmental Auditing ................................................................................. 289
8.6 Responsibilities and Costs for Environmental Mitigation Measures ................. 291
8.7 Responsibilities and Costs for Environmental Monitoring Measures ................. 294
8.8 Institutional Strengthening ................................................................................. 297
8.8.1 Uganda Energy Board (UEB) ................................................................. 298
8.8.2 Forest Department ......................................................................................... 298
8.8.3 Local Planning Authorities ............................................................................. 299
8.8.4 NEMA ........................................................................................................ 299
8.9 Cash Flow for Mitigation, Monitoring and Community Development ............... 299

9. REFERENCES .................................................................................................. 303

TABLES
Table 2.1: World Bank Group and IFC Safeguard Policies: An Overview ................... 29
Table 2.2: International Environmental Conventions to Which Uganda is a Signatory .... 34
Table 3.1: Summary of Biodiversity and Conservation Importance of the Five Indicator Taxa Surveyed in Mabira Forest Reserve ..................................................... 61
Table 3.2: Locations of Transect Sites Used for Ecological Survey Within Mabira FR ..................................................................................................................... 73
Table 3.3: Population Distribution and Density (1991) ............................................. 80
Table 3.4: Land Use along Route Corridor (km) ....................................................... 87
Table 3.5: 1997 Production Statistics for Food Crops in Mukono and Mpigi Districts 89
Table 3.6: Top 10 Outpatients Department Diagnoses in 1995 for All Reporting District .............................................................................................................. 90
Table 3.7: Cumulative reported AIDS cases by year in Uganda ............................... 91
Table 3.8: Health Profile for Mukono District and Uganda for the Year 1993 .......... 92
Table 4.1: Summary of Key Impacts of Route Corridors (from WS Atkins, 1998) .... 117
Table 4.2: Summary of Impacts of Three Potential Substation Sites in the Kawanda Area (from WS Atkins 2000) ................................................................. 125

AES Nile Power
March, 2001
Table 4.3: Other Alternatives Reviewed During EIA Studies and Conclusions of Those Reviews

Table 5.1: Existing Bridge Crossings in Mabira Forest and Works Required

Table 6.1: Summary of Consultation Activities for the Bujagali Project Transmission System

Table 7.1: Compliance of the Bujagali Electrical Transmission System Project with Government of Uganda Policies and Regulations

Table 7.2: Compliance of the Bujagali Electrical Transmission System Project with World Bank/IFC Operational Policy

Table 7.3: Compliance of the Bujagali Electrical Transmission System Project with International Treaties and Conventions Ratified by Uganda

Table 7.4: Total Land Requirements and Encumbrances

Table 7.5: Estimated Costs Associated With Purchase of a Private Forest and Enrichment Planting (from Muramira 2000b)

Table 7.6: Comparison of Electric and Magnetic Fields

Table 7.7: Description of Impact on Landscape and Property and Impact Rating

Table 7.8: Impact Mitigation, Net Effects Analysis, and Effects Monitoring Activities

Table 8.1: Mitigation Responsibilities

Table 8.2: Monitoring Responsibilities

Table 8.3: Cashflows for environmental and social mitigation and monitoring (thousand USD)

Figures

Figure 1.1: Location of the Bujagali Project

Figure 1.2: Location of Owen Falls and Bujagali Projects in Uganda

Figure 1.3: Existing and Proposed Electrical Transmission Works

Figure 1.4: Bujagali Project Schedule

Figure 2.1: EIA Process Flowchart for Uganda

Figure 3.1: Biophysical Features

Figure 3.2: Photographs of Landscape Units Along the Proposed Transmission System Route

Figure 3.3: Mabira Forest Reserve & Surrounding Forest Reserve

Figure 3.4: Current Land Uses Within Existing 30m Wayleave and Proposed 35 m Wayleave in the Mabira Forest

Figure 3.5: Photographs of Wayleave Within Mabira Forest Reserve

Figure 3.6: Socio-economic Features Along the Proposed Transmission System Route

Figure 4.1: Present Electrical Distribution Network in Uganda

Figure 4.2: Schematic Diagram of Study Area Power Infrastructure

Figure 4.3: Revised Connection of Bujagali Power Station to Ugandan National Network

Figure 4.4: Bujagali Project Connection to National Network

Figure 4.5: Alternative Transmission System Routes

Figure 4.6: Alternative Substation Sites in Kawanda Area
Figure 4.7: Conceptual Layout of Kawanda Substation ................................................. 127
Figure 4.8: Optimised Transmission System Route .................................................. 131
Figure 4.9: Major Milestones of Transmission System Development ......................... 141
Figure 4.10: ROW and Wayleave Requirements for 132 kV and 220 kV Transmission Lines .............................................................. 143
Figure 5.1: Organogram of Bujagali EPC Consortium (BEC) .................................... 146
Figure 5.2: Preliminary EPC Programme for Bujagali Transmission Line .................... 147
Figure 5.3: Transmission Tower Foundations ...................................................... 151
Figure 5.4: Tower Erection with Lateral Gin Pole ..................................................... 153
Figure 5.5: Tower Erection with Swinging Gin Pole .................................................. 155
Figure 5.6: Typical Design for a 220 kV Tension Tower ........................................... 159
Figure 5.7: Typical Design for a 220 kV Suspension Tower ...................................... 161
Figure 5.8: Existing Bridge Structures in Mabira Forest ......................................... 163
Figures 5.9: Compatible and Non-Compatible Uses of Wayleave ............................. 169
Figure 5.10: Compatible and Non-Compatible Uses of Wayleave ............................. 171
Figure 5.11: Preliminary EPC Programme for Kawanda Substation ......................... 173
Figure 5.12: Access Road to Kawanda Substation Site .......................................... 175
Figure 6.1: Public Consultation and Disclosure in Relation to Major Milestones of Transmission System Development ................................. 181
Figure 6.2: Villages Consulted Along Preferred Transmission Corridor ........................ 185
Figure 7.1: Range of Ownership Situations Encountered and Strategies for Compensation .......................................................... 209
Figure 7.2: Schematic of Cumulative Effects and Proposed Transmission Lines within Study Area ................................................................ 239
Figure 7.3: Schematic of Cumulative Effects of Transmission Lines Within Study Area Forest Reserves ................................................................. 241
Figure 8.1: Relationship of Bujagali Project Plan with ISO Standards and Skanska Policies .......................................................... 264
Figure 8.2: Component Plans of the Environmental Action Plan ................................. 265
Figure 8.3: Production Phase Preparation (Source: BEC, November 2000) ................. 269
Figure 8.5: AESNP Implementation Team Organisation Chart .................................. 275
Figure 8.6: Gantt charts with budgets and responsibilities ........................................ 276
Figure 8.7: BEC Environment/Working Environment Department Organisation Chart .... 288
APPENDICES (PROVIDED IN SEPARATE VOLUME)

Appendix A: Terms of Reference
Appendix B: List of Study Team
Appendix C.1: Description of Soils Within the Region
Appendix C.2: Climatic Information for the Region
Appendix C.3: Flora and Fauna Within Forest Reserves
Appendix C.4: Extracts from the Forest Management Plan for Mabira Forest Reserve, March 1999
Appendix C.5: Extracts from the Forest Management Plan for Mabira Forest Reserve, July 1997 - June 2007
Appendix C.6: Presence/Absence Data for Plants at Sites 1-9
Appendix C.7: Woody Species Above 3 cm dbh and their Abundance at Each Site
Appendix C.8: Species Accumulation Curves for Plant Species at Each Transect Site
Appendix C.9: List of Birds Recorded in Mabira, Kifu, and Namyoya Forest Reserves
Appendix C.10: Bird Species Recorded During 80 Point Counts at Eight Sites in Mabira Forest
Appendix C.11: Analysis of Time-Species Counts for Mabira, Kifu and Namyoya Forest Reserves
Appendix C.12: Vegetation Surveys Undertaken in Mabira, Kifu and Namyoya Forest Reserves
Appendix C.13: Report on the Assessment Study in Mwola (also known as Namyoya) Forest Reserve
Appendix D.1: Brief Assessment of the Proposed Replacement Forests in the Mitigation Plan to the Impacts of the 220 kV Electric Transmission Line Wayleave Through Mabira Forest Reserve
Appendix D.2: Environmental Economic Assessment of the 220 kV Electric Transmission Line Wayleave Through Mabira Forest Reserve
Appendix D.3: Mitigation Plan to the Environmental Economic Impacts of the 220 kV Electric Transmission Line Wayleave Through Mabira Forest Reserve
Appendix E: Minutes of Meetings With the Ugandan Electricity Board
Appendix F: WS Atkins' Notes of February, 2000 Evaluating Kawanda-Area Substation Sites
Appendix G: Site Description and Settlement Patterns Along the Preferred Transmission System Route
Appendix H: Public Consultation and Disclosure Plan
Appendix I.1: Skanska Environmental Policy
Appendix I.2: 'Our Way of Working'
Appendix I.3: Draft Project Plan
Appendix I.4: SEO/EWE Manager's Job Description
Appendix I.5: Site Inspection Sheet
Appendix I.6: Example of Environmental Mapping
## GLOSSARY

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AESNP</td>
<td>AES Nile Power</td>
</tr>
<tr>
<td>AfDB</td>
<td>African Development Bank</td>
</tr>
<tr>
<td>ASU</td>
<td>Area Superintendent</td>
</tr>
<tr>
<td>BEC</td>
<td>Bujagali Engineering, Procurement and Construction Consortium</td>
</tr>
<tr>
<td>BHPP</td>
<td>Bujagali Hydroelectric Power Project</td>
</tr>
<tr>
<td>CFR</td>
<td>Central Forest Reserve</td>
</tr>
<tr>
<td>DAO</td>
<td>District Agricultural Officer</td>
</tr>
<tr>
<td>dBLaeq</td>
<td>Energy Equivalent Sound Level in Decibel, A-Weighted</td>
</tr>
<tr>
<td>Dbh</td>
<td>Diameter at Breast Height</td>
</tr>
<tr>
<td>DCS</td>
<td>Digital Control System</td>
</tr>
<tr>
<td>DEO</td>
<td>District Environmental Officer</td>
</tr>
<tr>
<td>EAP</td>
<td>Environmental Action Plan</td>
</tr>
<tr>
<td>EdF</td>
<td>Électricité de France</td>
</tr>
<tr>
<td>EI</td>
<td>Environmental Inspector</td>
</tr>
<tr>
<td>EIA</td>
<td>Environmental Impact Assessment</td>
</tr>
<tr>
<td>EIS</td>
<td>Environmental Impact Statement</td>
</tr>
<tr>
<td>EMF</td>
<td>Electro-Magnetic Field</td>
</tr>
<tr>
<td>EMP</td>
<td>Environmental Management Plan</td>
</tr>
<tr>
<td>EMoP</td>
<td>Environmental Monitoring Plan</td>
</tr>
<tr>
<td>EMS</td>
<td>Environmental Management Structure</td>
</tr>
<tr>
<td>EPC</td>
<td>Engineering, Procurement, and Construction Contractor</td>
</tr>
<tr>
<td>ERP</td>
<td>Environmental Review Panel</td>
</tr>
<tr>
<td>ESG</td>
<td>ESG International Inc.</td>
</tr>
<tr>
<td>EWE</td>
<td>Environmental Working Environment</td>
</tr>
<tr>
<td>FD</td>
<td>Forest Department</td>
</tr>
<tr>
<td>FR</td>
<td>Forest Reserve</td>
</tr>
<tr>
<td>FSL</td>
<td>Full Supply Level</td>
</tr>
<tr>
<td>GoU</td>
<td>Government of Uganda</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Full Form</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Bujagali Project Transmission System EIS</td>
<td></td>
</tr>
<tr>
<td>HGV</td>
<td>Heavy Goods Vehicle</td>
</tr>
<tr>
<td>HV</td>
<td>High Voltage</td>
</tr>
<tr>
<td>ICNIRP</td>
<td>International Committee on Non-Ionising Radiation Protection</td>
</tr>
<tr>
<td>IDA</td>
<td>International Development Agency</td>
</tr>
<tr>
<td>IFC</td>
<td>International Finance Corporation</td>
</tr>
<tr>
<td>IPP</td>
<td>Independent Power Producers</td>
</tr>
<tr>
<td>IUCN</td>
<td>International Union for Conservation of Nature and Natural Resources</td>
</tr>
<tr>
<td>kV</td>
<td>Kilovolt</td>
</tr>
<tr>
<td>kW/hr</td>
<td>Kilowatts per hour</td>
</tr>
<tr>
<td>LC</td>
<td>Local Council (ranging from LC1 (village) to LC5 (district))</td>
</tr>
<tr>
<td>mAD</td>
<td>meters above Jinja datum</td>
</tr>
<tr>
<td>mG</td>
<td>milliGauss</td>
</tr>
<tr>
<td>MOL</td>
<td>Minimum Operating Level</td>
</tr>
<tr>
<td>MSL</td>
<td>Mean Sea Level</td>
</tr>
<tr>
<td>MUIENR</td>
<td>Makerere University Institute of Environment and Natural Resources</td>
</tr>
<tr>
<td>MW</td>
<td>Megawatt</td>
</tr>
<tr>
<td>NARO</td>
<td>National Agriculture Research Organisation</td>
</tr>
<tr>
<td>NEMA</td>
<td>National Environmental Management Authority</td>
</tr>
<tr>
<td>NWCMP</td>
<td>National Wetlands Conservation and Management Programme</td>
</tr>
<tr>
<td>OFEPS</td>
<td>Owen Falls Extension Power Station</td>
</tr>
<tr>
<td>OP</td>
<td>Operational Policies (of the IFC)</td>
</tr>
<tr>
<td>PAPs</td>
<td>Project Affected Persons</td>
</tr>
<tr>
<td>PC</td>
<td>Point Counts</td>
</tr>
<tr>
<td>PCDP</td>
<td>Public Consultation and Disclosure Programme</td>
</tr>
<tr>
<td>PoE</td>
<td>Panel of Experts</td>
</tr>
<tr>
<td>PM</td>
<td>Project Manager</td>
</tr>
<tr>
<td>PPA</td>
<td>Power Purchase Agreement</td>
</tr>
<tr>
<td>PRO</td>
<td>Production Manager</td>
</tr>
<tr>
<td>PSCP</td>
<td>Pollutant Spill Contingency Plan</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>----------------------------------------------------------</td>
</tr>
<tr>
<td>RAP</td>
<td>Resettlement and Community Development Action Plan</td>
</tr>
<tr>
<td>RPF</td>
<td>Request for Proposal</td>
</tr>
<tr>
<td>RoW</td>
<td>Right of Way</td>
</tr>
<tr>
<td>SCoufl</td>
<td>Sugar Corporation of Uganda Ltd.</td>
</tr>
<tr>
<td>SEO</td>
<td>Site Environmental Officer</td>
</tr>
<tr>
<td>SH&amp;E</td>
<td>Safety, Health, and Environment</td>
</tr>
<tr>
<td>TMP</td>
<td>Traffic Management Plan</td>
</tr>
<tr>
<td>TSC</td>
<td>Timed Species Count</td>
</tr>
<tr>
<td>UEB</td>
<td>Ugandan Electricity Board</td>
</tr>
<tr>
<td>UEMP</td>
<td>UEB Transmission System Environmental Mitigation Plan</td>
</tr>
<tr>
<td>UEmoP</td>
<td>UEB Transmission System Environmental Monitoring Plan</td>
</tr>
<tr>
<td>UHF</td>
<td>Ultra High Frequency</td>
</tr>
<tr>
<td>Ush</td>
<td>Ugandan Shilling</td>
</tr>
<tr>
<td>UWA</td>
<td>Uganda Wildlife Authority</td>
</tr>
<tr>
<td>UWS</td>
<td>Uganda Wildlife Society</td>
</tr>
<tr>
<td>WB</td>
<td>World Bank</td>
</tr>
<tr>
<td>WBG</td>
<td>World Bank Group</td>
</tr>
<tr>
<td>WCD</td>
<td>World Commission on Dams</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organisation</td>
</tr>
<tr>
<td>WMP</td>
<td>Waste Management Plan</td>
</tr>
<tr>
<td>WSAI</td>
<td>WS Atkins International</td>
</tr>
<tr>
<td>VLF</td>
<td>Very Low Frequency</td>
</tr>
</tbody>
</table>
1. INTRODUCTION

1.1 Project History

The Bujagali project is a proposed 250MW hydropower facility on the Victoria Nile in the Republic of Uganda. It is located approximately 8km downstream (i.e. north) of the Town of Jinja (Figure 1.1). AES Nile Power (AESNP) is the proponent of this project. To evacuate power from the proposed hydropower facility effectively, new transmission lines and improvements to some of Uganda's existing transmission and distribution system will be required. These new lines and system improvements are the subject of this Environmental Impact Statement (EIS)¹.

This EIS has been prepared to comply with the requirements of the National Environmental Management Authority (NEMA), Uganda's co-ordinating agency for Environmental Impact Assessment (EIA). A separate EIS was prepared for the hydropower generation component of the Bujagali project in March 1999 and approved with certain conditions by NEMA in November 1999 (WS Atkins, 1999). As the World Bank Group and the African Development Bank are potential lenders for the project, this document has also been prepared in accordance with their EIA requirements. Uganda is a small, landlocked country straddling the Equator in East Africa with a population of 20.9 million people (World Bank, 1999). Uganda's location in eastern Africa is shown in the inset of Figure 1.1. With a per capita Gross National Product of US$320 per annum (World Bank, 1999), Uganda is one of the world's poorest countries. In 1986, when President Yoweri Museveni came to power in Uganda, broad political, economic, and social reforms were initiated following a fifteen-year period of political, economic, and social turmoil in the country. By 1995, President Museveni's reforms had produced dramatic results as inflation decreased from 240% in 1987 to 5.4% in 1995 (World Bank, 1999). Despite the stability and economic gains brought by President Museveni's government, Uganda remains one of the least developed nations in the world. One indicator of Uganda's low degree of development is the lack of electricity in the country.

¹ NEMA uses the term “EIS” to refer to the published document summarising an EIA process. For the World Bank Group, “EIA” can refer to both the document and the process. Clarifications of terminology are made in the Glossary to this report. Additional details are provided in Chapter 2.
This page is intentionally blank.
Figure 1.1

Project Name: Bujagali Transmission System EIS
Date: December, 2000
File: 04053_T.12

Prepared for: AES Nile Power

Location of the Bujagali Project
At present, less than 6% of Uganda’s population have access to electricity in their homes (this figure is less than 1% for people living in rural areas) and, of those that do, many experience “load-shedding” blackouts on a recurrent, if not daily, basis. Economic growth in Uganda has also been compromised by this inadequate supply of power. Businesses lose *circa* 90 working days each year due to power cuts and load shedding, hampering Uganda’s economic growth by approximately 2% per annum (Ugandan Investment Authority, 1999). Present domestic demand for electricity is growing at a rate of 7-8% per annum (Électricité de France, 2000; Mubiru, 1999). The latest load forecasts by EdF (2000) estimate that by 2020, 783MW of capacity will be required to meet demand.

Uganda’s primary source of electricity is the 180 MW hydropower station located at Owen Falls, originally commissioned in 1954. A further hydroelectric development, known as the “Owen Falls Extension Project (OFEP),” is also under construction at Jinja. The locations of the original Owen Falls hydropower station and the OFEP, relative to the proposed Bujagali hydropower project, are shown in Figure 1.2. Two 40 MW turbines, the first phase of the OFEP, came on line in June and August 2000, respectively. This additional 80 MW capacity, however, is expected to be consumed by present unmet demand (Acres, 2000; UEB, 2000). Further electrical generation projects, apart from the Owen Falls Extension Project, are still needed to support Uganda’s economic development. In addition, the Government of Uganda (GoU) has identified electricity generation as a priority to assist in its poverty alleviation programme (Turyahikaho, 2000).
This page is intentionally blank.
Proposed Bujagali Site
The proposed Bujagali hydropower project is designed to meet Uganda's growing electricity demand in the context of the country's above-noted poverty alleviation and economic development objectives. From the forecasts of EdF (2000), the Bujagali hydropower project will also produce a surplus of energy with respect to domestic demand in its early years. This could enable the Uganda Electricity Board (UEB) to continue to export power to neighbouring countries when domestic demand is satisfied. Export of power by UEB would normally be carried out during "off-peak" periods.

AESNP is a special purpose company of the AES Corporation (U.S.A.) that has been incorporated in Uganda to build a hydroelectric project at Dumbbell Island, approximately 2.5 km downstream from Bujagali Falls on the Victoria Nile (see inset of Figure 1.2). The project will comprise a 250 MW power station, housing 5 x 50 MW turbines, with an associated 30 m high dam and spillway works. As noted earlier, NEMA approved the hydropower component of the Bujagali project in November 1999. The hydropower component of the Bujagali project will be owned and operated by AESNP for a period of 30 years; the transmission system component of the project will be constructed by AESNP, but gifted to UEB upon completion.

1.2 Key Project Features

In order to evacuate power from the new Bujagali hydropower facility at Dumbbell Island, AESNP has agreed to construct the following:

- A 200kV / 132kV switchyard on the west bank of the Victoria Nile adjacent to the Dumbbell Island hydropower facility (previously approved by NEMA as part of the Hydropower EIS, Atkins 1999);

- A 132kV line south from the Bujagali switchyard to the existing 132 kV line from Owen Falls to Tororo (length – 4.5 km), where that line will be severed;

- A second 132 kV line extending north from the severed Owen Falls-Tororo line to interconnect with the Bujagali switchyard (length – 5.0 km);

- A new 220 kV transmission line from the Bujagali switchyard to a new substation at Kawanda, north of Kampala (length 70.5 km);

- A new substation at Kawanda; and,
• A new 132 kV line from the Kawanda substation to the existing 132kV substation at Mutundwe in southern Kampala (length – 17.5 km). Internal improvements (i.e. new bay and switching gear) at Mutundwe to accommodate this new 132 kV line will also be required.

The above-noted transmission system components of the Bujagali project, relative to the existing transmission infrastructure in the same area, are shown in Figure 1.3. All these components are collectively referred to as the “Bujagali transmission system” in this EIS and constitute what AESNP is seeking approval for from NEMA and multilateral and bilateral funding institutions. AESNP is seeking these approvals on behalf of UEB.
Figure 1.3

BUJAGALI TRANSMISSION NETWORK

- Existing Substations
- Existing Lines
- New Substations
- New Lines

For illustration purposes only. Not to scale.
1.3 Project Schedule

AES Nile Power has been in Uganda since 1994, in response to an invitation from President Museveni to independent power producers around the world to assist in the development of the country’s electricity infrastructure. Figure 1.4 shows the milestone events that have occurred from that time forward, and the scheduled targets for events planned in the future, for the Bujagali project. The milestone events that have occurred specifically with respect to the Bujagali project transmission system are also shown in Figure 1.4.

1.4 EIA Process

The contents of this EIS report are designed to meet NEMA’s, as well as the World Bank Group’s and the African Development Bank’s documentation requirements, following an EIA process that has complied with these agencies’ procedural requirements. The EIS is accompanied by two separate volumes, the Transmission System Technical Appendices and the Transmission System Resettlement Action Plan (RAP). This EIS and its accompanying documentation will assist NEMA in deciding whether to approve the Bujagali transmission system domestically or not, and on what conditions. The EIA documentation (for both the transmission system and the hydropower generation component of the Bujagali project) is also intended to assist the World Bank Group and the African Development Bank in deciding whether to assist in financing the project or not.

A key aspect of the approach undertaken by AESNP for the Bujagali project was to conduct the EIA study according to terms of reference that were reviewed and endorsed by review agencies and affected members of the public. A Scoping Report and Terms of Reference for the Transmission Line EIS (WS Atkins, 1998) was produced in December 1998, following site visits and consultation with national and local stakeholders. The terms of reference from this document are reproduced in Appendix A. The Scoping Report examined transmission corridor options and identified an optimal corridor from the options considered. It was circulated to many reviewers for comment prior to commencement of the main EIA study, including: NEMA, IFC, UEB, Forest Department, the independent Panel of Experts (PoE) retained by AESNP for this project, and the National Wetlands Conservation and Management Programme (NWCMP) Director.
The main EIA study for the transmission system commenced in January 1999, comprising ecological fieldwork and consultations with relevant review agencies and potentially affected people. In March 1999, an Interim Draft EIS (WS Atkins 1999b) was submitted to NEMA and IFC and circulated to a number of other stakeholders for comment. On the basis of comments received on the Interim Draft, and detailed socio-economic, geotechnical and engineering feasibility studies in the corridor which followed, an optimised transmission route was selected, including individual tower locations and the substation site at Kawanda. A listing of experts who were involved in the preparation of these reports is in Appendix B.

Following this introduction, the contents of the Bujagali Project Transmission System EIS are as follows:

- Chapter 2 describes the legislative, regulatory, and policy requirements for the project;
- Chapter 3 describes the baseline conditions in the transmission system route from both an environmental and socio-economic perspective;
- Chapter 4 establishes the need for the project and discusses alternatives analysis and project description;
- Chapter 5 discusses the project construction and operation activities;
- Chapter 6 describes the public consultation and disclosure programme undertaken for the project;
- Chapter 7 describes impact identification, management and monitoring; and,
- Chapter 8 details the Environmental Action Plan.

A more detailed breakdown of the contents of each of these chapters can be seen in the Table of Contents in the front of this report. In addition, this EIS is accompanied by a volume of Technical Appendices and the Transmission System Resettlement Action Plan (RAP).
2. LEGISLATIVE, REGULATORY AND POLICY REQUIREMENTS

Environmental approvals for the construction and operation of electrical transmission systems in Uganda fall under the jurisdiction of the National Environment Management Authority (NEMA). This Environmental Impact Statement (EIS) has been prepared to comply with NEMA’s requirements. It has also been prepared to address the environmental and social review requirements of AESNP’s lenders. Consequently, this section discusses the applicable legislative and regulatory requirements of the Government of Uganda and the guidelines and policies of the World Bank Group and the African Development Bank.

2.1 Government of Uganda

This Section considers the following Ugandan statutes associated with electricity transmission:

- The Constitution of the Republic of Uganda, 1995;
- The Electricity Act, 1999;
- The National Environment Management Statute, 1995, and its regulations;
- The Land Act, 1998;
- The Forest Act, CAP 246;
- The Local Government Act No.1/1997;
- The Town and Country Planning Act CAP 30; and,

2.1.1 The Constitution of the Republic of Uganda, 1995

The Constitution of Uganda provides for matters pertaining to land and the environment, amongst other issues. Government holds land in trust for the people and is required to protect natural lakes, rivers, wetlands, forest reserves, game reserves, national parks and any land to be reserved for ecological or tourism purposes for the common good of all citizens. In this regard, government is required to enact laws to protect and preserve the environment from abuse, pollution and degradation, and to manage the environment for sustainable development. Against these constitutional obligations and authority, government has enacted
several pieces of legislation discussed below that are applicable in respect of the proposed construction of the Bujagali Electrical Transmission System.

2.1.2 The Electricity Act, 1999

The Electricity Act, 1999 replaced the Electricity Act, 1964 (CAP 135). The application of the Electricity Act, 1999 is subject to the Electricity Act (Commencement) Instrument, which provides for its coming into force. Under the Instrument, section 131 of the Electricity Act, 1999, which repeals the Electricity Act, 1964 (CAP 135) is not yet effective. Therefore, the Electricity Act, 1964 (CAP 135) is still applicable to the extent that it is not inconsistent with the Electricity Act, 1999. The discussion below will focus on the application of the Electricity Act, 1999, which is the principal applicable law with respect to the construction and operation of transmission lines.

S.54 of the Electricity Act requires every person intending to construct, own or operate a transmission line to obtain a transmission license. The application for the transmission license is submitted to the Electricity Regulatory Authority (ERA), which is mandated with the issuance of such licenses. The ERA is required to review the various aspects of the proposed project including the impacts of the project on electricity supply, socio-economics, cultural heritage, the environment, natural resources and wildlife prior to the making of the decision whether to grant the license.

AES Nile Power is not a licensee for transmission. AES Nile Power derives its mandate to construct the transmission system by virtue of agreements with the Government of Uganda, identifying the Uganda Electricity Board (UEB) as the licensee for the Bujagali project’s transmission system. AES Nile Power will construct the transmission line on behalf of UEB, and for the benefit of UEB. The transmission system will be owned and operated by UEB. The authorisation of AES Nile Power to construct the line is granted under S.68 (1) of the Electricity Act by the Electricity (Authorisation of Construction of the UEB Electric Supply Line) Notice 2000.

Part VII of the Electricity Act deals with rural electrification. Government is required to promote, support and provide rural electrification programmes through public and private sector participation. Government is required to prepare a sustainable and co-ordinated Rural Electrification Strategy and Plan for Uganda. Government is also required to establish a Rural Electrification Fund to support rural electrification programmes. The moneys for the
fund are to be from a number of sources including a levy on transmission bulk purchases of electricity from generation stations.

Part VIII of the Act provides for acquisition of land. Under S.68 (1)(d), a licensee for transmission or his or her representative is authorized, inter alia, to enter any land private or public to perform any activity necessary for establishing, constructing, repairing, improving, examining, altering or removing an electric supply line. However, in undertaking such activity, the licensee is required to cause as little damage as possible to the land and the environment and is required to ensure prompt payment of fair and adequate compensation to all interested parties for any damage or loss sustained (S.68 (3)). Further, under S.68 (2), a licensee or his or her representative does not acquire any other right in the land other than the right of user of the land under, over, across, in or upon which the electric supply line or post is placed.

Under S.68 (4), prior to entering any private land, a licensee or his or her representative, is required to give 60 days notice to the owner of the land, stating as fully and accurately as possible the nature and extent of acts intended to be conducted.

In the case of land under the management of the Uganda Land Commission, S.69 (2) the Electricity Act requires service of 30 days notice prior to entry, stating the nature and extent of acts intended to be done.

A person objecting to entry on to his/ her land for purposes of constructing a transmission line may lodge an objection to the ERA within 30 days from the date of receipt of the notice. The ERA will consider the objection and if found inadequate may cause compulsory entry in to the land but the affected person would still have the recourse to appeal to a tribunal or the High Court.

S.71 of the Electricity Act deals with compensation. Compensation for affected people should be determined in accordance with the Land Act, 1998 and the Land Acquisition Act, 1965. Where an interest in land greater than the right of use is required for purposes of construction of the line, government may exercise compulsory acquisition.

The National Environment Statute provides the legal framework for sustainable management of Uganda's environmental resources and for the establishment of NEMA. Section 20 makes it a legal requirement for every developer to undertake an Environmental Impact Study (EIS) where the project is listed in the third schedule in the Statute. Among the projects listed in this schedule are electrical transmission lines (paragraph 10 (b)) and electrical substations (paragraph 10 (c)). The Bujagali-Kampala transmission line and associated works to the transmission system will therefore require a certificate of approval before the project can be implemented.

The procedure for conducting the EIS as well as the considerations for the developer are elaborated further in the Environmental Impact Assessment Regulations S.I No. 13/1998. The regulations also provide for the procedure for review and approval of the EIS. The review may last a maximum period of 180 days from the date of submission of the Environmental Impact Statement report and involves consultation with lead agencies, the directly affected people and the public. As part of the EIS review process, NEMA may also call for a public hearing on the project. The public hearing is non-judicial and is conducted in accordance with the EIA Public Hearing Regulations, 1999.

Section 37 (1) (b) restricts the erection, construction or placing of any structure in, on, under or over a wetland without the approval of NEMA or the National Wetlands Conservation and Management Programme (NWCMP). The NWCMP coordinates the National Wetlands Policy, 1999 whose objectives include, inter alia, enhancing the optimal use of wetlands in a suitable manner and to end practices, which reduce wetland productivity.

2.1.4 The Land Act, 1998

The Land Act provides for acquisition of land or rights of use of land for execution of public works. A licensee under the Electricity Act is an Authorized Undertaker under the Land Act authorized to execute public works (S.68 (9)). S.74 of the Land Act provides for acquisition of land for execution of public works. Where it is necessary to execute any public works on any land, an authorized undertaker should seek to enter into mutual agreement with the occupier or owner of the land, and if no agreement is reached, the Minister responsible for land may be obliged to acquire the land.
The Constitution of Uganda requires prompt payment of fair and adequate compensation where land is compulsorily acquired. Such compensation is assessed in accordance with the valuation principles laid out in S.78 of the Land Act, briefly outlined below:

- The value for customary land is the open market value of the unimproved land;
- The value of buildings on the land is taken at open market value for urban areas, and depreciated replacement cost for rural areas;
- The value of standing crops on the land is determined in accordance with the district compensation rates established by the respective District Land Board. Annual crops which could be harvested during the period of notice to vacate given to the landowner/occupier of the land are normally excluded in determining the total compensation; and,
- In addition to the total compensation assessed, there is a disturbance allowance paid of fifteen per cent or, if less than six months’ notice to give up vacant possession is given, thirty per cent of the total sum assessed.

As noted in the discussion under the Electricity Act (1999), above, a licensee for transmission only acquires a right of use of the land - not title to the land - except for land required for substations. The assessment of compensation for the right use is based on the diminished use of the land by owner/occupier of the land.

Part III of the Land Act provides for land use. A person who owns or occupies land is required to manage and utilize land in accordance with the Forest Act, Mining Statute, National Environment Statute, 1995, The Uganda Wildlife Statute, 1996 and any other law. S.46 provides that any use of land is also required to conform to the provisions of the Town and Country Planning Act.

2.1.5 Forest Act Cap 246

The Forest Act is the main law that regulates and controls forest management in Uganda by ensuring forest conservation through the creation of forest reserves in which human activities are strictly controlled. The Constitution of Uganda also protects forests as natural resources to be reserved for ecological and tourist purposes for the common good of all citizens.

The proposed transmission line from Bujagali to Kampala passes through the Mabira Forest Reserve as well as two other smaller forests, namely Namyoya (also referred to as Mwola
Forest Reserve in some Ugandan mapping and documentation) and Kifu Forest Reserve. All three forests are declared under the Forest Act as Central Forest Reserves by virtue of the Forestry Reserves (Declaration) Order - Statutory Instrument 246-1. The management of Central Forest Reserves is subject to the Forest Rules – Statutory Instrument 246-2. All the above named forests are under the administration of the Forest Department of the Ministry of Lands, Water and Environment.

S.14 of the Forest Act provides for prohibited acts in forest reserves. No person is allowed to cut, take, and work or remove forest produce unless licensed to do so under the Act. Further, no person is allowed to clear, use or occupy any land in a forest reserve for the various listed purposes including industrial purposes and to construct or re-open any road or track without a permit granted under the Forestry rules. The Chief Conservator or forest officer appointed by the Chief Conservator grants the above licenses and permits.

The Ministry of Lands, Water and Environment also established a policy framework for the sustainable management of forest reserves. This policy framework includes the Forestry Nature Conservation Plan, March 1999 and the Forest Management Plan for Mabira Forest Reserve for the period of 1 July 1997 to 30 June 2007. The Forestry Nature Conservation Plan is a national plan that describes how the Forestry Department intends to integrate the conservation of biodiversity and other conservation measures in its programmes. It has primacy over forest management plans that are prepared for individual forest reserves (Forest Department, 2000). The Forest Management Plan for Mabira Forest Reserve 1997-2007 covers Mabira, Namukapa, Nadagi, Kalagala Falls, Namawanyi and Namananga Forest Reserves, all situated in Mukono district. The objectives of the management plan include conservation of the forest biodiversity and ecological condition and harnessing of the forest products in a manner that does not compromise the sustainability of the forest to provide environmental services and other local uses.

2.1.6 The Local Government Act No. 1/1997

This Act gives effect to the Government Policy on de-centralization and devolution of functions, powers and services to Local Governments. Under this Act, District and lower Local Councils are granted the responsibility of managing their natural resources. Some of the de-centralized services and activities for which District Councils are responsible include land administration, physical planning forests and wetlands.
2.1.7 The Town and Country Planning Act Cap 30

This Act consolidates the provisions for the orderly and progressive development of land, towns and other areas whether rural or urban. It establishes a Town & Country Planning Board that has the powers to declare an area a Planning Area on the recommendation of a local authority. All districts are required to prepare a Structure Plan indicating land use and development proposals and policies.

2.1.8 The Uganda Wildlife Statute, 1996

The Uganda Wildlife Statute provides for, *inter alia*, the sustainable management of wildlife, and establishes the Uganda Wildlife Authority as the body mandated with coordination, monitoring and supervision of wildlife management.

Wildlife is defined by the Statute to include wild plants. The Statute requires any developer desiring to undertake any project, which may have a significant impact on any wildlife species to undertake an environmental impact assessment in accordance with the National Environment Statute, 1995. The Uganda Wildlife Authority is also mandated, in consultation with NEMA, to carry out audits and monitoring of projects likely to affect wildlife.

2.1.9 Ugandan EIS Requirements

In 1995, the Government of Uganda promulgated the *National Environment Statute*. Under this statute, NEMA was created as the principle agent for coordinating, monitoring, and supervising all aspects of environmental management in Uganda. EIS emerged from this statute as a formal and legal requirement for all projects likely to have environmental impacts (Wabunoha, 2000). According to the Third Schedule of the *National Environment Statute*, all electricity infrastructure projects (including electricity generation stations, electrical transmission lines, electrical substations and pumped-storage schemes) must be the subject of a detailed EIS.

In Uganda, the level of EIS required depends on the nature, scale, site and possible effects of the proposed policy or project. There are three major categories for Ugandan EISs. The Bujagali project falls into the third category, which includes:

Projects which clearly will have significant impacts whose mitigation measures cannot readily be prescribed unless a detailed environmental impact study (EIS) of the project and its possible alternatives is conducted, with a view to determine
if an alternative exists which has minimal or less adverse environmental impacts (NEMA, 1997).

The EIA process in Uganda consists of three sequential phases: screening, environmental impact study and decision-making. These components can be applied to policies and projects in their conceptual and design stages or after completion of policy and/or project formulation and design, but before actual implementation.

After NEMA reaches a decision on the proposed project, if it is approved, the developer will be licensed or permitted to implement the project in accordance with the terms and conditions attached to the approval. If it is denied, the developer may, if such denial is based on environmental considerations that can be improved, be urged to revise the proposed project to eliminate adverse impacts, or choose to abandon the project.

Figure 2.1 provides a schematic diagram of the EIA process in Uganda.
2.2 World Bank Group

The Bujagali Transmission System EIS has been prepared to address the requirements of two members of the World Bank Group (WBG): the International Development Association (IDA) and the International Finance Corporation (IFC).

World Bank Group environmental and social reviews are guided by a hierarchy of requirements that include:

- Environmental and social ‘safeguard’ policies;
- Specific guidelines developed primarily by industrial sector; and,
- Other guidance and reference documents.

These exist within a framework of review, appraisal and decision-making procedures that differ somewhat among the different component institutions of the WBG. The policies and procedures of the IDA and IFC are described in Section 2.2.1.

Some of the primary World Bank Group reference documents that were utilised in the preparation of this EIS were, among others:

- Procedure for Environmental and Social Review of Projects (IFC, 1998);
- Guidance for Preparation of a Public Consultation and Disclosure Plan (IFC, 1998);
- Occupational Health and Safety Guidelines (IFC, 1998);
- Guidance for Preparation of a Resettlement Plan (World Bank, 1998);
- World Bank Operational Manual (World Bank Group); and,

2.2.1 Policies and Procedures

IDA and IBRD operational policies and procedures are codified in the World Bank Operational Manual. In 1987, the World Bank began consolidation of its Operational Manual Statements and Operational Policy Notes into Operational Directives. The Operational Directives included elements of policy, procedure, and guidance. In the 1990s, to differentiate between the elements of policy, procedure and guidance, the World Bank began the process
of converting the Operational Directives into a new system that describes Operational Policies, Bank Procedures, and Good Practices, as described below.

Up until July 1998, the IDA and IFC both utilised the World Bank’s Operational Policies. At that time, the IFC adopted its own Operational Policies (OPs). These IFC OPs were based on those of IBRD, with modifications to respond to the specific needs of IFC’s private sector mandate. IDA continues to utilise those of IBRD.

OPs cover matters of importance to the World Bank’s core objectives and provide staff direction and guidance in pursuit of those objectives. OPs establish the parameters for the conduct of operations, and also describe the circumstances under which exceptions to policy are admissible and clarify who authorizes such exceptions.

Operational Directives (ODs) contain a mixture of policies, procedures, and guidance. The ODs are gradually being replaced by OPs/BPs/GPs, which present policies, procedures, and guidance separately.

Table 2.1 provides a listing of the World Bank and IFC Operational Policies and Directives. Chapter 7 of this report discusses the applicability of these policies and directives to the Bujagali Transmission System Project.
<table>
<thead>
<tr>
<th>Safeguard Policy</th>
<th>Summary of Provisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>OP 4.01, Environmental Assessment (EA)</td>
<td>- States that all projects proposed for World Bank Group funding require EA review/analysis to ensure that they are environmentally and socially sound/sustainable.</td>
</tr>
<tr>
<td></td>
<td>- An EA evaluates a project’s potential environmental risks and impacts; examines project alternatives; identifies ways of preventing, minimizing, mitigating or compensating for adverse environmental impacts and enhancing positive impacts.</td>
</tr>
<tr>
<td></td>
<td>- EA considers: the natural environment (air, water and land); human health and safety; social aspects (involuntary resettlement, cultural property); as well as, trans-boundary and global environmental aspects.</td>
</tr>
<tr>
<td></td>
<td>- Various instruments are used to perform the EA depending on the complexity of the project: an Environmental Impact Assessment (EIA), an environmental audit, a hazard or risk assessment, and/or an Environmental Action Plan (EAP).</td>
</tr>
<tr>
<td></td>
<td>- Projects are categorised based on environmental significance. Category ‘A’ projects require a full EIA undertaken by independent EA experts.</td>
</tr>
<tr>
<td></td>
<td>- Project sponsors for Category A projects must prepare a Public Consultation and Disclosure Plan (PCDP) and an Environmental Action Plan (EAP). Project sponsor must consult project-affected groups and local NGOs at least twice: before TORs for EA are finalized and once a draft EA report is prepared.</td>
</tr>
<tr>
<td></td>
<td>- During project implementation, the project sponsor reports on compliance with (a) measures as agreed upon with IFC, including implementation of an EAP; (b) status of mitigative measures; and (c) the findings of monitoring programs.</td>
</tr>
<tr>
<td>OP 4.04, Natural Habitats</td>
<td>- Aims to promote and support natural habitat conservation, protection, maintenance, rehabilitation, and improved land use</td>
</tr>
<tr>
<td></td>
<td>- The World Bank Group does not support projects that involve significant conversion or degradation of critical natural habitats</td>
</tr>
<tr>
<td></td>
<td>- Where impact to natural habitats is inevitable, there is an opportunity to identify an ‘offset’ as compensation</td>
</tr>
</tbody>
</table>
Table 2.1: World Bank Group and IFC Safeguard Policies: An Overview

<table>
<thead>
<tr>
<th>Safeguard Policy</th>
<th>Summary of Provisions</th>
</tr>
</thead>
</table>
| OP 4.09, Pest Management                  | • Supports the use of biological or environmental control methods rather than the use of pesticides<br>• If pesticides are required, the policy sets forth the criteria for their use                                                                 | OP 4.10, Indigenous Peoples (World Bank)<br>• Operational Policy 4.10 is forthcoming; projects must comply with OD 4.20, Indigenous Peoples in the interim.  
  • Policy aims to ensure that indigenous people benefit from development projects and are unaffected by potentially adverse effects<br>• If Indigenous peoples are affected by project development, project sponsor must develop an Indigenous Peoples Development Plan |
| OD 4.20, Indigenous Peoples (IFC)         |                                                                                                                                                                                                                         | OP 4.11, Cultural Property (World Bank)<br>• Operational Policy 4.11 is forthcoming; projects must comply with OPN 11.03, Cultural Property in the interim.  
  • Policy aims to assist in the preservation, protection, and enhancement of cultural properties and to avoid their elimination.  
  • If there is any question of cultural property in the area, a brief reconnaissance survey should be undertaken.  
  • “Cultural property” definition includes unique natural environmental features (canyons, waterfalls) with cultural values                                                                 |
| OP 4.12, Involuntary Resettlement (World Bank)<br>• Operational Policy 4.12 is forthcoming; projects must comply with OD 4.30, Involuntary Resettlement in the interim.  
  • Aims to avoid or minimise the involuntary resettlement of people required for projects  
  • Applied wherever land, housing, or other resources are taken involuntarily from people  
  • Sets out procedures for baseline studies, impact analyses and mitigation plans for affected people  
  • Project sponsors must implement a Resettlement Action Plan (RAP), as specified in the annex  
  • RAP must address both physical resettlement and economic effects of displacement                                                                                      | OD 4.30, Involuntary Resettlement (IFC)<br>• Project sponsors must implement a Resettlement Action Plan (RAP), as specified in the annex  
  • RAP must address both physical resettlement and economic effects of displacement                                                                                                                                 |
| OP 4.36, Forestry<br>• Aims to reduce deforestation, enhance the environmental contribution of forested areas, promote afforestation, reduce poverty, and encourage economic development |                                                                                                                                                                                                                         |
### Table 2.1: World Bank Group and IFC Safeguard Policies: An Overview

<table>
<thead>
<tr>
<th>Safeguard Policy</th>
<th>Summary of Provisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>OP 4.36, Forestry</td>
<td>• Aims to reduce deforestation, enhance the environmental contribution of forested areas, promote afforestation, reduce poverty, and encourage economic development</td>
</tr>
</tbody>
</table>
| OP 4.37, Safety of Dams | • Dams over 15 m must be reviewed by a panel of three or more independent experts  
• Must have detailed plans and periodic safety inspections  
• Dams must be designed and constructed by experienced and competent professionals |
| OP 7.50, Projects in International Waterways | • Sets forth required agreements and notifications regarding projects situated on international waterways  
• Projects on international waterways must either have agreements or arrangements between the beneficiary state and other riparians, a positive response (i.e. consent, no objection, support) to the beneficiary state or a confirmation that the project will not harm their interests. |
| OP 7.60, Projects in Disputed Areas (World Bank) | • The World Bank Group may proceed with a project in a disputed area if the governments concerned agree that, pending the settlement of the dispute, the project proposed for country A should go forward without prejudice to the claims of country B  
• The World Bank Group must be assured that the other claimant to the disputed area does not object to the project, or that the project is not harmful to the other claimant’s interests. |
| Statement on Forced Labour and Harmful Child Labour (IFC) | • IFC will not support projects that used forced or harmful child labour  
• Forced labour consists of all work or service, not voluntarily performed, that is exacted from an individual under threat of force/penalty  
• Harmful child labour consists of the employment of children that is economically exploitative, or is likely to be hazardous to, or interfere with, the child’s education, or to be harmful to the child’s health, or physical, mental, spiritual, moral, or social development |
### Table 2.1: World Bank Group and IFC Safeguard Policies: An Overview

<table>
<thead>
<tr>
<th>Safeguard Policy</th>
<th>Summary of Provisions</th>
</tr>
</thead>
</table>
| Policy on Disclosure of Information (IFC) | - Sets out IFC policy on disclosure of information, minimum requirements for public consultation and describes materials which the public has the right of access to.  
- Public consultation required at least two times for Category A projects: during the setting of project terms of reference in the scoping stage and during the review of the draft EA.  
- Project sponsors are required to make project information publicly available at or near the location of project for all Category A and B projects.  
- Summary of Project needs to be disclosed in local language(s) at project site.  
- Once Category A project EAs are complete, they are released through the World Bank’s Info Shop and simultaneously in the host-country at least 60 days before proposed Board date, closing date, or management approval date.  
- EA reports must contain details of public consultations made from EA preparation including location and dates of meetings, description of parties consulted, overview of issues discussed and resolved and necessary future action. Main public comments and consultation are included after the EA is released.  
- After negotiations between IFC and sponsor, the EAP is updated and re-released publicly to reflect final understandings between IFC and the project company on measures taken to manage, mitigate and monitor environmental and social issues. |
2.2.3 Guidelines


IFC also uses a series of Environmental, Health and Safety (EH&S) Guidelines prepared internally by IFC staff. Of relevance to the preparation of this EIS were IFC’s *EH&S Guidelines for Electric Power Transmission and Distribution*.

2.3 African Development Bank

Within the African Development Bank (AfDB), the Operational Private Sector Department (OPSD) ensures that private sector projects comply with the Bank’s applicable environmental and social policies. Their guidance document for this is *Environmental Review Procedures for AfDB’s Private Sector Operations*. A project sponsor must show compliance with this document as well as ensure compliance with host country requirements. The first initial step to a proposed project is the approval by the Private Sector Operation Committee (PSOC).

The AfDB may accept a proposed project when the project has already passed and complied with the EIA processes of the World Bank Group and the African host country. If these requirements are met, the AfDB can be in a position to approve the project. Of relevance to the preparation of the Bujagali transmission system EIA and RAP were the additional following AfDB publications:

- Environmental Policy (AfDB, 1990)
- Environmental Assessment Guidelines (AfDB, 1992);
- Environmental Sectoral Policy Guidelines for the Industrial Sector (AfDB, 1995);
- Guidelines on Involuntary Displacement and Resettlement in Development Projects (AfDB, 1995);
- Environmental Assessment Guidelines – Fisheries (AfDB, 1997);
- Environmental Assessment Guidelines – Forestry and Watershed Management (AfDB, 1997);
• Cooperation with Civil Society Organisations: Policy and Guidelines (AfDB, 2000);
• Integrated Water Resources Management Policy (AfDB, 2000);
• Population Policy (AfDB, 2000); and,
• Gender Policy (AfDB, 2001).

2.4 International Conventions

Uganda is party to several international environmental conventions, as summarized in Table 2.2. Some of these have relevance to the Bujagali project’s transmission system, a concordance analysis for which is included in Chapter 7.

<table>
<thead>
<tr>
<th>International Convention</th>
<th>Ratified by Uganda</th>
<th>Description of the Convention</th>
</tr>
</thead>
<tbody>
<tr>
<td>1958 Convention on Fishing and Conservation of the Living Resources of the High Seas</td>
<td>1966</td>
<td>Took place in Geneva April 29, 1958: To regulate (moderately) the rights to fishing the high seas worldwide without compromising the national water boundaries of other countries.</td>
</tr>
<tr>
<td>1968 African Convention on the Conservation of Nature and Natural Resources</td>
<td>1977</td>
<td>“to ensure conservation, utilization and development of soil, water, flora and faunal resources in accordance with scientific principles and with due regard to the best interests of the people.”</td>
</tr>
<tr>
<td>Convention on Wetlands of International Importance especially as Waterfowl Habitat</td>
<td>1988</td>
<td>To stem the progressive encroachment on and loss of wetlands for today and in the future, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific, and recreational value (World Factbook, 1998).</td>
</tr>
<tr>
<td>1985 Vienna Convention for the Protection of Ozone Layer</td>
<td>1988</td>
<td>This convention was the preliminary step to further agreements (such as, later, the Montreal Protocol) to reduce the adverse affects of pollutants on the ozone layer.</td>
</tr>
<tr>
<td>1987 Montreal Protocol on Substances that Deplete the Ozone Layer</td>
<td>1988</td>
<td>A landmark international agreement designed to protect the stratospheric ozone layer.</td>
</tr>
</tbody>
</table>
### TABLE 2.2: International Environmental Conventions to Which Uganda is a Signatory

<table>
<thead>
<tr>
<th>International Convention</th>
<th>Ratified by Uganda</th>
<th>Description of the Convention</th>
</tr>
</thead>
<tbody>
<tr>
<td>1973 Convention on International Trade in Endangered Species of Wild Fauna and Flora</td>
<td>1991</td>
<td>To ensure a control (either by regulation or law enforcement) of the “overexploitation of certain endangered species by means of a system of import/export permits”</td>
</tr>
<tr>
<td>1992 International Convention to Combat Desertification</td>
<td>1992</td>
<td>Took place during the Rio de Janeiro Earth summit pertaining to land degradation in arid, semiarid and dry sub-humid areas resulting from various factors, including climate variations and human activities.</td>
</tr>
<tr>
<td>1992 Convention on Biological Biodiversity</td>
<td>1993</td>
<td>This convention was an agreement on developing nation strategies for the conservation and sustainable use of biological diversity.</td>
</tr>
<tr>
<td>1992 Convention on Climatic Changes</td>
<td>1993</td>
<td>The United Nations Framework Convention on Climate Change has been the centrepiece of global efforts to combat global warming. It also has been one of the international community's essential tools in its efforts to promote sustainable development.</td>
</tr>
<tr>
<td>Lusaka Agreement on Cooperative Enforcement Operations Directed at Illegal Trade in World Flora and Fauna</td>
<td>1994</td>
<td>Convention on International Trade in Endangered Species of Wild Fauna (CITES), where the main operations of this agreement are directed at Illegal Trade in Wild Fauna and Flora.</td>
</tr>
<tr>
<td>Intergovernmental Authority on Drought and Desertification</td>
<td>1996</td>
<td>It includes a plan of action and participation to aid the drought and adverse environmentally affected regions of the participating nations in the arid and semi-arid regions of Africa, especially in case of emergency situations.</td>
</tr>
</tbody>
</table>

### 2.5 World Commission on Dams (WCD)

In November 2000, the WCD, an independent organisation funded primarily by the World Bank and the International Union for the Conservation of Nature (IUCN) released its final report, after over two years of studies and consultations internationally. In its recommendations for how future dams ought to be developed, the WCD tried to balance the positive developmental impacts that dams can have with their undesirable social and environmental effects. The degree to which the Bujagali project is consistent with the WCD’s...
recommendations is discussed in the hydropower generation component of the EIA documentation submitted to the World Bank.

2.6 Concordance Analysis of EIS Requirements

In order to ensure that the Bujagali Electrical Transmission System project has addressed the requirements of the IDA, IFC, AfDB and NEMA, an analysis has been undertaken to examine the concordance of policies, procedural issues, and guidelines of the three institutions. This is presented in Chapter 7 of this report.
3. EXISTING ENVIRONMENTAL AND SOCIAL CONDITIONS

3.1 Land Conditions

3.1.1 Topography, Geology and Soils

The Lake Victoria basin, in which the Bujagali transmission system is located, is predominantly lowland, interspersed with remnants of upland surface typical of a landscape still undergoing erosion. The region is characterised by a pattern of low but often steep hills, which are generally highest towards the south, closer to Lake Victoria. The general level of the land falls away gradually northwards. Altitude ranges from 1,100 - 1,300 m ASL. The broad valleys are overlain by abundant fluvial deposit.

The Lake Victoria basin's relief is developed on pre-Cambrian metamorphosed sedimentary rocks two billion years old (MacDonald, 1966). The parent igneous rock is medium- to course-grained granite with large feldspar crystals. Characteristic granitic boulders are found along the Nile River valley and surrounding riverbanks. The dominant lithology exposed in the Nile channel is amphibolitic and doleritic rocks interbanded to varying degrees with foliated metasedimentary shale, phyllitic shales and schists (Knight Piesold/Merz & McLellan, 1998a). Within the Mabira Forest Reserve area, the underlying rocks are composed of micaceous schists and shales of the Buganda-Toro system with ridges of quartzite and amphibolite. A detailed description of soil catenas is included in Appendix C.1.

The hilly landform determines the drainage pattern for the region. Only short local streams and the lakeside marshes discharge into Lake Victoria, with all larger watercourses, including the valley marshland around the northern side of Kampala, flowing generally northwards towards Lake Kyoga or the Lugogo River.

Mabira Forest Reserve (FR) occupies approximately 18% of the transmission system wayleave area between Kampala and Jinja, providing a distinctive and enclosed contrast to the more highly populated farmland of its surroundings. There are many large estates, usually tea or sugar plantations, around the periphery of Mabira FR and to the south, which provide an open, rolling landscape with distant views.
3.1.2 Landscape Units

The landscape along the proposed transmission line can be divided into eight areas of relatively distinct landforms, land use and vegetation patterns moving from west to east (refer to Figure 3.1). Photographs presented in Figure 3.2 are illustrative of each landscape unit, described below.

- **Natete** - A densely developed suburban centre around the junction of Masaka Road and Natete Road/Old Masaka Road near the Mutundwe substation. There is a bustling market area around the junction, with various commercial and industrial uses filling the low ground across the head of the Lubigi Swamp. The roads are largely developed along both sides of the swamp and there is a distinctive group of buildings at the Martyrs Memorial, school, church and cultural centre to the south of Masaka Road. The area to the south of the railway line is slightly more rural in character, although here the converging electricity transmission lines have a strong visual influence. The Mutundwe substation site is set at approximately 1180 mASL on the north-facing slope of a distinctive hill that rises to over 1300 mASL.

- **Lubigi** - The distinctive open expanse of the Lubigi Swamp, located at approximately 1160 mASL, is surrounded by low, rounded hills along its western and eastern boundaries that rise to 1220 and 1280 mASL. The uniform appearance of the papyrus swamp is broken by scattered road crossings and by a small island near the Masaka Road crossing. Suburban development has spread over most of the slopes along the Kampala (eastern) side of the swamp, especially at Namungona by the Hoima Road, although there are still some areas of farmland between the suburbs, particularly near the swamp fringes. The western side of the swamp is still relatively rural in character with extensive areas of small-scale agriculture.

- **Kawanda** - A pattern of moderate hills rising to 1230-1290 mASL separated by moist valleys situated at 1140-1170 mASL. The higher ground at Nansana and Jinja-Kawenpe is heavily developed, particularly along the main roads out of Kampala, but the hills further north are less populated and visually more attractive. The valleys contain a mixture of small-scale farming, marsh and remnant areas of forest. The Kawanda Agricultural Station creates a distinctive landscape, with its large-scale cultivation,
institutional buildings and formal tree planting. The Namalere Agricultural Station to the north-east provides a similar landscape on a smaller scale.

- **Northern Kampala Farmland** - An area of relatively low relief to the north of Kampala, with ridges generally rising to 1180-1200 mASL between valleys at 1140 mASL. A hill at Misindye rises to 1260 mASL. Small-scale agriculture is the main land-use and determines the vegetation character and the limited extent of most views. Villages extend along most of the roads and tracks. The valley bottoms become drier towards the east and are usually farmed or contain remnants of forest. There are some larger dairy farms, mostly near Nyenje, and the large District Farm Institute to the south. Just to the west, near Namyoya, is part of the Mwola Forest Reserve (also known locally as the Namyoya Forest Reserve), with small areas of degraded forest on the ridge and larger areas of timber plantations. A small tea plantation lies between the forest and the farms.

- **Sezibwa Farmland** - This area extends eastwards from the narrow band of the Kifu Forest Reserve towards the fringes of the Mabira Forest. The hills are more prominent, rising to 1200 mASL at Kifu and 1160 mASL elsewhere. The Sezibwa is the main river flowing north through the area. The usual pattern of small-scale farms is broken up by several large sugar and tea estates, large farms, and areas of remnant forest outside the reserves.

- **Mabira Fringes** - This contains the highest land along the route, with crests rising to 1330 mASL. There are steep slopes near the crests of the ridges; these become increasingly rough and rocky, with a covering of scrub or thin woodland where not cultivated. The slopes range from 1:2.5 to 1:4. There are several tea and sugar estates along or close to the route, where the open landscape contrasts with the Mabira Forest. There are limited areas of small-scale farming, mostly around the forest edge. Wide-ranging views from the open high ground are common.

- **Mabira Forest** - The Mabira Forest Reserve, which covers an area of 29,974 ha (Forestry Department, undated), is generally high ground, with hilltops at 1300 mASL in the west and 1260 mASL in the east and valleys at 1140 mASL. The forest cover is discontinuous but relatively dense, with numerous plantain plantations. Views are
limited, apart from those along the existing transmission line. There are two areas where settlement and cultivation extend in as far as the transmission line at Ssese and Nkaga.

- **Eastern Farmland** - The landform east of the forest is relatively open, with hills rising to 1350 mASL to the southeast and to 1200 mASL to the north. Sugar and tea estates cover much of the higher ground and the area immediately east of the forest. Small-scale farming occupies most of the rest of the land east towards the Nile valley, with a high proportion of tree crops, which tend to reduce views of the surroundings, especially near the river. The Nile is deeply incised between steep banks in this section of the study area. Small settlements are frequent in the area and extend along almost the entire Njeru-Kayanga Road, between Njeru and Kangalumira.

Figure 3.1 also shows the location of existing transmission lines within the region. A double circuit line runs northwest from Jinja towards Kampala through the Mabira Forest Reserve and ends at the Kampala North substation. This “northern line” was built in the 1950s to evacuate power from the Owen Falls hydropower station. A second double circuit line was financed by DANIDA and completed in 1993. Referred to locally as the “DANIDA line”, it runs southwest from Jinja to Lugogo substation, located east of Kampala. An additional transmission corridor also exists between Jinja and Kampala that is strung with a single-circuit 66 kV line between Owen Falls substation and the Town of Lugazi and a single-circuit 33 kV line between Lugogo substation and the Town of Mukono. Between Lugazi and Mukono, there are no conductors.
FIGURE 3.1 BIOPHYSICAL FEATURES

Forest Reserve
- Namygat (see aussi)
- Np

10 Ecological Survey

Existing Transmission Lines
- Northern Line
- SANNIR Line
- 33/66kV Line

Proposed Transmission System Route

Landscape Units along Proposed Transmission System Route

Source: Forest Department, 1998 (UN: 1999).

SCALE 1:75,000

P.L.E. 00302_1.png

Map 1 of 3
Figure 3.1 Biophysical Features

Mabira Forest Reserve
Existing Transmission Lines

1. Northern Line
2. 345kv Line
3. Proposed Transmission System Route

Landscape Units along Proposed Transmission System Route

Forest Reserve
Protection Buffer Zone
Recreation Zones
Other Lines


Map 3 of 3
Mutundwe substation and typical peri-urban landscape near Natete.

Causeway across Lubigi Swamp.

Landscape typical of Kawanda area.

Project Name: BUJAGALI TRANSMISSION SYSTEM EIS
Prepared for: AES NILE POWER
Date: DECEMBER, 2000  FILE: 60503_T_21

PHOTOGRAPHS OF LANDSCAPE UNITS
Along the Proposed Transmission System Route
Northern Kampala Farmland

Sezibwa Farmland

Mabira Fringes

Figure 3.2b

PHOTOGRAPHS OF LANDSCAPE UNITS
Along the Proposed Transmission System Route

Project Name: BUJAGALI TRANSMISSION SYSTEM EIS
Prepared for: AES NILE POWER

Date: DECEMBER, 2000 FILE: G0503_T_22
Mabira Forest. Looking east of the existing transmission line, within the western portion of Mabira FR. Buffer zone is to the left of the transmission line. Recreation zone is to the right of the transmission line.

Eastern Farmland.
3.1.3 Hydrology, Drainage and Wetlands

The entire area of the alignment is dominated by the Lake Victoria Basin, formed by tectonic movements that started during the Miocene period (about 25 million years ago) and culminated in the formation of the East African Rift Valley. There are two main hydrological features on the proposed transmission line route: the River Nile to the east, and the Lubigi swamp to the west. The hydrological, physical and biological characteristics of the upper reaches of the River Nile have been reviewed in detail in the EIS for the hydropower component of the Bujagali project (WS Atkins, 1999).

To the north of Kampala, in the area of Kawanda, the transmission line will cross a number of poorly drained areas with resulting seasonal swamps, in particular the Mayanja swamp immediately south of the Kawanda Agricultural Station. Given the relatively small size of these swamps no towers will have to be sited within the swamps themselves. The conductor will span the swamp between towers on high ground adjacent to the swamp. Seasonal swamps are avoided since construction is more difficult than on dry sites. The swamps are also important breeding grounds for a number of bird species, including the crested crane, Uganda’s national symbol.

The Lubigi swamp, which lies approximately 8 km west of central Kampala, is a large permanent wetland area. The proposed alignment, which has been optimised to minimise disturbance to the swamp, follows the western and southern sides of the Lubigi swamp for a distance of approximately 6 and 3 km, respectively. Of the total 9 km length, approximately 1.2 km of the proposed transmission line will run adjacent to, and immediately south of, a railway line which itself runs through the swamp, while another 2 km will cut across the swamp itself. Where the proposed transmission line is located on land adjacent to the swamp, the proposed towers vary from approximately 50 m to 200 m from the edge of the swamp.

In addition to the above features, the transmission line will traverse smaller watercourses that generally drain from south to north, despite the presence of Lake Victoria only a few kilometres to the south. These watercourses include a few permanent and seasonal streams within the Mabira and Kifu Forest Reserves, which form ecologically important riverine corridor habitats, as well as drinking water sources for forest animals. Of these, the largest are the Musamya and Mobugwe (intermittent) and the Sezibwa (permanent) Rivers, which
rise in the hills to the south of Mabira, around Seta and Buikwe, and eventually flow into Lake Kyoga.

3.1.4 Seismicity

The transmission system routes proposed for the Bujagali project areas are located in a relatively aseismic region, midway between the eastern and western sections of the African Rift System (Knight Piesold/Merz & McLellan, 1998). Details of seismicity in the transmission system route can be found in *Bujagali Hydropower Project Feasibility Study, Volume I – Main Report, 1998* (Knight Piesold/Merz & McLellan, 1998). Additional seismic hazard analysis will be carried out under the Engineering, Procurement and Construction (EPC) contract. Figures derived by the EPC contractor will be subject to review and acceptance by the AESNP, as well as review by the project’s main lenders.

3.2 Atmospheric Conditions

3.2.1 Climate

The project area belongs to the Lake Victoria Climatic Zone. The zone is characterised by small temperature variations throughout the year.

Rainfall is influenced by Lake Victoria, the Mabira Forest Reserve and Lake Kyoga. The rainfall pattern is distinctly bimodal, with peaks occurring in March-May and again in September-November. Average annual rainfall is in the range of 1200 mm to 1500+ mm, depending upon the location. A dry spell occurs in December-February and a less pronounced one in June-August, when potential evapotranspiration is greater than rainfall. A summary of rainfall and evapotranspiration data collected in Mukono District (in which much of the transmission system is located) is included in Appendix C.2.

Mean annual temperatures recorded throughout Mukono District range from 23.5°C to 24.1°C. Mean maximum temperatures recorded range from 25.1°C in July to 27.5°C in January, while the minimum mean recorded temperatures range from 14.2°C in August to 16.0°C in April. At the extremes, the highest temperature recorded is 32.2°C in January and the lowest is 8.3°C in August. Meteorological measurements taken at Kituza Agricultural Research Station are included in Appendix C.2.
3.2.2 Wind

Wind speed and direction data were obtained from the Department of Meteorology for their Jinja Kimaka meteorological station. The data covered the period January 1999 to June 2000. Measurements were made four times a day at 06:00, 09:00, 12:00 and 15:00 hours. The most recent full year, July 1999 to June 2000, was analysed. Detailed data are included in Appendix C.2.

The local meteorology is characterised by a very high frequency of southerly winds. Prevailing southerly winds occur for over 30% of the year. Winds from the west-northwest to the east are very infrequent.

Wind speeds between 5 to 7 knots occur most frequently, and between 7 and 9 knots half as often. Southerly winds in these speed ranges occur for over 20% of the year. This is also the only direction from which higher winds (9+ knots) arise to any significant extent.

Given the recorded conditions at Jinja, wind erosion of exposed ground is unlikely to be a significant source of airborne dust. Dust generated by mechanical disturbance of soil most probably would affect an area limited to the north and north west of the source.

3.2.3 Ambient Noise

During the field surveys undertaken for the transmission system route, observations regarding existing noise were made, although no instrumental noise measurements were made. Noise levels along the route are expected to be consistent with typical rural areas found in developing countries (Jackson and Leventhall, 1985). From the field surveys that have been carried out for other aspects of project health and safety, it is noted that there are currently no significant sources of noise in the rural and Mabira Forest areas. Such conditions extend for the majority of the route from Bujagali, through the Mabira Forest Reserve, and westwards to the proposed substation at Kawanda, as well as the sections through Lubigi Swamp. Levels observed are believed to be consistent with the World Health Organization recommendation that external noise levels should be less than 45 dB\text{Aeq} (WHO, 1980).

Where the line crosses more densely settled areas, i.e., western Kampala and/or areas with industry (e.g. brick works at Naalya), ambient noise levels are expected to be higher than in the more rural areas. Nevertheless, due to the work and social patterns of the local residents, noise levels at night fall significantly, although not as low as typical rural areas.
The situation changes dramatically as the route swings east towards Natete and the substation at Mutundwe. Natete in particular is a thriving, busy township area, with significant human activity, industry, markets, heavily trafficked with matatus, buses and heavy goods vehicles (HGVs). Consequently, the daytime noise levels are likely to exceed 65 dBAeq for most of the day, and potentially well after dusk. Although no measurements have been made in the area, it is assumed that noise levels at night will exceed those experienced elsewhere, and be in the region of 40-45 dBAeq. Baseline measurements will be made prior to construction. Monitoring of noise levels is discussed in Chapters 7 and 8.

3.3 Biological Conditions

The proposed transmission line will traverse four ecologically significant areas: Mabira Forest Reserve, two smaller forest reserves, Kifu and Namyoya (the latter also known as Mwola) and Lubigi Swamp. In addition to a review of the literature on the flora and fauna of these areas, plant, bird and mammal surveys were carried out in the Mabira, Kifu and Namyoya Forest Reserves during January 1999 and November 2000. Detailed information from these surveys is included in Appendix C.3. Refer to Figure 3.1 for the location of these survey areas.

The national forest estate comprises 721 Forest Reserves encompassing 71% of Uganda’s 94 recognised vegetation communities across the forest and savanna zones of the country, totalling 15,000 km$^2$. Within the country’s Forest Reserves, 20% of the forest estate is dedicated to biodiversity preservation (classified as Nature Reserves), 30% to environmental protection allowing some low-impact uses, and 50% is managed for sustainable timber production. Within each forest, a totally protected ‘core’ area is managed as a Nature Reserve and is surrounded by a buffer zone where low-impact uses are permitted. Sustainable timber production is undertaken in areas closer to the reserve boundary (Forest Department, 1999).

The 65 principal forests within Uganda were ranked in terms of their biological importance (out of a total of 721 forests countrywide) (Forestry Department, 1999). Mabira Forest Reserve (FR) ranked 27th out of the 65 principal forests. It scored 6.4 out of 10 on species diversity, 6.7 out of 10 on rarity value, and 13 out of a maximum of 20 on biodiversity importance. Although Kifu and Namyoya Forest Reserves are also Central Forest Reserves,
they have not received the same level of management by the Forest Department as Mabira FR nor have they been scored in the same way.

3.3.1 Mabira Forest Reserve

Mabira Forest Reserve is the largest natural high forest reserve in the biogeographical zone of Lake Victoria Crescent (Forest Department, undated). Its boundaries are shown in Figure 3.3.

Mabira Forest has been, and remains, an important source of forest products. From a production point of view, the forest is less valuable today than in the past. The reserve has suffered significant destruction through illegal removal of forest products and agricultural encroachment that have threatened the forest’s flora and fauna, in particular during the politically turbulent 1970s and 1980s. Illegal pitsawing (banned in reserves since 1992) and charcoal production continue to be a problem. Due to its proximity to population centres such as Kampala, Mukono, Lugazi and Jinja, its role as a recreational centre is important. Thus, the management of Mabira is based on the productive, conservation and recreational functions of the forest (Forest Department, undated).

3.3.1.1 Establishment of Forest Reserve

Mabira Forest Reserve was established in 1900 under the Buganda Agreement. It was first gazetted as a central forest reserve, together with Namakupa FR, in 1932. The two reserves were regazetted in 1948 with an area of 30,003 ha. A number of leases were granted over some parts of the forest and, considering the length of the leases before their expiry, the government decided to excise these leases from the main body of the reserve. Under legal notice No. 78 of 1962, Mabira FR was regazetted with an area of 29,974 ha. The reserve is subject to the provisions of the Forest Act with its control vested in the Forest Department (Forest Department, undated).

3.3.1.2 Forest Cover

The vegetation of Mabira Forest is classified as “medium altitude moist semi-deciduous” (Brown, 1959). However, the forest has been greatly influenced by human activities, including timber harvesting, cultivation and grazing, for such a long time that it is regarded as secondary forest resulting from, and constantly being influenced by, human activities. The reserve is characteristic of vegetation types representing sub-climax or human-altered plant
communities. Three vegetation sub-types are recognized: young or colonizing forest; mature mixed forest; and, *Celtis* mixed forest.

In the past, the forest consisted of three forest types. The youngest of these was dominated by the colonising tree *Maesopsis eminii* that was associated with *Albizia* spp., *Markhamia lutea*, *Sapium ellipticum* and *Celtis* spp. This association covered about 25% of the reserve’s area. The second forest type was classified as a young mix of *Celtis-Holoptelea* forest which together formed 59% of the forest reserve. The final community was a poor mixed forest of wet valley bottom sites, dominated by *Baikiaea insignis*, which until recently covered about 15% of the reserve.

However, in the 1950s-1960s mechanical logging took its toll on trees. The largest trees were harvested and destruction was at its greatest because of the uncontrolled harvesting. This was followed by charcoal burning and encroachers who began to settle in the forest. In the 1960s, some silvicultural operations were undertaken, including the replanting of *Maesopsis eminii* at the forest edges to minimise the encroachment by settlers and to enrich the forest. During the 1970s and 1980s, the forest was essentially depleted of all high economic value tree species and encroachment took place on an even larger scale. In 1992, the encroachers were evicted and the affected areas replanted with paper mulberry, especially on the southern side of the existing transmission line. Today, only 0.06% of all trees are high economic value species, while 47.5% are moderate value tree species. The remaining 52.4% of the growing stock consists of tree species of low economic value (Davenport *et al*, 1996).

Since 1990, the Forest Department has received support from the European Union. The EU-financed Natural Forest Management and Conservation Project has enabled the re-demarcating and planting of live markers (e.g. tree seedlings) along parts of the Mabira FR boundary and the establishment of an ecotourism project (Forest Department, undated).
3.3.1.3 Biodiversity

Biodiversity is valued on the basis of two distinct attributes: 'richness' (expressed in terms of species numbers) and 'rarity'. Since these two attributes are rarely maximized in the same place, each of these attributes was considered separately when the Forest Department conducted its biodiversity survey in 1996. Mabira FR ranked as above average for birds and butterflies, average for other taxa and has 81 restricted range species (refer to Table 3.1 below). Three hundred and twelve (312) tree species have been recorded in Mabira FR, of which 9 species are of restricted range, and one (Caesalpinia volkensii) is not known elsewhere in Uganda. Howard (1991) reported 7 rare tree species that occur there as part of a limited range in Uganda, and 5 species are listed as endangered. No tree species is endemic to the country. Fauna in Mabira FR include 287 bird species, of which 37 are of restricted range, 9 are uncommon and one, Tit Hylia (Pholidornis rushiae), is unique to Mabira FR in the East African part of its range. Other faunal species unique to this forest include 6 butterflies out of the 218 species recorded, and one moth.

Table 3.1: Summary of Biodiversity and Conservation Importance of the Five Indicator Taxa Surveyed in Mabira Forest Reserve

<table>
<thead>
<tr>
<th>Number of species known within the forest</th>
<th>Number of restricted range species known from &lt;5 forests</th>
<th>No. of regional endemics</th>
<th>No. recorded in 1996 inventory</th>
<th>Species diversity</th>
<th>Species conservation value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trees &amp; Shrubs</td>
<td>312</td>
<td>9</td>
<td>284</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>Birds</td>
<td>287</td>
<td>37</td>
<td>107</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>Small Mammals</td>
<td>23</td>
<td>1</td>
<td>16</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>Butterflies</td>
<td>218</td>
<td>27</td>
<td>199</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>Large Moths</td>
<td>97</td>
<td>7</td>
<td>97</td>
<td>**</td>
<td>**</td>
</tr>
</tbody>
</table>

Key: Star ratings indicate values relative to other 64 Uganda forests investigated under the survey programme:

*** Site is within top 10% of sites
** Site is within top 11-25% of site

None of the large mammals found within Mabira FR are endemic to Mabira FR or considered to be threatened. Despite the fact that Mabira FR is regarded ecologically as a secondary forest, owing to prolonged human impact, it still retains a substantial number of small mammals (including rodents and elephant shrews) and some large ones like blue and red-tailed monkeys (Cercopithecus spp.), bush pigs (Potamochoerus larvatus), bushbucks (Tragelaphus scriptus) and forest duikers (Cephalophus spp.) (Davenport et al., 1996).

Mitigation measures to be taken to minimize the impact of the wayleave through Mabira FR (as a result of the proposed transmission line being sited immediately adjacent to, and parallel to, the existing 132 kV line) are addressed in Chapter 7, Section 7.2.2.

3.3.1.4 Forestry Nature Conservation Master Plan and the 1997-2007 Forest Management Plan

In late 1998, the Forest Department published its Forestry Nature Conservation Master Plan, excerpts from which are included in Appendix C.4. This policy document provides guidance to, and has precedence over, detailed management plans prepared for individual forest reserves (Forest Department, 2000). As stated in the Forestry Nature Conservation Master Plan, Mabira FR is designated a CORE conservation forest in recognition of its biodiversity importance, in particular because:

- the site contributes more than 1% of the national protected area system complement;
- the site supports at least one unique tree species that is of conservation importance; and,
- the site supports the only example of medium altitude moist semi-deciduous forest type D1 in the country's protected area system (Langdale Brown et al., 1964; Forestry Nature Conservation Master Plan, 1999).

Although the number of tree and shrub species known from Mabira is quite high, the reserve is poor in restricted-range species, and only one species is unique to this forest (Caesalpina volkensii) (Davenport et al., 1996). These authors therefore consider that Mabira FR is a forest of low importance for the conservation of known rare tree and shrub species, but emphasise that inventories to date are incomplete and the possibility of some rare species being missed cannot be ruled out.

A forest management plan (FMP) for Mabira FR was recently completed, and covers the period 1997 to 2007. In addition to Mabira FR, this Forest Management Plan includes
Namakupa, Nadagi, Kalagala Falls, Namawanyi and Namananga Forest Reserves – small reserves varying from 104 ha to 479 ha (Forest Department, undated). Excerpts from this FMP are included in Appendix C.5. Where zonations identified in this FMP contradict the zones identified in the Nature Conservation Master Plan, the Master Plan has primacy over the FMP since the Master Plan is a policy document which guides individual FMPs (Forest Department 2000, attached in Appendix C.5).

The 1997-2007 Forest Management Plan for Mabira FR states that the management objectives are to:

- Conserve the forest biodiversity and ecological conditions;
- Produce timber and non-timber forest products (NTFPs) on a sustainable yield basis using the most efficient methods, i.e., without compromising the capability of the forest to provide environmental services;
- Integrate the communities within the forest enclaves and parishes surrounding the forest reserve into the management of the forest;
- Provide recreational facilities for the people of Uganda, visitors and tourists; and,
- Carry out research aimed at obtaining information on various aspects of forest ecosystem dynamics for the improvement of the management of Mabira Forest in particular, and other forests in general (Forest Department, undated).

The zonation for Mabira Forest Reserve as shown in the Forestry Nature Conservation Master Plan is presented in Figure 3.3. The existing 132 kV transmission line from Owen Falls to Kampala forms the southern boundary of 4.6 km of Protection (Buffer) Zone and 11.6 km of Other Uses. The existing transmission line forms the northern boundary of 4.6 km of Recreation Zone and 11.4 km of Other Uses, which is encroached production forest. In addition, the line passes adjacent to 1.8 km and 2.0 km of cleared settled area (village enclave) on the north and south respectively.

The Strict Nature Reserve Zone, which lies immediately north of the Protection (Buffer) Zone, is 2.4 km away from the existing transmission line at its closest point. The objective of the Strict Nature Reserve is to protect and conserve a viable area of semi-deciduous forest type D1 for biodiversity preservation, wilderness protection, scientific research and environmental services. The adjacent Buffer Zone to the south and southwest of the core is
intended to enhance the long-term viability of the core area, while allowing controlled access for recreational activities centred around Najjembe and the Musamya River.

The Other Uses zone, which covers the majority of the reserve, includes the more accessible peripheral areas of the reserve that have already been heavily exploited by pitsawyers, and most of the south-central parts of the reserve which adjoin a number of enclaves and are most suitable for timber production. This zone will be managed to provide both consumptive and non-consumptive forest products on a sustainable basis (Forest Dept., 1999).

3.3.1.5 Tourism Within Mabira FR and Surrounding Area

According to the 1997-2007 Forest Management Plan for Mabira FR, an area south of the existing transmission line has been designated for recreational purposes. The Forest Department developed infrastructure at Najjembe station with assistance from the EU in accordance with its tourism development policy. Facilities include a visitors’ reception and office, two bandas (simple guesthouses), a picnic area, campsite and a trail network. By mid-2000, these facilities had deteriorated to the extent that visitor usage was declining (Roberts, 2000). Currently the Forest Department is considering a proposal, Analysis of Future Options for Forest Department Eco-Tourism Development (Roberts, 2000) to improve the tourism infrastructure. It is proposed to move the tourism infrastructure further north to reduce the impact of noise from the main Kampala-Jinja Road, and to extend the network of forest trails, possibly creating a loop trail as far north as Kalagala Falls. Kalagala Falls FR would also be developed to include campsites and bandas. Extensive tree planting would also be required due to serious encroachment by agriculturalists (Chemusto, 2000, included in Appendix D).

3.3.1.6 Current Land Uses Within the Forest

The wayleave of the existing 132 kV corridor is generally 30 m wide in order to avoid the risk of trees falling onto the line. A field survey was undertaken in November 2000 to determine the level of cultivation being undertaken along the existing wayleave through Mabira FR, as well as immediately outside the boundary of the reserve. Transects were taken at right angles from existing transmission towers, with distance to the first tree recorded. A tree is defined as a woody plant with 1 stem (versus a shrub with multiple stems). The presence of cultivation, dwellings and shrub cover was also recorded. Refer to Figure 3.4.
The survey findings indicate that much of the wayleave outside the forest reserve, as well as inside the community enclaves, are being cultivated. In addition, several transects have semi-permanent or temporary dwellings within the wayleave. Several communities were present in this area before Mabira Forest Reserve was gazetted. These community enclaves were formally recognized and were excluded when the forest was gazetted. Based on the results of the field survey, it appears that these settlers have generally recognised forest regulations and avoided cultivating within the gazetted forest.
This page is intentionally blank.
CURRENT LAND USES WITHIN EXISTING 30m WAYLEAVE & PROPOSED 35m WAYLEAVE IN THE MABRIA FOREST RESERVE

Date: DECEMBER, 2000  File: 00503_T_45  Figure 3.4

NOTE: Vertical axis is not to scale
Source: Field survey conducted in October, 2000.
3.3.1.7 Access Within the Forest Reserve

The existing wayleave is irregularly maintained by UEB with the result that fast-growing vegetation makes the wayleave inaccessible by foot or vehicle within 2 years. During the field survey, large portions of the wayleave were not accessible by foot or vehicle (refer to Figure 3.5 for photos taken along the wayleave).

Numerous tracks (seasonably accessible) currently provide access to and through Mabira FR and are described in more detail in section 3.4.4. Refer to Figure 3.4 for the location of the major roads and tracks. Some of the existing roads and tracks into and within Mabira FR will be upgraded, including five bridges, as a result of the proposed transmission line. No new access roads will be constructed in Mabira FR for erection of the new transmission system. Existing access tracks will be used for construction access, with spurs made to tower locations. Access may be controlled during and after construction, in collaboration with the Forest Department and UEB. Additional details are provided in Chapters 5 and 7 of this report.

The proposed transmission line from the Bujagali hydropower station to the new Kawanda transformer station north of Kampala is proposed to run parallel to, and to the north of, the existing line and result in the wayleave being widened. Presently, a large portion in the eastern portion of the Mabira FR (classified as Other Uses) is severely degraded. The widening of the wayleave through this portion of the forest reserve will result in minimal loss of forest cover.
This page is intentionally blank.
A semi-permanent dwelling located near tower 140. The structure is approximately 4 metres from the right of way and is within the wayleave. A forest community is located nearby.

Extensive cultivation around tower 141, in the vicinity of community situated within Mabira Forest Reserve.

The wayleave by tower 154, looking west towards Kampala. Access can be difficult due to infrequent maintenance in the wayleave.
3.3.1.8 Ecological Surveys Conducted Within Mabira Forest Reserve

Vegetation surveys conducted along the existing transmission line through Mabira FR indicate that there is a distinction between the state of the forest north and south of the existing transmission line, and between the eastern portion of the forest reserve versus the more westerly portion. Refer to Table 3.2, below, and Figure 3.1 for locations of transects.

**Table 3.2: Locations of Transect Sites Used for Ecological Survey Within Mabira FR**

<table>
<thead>
<tr>
<th>Site</th>
<th>Tower No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 1</td>
<td>Tower 179</td>
</tr>
<tr>
<td>Site 2</td>
<td>Tower 174</td>
</tr>
<tr>
<td>Site 3</td>
<td>Tower 174</td>
</tr>
<tr>
<td>Site 4</td>
<td>River Waliga (between Towers 169 and 170)</td>
</tr>
<tr>
<td>Site 5</td>
<td>Tower 164</td>
</tr>
<tr>
<td>Site 6</td>
<td>Tower 154</td>
</tr>
<tr>
<td>Site 7</td>
<td>Tower 149</td>
</tr>
<tr>
<td>Site 8</td>
<td>Tower 144</td>
</tr>
<tr>
<td>Site 9</td>
<td>Tower 66</td>
</tr>
<tr>
<td>(Within Kifu FR)</td>
<td></td>
</tr>
</tbody>
</table>

The section north of the existing transmission line is characterised by gaps in the upper-storey canopy, as indicated by the presence of light-demanding pioneer species such as *Alstonia boonei*, *Canarium schweinfurthii*, *Margaritaria*, *Zanthoxylum*, *Costus* and *Palisota* interspersed in a fairly mature mixed forest of mainly *Celtis* and to a lesser extent *Holoptelea*. Shade bearers include *Memecylon*, *Rinorea* and *Trichilia*. There is barely a trace of Mahogany species. A complete record of all species encountered is included in Appendices C.6 to C.8.

The section south of the existing transmission line is mainly in the colonisation stage characterised by pioneer invasive species (Swaine and Whitmore, 1988) such as the introduced *Broussonetia papyrifera* and colonising species such as *Lantana camara* and *Solanum mauritianum*. There are also immature tree species that are light demanders e.g. *Celtis*, *Albizia* and *Lasciodiscus*. Corridors appear with fairly different vegetation consisting
mainly of *Strombosia schefflera*, a rare species countrywide, interspersed with *Chrysopilo* and *Celtis*.

Resilient species, which are able to stand the ‘pressures’ of ingress to the existing wayleave by humans and grazing animals, tend to colonise and dominate the 12.5 m on either side of the transmission line and include *Ocimum gratissimum*, *Solanum mauritianum*, *Lantana camara* and *Broussonetia papyrifera*.

The northern side of the existing transmission line, starting from about transect site 3 (between towers 169 and 170 following River Waliga) to the western end of the forest is relatively more intact than the southern side. The southern side (mostly between transect sites 1 and 5) was adversely affected by human activities until about 8 years ago when encroachers were evicted. This area is now covered by secondary regrowth with sparse upper canopy cover. Vegetation surveys indicated that the eastern portion of the reserve is predominantly degraded forest with remnants of high rainforest species encountered, or secondary forest dominated by *Lantana camara* with some saplings of forest species. The riverine habitat along the River Waliga (located between Towers 169 and 170) has been less impacted to the north of the existing transmission line (65% upper canopy cover) than to the south (50% upper canopy cover). *Chrysophyllum prunifomes*, a rare plant species, was recorded on this transect. In addition, *Malacomys longipes*, a small mammal species of wetland conditions and an unconfirmed Congo clawless otter (*Aonyx congica*, a CITES Appendix 1, data deficient species) were recorded in this area. West of River Waliga, lightly logged mature mixed forest tends to dominate north of the existing transmission line. This stretch of the forest also supports 15 bird species that are listed as threatened in East Africa. These included:

- The Forest Wood Hoopoe (*Phoeniculus castaneiceps*), which was rare in Mabira. It is very sensitive to uncontrolled forest disturbance and has disappeared from Kenya probably due to uncontrolled forest destruction (Zimmerman et al 1996).

- The Grey Parrot (*Psittacus erithacus*), which though locally common is also very sensitive to forest disturbance due to its foraging and nesting behaviour.

- Nahan's Francolin (*Francolinus nahani*), (a CITES Appendix 1, endangered species) sensitive to forest disturbance.

Refer to Appendices C.6 to C.12 for more detailed information on the transect observations.
Amphibian and reptile surveys will be undertaken after submission of the EIA and prior to construction of the transmission system in order to confirm the presence/absence of endemic and/or endangered amphibian or reptilian species along the proposed route. The surveys will be conducted utilizing the same experts as were involved in the previous biological surveys.

Specific mitigation measures that will be undertaken by AESNP to minimize disturbance to Mabira FR are detailed in Chapter 7.

3.3.2 Namyoya Forest Reserve (also known as Mwola Forest Reserve)

Although Namyoya FR is shown on the 1:50,000 mapsheets as Mwola FR, the Forest Department has confirmed that the forest reserve is actually named Namyoya FR, with Mwola FR located adjacent to Lake Victoria (Forest Department, 2000, attached in Appendix C.5).

Namyoya FR was established in the 1960s as a Natural Forest Reserve. Prior to 1996, the reserve was managed for production and environmental benefits. However, the reserve is located in a densely settled area and was severely degraded due to encroachment.

A private woodlot farming programme was introduced into this 389 ha forest reserve in 1996. Under this scheme, individuals, institutions and companies with interest and the resources to invest in tree planting were encouraged to apply to the Commissioner for Forestry through their respective District Forest Officers for forest reserve land. The investor is required to pay ground rent and may plant only trees. The forest reserve land remains the property of the government but the trees planted belong to the investor who is free to use or sell them for income. In 1996, 189 ha were given out to private tree farmers through permits with the remaining 200 ha given out in 2000. The majority of trees planted to date have been Eucalyptus, although Cupressus lusitanica (cypress), pines and Maesopsis eminii (musizi) have also been planted (Oluka-Akileng, 2000).

Flora and fauna data was collected along the existing transmission line that cuts through the southern portion of the reserve, as well as along the proposed transmission route that passes through the northern section.

The southern section of Namyoya FR has been converted to Eucalyptus saligna plantations. A few coppiced stumps of Lovoa, Celtis and Albizia are present among the Eucalyptus
Gardens of cassava, sweet potatoes and maize have been established along the existing transmission line between Towers 51 and 52 and extend beyond the official 30 metre wide wayleave.

The proposed transmission line will go through an area that was leased to farmers in 2000. During a field survey in November 2000, the degraded natural forest, which had very few trees larger than 3 cm dbh, was in the process of being cut down and converted to Eucalyptus.

The proposed crossing of the transmission line through Namyoya FR will be approximately 310 m long. With a wayleave width of 35 m, 1.1 ha of productive forest will be lost. This represents 0.3% of the forest reserve.

Of the three forest reserves situated along the existing transmission route, Namyoya FR had the lowest proportion of forest specialist bird species, an indication that the forest cover is either very scattered or is composed of a limited variety of species. Namyoya FR, both in the northern and southern sections, has fewer bird species than Mabira FR. Two regionally near-threatened species were recorded along the proposed transmission line: Shrike Flycatcher (*Megabyas flammulata*) and Brown Snake Eagle (*C. cinereus*). Four regionally near-threatened species were recorded along the existing transmission line: Grey Crowned Crane (*Balearica pavonina*), Grey Parrot (*Psittacus erithacus*) as well as the Shrike Flycatcher and Brown Snake Eagle (*Kityo and Pomeroy, 2000*).

Interviews with local people revealed that some larger mammals continue to range into the Forest Reserve, including vervet monkeys (*Cercopithecus aethiops*), bush pigs (*Potamochoerus larvatus*) and bush bucks (*Tragelaphus scriptus*). Additional details on the ecological surveys undertaken are included in Appendices C.6 to C.12.

The proposed transmission line was originally proposed in WS Atkins (1999b) to run immediately adjacent to, and north of, the existing 132 kV line. However, in order to avoid a school and church at Nyenje (UTM 36N 4700440), Carl Bro (2000) recommended that the proposed line be moved to the north. The transmission line now avoids the school and church by 800 m. The line was shifted so as to cross the Namyoya FR at its narrowest point. The line as now proposed will cross through 350 m of the reserve, approximately 1.8 km to the north of the existing line. Specific mitigation measures that will be undertaken by AESNP to minimize disturbance to Namyoya FR are detailed in Chapter 7.
3.3.3 Kifu Forest Reserve

Although Kifu FR does not have a management plan, it contains significant areas of fully stocked tropical high forest in its northern section that are managed as a research forest. Trial plots of different tree species have been established for research purposes. The remainder of the forest reserve is being managed for the provision of environmental benefits and foods (Oluka-Akileng, 2000). However, much of this forest reserve is degraded.

The existing transmission line, which passes through the southern portion of the main forest in this reserve, goes through 1.0 km of degraded forest. The proposed transmission line will run parallel to, and immediately north of, the existing transmission line. A transect was run 250 m into the forest on both sides of the existing transmission line and all woody species over 3 cm dbh encountered along the transect were identified. The only woody species encountered had less than 11 cm dbh, an indication that large trees have been harvested and that the southern part of Kifu FR is very degraded. A survey conducted in October 2000 revealed no cultivation or dwellings situated within the existing wayleave. Despite the degraded forest conditions, some species of larger mammals continue to range into Kifu FR according to local people, including bushbucks (*Tragelaphus scriptus*) and bush pigs (*Potamochoerus porcus*). More details on the flora and fauna surveys undertaken are included in Appendices C.6 to C.12. Specific mitigation measures that will be undertaken by AESNP to minimize disturbance to Kifu FR are detailed in Chapter 7.

3.3.4 Lubigi Swamp

The Lubigi Swamp is the only permanent wetland area within the proposed transmission system. It is situated to the west of Kampala and north of the Mutundwe substation (see Figure 3.1). It is considered by the NWCMP to represent a typical papyrus swamp vegetation type found throughout Uganda. During a meeting with NWCMP personnel, it was acknowledged that some future encroachment into Lubigi Swamp is likely inevitable due to the swamp’s proximity to the Kampala urban area. Its conservation status is well below that accorded to the important wetlands around Murchison Bay to the southeast of Kampala (Dr. Litterick, pers. Comm., 1998).

Although Lubigi Swamp is situated within 15 km of Lake Victoria, it forms the headwaters of a continuous flooded valley system that eventually drains into Lake Kyoga. It is a flat valley through which the Lubigi River runs. The valley bottom is primarily papyrus swamp, part of
which is seasonally dry. The main area of the swamp extends in a westerly direction from Mutundwe, but a principal arm extends for some 7 km northeast towards the northern outskirts of Kampala. This arm has a maximum width of about 650 m, and comprises dense papyrus vegetation grading into reed swamp at its northern extremity. The seasonal variation in water level, and hence the area of the wetland is not recorded, but the NWCMP report that seasonal flooding can be extensive in the area (Dr. Litterick, pers. Comm., 1998). In times of high water levels, there may be areas inundated, over and above what is indicated on the mapsheets in Figure 3.1, in particular a 2 km stretch north of Lubigi Swamp and a low-lying area south of Kawanda Agricultural Station.

Until recently, the swamp supported populations of Sitatunga (Tragelaphus spekei), an antelope adapted to living in swamps that is widespread in tropical Africa. In recent years, individuals have been reported here several times. Lubigi Swamp is dominated by Cyperus papyrus, which is commonly found throughout Uganda, as well as many other plant species. Small-scale harvesting of papyrus is carried out on both the western and eastern margins of the Lubigi Swamp and cattle grazing takes place on the marginal grasslands. The grass species Paspalum vaginatum, which is found in Lubigi swamp, is a rare perennial grass that, grows up to 0.6 m high in swampy, saline and alkaline soils. This species is preferred by Sitatunga for grazing. Lubigi Swamp possibly provides aquatic habitat for Lungfish, Catfish, a variety of snake species and the Water Mongoose as well. Much of Lubigi Swamp is already affected by cultivation, burning and papyrus harvesting and is spanned by three causeways carrying roads and a railway (pers. obs; NWCMP, 1996).

The proposed transmission line will skirt the southern and western boundaries of the swamp for a distance of 3 km and 6 km respectively. Of the total 9 km length, approximately 1.2 km of the proposed transmission line will run adjacent to and immediately south of a railway line which itself runs through the swamp, while another 2 km will cross over the swamp itself. Where the proposed transmission line is located on land adjacent to the swamp, the centre line varies from 55 m to 190 m from the edge of the swamp. The alignment was chosen to eliminate the need to site towers in permanently wet sites.

3.4 Socio-Economic Conditions

According to 1991 Census data, approximately 85 percent of the population in Uganda reside in rural areas and depend mainly on agriculture for their livelihood. About 55 percent of the
population is estimated to be living below the poverty line. The economy is predominantly agricultural with over 90 percent of the population dependent on subsistence farming and light agro-based industries. Literacy rates are 45 percent for females and 65 percent for males. Average annual population growth rate between 1969 and 1991 was about 2.6 percent per annum (Government of Uganda, 1991), although this growth rate can be considered low due to the internal political unrest that existed in Uganda during that period.

From the social surveys that were undertaken as part of the Transmission System RAP, 46% of the people affected by the proposed transmission line depend on agriculture as their primary source of income, with the majority of the remaining people deriving some income from farming. Forty-eight (48) percent of the affected household heads are tenants, while 32% are licensees and 20% are landowners. The major occupations reported by the affected persons include: merchant (14%); student (6%); professional (5%); low-income entrepreneur (3%); driver (3%); civil servant, teacher/researcher, retired, house help (each at 2%); and, other (15%).

Thirty-five (35) percent of all affected household heads are women. The average affected household includes 4.9 individuals.

3.4.1 Administrative Boundaries

For the study area of the Bujagali project transmission system, administrative boundaries are shown in Figure 3.6. The proposed transmission system corridor passes through Mukono, Mpigi and Kampala Districts. Districts are further divided into counties, sub-counties, parishes and villages. Civil servants and local chiefs administer the decentralized system, from district down to village level. This hierarchy runs parallel to the elected local councils (LC) hierarchy from LC5 Chairman at the district level down to LC1 Chairman at village level. Local Councils are responsible for policies, resolving local conflicts and providing orderly leadership and overseeing democratic practices at the grassroots level in their respective areas. The list of LC3s and LC1s, and the villages they represent, that were consulted during the planning of the transmission line route are summarised in Chapter 6.

3.4.2 Land-Use and Settlement Patterns

Table 3.3 below gives the total population and population densities (1991 Census) by sub-county for Mukono and Mpigi Districts and by parish for Kampala District.
Comparing the two rural districts within the study area, the population density is generally lower in Mukono than in Mpigi, particularly in the central part of the District. This is primarily due to the presence of the Mabira Forest and a number of large agricultural plantations. Within Mpigi District, the population density is highest in Nabweru on the northwest fringes of Kampala city and to a lesser extent in Kira on the northeastern fringe. Within the part of Kampala District relevant to the proposed Bujagali transmission system, densities are fairly consistent and are about five times those of Mpigi District and ten times those of Mukono District.

<table>
<thead>
<tr>
<th>Table 3.3: Population Distribution and Density (1991)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>District / Sub-county</strong></td>
</tr>
<tr>
<td>---------------------------</td>
</tr>
<tr>
<td><strong>MUKONO DISTRICT</strong></td>
</tr>
<tr>
<td>Wakisi sub-county</td>
</tr>
<tr>
<td>Najembe sub-county</td>
</tr>
<tr>
<td>Nagojje sub-county</td>
</tr>
<tr>
<td>Kawuga (Nama /Ggoma)</td>
</tr>
<tr>
<td><strong>MPIGI DISTRICT</strong></td>
</tr>
<tr>
<td>Kira sub-county</td>
</tr>
<tr>
<td>Nangabo sub-county</td>
</tr>
<tr>
<td>Nabweru sub-county</td>
</tr>
<tr>
<td>Wakiso sub-county</td>
</tr>
<tr>
<td>Nsangi sub-county</td>
</tr>
<tr>
<td><strong>KAMPALA DISTRICT</strong></td>
</tr>
<tr>
<td>Lubya parish</td>
</tr>
<tr>
<td>Busega parish</td>
</tr>
<tr>
<td>Mutundwe parish</td>
</tr>
</tbody>
</table>

Source: The 1991 Population and Housing Census (District Summary Series)

Under the Town and Country Planning Act, all Districts are required to prepare a Structure Plan indicating land use and development proposals and policies. While Mpigi and Mukono Districts do not yet have a district wide Development Plan, a Kampala District Plan was approved in 1994.
FIGURE 3.6 SOCIO-ECONOMIC FEATURES ALONG PROPOSED TRANSMISSION SYSTEM ROUTE
FIGURE 3.6 SOCIO-ECONOMIC FEATURES ALONG PROPOSED TRANSMISSION SYSTEM ROUTE

Land Use and Settlement
- Small scale farming
- Large scale farming
- Degraded plot
- Woodland
- Tropical high forest
- Bushland
- Built-up area
- Wetland
- Broadleaved tree plantation

Proposed Transmission Lines
- Forest reserves
- District boundary
- County boundary

SCALE 1:75,000

FILE: G003_T_35  Map 3 of 3
Within Kampala District the predominant land use proposed is residential, although the swampy areas on the western fringes of the city are designated ‘environmental areas’ where the policy is the protection and preservation of open space. Commercial and service uses are to be concentrated in Natete sub-centre and to a lesser extent at the Busega / Masaka road junction where a new hospital is planned. A northern bypass for the city of Kampala is planned extending from the Busega / Masaka road junction in a north easterly direction across Rubaga Division and thence north around the city to join the Jinja road on the east side of Kampala.

The broad land use characteristics and settlement pattern along the route of the proposed transmission system are shown in Figure 3.6 and summarized in Table 3.4 below. A detailed description of land use and settlement along the preferred route is included in Appendix G.

<table>
<thead>
<tr>
<th>Table 3.4: Land Use along Route Corridor (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bujagali to Torororo Line</td>
</tr>
<tr>
<td>----------------------------</td>
</tr>
<tr>
<td>Small-scale farming</td>
</tr>
<tr>
<td>Plantations</td>
</tr>
<tr>
<td>Tropical High Forest</td>
</tr>
<tr>
<td>Degraded Forest</td>
</tr>
<tr>
<td>Woodland</td>
</tr>
<tr>
<td>Bushland</td>
</tr>
<tr>
<td>Grassland</td>
</tr>
<tr>
<td>Wetland</td>
</tr>
<tr>
<td>Built-up area</td>
</tr>
<tr>
<td>TOTAL</td>
</tr>
</tbody>
</table>


3.4.3 Transportation

Five all-weather roads run in a northerly-southerly direction and will be crossed by the proposed Mutundwe – Kawanda transmission line (refer to Figure 3.6):

- The Old Masaka Road runs southwest from Kampala to Masaka and passes to the east of the preferred substation site at Mutundwe. The proposed transmission line crosses this road three times;
• The Masaka Road runs southwest from Kampala towards Masaka and is crossed once by the proposed transmission line;

• The Mityana Road runs west-northwest from Kampala towards Mityana and is crossed twice by the proposed transmission line;

• Hoima Road runs northwest from Kampala to Hoima and Kiboga. The proposed transmission line crosses the road once; and,

• The Bombo Road runs north-northwest from Kampala towards Bombo and crosses the existing transmission line immediately east of Kifu Forest Reserve.

On the proposed Kawanda – Bujagali transmission line:

• The Kampala-Kasangati Road is proposed to be crossed once;

• The road running north from Seta, west of Kifu FR to Kiyunga, will be crossed once.

• The Mukono-Kayunga Road will be crossed once; and,

The area between Bujagali and Owen Falls is well serviced by a good quality Class I bitumen road, locally referred to as the Njeru to Kayunga Road

As with all the main roads in this area, a large number of local tracks branch off of them, providing access to numerous small settlements and agricultural areas. Given the abundance of roads and trails throughout the area, it is not anticipated that any new access road will need to be created as part of this project.

The only area along the proposed transmission line that does not have good all-weather access is the Mabira Forest Reserve. However, there are several seasonal tracks that branch off of the Kampala-Lugazi-Njeru highway, as well as the Nyenga-Lujamag road and provide access to the eastern portion of the reserve. Tracks also extend into the east portion of the reserve via the large sugar cane plantations that border the reserve. A track that is accessible year-round by 4-wheel drive leaves the Kampala-Lugazi-Njeru highway at Najembe and runs northwest through Ssese and Namanyama. In addition, the existing transmission line has a trail running alongside it that currently provides access for maintenance vehicles. Figure 3.4 shows the existing access roads through Mabira FR.
3.4.4 Agricultural Development

The general landscape of the region through which the proposed transmission system passes is comprised of flat or round topped hills, valleys incised into the plateau with farmlands and occasional swamps. The area lies to the north and west of Lake Victoria, commonly referred to as the banana - coffee belt. Minimum annual rainfall is over 760 mm and most of the area has over 1000 mm well distributed throughout the year. Most of the original rainforest vegetation has been cleared for the growing of sugarcane, tea, bananas and coffee. Elephant grass and thicket grow when the land is left fallow.

In the eastern portion of the proposed Bujagali transmission system, the agricultural activities are characterised by small-scale coffee banana based inter-cropping or intermixed systems (known as the “Buganda” agricultural system) in the Victoria Nile area and large-scale sugarcane production both to the east and west of the Mabira Forest. More small-scale coffee-banana systems occur in Mpigi district. The suburbs of Kampala have small-scale backyard farms consisting mainly of subsistence food crops. The average size of a holding along the alignment is about 0.8 ha (Andersen, 1994) which is adequate for support of a family unit at subsistence level with some cash surplus. Table 3.5 shows production statistics for some food crops in the districts of Mukono and Mpigi in 1997.

<table>
<thead>
<tr>
<th>Crop</th>
<th>Area (ha)</th>
<th>Prod. (t)</th>
<th>Area (ha)</th>
<th>Prod. (t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banana</td>
<td>60,603</td>
<td>370,089</td>
<td>62,862</td>
<td>347,470</td>
</tr>
<tr>
<td>Beans</td>
<td>15,506</td>
<td>5,386</td>
<td>10,822</td>
<td>3,759</td>
</tr>
<tr>
<td>Cassava</td>
<td>11,986</td>
<td>81,518</td>
<td>10,739</td>
<td>73,030</td>
</tr>
<tr>
<td>Field Peas</td>
<td>30</td>
<td>20</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Groundnuts</td>
<td>1,782</td>
<td>785</td>
<td>1,282</td>
<td>565</td>
</tr>
<tr>
<td>Irish Potato</td>
<td>307</td>
<td>1,986</td>
<td>526</td>
<td>3,411</td>
</tr>
<tr>
<td>Maize</td>
<td>4,983</td>
<td>6,307</td>
<td>8,674</td>
<td>10,983</td>
</tr>
<tr>
<td>Millet</td>
<td>2,523</td>
<td>3,210</td>
<td>194</td>
<td>243</td>
</tr>
<tr>
<td>Onion</td>
<td>150</td>
<td>565</td>
<td>1,013</td>
<td>3,805</td>
</tr>
<tr>
<td>Simsim</td>
<td>254</td>
<td>107</td>
<td>16</td>
<td>6</td>
</tr>
<tr>
<td>Sorghum</td>
<td>1,465</td>
<td>1,582</td>
<td>1,248</td>
<td>1,348</td>
</tr>
<tr>
<td>Soya beans</td>
<td>177</td>
<td>209</td>
<td>750</td>
<td>883</td>
</tr>
<tr>
<td>Sweet Potato</td>
<td>17,535</td>
<td>62,777</td>
<td>8,532</td>
<td>30,545</td>
</tr>
</tbody>
</table>

For this agricultural survey, most of the villages and farms along the alignment were visited and agricultural activities recorded.

### 3.4.5 Public Health

This section presents a brief overview of the current health situation in Uganda followed by more specific information that pertains to the transmission system area.

The top ten outpatient diagnoses for 1995 for all ages, from 22 reporting districts in Uganda, are shown in Table 3.6 below. It is based on 5,517,344 Outpatients Department (OPD) diagnoses. Malaria and respiratory infections account for 50% of OPD diagnoses while the top ten diagnoses account for 84.8% of the total diagnoses.

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Admissions</th>
<th>% of total diagnoses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malaria Acute</td>
<td>1431068</td>
<td>25.9</td>
</tr>
<tr>
<td>Lower Respiratory Infections</td>
<td>785114</td>
<td>14.2</td>
</tr>
<tr>
<td>Acute Upper Respiratory Infections</td>
<td>572639</td>
<td>10.4</td>
</tr>
<tr>
<td>Intestinal Worms</td>
<td>572639</td>
<td>10.0</td>
</tr>
<tr>
<td>Trauma (injuries, wounds, burns)</td>
<td>376613</td>
<td>6.8</td>
</tr>
<tr>
<td>Diarrhoea with Blood</td>
<td>335215</td>
<td>6.1</td>
</tr>
<tr>
<td>Skin Diseases</td>
<td>235157</td>
<td>4.3</td>
</tr>
<tr>
<td>Eye Infections</td>
<td>231349</td>
<td>4.2</td>
</tr>
<tr>
<td>Dental Caries</td>
<td>87487</td>
<td>1.6</td>
</tr>
<tr>
<td>Anaemia</td>
<td>73423</td>
<td>1.3</td>
</tr>
</tbody>
</table>

Source: Uganda Health Bulletin September-December 1996

#### 3.4.5.1 HIV/AIDS

The Ministry of Health's Three-Year Plan Frame 1993/94 - 1995/96 articulated the growing burden of HIV/AIDS on the population of Uganda. HIV/AIDS-related illness were then said to account for over 30% of all hospital admissions. Nearly 70% of the beds in the tuberculosis wards of the largest hospitals were occupied by patients who were also HIV positive.
As of 31st December 1997, a cumulative total of 53,306 AIDS cases (children and adults) had been reported to the STD/AIDS Control Programme Surveillance Unit (refer to Table 3.7). Of the reported 53,306 AIDS cases, 49,432 (92.7%) were adults aged 12 years and above while 3,874 (7.3%) were children below 12 years.

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1983</td>
<td>17</td>
</tr>
<tr>
<td>1984</td>
<td>28</td>
</tr>
<tr>
<td>1985/86</td>
<td>910</td>
</tr>
<tr>
<td>1987</td>
<td>3,824</td>
</tr>
<tr>
<td>1988</td>
<td>7,249</td>
</tr>
<tr>
<td>1989</td>
<td>13,339</td>
</tr>
<tr>
<td>1990</td>
<td>19,955</td>
</tr>
<tr>
<td>1991</td>
<td>30,190</td>
</tr>
<tr>
<td>1992</td>
<td>36,552</td>
</tr>
<tr>
<td>1993</td>
<td>41,193</td>
</tr>
<tr>
<td>1994</td>
<td>46,120</td>
</tr>
<tr>
<td>1995</td>
<td>48,312</td>
</tr>
<tr>
<td>1996</td>
<td>51,344</td>
</tr>
<tr>
<td>1997</td>
<td>53,306</td>
</tr>
</tbody>
</table>


The female to male ratio of adults infected was approximately 1:1. The overall mean age for adult AIDS cases was 32.57 years. Stratified by gender, the mean age was 34.38 and 30.59 years for males and females respectively. A cumulative total of 3,874 AIDS cases aged below 12 years had been reported to the STD/AIDS Control Programme as of 31st December 1997. The overall mean age for paediatric AIDS cases was 2.18 years.

3.4.5.2 Health Profile for Mukono District

Table 3.8 shows summary health statistics for Mukono District and compares them to Uganda national averages. Mukono District, which encompasses the majority of the transmission system, ranks higher than the national averages in all categories of health except for percentage of the population situated within a 5 km radius of a health facility (44.3% in Mukono District versus 49.0% nationally).
Table 3.8: Health Profile for Mukono District and Uganda for the Year 1993

<table>
<thead>
<tr>
<th>Health category</th>
<th>Mukono District</th>
<th>All Uganda</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population Growth Rate (Percent)</td>
<td>2.4</td>
<td>2.5</td>
</tr>
<tr>
<td>Population density (persons/km²)</td>
<td>179</td>
<td>85</td>
</tr>
<tr>
<td>Total Fertility Rate</td>
<td>6.8</td>
<td>7.5</td>
</tr>
<tr>
<td>Infant mortality rate/1000 persons</td>
<td>102</td>
<td>122</td>
</tr>
<tr>
<td>Child mortality rate/1000 persons</td>
<td>169</td>
<td>203</td>
</tr>
<tr>
<td>Hospitals</td>
<td>6</td>
<td>95</td>
</tr>
<tr>
<td>Health Units</td>
<td>31</td>
<td>1332</td>
</tr>
<tr>
<td>Total Beds</td>
<td>870</td>
<td>22,714</td>
</tr>
<tr>
<td>Population within 5 km Radius of health facility (%)</td>
<td>44.3</td>
<td>49.0</td>
</tr>
<tr>
<td>Deployment of trained Health personnel</td>
<td>638</td>
<td>12,289</td>
</tr>
</tbody>
</table>


3.5 Cultural Characteristics and Values

3.5.1 Cultural Property

Uganda is a multicultural society with several ethnic groups. The southern reach of the Victoria Nile, i.e., south of Lake Kyoga, is made up entirely of people of Bantu descent. In this area are the Baganda on the western side of the River Nile and the Basoga on the eastern side, both peoples of Bantu origin (Fountain Publishers Ltd., 1999).

While the official language is English in Uganda, there are over 30 languages spoken in the country (CIA, 1999). Along the Victoria Nile, Luganda (west of the river) and Lusoga (east of the river) are the languages that predominate south of Lake Kyoga. These languages are very similar to one another and mutually understandable.

Religious beliefs are divided in Uganda: 33% are Roman Catholic, 33% are Protestant, 16% are Muslim, and 18% practice indigenous beliefs (CIA, 1999). For the social survey undertaken for the Transmission System RAP, 37% of households within the study area are Protestant, 36% are Catholic, 23% are Muslim and 4% practice other beliefs.
No significant cultural properties are known to occur within the proposed transmission corridor. Consultations for the Transmission System were held at the Scoping Stage (late 1998) and during preparation of the Interim Report (early 1999).

Interviews were held with representatives for the Ministry of Tourism, Wildlife and Antiquities and the Uganda Tourist Board. No cultural properties were identified within the proposed transmission corridor. The Commissioner for Antiquities and Museums was sent a letter with a map of the alternative transmission routes being considered. No sensitive areas were identified by his office.

There are three cultural sites of national importance located on the western edge of Kampala city, outside of the proposed transmission corridor (refer to Figure 3.6). All three sites are located on hilltops. They are:

- The Kasubi Tombs (Kampala mapsheet 36N 4502366), an important tourist attraction, located 3.1 km from the proposed transmission line;

- Kiwewa Tombs (Kampala mapsheet 36N 4479371), located 1.1 km from the proposed transmission line; and,

- Wamala Tombs, the tombs of former Buganda kings (Kampala mapsheet 36N 4471436) (Dr. Kamuhangire, pers. Comm., Nov. 1998).

The Uganda Martyrs' site at Namugongo, northeast of Kampala (Kampala mapsheet 36N 4611430), is a cultural site of national importance. This site is located 2.6 km south of the preferred route and will not be impacted by the transmission system.

There are a number of personal household graves known to be located in the general vicinity of the proposed Kawanda substation site. There are 50 graves to the southeast and 10 graves to the northeast of the proposed site, discussed in more detail in Chapter 4 of this report. The shortest distance between a grave and the proposed substation site is approximately 20 m. Households were specifically asked during the socio-economic survey carried out for this project whether they had members of their family buried on their land and/or places of offerings (amasabo), and if so, whether or not they wanted these relocated should they be affected by the project. Details and plans for managing any potential project effects to cultural property are provided in section 8 of the Transmission System RAP.
A qualified archaeologist will walk the transmission system after the EIA has been approved and prior to construction taking place, to assess the potential for archaeological finds along the route. If archaeological sites are located, including during construction, mitigative measures will be implemented in collaboration with the Ministry of Tourism, Wildlife and Antiquities. Refer to Chapter 7 for details.

3.5.2 Aesthetic Values

The part of the existing line from Owen Falls to Kampala that would be followed by the proposed 220 kV line for the Bujagali project runs in a more-or-less straight line across the landscape from Namyoya to the SCOUl Estate east of Mabira Forest (existing tower 181). It runs across a varied sequence of hills and valleys, varying from 1080 mASL at the River Sezibwa to over 1320 mASL at Kito and also near Ssese, on the fringes of Mabira Forest.

The visual effect of the existing line on its surroundings varies, mostly according to the land use and the resulting vegetation. Through the farmland and the estates, clearance is usually limited to the width of the access track and the towers, with the appearance of the track often being absorbed onto the pattern of other farm tracks. The larger estates and some other steep ridges provide viewpoints from which long lengths can be seen, when the succession of towers may be intrusive aesthetically. The line does not follow ridgelines for any great distance, so it is rarely perceived as running along the skyline, except from nearby viewpoints. The highest part of the route, from Ndeeba to Waswa (west of Mabira FR), runs just to the north of the top of a ridge, which helps to mask the prominence of the line. The forest completely encloses the line from outside view, although there are often long views along the route for anyone crossing the line or living alongside it, with the width of forest clearance clearly evident across successive ridges.

The existing lines entering the Mutundwe substation have a significant effect on the visual character of the Natete area and on local property, especially the route from the north, which passes directly over the busy commercial and market area.

Two parallel 132 kV lines will run approximately 5 km along the west bank of the Nile between the hydropower station and the existing lines connecting Owen Falls with Tororo. This section of the route runs across gently undulating landscape in which tributaries drain into the River Nile that is deeply incised at this point. The area above the river is characterised almost entirely by smallholder farming. This has created a landscape of fairly

AES Nile Power 94 March, 2001
dense vegetation from ground level up to medium height trees with the canopies of taller trees occasionally rising above. Lines of view are short, except across larger fields.

3.6 Recreation and Tourism

At Namugongo, the burial place of the Uganda Martyrs contains a number of churches and shrines (refer to Figure 3.6). This is a key location for celebrations on Uganda Martyrs Day (June 3) when large numbers of people flock to the site for remembrance ceremonies. This site is located 2.5 km from the proposed transmission line (Kampala mapsheet 36N 611431 and 628441).

According to the Uganda Tourist Board, the only area of tourism value within the study area is located within Mabira FR. Tourism within Mabira FR and the surrounding area has been addressed in Section 3.3.1.
This page is intentionally blank.
4. ALTERNATIVES ANALYSIS AND PROJECT DESCRIPTION

The need for power in Uganda has been well documented, including in recent studies by Kennedy and Donkin (1997), EdF (1998) and Acres (2000). All report a debilitating deficit in electricity supply in Uganda, affecting its social and economic activities on a daily basis, and limiting its future growth (UIA, 1998). EdF (2000) have revised previous estimates of load forecasts in Uganda, relative to demand, following the 80MW of new electricity added to the system by the Owen Falls Extension Project (OFEP).

The most recent load forecasts by EdF estimate that by 2020, 783 MW of capacity will be required to meet domestic demand in Uganda. Presently, there is a potential to generate 260 MW of supply from hydroelectric sources at Owen Falls. There are also other small, “off-grid” sources of electricity, amounting to approximately 10MW, for a total of 270 MW of existing generation capacity (EdF, 2000). AESNP’s proposed Bujagali hydropower project has the potential to add 250 MW of additional capacity to the system.

4.1 Existing Electricity System in Uganda

The existing national electricity generation and transmission system for Uganda is shown in Figure 4.1. The major features of the existing and proposed transmission systems are shown schematically in Figure 4.2 for an area between Dumbbell Island (on the Victoria Nile) in the east and Kampala in the west (i.e., the study area for the Bujagali project’s transmission system).

As illustrated in Figure 4.2, energy generated from the Owen Falls hydropower station and from OFEP is distributed through the Owen Falls substation to three existing substations (Kampala North, Lugogo and Mutundwe) in the Kampala region, the main load centre of Uganda. This is done primarily via two 132 kV transmission lines:

- Owen Falls to Kampala North – A single circuit 132kV line running northwest of Jinja towards Kampala, passing through mainly plantation lands and forest. This “northern” route follows the original line route built in the 1950’s to evacuate power from the Owen Falls hydropower station (the line has subsequently been upgraded and rehabilitated and remains in service);

- Owen Falls to Lugogo - A double circuit 132kV line financed by the Danish International Development Agency (DANIDA) and completed in 1994 on a route proceeding
southwest from Jinja. This “southern” route was selected through an EA study process (Ornis Consultants, 1993) and passes through a number of settlements on its way to Lugogo substation, east of Kampala.

Between Lugogo and Mutundwe substations, the transmission line is strung with one circuit only. Double circuit lines exist between the substations at Kampala North and Lugogo and between Kampala North and Mutundwe, although these lines each have one circuit operating at 33 kV. All three of the substations at Lugogo, Mutundwe and Kampala North are presently saturated or near-saturated and expansion of them (i.e. building of new service bays) for all of the Bujagali project’s evacuated power is not feasible (Knight Piesold and Merz and McLellan, 1998; Acres, 2000).

An older 66 kV transmission line also exists between Owen Falls and Lugogo substation in Kampala that runs roughly parallel to, and south of, the 132 kV DANIDA line. Presently, this is strung with a 66 kV line from Owen Falls to Lugazi and a 33 kV line from Lugogo substation in Kampala to Mukono. The transmission towers between Mukono and Lugazi in this corridor are not in use and not strung with any conductors.

A double circuit 132 kV line also runs north from the Owen Falls generating station along the west bank of the Nile, then eastward toward Tororo substation, after which connections are made to Lira substation and to the Kenyan system.

4.2 Need for the Project

- No transmission infrastructure presently exists directly adjacent to the proposed Bujagali hydropower site. New transmission infrastructure is required to evacuate power from the hydropower facility to the national network. Feasibility studies undertaken for the Bujagali project (Knight Piesold and Merz and McLellan, 1998) also concluded that the national network in Uganda is insufficient to evacuate 250MW of power from the proposed Bujagali switchyard. Improvements to the national network are also required.
4.3 Technical Options

Knight Piesold and Merz and McLellan (1998) evaluated from a technical perspective four options by which power could be evacuated from the Bujagali hydropower station to a new Kampala-area substation to be located north of the city. The options were:

Option 1: Connection of Bujagali hydropower station using 132kV interconnectors, including a new 132kV line from Bujagali to a new substation in the vicinity of Kawanda (north of Kampala);

Option 2: Connection of Bujagali hydropower station at 220kV using 220kV interconnectors to Kawanda;

Option 3: Connection of Bujagali hydropower station at 132kV using 220kV interconnectors to Kawanda; and,

Option 4: Connection of Bujagali hydropower station at 132kV using 220kV interconnectors to Kawanda with initial operation at 132kV.

Knight Piesold and Merz and McLellan (1998) recommended that Option 1, above, be the option that AESNP pursue as the least cost, most efficient method to evacuate power from the Bujagali hydropower station to the national network. Moreover, their recommendation was to build the hydropower project in two phases: the first phase would be 3 X 50 MW units, the second phase 2 X 50 MW units.

Subsequently, this recommendation was revised by Knight Piesold and Merz and McLellan (1999) in favour of Option 2, above. The rationale for the decision and changes that resulted were explained in the Addendum to the Feasibility Study as follows:

To meet the load demand requirements of Uganda and the surrounding region (Kenya, Tanzania and Rwanda) to which the UEB grid system is connected, in addition to the construction of the Bujagali power station, the power development plan envisages the installation of a further five 40 MW units at the Owen Falls Extension Power Station and the development of the Kalagala site such that the total installed generation capacity on the UEB system would be about 1000MW. With Owen Falls, Owen Falls Extension, Bujagali and Kalagala power stations located on the Victoria Nile River electrically close to one another and the transmission system requiring to transfer this power primarily from the power stations to the principal load centre at Kampala and to locations to the west of Kampala (including exports to Tanzania and Rwanda), a 132 kV connection would have a constraining transmission capacity and require additional reinforcement as forecast demand increased.
and new generation came online. A more optimal solution would be to introduce a transmission voltage of 220 kV (consistent with the existing transmission systems in the region) permitting the required increased transfers from generating stations to load centres within an overall least cost transmission development plan. (Knight Piesold and Merz and McLellan, 1999, p.5-

The revised configuration for evacuating Bujagali's power, as justified above, is shown schematically in Figure 4.3. The Bujagali switchyard will now be connected to the UEB grid by two 132 kV lines, severing the existing Owen Falls-Tororo 132 kV line in two places. Figure 4.4 shows the manner in which this is proposed to be done. One of the 132 kV lines will connect to the existing Owen Falls-Tororo line, down to the Owen Falls substation and thence on to Kampala. The other will feed into the existing Owen Falls-Tororo line and thence on to Tororo and Kenya for export. The reason why the Owen Falls-Tororo line must be severed is that there is no capacity at the Owen Falls substation to accommodate two new 132 kV lines. New service bays have just been added to the substation to accommodate the 3 X 132 kV lines from the Owen Falls Extension Project and the substation is saturated (Knight Piesold and Merz and McLellan, 1999).

In addition, a 220 kV double circuit overhead line will connect the Bujagali switchyard to the Kawanda substation and a 132 kV double circuit overhead line would connect the Kawanda switchyard to the existing Mutundwe substation. The additional cost to AESNP to construct transmission infrastructure beyond the minimum required to connect the Bujagali project to the national network is regarded by the company as a developmental benefit to the country and region. It will also provide UEB with increased flexibility and capability for future system planning and development.

Refurbishment of the Tororo line, utilised by UEB for export of electricity to Kenya, was under active consideration by UEB at the time of writing this EIS. Carl Bro International Ltd. had been engaged by UEB to assess the condition of the Owen Falls - Tororo transmission line and prepare specifications for its refurbishment (Steddall, pers. Comm., 2001). Based on Carl Bro's recommendations, UEB intended to tender for these works in the first half of 2001 with a US$1.5m budget they have for these works. The works could include replacement of the existing wooden towers that exist in certain places along the route, in addition to general refurbishment of the overhead line, to ensure the sustainability of transmitting firm energy for export along this route. AESNP has not addressed this issue in this EIS, as it is not part of the Bujagali project.
Bujagali 220 kV 70.5 km 220 kV double circuit line

Kawanda Substation 220 kV

220/132 kV

Kawanda 132 kV

7.5 km 132 kV

132 kV

2 x 5 km 132 kV double circuit lines

Mutundwe 132 kV

Bujagali 220 kV

4x50 MW Generators

1x50 MW Generators (optional)

Owen Falls - Tororo Line 132 kV

Adapted from Knight Piésold and Merz & McLellan, 1999

Prepared for:
AES NILE POWER

REVISED CONNECTION OF BUJAGALI POWER STATION TO UGANDAN NATIONAL NETWORK
Figure 4.4a
EXISTING 132 kV ENTRIES INTO OWEN FALLS SWITCHYARD

Figure 4.4b
REARRANGED 132 kV ENTRIES INTO EXISTING OWEN FALLS SWITCHYARD
4.4 Alternative Options and Transmission Line Corridors

WS Atkins International Ltd. carried out an EIS Scoping Study (WS Atkins et al, 1998) on the transmission line options and corridors between 24 November and 18 December 1998. Its purpose was fourfold:

- To consider four technical options for evacuating power from the Bujagali plant;
- To consider alternative routes and define an optimum alignment taking into consideration environmental and economic considerations;
- To identify the key issues to be address in the EIA; and,
- To draw up final Terms of Reference for the EIA.

The four technical options considered by WS Atkins were the same described, above, from Knight Piesold and Merz and McLellan (1998 and 1999). WS Atkins concluded:

A 220 kV line (Option 2) is preferred from a technical point of view. This is primarily because it does not need any future additions to achieve the power evacuation requirements. Future changes to the line and substation would necessitate planned outages with attendant difficulties and costs. Whilst the 220 kV line would be more costly in the short term it may be more economic in the longer term although this would have to be balanced against the additional substation costs. A 220 kV system is the option preferred by UEB in the light of their long term plans for the transmission network. (WS Atkins, 1999b, p. 5-8)

From an environmental point of view a 220 kV line is preferred because it involves only one construction period, and the main impacts of a transmission line are greater during construction than operation. A 220 kV line also requires a narrower corridor than two 132 kV lines. (WS Atkins 1999b, p. 5-11)

With respect to the potential corridors for the Bujagali project's transmission lines, WS Atkins carried out an analysis using a range of criteria to identify the potential key impacts of the alternative corridors examined. UEB advised AESNP and WS Atkins that they believed any new transmission corridor associated with the Bujagali project should use the existing 132 kV corridors between Jinja and Kampala, i.e. the "northern route" or "DANIDA route" corridors discussed in section 4.1. These potential transmission corridors are shown in Figure 4.5. A summary of the analysis undertaken by WS Atkins (1998) evaluating these options appears in Table 4.1. The names given to the sections of the corridors in Table 4.1 are those shown in Figure 4.5.
This page is intentionally blank.
FIGURE 4.5 ALTERNATIVE TRANSMISSION SYSTEM ROUTES

Source: W. S. Atkins, 1996

FILE: G0503_T_49

Scale: 1:75,000

Map 3 of 3
Table 4.1: Summary of Key Impacts of Route Corridors (from WS Atkins, 1998)

<table>
<thead>
<tr>
<th>Impact</th>
<th>Bujagali to Tororo (A)</th>
<th>Bujagali to Owen Falls (B)</th>
<th>Bujagali to Northern Link (C)</th>
<th>Bujagali to Southern Link (D)</th>
<th>Owen Falls to Seeta/Namugoya</th>
<th>Seeta/Namugoya To Kawanda</th>
<th>Kawanda To Matumadi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approximate number of Properties Affected</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Community Facilities Affected</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Settlements Affected</td>
<td>Small part of Nkokonjeru affected</td>
<td>Small part of Nkokonjeru affected</td>
<td>Small part of Nkokonjeru affected</td>
<td>Naava affected and small part of Nkokonjeru</td>
<td>Large settlement between villages at Namwezi, Kinyonga and Wakiso affected</td>
<td>Large settlement between villages at Namwezi and Kinyonga and Wakiso</td>
<td>Large settlement between villages at Namwezi and Kinyonga and Wakiso</td>
</tr>
<tr>
<td>Heritage/ Antiquities Affected</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Tourism/ Recreation Impact</td>
<td>Visual impact from Bujagali camp site</td>
<td>Visual impact from Bujagali camp site</td>
<td>Visual impact from Bujagali camp site</td>
<td>Visual impact from Bujagali camp site</td>
<td>Minor impact on eco-tourism project in Mabira Forest</td>
<td>Small part of Mabira Forest</td>
<td>Small part of Mabira Forest</td>
</tr>
<tr>
<td>Access (for construction) requirements</td>
<td>New access from Kjeru to Kayunga road can be used</td>
<td>Same access as for (A) can be used</td>
<td>Same access as for (A) can be used</td>
<td>Same access as for (A) can be used</td>
<td>Access good due to proximity of Mabira Forest</td>
<td>Good access as route close to existing roads</td>
<td>Good access as route close to existing roads</td>
</tr>
<tr>
<td>LAND USE (km)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Built-up Area</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Small Scale</td>
<td>5</td>
<td>5.3</td>
<td>6.5</td>
<td>2.6</td>
<td>8.2</td>
<td>4.2</td>
<td>25.7</td>
</tr>
</tbody>
</table>

*AES Nile Power March, 2001*
<table>
<thead>
<tr>
<th>Impact</th>
<th>Bujagali to Owen Falls (A)</th>
<th>Bujagali to Owen Falls (B)</th>
<th>Bujagali to Northern Link (C)</th>
<th>Bujagali to Southern Link (D)</th>
<th>Owen Falls to Seeta/Namyoya (E)</th>
<th>Seeta/Namyoya To Kawanda (F)</th>
<th>Kawanda To Mutundwe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farming</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Plantations</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.6</td>
<td>-</td>
<td>5.6</td>
<td></td>
</tr>
<tr>
<td>- Tropical High Forest</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td>- Degraded Forest</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>10.0</td>
<td>2.1</td>
</tr>
<tr>
<td>- Woodland</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.0</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>- Bushland</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>- Grassland</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4.0</td>
<td>3.2</td>
</tr>
<tr>
<td>- Wetland</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.4</td>
<td>0.3</td>
<td>2.3</td>
</tr>
<tr>
<td>Total Length</td>
<td>5</td>
<td>5.3</td>
<td>6.5</td>
<td>5.2</td>
<td>8.6</td>
<td>9.8</td>
<td></td>
</tr>
<tr>
<td>Total Costs</td>
<td>-</td>
<td>-</td>
<td>Costs of crossing northern line</td>
<td>Costs of crossing northern line</td>
<td>Costs of crossing northern line</td>
<td>Costs of crossing northern line</td>
<td></td>
</tr>
<tr>
<td>Security</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Other Comments</td>
<td>This line required with all options</td>
<td>This line required with all options</td>
<td>Increases total corridor width between Bujagali and Tororo line</td>
<td>Reduces overall length of northern route to Seeta</td>
<td>Increases total corridor width between Bujagali and Tororo link</td>
<td>Reduces overall length of southern route to Seeta</td>
<td>Route crosses Jinja/Kampala road 5 times</td>
</tr>
<tr>
<td>Other Comments</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost Implications</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>
The following text from WS Atkins (1998) explains in narrative form the decisions made on each of the corridor alternatives evaluated in Table 4.1. The routes referred to in this text are those shown in Figure 4.5.

**Bujagali to the Owen Falls to Seeta / Namyoya link**

Route D is the preferred option for the link from Bujagali to the Owen Falls to Seeta/Namyoya link. This conclusion must be viewed in relation to the conclusions for the Owen Falls to Seeta Namyoya section where the northern route is preferred (see below). Route D reduces the overall length of this link and, because it means that a 220kV line is not required between Bujagali and Owen Falls, the overall width of the corridor in this section is kept to a minimum. Agricultural land take, severance of numerous land holdings and the visual impact of three parallel lines in the sight line of the existing and proposed recreational areas alongside the future reservoir would all be undesirable in this area.

The impact on property and settlement is minimal with Route D and the impact on small-scale subsistence farmland far lower than with the other routes. The route crosses plantation land and thus plantation access roads can be used for construction and maintenance purposes.

**Owen Falls to Seeta / Namyoya**

The northern route is preferred from a technical and engineering viewpoint, primarily because it avoids the need for costly crossings over the northern line. The crossovers may incur an additional premium of up to 5% of the [total] line cost. The southern route has the advantage of good access due to its proximity to the main Kampala to Jinja road, but crosses it five times and is longer.

The impact on settlement, property and community facilities is lower for the northern route. Both the southern and northern routes pass through approximately the same amount of small-scale subsistence agriculture. The main issue on this section is that the northern route passes through the Mabira Forest whilst the southern route crosses large sections of plantation land, and there are a number of factors to consider in this respect. The northern route would undeniably incur some loss of forest resources and the maintenance costs within the forest area may be higher. However, it is considered that a modest increase in the width of the existing corridor through Mabira Forest will not affect the sustainability of the Reserve.

The southern route has the advantage of use of plantation access roads but UEB have advised that compensation on plantation land in this area may be difficult. It is the view of UEB that the northern route is preferred. On balance therefore the advantages of the northern route outweigh those of the southern corridor.

**Seeta / Namyoya to Kawanda**

The alternative route [as generated by WS Atkins and shown in Figure 4.5] is preferred to the UEB proposal on this section. The impact on property and settlement is far lower with the alternative route as is the impact on small-
scale subsistence farming. The route is also shorter than the UEB proposal and has no impact on the important heritage site at Namungongo.

**Kawanda to Mutundwe**

The alternative route [as generated by WS Atkins and shown in Figure 4.5] is the preferred option on this section. This is primarily because it has a far lower impact on property, settlement and community facilities and crosses less small-scale subsistence farmland. It is a slightly longer route (by 2 km) and will involve crossing or passing through small areas of the Lubigi swamp. This will have a local impact during construction of the towers and conductor stringing, but in the long term it is considered that the line will not significantly affect the ecological functioning and traditional use value of the wetland.

Foundation costs may be slightly higher in the swamp area. However the UEB route would involve higher costs associated with crossing the existing transmission line from Kampala north to Mutundwe. (WS Atkins, 1998).

The justification provided, above, for the selection of the northern route transmission line was augmented by UEB's advice to WS Atkins and AESNP. In minutes of November 1998 and December 1998 meetings between WS Atkins and UEB (appended to this report as Appendix E), UEB advised that they wanted a new transformer station to the north of Kampala to provide future service to the poorly supplied northern region of the country. Moreover, they did not want the Bujagali project's transmission lines to:

- cross any existing transmission lines or other utility corridors, roads; nor,
- use the existing DANIDA transmission corridor due to problems they had experienced there with resettlement and compensation.

In summary, then, the major reasons for selection of the transmission corridor adjacent to the existing northern route over the southern corridor parallel to the DANIDA line were that the northern corridor:

- was shorter by about 7 km;
- affected 47 fewer properties;
- allowed a direct link to a northern substation (vs a circuitous, indirect route from southern corridor);
- would not require a new transmission line from its terminus to the new northern substation (involving challenging routing of a new transmission line through heavily populated areas of Kampala), as would be the case for the southern corridor.
would not cross other transmission lines (southern corridor would cross existing “northern route” twice);

would not cross other utility corridors (southern corridor would cross Jinja/Kampala road 5 times); and,

would be more economical (as a result of shorter length and lack of crossings of other corridors).

Additional, critical factors in the decision-making for the transmission corridor were:

unresolved resettlement and compensation issues associated with the construction of the DANIDA line;

- with the potential for a long, costly and difficult resettlement and compensation process for any new line, inevitably complicating existing, longstanding compensation issues along that corridor; and,

- the potential that some people would need to be resettled/compensated for a second time.

limited, if any, system expansion potential on the southern route: utilisation of this route would necessitate expansion of existing substations, which presently are at their maximum capacity so that new lands (requiring even further resettlement/compensation to be carried out) would be needed at each; and,

- high population densities, including along and beneath the existing transmission lines, along the southern (DANIDA) route.

Overall, the construction of the DANIDA line, and the outstanding issues associated with its construction (which was completed in 1993), appeared to have effectively ‘saturated’ that corridor’s capacity for routing of additional lines, at least in the near term. AESNP concluded that it could not realistically complete its resettlement/compensation obligations to a satisfactory standard along that corridor in anything like the timeframe required for it to implement the Bujagali project. Hence, AESNP decided that, within the existing and immediately foreseeable requirements and constraints for implementation of this transmission line, it had no feasible alternative to the northern corridor for routing this transmission line.

In its independent assessment of the transmission line route selection process, the Panel of Experts, in its fourth report, concluded that WS Atkins had selected the most appropriate
route in the 1998 Scoping Report. The Panel of Experts’ reports can be viewed in their entirety on www.bujagali.com. From a ground survey and an aerial visual inspection of the two route alternatives undertaken by helicopter, the Panel concluded that a line running parallel to the DANIDA line (on either side of it) would entail far more impacts to human settlements than the route selected. They further commented that the route selected (i.e. north of the existing northern line) was preferable to a route running south of the existing northern route, as it would also entail fewer impacts to human settlements.

4.5 Substation Site Alternatives

Under the planned transmission system configuration for the Bujagali project, a substation will be required in the Kawanda area (10 km north of Kampala) to reduce the voltage of the incoming transmission line from 220 kV to 132 kV. This transformer station will also provide for a more efficient low voltage distribution capability in and around Kampala, an otherwise saturated system. Construction of the substation will require the permanent acquisition of approximately 5 ha of land for the substation itself, plus additional area for an access road.

Three potential sites in the Kawanda area north of Kampala were considered for the location of the substation. The first site (Maganjo) is approximately 1 km south of the Kawanda township, with the centre of the site at a location of approximately 49211 E, 45321 N. The second site (Nkokonjeru) is 1.5 km west of the Kawanda Agricultural Research Institute (KARI), centred at 46689 E, 46135 N. The third site (Nakyesanja) is approximately 3 km east of Option 2, centred at 49300 E, 47300 N.

The locations of these three options are shown in Figure 4.6. Fieldwork for the comparative assessment and site selection was carried out in February, 2000 by WS Atkins, notes from which appear as Appendix F to this EIS. Table 4.3, summarizes the various impacts identified during the comparative evaluation of the three potential sites.
ALTERNATIVE SUBSTATION SITES IN KAWANDA AREA
Table 4.2: Summary of Impacts of Three Potential Substation Sites in the Kawanda Area (from WS Atkins 2000)

<table>
<thead>
<tr>
<th>Issue</th>
<th>Option 1: Maganjo</th>
<th>Option 2: Nkokonjeru</th>
<th>Option 3: Nakyesanja</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present main land use of plot</td>
<td>Small-holdings with some dwellings</td>
<td>Small-holdings with bush</td>
<td>Small-holdings with bush</td>
</tr>
<tr>
<td>Distance from Kampala - Bombo highway</td>
<td>0.4 km</td>
<td>2 km</td>
<td>1.5 km</td>
</tr>
<tr>
<td>Additional transmission line required (c.f. Option 1)</td>
<td>N/A</td>
<td>3.75 km</td>
<td>4.5 km</td>
</tr>
<tr>
<td>Cost of additional transmission line c.f. Option 1 (US$)*</td>
<td>0</td>
<td>656,250</td>
<td>787,500</td>
</tr>
<tr>
<td>Buildings on site (including access road)</td>
<td>5 (including two under construction)</td>
<td>15 (estimated, depending on access road alignment)</td>
<td>7 (estimated, depending on access road alignment)</td>
</tr>
<tr>
<td>Estimated population to be relocated**</td>
<td>42</td>
<td>125</td>
<td>58</td>
</tr>
<tr>
<td>Estimated value of buildings to be lost (US$)***</td>
<td>100,000</td>
<td>300,000</td>
<td>140,000</td>
</tr>
<tr>
<td>Estimated value of crops to be lost (US$)</td>
<td>45,500</td>
<td>22,750</td>
<td>12,250</td>
</tr>
<tr>
<td>Groundworks required</td>
<td>Minor</td>
<td>Extensive</td>
<td>Extensive</td>
</tr>
<tr>
<td>Landscape impact</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>Graves directly affected</td>
<td>10-60</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Wayleave impact on residences</td>
<td>None (no residences within 20 m)</td>
<td>Minor (a few houses near Nkokonjeru)</td>
<td>Moderate (church and several houses at Lubatu &amp; Nakyesanja)</td>
</tr>
<tr>
<td>Visual impact</td>
<td>Lowest</td>
<td>Medium</td>
<td>Highest</td>
</tr>
<tr>
<td>Total cost including buildings &amp; crops (USD)</td>
<td>145,500</td>
<td>979,000</td>
<td>939,750</td>
</tr>
</tbody>
</table>

*Assuming $150,000 per km for 132 kV line and $200,000 per km for 220 kV line

**Assuming 8.3 persons per dwelling (average figure from Bujagali Hydropower EIA socio-economic survey)

*** Assuming $20,000 per building replacement cost
Based on the analysis presented in Table 4.3, Option I (Maganjo) emerged as the most favourable site from both environmental and financial perspectives. The summary prepared at the time of this comparative analysis noted that "the main impacts associated with the Maganjo site, in comparison with the other two options were:

Positive

- Lowest construction cost;
- Lowest impact on buildings and crops;
- Flatter site, requiring less preparatory groundwork;
- Lowest visual impact due to lower-lying location; and,
- Best access from Kampala-Bombo highway.

Negative

- Potential impact on graves (10-60, depending on final site boundary).

That summary noted that "it may actually be possible to avoid all of the existing gravesites, which lie near two boundaries of the proposed substation, but this may have impacts on features at the other two (opposite) boundaries, such as the Kawanda Secondary School, and houses near the northern boundary." In fact, subsequent optimisation of this site location has made it possible to avoid direct impacts on the known gravesites and the school. The conceptual layout of the substation for the Maganjo site is shown in Figure 4.7.

4.6 Route and Site Optimisation: Stage 1

Following the identification of a preferred transmission system corridor by WS Atkins (1998, 1999b), a specific line route within that corridor needed to be established. The Bujagali EPC contractor (BEC) was the first party to undertake this work in February, 2000, precipitated by their need to produce an accurate cost estimate of project construction to AESNP. BEC used the work of WS Atkins (1998 and 1999b) as a starting point for their work. They then walked the entire length of the corridor, taking into account considerations of engineering feasibility (e.g., terrain conditions, site drainage, site access) and the minimisation of impacts to human settlement. The result of this exercise was a proposed centre line for the Bujagali project's transmission line.
CONCEPTUAL LAYOUT OF KAWANDA SUBSTATION

Project Name: BUJAGALI TRANSMISSION SYSTEM EIS
Prepared for: AES NILE POWER

Date: DECEMBER, 2000

Figure 4.7
In March, 2000, AESNP commissioned Carl Bro International A/S to carry out a study to identify the preferred line route, including topographical and geotechnical surveys of the route and a detailed route description. General objectives of the Carl Bro International A/S (2000) study included:

- Definition of specific line route based on fixed angle points and wayleave widths of 40m (220kV) and 30 m (132 kV), respectively, within the 1 km-wide corridor defined by WS Atkins (1999b); and,

- Optimization of the routing, taking into account the aim of avoiding dwellings.

Specific objectives of the survey were to:

- Identify and determine the optimum alignment;

- Provide a line route description; and,

- Provide any other information to assure “that all environmental concerns and consequences are fully integrated into the project.”

The study determined the position of angle points in the field to the extent reasonable to avoid dwellings, schools and other major structures/installations, as well as consider the visual impact and the construction needs, i.e., foundation and access conditions.

The field study also identified two significant issues to be resolved:

i) the need to establish a minimum distance away from the railway on the section between Mutundwe and Masaka Road; and,

ii) the need to establish a minimum distance between the old (existing) line through the Mabira Forest and the new line to be constructed.

Carl Bro decided, based on recent precedent, that the railway separation should be a minimum of 10 m from the centre of the existing track to the side of the tower. On the Mabira forest issue, they concluded that the minimum distance between the new 220 kV line and the old 132 kV line would have to be decided upon completion of the detailed design of the new line. Deciding factors will be:

- the spotting of new towers (including their positioning in relation to old towers); and,

- the height of the new towers (including considerations of ground clearance, length of isolators, the weight of conductors and sagging of conductors).
Carl Bro concluded that this could only be done after the detailed profiling of the line.

For this survey, the Consultant used a fixed distance of 45 m to the old line, recognizing that an adjustment by some m can easily be done following the detailed design.

4.6.1 Description of the Preferred Route and Site

Considerations made by Car Bro International (2000) to address site-specific issues along the transmission system route are contained in the following sections. The optimised route of the transmission system, as recommended by Carl Bro, is shown in Figure 4.8. Specific tower locations referenced in the following sections are also shown in Figure 4.8.

4.6.1.1 Bujagali Hydropower Plant to Kawanda Substation

Specific mitigation measures taken to minimize disturbance to the existing population include:

- Proposed section BP3-BP5 deviates from the routing proposed in the interim draft EIS (WS Atkins 1999b) in order to avoid a school and church at Nyenje. The preferred routing now avoids the school and church by 800 m, and crosses Namyoya Forest Reserve at its narrowest point;

- BP11 was moved approximately 100 m west of the location originally proposed in the interim draft EIS (to the west side of the high point, level 1207). This also resulted in a small realignment to section BP10 – BP11. This revision was done in order to avoid a settlement in the Lukaaga area and another settlement directly south of the high point; and,

- Between BP11 and the Kayunga Road, the line avoids a school and its playground by 50 m.

Despite mitigation efforts to minimize disturbance to the local population, some institutions, private dwellings and farmland will be impacted by the proposed transmission system, as follows:

- At existing tower number 79, which is adjacent to BP6, the proposed new line would affect a church under construction;

- At Wakiso, the proposed line would affect a few houses in the southern end of the village; and,

- At BP7, some houses for the workers on the adjacent tea estate are affected. A more northern routing of the new line was considered, but would have impacted on a greater number of houses in settlements located east of BP7.
FIGURE 4.8 OPTIMISED TRANSMISSION SYSTEM ROUTE

To-h Town
From Reserves
BP7
Optimised Route
SCALE 1:75,000

MUKONO DISTRICT

FILE: G0503_T_87
FIGURE 4.8 OPTIMISED TRANSMISSION SYSTEM ROUTE

Map 3 of 3
4.6.1.2 Kawanda to Mutundwe

Specific mitigation measures taken to minimize the impact of the transmission system on the local population and the physical environment include:

- No angle towers will be located in permanently wet areas. Towers AP5, AP6, AP7, AP9 and AP 10 will be constructed to a standard that they can support longer than normal spans (500m, instead of 300-350m), thus avoiding the necessity of placing towers in permanently wet areas. For towers located in seasonally wet areas, the foundation (tower legs) will be extended above the existing ground level in order to avoid contact between the swamp water and the tower steel; and,

- AP5 will be placed near the Masaka Road in order to provide maximum clearance above the Masaka Road in the span towards AP4 and the railway in the span towards AP6.

4.6.1.3 Bujagali Hydropower Plant to the Owen Falls-Tororo Line

The transmission lines from the Bujagali switchyard to the Owen Falls-Tororo line will run parallel to each other along the west bank of the Victoria Nile. The towers will be located side-by-side in order to minimise the cumulative visual impact of the towers.

4.6.1.4 Kawanda Substation

Carl Bro (2000) did not discuss the optimisation of the Kawanda substation site. Through careful location by AESNP of the footprint area of the proposed substation at Maganjo following the work by WS Atkins in February 2000, neither the gravesites nor the secondary school are now directly affected.

A detailed description of the entire transmission line corridor is included in Appendix G of the Transmission System Technical Appendices.

4.7 Route and Site Optimisation: Stage 2

In the second and third quarter of 2000, AESNP retained Young Stuart and Associates and Geomaps Ltd. to survey the angle towers and the wayleaves of the definitive transmission system identified by Carl Bro (2000). All technical, geotechnical and socio-economic criteria were taken into account in an iterative process carried out on the field with geologists, electricity engineers and socio-economists all of whom provided input to the final siting.
Ultimate adjustments were made to take into account the results of previous detailed studies and avoid houses, wherever possible. This process resulted in minimal impact on houses, churches and schools.

Socio-economic surveys and consultation with potentially affected persons were undertaken by AESNP in the 2nd and 3rd quarters of 2000 as part of the iterative process described above. Valuation of affected assets was also part of this process, undertaken by East African Consulting Surveyors. This provided the basis for the “census” required in OD 4.30, described in detail in Appendix 4 of the Transmission System RAP.

4.8 Other Alternatives Considered

In an effort to minimise the effects of the proposed transmission system on forest reserves (and in one case to minimise the effects of traffic accidents potentially caused by the transmission system’s construction), several other alternatives were considered by AESNP and their consultants during the planning of the project. These alternatives are summarised in Table 4.3.
### Table 4.3: Other Alternatives Reviewed During EIA Studies and Conclusions of Those Reviews

<table>
<thead>
<tr>
<th>Alternative Considered and Justification</th>
<th>Origination of Idea</th>
<th>Evaluation</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Single-tower configuration through core area of Mabira FR (~ 17 km) and Namyoya, Kifu FR to limit ecological effects</td>
<td>Study team (EIS)</td>
<td>Not feasible due to: • Significant outage of existing line during construction • Significant reduction in system redundancy • Increased maintenance &amp; security risks • Aesthetic concerns • Increased financial costs</td>
<td>Do not pursue</td>
</tr>
<tr>
<td>• Would negate need for new wayleave by stringing new 220kV lines and existing 132kV lines on “supertowers”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Move new 220kV wayleave to south side of existing 132kV wayleave through Mabira FR to avoid Buffer Zone to the North</td>
<td>Study team (EIS)</td>
<td>Not feasible due to: • security concerns of “arcing” between two transmission lines • maintenance issues • increased financial costs of crossing over, or burying under, existing line</td>
<td>Do not pursue</td>
</tr>
<tr>
<td>• Would entail either crossing over or burying under existing 132kV line</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Optimised tower configuration through Mabira, Namyoya and Kifu FR to reduce wayleave width and ecological effects • Use “monopole” towers requiring narrower footprint</td>
<td>Study team (EIS)</td>
<td>• Agreed. Wayleave will be reduced to 35m width through all forest reserves. • Monopoles will not be used as more expensive and taller, entailing greater aesthetic effects.</td>
<td>Commitments to compensate PAPs for 40 m wayleave will be honoured.</td>
</tr>
<tr>
<td>Route north of Mabira Forest from Bujagali hydropower station to Kawanda to reduce effects to FR</td>
<td>UEB</td>
<td>Prohibitively expensive</td>
<td>Do not pursue</td>
</tr>
<tr>
<td>Construct Transmission line by helicopter to reduce risk of highway traffic accidents.</td>
<td>William Jobin, PoE</td>
<td>Prohibitively expensive</td>
<td>Do not pursue</td>
</tr>
</tbody>
</table>
4.9 Summary

The details provided in this chapter respecting the examination of alternatives for the Bujagali project’s transmission system are summarised graphically in Figure 4.9. This examination of alternatives led to the optimised transmission system route, shown in Figure 4.8.

For the new 132kV transmission lines proposed for the Bujagali project, the wayleave width will be 30 m. The wayleave width for the 220kV transmission line will be 40 m in most locations, due to a combination of the following:

- 40 m minimises the potential effects of electromagnetic radiation to people (discussed in detail in Chapter 7 of this report);
- 40 m is the basis for the compensation and resettlement package to people affected by the project (discussed in detail in the Transmission System RAP); and,
- 40 m provides an adequate setback from non-conforming adjacent land uses and from dangerous trees or adjacent transmission towers which could fall onto the line.

The one exception to this 40 m wayleave width is in the Mabira, Kifu and Namyoya Forest Reserves where the wayleave has been reduced to 35 m to preserve as much of the forest as possible. Figure 4.10 shows the proposed wayleave widths for the Bujagali transmission system.
MAIN PROJECT EVENTS
(1-5 Complete)

1. Scoping Report
   December, 1998
   - selection of preferred transmission corridor

2. Interim Report
   March, 1999
   - environmental, social analyses within preferred corridor

3. Detailed Route Surveying,
   Mapping and Optimization
   March - August 2000

4. Refinement of RAP
   based on 2-3
   August - November 2000

5. Retention of EPC contractors
   by AESNP
   November, 2000

6. Review of EIS by
   NEMA/IFC
   December, 2000 - April 2001

FUTURE EVENTS

7. Project Financed

8. Implementation of RAP
   - completion 6 months after financial close

9. Construction
   - by AESNP's EPC Contractor

10. Operation
    - by UEB

See Report Glossary for Explanation of Acronyms.

Project Name:
BUJAGALI TRANSMISSION
SYSTEM EIS.

Prepared for:
AES NILE POWER

MAJOR MILESTONES OF TRANSMISSION
SYSTEM DEVELOPMENT
* Wayleave through Mabira, Kifu and Namyoya FR's will be limited to 35m as a mitigation measure. However, compensation will be based on a 40m wayleave.

Project Name: **BUJAGALI TRANSMISSION SYSTEM EIS**
Prepared for: **AES NILE POWER**

**R.O.W. AND WAYLEAVE REQUIREMENTS FOR 132kV AND 220kV TRANSMISSION LINES**

Date: DECEMBER, 2000
G0503_T_03  Figure No. 4.10
5. PROJECT CONSTRUCTION, OPERATION AND DECOMMISSIONING

5.1 Life Cycle Overview

The characteristics of the transmission system required for the Bujagali project include several components and project activities. These include:

- towers, foundations, conductors (i.e. wires), substations and storage yards;
- the land requirements for the towers, wayleave and access roads;
- the activities required to clear the wayleave, prepare the tower sites and access roads and to build and string the transmission line;
- the labour force to clear and build the line;
- the purchase and transportation of construction materials; and,
- the activities and effects of operating and maintaining the line and right-of-way.

The characteristics of the substations include transformers, switchgear, bus work, capacitor banks, and line terminator structures. A control building containing the instruments and control panels to operate the equipment is also required. Construction of, and modifications to, the substations requires site preparation, civil works, foundations, delivery and installation of equipment.

These specific facility characteristics and their associated activities result in the potential for environmental and social impacts from the transmission system during the planning and acquisition, construction, operation and maintenance stages of the project life cycle. Experience and understanding of how these project characteristics affect the biological, physical, and socio-economic environments form the basis for the prediction and assessment of the potential impacts for the project.

A life cycle analysis identifies the major issues and concerns that are likely to evolve over the life of a project. For a transmission system project, these issues are location and design, construction, operation, maintenance, and decommissioning. These issues have been considered during the EIA prior to any non-reversible actions being undertaken by AESNP, its contractors, and other project associates. The following sections identify the key activities to be completed and facilities to be constructed and operated over the lifetime of this project.
The selected Construction Contractor for the Transmission System is the Bujagali EPC Consortium (BEC). The structure of the consortium is outlined below.

Figure 5.1  Organogram of Bujagali EPC Consortium (BEC)

BEC will be responsible for engineering, procurement and construction in relation to both the hydropower and the transmission system components of the Bujagali project.

5.2 Transmission Line

5.2.1 Key Activities and Programme

Key activities in the development of the transmission line system include:

- Procurement, Manufacturing and Transportation;
- Construction;
- Testing and Commissioning;
- Operation and Maintenance; and,
- Decommissioning.

The proposed engineering, procurement and construction (EPC) programme for the transmission line component is presented in Figure 5.2, and is based upon a six-day working week (Monday to Saturday inclusive). The commencement date for this programme is
transmission line are divided into two separate components. The first component is
Under the proposed program approved in Figure 2.2, the EPC process for the
one of the requirements of the RAP.
cluded in the public disclosure process to be carried out along the transmission line route as
the date of approval of the project by the contact commission (This plan will be
The Construction Contractor has agreed to provide AESNP with a more detailed schedule for
Figure 2.2: Preliminary EPC Programme for Bungalan Transmission Line
accomplishment of action plan (RAP).
follow-up implementation of the construction and resettlement program is outlined in the
six months after the project is approved. Regardless of the commencement date. This will
construction of the line transmission line sections is expected to commence approximately
become subject to change, and will be determined by the date of approval of the project by the

Chapter 5
Preliminary Project Transmission System EIS
Procurement, Manufacturing and Transport and the second component is Construction (divided into the three distinct sections of transmission line).

The procurement, manufacturing and transportation component is broken down into five tasks, as can be seen on the programme. The first task (engineering) involves design and specification of all transmission line components. The remaining tasks involve the actual procurement of these components, and the logistics of transportation to Uganda.

The construction component is broken down into six tasks: site survey, route clearance and access, civil works (i.e. construction of foundations), tower erection, conductor stringing and inspection testing. Although the overall programme requires 31 months, the time span between commencement of route clearance and the completion of conductor stringing is 16 months. The BEC proposes to carry out the works on the three sections of transmission line (220 kV Bujagali to Kawanda, 132 kV Mutundwe to Kawanda and 2 x 132 kV Bujagali to Tororo/Owen Falls line) simultaneously. An alternative construction scenario was investigated within the project planning process called ‘in series’ construction, i.e. where the transmission line is constructed from one end to the other. This alternative was rejected on the grounds of the overall construction timetable, under which there was a risk of the transmission system not being completed by the time the Bujagali hydropower facility is completed. Another key consideration was security of the transmission line system prior to commissioning. The ‘in series’ construction approach would mean that the first sections of the line to be constructed would be standing unused for up to three years before commissioning. Under this scenario, there would be a distinct possibility of sections of the towers, and the conductors themselves if installed, being vandalised or stolen prior to electrification.

The activities involved in both components of the BEC’s activities are outlined in more detail in the following sections.

5.2.2 Procurement, Manufacturing and Transportation

Details of the proposed transmission line corridor and route selection, and the optimisation process that led to finalisation of the preferred route, are outlined in Chapter 4.

Although geotechnical and engineering surveys have been carried out along the proposed transmission line corridor, additional surveys will be carried out to identify the optimum
foundation design for each tower. Detailed design of tower structures will commence upon award of contract, and foundation design will follow the collection of site survey data for each tower location. At this stage, minor adjustments may be made to the final tower location, due to the vertical profile of the transmission line corridor, and to avoid newly constructed buildings and other environmental constraints. Such adjustments are expected to be limited to a few metres in any direction.

A major portion of the material incorporated into the transmission line will be manufactured components (e.g. tower steel and components, conductors, insulators, transformers and switchgear), from outside of Uganda. However, an estimated 4,000 m$^3$ of concrete and 11,000 m$^3$ of aggregates will be procured locally. Other local procurement will include foodstuffs and miscellaneous supplies and services.

Materials for tower construction will be stored in a main yard. The location of this yard has not been finalised by the BEC, but an estimated 0.5 to 1.0 ha site will be required approximately mid-way between Kampala and Jinja. The storage yard will require:

- hard standing or graded and pre-compacted soil;
- office space;
- a workshop;
- water and electricity;
- sewerage;
- security (fencing and a gatehouse); and,
- a close location to the Jinja-Kampala highway.

To meet these requirements, a pre-existing industrial site will be identified in the area of Mukono or Lugazi, and rented by the contractor for the duration of construction. The site will be returned to its original state at completion of construction. No staff accommodation will be provided at the storage yard, other than for a night-watchman.

Steel components for transmission towers will be produced outside Uganda. These, along with conductors, insulators and fittings, will be delivered by ship to the port of Mombasa in Kenya. All material and equipment procured internationally will be transported by rail or road to a bonded warehouse in Jinja, and from there to the storage yard via public highways.
Materials and equipment procured locally or nationally will be transported directly to the storage yard. Sorting, inspection and reconciliation of quantities will be carried out upon delivery to the storage yard.

Material destined for the transmission line will be trucked from the storage yard to site via public highways and the wayleave itself. It is planned that 3-5 teams will work on the transmission line at any one time, using this storage yard as a depot. On this basis, there will be an estimated maximum of 80 vehicle movements per day due to the presence of the storage yard, including deliveries and movement of light/personal vehicles.

5.2.3 Construction Overview

All the towers on the transmission line will be constructed prior to the installation of conductors. Tower foundations will vary according to the prevailing geology. For the majority of towers, pad and chimney foundations will be used, which will be excavated mechanically. A cross section through a typical foundation of this type is provided in Figure 5.3. By this method, a concrete pad will be constructed at the bottom of the excavation, and each foot of the tower erected within its own 'chimney' of steel reinforced concrete. After 48 hours, the form work will be removed, and the excavation will then be back-filled to original ground level and consolidated.

In any areas that may be prone to seasonal flooding, a raft foundation for transmission line towers will be used, a cross-section for which is also shown in Figure 5.3.

The raft foundation is similar in concept to the pad and chimney foundation, except all four feet of each tower will be set on a single raft of concrete. If the tower is sited upon hard rock, a minimal foundation only is required. Any required excavation of rock will be carried out by drilling, barring, wedging or use of compressed air tools. It is not anticipated that blasting will be necessary.

Upon delivery of the steelwork from the storage yard to the tower location, erection of the transmission towers will proceed using a winch and gin pole. Typically, the gin pole will be supported on one leg of the tower while the sections are bolted on. The gin pole will then be lifted to a higher attachment point to repeat the process. Figures 5.4 and 5.5, which are generic drawings provided by ABB, an international contractor, show the process of tower erection.
Figure 5.3a
Typical Pad and Chimney Foundation

Figure 5.3b
Typical Raft Foundation

Source: Bujagali EPC Consortium, 2000
GIN-POLE WITH HIGH YIELING RESISTANCE MADE OF ALUMINUM ALLOY

GUYING ROPES MUST BE PLACED ON ALL MAIN STRUCTURES

INSTALLATION OF THE GIN-POLE (8m. OR 12m. LENGTH)
ON THE TOWER BASE

Source: Bujagali EPC Consortium, 2000

Prepared for:
AES NILE POWER

Project Name:
BUJAGALI TRANSMISSION SYSTEM EIS

Date: DECEMBER, 2000

TOWER ERECTION WITH LATERAL GIN-POLE

G0503_T_63 Figure 5.4
SETTING OF THE SWINGING GIN-POLE INSIDE THE TOWER BASE

TOWER ERECTION

TO THE WINCH

SETTING OF THE SWINGING GIN-POLE (18m OR 21m. LENGTH)

Project Name: BUJAGALI TRANSMISSION SYSTEM EIS
Prepared for: AES NILE POWER

Source: Bujagali EPC Consortium, 2000

Figure 5.5

TOWER ERECTION WITH SWINGING GIN-POLE
Figures 5.6 and 5.7 show typical designs for the two main types of transmission towers to be constructed. Figure 5.6 shows the design of a tension tower (also known as a compression tower). Tension towers are used at Angle Points, at points where the local topography demands it and at intervals of approximately 5 km along the line. They are recognisable because the insulators are mounted horizontally. The majority of the transmission towers will be suspension towers (Figure 5.7), which are recognisable because the insulators are mounted vertically.

Once the towers are erected, the conductors and shield wires will be strung and tensioned with specialised equipment to achieve the design sag. Stringing is carried out first by hanging a pilot wire from each tower, connecting the pilot wires together, and then using the pilot wire to draw the conductor along the insulators. This is done in sections of 6-7 km at a time.

Guard structures will be used when installing the conductor over highways, main roads, waterways, railroads or any overhead power or communication lines to ensure the conductors do not cause a hazard to the public or the construction staff. Compression dead-ends and splices will be used to secure the conductor to certain towers and join sections of conductor. After the conductors and shield wires are attached to the insulators or clipped to supports the lines will be sagged to the proper tensions, and fitted with vibration dampers.

A number of tests will be undertaken to ensure that the line performs as per specifications. During testing, line ground clearance will also be thoroughly checked. Once construction of the transmission line is completed, the soil along the right-of-way will be assessed for problems such as erosion or compaction, and corrective action will be taken as appropriate. Areas of bare soil will be seeded with native cover crops to stabilize the soil, reduce erosion and prevent invasion by undesirable plant species.

No use of chemicals (e.g. curing agents, plasticisers, cable oils or pesticides) will be required on site during construction. Curing of concrete foundations will be executed by means of wet jute bags.

5.2.4 Access Roads

Access to the transmission line wayleave will be gained solely by use of existing public highways and access roads. No new roads will need to be constructed.
Where the new transmission line will follow the existing "northern route" transmission line (39.5 km), the existing access track within that wayleave will be used. Access to the new tower locations will be gained via a short 'spur' from this track.

Where an existing UEB access track is not present (i.e. in areas where the new transmission line will not following the existing line), an access track of approximately 5 m width will be cut through all vegetation along the wayleave, where possible following the centreline of the wayleave. Clearance for housing and other buildings will be maintained by local adjustment of the route. Cut trees will be left for the use of (or sale by) local owners.

In areas of the wayleave other than the access track, clearance of vegetation will be minimised, but a certain amount of clearance will be required in the immediate area of the towers. Only so-called ‘dangerous trees’ will be cut, i.e. those which could damage the transmission line if they fell on it (typically large trees within 30 m of the transmission line). All clearance of vegetation will be done by hand and will not use heavy machinery. Soils will not be left exposed.

It is not planned for the access track to pass through wetlands. Watercourse crossings are also minimised. Within Mabira Forest, upgrading of existing bridge structures will be required at the locations, and in the manner, presented in Table 5.1. Photographs of some of these crossings are shown in Figure 5.8.

<table>
<thead>
<tr>
<th>River</th>
<th>Location (in relation to BP)</th>
<th>Location (in relation to existing towers)</th>
<th>Works required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lwankima</td>
<td>Between BP7 and BP8</td>
<td>Between T131 and T132</td>
<td>Bridge in poor condition to be upgraded (see photograph)</td>
</tr>
<tr>
<td>Nkusa</td>
<td>Between BP8 and BP9</td>
<td>Between T144 and T145</td>
<td>Bridge to be improved over small stream</td>
</tr>
<tr>
<td>Mabugwe</td>
<td>Between BP8 and BP9</td>
<td>Between T151 and T153</td>
<td>Bridge to be constructed over small stream (swampy during rainy season)</td>
</tr>
<tr>
<td>Mabuguwe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kasota</td>
<td>Between BP9 and BP10</td>
<td>Between T164 and T165</td>
<td>Bridge to be strengthened (see photograph)</td>
</tr>
<tr>
<td>Waliga</td>
<td>Between BP9 and BP10</td>
<td>Between T169 and T170</td>
<td>Bridge to be improved over seasonal stream (see photograph)</td>
</tr>
</tbody>
</table>

AES Nile Power 158 March, 2001
This drawing does not represent a final design but is intended to be an indication of the overall requirements.

Figure 5.6

TYPICAL DESIGN FOR 220 kV TENSION TOWER

Source: Bujagali EPC Consortium, 2000

Project Name: Bujagali Transmission System EIS
Prepared for: AES Nile Power

Date: DECEMBER, 2000 G0893_T_55
This drawing does not represent a final design and is intended to be an indication of the overall requirements.

Source: Bujagali FPC Consortium, 2000

Figure 5.7

TYPICAL DESIGN FOR 220 kV SUSPENSION TOWER
Figure 5.8

SYSTEM EIS

EXISTING BRIDGES IN MABIRA FOREST RESERVE

Project Name: BUJAGALI TRANSMISSION SYSTEM EIS
Prepared for: AES NILE POWER

Date: DECEMBER 2000
FILE: G0503_T_46

Lwankima

Waliga

Kasota
In these locations, new steel structures will be laid across the channel, and decking laid across these to form a driving surface. No works will be carried out in river channels.

The Forest Department and UEB will be consulted by AESNP and BEC with regard to managing public access to the Mabira Forest Reserve that would be improved by these new bridge improvements. If required, the Construction Contractor will erect lockable barriers (and staff these with watchmen) along any improved access points to Mabira FR. In this way, access to the transmission wayleave in the Mabira FR could only be gained by authorised persons. The Forest Department and UEB will also be consulted as to whether bridges or barriers should be left in place after completion of construction, and used by the Forest Department for long-term access management.

During conductor stringing, construction workers will need pedestrian access in a direct line between towers in order to hang the pilot wire. This will be done with minimal damage to crops. This access will not be required in low-lying areas such as permanent or seasonal swamps.

5.2.5 Equipment

The storage area is expected to be the base for a fleet of vehicles to be used for the construction process. It is anticipated that the following vehicles and plant will be required:

- One large crane for handling goods within the storage yard;
- Trucks: of various sizes, some fitted with Hiab or Atlas-type hoists for unloading materials and equipment at each tower site;
- Mobile cranes of 26-30 tonne capacity;
- ‘Forest type’ large wheeled tractors with winches;
- Cable stringing pullers;
- Pilot line winders;
- Cable stringing tensioners;
- Cable reel carriers;
- Truck/trailer mounted water tanks;
- All purpose four-wheel trailers;
• 4 wheel drive vehicles;
• Compressors with pneumatic equipment such as rock drills; and,
• Concrete mixers.

5.2.6 Labour Force

The forecast number of staff required for construction of the transmission line is as follows: 2 Project Managers (expatriate), 6-10 Supervisors (mainly expatriate), 150 semi-skilled and unskilled workers (recruited locally). These workers will operate as approximately 5 separate erection crews. Semi-skilled and unskilled workers will be trained by supervisors prior to commencement of construction. Local people will be recruited as unskilled labourers, from the villages traversed by the transmission line, where possible.

While in many cases these will arrive at site by foot, buses will be provided as necessary to bring workers to the wayleave. Expatriate staff will be housed in existing accommodation (apartments or hotels). No construction workers' camp will be required. No "induced impacts" traditionally associated with workers' camps (e.g. growth in prostitution, stretching of social services like schools and health clinics beyond their capacities) are therefore anticipated.

5.2.7 Testing and Commissioning

A number of tests will be undertaken to ensure that the line performs as per specifications. During testing, line ground clearance will also be thoroughly checked. Once construction of the transmission line is completed, the soil along the right-of-way will be assessed for problems such as erosion or compaction and corrective action will be taken, as appropriate. Areas of bare soil will be seeded with native cover crops to stabilize the soil, reduce erosion and prevent invasion by undesirable plant species.

5.2.8 Operation and Maintenance

After commissioning, ownership of the transmission system will pass to UEB or its successor organisation. UEB's operation and maintenance of the transmission line will be based on accepted international standards, such as those of the International Electrotechnical Commission (IEC). Specific procedures for operation and maintenance are outlined in UEB's Electrical and Safety Rules, which are a confidential internal document, and therefore...
cannot be elaborated upon here in detail. However, operation and maintenance activities can be outlined in generic terms.

The main activities to be carried out during the operating life of the transmission line include surveillance of the condition of the transmission line and wayleave; routine and emergency maintenance and repairs; and vegetation control.

Vehicular access to sections of the wayleave will be required to effect line repairs or to correct any localized erosion or terrain instability problems that might develop.

Growth of vegetation on the right-of-way will be controlled to ensure safe and reliable operation of the line. This will be accomplished by an ongoing programme of removal of accumulated growth, on an approximately biennial basis, as is currently carried out for the existing wayleave.

UEB will be responsible for controlling future land uses within the wayleave. No structures will be permitted to be constructed within the 40m wayleave. Growth of crops will be permitted, but limited to a height of 1.8m or less. Figures 5.9 and 5.10 depict compatible and non-compatible land uses within the wayleave.

5.2.9 Decommissioning

It is anticipated that the power transmission line will be continuously maintained and repaired, and will be operated for several decades. Because of its long life cycle, the circumstances under which it might ultimately be decommissioned and abandoned are difficult to foresee. Also, because the transmission system will not be the property of AES at the time of abandonment, the company cannot speak with authority on the decommissioning and abandonment procedures that would be followed. Therefore, towers may be upgraded/renewed based on cost/benefit analysis and new technologies. However, if decommissioning is undertaken, a generic approach can be suggested as outlined below.

The conductors and shield wires would be lowered to the ground, and all cables would be spooled and removed from the right-of-way for salvage. The towers would then be dismantled and removed from the right-of-way for salvage.

The disposal or otherwise of tower foundations would depend upon the intended future land use. In grazing lands and in areas allowed to revert to forest, the foundations would likely be
left in place, and would gradually deteriorate. In other situations (e.g. cultivated fields, land intended for residential or industrial development), foundations might be demolished and removed. Similarly, measures to restore soils would depend upon the intended future use.
Minimum line height 7m

- Low Vegetation (eg. crops < 1.8m)
- Livestock
- Farming Equipment
- Roads and Vehicles
- People

Project Name: BUJAGALI TRANSMISSION
SYSTEM EIS

Date: DECEMBER, 2000

Prepared for: AES NILE POWER

COMPATIBLE LAND USES
WITHIN TRANSMISSION WAYLEAVE
Connect a Wire to Your House

Project Name: BUJAGALI TRANSMISSION SYSTEM EIS
Date: DECEMBER, 2000
FILE: G0903.T.47
Figure 5.10

Non-compatible land uses within transmission wayleave

Prepared for: AES NILE POWER

* Wayleave through Mabira, Mulu and Namugoya FRs will be limited to 35m as a mitigation measure. However, compensation will be based on a 40m wayleave.
5.3 Kawanda Substation

Development of the 220/132kV substation at Kawanda will include:

- Design;
- Procurement, Manufacturing and Transport;
- Construction;
- Commissioning;
- Operation and Maintenance; and,
- Decommissioning.

A preliminary time schedule for development of this component is included in Figure 5.11, and is based upon a 6-day working week (Monday to Saturday inclusive). As was the case for the transmission line component, the commencement date (Day 1) signifying the start of the construction phase will depend upon the date of project approval by lending agencies. However, the time period between commencement of construction and completion of station commissioning will not change. The BEC has agreed to provide AESNP with a detailed construction plan within 30 days of the Commencement Date and this will subsequently be disclosed as part of the Public Consultation and Disclosure Plan.

Figure 5.11: Preliminary EPC Programme for Kawanda Substation

The site selection and optimisation process that led to the Kawanda transformer station is described in Chapter 4.
5.3.1 Engineering

Preliminary layouts for the substation site are presented in Chapter 4. Upon award of the contract, detailed design of the substation will commence, which will include single line diagrams for the control system, high-voltage (HV) layouts, and design of the control building.

5.3.2 Procurement, Manufacturing and Transport

HV equipment, control systems, steel structures and necessary installation equipment will be manufactured outside Uganda, and delivered by ship to the port of Mombasa in Kenya. From there, equipment will be delivered by rail or road to Jinja. All material and equipment, whether procured locally, nationally or internationally, will then be transported over existing roads to Kawanda. Although certain components may be kept at the transmission line storage yard (at Mukono/Lugazi), the majority of components will be delivered directly to the Kawanda substation site. Sorting, inspection and reconciliation of quantities will be carried out upon delivery to the substation site.

The BEC proposes to use the existing access road from the Kampala-Bombo highway, which is currently used for access to Kawanda Secondary School. No new access roads will be constructed, except for a short (100 m) extension from where the existing access road ends to the substation site. The remainder of the access road (300 m) will be upgraded to take heavy vehicles, but it is not anticipated that paving will be required. A barrier will be erected between the traffic zone and pedestrian zone on this road, and crossing corridor personnel will be provided at the beginning and end of the school day, if required. Speed limits on this road for construction vehicles could also be posted to minimise any problems with pedestrians. School staff and pupils will be briefed on the nature and risks of vehicle movements to and from the site. Photographs, taken from the Kampala-Bombo highway, of the existing access road to the Kawanda substation site are shown in Figure 5.12.

The proposed construction plan will require approximately 140 containers to be delivered to the site over 7 months. This combined with movements of light vehicles will result in less than 20 vehicle movements per day to and from the site.

No staff accommodation will be provided at the substation site, other than for a night-watchman.
While building in top left is Kawanda Secondary School.
5.3.3 Construction

Work at the Kawanda substation will take place over a period of 30 months. The level of activity in the first year will be most significant, and will consist of site surfacing and other civil works. The electrical installation activities will take place in the second year. This will consist of the erection of steel structures and the installation of high voltage equipment, control boards, wiring and control cables. Tasks required during the construction phase include:

- Civil works (levelling, drainage and fencing);
- Drilling and excavation of footings, and preparation of crushed rock pad;
- Installation of foundations and other support structures;
- Installation of oil collection systems;
- Erection of steel structures;
- Erection of HV equipment;
- Construction of control building and installation of control boards;
- Installation of wiring and control cables; and,
- Testing, energising and commissioning of substation.

5.3.4 Labour Force

At the peak of construction activity, about 100 workers will be involved in the construction of substation facilities at Kawanda. It is estimated that 85% of the workforce will be labourers; 5% semi-skilled workers (e.g. equipment operators); 5% highly skilled workers and 5% managers and supervisors. The BEC intends to hire as many workers as practical from the local area. It is expected that there will a large number of suitable workers available within easy commuting distance; consequently, a construction camp will not be required.

5.3.5 Testing and Commissioning

Once all circuits have been connected, including to the control room, ‘dry’ testing will begin. This entails confirmation that all connections have been made according to the wiring diagrams. Voltage is then applied to individual circuits to check for correct performance of circuit breakers and correct settings of relays. ‘Wet’ testing will involve connection to the transmission line, energising the complete system and a final test, prior to full commissioning.
Testing and commissioning will be carried out by 2-3 inspection engineers and no more than 10 semi-skilled workers.

5.3.5 Operation and Maintenance

During normal operation, there will be a very limited number of skilled workers and technicians at site: generally 2-3 operational staff and 2-3 cleaners and guards. The majority of traffic to and from the substation will be light vehicles, i.e. no regular loads greater than 2 tonnes, and should be no more than 5 vehicle movements per day.

The HV system is almost free from noise, and emissions will be limited to a low hum. This will not be noticeable from within buildings outside the substation site.

The substation will be nearly maintenance-free. Maintenance will be limited to annual cleaning and checking of circuit breaker connections, and will require a team of approximately 5 engineers and semi-skilled workers, for approximately one week. Changing of transformer oil will not be required.

5.3.6 Decommissioning

It is anticipated that the substation will be continuously maintained and repaired, and therefore will operate for the life of the transmission system, i.e. several decades. Because the substation will be the property of UEB or its successor organisation at the time of abandonment, AES cannot speak with authority on the decommissioning or abandonment procedures that would be followed.

The decision on whether to decommission or upgrade Kawanda substation will depend on development of the Ugandan transmission system in the interim, and the system requirements at the time. If the option to decommission is selected, UEB or its successor organisation will decide what will be executed at the Kawanda site. Under a typical decommissioning process, all steelwork would be lowered to the ground, the cables spooled, and all components including transformers removed for salvage. Transformer oil would be drained and recycled. Access would be via the existing access road to the Kampala-Bombo highway, and no new access route would need to be constructed. Should a decommissioning decision be made, it is anticipated that the substation site and control building would be re-used for industrial, commercial or other compatible purposes.
6. PUBLIC CONSULTATION AND DISCLOSURE PROGRAMME

6.1 Regulatory Context

6.1.1 Government of Uganda Requirements

A key provision of the EIA process in Uganda is to enable the public to have the full opportunity to participate in environmental decision-making associated with projects subject to the process. NEMA (1997) sets out the following requirements for public consultation for an EIA study.

(i) Prior to Commencement of the EIA

Having received the developer's brief, if NEMA decides it is necessary to consult and seek public comment it shall, within four weeks of submission of the brief, publish the developer's notification and other supporting documents in a public notice. Objections and comments from the public shall be submitted to the authority within 21 days of publication of the notice.

(ii) During the EIA Study

The team conducting the study shall consult with the public and seek public opinion on environmental aspects of the project.

(iii) After Completion of the Study

The EIS will be a public document open for inspection. Within two weeks of receipt of the EIS, NEMA will make copies of it available for public inspection by issuing a public notice. Comments on the EIA are then due within three weeks of publication of the public notice.

If NEMA considers the level of public consultation to have been insufficient at any point through the EIA process, or if they feel that the project would benefit from further public involvement, a public hearing will be announced. Ten days between this notification and the public hearing is required.

6.1.2 World Bank Group Requirements

The World Bank and IFC requirements with respect to public consultation in environmental assessments are set out in OP4.01 Environmental Assessment (See Table 2.1). The Bujagali project (both the hydropower generation and transmission components) is classified as a Category A project under OP 4.01, as it will have the potential for significant adverse
environmental effects. For such projects, project sponsors are required to consult with stakeholders on the preparation and results of their EIA and to disclose to the public the results of the EIA process. On-going consultation is also required during construction and operation phases of the project. A Public Consultation and Disclosure Plan (PCDP) is required for all Category A projects. Guidelines for the production of a PCDP are set out in IFC Guidance Note F - Procedure for Environmental and Social Review of Projects. The PCDP for the Bujagali project’s transmission system is contained in Appendix H of this EIS’ Technical Appendices.

Essential World Bank Group requirements regarding public consultation and disclosure include:

- At least one round of public consultation at each of the “scoping”, EA review and construction/operation stages of the project, to be conducted in culturally appropriate ways;

- Careful documentation of all public consultation activities and issues;

- Public disclosure of EA documentation both at the World Bank Infoshop and in the country where the project is proposed for specified periods of time;

- Circulation of local language summaries of EA results; and,

- Demonstrated responsiveness by project sponsor to issues raised during consultation.

AES Nile Power’s intent has been to comply fully with World Bank Group, AfDB and NEMA requirements regarding public consultation and disclosure as the project planning and implementation for the Bujagali project has progressed and to use the results of this consultation to inform project design. Figure 6.1 illustrates the major public consultation and disclosure activities that have been undertaken by AESNP, in relation to the major milestones of the Bujagali transmission system’s development.
PUBLIC CONSULTATION AND DISCLOSURE (PCD)

PCD - Phase 1
by AESNP

PCD - Phase 2
by AESNP

PCD - Phase 3
by AESNP

FUTURE EVENTS

PCD according to RAP by AESNP

PCD by EPC Contractor

PCD by UEB according to their standard procedures

MAIN PROJECT EVENTS (1-5 Complete)

1. Scoping Report
   December, 1998
   - selection of preferred transmission corridor

2. Interim Report
   March, 1999
   - environmental, social analyses within preferred corridor

3. Detailed Route Surveying, Mapping and Optimization
   March - August 2000

4. Refinement of RAP based on 2-3
   August - November 2000

5. Retention of EPC contractors by AESNP who assume detailed PCD planning, design and implementation during construction
   November, 2000

6. Review of EIS by NEMAIIFC
   December, 2000 - April 2001

7. Project Financed

8. Implementation of RAP
   - completion 6 months after financial close

9. Construction
   - by AESNP's EPC Contractor

10. Operation
    - by UEB

See Report Glossary for Explanation of Acronyms

Project Name: BUJAGALI TRANSMISSION SYSTEM EIS

Prepared for: AES NILE POWER

PUBLIC CONSULTATION & DISCLOSURE (PCD) IN RELATION TO MAJOR MILESTONES OF TRANSMISSION SYSTEM DEVELOPMENT
6.2 Consultation and Disclosure Methodology

6.2.1 Consultation
AESNP has used culturally sensitive methods for carrying out their public consultation activities for the Bujagali project's transmission system. For example, meetings with local people were generally conducted in Luganda and/or Lusoga languages and the AESNP team was available to answer questions. AESNP also used charts, maps and diagrams as much as possible to accommodate those who were illiterate to ensure broad understanding of the project. To schedule a meeting, an AESNP Liaison Officer went to the site personally, using written letters and messengers to schedule a village meeting through the appropriate LCs. In some cases, this could take several days. Finally, stakeholders were consulted by AESNP at times and locations that best accommodated them. For example, most meetings took place in evenings and weekends, outside of working hours. Table 6.1 presents a summary of the consultation activities that were undertaken for the transmission system, the dates when they took place, the principal people who were consulted and the issues/concerns that were raised.

For the transmission system component of the Bujagali project, AESNP utilised the following methods for engaging the public in the EIA process.

Advertising: used to advise people of a forthcoming event or deadline, or present information about the project. For instance, AESNP distributed circulars through several levels of government to the affected stakeholders, updating them on the project process. In addition, the stakeholders were informed of the forthcoming project events at public meetings, and through letters via the LC1 level of government. This form of public notification was used in January 2000, for example, to provide the 60 day notice under the Electricity Act that AESNP was considering a transmission line through the affected villages.

Public Meetings: used to ensure that all stakeholders were included in the communication process and to ensure their statements and views were made publicly. Such meetings were conducted in 55 villages along the preferred transmission system route in January and February of 2000. These villages are shown and listed in Figure 6.2. Local councillors assisted in the facilitation of these meetings that were intended to sensitise people to the proposed transmission system. Local consultants retained by AES Nile Power recorded stakeholders' concerns, as these were often voiced in local languages. The local consultants subsequently translated the proceedings into English for the AESNP team.
In June, 2000, AESNP also hosted a public forum for international non-governmental organisations (NGOs) and other concerned stakeholders in Washington DC to discuss the Bujagali project in its entirety, including World Bank policies concerning the project. At this meeting, few concerns were raised about the transmission system required for the project.

*Interviews with Key People:* used to identify issues and listen to peoples' concerns, particularly informed, local leaders, central government representatives, and NGOs who may or may not support the project. Examples of such interviews (both formal and informal) included the Uganda Electricity Board, the Ugandan Tourist Board, the Sugar Corporation of Uganda (SCOUL), and the Principal of the Kawanda School. These Interviews took place between November 1998 and February 2000. A full listing of all meetings with consultees can be found in Appendix H.

*Informal At-home Meetings:* used to meet and discuss concerns with people that are likely to be directly affected by the project, but who may not able to participate in more public or distant events. AESNP used this method most often to discuss resettlement, land valuation and compensation with directly affected people.

AESNP's two offices in Jinja and Kampala were, and continue to be, open daily to respond to queries from any stakeholder or interested party. Village dwellers frequently visited the closest AESNP office when they had a question or concern about the project and are encouraged to continue to do so. AESNP's official website (www.bujagali.com) also disseminates information about the project in general and includes a provision for public feedback.

During the construction phase of the project, AESNP's contractors will proactively, through local authorities, disseminate the information regarding construction activities, in order to maintain public dialogue. Clauses are included in the Contractor's contractual agreement to ensure this is executed. During the operation phase, the transmission system will be maintained by UEB and the continuing consultation/community liaison is expected to be in accordance with normal UEB practices.

### 6.2.2 Disclosure and Accompanying Consultation Activities

In satisfying the Ugandan, World Bank and AfDB requirements for adequate public disclosure of documentation respecting the EIA of the Bujagali transmission system, AESNP has produced three major documents:
FIGURE 6.2 VILLAGES CONSULTED ALONG PROPOSED TRANSMISSION CORRIDOR

BUJAGALI TRANSMISSION SYSTEM EIS
• A Scoping Report, containing draft terms of reference for the T-line EIS, which was submitted in December, 1998 following site visits and consultation with national and local stakeholders (these people are listed in Table 6.1). This report examined route options and identified the preferred transmission system corridor;

• An Interim Draft EIS, submitted in March 1999, following fieldwork and consultations in January and February 1999. This interim EIS optimised the eventual transmission system route at the next level of detail within a 1km wide corridor; and,

• This Environmental Impact Statement.

Three major phases of public consultation, undertaken by AESNP, accompanied the preparation of these reports. Details of these three phases are as follows:

Public Consultation and Disclosure (PCD) Phase 1
The Report of Scoping Studies was prepared in December 1998. During the preparation of this report, a series of consultations were held with relevant authorities at national and district levels to obtain background information and to seek views on potential route corridors and on the draft Terms of Reference for the Bujagali transmission system EIA. Their comments were primarily concerned with the impact of the Transmission system (t-system) on biodiversity and the potential health impacts of electromagnetic radiation (EMR). Their comments were used in the development of the final Terms of Reference (TOR) and selection of potential t-line routes. The Report of Scoping Studies containing the TOR was circulated for comment to IFC, UEB and NEMA, and was finalised for the EIA study based on these reviewers’ comments.

PCD Phase 2
Following fieldwork and consultations in January and February of 1999, an Interim Draft Report was prepared and sent to key stakeholders, including UEB, NEMA and IFC for circulation in March 1999. The main issues of concern related to resettlement and compensation and the development of an Environmental Action Plan. Consultations were also held with LCV’s, LCIII’s and LCI’s along the route. Due to the large number of villages affected, it was decided to invite representatives from LCI’s to LCIII headquarters for these meetings. Participation was solicited via circulars in local languages during the sixty-day notice that was given. All comments received have been taken into consideration in the preparation of the final EIS.
Phase three of the public consultation and disclosure activities has been taking place since February 2000 and is ongoing. During this round of consultation, individual meetings have been held with all local authorities at LCV, LCIII and LC1 levels. Each village has been given notice of the meetings by means of letters and circulars that were distributed by AESNP in local languages. The open question and answer periods were held in the local language at venues that were most convenient for the stakeholders. Venues included schools, churches, and homes (particularly in the homes of individuals who were unable to travel). Various levels of government, NGOs, and business interests were also consulted during Phase 3. This phase of consultations has focussed primarily on resettlement and compensation issues, details of which are provided in the Transmission System RAP. This phase will culminate, but not end, with the submission of this EIS and the mandatory public notification associated with it.

Before NEMA makes a decision on this EIS, the following disclosure activities are expected to take place in Uganda:

- A public notice is to be given in Uganda advising of the public’s right to review the final EIS (locations still to be determined between NEMA and AESNP) and an allowance of 21 days after publication of the notice for the public and government reviewers to provide comments;

- Consideration of all written opinions from the public soon after the 21-day deadline takes place (NEMA has the authority to direct AES Nile Power to take all necessary steps to address issues raised); and,

- An optional public hearing may be called (at the discretion of NEMA).

Before the World Bank Board makes a financing decision for the Bujagali project, the following disclosure activities are expected to take place:

- Disclosure in Uganda and in the World Bank Infoshop of the EIA for the entire project for at least 120 days; and,

- Summary of document in Luganda language to be prepared and distributed locally.

If the World Bank Board were to approve the financing of the project, IFC would negotiate a loan provision contract upon agreement with AESNP who would then revise the project’s
Environmental Action Plan (EAP) to reflect environmental and social commitments contained in those contractual agreements and re-release the EAP publicly.

Apart from the above-noted requirements for public disclosure of project information, AESNP has also committed itself to the following public disclosure and accountability procedures following project approval:

- During construction, information will be regularly disseminated by the EPC contractor through local authorities regarding activities to take place;

- AESNP will provide Community Liaison Officers to ensure that problems are dealt with efficiently and effectively. Any aggrieved person can bring their grievance to the AES office in Jinja or Kampala at anytime. Grievance resolution mechanisms will involve both traditional approaches, as well as judicial recourse; and,

- AESNP will fund a “Witness NGO” to independently observe the compensation/resettlement process throughout the duration of the Project, so as to verify the compliance of AESNP with the T-system RAP. The witness NGO will attempt immediate settlement of problems, wherever possible, before grievance resolution procedures.

During the operational phase, the transmission system will be maintained by UEB and consultation/community liaison are expected to be in accordance with normal UEB practices.

6.3 Results of the Consultation Activities

Throughout the planning stages of the Bujagali project’s transmission system, AES Nile Power consulted with government agencies, institutions, affected communities, non-governmental organisations (NGOs) and business stakeholders to obtain information and to seek views on the route corridor, the development of the system, its impact, and means and methods of mitigation. The concerns, priorities and opinions of the directly and indirectly affected stakeholders related to the Bujagali project transmission system were recorded at each stage of consultation and were considered by AES Nile Power in the design, planning, and optimisation of the transmission system. Table 6.1 presents a summary of the consultation activities that were undertaken for the transmission system, the dates when they took place, the principal people who were consulted and the issues/concerns that were raised.

The table also directs the reader where AESNP’s response to these issues can be found in this report and how AESNP intends to address each of the issues/concerns raised. Full lists of
consultees and their comments from all three PCD Phases of the Bujagali Project's Transmission System development are contained in Appendix H of this EIS. AESNP also maintains complete records of meeting minutes on file in Kampala for reference, as well as electronically.

Below is a summary of all consultations made by AES Nile Power and other parties regarding the Transmission Line Route:

<table>
<thead>
<tr>
<th>Organisation / Party</th>
<th>Times Consulted</th>
<th>No. of Consultees</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Local Residents' consultations and sensitisation meetings</td>
<td>75</td>
<td>2,420 (approx.)</td>
</tr>
<tr>
<td>2. Local Government</td>
<td>30</td>
<td>140 (approx.)</td>
</tr>
<tr>
<td>3. The Government of Uganda</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>4. Environmentalists / NGOs</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>6. Stakeholders meetings, consultations and discussions.</td>
<td>27</td>
<td>30</td>
</tr>
<tr>
<td>7. Contractors</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>8. Others</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

1 An average of 40 persons per village was used to determine the number of people who attended each village consultation meeting. Attendance lists ranged from an average of 20 to 60 persons. Sub-committees were formed from the village meetings, since it was more effective to sensitise a smaller group of people than a large group. These sub-committees then reported back to the village residents. Sub-committee sizes ranged from 10 to 30 persons, so an average of 20 persons/committee/session was used. During the Survey and Valuation exercise, AESNP staff had several teams in the field over a 5-month period. The staff dealt with PAPs on a daily basis. These consultations are not included in the above table.

The associations formed in the villages, e.g., traditional healers, women's groups, ranged from an average of 20 to 40 persons, so 30 persons/session was used.

Village representative ranged from 2 to 3 persons/village, excluding the Village Chairman.

The LC Committees consist of 10 members. LC Executives consist of 5 members.
### Table 6.1 Summary of Consultation Activities for the Bujagali Project Transmission System

<table>
<thead>
<tr>
<th>EIA Consultation Methodology</th>
<th>Date</th>
<th>Principle Consultees</th>
<th>Comments/Issues of Concern</th>
<th>Concern Addressed Where in this EIS</th>
</tr>
</thead>
</table>
| Public Meetings             | Jan-Oct. 2000 | Affected stakeholders in 55 villages along the preferred transmission system route                          | - Resettlement, e.g., would people have a choice where to resettle, and how much time would they be given  
- Land valuation and compensation; e.g., how much, when it would be paid, how it would be determined, who it would be paid to, what conditions apply (particularly if ancestor graves are affected), how would land fertility be affected  
- Employment opportunities and use of local people for unskilled labour, e.g., economic development  
- Local accessibility to new source of electricity, e.g., whether affected villages would receive electricity, whether electricity prices would decrease  
- Banking training  
- Health effects of EMR  
- Benefit of the project to local communities  
- Concern that AESNP is not in control of power distribution and confusion about the UEB/AESNP relationship  
- Concerns about the quality of AESNP's public relations/transparency of process | - Section 7.2.1 of EIS; T-system RAP  
- Section 7.2.1 of EIS; T-system RAP  
- Section 7.2.8 of EIS; T-system RAP  
- Distribution of electricity is UEB responsibility  
- T-system RAP  
- Section 7.2.4 of EIS  
- Section 7.2.8 of EIS  
- UEB will operate T-system; AESNP will construct it  
- Public disclosure of EA documentation on project both locally and at World Bank |
<table>
<thead>
<tr>
<th>EIA Consultation Methodology</th>
<th>Date</th>
<th>Principle Consultees</th>
<th>Comments/Issues of Concern</th>
<th>Concern Addressed Where in this EIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>NGO Forum convened by the Panel of Experts</td>
<td>March 2000</td>
<td>Ugandan or Uganda-based NGOs (21 including the Uganda National Chamber of Commerce, Uganda Wildlife Authority, Busoga Youth Development Association, Wairaka Women in Progress)</td>
<td>- Transmission system routing, e.g., avoidance of settlements  &lt;br&gt; - Environmental effects (e.g., electromagnetic radiation, effects to Mabira Forest and wetlands)</td>
<td>- Section 4.4 of EIS  &lt;br&gt; - Sections 7.2.4, 7.2.2 and 7.2.3 respectively</td>
</tr>
<tr>
<td>Consultation with Government Agencies</td>
<td>Nov. 1998-Feb. 2000</td>
<td>Ministry of Tourism, Department of Forestry, Ministry of Gender, Labour and Social Dev't, Institute of Health, NEMA, Minister of State for Lands, UEB, Ministry of Works,</td>
<td>- Views on route corridors  &lt;br&gt; - Planning guidelines and legal, health and safety issues for transmission system (t-system)  &lt;br&gt; - T-system impacts on Lubigi Swamp and Mabira Forest  &lt;br&gt; - Effects of electromagnetic radiation  &lt;br&gt; - Compensation Issues  &lt;br&gt; - Tourism potential  &lt;br&gt; - Impact of t-system on public</td>
<td>- Section 4.4 of EIS  &lt;br&gt; - Section 2.1 and 7.1 of EIS  &lt;br&gt; - Section 7.2.3 and 7.2.2 of EIS, respectively  &lt;br&gt; - Section 7.2.4 of EIS  &lt;br&gt; - Section 7.2.1 of EIS; T-system RAP  &lt;br&gt; - Section 7.3 of EIS</td>
</tr>
<tr>
<td>Consultation with National Organizations</td>
<td>July 1998-Oct. 2000</td>
<td>UEB, Uganda Tourist Board, Uganda Wildlife Authority, Sugar Corporation of Uganda, Uganda Railways Corporation.</td>
<td>- Tourism potential in t-system corridors  &lt;br&gt; - Impact on wildlife  &lt;br&gt; - Impact on sugar estates  &lt;br&gt; - Financing possibilities  &lt;br&gt; - T-system route impact on railway</td>
<td>- Section 4.4, 4.6 and 7.3 of EIS</td>
</tr>
</tbody>
</table>
### Table 6.1 Summary of Consultation Activities for the Bujagali Project Transmission System

<table>
<thead>
<tr>
<th>EIA Consultation Methodology</th>
<th>Date</th>
<th>Principle Consultees</th>
<th>Comments/Issues of Concern</th>
<th>Concern Addressed Where in this EIS</th>
</tr>
</thead>
</table>
- Project update  
- Socio-economic issues incl. impact of EMR on public health, special arrangements for orphan/child-headed households, impact on public facilities and gender issues regarding compensation matters  
- Benefits to stakeholders  
- Banking for stakeholders  
- Concerns about UEB ownership rather than AESNP | - Section 7.2.1 of EIS; T-system RAP  
- Section 7.2.4 of EIS  
- Section 7.2 of EIS  
- Section 7.2.8 of EIS; T-system RAP |
| Consultation with Business Interests | Jan 1999-March 2000 | Construction company, hatchery farm, dairy farm          | - Impacts on farms  
- Survey of t-system route | - Section 7.3 of EIS  
- Sections 4.6 and 4.7 of EIS |
From the above table, the issues of compensation and resettlement were of greatest concern to the public and agencies consulted by AESNP. People who will need to be relocated in the immediate areas of the transmission system expect the valuation of their property and holdings to be carried out transparently and the compensation they receive to be at fair market value. They also expect to be compensated for the "economic displacement" that will result from their resettlement (e.g., loss of productive agricultural land). In response, AES Nile Power worked with the citizens and government regulators to develop an effective and fair manner to appropriately compensate people affected by the Bujagali project's transmission system. This is detailed in the Resettlement Action Plan (RAP) for the transmission system (part of this EIS, but under separate cover), prepared in accordance with Ugandan law and World Bank Group policies, in particular OD 4.30 "Involuntary Resettlement". The RAP also sets out how information regarding employment opportunities will be made available locally, how education and training will be developed, and how people will qualify and will be able to access information respecting a possible compensation package.

Other important issues/concerns raised during the public and agency consultations, addressed in the RAP, included:

- assisting in opening bank accounts for the citizens affected so they can effectively deal with AESNP compensation;

- to the extent possible, casual labour for the construction of the transmission system to be sourced from the villages that will be directly affected. Villagers expressed concerns that labour being imported from the outside can detriment local economies;

- assisting in identifying alternative income sources, loan arrangements/financing for affected people (in response to affected villagers' concerns of relocation/restructuring of the local economy); and,

- keeping stakeholders up to date with voluntary circulars regarding project progress.
Concerns Regarding the Negative Effects of the Project

The people in the transmission system project area appeared to have fewer concerns about the construction and operation of the transmission system than the construction of the proposed hydropower facility. However, some stakeholders were concerned about the speed at which the project is moving ahead. They are concerned they will starve due to the fact that they failed to plant crops in transmission system allowances because they are waiting to be resettled. They also expressed concern that expatriate workers will receive higher wages than local workers, as was reportedly the case in the Owen Falls Extension Project.

General Support for the Project

While there is some significant opposition to the entire Bujagali project, the general result of the consultation exercises undertaken domestically by AESNP is that the majority of directly and indirectly affected stakeholders in Uganda support the project.

In April 2000, AES Nile Power retained an independent market research firm to poll the attitudes of 64 NGOs in Uganda. Ninety-six percent of those polled either support or strongly support the Bujagali power project (Steadman Research Services, 2000). Broad, general support was also expressed at the Jinja public hearing on the project convened by NEMA in August 1999 to discuss the hydro component of the EIS, providing its RAP package is implemented. Similarly, general support was expressed at a NGO Forum in Kampala in March 2000 convened by the Panel of Experts, and by the villages along the transmission line.

The most significant opposition to the project comes locally from Save Bujagali Crusade and the National Association of Professional Environmentalists, and internationally from the International Rivers Network (IRN). The position of IRN respecting the Bujagali project can be viewed on www.irn.org. This site also contains a link to the homepage of Save Bujagali Crusade.

6.4 The Panel of Experts

A Panel of Experts was established in late 1997 following a recommendation from the World Bank Group that AESNP should fund, and receive advice from, independent environmental and social specialists who would review the Bujagali project. This Panel of Experts made six trips to Uganda between February 1998 and March 2000. Six resulting reports were written about its observations, its public and agency consultation activities and its recommendations.
on how the Bujagali project could be developed in more appropriate ways. These reports are reproduced in their entirety on www.bujagali.com.

The Panel of Experts consulted with a broad cross-section of stakeholders regarding the Bujagali project, discussing environmental issues related to both the transmission and generation components of the project. Many of the results they obtained were similar to those obtained by AESNP and its consultants. During their final visit to Uganda in March 2000, the Panel convened a NGO Forum in Kampala. They, like AESNP, found that most of the comments were positive, urging AESNP and the environmental establishment to speed the project along because of the need for electricity at all levels of Ugandan society.

The Panel commented on the transmission system in their fourth report, specifically on the issue of electromagnetic radiation (EMR) from transmission lines. The Panel concluded that AESNP has been prudent in maximizing the distance between human settlements and the transmission system due to the conflicting evidence that long-term exposure to the EMR is harmful to human health. Furthermore, they acknowledged that routing and siting of the transmission system was appropriately undertaken to comply with the Government of Uganda’s power requirements and its infrastructure development strategy. Finally, they found AESNP’s avoidance of settlements wherever possible in their transmission system routing noteworthy.

6.5 Future Public Consultation and Disclosure Commitments

AESNP has attempted to address all comments and concerns raised by the public and agencies during consultations on the Bujagali transmission system. Responses to public input by AESNP are detailed in the project mitigation measures in Chapters 7 and 8 of this EIS and in the Transmission System RAP. AESNP has taken, and will continue to take, action to ensure the RAP and other mitigative actions are adequately implemented, and that stakeholder concerns continue to be addressed. The Public Consultation and Disclosure Plan, found in Appendix H of this EIS, details how this will be done in the project phases to come.
7. IMPACT IDENTIFICATION, MANAGEMENT & MONITORING

This EIA adopts a project life cycle assessment format. It focuses on the development of specific management initiatives during the construction, operation, and decommissioning phases of the project to ensure that: i) the people closest to the project receive the projected benefits; ii) environmental and socio-economic impacts are minimised; and iii) health and safety impacts are kept to a minimum. To optimise the life cycle assessment, linkages between potential impacts (i.e., key environmental issues), mitigative measures (i.e., management actions), net effects (i.e., residual effects), and monitoring programs (i.e., management decision tools) are explicitly made.

The section provides:

1. Compliance screening of the project against Government of Uganda, World Bank/International Financial Corporation and AfDB requirements and consistency with International Treaties and Conventions Ratified by Uganda (Section 7.1);
2. Identification and analysis of “Key Project Issues” (Section 7.2); and,
3. A net effects analysis in tabular format summarizing the key project issues from Section 7.2, as well as the balance of issues and concerns that are of a more routine nature, the impacts of which are well understood and manageable using proven techniques (Section 7.3).

The mitigation and management tables provided in Section 7.3 provide the basis for development and implementation of the project specific Environmental Action Plan presented in Section 8.

7.1 Compliance Screening

7.1.1 Government of Uganda Policies and Regulations

The applicable Government of Uganda policies and regulations, along with a brief statement indicating project compliance with each, are provided in Table 7.1.
Table 7.1: Compliance of the Bujagali Electrical Transmission System Project with Government of Uganda Policies and Regulations

<table>
<thead>
<tr>
<th>Act or Regulation</th>
<th>Project Status: Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Constitution of the Republic of Uganda, 1995</td>
<td>Complies: The Bujagali Electrical Transmission System Project has been planned in accordance with all relevant government enacted laws to protect and preserve the environment from abuse, pollution and degradation, and to manage the environment for sustainable development.</td>
</tr>
<tr>
<td>The Electricity Act, 1999</td>
<td>Complies: AESNP will construct the transmission line on behalf of UEB, and for the benefit of UEB. The transmission line will belong to and be operated by UEB. The authorisation of AESNP to construct the line is granted under S.68 (1) of the Electricity Act by the Electricity (Authorisation of Construction of the UEB Electric Supply Line) Notice 2000. AESNP has issued 60-day advance notices to all landowners whose land it wishes to enter. Compensation for affected people will be determined in accordance with the Land Act, 1998 and the Land Acquisition Act, 1965. Where an interest in land greater than the right of use is required for purposes of construction of the transmission system, the Government of Uganda may exercise compulsory acquisition. This could be the case in respect of land required for the substation at Maganja.</td>
</tr>
<tr>
<td>The National Environment Management Statute, 1995</td>
<td>Complies: An Environmental Impact Study is being prepared following the requirements of the Statute, including obtaining a certificate of approval of EIA before the project is implemented. The transmission line will run through or near the Lubigi swamp, situated west of Kampala. Although the erection of towers will have no significant effect on the ecological composition of the swamp, specific permission will be sought from NWCMP and NEMA by AESNP. Gazettement of a private forest adjacent to the Mabria Forest Reserve (to be purchased by AESNP and gifted to the Government of Uganda) will be undertaken in accordance with Schedule 3 of this Statute.</td>
</tr>
<tr>
<td>The Land Act, 1998</td>
<td>Complies: As required under the Constitution of Uganda, prompt payment of fair and adequate compensation where land is compulsorily acquired will be made by the UEB in accordance with the valuation principles laid out in S.78 of the Land Act. The assessment of compensation for the right to use the land is based on the diminished use of the land by owner/occupier of the land and will be paid by AESNP.</td>
</tr>
<tr>
<td>The Forests Act, CAP 246</td>
<td>Complies: AESNP will obtain a license in the form of Form A of the second schedule of the Forest rules for purposes of clearing forest products from Mabira, Kifu and Namyoya Forest Reserves. AESNP will also obtain a permit in the form of Form E for the purposes of occupation of forestry land or undertaking works. The Ministry of Lands, Water and Environment also established a policy framework for the sustainable management of forest reserves. AESNP will operate within this framework in implementing the transmission line project.</td>
</tr>
</tbody>
</table>
Table 7.1: Compliance of the Bujagali Electrical Transmission System Project with Government of Uganda Policies and Regulations

<table>
<thead>
<tr>
<th>Act or Regulation</th>
<th>Project Status: Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Local Government Act No.1/1997</td>
<td>Complies: The proposed corridor line will pass through the three districts of Kampala, Mukono and Mpigi. AESNP has consulted with, and will continue to consult with District and lower Local Councils, which were granted the responsibility of managing their natural resources by the Act so that their concerns can be adequately addressed.</td>
</tr>
<tr>
<td>The Town and Country Planning Act CAP 30</td>
<td>Complies: The proposed corridor passes through the districts of Kampala, Mpigi and Mukono. Of these three, only Kampala has a District Plan, approved in 1994. The project will comply with the District Plan, wherever possible, and with all other provisions of the Town and Country Planning Act CAP 30. Consultations will also be held with District Planners in the other two Districts in the event they have proposals for their District Plans.</td>
</tr>
<tr>
<td>The Uganda Wildlife Statute, 1996</td>
<td>Complies: The Bujagali Electrical Transmission System Project will be consistent with the requirements of the Uganda Wildlife Statute, 1996, including preparation of an Environmental Impact Assessment. However, save from the above, no approvals for implementation of the project will be required from the Uganda Wildlife Authority.</td>
</tr>
</tbody>
</table>

7.1.2 World Bank/International Financial Corporation Policies and Procedures

The applicable World Bank/IFC policies, along with a brief statement indicating overall project compliance with each policy, are provided in Table 7.2. Included also are comments on compliance of the Electrical Transmission System Project with the IFC and draft World Bank Group policies on Labour Standards and Disclosure of Information.

Table 7.2: Compliance Of The Bujagali Electrical Transmission System Project With World Bank/Ifc Operational Policies

<table>
<thead>
<tr>
<th>WB/IDA and IFC Policy</th>
<th>Status: Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>OP 4.01, Environmental Assessment</td>
<td>Complies: An environmental assessment is being prepared following the requirements for a Category A project.</td>
</tr>
<tr>
<td>OP 4.04, Natural Habitats</td>
<td>Complies: To compensate for the loss of natural habitat in the Mabira, Kifu and Namyoya Forest Reserves, an &quot;offset&quot; has been designed in the form of the purchase and gazettment of a private forest enclave within Mabira FR. This enclave is greater in ha than the areas cut down in the three forest reserves.</td>
</tr>
<tr>
<td>OP 4.09, Pest Management</td>
<td>Complies: No significant pest management activities will be undertaken.</td>
</tr>
</tbody>
</table>
### Table 7.2: Compliance Of The Bujagali Electrical Transmission System Project With World Bank/IFC Operational Policies

<table>
<thead>
<tr>
<th>WB/IDA and IFC Policy</th>
<th>Status: Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>OP 4.10, Indigenous Peoples (IFC)</td>
<td>Complies: No indigenous peoples, according to the definition used in OD 4.20, are to be affected by the Bujagali Transmission System.</td>
</tr>
<tr>
<td>OD 4.20, Indigenous Peoples (World Bank)</td>
<td>Complies: No cultural property or artefacts are known to be located in, or immediately nearby, the Bujagali Electrical Transmission System's study area. The project's Environmental Action Plan contains provisions on how the discovery of artefacts (if any are found before or after construction commences) will be managed.</td>
</tr>
<tr>
<td>OP 4.11, Cultural Property (IFC)</td>
<td>Complies: A Resettlement Action Plan has been prepared and will be implemented to ensure the Bujagali Electrical Transmission System Project meets the policy's requirements.</td>
</tr>
<tr>
<td>OPN 11.03, Cultural Property (World Bank)</td>
<td>Complies: The only forestry practices involve clearing to establish the wayleaves. Establishment of the wayleaves through Mabira, Kifu and Namyoya Forest Reserves is being done in consultation with the Ugandan Forest Department.</td>
</tr>
<tr>
<td>OP 4.36, Forestry</td>
<td>Complies: Information about the project will be made available locally and nationally in Uganda, and at the World Bank Infoshop. Information disclosure has been carried out in English and in Luganda.</td>
</tr>
<tr>
<td>OP 4.37, Safety of Dams</td>
<td>Complies: AES will not utilize forced or child labour.</td>
</tr>
<tr>
<td>OP 7.50, Projects on International Waterways</td>
<td>Complies: Information about the project will be made available locally and nationally in Uganda, and at the World Bank Infoshop. Information disclosure has been carried out in English and in Luganda.</td>
</tr>
<tr>
<td>OP 7.60, Projects in Disputed Areas</td>
<td>Complies: The Bujagali Electrical Transmission System Project is not situated in a disputed area.</td>
</tr>
<tr>
<td>Labour Standards</td>
<td></td>
</tr>
<tr>
<td>Disclosure of Information Policy</td>
<td></td>
</tr>
</tbody>
</table>

#### 7.1.3 African Development Bank (AfDB) Policies and Procedures

It is expected that compliance of the project with NEMA, World Bank and IFC Policies, Procedures and Guidelines will result in compliance with all AfDB policies, procedures and guidelines listed in Section 2.3. In order to comply with AfDB’s Public Disclosure requirements, the environmental assessment documentation will be provided to AfDB for public release by the Bank.
## 7.1.4 International Treaties and Conventions

Relevant international environmental treaties and conventions, along with a brief statement indicating project compliance with each, are provided in Table 7.3.

<table>
<thead>
<tr>
<th>Treaty / Convention</th>
<th>Status: Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1958 Convention on Fishing and Conservation of the Living Resources of the High Seas</td>
<td>Not Applicable: The Bujagali Electrical Transmission System will not involve activities within the high seas.</td>
</tr>
<tr>
<td>1968 African Convention on the Conservation of Nature and Natural Resources</td>
<td>Consistent with Article XIV, full consideration was given to ecological, as well as to economic and social factors in the formulation of development plans for the transmission system. A number of mitigation measures were developed to reduce its potential ecological effects, including optimisation of the route and facility locations, reduction of right-of-way width, access management, and provisions for local people to be able to utilize portions of the right-of-way for specific purposes. The project has also committed to mitigation measures that will result in a net overall increase in forest reserve size, an increase in number of hectares of high quality forested land, and improved management of the resources within the forest reserves, including the involvement of local communities.</td>
</tr>
<tr>
<td>Convention on Wetlands of International Importance Especially as Waterfowl Habitat</td>
<td>Complies: The Bujagali Electrical Transmission System will not involve activities within a wetland of international importance.</td>
</tr>
<tr>
<td>1985 Vienna convention for the Protection of Ozone Layer</td>
<td>Complies: The Bujagali Electrical Transmission System will not produce or emit significant amounts of ozone-depleting compounds.</td>
</tr>
<tr>
<td>1987 Montreal Protocol on Substances that Deplete the Ozone Layer</td>
<td>Complies: The Bujagali Electrical Transmission System will not produce or emit significant amounts of ozone-depleting compounds.</td>
</tr>
<tr>
<td>1992 International Convention to Combat Desertification</td>
<td>Complies: Activities associated with the Bujagali Electrical Transmission System will not promote desertification.</td>
</tr>
</tbody>
</table>
### Table 7.3: Compliance Of The Bujagali Electrical Transmission System Project With International Treaties And Conventions Ratified By Uganda

<table>
<thead>
<tr>
<th>Treaty / Convention</th>
<th>Status: Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992 Convention on Biological Diversity</td>
<td>In accordance with Article 14, Impact Assessment and Minimizing Adverse Impacts, potential adverse environmental impacts on biological diversity due to a transmission line going through forest reserves, have been identified and appropriate mitigation measures have been developed to ensure that impacts are minimized. In accordance with Article 8 In-situ Conservation, the project will provide funding for the Forest Department to rehabilitate portions of the Mabria CFR, in addition to facilitating the purchase and rehabilitation of a private forest enclave adjacent to Mabria CFR, resulting in a net increase in gazetted forest reserve.</td>
</tr>
<tr>
<td>1992 Convention on Climatic Changes</td>
<td>Complies: The project does not involve significant emission of greenhouse gases.</td>
</tr>
<tr>
<td>Lusaka Agreement on Cooperative Enforcement Operations Directed at Illegal Trade in World Flora and Fauna</td>
<td>Complies: The Bujagali Electrical Transmission System will not involve importation or exportation of flora or fauna. Measures are in place to manage illegal take of bushmeat.</td>
</tr>
<tr>
<td>Intergovernmental Authority on Drought and Desertification</td>
<td>Complies: Activities associated with the Bujagali Electrical Transmission System Project will not promote desertification.</td>
</tr>
</tbody>
</table>
7.2 Key Project Issues

The following key project issues have been identified based on comments received by project stakeholders, and the experience of the study team with similar assignments. Each of the issues is dealt with, in turn, in the following subsections. Issues of a more routine nature that are common to large construction projects, and for which effective mitigation measures are well known, are dealt with directly in the summary impacts, mitigation and monitoring table (Table 7.8).

- Resettlement and Compensation;
- Impacts on Forest Reserve Lands;
  - Mabira Forest Reserve;
  - Kifu and Namyoya Forest Reserves; and,
  - Kalagala Falls Forest Reserve;
- Impacts on Lubigi Swamp;
- Impacts on public health;
- HIV/AIDS;
- Aesthetics;
- Electric and Magnetic Fields (EMFs);
- General construction related issues;
- Cumulative Effects; and,
- Developmental and Community Benefits.

7.2.1 Resettlement and Compensation

The details of Resettlement and Compensation activities to be carried out for the Bujagali transmission system are presented in the Transmission System Resettlement Action Plan (RAP). The RAP also contains details of monitoring activities to be carried out to assess the effectiveness of the compensation and resettlement programme and to identify any additional measures required. This section provides a summary of:
the land required for the project;
the people, businesses and other land uses affected; and,
AESNP’s compensation and resettlement strategy.

Overall, the compensation and resettlement measures to be provided are designed to ensure that project-affected persons are better off or, at least, no worse off as a result of the project.

7.2.1.1 Project Land Requirements & Encumbrances

Principles – Wayleave and Right of Way

Land required for the construction and operation of the transmission lines falls into two categories: wayleaves and rights of way.

The wayleave is recognised as the safety corridor outside of which negative impacts from transmission lines are assumed to be negligible. The width of the corridor depends on the line voltage. The Ugandan standard is a 30 m wide wayleave for a 132 kV line and 40 m for a 220 kV line. The wayleave for the Bujagali project’s 220 kV line will generally be 40 m, but 35 m within the project-affected forest reserves. Within the wayleave, no house is permitted and crops are to be less than 1.8 m (6 feet) in height.

The right of way is the land required for a maintenance track under the line and for the location of the towers. This corridor is 5 m in width, which suffices for both the access track and the 4 legs of towers, and will be an encumbrance on the existing land uses in this 5 m strip.

All land required for both rights of way and wayleaves remains under the ownership of the present owners and no transfer of ownership occurs.

The land encumbrances for the various voltages and arrangements proposed under this project are shown on Figure 7.1.

Principles – Kawanda substation

Land required for the construction of the substation in Kawanda is to be acquired by AESNP on behalf of UEB. Formal title of the land will be transferred from its present owners to UEB.
OWNERSHIP SITUATIONS -> STRATEGIES FOR COMPENSATION

SITUATION 1
The plot lies partly within the wayleave corridor and is partly unaffected. No structure.

Cultivation may continue within the wayleave corridor subject to height limitations. The loss of value resulting from this limitation will be compensated for in cash.

SITUATION 2
The affected plot is partly within the right of way corridor, partly within the wayleave corridor, and partly unaffected. No structure.

Land in the Way Leave will be subject to some limitations as in Situation 1 and loss of value will be compensated on same basis. All rights on land within the Right of Way will be compensated for as if the land had been acquired. Perennial crops on this strip will be compensated as well. Land for land compensation will be offered as an option if the remaining land is not sufficient for the household.

SITUATION 3
The whole plot is affected, with a part within the right of way corridor and another within the wayleave corridor. No structure.

Same as 2. Land for land compensation will also be offered as an option if the household does not have sufficient land elsewhere.

SITUATION 4
There is a structure in the affected part of the plot.

As far as land is concerned, situation 4 is the same as situation 2, but the structure has to be relocated. If the household can relocate within the unaffected part of their plot and the remainder is sustainable, same as situation 2, with the addition of the cash compensation for the structure. Otherwise, an option between land for land and cash compensation will be offered, together with a replacement structure if the household chooses land for land compensation.

SITUATION 5
There is a structure in the unaffected part of the plot.

The structure does not have to be removed. Situation 6 is same as situation 2.

SITUATION 6
The whole plot is affected and there is a structure within the corridor.

The PAPs must move, they will be offered land for land compensation and a replacement house. They may prefer cash compensation and relocate themselves.

Figure 7.1
RANGE OF OWNERSHIP SITUATIONS ENCOUNTERED AND STRATEGIES FOR COMPENSATION

Project Name: BIJAGALI TRANSMISSION SYSTEM EIS
Prepared for: AES NILE POWER

Data: DECEMBER, 2000
Process: G0503_T_41
Land Requirements and Encumbrances for the Transmission System

The total surface of encumbrances on land is 376 hectares (929 acres), 68% of which is needed for the 220kV line from the hydropower plant at Dumbbell Island to Kawanda. An additional 4.7 hectares of land is required for Kawanda substation. Table 7.4 shows the distribution of the land requirements for the transmission system.

Table 7.4: Total Land Requirements and Encumbrances

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydropower station at Dumbbell Island to Kawanda Substation</td>
<td>220 kV</td>
<td>255.8</td>
<td>36.9</td>
<td>292.7</td>
<td>40</td>
<td>5</td>
</tr>
<tr>
<td>Kawanda Substation (ACQUISITION)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4.7</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Kawanda Substation to Mutundwe Substation</td>
<td>132 kV</td>
<td>45.1</td>
<td>8.9</td>
<td>54.0</td>
<td>30</td>
<td>5</td>
</tr>
<tr>
<td>Hydropower station to Tororo line and Hydropower station to Owen Falls line</td>
<td>2*132 kV</td>
<td>25.3</td>
<td>4.6</td>
<td>29.9</td>
<td>70</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>326</strong></td>
<td><strong>50</strong></td>
<td><strong>381</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. In all Forest Reserves, the width of the wayleave is reduced to 35m to minimize clearing of forest cover.

7.2.1.2 Project Affected Persons

Physically Displaced Persons

The total number of Physically Displaced Persons that will be required to move their domicile is 1,522 individuals from 326 households. The number of Physically Displaced Persons was determined by direct counts of the people residing within the proposed wayleave.

Within the 326 households that are categorised as physically displaced, a certain proportion will only have to relocate to the unaffected part of their plot. In these situations, there will be limited disruption to the household. The final number of households falling into this category will only be known as the RAP is implemented and the physically displaced households make their wishes known to AESNP.
The total number of affected residential structures is 326. These include 132 permanent structures, 132 “semi-permanent” and 62 “non-permanent” structures.

The total number of persons who currently reside on affected plots is 552 households or 1,867 individuals. Not all of these persons are physically displaced as some of them live on parts of plots not affected by the proposed transmission system, i.e., outside the proposed wayleave.

**Total number of Project Affected Persons**

Project Affected Persons are persons who lose assets as a result of the project, whatever the extent of the loss. Lost assets may be land rights, structures, crops, or a combination of these three. Not all Project Affected Persons (PAPs) have to relocate as a result of the project. The total count of Project Affected Persons amalgamates persons with very different levels and extents of loss.

The total number of Project Affected Persons is 1,183 households, or 5,796 individuals. The types of land ownership situations that make up the total PAPs number are shown in Figure 7.1.

**Businesses Affected**

Nine businesses will be directly affected by the project, seven of which are tea or sugar cane plantations. No relocation of businesses will be required.

**Public Facilities Affected**

One mosque is located within the wayleave and will need to be relocated.

**7.2.1.3 Principles for Compensation and Resettlement**

AESNP will acquire, on behalf of UEB, an easement from the landowner to establish the wayleave and the right of way. In general, compensation for the right of way will be higher to reflect the more stringent restriction on land use in the right of way compared to the wayleave. For both the right of way and wayleave, the land will remain under the original ownership; no transfer of ownership will occur. No buildings are allowed in rights of way or wayleaves, therefore any existing dwellings will be displaced. The other key land use restriction is an approximate 1.8 m height limitation imposed on trees or crops located within the wayleaves.
More specifically, compensation and resettlement along the transmission system falls within one of six situations. Figure 7.1 illustrates the six situations encountered and the encumbrances for those situations required by the project.

The land required for Kawanda Substation is to be acquired by AESNP on behalf of UEB. Formal transfer of title will take place. All land rights, structures and crops will be compensated. Alternative land will be offered to those project affected persons who may require it.

The RAP allows for land compensation, or cash, depending on the individual situation and preference of the project-affected persons. These measures are designed to ensure that project affected persons are better off, or at least no worse off, following resettlement.

The RAP provides for additional assistance to vulnerable persons. Grievance, monitoring and evaluation procedures are also prescribed in the RAP.

The RAP has been designed to comply with all Ugandan Laws, and to meet the relevant World Bank, IFC and AfDB safeguard policies and guidelines. The RAP specifies the activities to be completed, implementation schedules, budgets and roles of the responsible parties.

7.2.2 Impacts on Forest Reserve Lands

Three forest reserves (the Mabira FR, the Kifu FR and the Namyoya FR) will be affected by the proposed Bujagali transmission system. Each of these gazetted areas is considered a "natural habitat" under World Bank Safeguard Policy 4.04. Under this policy, effects to such areas must first be avoided; a project sponsor must then demonstrate there was no feasible alternative to its project configuration before the World Bank Group will contemplate a discussion regarding mitigation of effects to natural habitats arising from the project. This demonstration is provided in section 4.4 of this EIS.

7.2.2.1 Mabira Forest Reserve

A total of 16.9 km of the proposed 220 kV line is located in the Mabira Forest Reserve, affecting 59.2 hectares of Forest Reserve land based on a 35 m wide wayleave. The figures of 16.9 km and 59.2 ha are a reduction from the previously reported figures of 18 km and 72 ha. These figures were used prior to detailed field data being compiled, and prior to the wayleave
width through the forest reserve being reduced from 35 m to 40 m as a mitigation measure. Location of the line in the Reserve has been raised as a concern with respect to loss of treed vegetation and habitat for forest wildlife within the wayleave, especially in light of the World Bank’s Natural Habitats Safeguard Policy (OP 4.04). Specific concerns that have been identified, and which are discussed in this section are:

- The permanent loss of 59.2 ha of forested land will reduce the available habitat for forest dwelling animal species and reduce the forest’s capacity to sequester carbon;

- The proposed transmission line will go through 4.3 km of protection (buffer) zone;

- The approximate doubling of the width of the existing cleared corridor may create a barrier to movement of forest species between the forest lands north and south of the cleared corridor;

- The line introduces a physical hazard to birds and climbing animals (applies to entire length of the line); and,

- Improved road access in the vicinity of Mabira Forest Reserve may result in an increased level of illegal timber harvesting and hunting within the reserve.

The mitigation measures specified herein have been developed through a consultative process with:

- forestry staff at the Forest Department Headquarters in Nakawa;

- forestry field staff at the Mabira Forest Station;

- the National Environment Management Authority (NEMA);

- the Ministry of Water, Lands and Environment;

- local leaders;

- women’s groups;

- private forest owners; and,

- NGOs and environmentalists active within the area.
Issue: The permanent loss of 59.2 ha of forested land will reduce the available habitat for vegetation and wildlife and reduce the forest’s function as a carbon sink.

To address the loss of forested land, AESP will:

- reduce the width of the wayleave in the Forest Reserve to the minimum needed for safe construction and operation;
- undertake enrichment planting; and,
- purchase a private forest and gift the land to the Government of Uganda to expand the size and quality of Mabira Forest Reserve.

To minimize the amount of forested land affected, AESNP will limit the width of the wayleave through Mabira FR to 35 m. During preliminary project design, a 40 metre wayleave was identified as being necessary. However, at a later stage of design, it was determined that in the Mabira Forest area, a 35 metre wayleave would be sufficient to meet safety requirements. Compensation will continue to be based on a 40 metre wayleave, given the advanced state of discussions with landowners and stakeholders, including the Forest Department. With the narrowing of the wayleave through Mabira FR from 40 m to 35 m, the permanent loss of forested land is reduced from 68 ha to 59.2 ha.

To offset loss of forested land in the Mabira FR, AESNP will:

1. Purchase a private forest enclave located adjacent to Mabira FR and gift the land to the Government of Uganda. Gazettement of the private forest will be undertaken in accordance with Schedule 3 of the National Environmental Statute No. 4/1995.

2. Undertake regeneration/enrichment planting and tending of approximately 899 ha of existing degraded areas within Mabira Forest Reserve and the purchased forest enclave.

The enrichment and regeneration planting will be part of a wider improved management and protection strategy for the whole of the Mabira FR (including revising the Forest Management Plan and improving ecotourism facilities). All planting will be done with indigenous species such as Maesopsis eminii, Markhhania lutea, Melicia excelsa, Antiaris toxicaria, Ficus spp., Funtumia elastica, Terminalia spp., Celtis spp., and Albizia spp. Seedlings will be purchased from tree nurseries operated by the Forest Department and, if necessary, supplemented by wildlings obtained from the forest, including from the wayleave prior to clearing.
This regeneration will, in the long run, result in a net overall gain of approximately 840 ha of high quality forested land within the Forest Reserve that will provide habitat utilized by forest dwelling animals and increase the forest’s capacity to sequester carbon. Thus, there will be a net improvement in the extent and quality of forest within the forest reserve as a result of the mitigative measures to be undertaken by AESNP.

There are currently two options being pursued for the purchase by AESNP of a privately owned forest enclave located within Mabira FR. The options are either Namanyama (234 ha) or Kiwala (161.41 ha) forests. See Figure 3.3 for the location of these private forests. Both of these forests are presently severely degraded with forest remnants on hilltops. More detailed information on Namanyama and Kiwala private forests is included in Appendix D.1. The purchased lands will be gifted to the People of Uganda for gazetting as part of Mabira Forest Reserve.

Muramira (2000a, attached in Appendix D.2) calculated the economic value of the overall impact of an 18 km wayleave of 40 m in width (for a total of 72 ha) through Mabira FR, taking into account the impact of wayleave construction on: timber and pole production, non-timber forest products, biodiversity, carbon sequestration, eco-tourism and forest management. The total cost calculated by Muramira was USh 544,417,779 (equivalent to USD 340,262 at mid-year 2000 at an exchange rate of USh 1600 to USD 1) or USh 7,561,358/ha based on 72 ha being affected by the transmission line. AESNP has committed itself to supporting mitigation and offset measures pertaining specifically to Mabira FR to the equivalent of USh 7,561,358 x 67.6 ha = USh 511,147,800. This amount is based on a 40 m wayleave given the advanced stage of negotiation with the Forest Department, even though the wayleave will be limited to 35 m wide. Table 7.5 provides a summary of the costs allocated for the purchase and gazettlement of a private forest and enrichment/regeneration planting, based on Muramira’s report, entitled: “Mitigation Plan to the Environmental Economic Impacts of the 220 kV Electric Transmission Line Wayleave Through Mabira Forest Reserve” (2000 b, copy included in Appendix D.3).
Table 7.5: Estimated Costs Associated With Purchase of a Private Forest and Enrichment Planting (from Muramira 2000b)

<table>
<thead>
<tr>
<th>Cost Item</th>
<th>Cost (USh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase of private forest, either the 210 ha Namanyama forest or the 162.41 ha Kiwala forest</td>
<td>162,410,000</td>
</tr>
<tr>
<td>Re-survey, preparation of deed plans and titling</td>
<td>52,000,000</td>
</tr>
<tr>
<td>Environmental Impact Assessment of private forest</td>
<td>10,000,000</td>
</tr>
<tr>
<td>Gazettement to forest reserve status</td>
<td>2,000,000</td>
</tr>
<tr>
<td>Revision to 1997-2007 Mabira Forest Management Plan to reflect additional gazetted area and operational changes</td>
<td>1,500,000</td>
</tr>
<tr>
<td>Ecotourism facilities replaced</td>
<td>1,200,000</td>
</tr>
<tr>
<td>899 ha (estimated) of enrichment planting and tending based on a cost of 313,620/ha:</td>
<td></td>
</tr>
<tr>
<td>• 400 seedlings/ha @ USh 500/sdlg = 200,000/ha</td>
<td></td>
</tr>
<tr>
<td>• Tools will be obtained from Forestry Dept. central store</td>
<td></td>
</tr>
<tr>
<td>• Line slashing @ 40 days/ha X 2,000/day = 80,000/ha</td>
<td></td>
</tr>
<tr>
<td>• Pitting (400 pits/ha) @ 100 pits/day X 2,000/day X 4 days/ha = 8,000/ha</td>
<td></td>
</tr>
<tr>
<td>• Planting (400 trees/ha) @ 100 trees/day X 2,000/day X 4 days/ha = 8,000/ha</td>
<td></td>
</tr>
<tr>
<td>• Transport = 220/ha</td>
<td></td>
</tr>
<tr>
<td>• Allowances for forestry staff @ 2600/ha</td>
<td></td>
</tr>
<tr>
<td>• Labour for liberation tending = 10,800/ha</td>
<td></td>
</tr>
<tr>
<td>• Staff allowances for staff involved with tending = 4,000/ha</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL COSTS</strong></td>
<td><strong>511,147,800</strong></td>
</tr>
</tbody>
</table>

Notes:

1. The owner of Namanyama Forest has indicated his willingness to sell the 210 ha forest for 160,000,000. The owner of Kiwala Forest has indicated his willingness to sell the 162.41 ha forest for 162,410,000. For the purpose of these calculations, the higher cost was used. If Namanyama Forest is purchased rather than Kiwala Forest, the difference in cost will be used to plant and tend an additional 7 ha.

2. In accordance with the National Environmental Statute No. 4/1995, Section 20, and Environmental Impact Assessment Regulation No. 12/1998, it is a legal requirement for every developer to undertake an environmental impact study where the concerned project is listed in the third schedule of the Statute. Gazetting of new protected areas including forest reserves fall into Schedule 3.

3. Cost estimates based on 1998-99 annual work programme for Mabira Management Plan. Enrichment planting and tending to be undertaken as required within the private forest after it is gazetted as part of Mabira FR and within presently degraded areas of Mabira FR.

4. Tending to be carried out approximately 3 times within first year of planting. Since large planting stock will be used, it is assumed that no tending will be required after the first year.
AESNP and the Forest Department will finalise agreement on which private forest enclave is to be gifted to the Government of Uganda, prior to AESNP: purchasing the land; conducting an Environmental Impact Assessment on the land; and, arranging for it to be gazetted as part of Mabira FR. The EIA on the private forest enclave will be undertaken after submission of the EIA and prior to construction of the transmission system.

It is the responsibility of the Forest Department to revise the Forest Management Plan for the Mabira FR and to determine when and where mitigation activities are to occur, including: areas to be enrichment planted and tended; and, relocation of ecotourism facilities. A timetable with milestones is to be prepared by the Forest Department and agreed upon by AESNP within 6 months of the Transmission System EIS being approved by NEMA. AESNP will release funds to the Forest Department in instalments, with future payments dependent upon successful completion of milestones.

The Forest Department has trained staff capable of implementing the above activities, but the department is handicapped by a lack of funds. Thus, AESNP has committed itself to providing funds for the mitigation activities outlined in Table 7.5.

During the public consultations, it was proposed to plant replacement forests near Dumbbell Island and in the 100 meter protected zone along the banks of the River Nile as an offset for removing 59 ha of forest land from production in Mabira FR. The Forest Department stated that this proposed offset should be considered as a mitigation measure for the loss of productive land due to the construction of the hydropower station to be constructed by the same company (Muramira, 2000b, pg. 51, document is attached in Appendix D.3). Therefore, this measure will be considered as part of the hydropower station undertaking and is not discussed further here.

**Issue:** The resulting cleared corridor may pose a barrier to movement of “forest interior” wildlife species between the forested areas north and south of the route

The route for the 220 kV line through the Mabira Forest Reserve has been routed immediately adjacent to the existing 132 kV line to minimize fragmentation effects on the forest. Cross line corridors between the north and south forested areas will be established by selectively minimizing clearing along the wayleave, and by selective planting of suitable vegetation at the following locations:
• The valley at tower 142 of the existing line;
• The valley between towers 147 and 146 of the existing line;
• The valley stream about 50 m east of tower 152 of the existing line;
• The valley between towers 153 and 154 of the existing line; and,
• The Valley of the River Waliga between towers 169 and 168 of the existing line.

**Issue: The line introduces a physical hazard to birds and climbing animals (applies to entire length of the line)**

Concern has been expressed by the Uganda Wildlife Society, Forest Department and NEMA as to the possibility of injury to migratory birds arising from collision with transmission lines. This was prompted by reports of such incidences occurring in other countries such as South Africa (e.g. ESKOM, 1998).

Bird strikes and mortality are a concern for power lines primarily in areas for lines that are located in areas with high bird densities, such as waterfowl breeding colonies or staging areas. The proposed line is not located near any significant breeding or staging areas, and therefore bird strikes are not expected to have any significant effects on bird populations in Uganda.

Risk of electrocution by large climbing animals, such as vervet monkeys, or bats are not expected as the spacing of the conductors and the length of the insulators exceeds the reach of the climbing species and wingspan of bats present in the area. A reach of at least 1 m – with the animal touching both the insulators and conductors at the same time - would be required to achieve a short circuit between the conductor and tower. No species known in Mabira, or elsewhere in the study area, has a reach this long.

**Issue: Presence of the line reduces aesthetic values for ecotourism and recreation**

The 220 kV transmission line will not create a new visual element in the landscape, as it is adjacent to an existing line. It will, however, incrementally increase the level of intrusion present.

AESNP will provide money and expertise to the Forest Department to assist with relocation of existing tourist facilities, including cycling tracks and foot trails, away from the transmission line in order to minimize the visual impact of the wayleave. As previously mentioned in
Section 3.3.1, infrastructure presently situated at Najjembe station will be relocated further north. An amount of USh 1,200,000 has been earmarked to pay for the relocation of tourist facilities, as agreed upon by management at the Forest Department and the Eco-tourism Centre in Mabira (Muramira, 2000b).

In the long run, AESNP’s regeneration/enrichment planting measures will provide increased opportunities for ecotourism.

**Issue: Improvements to Access Required for Construction May Increase Grazing and Illegal Felling of Timber**

The 1997-2007 Forest Management Plan for Mabira Forest Reserve (Forest Department, undated) indicates that the key activities damaging forest resources are (i) illegal farming, (ii) grazing of animals by people living in enclaves and areas adjacent to the reserve, and (iii) illegal felling of trees for lumber and charcoal production.

The access track along the existing transmission line provides access to much of the area traversed by the line, although certain portions are not passable (refer to Figure 3.4). The conditions observed along the existing line indicate that agricultural cultivation and grazing is occurring within and adjacent to the wayleave of the existing line. It is also expected that tree felling is occurring adjacent to the wayleave of the existing line.

During construction of the transmission line through Mabira Forest, the current access track will need to be upgraded in order to permit passage of heavy goods vehicles. In particular, five bridges, such as the ones shown in Figure 5.8, will need to be strengthened or otherwise upgraded and areas currently inaccessible due to overgrown brush will need to be cleared. The improvements to access will increase opportunities for illegal grazing and tree felling.

Prior to any upgrading of roads or bridges that provide access into and within the forest reserve, AESNP will meet with the Forest Department and UEB officials to verify the level of access that the FD and UEB want to maintain during and after construction.

The following measures will be used, as appropriate and as agreed to by the FD and UEB, to control post-construction access:

- Restoration or creation of natural obstructions to access following construction;
• Installation of locked gates at watercourse crossings where the natural obstruction of the watercourse precludes skirting of the gate; and,

• Education and monitoring programs for workers and residents in area settlements.

BEC will implement the following procedures to prevent illegal hunting of bushmeat by workers during the construction phase:

• Project workers will be prohibited from hunting bushmeat during working hours or on project work sites;

• Project workers will be sufficiently paid that they will not need to supplement their purchased food with illegally obtained bushmeat;

• Project workers will be prohibited from possessing firearms, snares and other hunting equipment when on project work sites; and,

• Bushmeat transport will not be permitted on project vehicles.

Merchantable timber cut during the construction of the proposed transmission line will be sold and removed from the forest reserve. Timber that has no market value will be stacked within the wayleave and left for local people to utilize for firewood or charcoal. The production of charcoal within the forest reserve by local people is done in cooperation with Forest Department staff.

7.2.2.2 Kifu and Namyoya Forest Reserves

The proposed transmission system will also pass through Kifu and Namyoya (also known as Mwola) Forest Reserves.

In the case of Kifu FR, the proposed transmission line will run immediately adjacent to an existing 132 kV line for a distance of 1.0 km through presently degraded forest. The proposed transmission line will result in 3.5 ha being removed from productive land. This represents 0.25% of the forest reserve.

In Namyoya FR, the proposed transmission line will go through 310 m of degraded natural forest that is in the process of being converted to Eucalyptus plantations, under agreement with the Forest Department. With a wayleave width of 35 m, 1.1 ha will be removed from productive land, representing a total of 0.3% of the forest reserve.
Mitigation measures that will be undertaken to limit the impact of the proposed transmission line in these reserves include:

- Wayleave width will be limited to 35 m; and,
- Clearing will be limited in selected areas along the wayleave so that the resulting corridor does not pose a barrier to the movement of "forest interior" wildlife species between the forested areas north and south of the route.

Neither Kifu nor Namyoya FRs has high tourism value at present. Field surveys undertaken in Kifu FR in October 2000 revealed that there is no cultivation within or beside the existing wayleave. Namyoya FR is in the process of being converted to 12 ha woodlot plots under agreement with the Forest Department. Therefore, the possibility of illegal cultivation occurring within these two reserves as a result of the widened wayleave is considered to be low. If there were any OP 4.04 implications to the forest habitat lost within these two reserves, the proposed offset within the Mabira Forest Reserve, discussed in detail in 7.2.2.1, would more than compensate for these losses. This is because the area to be acquired in Namanyama or Kiwola FRs is far greater than the area lost in Namyoya and Kifu FRs. Moreover, the enrichment plantings to take place in Namanyama or Kiwola FRs are in areas directly adjacent to Strict Nature Reserve zones within Mabira Forest Reserve, making one larger, contiguous ecological unit there.

7.2.2.3 Kalagala Falls Forest Reserve

In response to suggestions that the Kalagala Falls Forest Reserve area might be appropriate for consideration as an offset area, AESNP commissioned a survey of Kalagala Falls Forest Reserve, including its legal history and present vegetative cover. The management of this reserve is addressed in the Forest Management Plan for Mabira Forest Reserve (including Mabira, Namakupa, Nadagi, Kalagala Falls, Namawanyi and Namananga Forests), Second Edition, for the Period 1st July 1997 to 30th June 2007 (Forest Department, undated). As shown in Figure 3.3, Kalagala Falls Forest Reserve is located 9 km north of Mabira FR and 7 km northeast of Namananga FR.

Kalagala Falls Central Forest Reserve is contiguous with the Nile Bank Central Forest Reserve and was originally treated as one reserve. The reserve was divided for administrative purposes since the reserve falls within two districts.
The area separating Kalagala Falls FR from Mabira and Namananga FRs is densely populated by subsistence farmers and large tea estates. A copy of the report commissioned by AESNP, *Brief Assessment of the Kalagala Central Forest Reserve for Proposed Tourism Mitigations of the Bujagali Hydropower Project* (Chemusto, 2000) is included in Appendix D.4.

### 7.2.3 Impacts on Lubigi Swamp

Lubigi Swamp is a large wetland area in Kampala with significant hydrological and biological functions. For the transmission system, the main concern, aside from short-term disturbance along the temporary access tracks to tower sites, is the effect on the hydrological functions of the wetland resulting from installation of concrete tower pads. The dominant vegetation is 2-3 m high papyrus. There is currently a weaving/basket-making industry based on the swamp. Since papyrus regenerates within 12 months, any construction related clearance will be short-term only in nature. No significant clearing will be necessary for operation or construction. Thus, no significant biological effects are expected.

The National Wetlands Conservation and Management Programme (NWCMP) was consulted with regard to the transmission line being sited adjacent to Lubigi swamp (see Appendix H). The NWCMP commented that the Lubigi Swamp is representative of a type of wetland that is widespread in Uganda. Moreover, it is ‘self-protecting’ to a large degree, as any construction within the wetland will be more difficult (and expensive) than on dry land, and therefore will tend to be avoided during both design and construction. This is reflected in the final alignment of the transmission line, which avoids wetland areas wherever possible.

NWCMP raised concern that any large-scale earthworks, such as temporary or permanent causeways, might cause large amounts of suspended solids to be mobilised into the water column. The project will not require any permanent or temporary causeways as access can be gained to all proposed tower locations by wheeled or tracked vehicles. This includes the ‘island’ at the southwestern corner of the transmission line (the site for one tower), which is accessible by an existing causeway.

In summary, the following mitigative measures will be used to minimize temporary disturbance of the wetland, and avoid permanent intrusion into the wetland area:
• **The transmission line will be located on the west side of the swamp**
  In order to minimize impact on the heavily populated eastern shore of Lubigi Swamp, and to minimize impact on the swamp’s hydrological functions, the transmission line has been routed along the western side of the swamp. Towers will be sited on permanently dry sites (versus seasonally wet sites) as much as possible in order to minimize disturbance to the swamp.

• **No towers will be sited in permanently wet locations**
  No towers will be sited in permanently wet locations, although several are sited on seasonally wet edges where there is already substantial human disturbance from papyrus cutting and livestock grazing. Tower AP 6 will be sited on an island with a small factory on it, rather than in a permanently wet area.

• **Footings of towers will be built to address wet season conditions**
  Towers that are located in seasonally wet areas will be built with raft foundations, rather than the pad and chimney foundation that is normally used on dry sites (Figure 5.3 shows the differences between these two types of foundations). The concrete pads that form the base of these towers will have no significant effect on hydrology. Construction of the raft foundations will require dewatering in the immediate area of foundation excavation. The dewatering will be temporary and localised and is not expected to have any long term effect on flora or fauna.

• **No intermediate towers will be sited within the swamp**
  Towers AP5, AP6, AP7, AP9 and AP10 will be constructed to a standard such that they can support longer than normal spans (500 m span versus normal span of 330-350 m). This measure will eliminate the need to locate towers within the swamp.

• **Construction of new access roads will be kept to a minimum**
  Lubigi Swamp is currently accessed by a number of roads and causeways, especially in its southern end. The transmission line between towers AP2 and AP5 (a distance of 1.2 km) run immediately south of, and parallel to, a railway bed that has been built up within the swamp. Rather than build a new access trail along this portion of the transmission line, efforts will focus on widening the existing railway bed to support an access trail. Final agreement is still required between the owner of the railway line and UEB, who will assume ownership of the transmission system upon completion of construction.
7.2.3.1 Other Wetlands

Wetland areas along the transmission line route, aside from Lubigi swamp, are located on the western fringes of Kampala. Several small seasonal wetlands are also in and around the Kawanda area. No towers will be sited within these wetlands. The greatest impact on these wetlands will be aesthetic, due to a transmission line passing over them.

Where the transmission line will cross areas that are potentially important as bird flight paths, in particular large wetland bird species, BEC shall take reasonable measures to make the conductor more conspicuous. These include the use of reflectors placed at intervals along the conductor. Such measures will be employed where the line crosses the Lubigi Swamp and where the line crosses the seasonal swamps to the north of Kampala.

7.2.4 Impacts on Public Health

This section examines concerns for public health related to HIV/AIDS and other communicable and sexually transmitted diseases (STDs) and exposure to electric and magnetic fields (EMFs). Public health issues and safety issues related to traffic and construction are dealt with in Section 7.2.7 of this report.

7.2.4.1 HIV/AIDS

The spread of HIV/AIDS was identified as a key public health issue in the First Report of the International Environmental and Social Panel of Experts (February 25, 1998). Concern was expressed that the already high prevalence of HIV found in Uganda could be exacerbated through spread of the disease by construction workers, truck drivers and prostitutes attracted to worker camps.

BEC will bus workers to active construction sites each day from Jinja or Kampala. No camps will be used that might attract a concentration of prostitutes.

BEC will, as part of each worker’s initial orientation and ongoing education, provide public education information about HIV/AIDS transmission and preventative measures. Condoms will be made available to project workers at no cost.
7.2.4.2 Electric and Magnetic Fields (EMFs)

Background

Humans are exposed to a wide variety of natural and man-made electric and magnetic fields. The earth’s atmosphere produces slowly varying electric fields (about 0.1 to 10 kV/m), with a product of these fields being lightning. The earth’s core produces a steady magnetic field, which ranges in strength from about 470 milliGauss (mG) to 590 mG over North America. Many childhood toys contain magnets, and many individuals use magnets to hold items onto metallic surfaces. These permanent magnets typically have fields in excess of 100,000 mG. An increasingly common diagnostic procedure, magnetic resonance imaging (MRI), uses fields of 20,000,000 mG on humans and is preferred over X-rays because of its safety.

In modern electrified homes and apartments, typical baseline 60 Hz magnetic fields in the middle of rooms range from 0.5 to 2.0 mG. 60 Hz EMFs can also be found in the vicinity of all electrical appliances, which produce magnetic fields of 40-80 mG at distances of about half a meter, although the fields quickly diminish with distance. Personal electric appliances such as shavers, hair dryers, and electric toys can produce fields in the hundreds of mG in the vicinity of the person using them.

In the school and work environment copy machines, vending machines, computer terminals, telephones, wireless telephones, electric lights, tools, motors and heaters are all sources of EMFs.

Electric fields and magnetic fields have different properties (Table 7.6); however, more recent interest and research has focused on the potential human health effects of magnetic fields.
Table 7.6: Comparison of Electric and Magnetic Fields

<table>
<thead>
<tr>
<th>Electric Fields</th>
<th>Magnetic Fields</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Produced by voltage (i.e., lamp plugged in but turned off)</td>
<td>1. Produced by current (i.e., lamp plugged in and turned on)</td>
</tr>
<tr>
<td>2. Measured in volts per metre (V/m) or in kilovolts per metre (kV/m)</td>
<td>2. Measured in gauss (G) or tesla (T)</td>
</tr>
<tr>
<td>3. Easily shielded (weakened) by conducting objects like trees and buildings</td>
<td>3. Not easily shielded (weakened) by most material</td>
</tr>
<tr>
<td>4. Reduced in strength with increasing distance from the source</td>
<td>4. Reduced in strength with increasing distance from the source</td>
</tr>
</tbody>
</table>


EMFs from electrical transmission lines have extremely low frequencies and thus low energy levels. The energy levels are unable to break molecular bonds and thus are considered non-ionising. Higher frequency fields, such as microwaves, have sufficient energy to cause heating in conductive materials but are still non-ionising. The still higher frequencies of x-rays and gamma rays have sufficient energy to cause ionisation (breaking of molecular bonds). High-energy ionising radiation can, therefore, disrupt the molecular structure within cells.

Effects on Human Health

Research on the human health effects of EMF was initiated in the 1960s. Since that time, universities, government agencies, utilities, and other expert bodies at a global level have conducted significant research and review of the potential human health effects of exposure to EMF. Such research has included laboratory studies concerning the effects on cells, tissues and animals, as well as studies on human exposure and epidemiology (Federal-Provincial Working Group, 1998).

In the United States, the National Institute of Environmental Health Sciences (1995) has concluded that:

"Most recent reviews have concluded that the existing evidence, although suggestive, does not show that EMFs cause cancer. These include national reviews by the U.S. Environmental Protection Agency, the Committee on Interagency Radiation Research and Policy Coordination, the Australian Minister of Health, the National Radiological Protection Board of the United

AES Nile Power 227 March, 2001
Kingdom, the Danish Ministry of Health, the French National Institute of Health and Medical Research, and reviews sponsored by the states of California, Texas, Connecticut, Illinois, Maryland, and Colorado.”

Available laboratory or human data have not demonstrated what, if any, magnitudes of power-line electric and magnetic fields cause human health effects (National Research Council, 1997).

Despite the lack of a demonstrated “cause and effect” relationship between exposure to EMF and human health effects, a precautionary approach has been embraced by several governments and organizations through the adoption of guideline limits. This approach provides guidance for the establishment of EMF exposure limits, as discussed below.

Applicable Regulatory Guidance on EMF Health Effects

In Uganda there are no promulgated EMF health and/or safety standards and, consequently, there are no particular levels of EMF that trigger “regulatory action.” Regulatory agencies have been unable to identify an adverse health effect against which it is possible to specifically define “safe” magnetic field levels. As discussed below, some non-regulatory guidance has been offered, based on limiting electric currents induced in body tissues to below one-tenth of typical naturally occurring electric currents in the body, even though such induced currents have not been associated with deleterious effects on health.

In the United States, some States have adopted guidelines based on maintaining the status quo for EMF exposure. Several States have adopted as guidelines the electric and magnetic field levels that have historically been present at ground level in transmission line corridors. However, none of these guidelines have been based on the conclusion that particular levels of EMF pose a risk to human health, and none have been developed using careful scientific methodologies.

The International Commission on Non-Ionising Radiation Protection (ICNIRP, 1990; 1998) has published interim guidelines on limits of exposure to 50/60 Hz electric and magnetic fields. The guidelines are based on analyses of the most recent scientific literature and on earlier review articles published by the World Health Organization (WHO, 1993). The WHO concluded that no biological effects could be expected for magnetic fields smaller than 50,000 mG. The ICNIRP (1998) guidelines state that occupational exposure continuing throughout the working day should be limited to below 4,167 mG for magnetic fields and below 8.33 kV/m for electric...
fields. The guidelines also state that exposure for members of the general public should be limited to 833 mG for magnetic fields and 4.16 kV/m for electric fields. In addition, general public magnetic field exposure between 1,000 and 10,000 mG should be limited to a few hours per day.

Electric and Magnetic Fields for Bujagali Transmission System

Prior to final design, the BEC Contractor will calculate the EMF levels generated by the various components of the transmission system. Design changes will be made to ensure levels for the proposed transmission system will be well below the range suggested by guidelines and also well within the range of EMF generated by other common sources.

No adverse effects on human health and welfare can be expected from operation of the proposed facilities, either on the basis of EMF guidelines, or on the basis of conclusions reached by scientific review groups that have examined EMF studies reported in the scientific literature.

Mitigation and Monitoring Activities

The electrical transmission line will be designed and constructed to ensure that EMF levels are well below accepted guidelines for occupational and human health exposure limits. No additional mitigative measures are required. EMF levels will be measured at representative cross-sections of the various transmission lines that are part of the system during initial full load operation. EMF levels are not expected to change with time so further monitoring is not planned.

7.2.4.3 Ebola Outbreak

Contact has been made with the Jinja District Health office on measures to be put in place should an outbreak of Ebola fever occur within the project area. Any suspected cases of Ebola will be immediately isolated and treated within the same locality that the person acquired the disease, i.e., if a worker is suspected of being infected, his/her entire family will be quarantined, with movement into and out of the family restricted until adequate measures have been taken and the person is proven to be free of the virus. All emergency measures will be coordinated by the Ministry of Health. Training on detection and protective measures to be taken in the event of an Ebola outbreak will be given to all staff and workers as part of their orientation training.
7.2.5 Impacts on Aesthetics

The following mitigative measures and design elements will be used to minimize the aesthetics effects of the transmission system:

- Where possible, straight line runs are maximised so that the need for angle towers, which have a more negative visual impact due to their heavier construction, is minimized. However, on the section from Mutundwe substation to the crossing of Hoima Road, a large number of angle towers are required in order to avoid the large number of routing constraints in the area;

- Where possible, including the portion of the 220 kV line within the Mabira Forest Reserve, the transmission route is located immediately adjacent to, and parallel to, an existing 132 kV line. This limits effects to an already disturbed area, rather than creating a new, discrete second corridor and impact zone;

- Where two lines are parallel, new towers will be constructed adjacent to existing towers, when possible, to minimize visual "clutter". The spans on the 220 kV may differ from the spans of the existing 132 kV line and thus limit opportunity for adjacent tower siting. The towers for the two lines between Bujagali and the Tororo/Owen Falls line allow for adjacent tower construction since both lines are of the same voltage;

- Existing tracks will be used for construction and maintenance operations as much as possible;

- Where a transmission line runs across ridges, the access track will run off or across the line as it climbs the slopes in order to avoid accentuating the route of the transmission line, especially where lines are parallel;

- New sub-stations will be designed to limit the amount of major earthworks required, and to ensure enough space is left to create a vegetative buffer around the main built elements;

- Lighting schemes for the sub-stations will be designed so that they do not create intrusive glare when seen from outside; and,

- All temporary construction works, such as borrow pits and contractor’s yards, will be restored upon completion.

The net effects of the proposed transmission system have been assessed in accordance with the visual and aesthetic quality checklist included in NEMA’s Guidelines for EIA in Uganda. Table
7.7 describes the impact on landscape and property for various sections of the transmission system, and rates the visual effects according the categories in NEMA’s checklist.

As indicated in Table 7.7, for the most part aesthetic impacts of the proposed transmission system are considered insignificant (NEMA’s impact rating B). Significant impacts (NEMA’s impact rating A) are expected where the Kawanda to Mutundwe 132 kV line crosses the Lubigi Swamp, and where the 220 kV line runs between Mabira and Namyoya Forest Reserves where steep terrain creates potential for clear views of the towers and cleared wayleave. In these areas, impacts will be minimised to the extent possible using the measures set out above.

<table>
<thead>
<tr>
<th>Section of Transmission Line</th>
<th>Description of Impact on Landscape and Property</th>
<th>NEMA Impact Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bujagali to Tororo and Mabira</td>
<td>The existing transmission lines from the Owen Falls complex along the western bank of the Nile mean the Bujagali Falls-Tororo transmission line will have a minimal impact when viewed from the road. The view from the river is influenced by the steeper nature of the river banks in this section. Around Bujagali Falls, the lines will be visible on the western bank. However, the increasing steepness of the river bank downstream from Bujagali Falls to the hydro dam complex will result in only the tops of the towers being visible from the eastern bank. Dual lines along west side of Nile River will extend the existing effect further to north, but tree cover in area limits the effect. Views from proposed reservoir and eastern river bank will show pairs of towers set against backdrop of trees and rising ground, so will be seen in silhouette only occasionally. Line across estates will be largely contained by the wider landform.</td>
<td>B</td>
</tr>
<tr>
<td>Section of Transmission Line</td>
<td>Description of Impact on Landscape and Property</td>
<td>NEMA Impact Rating</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Mabira Forest Reserve</td>
<td>Existing straight clearing through forest will be widened, but additional clearing will be perceived from a few locations only due to forest cover. Wayleave will be limited to 35 m. Proposed route has been located adjacent to an existing line thereby creating an incremental effect at this location. Intermediate towers will be kept to a minimum.</td>
<td>B</td>
</tr>
<tr>
<td>Mabira Forest Reserve to Namyoya</td>
<td>Dualling of the route will be more apparent across this area of steeper terrain and open estate land.</td>
<td>A on steeper areas, otherwise B</td>
</tr>
<tr>
<td>Namyoya to Kawanda</td>
<td>Route generally follows lower ground so visual influence will be local and limited. West of Namyoya, the route follows the existing line and crosses a series of ridges and valleys. Impact here is intensification of existing influence. Many small groups of rural properties will be crossed. Many of these rural dwellings are often enclosed by crops, so view of line will be hidden during rainy season by crops. A few large houses at Naalya and Lubatu will have their views impacted. 50 properties affected in total, including a school and a church.</td>
<td>B</td>
</tr>
<tr>
<td>Kawanda</td>
<td>Route follows lower ground close to the edges of the valley bottom. Line will not be prominent in landscape except when crossing low hill at Katooke. Substation will be situated on a low-lying round-topped hill and will not be easily visible except from vicinity of the NARO Agricultural Research Institute (1 km to west).</td>
<td>B</td>
</tr>
<tr>
<td>Kawanda to Namungoona</td>
<td>Route between Nansana and Kawanda will affect about 35 properties and part of the Agricultural Station. Substantial length of line will be visible from Wamala’s Tombs (located on hill top near Katooke) until trees recently cut down in field east of Tomb site regenerate.</td>
<td>B</td>
</tr>
<tr>
<td>Namungoona to Mutundwe</td>
<td>Route follows the less settled western side of the swamp. In most places, line will be seen against a backdrop of low hills. The Natate area is already heavily developed (railway, existing transmission lines and sub-station) so new line will not add significant new influence.</td>
<td>B, except where route crosses the swamp by Masaka Rd, then is A</td>
</tr>
</tbody>
</table>
### Table 7.7: Description of Impact on Landscape and Property and Impact Rating.

<table>
<thead>
<tr>
<th>Section of Transmission Line</th>
<th>Description of Impact on Landscape and Property</th>
<th>NEMA Impact Rating 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>About 60 properties, including a school, in vicinity of Lubigi Swamp will be visually impacted, esp. large houses on hillsides overlooking the swamp. Visually impacted properties around the swamp include:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• at Nkokojreru along Old Masaka Rd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• on the island with the foam mattress factory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• at Bulenga along Mityana Rd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• occasional properties along west side of swamp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• south end of Nansana where Hoima Rd. is crossed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• At Mutundwe, local housing west of existing substation will be visually impacted.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Some houses near the rail crossing on Old Masaka Rd will be visually impacted.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dense crops and trees around many of the houses and existing urban development will limit impact.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. NEMA impact categories are: “A” (impacts significant unless mitigation incorporated) and “B” (impacts not significant).

### 7.2.6 General Construction Related Issues

As part of project planning, a number of construction-related issues were identified that should be addressed within the context of this EIS/EIA. These are issues that are common to most large-scale construction projects and for which potential effects are well-known and effective mitigation available.

The issues identified are:

- Public and Worker Health and Safety;
- Traffic Management;
- Management of Hazardous and Contaminating Material;
- Management of Solid Waste;
- Soils and Agriculture;
- Water Quality;
- Air Quality;
• Noise;
• Siting and Design of Laydown and Storage Areas; and,
• Archaeological Sites.

The BEC will be responsible for measures to mitigate and manage the potential effects related to construction activities. Project specific plans and programs to be developed by BEC are more fully described in Chapter 8 of this report. The mitigation, management and monitoring measures for all of the issues identified above are set out in Table 7.8.

7.2.7 Cumulative Effects

Cumulative effects are incremental effects that result from an action when added to other past, present, and reasonably foreseeable future actions (U.S. CEQ, 1997). Cumulative Effects Assessment (CEA) considers the multiple effects that a project may have on the environment, over spatial and temporal boundaries, through the identification of Cumulative Environmental Effects (CEE) (Shoemaker, 1994).

The process of accumulation of CEE through the environment, together with the causes of environmental change, was examined to determine the potential and/or significance of CEE for the proposed transmission system of the Bujagali project.

The spatial boundary used for this CEA corresponds with the study area for the Bujagali project’s transmission system; it lies between Dumbbell Island in the east and Kampala in the west. Temporal boundaries used included the effects of past activities since hydroelectricity was introduced into the country in the 1950s, through to foreseeable future projects within a 20-year planning horizon.

Figure 7.2 provides a schematic of the existing and proposed transmission lines within the study area over the past fifty years.

Cumulative effects resulting from the proposed transmission system include the following:

Ecological Features

• Wayleave width through Mabira and Kifu Forest Reserves will increase from current 30 m to 65 m, but future potential incremental increase to 90 m (3-132 kV x 30 m) wayleave is avoided (see Figure 7.3);
• Access to, and within, Mabira Forest Reserve may be improved and control measures implemented in collaboration with the Forest Department and UEB, facilitating improved management of the forest;

• Recreational facilities within Mabira FR will be relocated within the reserve and improved, resulting in a net positive benefit to the reserve and its users; and,

• A private forest enclave will be purchased and gazetted to offset residual effects in Mabira Forest Reserve, and approximately 697 ha of currently degraded forest will be enrichment-planted, resulting in a net positive increase of 638 ha in forest acreage and forest quality.

**Social Features and Conditions**

• By locating the transmission line between Bujagali and Kawanda substation parallel to the “northern route” versus the DANIDA or 66 kV transmission corridor to the south, involuntary resettlement is minimised and sensitive compensation issues are not aggravated further. (Siting a new line adjacent to the DANIDA line could potentially displace some families for a second time as a result of transmission line construction.);

• Landowners will receive compensation to meet World Bank/IFC requirements including, in certain cases, a “top-up” over Government of Uganda requirements. In general, landowners may receive a small net positive benefit due to the project; and,

• Community development in the Bujagali area will be enhanced with the development of a market and establishment of a business centre where local residents will receive training and guidance in operating small businesses.

**Aesthetics**

• Visual impact of the transmission system will be greatest in the vicinity of Lubigi Swamp where no major transmission infrastructure presently exists and along the Bujagali substation to the Tororo line connection (as seen from the eastern bank of the Nile River). Here, several transmission lines already come in/out of the Owen Falls Generating Station switchyard.

**Land Development Patterns**

• A new substation is required at Kawanda since the 3 existing substations in Kampala (Kampala North, Mutundwe and Lugogo) are saturated;
• Locating a substation north of Kampala (i.e., at Kawanda) facilitates future expansion of the transmission grid within Uganda and potentially to export markets in Tanzania and Rwanda;

• By building the transmission line between Kawanda and Bujagali at 220 kV, the necessity of constructing a third 132 kV line in the future, possible running parallel to 2x132 kV lines through Mabira FR is avoided (see Section 7.2.2.1 and Figure 7.3);

• Constructing the line to 220 kV will result in a somewhat larger footprint for Kawanda substation, i.e., 4.7 ha, versus if the line was built to 132 kV, i.e., 3.5 ha; and,

• The establishment of a second transmission line along the "northern" route may reinforce the validity of this route as a corridor, possibly resulting in future linear projects seeking to utilise this corridor, as well.

7.2.7.1 Mitigation and Monitoring Measures

The complex ecological, social and developmental issues encountered during the development of this project highlight the need for coordinated land use planning in Uganda. For this reason, it is recommended that international financing institutions provide assistance to Uganda for establishment of a framework for siting future linear facilities. A land use planning model that has proven to be very effective in Canada, and which may be adaptable to Uganda, is The Parkway Belt West Plan (Government of Ontario, 1978). The goals of the Parkway Belt West Plan include:

• to provide a land reserve for future linear facilities and for unanticipated activities requiring sites of high accessibility and substantial land use; and,

• to link urban areas with each other and with areas outside the region by providing space for the movement of people, goods, energy, and information, without disrupting community integrity and function.

The Parkway Belt West Plan acknowledges the need for major utility and transportation corridors, and attempts to minimize their individual effects by locating them all in one corridor.
7.2.8 Developmental & Community Benefits

The project will result in several developmental and community benefits at the national, regional and community levels. These benefits include:

1. The infrastructure being provided at a cost to the project (namely, a 220 kV double circuit line) is beyond the needs of this single project (single circuit 132 kV Line). Ugandans will benefit through improved transmission system redundancy and potential capacity for future expansion.

2. Upon completion of construction, the ownership of the project will be transferred to UEB and become an asset of Ugandans.

3. Improvements to roads and bridges required for construction could provide lasting improved access for communities along those roads. UEB and the Forest Department will advise AESNP and BEC whether they want the bridge improvements within Mabira Forest Reserve needed for project construction to be maintained.

4. The regional and local economies will benefit from opportunities for employment and by opportunities to provide goods and services required during construction.

7.3 Summary of Impact Management, Net Effects and Monitoring Measures

Table 7.8 sets out the potential impacts associated with construction of the transmission system, along with the key impact management measures and effects monitoring measures to be implemented, and the expected net effects. The assessment of construction-related effects assumes full implementation of the procedures and management measures specified in the Project Plan that has been prepared (in draft form) by BEC. The draft plan is provided as Appendix 1.3. Additional implementation details are specified in Chapter 8.

Mitigative measures associated with potential effects during operations are not included in Table 7.8. At completion of construction, ownership of the Transmission System will be transferred to UEB. UEB will be responsible to implement environmental management measures associated with operation of the transmission system. If necessary, AESNP will offer technical assistance and training in environmental management practices for operation of transmission systems to strengthen UEB's capabilities in this area.
This page is intentionally blank.
- Main road constructed between Kampala and Jinja
- Rural settlements scattered throughout area
- Mabira, Kifu & Namyoya Forest Reserves gazetted
- Railway built between Kampala and Jinja

- Owen Falls Hydropower station constructed
- 132 kV transmission line constructed from Owen Falls dam to Kampala North substation, known as "northern line". Line goes through Mabira, Kifu and Namyoya Forest Reserves.
- 66 kV line built from Owen Falls to Lugogo. Line crosses the main Kampala-Jinja Highway 5 times
- Land use intensifies as population increases.

- 66 kV line is downgraded to 33 kV between Mukono and Lugogo substation, and is decommissioned entirely between Mukono and Lugazi.
- 132 kV "DANIDA" line completed, running north of 66 kV line, from Owen Falls substation to Kampala North substation. DANIDA line varies from 50 m to several km from the existing 66 kV line. No public consultation known to have been carried out prior to line being constructed. Ongoing issues associated with compensation.
- 3 transmission substations (Kampala North, Mutundwe and Lugogo) are saturated and cannot receive additional power or lines.
- Permanent buildings are sited within wayleave of DANIDA and 66/33 kV lines.
- Segments of "northern line" wayleave through Mabira Forest Reserve have regenerated and are inaccessible by vehicle.
- Land use intensified, with much of the region under small-scale farms or large farm estates.

- New substations to be built at Bujagali and Kawanda
- 220 kV line to be built between Bujagali and Kawanda substation, for total distance of 70.4 km. 39.6 km will run parallel to, and immediately north of, the existing 132 kV "northern" line, including 18.0 km that will go through Mabira Forest Reserve. Wayleave will be expanded from current 30 m to 70 m (66 m in forest reserves.) Wayleave assumed to be maintained by UEB. Extensive portions of wayleave routinely become inaccessible due to fast-growing vegetation.
- 132 kV line to be built between Mutundwe and Kawanda substations for 17.4 km. Entire section will be through greenfield. Transmission line to run along western and southern edges of Lubigi Swamp.
- Transmission line to run parallel to railway for 4.9 km.
- 2x132 kV lines to run parallel to each other from Bujagali substation to Tororo line interface, for 4.9 km.
By building the proposed transmission line (220kV rather than 132kV), the need to build a third 132kV line (with resultant wayleave of 90m) in the future is avoided.
### Table 7.8: Impact Mitigation, Net Effects Analysis, and Effects Monitoring Activities

<table>
<thead>
<tr>
<th>Issue</th>
<th>Location</th>
<th>Mitigation Measures</th>
<th>Net Effects</th>
<th>Monitoring/ Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resettlement and Land Compensation</td>
<td>Wayleaves, Rights of way and Kawanda Transformer Station</td>
<td>AESNP has identified all project affected persons and developed a Resettlement Action Plan (RAP) to address economic losses, physical resettlement and loss of land or land rights. The RAP overall allows for land for land compensation, or cash, depending on the individual situation and preference of the project affected persons. The RAP provides for additional assistance to vulnerable persons.</td>
<td>The compensation and resettlement measures to be provided are designed to ensure that project affected persons are better off or at least no worse off as a result of the project.</td>
<td>AESNP to implement grievance, monitoring and evaluation procedures as prescribed in the RAP.</td>
</tr>
<tr>
<td>Impacts on Forest Reserve Lands</td>
<td>Mabira, Namyoya and Kifu Forest Reserves</td>
<td>AESNP to purchase and gazette a private forest enclave situated within Mabira Forest Reserve as an offset measure. The transmission system routing avoided the area identified as “Strict Nature Reserve” within Mabira FR. To reduce effects of the wayleave within Forest Reserves by limiting wayleave to 35 m, versus 40 m in non forest reserve areas.</td>
<td>Net gain of Gazetted Forest Reserve Land</td>
<td>BEC to inspect clearing in forest reserve areas to confirm work confined to 35 m wayleave. AESNP to update status of land purchase and gazetting in regular compliance reporting.</td>
</tr>
<tr>
<td>Issue</td>
<td>Location</td>
<td>Mitigation Measures</td>
<td>Net Effects</td>
<td>Monitoring/ Follow-Up</td>
</tr>
<tr>
<td>-------</td>
<td>----------</td>
<td>---------------------</td>
<td>-------------</td>
<td>-----------------------</td>
</tr>
</tbody>
</table>
| The permanent loss of 59 ha of forest land will reduce the available habitat for vegetation and wildlife and reduce the forest’s function as a carbon sink | Mabira Forest Reserve | To offset loss of forested land AESNP will:  
- Purchase a private forest enclave located adjacent to Mabira Forest Reserve and gift the land to the Government of Uganda. Gazettement of the private forest will be undertaken in accordance with Schedule 3 of National Environmental Statute No. 4/1995; and,  
- Undertake regeneration/enrichment planting and tending of approximately 899 ha of existing degraded areas within Mabira Forest Reserve and the purchased forest enclave.  
Amphibian and reptile surveys will be undertaken by AESNP after submission of the EIA and prior to construction of the transmission system. Surveys will be conducted utilising the same experts as were involved in the previous biological surveys. | This regeneration will, in the long run, result in an overall net gain of approximately 840 ha of high quality forested land within the Forest Reserve that will provide habitat utilised by forest dwelling animals and increase the forest’s capacity to sequester carbon. | AESNP to update status of regeneration plan in regular compliance reporting. |
### Table 7.8: Impact Mitigation, Net Effects Analysis, and Effects Monitoring Activities

<table>
<thead>
<tr>
<th>Issue</th>
<th>Location</th>
<th>Mitigation Measures</th>
<th>Net Effects</th>
<th>Monitoring/ Follow-Up</th>
</tr>
</thead>
</table>
| The resulting cleared corridor may pose a barrier to movement of “forest interior” wildlife species between the forested areas north and south of the route | Mabira Forest Reserve | The route for the 220 kV line through the Mabira Forest Reserve has been routed immediately adjacent to the existing 132 kV line to minimise fragmentation effects. Cross line corridors between the north and south forested areas will be established by minimizing clearing and selective planting of suitable vegetation at the following locations:  
- The Valley of the River Waliga between towers 169 and 168 of the existing line;  
- The valley between towers 147 and 146 of the existing line;  
- The valley stream about 50 m east of tower 152 of the existing line;  
- The valley between towers 153 and 154 of the existing line;  
- The valley at tower 142 of the existing line. | Incremental clearing of the wayleave is not expected to significantly change movements of wildlife species | Current status of “cross line corridors” to be determined by BEC and Forest Department. Status of corridors discussed in post-construction line inspection report. |
| Improvements to access required for construction may increase grazing and illegal felling of timber | Mabira Forest Reserve | BEC and AESNP will, with agreement of the Forest Department and UEB, and as appropriate on a site-specific basis:  
- Restore natural obstructions to access following construction;  
- Install locked gates at watercourse crossings where the natural obstruction of the watercourse precludes skirting of the gate;  
- As part of public consultation activities, provide education and monitoring programs for workers and residents in area settlements. | No significant change in existing accessibility of the Mabira Forest Reserve is expected. In some cases, accessibility may be reduced over current situation | BEC, in collaboration with FD, to report on status of access and access controls, in regular compliance reporting |
### Table 7.8: Impact Mitigation, Net Effects Analysis, and Effects Monitoring Activities

<table>
<thead>
<tr>
<th>Issue</th>
<th>Location</th>
<th>Mitigation Measures</th>
<th>Net Effects</th>
<th>Monitoring/ Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>The power lines introduce a physical hazard to birds and climbing animals</td>
<td>Entire length of lines</td>
<td>Locate the line to avoid significant bird breeding or staging areas&lt;br&gt;Design line to exceed reach of common climbing animals&lt;br&gt;Reflectors to be placed at intervals along conductors crossing swamps where bird strikes may be more common</td>
<td>The proposed line is not located near any significant breeding or staging areas, and therefore bird strikes are not expected to have any significant effects on bird populations in Uganda&lt;br&gt;Risk of electrocution by large climbing animals is not expected</td>
<td>BEC, in collaboration with UWS, to report on unusual bird strikes and/or animal electrocutions, in regular compliance reporting</td>
</tr>
<tr>
<td>Presence of the line reduces aesthetic values for ecotourism and recreation</td>
<td>Section of 220 kV line in Mabira Forest Reserve utilised for ecotourism</td>
<td>AESNP will provide money and expertise to the Forest Department to assist with relocation and improvements to existing tourist facilities, including cycling tracks and foot trails, away from the transmission line in order to minimise the visual impact of the wayleave</td>
<td>In the long run, the improvements to the tourism facilities and the regeneration/enrichment planting measures will provide increased opportunities for ecotourism.</td>
<td>During construction AESNP to report on status of tourist facilities in regular compliance reporting&lt;br&gt;After construction, AESNP to report on status of relocation of tourist facilities in annual report</td>
</tr>
<tr>
<td>Illegal hunting of bushmeat by workers during construction</td>
<td>Primarily Mabira Forest Reserve</td>
<td>BEC will:&lt;br&gt;- Prohibit project workers from hunting bushmeat during working hours or on project work sites.&lt;br&gt;- Prohibit project workers from possessing firearms, snares and other hunting equipment when on project work sites.&lt;br&gt;- Prohibit transport of bushmeat on project vehicles.&lt;br&gt;- Pay their workers an adequate wage so that they can buy their food without augmenting it with illegally obtained bushmeat</td>
<td>No significant illegal hunting expected</td>
<td>BEC to randomly inspect vehicles at ingress and egress points of construction areas in the vicinity of Mabira FR</td>
</tr>
<tr>
<td>Issue</td>
<td>Location</td>
<td>Mitigation Measures</td>
<td>Net Effects</td>
<td>Monitoring/ Follow-Up</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>---------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Impacts on Wetlands</td>
<td></td>
<td></td>
<td>No significant changes to hydrogeological function are expected</td>
<td>BEC to inspect construction activities in Lubigi Swamp daily</td>
</tr>
<tr>
<td>Effects on the hydrological functions on Lubigi Swamp due to installation of concrete tower pads.</td>
<td>Lubigi Swamp</td>
<td>The transmission line will be located on the west side of the swamp avoiding permanently wet areas. No towers will be sited in permanently wet locations. Tower AP 6 will be sited on an island with a small factory on it, rather than in a permanently wet area. Footings of towers will be built to address wet season conditions. Construction will occur during the dry season to minimise dewatering of foundation excavations. Towers AP5, AP6, AP7, AP9 and AP10 will be constructed to a standard that they can support longer than normal spans (500 m span versus normal span of 330-350 m) to eliminate the need to locate towers within the swamp.</td>
<td>No significant change in vegetation or water levels are expected</td>
<td></td>
</tr>
<tr>
<td>Effects on breeding grounds for crested crane</td>
<td>Seasonal swamps, Lubigi Swamp</td>
<td>In areas that are potentially important as bird flight paths, in particular large wetland bird species, BEC shall take reasonable measures to make the conductor more conspicuous, e.g. reflectors placed at intervals.</td>
<td>No significant impact on bird population</td>
<td>BEC to maintain records of abnormal bird strikes and corrective actions taken</td>
</tr>
</tbody>
</table>
### Table 7.8: Impact Mitigation, Net Effects Analysis, and Effects Monitoring Activities

<table>
<thead>
<tr>
<th>Issue</th>
<th>Location</th>
<th>Mitigation Measures</th>
<th>Net Effects</th>
<th>Monitoring/ Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Impacts on Public Health</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spread of HIV/AIDS and other communicable and sexually transmitted diseases (STDs)</td>
<td>Areas of concentrated workers</td>
<td>BEC will bus workers to active construction sites each day from Jinja or Kampala. No worker camps will be used that might attract a concentration of prostitutes. BEC will undertake an awareness programme for communicable diseases for workers and the public. BEC to distribute condoms to project workers at no cost BEC to make malaria prophylactics available to expatriate work force at no cost</td>
<td>The project is not expected to have a significant effect on prevalence or transmission of HIV/AIDS and other communicable diseases</td>
<td>BEC and AESNP to maintain a record of each worker’s orientation and ongoing education Maintain records of condom distribution programme.</td>
</tr>
<tr>
<td>Effects on EMF levels generated by the transmission system on public health</td>
<td>Extent of Transmission system</td>
<td>The electrical transmission line will be designed and constructed to ensure that EMF levels are well below accepted guidelines for occupational and human health exposure limits. Habitations and other permanent structures such as schools, shops or offices will be prohibited within the wayleaves.</td>
<td>No adverse effects on human health and welfare can be expected from operation of the proposed facilities, either on the basis of EMF guidelines, or on the basis of conclusions reached by scientific review groups that have examined EMF studies reported in the scientific literature</td>
<td>BEC to measure EMFs at representative cross-sections of the various transmission lines during initial full load operation of the system.</td>
</tr>
</tbody>
</table>
Table 7.8: Impact Mitigation, Net Effects Analysis, and Effects Monitoring Activities

<table>
<thead>
<tr>
<th>Issue</th>
<th>Location</th>
<th>Mitigation Measures</th>
<th>Net Effects</th>
<th>Monitoring/ Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aesthetics</td>
<td>Entire transmission system</td>
<td>• Straight-line runs are maximized to minimize need for angle towers;</td>
<td>For the most part, aesthetic impacts of the proposed transmission system are considered to be insignificant</td>
<td>No monitoring recommended</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Where possible, locate the new line adjacent to existing power lines. Locate new towers adjacent to existing towers to minimize visual “clutter”;</td>
<td>Significant impacts are expected where the Kawanda to Mutundwe 132 kV line crosses the Lubigi Swamp, and where the 220 kV line runs between Mabira Forest Reserve and Namyoya where steep terrain creates potential for clear views.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Existing tracks will be used for construction and maintenance operations as much as possible;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Where a transmission line runs across a ridge, locate the access track off or across the line to avoid accentuating the route;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• New sub-stations will be designed to limit the amount of major earthworks required, and to ensure enough space is left to create a vegetative buffer around the main built elements;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Lighting schemes for the sub-stations will be designed so that they do not create intrusive glare when seen from outside; and,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• All temporary construction works, such as borrow pits and contractor’s yards, will be restored upon completion.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

General Construction Related Issues: Public and Worker Health and Safety

<table>
<thead>
<tr>
<th>Public safety issues regarding: accidental contact with lines, collision with construction equipment, excavations on ROW, material storage, tower construction</th>
<th>Active Construction Areas</th>
<th>Secure equipment and demarcate any excavations in such a way as to prevent accidents when construction not in progress;</th>
<th>Communities are used to the presence of major construction projects in the area; Risk of serious injury or health effects managed to internationally acceptable levels.</th>
<th>BEC to maintain records of any incidents, investigations and corrective actions.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Keep non-authorised persons away from any construction activities/sites/yards/equipment;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post warning signs with appropriate text and graphics;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Begin educational programs in schools and communities to educate people of hazards and safe practices when playing and working near high voltage power lines.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 7.8: Impact Mitigation, Net Effects Analysis, and Effects Monitoring Activities

<table>
<thead>
<tr>
<th>Issue</th>
<th>Location</th>
<th>Mitigation Measures</th>
<th>Net Effects</th>
<th>Monitoring/ Follow-Up</th>
</tr>
</thead>
</table>
| Risk of accidents due to project related traffic | Transportation routes and access roads | BEC will prepare and implement a Traffic Management Plan (TMP) that contains appropriate strategies for: moving materials, equipment and workers to and from the site, including abnormal loads; and, management of connection points between access roads and main public highways. The TMP will include procedures for:  
  - parking and on-site traffic movement;  
  - training and testing of heavy equipment operators and drivers, including vision tests, with records kept of all training;  
  - use of project buses to transport workers to reduce pressure on existing public transport;  
  - all vehicles to be lit front and back and to be properly maintained;  
  - enforcement of maximum load restrictions;  
  - posting and enforcement of speed limits;  
  - compliance with all relevant Applicable Laws. | Risk of serious traffic accidents minimised | BEC to maintain records of all accidents involving project vehicles. AESNP and BEC to implement a traffic complaints and corrective action procedure. |
| Risk to students and staff of Kawanda Secondary School | 300 m Access road to Kawanda Station | As part of upgrading the access road, BEC will erect a barrier to separate vehicles and pedestrian traffic. BEC to post and abide by speed limits on this access road. BEC will provide a manned crossing at the beginning and end of the school day, if required. AESNP will make a presentation to school staff and students about traffic safety and project scheduling. | Risk of accident minimised | BEC to maintain records of any traffic related incidents, investigations and corrective actions. |
Table 7.8: Impact Mitigation, Net Effects Analysis, and Effects Monitoring Activities

<table>
<thead>
<tr>
<th>Issue</th>
<th>Location</th>
<th>Mitigation Measures</th>
<th>Net Effects</th>
<th>Monitoring/ Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work related injury or health effects</td>
<td>All project areas</td>
<td>BEC will comply with relevant WB/IFC health and safety requirements, including specific provisions for: • Introduction, and use of, poisonous or other chemicals injurious to health; • Handling dangerous goods and specialized waste; • Training; • Working environment committee; • Use of helmets; • Personal injuries and accidents; • Damage to material, equipment and buildings; • Poison treatment, chemical and fire injuries; • Safety audit; • Work done by hired personnel or firms; • Operating cranes; • Working with heat in confined places; • Corrective action; and • Protective action.</td>
<td>Risk of serious injury or health effects managed to internationally acceptable levels, and to meet all Ugandan standards and WB/IFC guidelines</td>
<td>BEC to complete Monthly Environmental Inspection report. BEC to maintain records of inspections, incidents, investigations and corrective actions</td>
</tr>
</tbody>
</table>

General Construction Related Issues: Traffic Management

| Structural Integrity of Roads | Transportation routes and access roads | Regular inspection of access road conditions Traffic-related construction damage to be repaired as soon as practical When abnormal loads (e.g. large transformers and turbines) are to be transported, BEC will, along with the relevant District Engineer or his representative, inspect structures along the roads to be used before and after movement of the load(s). BEC will make good any damage to structures and road surfaces caused by the transporting of these loads. | Risk of serious traffic accidents minimised Long term impacts to road structural integrity minimised | BEC to inspect road conditions weekly |
## Table 7.8: Impact Mitigation, Net Effects Analysis, and Effects Monitoring Activities

<table>
<thead>
<tr>
<th>Issue</th>
<th>Location</th>
<th>Mitigation Measures</th>
<th>Net Effects</th>
<th>Monitoring/ Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disruption of traffic at access points to access roads</td>
<td>Transportation routes and access roads</td>
<td>No new access roads will be constructed apart from a 100 m extension to the existing access road at Kawanda Substation. Plans for connection of any upgraded access roads to the public highway network will be submitted for approval by the District Engineer or other appropriate Relevant Authority before construction commences. Any proposals for management of highway traffic (such as speed humps or tidal flow) will be submitted for approval to the Ministry of Works, Housing and Communications at the District Engineer level in accordance with the UEB Transmission System Environmental Mitigation Plan, a component of the Project Plan. It will be demonstrated that any new junction will not be a safety hazard, and that adequate signage, warnings and speed controls will be in place.</td>
<td>Net improvement in road infrastructure and safety due to project upgrades</td>
<td>BEC to implement a traffic complaints and corrective action procedure</td>
</tr>
<tr>
<td>Issue</td>
<td>Location</td>
<td>Mitigation Measures</td>
<td>Net Effects</td>
<td>Monitoring/ Follow-Up</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Traffic congestion as a result of incremental traffic associated with the project</td>
<td>Main transportation routes</td>
<td>The Kampala to Jinja highway has a high capacity factor. The estimated day-to-day vehicle requirements will not result in significant change in traffic flows or volume on this road. The occasional movement of abnormal loads to the wayleave, substation sites or storage areas may impede traffic flow. Procedures will be included in the Traffic Management Plan to ensure transport of abnormal loads is timed and executed to minimise traffic disruption. The Kawanda substation site will be reached via the Kampala-Bombo highway, which is in good condition. Although it is of only single carriageway construction, it is of reasonably high traffic-carrying capacity. The estimate of three vehicles per hour is not considered to represent a change in existing traffic volumes. The selection of local access roads will be made in consultation with local officials to optimise use of roads with adequate capacity. Due to the poor condition of most local access roads, and the low rate of vehicle ownership in villages situated along the transmission system, vehicle movements along most access roads are infrequent and speeds are low. Improvements to the condition of access roads will improve their capacity.</td>
<td>No significant traffic congestion is expected</td>
<td>BEC to implement a traffic complaints and corrective action procedure.</td>
</tr>
</tbody>
</table>
### Table 7.8: Impact Mitigation, Net Effects Analysis, and Effects Monitoring Activities

<table>
<thead>
<tr>
<th>Issue</th>
<th>Location</th>
<th>Mitigation Measures</th>
<th>Net Effects</th>
<th>Monitoring/ Follow-Up</th>
</tr>
</thead>
</table>
| General Construction Related Issues:       | All construction sites | BEC shall dispose of materials defined as hazardous waste (e.g. hydraulic oil) in a responsible way, and where reasonable, shall return such materials to the manufacturer for recycling. The risk of release of contaminating material will be reduced through implementation and enforcement of the Pollutant Spill Contingency Procedures of BEC’s Project Plan, including:  
  - Prohibition of dumping of any contaminating material product into the environment/onto the ground, including waste oils, in accordance with NEMA regulations;  
  - Storage and routine handling of fuels, lubricants, and other potentially contaminating substances in a weather-protected area equipped with a secondary containment system for spills;  
  - Storage areas shall be designed such that they will contain 110% of the largest container/vessel stored in the storage area;  
  - Have available on-site all equipment and materials required to execute a clean-up;  
  - All wastes recovered during cleanup operations to be collected and stored for subsequent disposal;  
  - Supply agreement will include responsibility for supplier to take waste oil;  
  - BEC will verify each supply/disposal subcontractor(s) has adequate arrangements or facilities for proper disposal, treatment or recycling of these wastes;  
  - Personnel will be educated on proper use and disposal of hazardous materials. | Negligible risk of significant contamination | Monthly Environmental Inspection form to be completed. |
### Table 7.8: Impact Mitigation, Net Effects Analysis, and Effects Monitoring Activities

<table>
<thead>
<tr>
<th>Issue</th>
<th>Location</th>
<th>Mitigation Measures</th>
<th>Net Effects</th>
<th>Monitoring/ Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Construction Related Issues: Management of Solid Waste</strong></td>
<td></td>
<td>BEC will manage solid waste according to its Project Plan. In addition, the following management measures may be implemented:</td>
<td>Minor short-term decrease in air quality. Minor incremental impacts on soil, groundwater, and surface water at municipal disposal location due to improper storage</td>
<td>Monthly Environmental Inspection form completed.</td>
</tr>
<tr>
<td>Visual impact and environmental contamination from improper disposal of solid wastes. Air pollution from on-site burning of solid waste.</td>
<td>All construction areas</td>
<td>- Waste management training for all workers;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- BEC shall identify a suitable site for the disposal of solid waste from construction activities in general in agreement with the District Council and shall ensure that such a site is used properly;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Wood etc. e.g., cable reels, may be sold for a nominal fee to local persons;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Burning will be used as a last resort and only when material cannot be disposed of at a licensed disposal location. Burning will not occur within the wayleave, but at the hydropower station under controlled combustion; and</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Only dry, clean-burning material (wood, cardboard, paper, dry vegetal material) will be burned.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>General Construction Related Issues: Soils and Agriculture</strong></td>
<td></td>
<td>Use existing access roads or tracks wherever available;</td>
<td>Short term loss of agricultural productivity of disturbed soils; Compensation adequate to address economic loss to agriculturalists.</td>
<td>Following construction, BEC to check for compaction on cultivated soils outside the ROW and remediate as necessary.</td>
</tr>
<tr>
<td>Topsoil compaction, rutting and mixing from: grading, excavations and transportation of equipment, concrete and steel to tower sites over access roads and ROW</td>
<td>Areas to be cleared or excavated along transmission lines including tower sites and access tracks</td>
<td>- Strip and store topsoil separate from subsoil for major tower site excavations;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- In agricultural areas, movement of heavy equipment will be restricted during wet-soil conditions to prevent subsoil compaction;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Rehabilitation of exposed soils following BEC’s Project Plan.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

AES Nile Power 255 March, 2001
Table 7.8: Impact Mitigation, Net Effects Analysis, and Effects Monitoring Activities

<table>
<thead>
<tr>
<th>Issue</th>
<th>Location</th>
<th>Mitigation Measures</th>
<th>Net Effects</th>
<th>Monitoring/ Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erosion of soils on steep slopes disturbed by excavation for tower footings or clearing for access track</td>
<td>Steep slopes along extent of transmission lines</td>
<td>Steep slopes to be identified on the “Detailed sensitivities mapping” Where practical, steep slopes will be avoided during final tower spotting and access tracks will be routed across rather than vertically on steep slopes; Vegetation clearing will be avoided on steep slopes. All exposed soils on steep slopes will be rehabilitated immediately following construction activities in accordance with BEC’s Project Plan; Areas susceptible to erosion shall be properly sloped and compacted to reduce the effect of runoff and shall be seeded immediately; Use lower impact / tracked vehicles for pulling stringing ropes along ROW.</td>
<td>Minor decrease in slope stability due to initial tower site and access preparation; No long-term net effects within following construction.</td>
<td>Periodic inspection by BEC of steep slopes during construction and rehabilitation measures following construction.</td>
</tr>
</tbody>
</table>

General Construction Related Issues: Water Quality

| Potential for microbial contamination of surface water and soil | Active construction sites, Staging Area | A Waste Management Programme will be developed as part of the Project Plan including: • Provision of an appropriate number of toilets at worksites; • Septic tanks or an alternative sewage system will be designed to accommodate the sewage level at the substation sites; • Provision for on-site treatment of effluent (defined by NEMA as ‘foul water arising from the sanitary system and any process water’) at long-term work sites. Effluent standards being developed by NEMA will be met; and • Training of construction employees on project sanitation practices. | Minimal risk of environmental or human health impacts. GoU and WB/IFC standards for effluent quality will be met; and | Effluent shall be monitored at the discharge point of the Site Effluent treatment works. Monthly Environmental Inspection report completed. |
### Table 7.8: Impact Mitigation, Net Effects Analysis, and Effects Monitoring Activities

<table>
<thead>
<tr>
<th>Issue</th>
<th>Location</th>
<th>Mitigation Measures</th>
<th>Net Effects</th>
<th>Monitoring/ Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deposition of eroded soils into watercourses; Disturbance of flows and habitat from installation of culverts and bridges</td>
<td>Throughout the transmission system</td>
<td>Towers to be located outside the top-of-bank of all watercourses. Setbacks to be identified on the “detailed sensitivities mapping” (Appendix 1.6); Existing bridges to be upgraded, rather than new bridges installed; A vegetated buffer will be maintained along both sides of all watercourse crossings;</td>
<td>Minor, short term effects during construction on water quality and habitat</td>
<td>Periodic inspection of watercourse crossings by SEO</td>
</tr>
<tr>
<td>General Construction Related Issues: Air Quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fugitive dust in the immediate vicinity of construction activities, and along loose surface roadways</td>
<td>Right-of-Way and Access Roads, Kawanda Substation</td>
<td>The following measures may be utilized to control fugitive dust: protect stockpiles of friable material subject to windthrow by wetting, or with a barrier, vegetation, or windscreen; water stockpiles; cover loads of friable material during transportation; watering of roadways to reduce dust when necessary, or use biodegradable (e.g. lignin-based) road sealing compounds; restrict speed on loose surface roads to 25 km/h during dry or dusty conditions; in sensitive areas, including the substations, suppress dust during dry periods by use of water sprays.</td>
<td>Short-term, localized effects on air quality, primarily in relation to fugitive dust.</td>
<td>Daily inspection by BEC of construction areas for excessive nuisance dust AENSP/BEC to maintain records of complaints on air quality, and follow-up corrective or measures</td>
</tr>
<tr>
<td>Impaired air quality from exhaust of heavy equipment, motor vehicles and other equipment with internal combustion engines</td>
<td>Transportation routes, construction sites</td>
<td>The following measures may be utilized to control exhaust emissions: maintain equipment in good running condition – no vehicles to be used that generate excessive black smoke; enforce vehicle load restrictions to avoid excess emissions from engine overloading; where practical, switch off engines when not in use.</td>
<td>Short-term, localized effects on air quality</td>
<td>BEC to make spot visual inspections of exhaust and vehicle loads and complete Monthly Environmental Inspection report. BEC to maintain records of corrective action taken.</td>
</tr>
</tbody>
</table>
### Table 7.8: Impact Mitigation, Net Effects Analysis, and Effects Monitoring Activities

<table>
<thead>
<tr>
<th>Issue</th>
<th>Location</th>
<th>Mitigation Measures</th>
<th>Net Effects</th>
<th>Monitoring/ Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoke from uncontrolled combustion of cleared vegetation and combustible construction waste</td>
<td>Forested sections of wayleaves, Kawanda Substation</td>
<td>Uncontrolled burning of woody debris and constructing waste to be prohibited within the wayleave&lt;br&gt;Slash from vegetation clearing to be chipped and left as mulch or transported to the Hydroelectric Plant construction site for disposal by controlled combustion&lt;br&gt;Combustible construction waste to be landfilled or transported to the Hydroelectric Plant construction site for disposal by controlled combustion</td>
<td>Local incremental effect on air quality at Hydroelectric Plant Construction Site</td>
<td>Monthly Environmental Inspection report completed.</td>
</tr>
</tbody>
</table>

### General Construction Related Issues: Noise

| Nuisance noise at adjacent sensitive receptors | Schools and residences along the transmission lines<br>Kawanda Secondary School, located to the west of Kawanda Substation, and ten houses located to the north of Kawanda Substation | Baseline noise readings will be taken prior to commencement of construction.<br>Implement noise management measures as specified in BEC's Project Plan. In addition, the following practices may be adhered to:<br>- All internal combustion equipment will have properly functioning silencers or mufflers;<br>- Landowners along the routes to be notified about the construction schedule and activities, including blasting, should it be required;<br>- Noise generating activities that take place near residential or sensitive institutional receptors will be restricted to the period between 0600 and 2200 h, which is defined as 'daytime' in the draft Ugandan noise standards;<br>- At the Kawanda Substation, noisy activities will be scheduled to avoid noise-sensitive periods at the adjacent school;<br>- At Kawanda Substation and storage yard, the BEC will comply with Ugandan national noise standards. These derived standards are 66 dBA eq during daytime, and 57 dBA eq at night, measured at a point 15 m from the site boundary. If necessary, measures to be taken to reduce noise emissions from the site will include | Transitory short-term nuisance noise effects, primarily during daytime.<br>Noise levels will meet WB/IFC Guidelines and Ugandan Standards. | Liaison by BEC with adjacent residents and landowners to identify nuisance noise issues and resolve complaints. |
### Table 7.8: Impact Mitigation, Net Effects Analysis, and Effects Monitoring Activities

<table>
<thead>
<tr>
<th>Issue</th>
<th>Location</th>
<th>Mitigation Measures</th>
<th>Net Effects</th>
<th>Monitoring/ Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Construction Related Issues: Siting and Design of Laydown and Storage Areas</td>
<td>Staging area to be located in Mukono or Lugazi.</td>
<td>provision of screens or bunds to absorb noise and deflect it away from receptors.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General biophysical and socio-economic disturbance</td>
<td>Staging area to be located in Mukono or Lugazi.</td>
<td>BEC shall site and construct any laydown or storage area/s, in agreement with the Environmental Manager, who may consult NEMA if required or other Relevant Authorities for the purpose of agreeing on such a site. Mabira FR will not be used for staging area.</td>
<td>Temporary disruption of area in vicinity of laydown or storage area</td>
<td>Monthly Environmental Inspection report completed.</td>
</tr>
<tr>
<td>General Construction Related Issues: Archaeological Sites</td>
<td>A site(s) may be uncovered anywhere along the transmission system</td>
<td>AESNP will ensure that the transmission system will be walked by an archaeologist upon approval of the EIA and prior to construction. Mitigation measures to be agreed upon by Ministry of Tourism, Wildlife and Antiquities (MTWA) and BEC. Prior to construction, BEC will undertake detailed environmental mapping of the transmission system and identify (in consultation with AESNP and relevant authorities which may include the District Forest Officer or District Environment Officer) sensitive areas to be avoided, trees to be marked for preservation, etc. The unearthing of archaeological remains will be monitored during excavation. BEC will seek the advice of the Department of Antiquities as to the type of relics that might be found in the area, and include a briefing on this issue within the training programme for construction workers. Construction workers will be vigilant to protect such relics during excavation, if encountered. The SEO and Environmental Manager will report any relevant finds to the Department of Antiquities, who will advise on measures to be taken to ensure their preservation.</td>
<td>Any discovered archaeological features will be saved</td>
<td>Workers to receive training on importance of archaeological sites and artefacts and how to identify them.</td>
</tr>
</tbody>
</table>
### Table 7.8: Impact Mitigation, Net Effects Analysis, and Effects Monitoring Activities

<table>
<thead>
<tr>
<th>Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumulative Effects of the project on ecological and social conditions, aesthetics, and land development patterns</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Location</th>
<th>Mitigation Measures</th>
<th>Net Effects</th>
<th>Monitoring/ Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Area</td>
<td>AESNP avoided potentially significant cumulative social effects along the southern “DANIDA” line by routing the 220 kV line through the Mabira Forest Reserve. In Forest Reserve Lands, wayleave width will be restricted to 35 m. Offset effects on ecological functions in Forest Reserves by purchasing and gazetting a private forest enclave and enrichment planting of forest within the reserve. Enhanced capacity of the system by building a 220 kV line now avoids need for construction of additional line as transmission demand grows.</td>
<td>No significant unidentified cumulative effects expected</td>
<td>AESNP report on status of mitigation measures taken for Mabira FR in yearly progress report.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developmental and Community Benefits</td>
</tr>
<tr>
<td>Purchase of local goods and services will boost local economy</td>
</tr>
</tbody>
</table>

| Project region | BEC will investigate Ugandan capacity to supply construction materials, goods and services. Whenever goods or services are available on a competitive basis, the policy will be to purchase locally. | Expanded local economic benefits | AESNP will encourage local business leaders to form a project liaison group to assist AESNP in monitoring local procurement practices |

| Opportunities for employment |
| Extent of facilities |

| BEC will develop and implement a plan to ensure that local residents are given first priority for job opportunities for which they are qualified, before workers from outside the region are hired. Details of specific job opportunities will be released and information provided on application procedures. | Increased local employment benefits. Reduced potential for schemes to defraud job-seekers. | AESNP in monitoring local procurement practices |
8. ENVIRONMENTAL ACTION PLAN

The management and monitoring actions proposed to avoid or minimize impacts during construction and operation of the Bujagali project transmission system were identified and detailed in Chapter 7 of this EIS. This chapter presents the specific plan for implementing the management and monitoring requirements within the framework of an Environmental Action Plan (EAP). The following principles were used to guide the preparation of the EAP:

- focus on occupational health, safety, and environment risk prevention;
- conformance with relevant standards, codes, and practices in the application of safe technologies;
- all activities will be performed in a safe and effective manner and all equipment will be maintained in good operating condition for the protection of the health and safety of all persons and to conserve the environment and property;
- all necessary precautions will be taken to control, remove, or otherwise correct any leaks and/or spills of hazardous materials, or other health and safety hazards; and,
- construction of the transmission system will meet relevant international standards that ensure sufficient technical levels of safety.

At the time this EIS was written, certain detailed planning and design activities were still to be completed. Thus, this section describes the EAP at the level of detail available at the time of writing. When the detailed activities are completed, they will be integrated within the framework of the EAP and an update will be prepared by AESNP. Currently, the EAP addresses the following key components:

- environmental management policies and systems;
- mitigation plans, procedures, and programs;
- monitoring activities;
- implementation schedules and cost estimates; and,
- plans for integrating the EAP within the overall development plan for the project.
8.1 Environmental Management

AESNP is the project sponsor and will have overall responsibility for the design and building of the transmission system. Upon completion of construction, ownership of the assets will be transferred to the Uganda Energy Board (UEB), or its successor organisation. UEB will then be solely responsible for the operation of the system. A joint venture company, known as the Bujagali EPC Consortium (BEC), will construct the transmission system on a turnkey Engineer, Procure and Construct basis.

Based on its previous track record on similar projects and a commitment to environmentally sustainable construction practices, BEC has been selected to construct both the hydropower facility and the transmission system components of the Bujagali project. BEC’s participating companies and their relationships were previously outlined in Chapter 5 of this EIS. BEC will be governed by the environmental policies and procedures of Skanska International Civil Engineering (Skanska), which are the most stringent of any of BEC’s participating companies, and are outlined later in this EAP.

On 17 November 2000, AESNP and BEC signed an EPC contract for the construction of the Bujagali Hydropower Project and Transmission System. In general terms, under this contract, BEC is responsible for implementing the majority of the day-to-day, construction-related environmental mitigation and monitoring measures specified in Chapter 7 of this report, and the measures stipulated in the contract ensuring full compliance with ISO 14001 standards (see Figure 8.1).

AESNP will be responsible for implementing the higher-level, project-related mitigation measures such as implementation of the resettlement action plan.

Upon completion of construction, ownership of the Transmission System will be transferred to UEB. UEB will be responsible for implementing environmental management measures associated with operation of the transmission system. AESNP will offer technical assistance and training in environmental management practices for operation of transmission systems to strengthen UEB’s capabilities in this area.

As a result of the legal arrangements set out above, this EAP addresses the construction phase only. However, the EAP does include provisions for environmental management following
handover of the transmission system to UEB, such as strengthening the environmental management capabilities of UEB.

Both AESNP and BEC are committed to executing their respective responsibilities in an environmentally responsible manner and in compliance with all applicable environmental laws, regulations, and guidelines.

In adopting its environmental policy, BEC will communicate its principles and intentions to each employee, as well as the nature of their individual environmental responsibilities. Where appropriate, staff training will be undertaken to ensure employees' continued environmental performance. Skanska's Environmental Policy is set out in Appendix I.1.

AESNP and BEC are committed to the creation and implementation of programs to reduce the probability of occurrence of deleterious environmental incidents. Contingency plans will be developed for dealing with such adverse incidents, if they occur.

AESNP and BEC expect the same level of environmental performance from their agents, suppliers, and sub-contractors and will stipulate this in any legally binding agreements it enters with these parties. These measures include those specified in the EPC Contract which BEC and AESNP signed in November 2000. BEC will be under contractual obligation to AESNP to implement the aspects of the EAP that apply to it, and to ensure compliance by its own subcontractors. AESNP and BEC will ensure that appropriate corporate resources, personnel and reporting and accountability systems, are in place for the successful implementation of the EAP. AESNP and BEC will, on a continuing basis, review the objectives of the EAP as well as the company's success in achieving them. Where objectives are not being achieved, corrective action will be taken. The EAP objectives will also be modified over the life of the project, as appropriate, to reflect changing environmental laws, regulations, standards, and technologies.

8.2 Relationship of the EAP to other Project Plans

The EAP is an umbrella plan that is comprised of several components that are to be integrated and implemented by AESNP and BEC with regard to the Bujagali transmission system. BEC's Project Plan integrates all of the environmental mitigation and monitoring procedures into one overriding plan. For the purposes of this EIS, the components of the Project Plan are
referred to as separate sub-plans (Figure 8.2). These sub-plans will be fully integrated by BEC into the Project Plan.

Figure 8.1: Relationship of Bujagali Project Plan with ISO Standards and Skanska Policies

8.3 EAP Component Plans

This section outlines the components that have been, or will be, generated in order to execute the EAP. The components that are the responsibility of AESNP to generate and execute are outlined first, followed by those that are the responsibility of BEC.

8.3.1 AESNP Environmental Manual

AESNP will compile a project specific Environmental Manual, which will be made available to all project staff. This manual will be completed before mobilization of the EPC Contractor. The Environmental Manual will be a stand alone, working copy of this Environmental Action Plan, and will include all cross-referenced procedures and detailed mitigation and monitoring specifications such as those in Chapter 7, and the project plan of BEC. Thus, it will contain all of the relevant policies and guidelines, mitigation measures to be implemented to reduce environmental (including social and economic) impacts of the
project, and monitoring activities by which the effectiveness of mitigation will be assessed. The manual will serve as a guideline to AESNP and its agents and contractors.

Figure 8.2: Component Plans of the Environmental Action Plan

AESNP also recognises that environmental and social issues covered by the Environmental Manual will change as the project proceeds. AESNP accepts the responsibility of managing these changes in a pro-active manner on an ongoing basis. To facilitate this management responsibility, AESNP proposes to appoint an Environmental Review Panel (ERP) with whom they can consult. The ERP will meet regularly to:

- review internal environmental reports;
• discuss significant issues as they arise;

• make decisions about modifications to mitigation and monitoring needs and requirements; and,

• advise on external reporting of ERP issues, as required.

Composition of the ERP will include a broad range of stakeholder groups including community members, technical representatives, the witness NGO and BEC representatives.

8.3.2 Public Consultation and Disclosure Plan (PCDP)

A PCDP has been developed in order to bring continuity to the consultation and disclosure process that has been completed to date, as described in Chapter 6 of this report. The PCDP and the results generated by it to date have been used to guide the impact assessment and mitigation measures outlined in Chapter 7.

Specific elements of the PCDP are described in Chapter 6, and will continue to be executed by AESNP, based upon the schedule set out in the PCDP. Where appropriate, the EAP will be updated by AESNP based upon the outcome of future consultation and disclosure activities.

BEC will have a role in the consultation and disclosure process during construction, particularly with regard to disclosure of information in relation to construction scheduling, traffic management, public health and safety, and the results of environmental monitoring. This will be included in BEC’s Training Programme (see below), and therefore there will be cross-references between this programme and the PCDP.

8.3.3 Resettlement Action Plan (RAP)

In order to compensate and mitigate effects on Project-Affected Persons (PAPs), AESNP will implement the Transmission System RAP. For reference, the RAP was finalized following the public consultations that were held to review the Draft EIS, submitted to NEMA in March 1999. Revisions will be incorporated into the RAP, based upon lending agency comments or ongoing consultations, as required.

AES Nile Power 266 March, 2001
8.4 Construction Contractor’s Plans

The existing environmental policies and management systems of Skanska will apply to BEC’s activities on site. Skanska is certified under ISO 14001, and BEC will operate an Environmental Management System that complies with this standard, as per the contract between AESNP and BEC (refer to Figure 8.1).

Skanska’s policies for control of its projects and operations are articulated in the document ‘Our Way of Working’ (see Appendix 1.2). This document provides a synthesis of the requirements arising from ISO 14001, ISO 9001 and the company’s various internal policies regarding the working environment.

The controlling plan for all of BEC’s activities (including environmental responsibilities) will be its Project Plan, which outlines the ‘way of working’ for each specific project. BEC will develop a single, integrated Project Plan for the entire Bujagali project, covering both the Hydropower Component and the Transmission System Component.

The Project Plan will be comprised of a set of method statements covering all aspects of construction and environmental management. A preliminary draft of the Project Plan is provided in Appendix 1.3. The components of the Project Plan will be generated, drawing together the relevant method statements for management of environmental aspects of the construction process. The entire plan and its components are currently under preparation, and will be completed before the commencement of construction.

Details of the aspects covered under ‘Production Phase Preparation’ and ‘Production Phase Control’ are provided in Figures 8.3 and 8.4 respectively.
This page is intentionally blank.
Figure 8.3: Production Phase Preparation (Source: BEC, November 2000)

FLOWCHART FIG. 1

ATTACHMENT TO PROJECT PLAN OVERVIEW

EXTERNAL DOCUMENTS

KDE / Revision 0
Figure 8.4: Production Phase Control (Source: BEC, November 2000)

FLOWCHART FIG. 2

Production Phase Control

- Startup Meetings
  - Planning of works
    - Organization
    - Control Plans
    - QEW
    - Training
  - Control of Subcontractor
  - Skanska

- Control QEW
  - Testing
    - NCR
    - Audits
    - Calibration
    - Environment monitoring
    - Inspection Rounds

- Management meeting
  - Improvement Cycle
    - Locals Residents /Authorities
    - Media
    - Water Quality
    - Noise / Dust
    - Waste disposal
    - Handling of Dangerous Substances

- Communications
  - Skanska Policy
  - Planning & Works Control
    - Project Schedule
    - Cost Control
  - Meetings
    - 3 week Schedule
    - Continuous Monitoring

KDE / Revision O
The key components of the Project Plan are outlined in the following sections.

8.4.1 Hydropower Facility Environmental Mitigation Plan and Environmental Monitoring Plan (EMP and EMoP)

Within these two plans, BEC will outline specific mitigation measures and monitoring procedures to be implemented in relation to the hydropower component of the project at Dumbbell Island. The requirements for these are set out in the environmental assessment documentation for the Hydropower Component of the project. The EMP and EMoP are mentioned here in order to set them in the context of the single combined Project Plan for the Bujagali Project.

8.4.2 UEB Transmission System Environmental Mitigation Plan (UEMP)

BEC's Project Plan for the construction of the UEB Transmission System will incorporate an Environmental Mitigation Plan. The UEMP will specify the measures to be implemented by BEC before, during and after construction of the transmission system, in order to mitigate the potential environmental impacts of the project. The specific measures will include, but not be limited to, those assigned to the Construction Contractor within Chapters 7 and 8 of this EIS.

Elements of the Project Plan's Environmental Mitigation Plan that will address environmental issues are outlined below.

8.4.2.1 Traffic/Access Management Plan (TMP)

Within 30 days of the Project Commencement Date (defined as the date of project approval by lenders), BEC will produce a Traffic Management Plan (TMP) that contains appropriate strategies for moving materials and persons to and from construction areas, including abnormal loads. It will also contain provisions for management of connection points between site access roads, the wayleave and the main public highways, and for any upgrading work to be carried out on the wayleave or access routes to the site. The TMP will incorporate actions specified by AESNP and the Forest Department to address long-term access along the transmission line, such as use of temporary bridges rather than permanent bridges, and security gates and checkpoints.

The TMP will also specify the procedures for monitoring construction-generated traffic movements, and environmental problems arising therefrom.
8.4.2.2 Waste Management Plan (WMP)

Within 30 days of the Project Commencement Date, BEC will produce a Waste Management Plan (WMP), which will be incorporated into the overall Project Plan for dealing with waste generated as a result of construction. The WMP will specify provisions for disposal, re-use or recycling of solid waste, hazardous waste, foul and process water. Specific waste management measures will include, but not be limited to, those provided in Chapter 7.

8.4.2.3 Pollutant Spill Contingency Plan (PSCP)

Within 30 days of the Project Commencement Date, BEC will produce a Pollutant Spill Contingency Plan, which will be incorporated into the overall Project Plan on the proper handling of pollutant spills and the procedures to be taken in the event of a pollutant spill. It will also specify equipment procurement and training of construction personnel. Specific pollution management measures will include, but not be limited to, those provided in Chapter 7.

8.4.3 UEB Transmission System Environmental Monitoring Plan (UEMoP)

Within 30 days of the Project Commencement Date, BEC will prepare the UEMoP. The UEMoP will identify the monitoring objectives and specify the type of monitoring required to achieve the obligations set out in this EIS, as well as the obligations specified in the EPC Contract, and the appropriate locations and equipment to be used. Specifically, the UEMoP will identify:

- environmental issues;
- parameters to be monitored;
- monitoring methodology including locations, equipment, frequency etc;
- threshold limits that trigger corrective action;
- reporting procedures; and,
- responsibility for monitoring (within EPC team).

BEC will monitor the parameters set out in the UEMoP to ensure that the performance of the Works complies with the threshold limits which trigger intervention, including relevant Ugandan standards (e.g. noise limits), performance standards of key lenders and internal...
corporate performance standards. AESNP will undertake a detailed compilation and reconciliation of the various standards, revise the EAP accordingly and re-release the EAP.

8.4.4 Health and Safety Management Procedures

Health and Safety Management procedures will be prepared that address all Ugandan Health and Safety Standards, as well as the Health and Safety guidelines of the World Bank Group, including:

- workplace noise;
- workplace air quality;
- electrical safety in the workplace;
- working in confined spaces;
- general health and safety; and,
- personnel training.

The procedures will include internal incident tracking and a corrective action programme to monitor any incidents that may occur. BEC will be responsible and accountable for the actions of its company and employees. These responsibilities will be incorporated into the contract documents consistent with the recommendations of the EAP.

8.5 Implementation of the Environmental Action Plan

This section outlines the commitments of AESNP and BEC in relation to the staff resources, team structures and reporting lines required to implement the EAP. It also outlines the system for internal and external reporting and auditing in relation to environmental matters, and the proposed Change Management System that will be used to assess and manage the environmental impacts of future changes in project scope.

8.5.1 AESNP’s Commitments

In order to discharge its commitments with respect to management of biophysical impacts of the project, AESNP will designate an Environmental Manager who will be responsible for the implementation of the EAP and its components. The Environmental Manager’s key responsibilities will include the following:
• point of contact for the Construction Contractor’s Site Environmental Officer;

• ensure that all environmental protection procedures are followed as planned;

• review and approval of the Environmental components of the Construction Contractor’s Project Plan;

• audit the UEMoP;

• liaise with members of the public, local organisations and governmental and non-governmental organisations;

• liaise with other businesses potentially affected by the project; and,

• report results of mitigation and monitoring activities to NEMA, the lenders and other relevant parties.

The Environmental Manager shall report directly to AESNP’s Implementation Manager, and will be provided with sufficient support staff and facilities to allow all of AESNP’s environmental commitments to be discharged appropriately. The Environmental Manager and his team will fall within the overall Implementation Team for the project. The planned structure for the overall Implementation Team is outlined in Figure 8.5.

The Environmental Manager’s Team will be charged with management of issues in relation to the biophysical environment. With regard to the transmission system, these fall into two broad areas: the construction environment, and forests/wetlands. A Task Manager will be appointed to deal with each of these. Construction environment issues are those short-term issues arising directly from construction activities, e.g. traffic, noise, air quality and waste issues. The Forest/Wetlands Task Manager will be responsible for management of long-term impacts on the three Forest Reserves and on seasonal or permanent wetlands. Staffing requirements for management of hydropower issues are outlined in the separate volume for the hydropower component of the project.

Details of activities to be carried out by the Socio-Economic Environment Team are provided in the RAP, which accompanies this EIS.

A detailed plan for the tasks to be undertaken by the Environmental Department, in relation to construction activities and other project milestones, is shown in Figure 8.6.
Figure 8.5: AESNP Implementation Team Organisation Chart

Key:
TM = Task Manager
CIO = Community Information Officer
### Figure 8.6: Timeline of Transmission System Compensation, Resettlement, Mitigation and Community Development Activities

<table>
<thead>
<tr>
<th>ID</th>
<th>Task Name</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Approval of Project by Lenders</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Resettlement Action Plan</td>
<td>$7,522,049</td>
</tr>
<tr>
<td>3</td>
<td>Compensation process preparation</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Prepare household files from database</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Calculation of amount owing</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Check</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Develop detailed consultation methodology</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Option disclosure at L.C levels</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Preparation of schedule for individual consultations</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Individual disclosure/consultations on compensation options</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Update of database with individual consultation results</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Agreement on compensation certificates</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Resettlement process preparation</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Determine residents to resettle from consultation results</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Determine resettled residents who need building construction</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Determine resettlement areas from consultation results</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Agree with concerned PAPs on resettlement plots</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Identify &amp; acquire resettlement land</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Land acquisition process preparation</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Identify all persons concerned by Section 40 consents</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Obtain Section 40 consents together with comp. cont.</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Cash compensation</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Cash compensation payment</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Notice to vacate where applicable</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Moving of cash compensated people</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Resettlement of Physically Displaced Persons</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Cash compensation payment where applicable</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Notice to vacate where applicable (Kawanda)</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Construction of resettlement buildings</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Relocation implementation</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Assistance during moving and transition period</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>Appoint Witness NGO</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Witness NGO oversight</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>Evaluation</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>1st mission</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>2nd mission: 2 years after</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>Commerce post-implementation monitoring (5 years)</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>Construction</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Procure, Manufacture, Transport</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>Engineering</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>Foundation steelworks</td>
<td></td>
</tr>
</tbody>
</table>
Figure 8.6: Timeline of Transmission System Compensation, Resettlement, Mitigation and Community Development Activities

<table>
<thead>
<tr>
<th>ID</th>
<th>Task Name</th>
<th>Cost</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>43</td>
<td>Conductors, earthwires</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>Towers steelwork</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>Insulators, fittings etc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>220 kV Bujagali to Kawanda</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>Site survey, tower pegging, soil investigations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>Route clearance and access</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>Civil works</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>Tower erection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>51</td>
<td>Conductor stringing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>52</td>
<td>Inspection testing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>53</td>
<td>132 kV Mutundwe to Kawanda</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>Site survey, tower pegging, soil investigations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>Route clearance and access</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56</td>
<td>Civil works</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>57</td>
<td>Tower erection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>Conductor stringing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>59</td>
<td>Inspection testing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>2 x 132 kV Bujagali to Tororo/Owen Falls</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>Site survey, tower pegging, soil investigations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>62</td>
<td>Route clearance and access</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>Civil works</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>64</td>
<td>Tower erection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>Conductor stringing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>Inspection testing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>67</td>
<td>Kawanda Substation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>68</td>
<td>Engineering</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>69</td>
<td>Engineering &amp; Design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>Procurement, Manufacturing and Transport</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>71</td>
<td>Manufacturing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>72</td>
<td>Shipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>73</td>
<td>Transport</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>74</td>
<td>Construction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>Civil Works</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>76</td>
<td>Electrical Installations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>77</td>
<td>Commissioning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>78</td>
<td>Dry and wet testing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>79</td>
<td>Commissioning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>UEB Line Acceptance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>81</td>
<td>Environmental Mitigation Plan</td>
<td>$330,897</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>82</td>
<td>Environmental Management and Review</td>
<td>$10,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>83</td>
<td>Appoint Environmental Manager</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>84</td>
<td>Appoint EWE Manager/SEO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Project: Project1
Date: Thu 3/15/01
### Timeline of Transmission System Compensation, Resettlement, Mitigation and Community Development Activities

<table>
<thead>
<tr>
<th>ID</th>
<th>Task Name</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>65</td>
<td>Form Environmental Review Panel</td>
<td>$10,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>Form Forest Management Committee</td>
<td>$10,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>67</td>
<td>Environmental Planning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>68</td>
<td>Identity and designate Mukono/Lugazi storage yard site</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>69</td>
<td>Develop Project Plan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>Develop Environmental Manual</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>71</td>
<td>Develop detailed Construction Plan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>72</td>
<td>Develop Waste Management Plan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>73</td>
<td>Develop Traffic/Access Management Plan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>74</td>
<td>Develop Training Plan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>Commence Training Plan Implementation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>76</td>
<td>Detailed Environmental Mapping</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>77</td>
<td>Forest habitat and biodiversity</td>
<td>$316,087</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>78</td>
<td>Implement Forest Offset Plan</td>
<td>$142,457</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>79</td>
<td>Enrichment planting</td>
<td>$170,250</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>Tourism</td>
<td>$10,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>81</td>
<td>Relocate tourism facilities in Mabira Forest</td>
<td>$10,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>82</td>
<td>Archaeology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>83</td>
<td>Consult Dept of Antiquities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>84</td>
<td>Develop archaeology component of training plan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>85</td>
<td>Institutional Strengthening</td>
<td>$60,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>86</td>
<td>Consultations with UCB, Forest Dept and Local Authorities</td>
<td>$10,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>87</td>
<td>Develop and implement Inst Strengthening/TA programs</td>
<td>$50,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>88</td>
<td>Environmental Monitoring Plan</td>
<td>$148,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>89</td>
<td>Baseline Monitoring</td>
<td>$10,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>Noise</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>91</td>
<td>Air Quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>92</td>
<td>Reptile/amphibian survey</td>
<td>$10,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>93</td>
<td>Construction Monitoring</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>94</td>
<td>Compliance with Waste Management Plan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>95</td>
<td>Compliance with Traffic Management Plan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>96</td>
<td>Effluent quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>97</td>
<td>Construction Noise</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>98</td>
<td>Air quality at Kawanda</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>99</td>
<td>Reinstatement of wayleave</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>Operational Monitoring</td>
<td>$138,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>101</td>
<td>Reptile/amphibian survey</td>
<td>$10,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>102</td>
<td>EMF survey</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>103</td>
<td>Commerce forest diversity monitoring</td>
<td>$120,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>104</td>
<td>Commerce development control monitoring</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>105</td>
<td>Environmental Reporting and Review</td>
<td>$40,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>106</td>
<td>Quarterly reports to Environmental Manager</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Project:** Project
**Date:** Thu 3/15/01
**Task:** Milestone
**Milestone:** Summary
**Rolled Up Task:**

---

- **AESNP:** AESNP
- **BEC:** BEC
- **SP:** SP
- **ESNP:** ESP
- **EC:** EC
Figure 8.6: Timeline of Transmission System Compensation, Resettlement, Mitigation and Community Development Activities

<table>
<thead>
<tr>
<th>ID</th>
<th>Task Name</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Qtr 1</td>
<td>Qtr 2</td>
<td>Qtr 3</td>
<td>Qtr 4</td>
<td>Qtr 1</td>
</tr>
<tr>
<td>169</td>
<td>Review annual environmental reports 2</td>
<td>CTR</td>
<td>CTR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>170</td>
<td>Review annual environmental reports 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NEMI/FNC comments to AESNP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NEMA/ Lenders</td>
</tr>
<tr>
<td>171</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NEMA/Lenders</td>
</tr>
<tr>
<td></td>
<td>NEMI/FNC comments to AESNP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NEMA/Lenders</td>
</tr>
<tr>
<td>172</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NEMA/Lenders</td>
</tr>
<tr>
<td>173</td>
<td>NEMI/FNC comments to AESNP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NEMA/Lenders</td>
</tr>
<tr>
<td>174</td>
<td>NEMI/FNC comments to AESNP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NEMA/Lenders</td>
</tr>
<tr>
<td>175</td>
<td>NEMI/FNC comments to AESNP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NEMA/Lenders</td>
</tr>
<tr>
<td>176</td>
<td>Update EAP as necessary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AESNP</td>
</tr>
<tr>
<td>177</td>
<td>Update EAP as necessary 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AESNP</td>
</tr>
<tr>
<td>178</td>
<td>Update EAP as necessary 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AESNP</td>
</tr>
<tr>
<td>179</td>
<td>Update EAP as necessary 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AESNP</td>
</tr>
<tr>
<td>180</td>
<td>Update EAP as necessary 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AESNP</td>
</tr>
</tbody>
</table>

Project: Project 1
Date: Thu 3/15/01
8.5.2 BEC’s Commitments

BEC will designate an appropriately qualified Site Environmental Officer (SEO) acceptable to AESNP and NEMA, who will be responsible for implementation of the measures set out in the UEMP and UEMoP. The SEO’s key responsibilities will include the following:

- ensuring that all environmental protection procedures are followed;
- co-ordination of environmental monitoring of site-related activities in respect of BEC’s obligations;
- liaison and reporting with the Environmental Manager;
- monitoring of hazardous substances on site to ensure that the possibility of accidental release is minimised;
- ensure, where appropriate, that monitoring equipment required for the execution of the obligations of BEC are calibrated and maintained as required;
- promoting on-site environmental awareness;
- liaison with other businesses and industry; and,
- maintaining an Environmental Management System based on ISO 14001.

There may be occasions where BEC considers that outside bodies are required for specialist monitoring, training or consultation purposes. AESNP will be responsible for contacting any external parties, while the SEO shall co-ordinate any site-related monitoring conducted by those outside bodies and all monitoring results provided to BEC shall be reported directly to the Environmental Manager.

An alternative title for the SEO is the Environment/Working Environment (EWE) Manager. Skanska’s preliminary job description for the EWE Manager is included in Appendix 1.4.

The proposed structure of the EWE Department (to be headed by the SEO/EWE Manager) is outlined in Figure 8.7. The Field Inspectors will be appointed during the mobilization phase, and will be local staff with relevant environmental/engineering experience, who are fluent in local languages. The number of field inspectors may be adjusted upwards according to the environment on-site.
The EWE Manager will have overall responsibility for the activities of the EWE department (Figure 8.7). On a day-to-day basis the emphasis of his work will be upon liaison with AESNP’s Environmental Manager, and with relevant authorities, local residents and NGOs on environmental issues (i.e. external liaison). The responsibility for day-to-day management of the field team will be devolved to the EWE Field Co-ordinator. The field team will comprise Field Inspectors (a minimum of four, one of whom will be dedicated to the transmission system component of the project), supported by drivers and labourers. The Field Inspectors will maintain a permanent presence on site, carrying out routine checks of operating procedures and environmental monitoring as specified in Chapter 7.

Figure 8.7: BEC Environment/Working Environment Department Organisation Chart

8.5.3 Reporting lines and decision-making

Reporting the results of environmental monitoring allows the responsible agencies to identify if any mitigation measure is not being effective and will enable corrective action to be taken. During construction, AESNP will have the ultimate responsibility to ensure environmental reporting procedures are being undertaken. After handover of the transmission line, UEB will have ultimate responsibility to ensure that environmental reporting procedures are undertaken (Section 23 (3) of the National Environment Statute 1995).
The monitoring programme specified in Chapter 7 requires recurrent and *ad hoc* inspections and surveys for different parameters. A set of *pro forma* report documents will be drawn up and used by the Environmental Manager and SEO for recording the findings of these, and if necessary, reporting any exceptions to NEMA. These documents may be inspected and/or audited by NEMA and project lenders from time to time, in accordance with the above statute. A sample *pro forma* for monthly site inspections has been drawn up by BEC and is included in Appendix 1.5.

On a quarterly basis, the SEO will provide to the Environmental Manager a report containing monitoring results (and a summary of these), a synopsis of environmental issues encountered, and the efficacy of solutions to these issues. Extracts from a sample quarterly environmental report produced by Skanska (for a pipeline project in Zimbabwe) are provided in Appendix 1.6. The Environmental Manager will use these as the basis for quarter-yearly environmental reports, which will be circulated to all members of the Environmental Review Panel (the composition and functions of which are outlined in Chapter 7). AESNP’s quarterly reports will also include commentary on the implementation and efficacy of environmental mitigation actions implemented by AESNP.

The ERP will hold quarterly meetings, which will follow the issuance of quarterly environmental reports by the Environmental Manager. These meetings will be the forum for discussion of environmental issues, and decision-making with regard to further mitigation, monitoring, or changes to construction practices.

The Environmental Manager will provide annual environmental reports both to NEMA (as a requirement of the Environmental Impact Assessment Regulations) and to the lenders. This will provide the opportunity for NEMA and the lenders to comment both on the impacts of the project itself and the efficacy of the EAP. Where necessary, the EAP will be updated.

All monitoring and reporting documents will be kept on file for the life of the project, and will not be disposed of without permission from NEMA.

**8.5.4 Environmental Auditing**

Auditing of the environmental compliance of the project will be carried out at two levels: internal and external.
AESNP will carry out annual internal audits of its compliance with the requirements of the EAP, and any other environmental requirements, such as those imposed by NEMA and/or the lenders. The responsibility for implementing these audits will lie with the Environmental Manager, who may elect to employ external Consultants.

Audits of implementation of the RAP are outlined separately in the RAP document.

Internal audits are also a requirement of the Environmental Management System to be implemented as a requirement of Skanska’s ISO 14001 certification. Skanska has trained more than 500 auditors and inspectors for this work. Audits will be carried out at a minimum frequency of six months.

External audits of BEC’s environmental compliance will be carried out on an approximately yearly basis by Skanska’s ISO 14001 certification body (Det Norske Veritas: DNV). The exact timing of audits will be determined by DNV.

It is a NEMA requirement that annual environmental reports ('self-auditing') be submitted for review. The Environmental Manager will be responsible for compiling and submitting these reports, and will consult with NEMA to determine any additional mitigation measures or monitoring that is considered to be required. Self-audit reports will be compiled from internal and external audits carried out by both AESNP and BEC. It should be noted that the EIA Regulations require the names and qualifications of persons carrying out ‘self-auditing’ to be approved by the Executive Director of NEMA. Therefore the Environmental Manager and the SEO/EWE Manager will have to be approved by NEMA before official appointment.

**Change Management**

During the implementation of the project, change may be required to address unforeseen or unexpected conditions or situations. A change management process will be applied to ensure environmental and social issues are addressed as part of any significant changes to project procedures, processes, design or activities. Both AESNP and BEC will be responsible for managing changes within their respective areas of responsibility. AESNP will incorporate into its Environmental Manual, and BEC will incorporate into its project plan, a change management process similar to the following.

1. Identification of item/situation potentially requiring change.

2. Preparation of a Change Request Document that:
8.6 Responsibilities and Costs for Environmental Mitigation Measures

Table 8.1 below outlines the overall package of environmental mitigation measures that will be implemented in relation to the Bujagali transmission system (as outlined in detail in Chapter 7). The table also assigns general responsibilities for implementing each group of mitigation measures, and provide budget estimates and locations for each.

The detailed timelines provided in Figure 8.6 show the timings of environmental and social mitigation measures that will be carried out, in relation to construction and operational activities that make this mitigation necessary. The columns on the left hand side of the figure show the budget cost for each activity, and the responsibility for its implementation.

Consistent with the Bujagali Project's contracting strategy of integrating environmental protection and mitigation activities into the EPC Contractor's Scope of Work, the specifications for many of the activities were included in the bid package upon which BEC has developed its base rates. Therefore, since many of the costs associated with
environmental protection and mitigation activities are included in BEC’s base rates, it is not possible to present a detailed accounting of all the monies devoted to the project’s construction phase environmental protection and mitigation activities. These costs are therefore described as ‘Within construction budget’ in Table 8.1, but reported as $0 in Figure 8.6. Similarly, mitigation or monitoring measures that will be carried out by AESNP staff, with no additional expenditure required, are described as ‘Within operational budget’ in Table 8.1, and reported as $0 within Figure 8.6.

<table>
<thead>
<tr>
<th>Issue</th>
<th>Action/s</th>
<th>Location</th>
<th>Responsibility</th>
<th>Cost (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compensation/Resettlement of PAPs</td>
<td>Implement RAP</td>
<td>Transmission Line route and Kawanda substation site</td>
<td>AESNP</td>
<td>7.8 million</td>
</tr>
<tr>
<td>Environmental Management</td>
<td>Appoint Environmental Manager</td>
<td>To operate from AESNP Jinja/Kampala offices</td>
<td>AESNP</td>
<td>10,000</td>
</tr>
<tr>
<td>Environmental Management</td>
<td>Appoint Site Environmental Officer</td>
<td>To operate from Bujagali site office</td>
<td>BEC</td>
<td>10,000</td>
</tr>
<tr>
<td>Environmental Review</td>
<td>Form/chair Environmental Review Panel</td>
<td>Meetings at AESNP Jinja office</td>
<td>AESNP</td>
<td>10,000</td>
</tr>
<tr>
<td>Environmental Review</td>
<td>Form/chair Forest Management Committee</td>
<td>Meetings at AESNP Jinja office</td>
<td>AESNP</td>
<td>Within ERP budget</td>
</tr>
<tr>
<td>Environmental Review</td>
<td>Review annual self-monitoring reports from AESNP</td>
<td>Kampala/ Washington DC</td>
<td>NEMA/IFC</td>
<td>Within EIS fee</td>
</tr>
<tr>
<td>Environmental Reporting</td>
<td>Quarterly construction monitoring reports to Environmental Manager</td>
<td>Jinja</td>
<td>BEC (SEO)</td>
<td>Within SEO salary</td>
</tr>
<tr>
<td>Environmental Reporting</td>
<td>Quarterly monitoring reports to ERP/FMC</td>
<td>Jinja</td>
<td>AESNP (Environmental Manager)</td>
<td>Within Environmental Manager’s salary</td>
</tr>
<tr>
<td>Environmental Reporting</td>
<td>Submit annual self-monitoring reports to NEMA/IFC</td>
<td>Kampala</td>
<td>AESNP (Environmental Manager)</td>
<td>Within Environmental Manager’s salary</td>
</tr>
<tr>
<td>Economic and social effects, other than physical and economic displacement</td>
<td>As specified in Chapter 7</td>
<td>Transmission line route and Kawanda substation site</td>
<td>AESNP and BEC (as specified in Chapter 7)</td>
<td>Included in project budget (plus Social Responsibility fund)</td>
</tr>
<tr>
<td>Mukono/Lugazi storage yard</td>
<td>Designate in agreement with NEMA/AESNP</td>
<td>Mukono or Lugazi</td>
<td>BEC (SEO)</td>
<td>Within construction budget</td>
</tr>
<tr>
<td>Forest habitat/biodiversity issues</td>
<td>Implement forest offset proposal</td>
<td>Mabira CFR (possibly Kalagala Falls CFR)</td>
<td>AESNP (Forest/Wetland Task Manager)</td>
<td>USh 227.9 million</td>
</tr>
</tbody>
</table>
### Table 8.1: General Responsibilities for Environmental Mitigation Measures

<table>
<thead>
<tr>
<th>Issue</th>
<th>Action/s</th>
<th>Location</th>
<th>Responsibility</th>
<th>Cost (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enrichment planting</td>
<td>Enrichment planting</td>
<td>Mabira CFR</td>
<td>AESNP (Forest/Wetland Task Manager)</td>
<td>USh 282 million. Staged payments within above budget (linked to Environmental Manager confirming that planting and tending of forest sections has occurred)</td>
</tr>
<tr>
<td>Controlled access of roads improved during project</td>
<td>Controlled access of roads improved during project</td>
<td>Mabira CFR</td>
<td>BEC and AESNP (Forest/Wetland Task Manager)</td>
<td>Within construction budget</td>
</tr>
<tr>
<td>Construction-related forestry issues as specified in Chapter 7</td>
<td>Construction-related forestry issues as specified in Chapter 7</td>
<td>Mabira, Kifu &amp; Namyoya CFRs</td>
<td>BEC</td>
<td>Negligible</td>
</tr>
<tr>
<td>Ecotourism/recreation</td>
<td>Existing tourist facilities to be relocated and improved</td>
<td>Mabira CFR</td>
<td>BEC and AESNP (Forest/Wetland Task Manager)</td>
<td>USD 10,000</td>
</tr>
<tr>
<td>Bird flight paths</td>
<td>Make conductors more conspicuous</td>
<td>Lubigi Swamp, seasonal swamps</td>
<td>BEC (SEO)</td>
<td>Within construction budget</td>
</tr>
<tr>
<td>Traffic and access issues</td>
<td>As specified in Chapter 7</td>
<td>Transmission line route, substations and access roads</td>
<td>BEC (SEO) in consultation with AESNP (Environmental Manager)</td>
<td>Within construction budget</td>
</tr>
<tr>
<td>Construction noise</td>
<td>As specified in Chapter 7</td>
<td>Transmission line route and Kawanda substation</td>
<td>BEC (SEO)</td>
<td>Within construction budget</td>
</tr>
<tr>
<td>Air quality</td>
<td>As specified in Chapter 7</td>
<td>Kawanda substation</td>
<td>BEC (SEO)</td>
<td>Within construction budget</td>
</tr>
<tr>
<td>Erosion control</td>
<td>As specified in Chapter 7</td>
<td>Transmission line route and Kawanda substation</td>
<td>BEC (SEO)</td>
<td>Within construction budget</td>
</tr>
<tr>
<td>Effluent disposal</td>
<td>As specified in Chapter 7</td>
<td>Storage yard and construction sites</td>
<td>BEC (SEO)</td>
<td>Within construction budget</td>
</tr>
<tr>
<td>Solid waste management</td>
<td>As specified in Chapter 7</td>
<td>Storage yard and construction sites</td>
<td>BEC (SEO)</td>
<td>Within construction budget</td>
</tr>
<tr>
<td>Hazardous waste management</td>
<td>As specified in Chapter 7</td>
<td>Storage yard and construction sites</td>
<td>BEC (SEO)</td>
<td>Within construction budget</td>
</tr>
<tr>
<td>Archaeology</td>
<td>As specified in Chapter 7</td>
<td>Transmission line route and Kawanda substation site</td>
<td>AESNP (Environmental Manager) and BEC (SEO), in agreement with Antiquities Dept</td>
<td>Within construction budget</td>
</tr>
<tr>
<td>Occupational Health and Safety</td>
<td>As specified in Chapter 7</td>
<td>Storage yard (during construction phase only), transmission line and substations</td>
<td>BEC (SEO)</td>
<td>Within construction budget</td>
</tr>
<tr>
<td>HIV/AIDS Mitigation</td>
<td>As specified in Chapter 7</td>
<td>Areas of concentrated workers</td>
<td>BEC (El)</td>
<td>Within construction budget</td>
</tr>
<tr>
<td>EMFs</td>
<td>As specified in Chapter 7</td>
<td>Transmission line route and Kawanda substation site</td>
<td>BEC (SEO)</td>
<td>Within construction budget</td>
</tr>
<tr>
<td>Public Safety and Security</td>
<td>As specified in Chapter 7</td>
<td>Storage yard (during construction phase only), transmission line route, substations, public highways and access roads</td>
<td>BEC (SEO)</td>
<td>Within construction budget</td>
</tr>
<tr>
<td>Institutional Strengthening</td>
<td>As specified in Chapter 8</td>
<td>Kampala, Mpiigi and Mukono districts</td>
<td>AESNP</td>
<td>50,000</td>
</tr>
</tbody>
</table>

Note: Details of responsibilities, timescales and costs for individual activities are provided in Figure 8.6.
8.7 Responsibilities and Costs for Environmental Monitoring Measures

Table 8.2 outlines the overall package of environmental monitoring that will be carried out in relation to the Bujagali electricity transmission system (as outlined in detail in Chapter 7). The table also assigns responsibilities for each monitoring activity, and proposes parties who are capable of carrying out the monitoring, on behalf of the responsible body. Detailed timelines for monitoring, and cost estimates for monitoring activities are included in Figure 8.6.

It should be noted that, consistent with the strategy of integrating environmental protection and mitigation activities into the EPC Contractor’s Scope of Work, the specifications for many of the construction-related monitoring activities were included in the bid package upon which BEC developed its base rates. Therefore it is not possible to develop a definitive accounting of all the monies devoted to the project’s construction phase environmental monitoring activities.

Although the EIS is not binding on UEB (or its successor organisation), which will take ownership of the line during operation, a number of monitoring recommendations are made for the operational phase.
<table>
<thead>
<tr>
<th>Parameter to be monitored</th>
<th>Reason for monitoring</th>
<th>Monitoring location</th>
<th>Monitoring method</th>
<th>Recommended trigger level</th>
<th>Responsibility for instigation</th>
<th>Responsibility for execution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compliance with OD 4.30 OP4.12 Involuntary Resettlement</td>
<td>Outlined in RAP volume</td>
<td>Outlined in RAP volume</td>
<td>Outlined in RAP volume</td>
<td>To be determined by Independent Auditor</td>
<td>AESNP/Independent Auditor</td>
<td>AESNP</td>
</tr>
<tr>
<td>Compliance with Construction Contractor's Traffic Management Plan</td>
<td>Public and worker safety</td>
<td>Access roads and laydown areas</td>
<td>Visual inspection of site and traffic records</td>
<td>Any sign of non-compliance</td>
<td>BEC (SEO)</td>
<td>BEC (SEO) with relevant District Engineer's</td>
</tr>
<tr>
<td>Public highways: abnormal loads</td>
<td>Damage to highway structures</td>
<td>Highways identified for transporting abnormal loads</td>
<td>Visual inspection and photographs before and after movement of loads</td>
<td>Significant deterioration</td>
<td>BEC (SEO)</td>
<td>BEC (SEO) with relevant District Engineer's</td>
</tr>
<tr>
<td>Safety of wayleave during construction, including storage and laydown areas</td>
<td>Public and worker safety</td>
<td>Working area of wayleave</td>
<td>Visual inspection</td>
<td>Any non-compliance with measures outlined in Chapter 7 and in Project Plan</td>
<td>BEC (SEO)</td>
<td>BEC (SEO) with relevant District Engineer's</td>
</tr>
<tr>
<td>Solid Waste Management</td>
<td>Minimise environmental impact</td>
<td>Working area of wayleave, plus designated disposal site</td>
<td>Visual inspection</td>
<td>Non-compliance with WMP</td>
<td>BEC (SEO)</td>
<td>BEC (SEO) with relevant District Engineer's</td>
</tr>
<tr>
<td>Effluent quality: all NEMA determinants</td>
<td>Comply with Ugandan effluent standards (1999)</td>
<td>All effluent discharge locations, e.g. downstream of any site ablation blocks</td>
<td>Sampling and APHA analysis</td>
<td>see NEMA (1997)</td>
<td>BEC (SEO)</td>
<td>BEC (SEO) with relevant District Engineer's</td>
</tr>
<tr>
<td>Effluent quality: BOD, TSS, bacteria, nutrients, pH, temperature, EC</td>
<td>Comply with Ugandan effluent standards (1999)</td>
<td>All effluent discharge locations, e.g. downstream of any site ablation blocks</td>
<td>Sampling and APHA analysis</td>
<td>see NEMA (1997)</td>
<td>BEC (SEO)</td>
<td>BEC (SEO) with relevant District Engineer's</td>
</tr>
<tr>
<td>Noise</td>
<td>Establish baseline conditions</td>
<td>Residences nearest to Kawanda substation site</td>
<td>Instrumental monitoring according to NEMA (1997a)</td>
<td>None (baseline monitoring only)</td>
<td>BEC (SEO)</td>
<td>BEC (SEO) with relevant District Engineer's</td>
</tr>
<tr>
<td>Noise</td>
<td>Minimise impact on neighbouring residences</td>
<td>15 m from site boundary, or 1 m from nearest affected building if located more than 15 m from site boundary (at main store and Kawanda substation)</td>
<td>Instrumental monitoring according to NEMA (1997a)</td>
<td>NEMA (1997a) levels</td>
<td>BEC (SEO)</td>
<td>BEC (SEO) with relevant District Engineer's</td>
</tr>
<tr>
<td>Noise</td>
<td>Minimise impact on neighbouring residences</td>
<td>Construction site</td>
<td>Maintain and review register of residents' complaints</td>
<td>To be determined by SEO</td>
<td>BEC (SEO)</td>
<td>BEC (SEO) with relevant District Engineer's</td>
</tr>
<tr>
<td>Air Quality</td>
<td>Prevent dust impact near Kawanda site</td>
<td>As for noise monitoring at Kawanda</td>
<td>Instrumental monitoring according to NEMA (1997b)</td>
<td>According to NEMA (1997b)</td>
<td>BEC (SEO)</td>
<td>BEC (SEO) with relevant District Engineer's</td>
</tr>
<tr>
<td>Parameter to be monitored</td>
<td>Reason for monitoring</td>
<td>Monitoring location</td>
<td>Monitoring method</td>
<td>Recommended trigger level</td>
<td>Responsibility for instigation</td>
<td>Responsibility for execution</td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>---------------------------</td>
<td>---------------------------------------------------</td>
<td>----------------------------------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td>Reinstatement of wayleave and laydown areas</td>
<td>Erosion control</td>
<td>Wayleave areas where construction activities have ceased</td>
<td>Visual inspection</td>
<td>Any sign of failure to reinstate at least to grass</td>
<td>AESNP (Environmental Manager)</td>
<td>AESNP (Environmental Manager)</td>
</tr>
<tr>
<td>EMF</td>
<td>Ensure compliance with international guidelines</td>
<td>Each village along t-line route</td>
<td>Instrumental determination of field strength</td>
<td>ICNIRP standards</td>
<td>BEC</td>
<td>UEB</td>
</tr>
<tr>
<td>Species diversity</td>
<td>Potential impacts on amphibians and reptiles</td>
<td>Amphibian and reptile surveys at Mabira CFR and Lubigi swamp</td>
<td>Trap and count</td>
<td>Significant decrease</td>
<td>AESNP</td>
<td>AESNP</td>
</tr>
<tr>
<td>Forest species diversity</td>
<td>Ensure no loss of biodiversity</td>
<td>Transects used for baseline monitoring</td>
<td>As outlined for baseline monitoring</td>
<td>Significant decrease after 5 years</td>
<td>AESNP (Environmental Manager)</td>
<td>UEB (via MUIENR/Forest Department)</td>
</tr>
<tr>
<td>Forest habitat</td>
<td>Survey establishment of plants in valley corridors</td>
<td>Sites outlined in Chapter 7</td>
<td>DBH surveys and tree counts</td>
<td>No improvement in tree cover after 2 years</td>
<td>AESNP (Environmental Manager)</td>
<td>UEB (via MUIENR/Forest Department)</td>
</tr>
<tr>
<td>Forest habitat</td>
<td>Survey establishment of plants in wayleave margins</td>
<td>Transects used for baseline monitoring</td>
<td>DBH surveys and tree counts</td>
<td>No improvement in tree cover after 2 years</td>
<td>AESNP (Environmental Manager)</td>
<td>UEB (via MUIENR/Forest Department)</td>
</tr>
<tr>
<td>Compliance with UEB policy on development in wayleave</td>
<td>Prevent EMR risk to residents and risk to UEB asset</td>
<td>Entire wayleave</td>
<td>Visual inspection</td>
<td>As per UEB policy</td>
<td>UEB</td>
<td>UEB (with Local Planning Authority)</td>
</tr>
</tbody>
</table>
8.8 Institutional Strengthening

This section outlines the framework that AESNP will adopt for ensuring that the third party institutions that are assigned responsibilities under the EAP have the capacity to discharge these responsibilities.

The approach that will be taken by AESNP will be guided by the following principles:

1. Any capacity to be developed within Ugandan institutions for dealing with or monitoring environmental impacts of the Bujagali project should be transferable, such that it can be used in relation to other projects or plans; and,

2. Where appropriate, institutional strengthening should be integrated with existing programmes being planned or implemented by the institutions themselves, or by national or international organisations such as NGOs, lenders and aid agencies.

Several governmental agencies at both the local and national levels will be responsible for ongoing monitoring of construction and operational conditions and activities. In general AESNP will consult with the applicable agencies to establish the extent of each agency’s ‘in house’ capability for managing such activities, and identify any shortfalls.

The general process to be followed to establish institutional strengthening needs is as follows:

- discuss the mandate and monitoring responsibilities of each agency, and develop a monitoring plan that will include details of procedures, equipment requirements and staff requirements;
- establish the Agency’s ‘in house’ capability for managing such activities, and identify any shortfalls;
- develop, in consultation with the Agency, a plan for meeting these shortfalls;
- assist the Agency to implement a specific capacity building plan, taking into account other capacity building programs being planned or implemented by government or international organisations; and,
- monitor the effectiveness of institutional strengthening measures, and carry out any further measures as required.

Preliminary information about the institutional strengthening needs of the key government agencies involved, based on preliminary consultations during the EIA process, is outlined below.
8.8.1 Uganda Energy Board (UEB)

Following transfer of ownership of the transmission system to UEB, UEB will be responsible for:

- worker health and safety during operation and maintenance;
- public health and safety during operation and maintenance; and
- ongoing monitoring of compliance with the ecological objectives of the project (re-establishment of biodiversity in wayleave corridor and in adjacent forest areas).

The first two points are understood to be covered in UEB’s operational procedures, which are confidential documents. The third point is likely to require the establishment of an environmental monitoring capability within UEB. This is a task for AES’s Environmental Manager during the construction phase. Identified actions are as follows:

- establish final recommended monitoring programme in consultation with UEB. This will be based on that used for establishment of baseline conditions, and modified to take into account final mitigation measures. Plan should include details of procedures, equipment requirements and staff requirements;
- consult with UEB to establish the extent of UEB’s ‘in house’ capability for managing such activities, and identify any shortfalls. Note that in-house ecological capability is not necessarily required, as this exists within other organisations (e.g. MUIENR, Forest Department); however, general knowledge of the issues, and the ability to manage a monitoring programme will be required;
- develop, in consultation with UEB, a plan for meeting these shortfalls;
- assist UEB in implementing this specific capacity building plan, taking into account other capacity building programs being planned or implemented by government or international organisations; and,
- monitor effectiveness during operational phase, and take further action if necessary.

8.8.2 Forest Department

The Forest Department will be responsible for the following activities during the operational phase:

- ongoing management and monitoring of the forest offset area/s; and,
- ongoing management and monitoring of areas to undergo enrichment planting.
AESNP will ensure that the Forest Department has sufficient capacity to carry out these activities as defined in Chapters 7 and 8 of this EIS. In doing so, the over-riding objective will be to develop capacity within the Forest Department in accordance with its own plans, in particular the Forestry Nature Conservation Master Plan of March 1999. Specific objectives of this plan include development of capacity. Refer to Appendix C.4 extracts from this Plan.

8.8.3 Local Planning Authorities

The Town and Country Planning Act requires each District to prepare a Structure Plan (only Kampala District has done this so far). Two stages for strengthening, as follows:

- consult local authorities to establish the potential for re-zoning of wayleave corridors as 'electrical transmission' use or similar, i.e. establish the legal basis for effective development control; and,

- ensure that local authorities have the capacity to maintain effective development control within wayleave corridor (resources and training). This will take into account other capacity building programs being planned or implemented by government or international organisations.

8.8.4 NEMA

NEMA has a dedicated Environmental Assessment group, which has full capability assess EIAs, and for monitoring the compliance of projects with environmental regulations. Consultation with NEMA has indicated that no strengthening of its capabilities will be required in order to oversee the environmental aspects of this project.

8.9 Cash Flow for Mitigation, Monitoring and Community Development

Table 8.3 summarises the project cashflows for environmental and social mitigation and monitoring measures, with regard to the transmission system component of the Bujagali hydropower project. The table is broken down into quarterly cashflows within broad expenditure categories. A detailed breakdown of cashflows is included within Figure 8.6.
This page is intentionally blank.
Table 8.3. Cashflows for environmental and social mitigation and monitoring (thousand USD)

<table>
<thead>
<tr>
<th>Resettlement Action Plan</th>
<th>7,523</th>
<th>7,523</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Mitigation Plan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental Management and Review</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Forest habitat and biodiversity</td>
<td>319</td>
<td>143</td>
</tr>
<tr>
<td>Institutional Strengthening</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Relocate tourism facilities in Mabira CFR</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Environmental Monitoring Plan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline monitoring</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Construction Monitoring</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Operational Monitoring</td>
<td>138</td>
<td></td>
</tr>
<tr>
<td>Environmental Reporting and Review</td>
<td>40</td>
<td>3</td>
</tr>
<tr>
<td>Grand Total</td>
<td>8,110</td>
<td></td>
</tr>
</tbody>
</table>

Note: cashflows for mitigation and monitoring of construction-related impacts are included in EPC contract price, and are not duplicated in this table.
9. REFERENCES


http://hivinsite.ucsf.edu/international/africa/2098.41a6.html


Knight Piésold and Merz and McLellan Consulting Engineers. 1999. *Bujagali Hydropower Project Addendum to the Feasibility Study (Draft).*


Mabira Forest Reserve Biodiversity Report, Republic of Uganda, 1996.


Steadman Research Services, 2000. *Local Non-Governmental Organisations (NGOs) Opinions on the Bujagali Hydro Project in Uganda.*

Uganda Department of Forestry, 1996 "National Biomass Study"


